New Hampshire DOT
Department of Transportation

STATEWIDE FREIGHT PLAN

FINAL REPORT
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List of Acronyms

AADT	Average Annual Daily Traffic
AET	All-Electronic Tolling
CAGR	Compound Annual Growth Rate
CAV	Connected and Automated Vehicle
CCTV	Closed Circuit Television
CRFC	Critical Rural Freight Corridors
CUFC	Critical Urban Freight Corridors
DMS	Dynamic Message Signs
DOT	Department of Transportation
ELD	Electronic Logging Devices
FAA	Federal Aviation Administration
FAF	Freight Analysis Framework
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTZ	Foreign-Trade Zone
FY	Fiscal Year
GACIT	Governor's Advisory Council on Intermodal Transportation
GIS	Geographic Information Systems
GPS	Global Positioning Satellite
HCM	Highway Capacity Manual
HOS	Hours of Service
INFRA	Infrastructure for Rebuilding America Grant
IRAP	Industrial Rail Access Program
ITS	Intelligent Transportation System
LNG	Liquefied Natural Gas
LOI	Letter of Interest
LOTTR	Level of Travel Time Reliability
LRTP	Long Range Transportation Plan
MLW	Mean Low Water
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NHDES	New Hampshire Department of Environmental Services
NHDOT	New Hampshire Department of Transportation
NHFN	National Highway Freight Network

NHFP	National Highway Freight Program
NHS	National Highway System
NMFN	National Multimodal Freight Network
NPIAS	National Plan of Integrated Airport Systems
NPMRDS	National Performance Management Research Data Set
O&M	Operations & Maintenance
ORT	Open Road Tolling
PBS	Professional and Business Services
PHFS	Primary Highway Freight System
PHMSA	Pipeline and Hazardous Materials Safety Administration
PM3	System Performance Measures (FHWA)
PPP/P3	Public Private Partnerships
RA	Rest Area
RPC	Regional Planning Commission
RWIS	Road Weather Information Systems
SFAC	State Freight Advisory Committee
SMHT	Smart Manufacturing/High Technology
STIP	Statewide Transportation Improvement Plan
TEU	Truck Equivalent Unit
TIGER	Transportation Investment Generating Economic Recovery Grant
TIP	Transportation Improvement Plan
TMA	Transportation Management Area
TMC	Traffic Message Channel (referred to as a TMC Link or TMC Segment)
TMC	Traffic Management Center
TSM&O	Transportation Systems, Management, & Operations
TTAC	Technical Transportation Advisory Committee
TYP	Ten Year Plan
UPWP	Unified Planning Work Program
VSLS	Variable Speed Limit Signs
WIC	Welcome & Information Center

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Executive Summary

The New Hampshire Statewide Freight Plan is a plan for present and future freight activities: the freight system, statewide economic context, freight needs, and projects and policies that will help New Hampshire maintain its quality of life and economic competitiveness by reducing the cost of transporting goods and improving the reliability of New Hampshire's freight infrastructure. The Fixing America's Surface Transportation Act (FAST Act) was adopted in December 2015. The FAST Act requires states that receive funding under the National Highway Freight Program (NHFP) to develop a Statewide Freight Plan.

Statewide Freight System

Highway System

The highway system provides critical first and last mile connections, access to the National Highway Freight Network (NHFN) for long haul truck trips, and access from businesses, warehouses, and distribution centers to railroads, ports, and airports. The vast majority of freight in New Hampshire relies on trucks for at least a portion of its supply chain. In fact, as the main transportation system in the state, more than 95% of goods are transported on New Hampshire's highway system.

New Hampshire puts an emphasis on maintaining a state of good repair for its infrastructure system, including roadways and bridges. Pavement conditions, red list bridges, and height/weight restricted bridges are reevaluated and updated on a periodic basis. Since Interstates carry the highest traffic volumes, both passenger cars and trucks, measures have been taken to ensure that the Interstates operate at acceptable levels of service and provide a safe and reliable route for the movement of freight and goods.

Rail System

The rail system consists of 443 route miles of active rail lines. Through traffic makes up the highest share of New Hampshire's rail freight activity, with approximately 81% based on tonnage and 95% based on value. Changes in the rail industry over the last two decades have resulted in consolidation of larger Class I railroads, abandonment of light density rail lines, and the creation of regional railroads and local short line freight railroads.

For through rail freight flows, the commodities that use rail as the primary mode of transport to origins and destinations outside of New Hampshire are currently using these services already. For inbound and outbound rail flows with origins and destinations within the state, most New Hampshire rail customers are located on branch lines that cannot handle heavier cars. As a result, customers usually face issues such as shipping delays, additional transloading fees, or penalty costs for partially filling higher capacity cars to stay within track limitations.

Airport System

The airport system consists of three primary commercial service airports: Lebanon Municipal Airport, Manchester-

Boston Regional Airport, and Portsmouth International Airport at Pease - cargo services are available at two of the three airports. The Manchester Airport serves as a regional cargo hub for both FedEx and UPS, and there are regional truck warehouses located in the vicinity, while the Pease International Tradeport handles and clears international cargo.

There are currently no cargo rail service stops at the airports in New Hampshire. Changes are not anticipated in the foreseeable future due to lack of demand. However, if future development opportunities (e.g. seafood and E-commerce air cargo service), come to fruition over time, cargo rail service stops can be revisited to see if future demands support these additional rail services.

Marine System

The marine system consists of Portsmouth Harbor and the terminals hosted along the Piscataqua River. The Market Street Terminal is the only public access, general cargo terminal on the Piscataqua River. With onsite rail access and close proximity to I-95 and the Portsmouth International Airport at Pease, the Port is capable of handling imports, exports, and specialty on-demand services. Due to construction of the Sarah Mildred Long Bridge and existing structural deficiencies, the Main Wharf at the Market Street Terminal will require rehabilitation and enhancements. Without significant improvements, the Port is in danger of complete closure by the end of 2021.

If funding can be secured, the Port will be in a better position to grow its business of New England – Canadian cargo. For general cargo operations to be successful, it is imperative to be able to offer flexible, reliable, and convenient services. The Port of Portsmouth's proximity to I-95 and other north-south highway connections, its geographic proximity to key markets for fresh products and rail service, and the Port's drive to continue and grow operations will help make the Port an attractive location for the expansion of transportation services.

Key Findings and Recommendations

Key findings regarding freight transportation projections for the state of New Hampshire are noted below.

Highway System

- Mode split is not expected to change significantly by 2040. The highway system will likely continue as the dominant mode of travel for freight shipments.
- Through truck traffic is not expected to change by 2040 and will likely be dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England.
- Top outbound and inbound trading partners via truck mode are neighboring states. These trade partnerships are expected to continue through 2040.
- Top outbound and inbound commodities by tonnage via truck mode are not expected to change, only their ranking order. For exports, the state is expected to diversify into new sectors of high value electronic equipment. For imports, construction related commodities are expected to decline while liquefied gas shipment trucks from Massachusetts are expected to double.

Rail System

- The distribution of through/outbound/inbound rail traffic in the state is expected to remain consistent through 2040. Outbound rail tonnage is estimated to grow quicker at 3% followed by through at 1.7% and inbound at 1% from 2015 to 2040.
- By 2040, rail projections reveal the following predications:
    - Almost 50% of rail imports are expected from Canada (Quebec and British Columbia).
    - Coal imports will likely decline by 47% as environmental groups push for a switch to clean energy (specifically, the Bow Power Plant is closing)
    - Outbound traffic is expected to grow 3.0% by weight and 2.2% by value, due to growth in sand and gravel shipments to Massachusetts.

Air System

- Air freight is projected to grow robustly through 2040, increasing by almost 47% from $6.6 billion to $11.5 billion.
- Electrical, manufacturing and optical equipment compose a large share of air freight volume. These commodities reflect the high-value manufacturing activity of the State.

Marine System

- By 2040, marine freight exports by value are expected to increase by almost 4 times the 2015 value from $327 million to $1.62 billion.
- By 2040, total exports by value are expected to increase due to high value goods like machinery and electric equipment, namely electronic data processing equipment. Spain, China and Japan are expected to be the top importers of electronics and electrical equipment.
- Inbound freight accounts for 98% of all marine tonnage, and 100% of domestic traffic (all domestic traffic is inbound).
- New shipment opportunities should be explored to see if the marine mode of transport is a feasible and viable option, especially for the top goods produced in New Hampshire.

Top trading partners, commodities, and mode splits are not anticipated to change in the future for highway, rail, air, and marine freight transportation in New Hampshire. But the magnitude of goods movement is expected to increase over time across all modes, so it is important to factor the anticipated growth and freight routes into future freight funding considerations.

The majority of freight destined and originated in New Hampshire is from neighboring New England and northeastern states. Freight from these states travel mostly on trucks which puts stress on the highways connecting them. New Hampshire should continue investing in the highway system to keep up with growing freight demand. The shipment of high value manufactured goods is expected to increase for both air and marine modes. Infrastructure related improvements, along and further logistical analysis will put the state in a better position to handle the anticipated increases in freight activity.

It is highly recommended to incorporate insights from the freight plan's project prioritization efforts and critical freight corridor designations into broader discussions relative to formal project planning, programing, or funding decisions for the STIP and TYP. This will allow the state to plan accordingly for current and future freight needs across all modes of transportation, and the utilize other funding opportunities specific to freight enhancement.

FAST Act Freight Plan Requirements & Compliance

The most recent FAST Act guidance addresses ten overall requirements/topics to be addressed by statewide freight plans. These requirements will be cross-referenced to relevant chapters in the NH Freight Plan (*Exhibit ES-1)*. While most of the FAST Act freight planning requirements are carried over from the criteria designated in MAP-21, the major changes or additions for FAST Act compliancy include the following:

CUFC/CRFC Routes

Critical urban freight corridors (CUFC) and critical rural freight corridors (CRFC) must be designated by the State and MPOs per 23 U.S.C. 167. The critical freight corridor candidates identified in this State Freight Plan will help inform designation efforts, which includes approximately 75 miles of CUFC routes and 150 miles of CRFC routes. The related discussion, tables, and mapping can be found in Section 3.2.2 and *Appendix C-7*.

Multimodal Freight

Multimodal critical rural freight facilities and corridors must be designated by the State per 49 U.S.C. 70103. Beyond the current CRFC routes, NHDOT has not included specific multimodal additions under this provision but will continue to monitor needs/interests into the future. As part of future policies and strategies, further studies will be carried out to identify potential transload or intermodal facilities within the state. The policies related to this topic can be found in Section 3.2.3 and *Appendix C-6*.

The specific policies/strategies and implementation next steps related to multimodal freight designations are noted as below.

- ***Multimodal Freight Policy/Strategy #1****:*
  Support opportunities for intermodal facilities and multimodal expansion.

  Multimodal Freight Implementation Next Steps #1:
  Conduct a study to identify key rail, port, and airport intermodal transfer points. Based on cost and feasibility, determine potential transload facilities for intermodal consideration

- ***Multimodal Freight Policy/Strategy #2:***
  Provide guidance to analyze & improve multimodal first/last mile connections and access to major intermodal centers and manufacturing hubs.

  Multimodal Freight Implementation Next Steps #2*:*
  Develop a general design guide to help improve access to key freight facilities

Freight Investment Plan

A fiscally constrained freight investment plan must be included as part of the statewide freight plan, specifically related to projects that will use the new formula-based National Highway Freight Program (NHFP) funds provided under the FAST Act. NHDOT is allocated just over $26 million in total NHFP funds for use in FY 2016-2020.

Previously in 2017 and 2018, NHFP funds were obligated for NHDOT Project #15880, a roadway and bridge rehabilitation project located on I-89. Based on eligible project identification and prioritization efforts carried out as part this plan, three additional projects have been proposed to receive the remaining New Hampshire NHFP funding allocations, as summarized in *Exhibit ES-2*.

Exhibit ES-1: FAST Act Freight Planning Requirements and New Hampshire Compliance

FAST Act Requirements (49 USC 70202)	**2018 New Hampshire Statewide Freight Plan**								
	Section 1.1 Project Overview & Premise	**Section 1.2** Inventory & Assessment	**Section 1.3** Freight Institution & Roles	**Section 2.1** Economic Context	**Section 2.2** Freight Profile	**Section 2.3** Freight Focus Areas & Needs	**Section 3.1** Freight System Analysis and Project Development	**Section 3.2** Action Plan	**Section 3.3** Resources & Applications
Requirement 1 Freight System Trends, Needs, and Issues		✓		✓	✓	✓			
Requirement 2 Freight Policies, Strategies, and Performance Measures							✓	✓	
Requirement 3 Freight Network Facilities								✓	
Requirement 4 National Freight Policy/Program Support	✓							✓	
Requirement 5 Innovative Technology Considerations		✓				✓			
Requirement 6 Roadway Deterioration and Mitigation Strategies		✓				✓			
Requirement 7 Freight Mobility Issues and Mitigation Strategies		✓				✓			
Requirement 8 Freight Induced Congestion and Mitigation Strategies						✓			
Requirement 9 Freight Investment Plan							✓	✓	
Requirement 10 State Freight Advisory Committee Consultation			✓						✓

Exhibit ES-2: Freight Investment Plan for National Highway Freight Program (Z460) Funding

Ranking Score	NHDOT Project #	Project	Phase	FY	Federal NHFP Funding	Non-Federal Funding	Expenditures (Per Fiscal Year)	*TOTAL Project Funding Required
(PREVIOUSLY OBLIGATED NHFP FUNDING)	15880	**I-89** FROM NORTH OF HARDY HILL RD BRIDGE NORTH 5 MILES TO SOUTH OF EXIT 20 - REHABILITATE ROADWAY & BRIDGES	CON	2017	9,401,547	-	**9,401,547**	**$16,030,583**
			CON	2018	1,233,815	-	**1,233,815**	
			Project Sub-Total		**10,635,362**	**-**	**10,635,362**	
4.90	16148	**I-89 NB & SB** SUPERSTRUCTURE REPLACEMENT & WIDENING, I-89 NB & SB OVER CONNECTICUT RIVER (BR NO 044/103 & 044/104)	CON	2019	7,936,545	33,012,553	**40,949,098**	**$40,051,898**
				2020	-	-	**-**	
				2021	-	-	**-**	
			Project Sub-Total		**7,936,545**	**33,012,553**	**40,949,098**	
4.85	13742	**I-93** WIDENING FROM I-89 TO BETWEEN EXIT 15 AND 16	PE	2019	7,752,427	9,903,987	**17,656,414**	**$329,723,635 (for PE, ROW, CON)**
				2020	-	-	**-**	
				2021	-	-	**-**	
				2022	-	-	**-**	
				2023	-	-	**-**	
				2024	-	-	**-**	
				2025	-	-	**-**	
				2026	-	-	**-**	
			Project Sub-Total		**7,752,427**	**9,903,987**	**17,656,414**	
					26,324,334	**42,916,540**	**69,240,874**	

**Funding Summary (All Projects)	FY	Federal NHFP Funding	Non-Federal Funding	Expenditures (Per Fiscal Year)	Annual NHFP Apportionments	Unused NHFP Balance at End of FY
FY 2016-2020	2016	-	-	**-**	4,805,235	4,805,235
	2017	9,401,547	-	**9,401,547**	4,596,312	-
	2018	1,233,815	-	**1,233,815**	5,014,159	3,780,344
	2019	15,688,972	42,916,540	**58,605,512**	11,908,628	-
	2020	-	-	**-**		-
Overall 2016-2020		**26,324,334**	**42,916,540**	**69,240,874**	**26,324,334**	**-**

**Total based on funding needs in 2017-2020 STIP, 2019-2028 TYP, & FY 2018 BUILD Grant Application - includes funds secured in previous years not shown.*

***Funding summary shows the federal NHFP funding allocations for each fiscal year, and the remaining balance at the end of each fiscal year (accounts for annual NHFP apportionments through FY 2020).*

Freight Keeps the Economy Moving

Freight transportation is a key component to the quality of life enjoyed by the residents of New Hampshire, although most people only think about freight indirectly when they see trucks on the road, trains passing by on their tracks, or ships pulling into port. Most food and goods purchased in stores, fuel that heats homes, and materials used for construction rely on trucks, ships, trains, jets, and pipelines to connect places where raw materials are gathered, then processed into useful products and where they are ultimately purchased or consumed.

The New Hampshire Statewide Freight Plan will help support future freight planning efforts. Knowledge of the freight system, economic drivers, freight needs, projects, and policies will help the state maintain its quality of life and economic competitiveness by reducing the cost of transporting goods and improving the reliability of statewide freight infrastructure.

Why is Freight Important?

The efficient and reliable movement of goods is a key component to New Hampshire's economic vitality and long-term sustainability. The cost of transportation accounts for approximately 10% of the cost of the product. Improving freight efficiency and connectivity helps New Hampshire's industries compete in statewide, regional, national and global markets. In addition, freight and distribution directly create jobs in ports, airports, trucking, and trains that are critical to the state's economy. This includes all the unseen teams of people employed to ensure that products are traveling in the most cost-efficient manner. They transfer products on and off trucks, ships, airplanes, and trains, sort them for distribution, and deliver them to their correct destinations. Overall, freight transportation, logistics, and distribution approximately 14,000 jobs to New Hampshire's workforce.

How Does Freight Connect New Hampshire?

Products consumed in New Hampshire travel from all over the world, and likewise products produced in New Hampshire travel the globe. For example, consumer products destined for New Hampshire from overseas first enter the US through East Coast ports. At transload facilities, goods are transferred onto trucks and taken to the nearest distribution center. Consumer products are sorted once again and placed on trucks to be delivered to their final customer destination. The process of converting raw materials to products purchased by consumers is referred to as a supply chain. Examples of New Hampshire supply chains include home heating oil (*Exhibit Intro-1*), consumer products from online retailers (*Exhibit Intro-2*), and lumber products purchased from a home improvement store (*Exhibit Intro-3*).

Freight is a Key to New Hampshire's Economic Driver

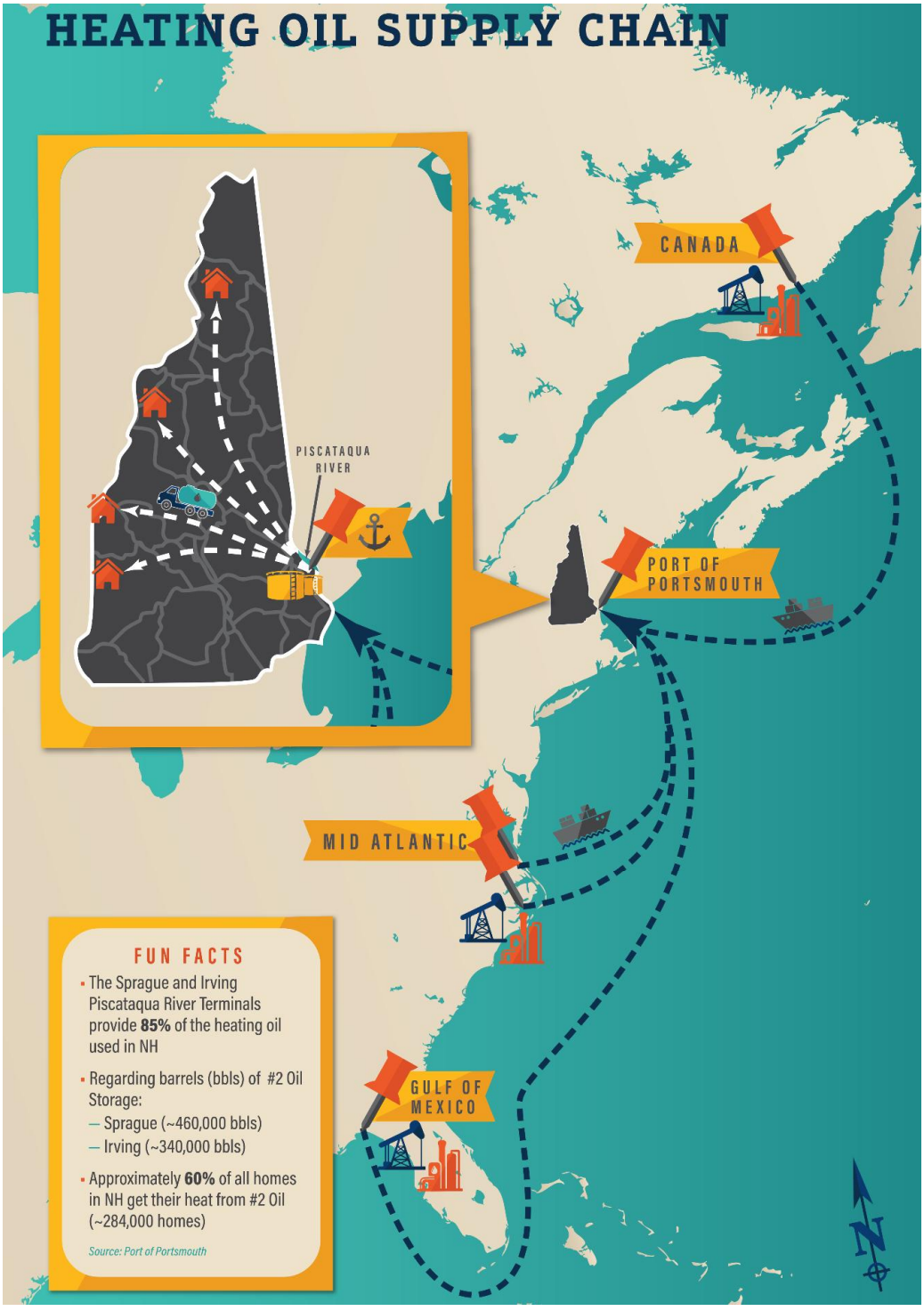
New Hampshire's economic growth is driven in large part by high tech manufacturing (SMHT – Smart Manufacturing/High Technology), retail trade, healthcare, and financial services, while key industries include computers, electrical equipment, industrial machinery, plastics, and paper products.

According to the NH Center for Public Policy, "advanced manufacturing and high technology businesses are the leading drivers of New Hampshire's economy. Jobs in this sector pay higher wages and export products from the state to other areas of the nation and the world, effectively transferring outside money into the state's economy. For these reasons, this sector is the strongest engine of economic activity in New Hampshire." [1]

Freight plays a major role in the viability of the state's top economic driver. As products are manufactured in the region, fast and cost-efficient shipping methods are needed in order to stay at the top of the industry. As quality is maintained and freight reliability is proven, high tech manufacturing will likely continue to flourish in the state.

[1] *New Hampshire High Tech Council – Advancing Innovation*
https://nhhtc.org/about/the-nh-tech-sector/

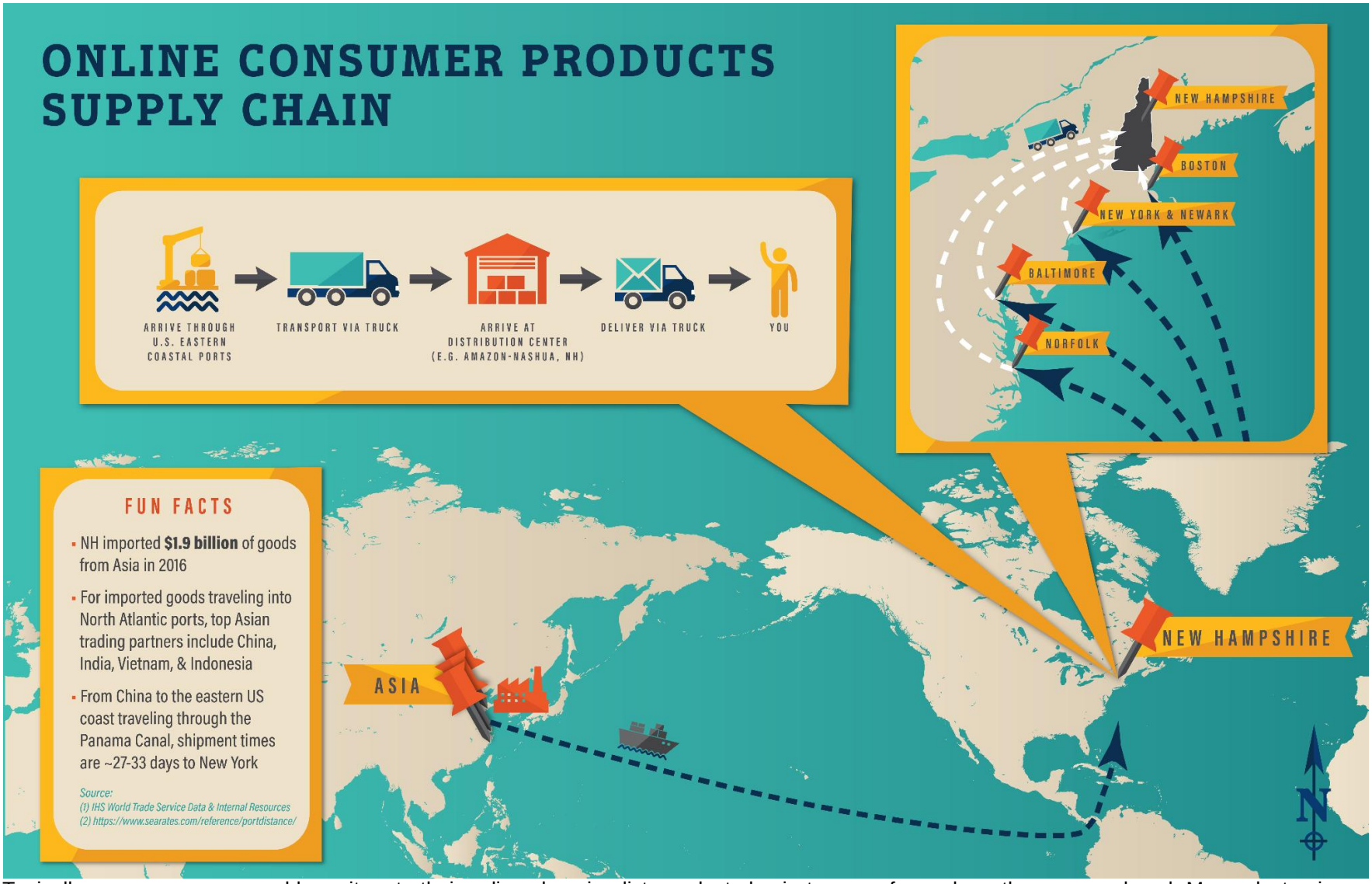
Exhibit Intro-1: Home Heating Oil Supply Chain Diagram



Refined oil products arrive from the Mid-Atlantic and Gulf of Mexico to Port of Portsmouth or are imported from Canada. Heating Oil is stored in port storage facilities and then shipped on truck to consumers inland. Heating oil fuels nearly half of all New Hampshire households[2].

[2] *IHS Transearch*

Exhibit Intro-2: Consumer Products from Online Retailers Supply Chain Diagram



Typically, once a consumer adds an item to their online shopping list, products begin to move from where they are produced. Many electronics are produced in Asia and travel by ship to ports in the eastern US. There they are transferred to trucks that deliver them to local distribution centers. From there they are delivered to consumers using local delivery trucks such as those used by the US Postal Service.

Exhibit Intro-3: Lumber Products Chain Diagram

Many sawed, dried and finished lumber products purchased in home improvement stores in New Hampshire originate from British Columbia, Canada. From there they are shipped via train to a transloading facility where the goods are loaded onto trucks that deliver the lumber products to home improvement centers for sale to the public.

1.0 New Hampshire Transportation System

The FAST Act requires states that receive funding under the National Highway Freight Program (NHFP) to develop a Statewide Freight Plan. The New Hampshire Freight Plan satisfies this provision.

1.1 Project Overview and Premise

1.1.1 Introduction

The New Hampshire Statewide Freight Plan, referred to as the NH Freight Plan, is a plan for present and future freight activities: the freight system, statewide economic context, freight needs, and projects and policies that will help New Hampshire maintain its quality of life and economic competitiveness by reducing the cost of transporting goods and improving the reliability of New Hampshire's freight infrastructure. The Fixing America's Surface Transportation Act (FAST Act) was adopted in December 2015. The guidance for Statewide Freight Plans and State Freight Advisory Committees was published with an effective date of October 14, 2016. Within this context, the FAST Act has established NHFP Goals (*Appendix A-1*), National Multimodal Freight Policy Goals (*Appendix A-2*), and Statewide Freight Plan Guidelines (*Exhibit 1-1*).

Exhibit 1-1: FAST Act Statewide Freight Plan Requirements[3]

Required Elements	Plan Reference
1: An identification of significant freight system trends, needs, and issues with respect to the State;	1.2, 2.1, 2.2, 2.3
2: A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State;	3.1, 3.2
3: When applicable, a listing of— a. multimodal critical rural freight facilities and corridors designated within the State under section 70103 of title 49 (National Multimodal Freight Network); b. critical rural and urban freight corridors designated within the State under section 167 of title 23 (National Highway Freight Program);	3.2
4: A description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in section 70101(b) of title 49, United States Code and the national highway freight program goals described in section 167 of title 23;	1.1, 3.2
5: A description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of the freight movement, were considered;	1.2, 2.3
6: In the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration;	1.2, 2.3
7: An inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State owned or operated, a description of the strategies the State is employing to address those freight mobility issues;	1.2, 2.3
8: Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay;	2.3
9: A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched; and	3.1, 3.2
10: Consultation with the State Freight Advisory Committee, if applicable.	1.3, 3.3

[3] *Guidance on State Freight Plans*, *49 U.S.C. §70101(b)*
https://www.gpo.gov/fdsys/pkg/USCODE-2015-title49/html/USCODE-2015-title49.htm

1.1.2 Goals & Objectives

The NH Freight Plan follows these policies, programs, and guidelines while customizing them to meet New Hampshire's needs by combining the federal guidance with the NHDOT Long Range Transportation Plan (LRTP) Goals and Objectives (*Appendix A-3*). The NH Freight Plan's goals and objectives were developed to meet both the Federal and State goals (*Exhibit 1-2*).

Exhibit 1-2: New Hampshire Statewide Freight Plan Goals & Objectives

ID	National Multimodal Freight Policy Goal Areas	New Hampshire LRTP Goal Areas	New Hampshire Freight Plan Goals & Objectives
1	Infrastructure & Operational Improvements	System Preservation & Maintenance	Maintain and improve existing infrastructure to provide safe, convenient, and reliable operations along the freight transportation network
6	Reliability		
2	Safety, Security, Efficiency, Resiliency	Safety Security	Promote the safety and security of freight infrastructure for all transportation modes
3	State of Good Repair	System Preservation & Maintenance	Achieve and maintain a state of good repair on priority freight corridors
4	Innovation & Advanced Technology	Land Use – Transportation Integration Stewardship of Public Resources & the Transportation System	Determine innovative and advanced technologies along with improved land use planning practices to meet future freight demands
5	Economic Efficiency	Stewardship of Public Resources & the Transportation System	Support freight transportation improvements that encourage economic vitality
7	Movement of Goods & System Resiliency	Mobility & Modal Choice	Improve system reliability and resiliency for the connections between New Hampshire and the National and International freight system
8	Multi-Jurisdictional Planning	Coordination & Collaboration	Encourage multi-jurisdictional coordination to create partnerships and develop funding opportunities for the freight transportation network
9	Environmental Sustainability	Environment & Public Health	Increase the energy efficiency of freight transportation and seek investments that reduce the impacts of the movement of freight on the environment and public health

1.1.3 Summary Freight Roles and Initiatives

The statewide LRTP, included a series of listening sessions to identify the most critical regional and statewide transportation related issues. Core trends viewed as most influential to the future of the State's transportation system were identified, along with related implications and potential opportunities (*Exhibit 1-3*).

Exhibit 1-3: Regional and Statewide Freight Related Trends, Implications, Opportunities[4]

Category	Key Trends	Potential Implications	Opportunities
Passenger	Travel for all types of trips is becoming increasingly inter-regional as trip distances (such as for commutes and tourism) increase.	Solutions that address root causes go beyond one town or city to include more than one region and sometimes multiple states and provinces.	Develop mechanisms to address problems at larger scales, such as longer corridors, multiple regions or multiple states.
Freight	Freight movement via trucks and highways is forecasted to increase by 80% over the next 20 years.	Increased wear and tear on roads, truck-related traffic congestion, and safety concerns.	Strategically invest in rail corridors and freight intermodal facilities to minimize bulk freight traveling long distances by highways.
	Business models increasingly rely on 'Just in Time' Delivery for raw and finished goods – essentially, mobile inventory management.	Reliability of shipping becomes more critical. Number of individual shipments to increase.	Implement accessible, real time traffic condition systems in NH and with regional neighbors that allow trucks to maintain on-time delivery.
Intra-State & Statewide	Population & Jobs are becoming more dispersed in a low-density development pattern.	Increasing automobile & truck freight dependency. Non-auto travel options become less cost-effective and efficient to deploy and use.	Utilize integrated land use and transportation strategies that maximize the efficiency of the transportation system such as directing growth to designated growth areas.
	Manufacturing jobs that survive may involve lower volume, albeit higher value products.	More goods may travel greater distances from production to consumption.	Focus transportation investments to facilitate the efficient flow of goods.
	Modal planning remains largely independent with little focus on intermodal relationships.	Lost opportunity to leverage strength of individual modes.	More fully integrate planning across passenger and freight modes through corridor and other opportunities.
Intra-state; Statewide; Regional & Local	Much of the roadway infrastructure is approaching the end of its design life (more red list bridges, etc.)	Large investments are needed to preserve and rehabilitate the road and bridge systems while congestion needs also call for new transport capacity.	Develop Asset Management systems to prioritize and assess cost-effectiveness of investment options. Continue with Preservation based strategies.
	Much of the rail network in NH cannot support moderate to high-speed rail operations.	Continued erosion of mode share by rail freight leading to further dependency on truck freight.	Invest in rail freight infrastructure to improve competitiveness of rail freight network in NH.
	Traffic & available technology are both growing rapidly.	Traffic volumes continue to outstrip available capacities, reducing system Levels of Service.	As access to technology grows, efforts to install latest available, compatible tech should be made to ensure improved control to sustain current LOS.
National & Global	Globalization of the economy is expected to continue and possibly accelerate.	With increasing trade and limited transportation capacity, reliability may become the most important characteristic of the transportation system.	NH can preserve its competitive advantages of being a desirable place to live, work, and recreate by preserving its high degree of environmental, historical & community qualities.
	Increased instability of the price and supply of gasoline.	Over-reliance on automobile and truck freight may create large disruption to mobility of citizens and the state's economy.	Diversify transport options for movement of goods and people.
	Border passenger and freight security issues highlight lack of border capacity to expedite passenger and freight flows.	Potential stifling of trade and travel that could have economic development impacts on NH.	Work with neighboring states and provinces to advocate for investment to eliminate potential bottlenecks.

[4] *NH Long Range Transportation Plan 2010-2040, July 2010*

1.1.4 Connectivity and System Perspectives

Statewide Connectivity

As the main transportation system in the state, more than 95% of goods are transported on New Hampshire's highway system. Neighboring states account for 69% of total inbound truck traffic and 82% of outbound truck traffic. The majority of goods are carried on I-95, I-93 and US 3.

Inbound freight traffic on I-95 is 64% from Maine, while outbound traffic is 30% to Massachusetts. I-93 freight traffic is primarily to and from Massachusetts and intrastate New Hampshire. Similarly, US 3 mainly carries goods to and from Massachusetts, with intrastate traffic at 73%. NH 125 also carries 15% inbound and 20% of outbound traffic from neighboring states. Core commodities on these highways are sand and gravel, broken stone, lumber, petroleum products and waste and scrap.

The rail system in New Hampshire consists of 443 route miles of active rail lines. Changes in the rail industry over the last two decades have resulted in consolidation of larger Class I railroads, abandonment of light density rail lines, and the creation of regional railroads and local short line freight railroads. These railroad classes are defined as follows[5]:

- *Class I Railroads - Line haul freight railroads having 2010 operating revenue equal to or greater than $398.7 million. There are no Class I Railroads operating in New Hampshire.*
- *Regional Railroads: 2010 operating revenue between $40 million and $398.7 million; or operate at least 350 miles of railroad and have revenues of at least $20 million*
- *Short Line Railroads - Line haul railroads that do not qualify as a Class I or Regional railroads. According to the Association of American Railroads, 75 percent of those railroads operate fewer than 100 miles of railroad line.*
- *Tourist Railroads – Operate approximately 106 miles of railroad*

Regional and short line railroads connect to four of the country's seven Class I Railroads. With access to Class I railroads, New Hampshire has connections to states such as Illinois, Rhode Island and New York, which account for 66% of the state's inbound rail traffic. Outbound rail traffic is mainly limited to nearby states, such as Massachusetts and New Jersey. Rail lines in state carry mainly through freight traffic, accounting for almost 85% of total rail tonnage in the state. Inbound commodities include nonmetallic minerals, structural wood and malt whereas outbound commodities include gravel and sand, liquified gas and metal scrap.

When discussing New Hampshire's freight system, it is important to consider both regional and national perspectives since the freight system transports goods to support imports, exports, intrastate, and through travel.

[5] *New Hampshire State Rail Plan, 2012*

The marine system carries 1.4 million tons of cargo annually. The Market Street Terminal has onsite rail access to Pan Am Railways' Portsmouth Branch, which connects to their main line at Newfields, NH. The most economical intermodal connection to the port is by truck via I-95. The Pease International Airport is also within 2 miles from the port. The port's longest wharf is 600-foot-long with 35 feet draft at mean low water.

When discussing New Hampshire's freight system, it is important to consider both regional and national perspectives. System deficiencies may appear differently than if analyzed only from an intrastate viewpoint. For marine and air cargo transportation, even a global perspective is appropriate.

Key considerations include:

- New Hampshire represents a small share of the nation's area (0.3%) and population (0.4%). As a freight origin state, the state's share of freight is only 0.3% by value and 0.2% by tonnage.
- New Hampshire is in a 'far northeast' corner of the US relative to the nation's geographic and population centers of mass (near Lebanon, KS and in Wright County, MO respectively). It is therefore not in an ideal position in terms of geographic accessibility to the country.
- The Appalachian Mountains in northern New England occur in two predominant ranges, the White and Green Mountains, separated by the Connecticut and White Rivers. The difficulty of establishing east-west links to/from upstate New York and points west has led to surface transportation in the state being strongly oriented in a north-south direction. For both long-distance trucking and rail movements, the most favorable routes for most New Hampshire freight run through Massachusetts, via the Massachusetts Turnpike (I-90) or CSX Transportation's Albany Division respectively.
- Within 175 miles of the state's border, there are seven metropolitan areas with a total population ten times that of the state of New Hampshire (Albany, NY; Boston, MA; Hartford, CT; Montreal, QC; Quebec, QC; Springfield, MA; and Worcester, MA). Greater Boston and greater Montreal each have a population more than three times that of the state. Part of southern New Hampshire is actually included in the US Census Bureau's Boston–Cambridge–Newton, MA–NH Metropolitan Statistical Area
- Although located on the coast with competitive transit times by ships from Europe, the Port of Portsmouth handles less than 1% of the total cargo of the top twelve ports on the Atlantic seaboard (including Halifax, NS). Three relatively nearby ports, Portland, Boston, and Halifax, handle 2.0, 2.6, and 4.3 times its tonnage, respectively. Both Halifax and Boston have good railroad connections to the west, but from a continental perspective are themselves much less significant than either the Port of New York and New Jersey or Hampton Roads, and handle less traffic than eight other east coast ports.

By its location and other factors above, a significant fraction of the freight movements in New Hampshire have neither an origin nor a destination in the state. The *2012 State Rail Plan* indicated that 79% of rail carload movements in the state were 'through' movements. From data available from 2015 in the FHWA's Freight Analysis Framework (FAF), it is estimated that 62% of the domestic tonnage hauled by trucks in the state travels through it. If trucks to and from Canada were included, this fraction could well be higher.

Statewide System Perspectives

The nature and characteristics of each freight transportation mode have influenced their development into their present configurations and will likely shape their future evolution.

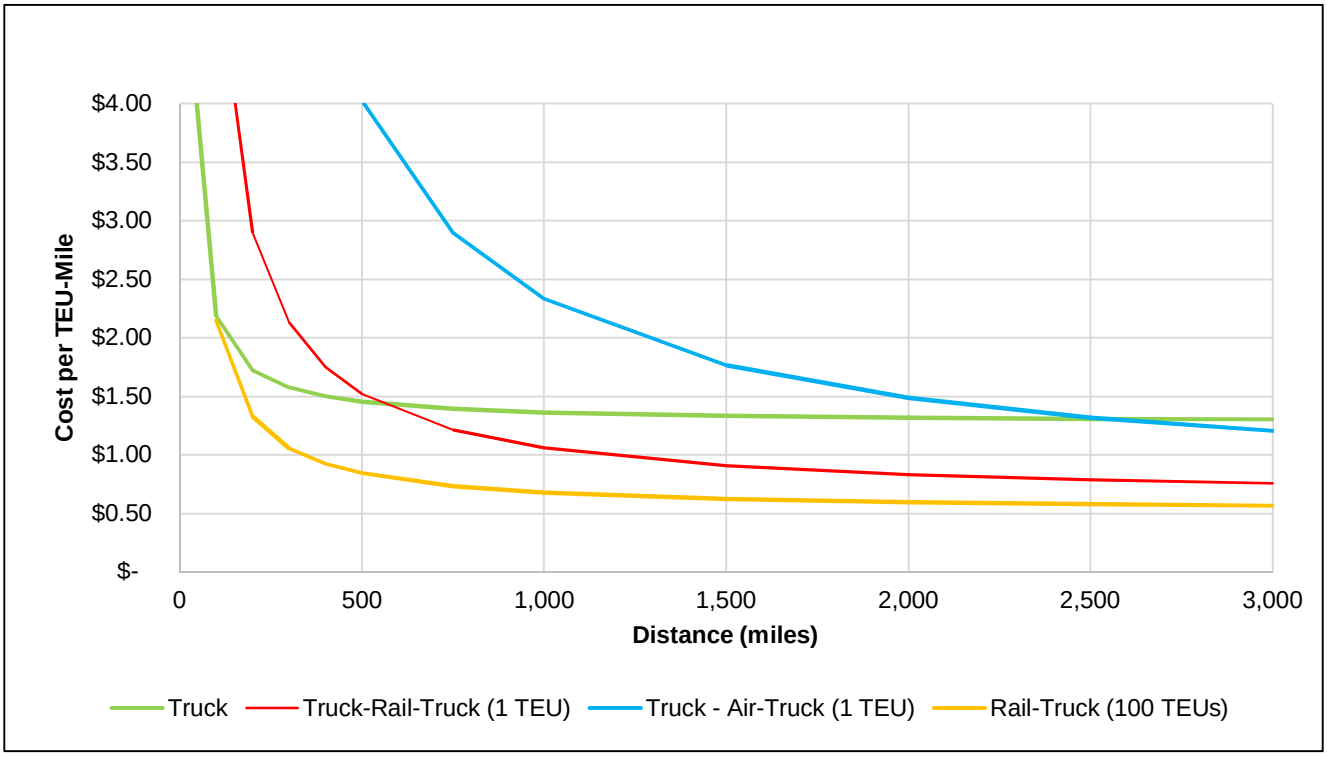
The modes which dominate a freight market are principally determined by three factors: the distance to be covered, the importance of rapid delivery, and the volume to be carried.

The modes which dominate a freight market are principally determined by three factors: the distance to be covered, the importance of rapid delivery, and the volume to be carried. Generally, trucks are the most cost-effective for shorter distances, and over even long distances can offer shorter and more predictable travel times than rail. Rail offers significant economies of scale with both distance and quantity moved, but typically has longer transit times than for trucks. Air freight offers speed, but at significant cost, and requires handling at both ends of trip. An example of how some modal and intermodal combinations can differ in terms of the average cost of moving a truck equivalent unit (TEU) per mile from origin to destination (*Exhibit 1-4*) can be used to compare the cost of transporting goods by distance and provide insight into the decision-making that goes into selecting a shipping mode. Among these:

- A direct truck haul from origin to destination yields relatively consistent costs per mile except for short hauls, where the overhead costs at the origin and destination are spread over fewer miles. There is relatively little opportunity for cost savings with quantity shipped at the TEU level, because each TEU travels individually. As the most prevalent form of freight transport, this can serve as a benchmark for comparison.
- For a single TEU over a long distance, a rail-highway intermodal solution may offer a lower cost, albeit with a longer transit time. The fixed costs of transshipment or transloading twice (from truck to rail and then from rail to truck) require long trip lengths to achieve savings.
- For TEUs in quantity, intermodal may be effective at shorter distances. A high-volume origin may have direct rail access, elimination a transloading operation. As the number of cars for an individual movement increases, rail can handle TEUs more efficiently
- Over long distances, intermodal air freight is a possibility for goods that require rapid delivery. Two transshipments (truck to aircraft and aircraft to truck) are required as for intermodal rail. Depending on the frequency of air cargo service, time savings may not achievable for some origin-destination combinations.

The discussion above omits consideration of marine transportation, which offers very low incremental costs per TEU-mile and dominates transatlantic cargo shipment.

Exhibit 1-4: Estimated Unit Costs for Different Modes



The differences above influence several important aspects of freight transportation in New Hampshire:

- That the bulk of air freight arriving in the state is conveyed by truck to and from the Manchester-Boston Regional Airport. Cargo activity at Portsmouth International Airport at Pease has been primarily transatlantic;
- Rail freight traffic is predominantly north-south, and both originates and terminates outside the state; and
- Marine cargo at the Port of New Hampshire is predominantly liquid bulk cargo (petroleum products), which are transported inland relatively short distances by truck.

Intermodal & Transloading Stations

A substantial majority of both the highway and rail freight traffic in New Hampshire moves through the state, and a large majority of the freight originating in or destined to New Hampshire moves by truck. The highway network provides a good level of connectivity for most truck movements, including four Interstate highway connections with adjoining states.

Intermodal freight involves the transport of goods by multiple modes in a container or vehicle without any cargo handling. There are no Intermodal Facilities within NH. Transloading is the process of transferring goods from one mode to another and requires cargo handling. There are 9 transloading facilities in NH.

Although intermodal movements are a small fraction of total freight activity, there are four specific types of intermodal related stations in the state (*Exhibit 1-5*):

- Rail to truck transloading facilities, where shipments travel by rail from points as far away as the west coast of Canada. Having taken advantage of the low unit cost of rail over long distances, these shipments are then transferred to trucks to reach their ultimate destination, usually less than 200 miles away. These rail to truck transloading facilities are not large in scale compared to full intermodal facilities located outside the state.
- Facilities for transferring marine cargo to trucks at the Port of New Hampshire, in both Newington and Portsmouth. Much of this freight consists of liquid petroleum products. As for these transloading facilities, the truck hauls are generally less than 200 miles.
- A facility for transferring liquid propane from ocean-going vessels to railcars, also at the Port of New Hampshire
- Transfers of high-value freight between trucks and aircraft at the Manchester-Boston Regional Airport and Portsmouth International Airport at Pease. Major origins and destinations for these truck movements include the Boston and New York metropolitan areas.

All facilities involving truck services are within reasonable proximity to the Interstate highway system, although connections via local roadways are not ideal in terms of speed and convenience for truckers. The rail connection between the Port of New Hampshire and the Pan Am Railways mainline is marginally adequate (FRA track class 1) for the present volume; there are plans to improve the link in conjunction with an increase in traffic.

There are currently no intermodal terminals within the state - intermodal activity occurs in neighboring states at (*Exhibit 1-6*):

- CSX Intermodal terminal in Worcester, MA
- NS intermodal terminal in Ayer, MA
- Pan Am Southern intermodal terminal Mechanicsville, NY
- CN, CP and CSX intermodal terminals in Montreal, Canada

A new rail intermodal connection at the port of Portland, ME is mainly used for transportation of Poland Spring water. Proximity to intermodal terminals is valuable for freight connections when flexibility of shipping is required. As previously mentioned these terminals are located less than 100 miles from state lines and are viable options when intermodal freight transport is required with two additional terminals within 250 miles.

Exhibit 1-5: Intermodal and Transloading Connections

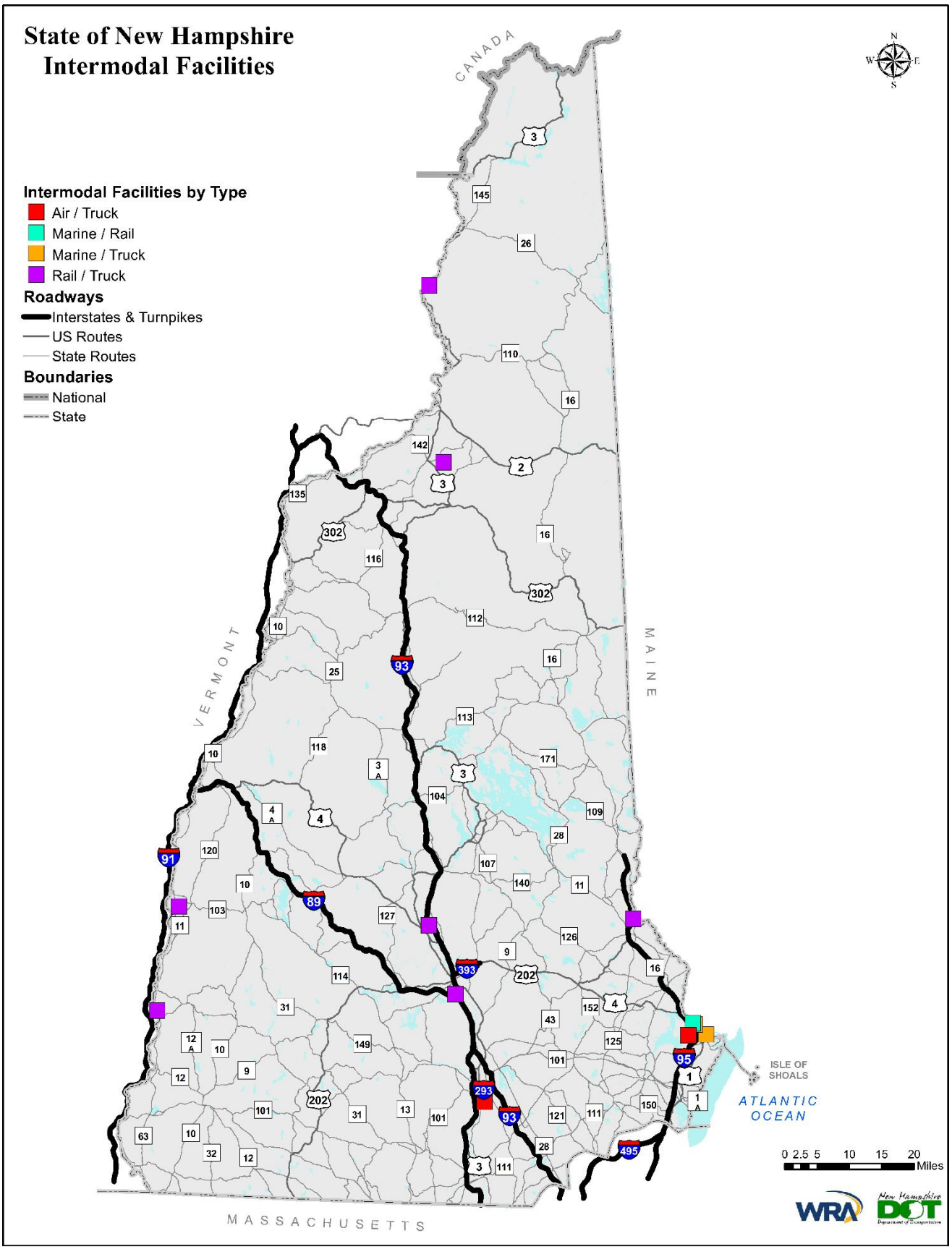
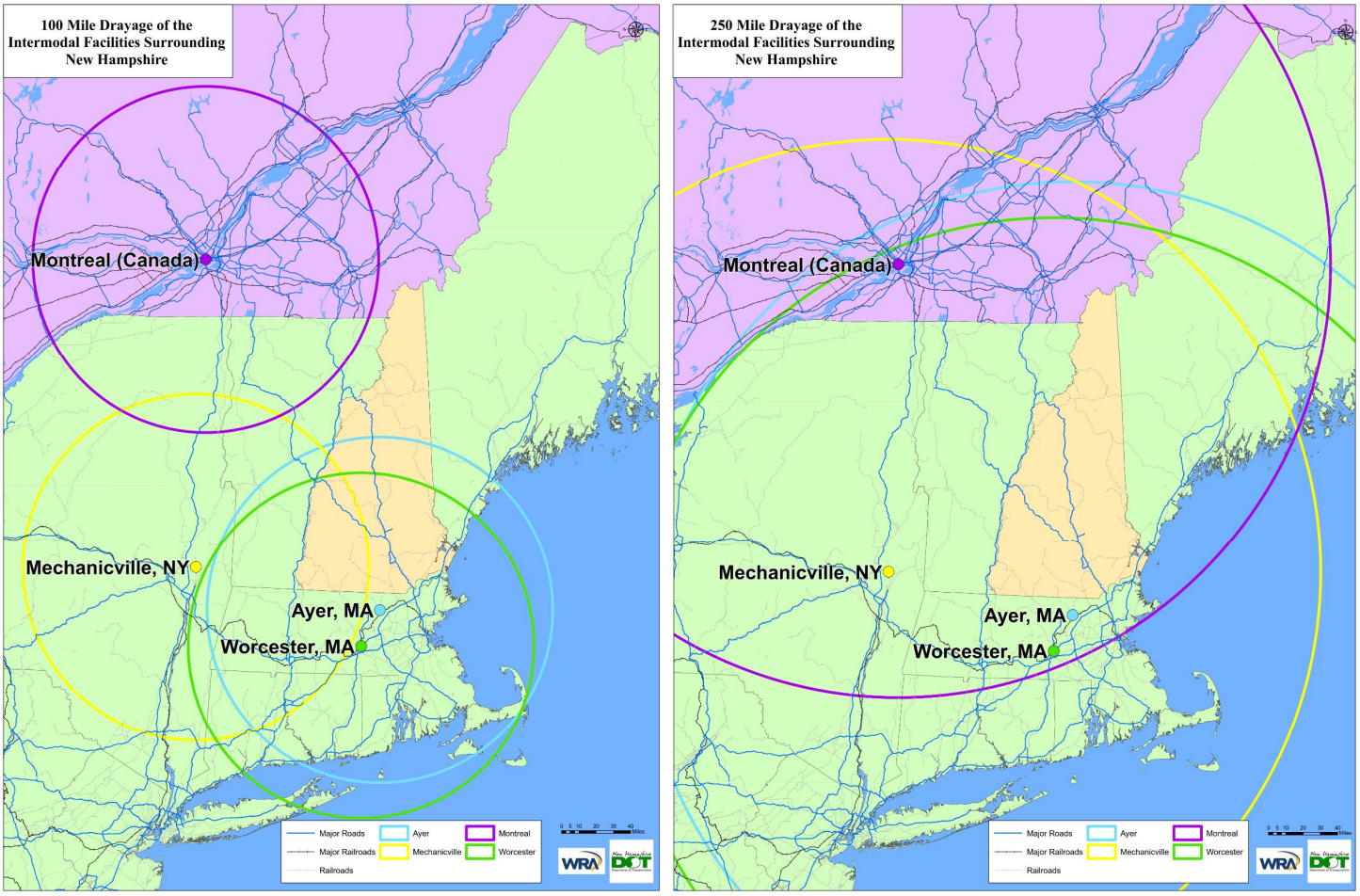


Exhibit 1-6: Short Haul and Regional Drayage Intermodal Facilities Surrounding New Hampshire[6]



There is a proposed satellite intermodal facility in the southern portion of the state (Nashua Region) that is expected to provide supplemental service to Pan Am Railways at the Ayer, MA facility. As part of the New Hampshire State Rail Plan, the proposed project was developed as an investment scenario to promote development of freight distribution areas.

Transload facilities are locations where products are stored in a rail car for direct transfer to delivery trucks. This serves as a very attractive feature to customers along existing or former branch lines where direct rail service can no longer be supported. These facilities allow for long-haul rail service flexibility of on-demand local truck delivery direct to non-rail served locations. As commodity flows and traffic volumes to and from transloading facilities increase, it can potentially help create a purpose and need to support further rail infrastructure improvements.

There are a number of current transload facilities within New Hampshire. Specific locations include: (1) Bow, (2) Canterbury, (3) Claremont, (4) North Stratford, (5) North Walpole, (6) Portsmouth, (7) Rochester, (8) West Lebanon, and (9) Whitefield.

Additional details regarding each of the transload facilities are noted in the following section.

[6] *New Hampshire State Rail Plan*, 2012

(1) ***Bow*** – This facility[7] serves Pan Am and is situated between Concord and Manchester near I-89, I-93, and I-293. The facility handles coal from the state's largest coal power plant for electricity generation. However, during the deregulation process of New Hampshire's electric facilities, the power plant was sold by Eversource. The future of the coal plant and related coal handling operations at the Bow transload facility will depend on future regulations[8].

(2) ***Canterbury*** – This facility[9] serves New England Southern Railroad. Traffic can be moved into New Hampshire via CSX or Norfolk Southern via Pan Am Railroad to New England Southern Railroad based at Canterbury. It is located off Exit 18 on I-93. From Canterbury, railroad traffic can be routed to Montpelier, Augusta, Boston, Providence, Hartford, and Albany. The facility has five car placement spots, (89 feet each) for loading/unloading, two sidings (450 feet each) with a ramp on one end, and partially fenced with area lighting. Major commodities shipped are paper mill products to Tilton and occasional shipments for the National Guard. In August 2018, the National Guard shipped 70 rail cars to northern Michigan for military exercise purposes[10].

(3) **New England Central Railroad** – This facility[11] serves the former Claremont and Concord Railroad for loading/unloading rock salt, recycled steel, and lumber. The New England Central Railroad is near I-89, I-91, and the Claremont Municipal Airport.

(4) **North Stratford** – This facility[12] serves New Hampshire Central Railroad for loading/unloading of bulk products, forest products, and building projects via St. Lawrence and Atlantic Railroad. It is located on US 3. The facility is 70 miles from Sherbrooke, Quebec and 150 miles from Montreal. The facility is a short driving distance from I-91 and I-93 and has five car placement spots for loading/unloading.

(5) **North Walpole** – This facility[13] serves the New England Central Railroad and is a connection to the Green Mountain Railroad in Vermont. It is used for loading/unloading rock salt and is a fuel trans loading facility. It is located near I-91.

(6) **Portsmouth** – This facility[14] serves Pan Am Railways and is used to transload propane. It is located near I-95 and the Portsmouth International Airport, with a short driving distance to Boston. The facility has a storage capacity of 560,000 barrels and three rail berths that allow offloads of up to six rail cars of domestically produced propane per day. SEA-3, Inc. submitted a petition to reconfigure and expand the facility by constructing five additional rail berths on land leased from Pan Am Railways. If approved, propane can be domestically sourced, reducing the need and dependency on international shipments[15].

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[7] *https://bownh.gov/156/Rail-Service*

[8] *https://www.concordmonitor.com/merrimack-station-eversource-power-plant-bow-sold-14817029*

[9] *http://www.newenglandsouthernrailroad.com/transload.php*

[10] *https://www.concordmonitor.com/military-train-canterbury-18885086*

[11] *New Hampshire State Rail Plan, 2012*

[12] *http://www.newhampshirecentralrailroad.com/services.html*

[13] *New Hampshire State Rail Plan, 2012*

[14] *http://www.seacoastonline.com/article/20151022/NEWS/151029612*

[15] *https://www.stb.gov/decisions/readingroom.nsf/fc695db5bc7ebe2c852572b80040c45f/3720a646f0e62b1485257e0b004a12cf?OpenDocument*

(7) Rochester – This facility[16] serves the Conway Branch of the New Hampshire Northcoast Railroad. It is a short drive from Portsmouth and I-95, and near the Skyhaven Airport (Rochester). It provides service to Ossipee Aggregates in Rochester and it interchanges with the Pan Am Railways at Dover, NH for direct shipment of Ossipee products to BSG facility in Boston. The Rochester facility is a 21-acre site used for rail car off-loading and product storage and distribution. Products sold from this facility are bulk aggregate, landscape materials, and propane facilities. Products are delivered by truck to customers from the Rochester terminal[17].

(8) West Lebanon – This facility[18] serves the New England Central. It is used for trans loading cement, propane, and rock salt. It provides a connection to the New England Central Railroad and the Washington County Railroad Company, both in Vermont. It is located near I-89 and I-91.

(9) Whitefield – This facility[19] serves New Hampshire Central Railroad for loading/unloading of bulk products, forest products, and building products. It is situated in an industrial park near Mt. Washington Regional Airport (Whitefield) and US 3. The facility is 4 hours to both the Boston and Montreal metropolitan areas and 3 hours to Maine on US 2. This facility is a short driving distance from I-91 and I-93and has five car placement spots for loading/unloading. The facility is also used for transloading plastic pallets to Presby Environmental used in the manufacturing of piping for residential and commercial waste water disposal systems[20].

[16] *http://www.nhnorthcoast.com/about-us/*

[17] *http://www.ossipeeaggregates.com/about-us/*

[18] *http://vtrans.vermont.gov/sites/aot/files/rail/VT%20State%20Rail%20Plan_Final.pdf*

[19] *http://www.newhampshirecentralrailroad.com/services.html*

[20] *http://desmoautoparts.com/railroad-car-repair-test/*

1.2 Inventory and Assessment

With the enactment of the FAST Act, a series of freight provisions were created. The Fast Act also required the identification of the National Multimodal Freight Network (NMFN) which includes the National Highway Freight Network (NHFN).

1.2.1 Federal Perspectives

National Multimodal Freight Network (NMFN)

The National Multimodal Policy was established under the FAST Act to improve the conditions and performance of the NMFN (*Appendix A-7, Appendix A-8*). The NMFN includes the NHFN plus nationally significant railroads, ports, and airports (*Exhibit 1-7*). Currently, an interim NMFN has been established. A designation and/or re-designation of the final network will be established after USDOT solicits feedback from stakeholders, multimodal freight users, and government agencies. The NMFN represents the multimodal freight network that connects New Hampshire to the world. The interim NMFN designations by mode for the State include highways, railroads, the Port of Portsmouth, and the Manchester- Boston Regional Airport (*Exhibit 1-8, Exhibit 1-9*).

Exhibit 1-7: Interim National Multimodal Freight Network

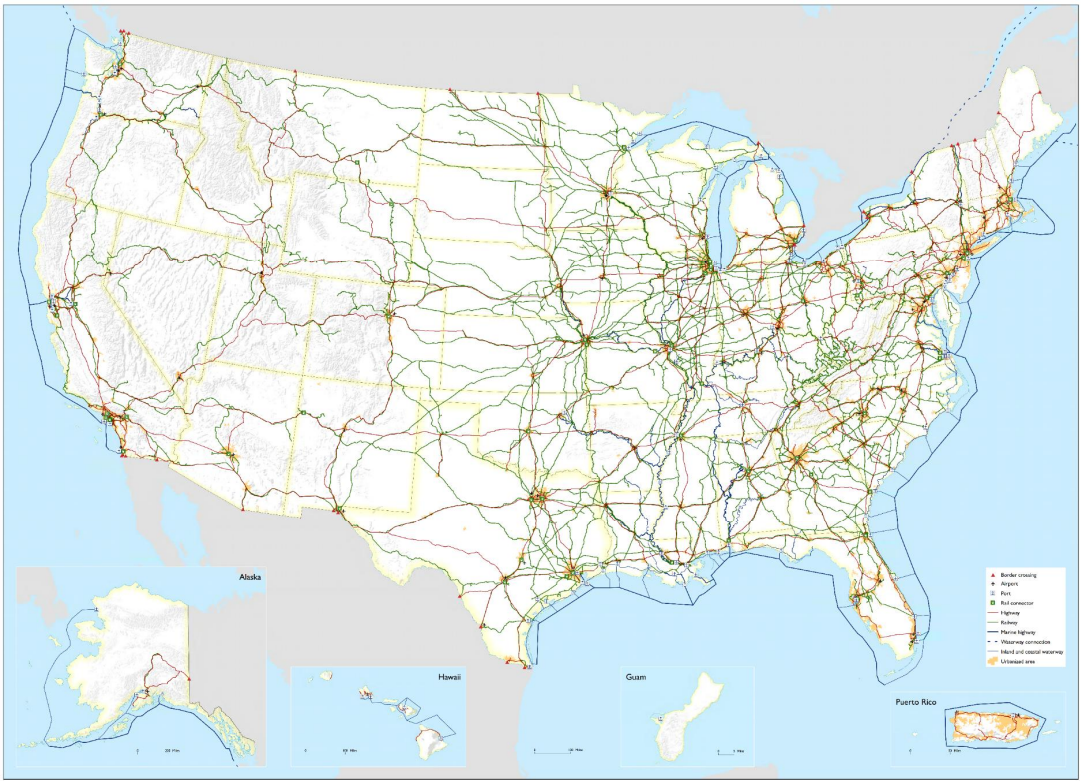
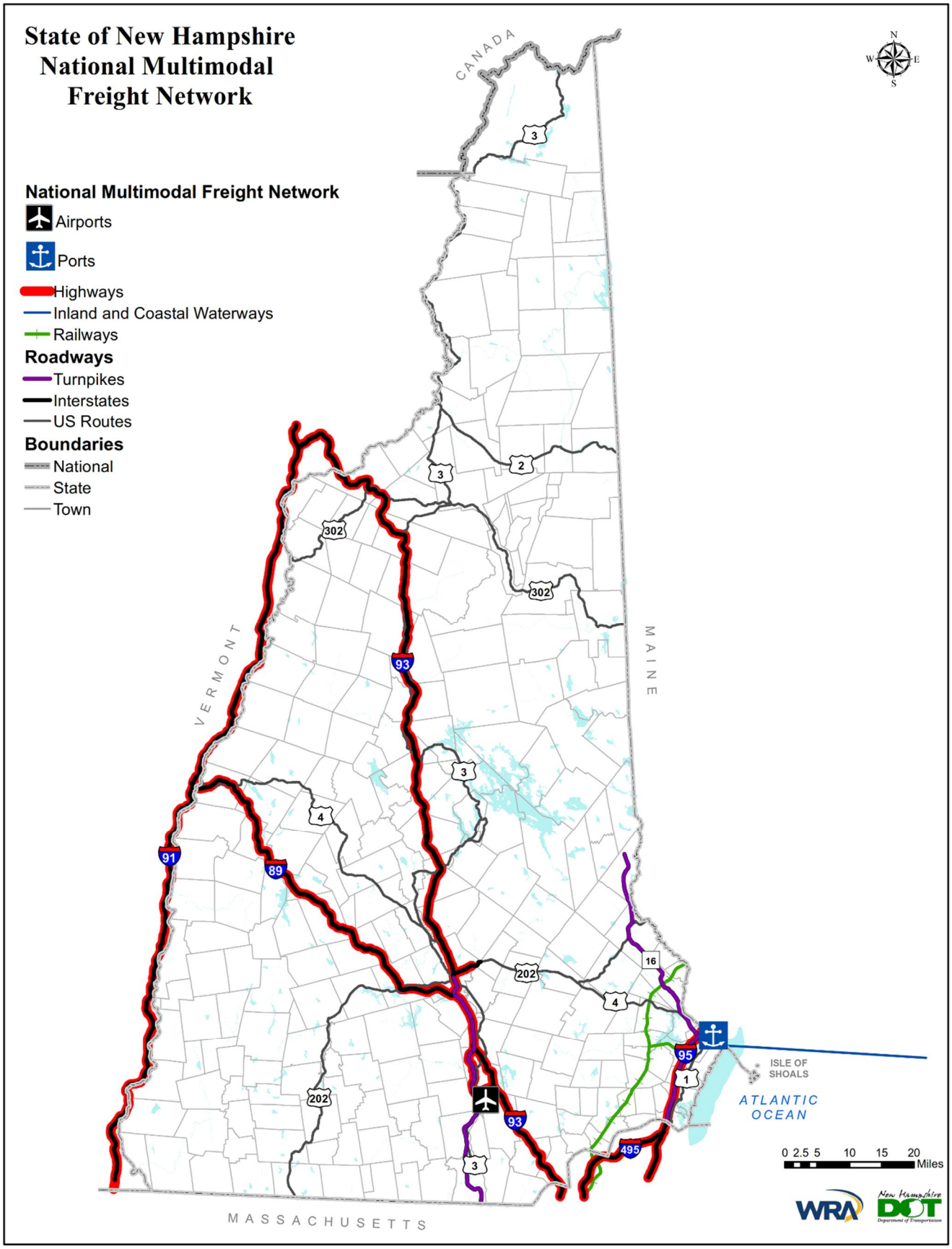


Exhibit 1-8: National Highway Freight Network Routes

MODE	FACILITY
Highways	PHFS (I-95) Non-PHFS (I-89, I-93, I-293, I-393)
Railroads	Boston and Maine Corp Railroad (~45 miles)
Ports	Port of Portsmouth
Airports	Manchester-Boston Regional Airport

Exhibit 1-9: Interim National Multimodal Freight Network (NMFN)



National Highway Freight Network (NHFN)

The National Highway Freight Program (NHFP) (*Appendix A-4*) was established under the FAST Act as part of the core Federal-Aid Highway program structure to improve conditions and performance of the NHFN using formula-based funding for each state. The NHFN includes four components:

New Hampshire's PHFS mileage is currently 17.03 miles, which includes a portion of I-95 and the Port of Portsmouth.

- Primary Highway Freight System (PHFS): 41,158 miles of network under current federal designation
- Non-PHFS Interstates: Interstates that are currently not on the PHFS
- Critical Rural Freight Corridors (CRFC): Freight corridors that meet criteria and should not exceed 150 miles or 20% of the State's PHFS mileage, whichever is greater (*Appendix A-5*)
- Critical Urban Freight Corridors (CUFC): Freight corridors that meet criteria and should not exceed 75 miles or 10% of the State's PHFS mileage, whichever is greater (*Appendix A-6*)

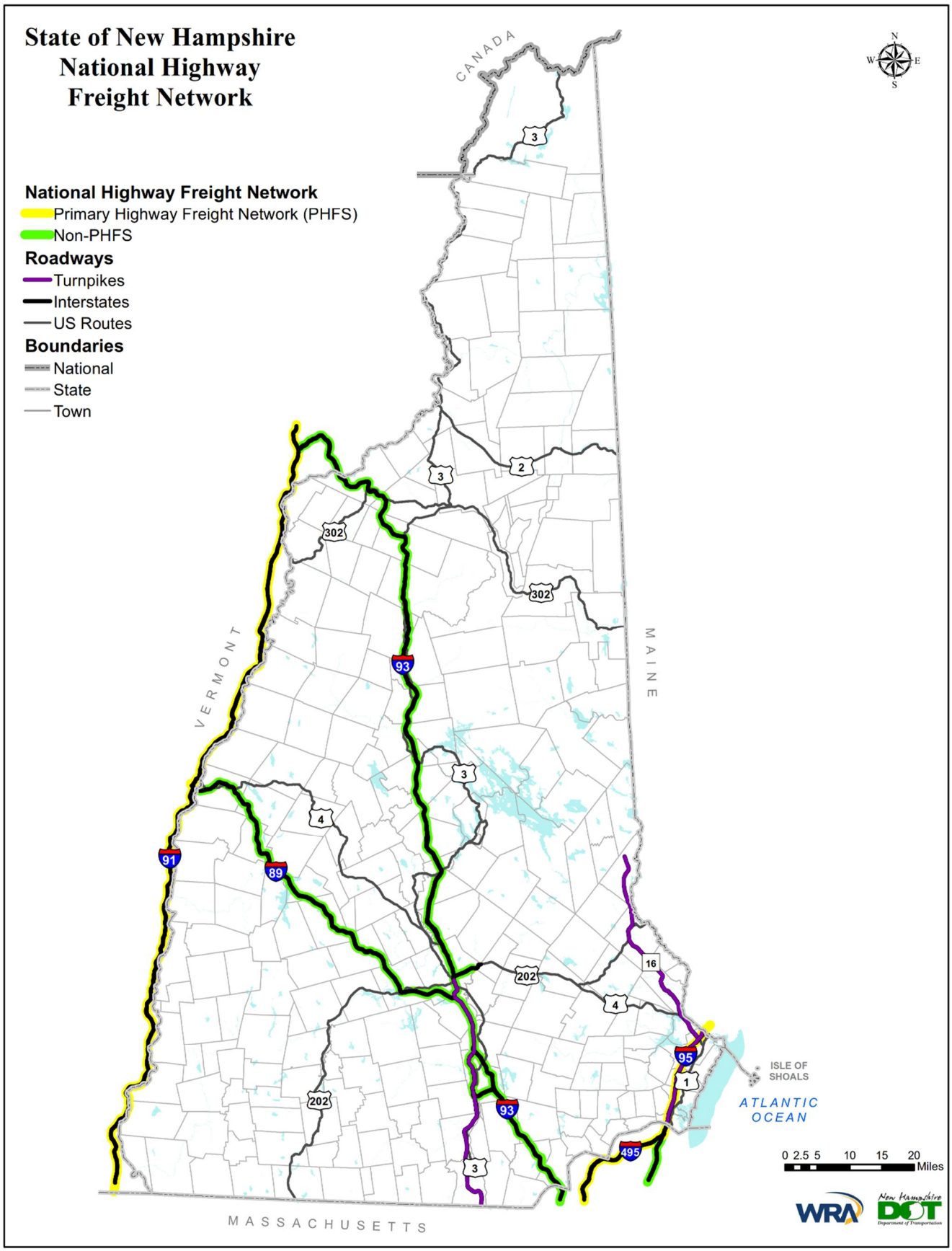
New Hampshire's portion of the NHFN includes the interstate system (*Exhibit 1-10, Exhibit 1-11).*

Exhibit 1-10: New Hampshire National Highway Freight Network Routes

Route No / Facility Name	Start Point	End Point	Length (Miles)
Primary Highway Freight System (PHFS) Routes			
I-95	MA / NH Line	NH / ME Line	16.15
PHFS Intermodal Connectors			
NH11P – Port of Portsmouth	I-95 (Exit 6): E 0.7 mi on Market St	Port	0.87
PHFS Total			**17.03**
Non-PHFS Interstate Routes			
I-293	I-93 (South)	I-93 (North)	10.70
I-393	I-93	S9	3.76
I-89	I-93	NH / VT Line	60.90
I-93	MA / NH Line	NH / VT Line	133.11
Non-PHSF Interstate Total			**208.47**

New Hampshire's PHFS mileage is currently 17.03 miles, which includes a portion of I-95 and the Port of Portsmouth. Therefore, the State can designate up to 150 miles of CRFC and 75 miles of CUFC to be eligible for funding under the NHFP guidelines

Exhibit 1-11: New Hampshire National Highway Freight Network



1.2.2 Statewide Freight Infrastructure – Highway Network

New Hampshire's freight infrastructure consists of the highway network, railways, airports, marine, and pipeline transportation.

Highways

Based on 2017 roadway data[21], New Hampshire's Roadway System includes approximately 16,622 miles of roadway. Approximately 28% of these roadways (statewide/regional corridors and local connectors) are maintained by the State, and the remaining 72% (town and compact roads) are maintained by local municipalities.

The NH Turnpike System currently consists of 167 miles of limited access highway, with 71 miles being part of the Interstate Highway System. The Turnpike System is comprised of three limited-access highways: the Blue Star Turnpike (I-95) and the Spaulding Turnpike make up the Eastern Turnpike, while the F.E. Everett Turnpike is also known as the Central Turnpike.

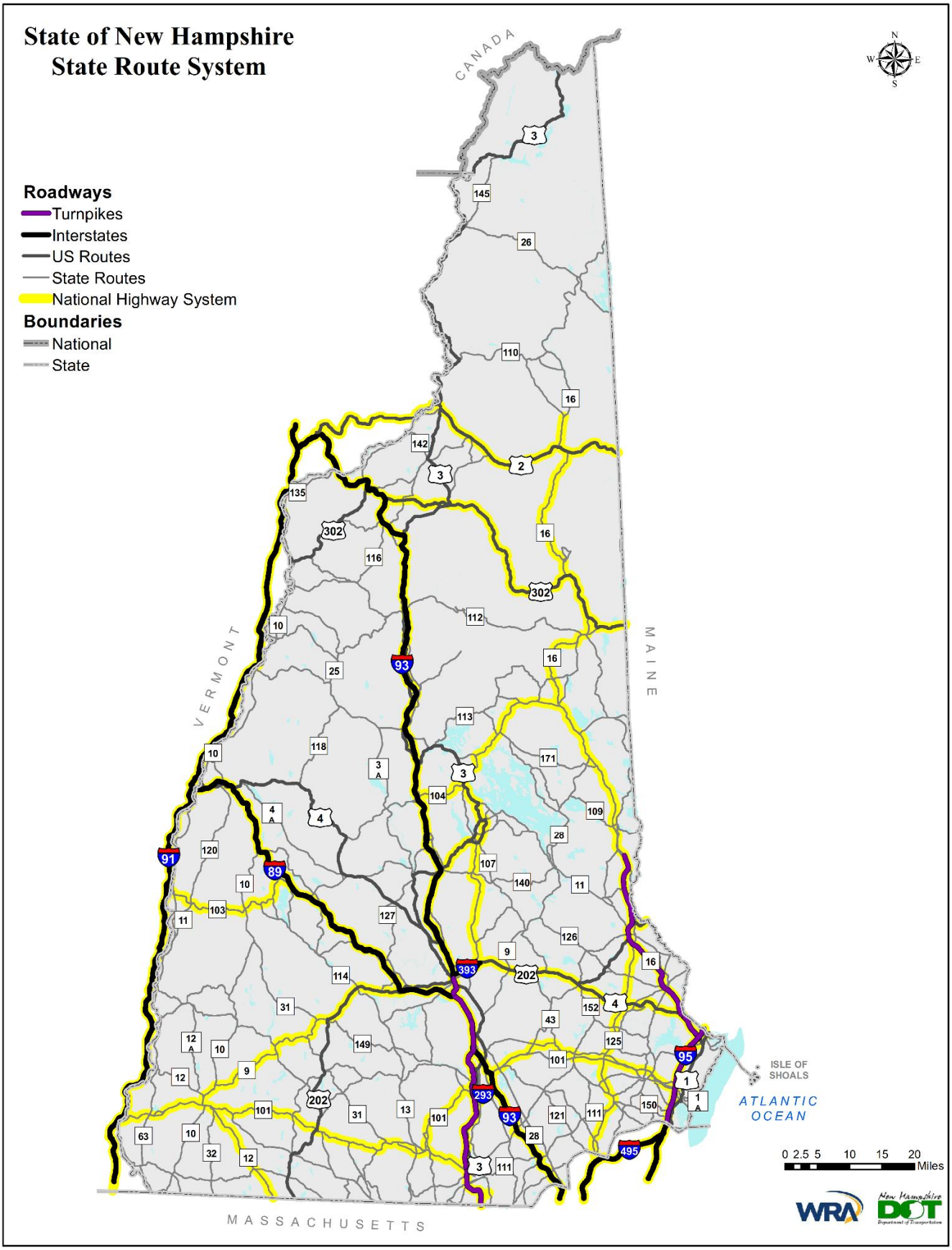
Roadways provide critical first and last mile connections, provide access to the NHFN for long haul truck trips and provide access from businesses, warehouses, and distribution centers to railroads, ports, and airports. The vast majority of freight in New Hampshire relies on trucks for at least a portion of its supply chain.

The National Highway System (NHS) *(Exhibit 1-12)* includes 1,256 miles of the State's highway system, including Turnpikes, Interstates, and other priority highways (US/State Routes, Traffic Circles, Local Roads, and Ramps). The NHS is critical for public safety, emergency preparedness and statewide connectivity to ensure continuous travel within New Hampshire as well as to neighboring states.

Most shipments are transferred to trucks and delivered to their final destinations. These vehicles come in a variety of sizes and types and are regulated by size and weight limitations. Single unit vehicles are vehicles traveling without a trailer, while combination vehicles include a truck and one or more trailers. A third category has been designated for certified vehicles, which have additional registration requirements for either specific weight limits or in excess of maximum load limits. Special permitting is required for oversize/overweight loads.

[21] *2017 Roads and Highways Facts and Figures*, NHDOT Planning – GIS Section, Jan 2017

Exhibit 1-12: National Highway System (NHS)



Pavement Conditions

NHDOT's current philosophy is to keep the most widely-used roadways in good condition and focus on pavement preservation. Pavement conditions are affected by a number of factors, including the base material, construction date, traffic and truck volumes, and roadway drainage.

New Hampshire's roadway system is categorized based on connectivity, regional significance, and winter maintenance requirements, which helps to provide a comparison basis for performance, investment levels, and operation/maintenance levels. The roadway system is categorized into six different tiers *(Exhibit 1-13).*

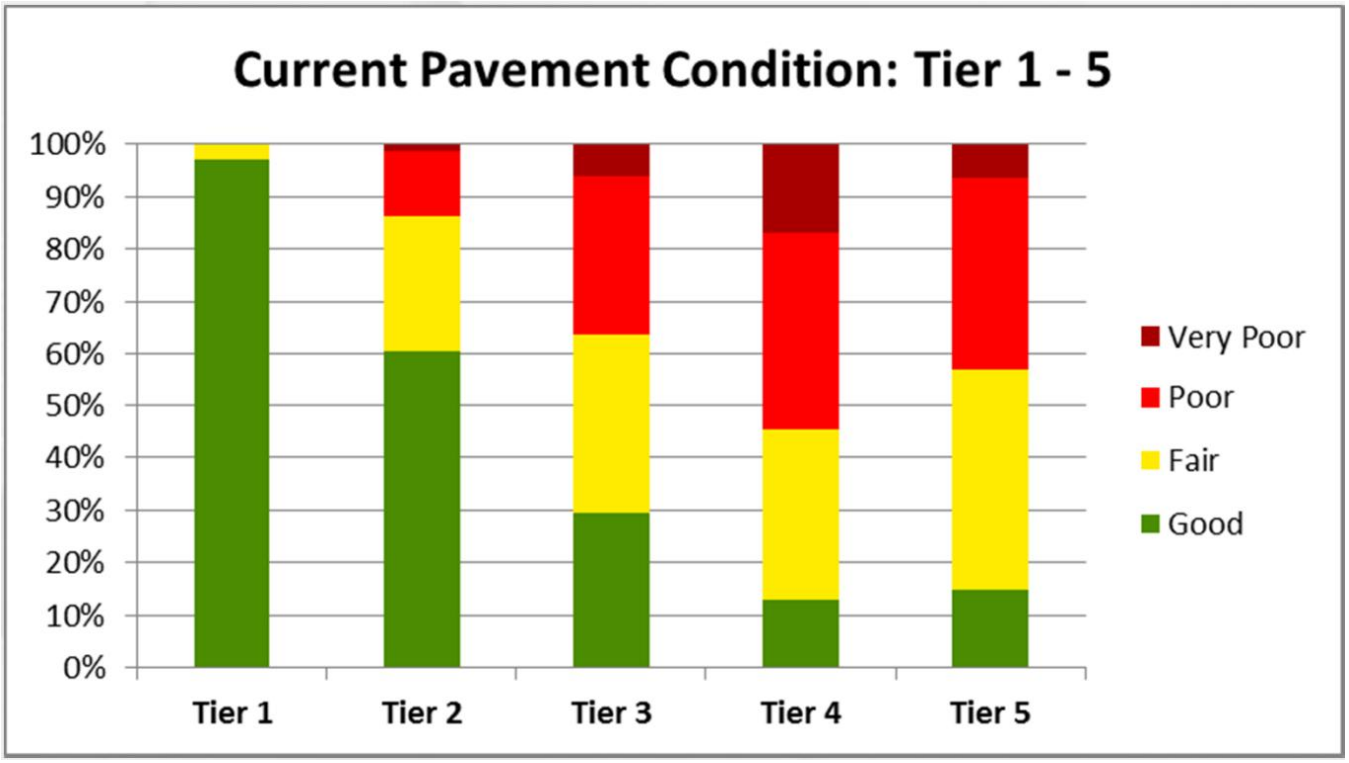
Exhibit 1-13: NHDOT Highway Tier Definitons[22]

Tier Level	Tier Name	Description
1	Interstates, Turnpikes, and Divided Highways	Interstates, Turnpikes, and NH Route 101 between Bedford and Hampton support the highest traffic volumes and speeds in the entire state. These multi-lane, divided highways convey the majority of commuter, tourist, and freight traffic throughout the state.
2	Statewide Corridors	Statewide Corridors, like US 202 or NH 16, carry passengers and freight between regions of the state as well as to and from neighboring states. These roads can have moderate to high traffic volumes, particularly during morning and afternoon commutes. While functionally similar, condition and features of these corridors vary the most out of any Tier. Some of these roads are formally constructed higher-speed facilities while others are more rural roads that became high use roads as surrounding neighborhoods and communities developed.
3	Regional Transportation Corridors	Regional Transportation Corridors provide travel within regions, access statewide corridors, and support moderate traffic volumes at moderate speeds. Good examples include NH 112 and NH 155.
4	Local Connectors	Secondary highways and unnumbered routes as well as the bridges along them are local connectors and they provide travel between and within communities. Traffic on local connectors, such as NH 141 or Bean Rd in Moultonborough, is usually low volume and low speed.
5	Local Roads	Locally owned roads and bridges or State-owned roads within compact limits provide varying travel functions and are maintained by communities. Traffic volumes and speeds can vary on local roads. Good examples include North State St in Concord or Elm St in Manchester. Though, the Department does not maintain local road and bridges, it does provide assistance to communities.
6	Off Network	The Department needs to track work accomplished on off network assets such as park 'n' rides, patrol shed, or rest stop parking lots.

Based on 2016 pavement conditions (*Exhibit 1-14*), Tier 1 and Tier 2 roadways are mostly (91%) in good or fair condition. For Tier 3 and Tier 4, 57% of roadways are also in good or fair condition. There is a total of 4,906 roadway miles within the state highway system. Overall, 72% (3,734 miles) of roadways are in good or fair condition, while the remaining 28% (1,172 miles) are in poor or very poor condition. As discussed previously, New Hampshire's portion of the National Highway Freight Network (NHFN) includes all interstate roadways. It should be noted that 100% of roadways along the NMFN are in either good or fair condition.

[22] *NHDOT Highway Tiers – Definitions*
https://www.nh.gov/dot/org/projectdevelopment/planning/amps/documents/tier_definitions.pdf

Exhibit 1-14: 2016 Pavement Conditions Statistics[23]



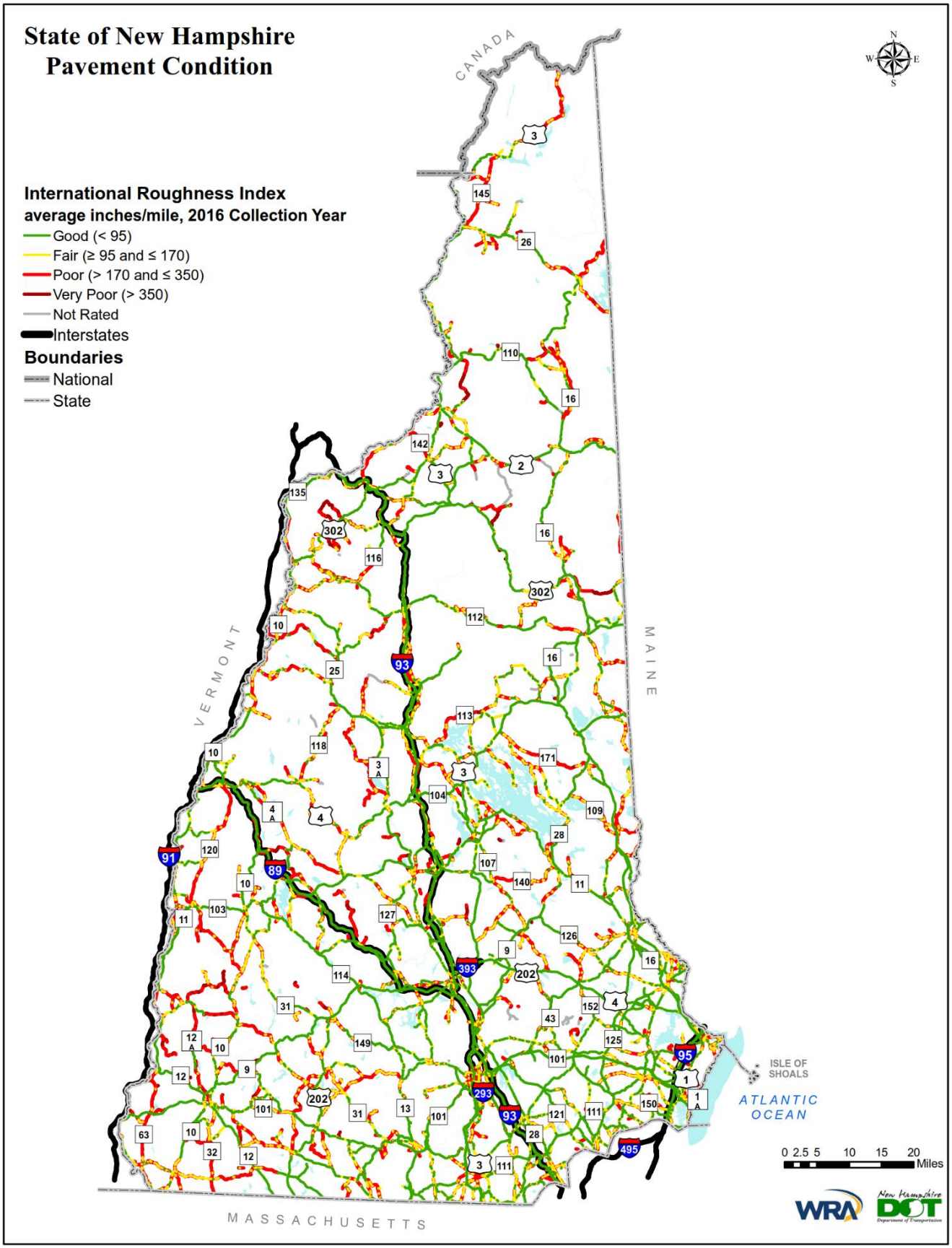
While the NHFN roadways are being maintained in Fair to Good condition many of the roadways serving as connections to the NHFN include segments in Poor or Very Poor Condition. This has the potential to reduce reliability and increase maintenance costs for trucks traveling these roadways.

One of NHDOT's goals is to upgrade roads in poor condition. Typically, any resurfacing or other maintenance project will only show an improvement for a short period of time (typically five years) before conditions return to their original state. With advancement in maintenance technologies, continued funding, and municipal project rankings, the State will continue its efforts toward improving the state of repair for the roadway system. A map of the 2016 pavement conditions is shown in *Exhibit 1-15*.

State routes provide critical interconnections between places and corridors, while lower tier roadways provide direct community access, circulation, and first/last mile connectivity. Trucks are typically the first/last mile link for many freight producers and consumers. Since trucks play a critical role in transporting freight locally, regionally, and across the state and nation, keeping roadways in a state of good repair is imperative. Regular repair and upgrades can improve the efficiency of goods movement by reducing maintenance costs for trucks and improving reliability.

[23] *Governor's Advisory Commission on Intermodal Transportation (GACIT) – Fall 2017 PowerPoint Presentation*
https://www.nh.gov/dot/org/projectdevelopment/planning/typ/documents/GACITFall2017_web.pdf

Exhibit 1-15: 2016 Pavement Conditions Map



Bridges

From a freight perspective, deficient bridges can increase the cost of delivery goods by creating inefficient routes to avoid bridges posted with height or weight restrictions. Since New Hampshire's highway system is the dominant mode for freight transport, rules and regulations have been put in place in order to maintain a state of good repair for bridges and minimize further wear and tear.

Over the past 5 years, 22 red list bridges have been added per year while 21 bridges per year are removed from the list which means that the number of deficient bridges increases every year. The result of this is an increase in shipping costs to areas of the state that rely on these bridges to access the NMFN by requiring trucks to detour to other bridges, essentially making these areas less economically competitive.

There are a number of bridges with vertical clearance issues and weight restrictions within the state of New Hampshire. Based on federal standards, the ranges for minimum vertical clearance are 14-16 feet for freeways and arterials and 14 feet for collectors and local roads. There are 34 bridges with vertical clearances of less than 14 feet. As of December 18, 2017, there are 282 weight restricted bridges[24] with bridge designations that either exclude travel on specific bridges (E-series) or must follow specific cautionary crossing procedures (C-series) where vehicles must wait until there are no other trucks on the bridge before they can cross. The designations include:

- E-1 Sign: Excluded Bridge - Single Unit Vehicles only
- E-2 Sign: Excluded Bridge - Certified Vehicles, both Single Unit and Combination Vehicles
- C-1 Sign: Caution Crossing Bridge - Single Unit Vehicles only
- C-2 Sign: Caution Crossing Bridge - Certified Vehicles, both Single Unit and Combination Vehicles
- C-3 Sign: Excluded Bridge - Single Unit Vehicles only, and Caution Crossing Bridge for Combination Vehicles only.

Within the state, there is a significant backlog of bridges designated as "Red List." Red List bridges are either structurally deficient or functionally obsolete and require interim inspections due to poor conditions *(Exhibit 1-16).* Bi-annual inspections are required for state-owned bridges and annual inspections are required for municipal-owned bridges *(Exhibit 1-17).* New Hampshire is actively addressing these deficiencies, but more bridges are being added from the list than removed to the list. It should be noted that there are historic bridges that will always remain on the list, as well.

Exhibit 1-16: 2017 Red List Bridges List[25]

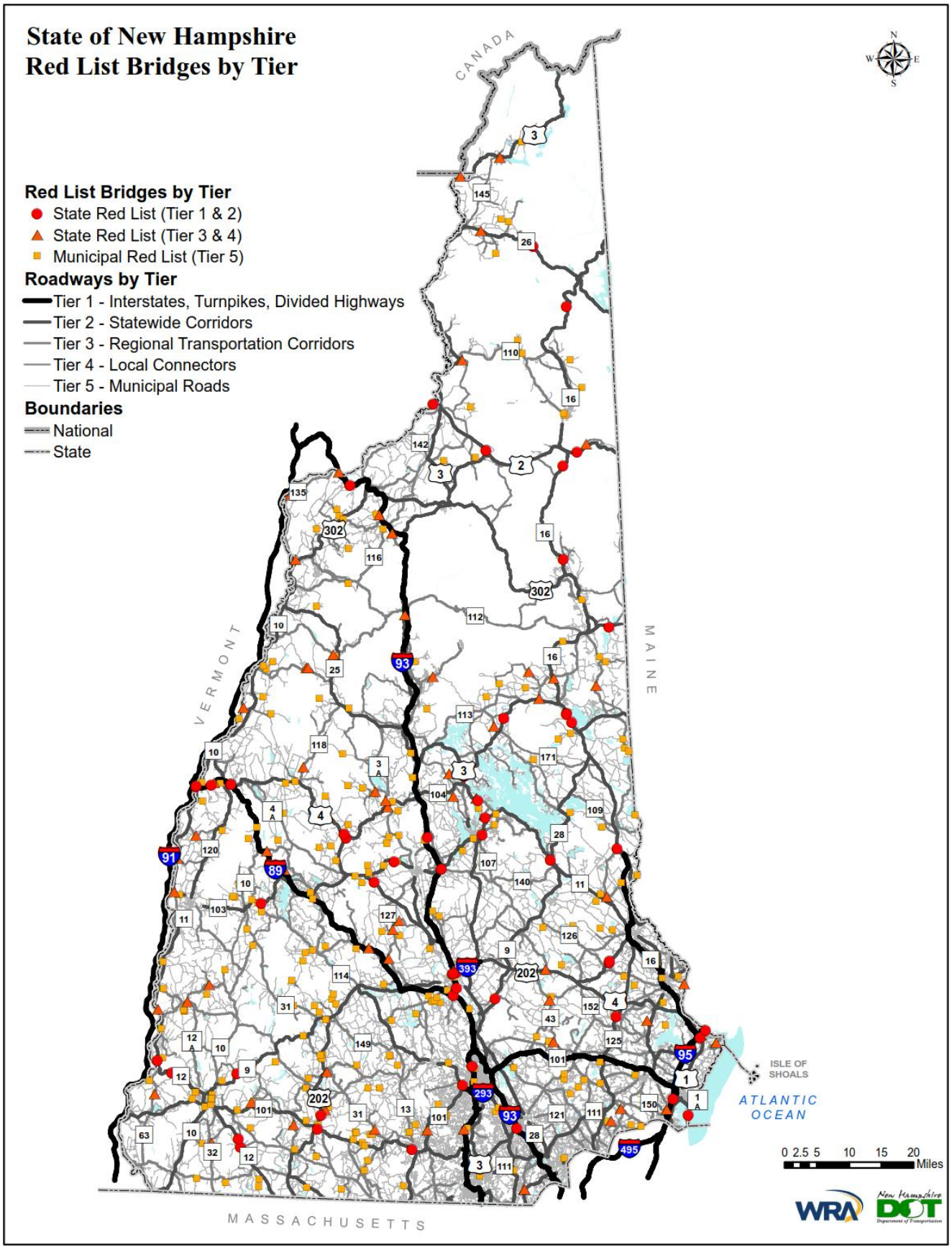
	Categories	Red List Count	RED LIST TOTAL
STATE	Tier 1 – Interstates, Turnpikes, Divided Highways	17	140
	Tier 2 – Statewide Corridors	45	
	Tier 3 – Regional Transportation Corridors	37	
	Tier 4 – Local connectors	33	
	Tier 6 – Off Network	8	
MUNICIPAL (AND OTHER)			254

Identifying these restrictions can help prioritize improvements in order to increase the economic competitiveness of the region through improving access to the broader national markets using the NMFN.

[24] *State Load Restricted Bridges (sorted by Town)*
ftp://pubftp.nh.gov/DOT/Bridge%20Design/nhdot_posted_bridge_bytown.pdf

[25] *Governor's Advisory Commission on Intermodal Transportation (GACIT) – Fall 2017 PowerPoint Presentation*
https://www.nh.gov/dot/org/projectdevelopment/planning/typ/documents/GACITFall2017_web.pdf

Exhibit 1-17: 2017 Red List Bridges Map



Base Truck Movement Analysis

The 2016 Average Annual Daily Traffic for New Hampshire (*Exhibit 1-18*) shows that traffic volumes are highest along the Interstate system at the southern borders of the state, traveling into Massachusetts. The Interstates typically carry more traffic than other routes. Portions of the Everett Turnpike in Nashua, I-93 in Salem, and most of I-95 along the southeastern border carry more than 80,000 vehicles per day. From a freight perspective, the data supports the fact that highway is the dominant mode for freight transport and Massachusetts is the state's top trading partner.

Portions of the Everett Turnpike in Nashua, I-93 in Salem, and most of I-95 along the southeastern border carry more than 80,000 vehicles per day.

Traffic volumes along the Interstate gradually decrease further north, past urbanized boundaries and into more rural portions of the state. Segments of I-93 traveling into the North Country area decrease to less than 10,000 vehicles per day. Traffic along I-89 decreases to 20,000 vehicles or less, and then increases to over 30,000 vehicles per day at the Vermont state line.

The most traveled non-Interstate roadways in New Hampshire include the following sections, where traffic volumes range from 30,000 to 50,000 vehicles per day. There are sections of NH 101 just east of I-93 and NH 16 just north of I-95 where traffic volumes range from 50,000 to 80,000 vehicles per day.

- NH 9 just west of I-93
- NH 101 just west of the Everett Turnpike
- NH 101 from I-93 to I-95
- NH 16 in the Rochester/Dover area

Segments of higher truck traffic levels mirror the same locations as those for overall daily traffic. The 2016 Annual Average Daily Truck Traffic (*Exhibit 1-19*) shows that the highest truck volumes are located along the Everett Turnpike, I-93, and I-95 in the southern portion of the state. More than 5,000 trucks travel on I-93 from the Massachusetts border up to the Concord area. From a freight perspective, I-93 serves as the main route for packages and deliveries to/from the Manchester Airport and is a key connection, providing US and state highways within New Hampshire access to not only adjacent states, but to the rest of the country, as well.

For non-Interstate roadways, truck traffic also mirrors the locations previously identified along NH 9, NH 101, and NH 16. Based on a qualitative assessment, isolated "pockets" of higher truck traffic have been identified in the following locations, with a range of 1,500-5,000 trucks per day:

- US 302 in Conway
- NH 101 in Keene
- NH 103 in Claremont

These isolated locations of truck traffic are due to serving as key connections to neighboring states, major intersecting crossroads, or transloading activity. US 302 in Conway is a key east-west connection into Maine in the northern part of the state. US 2 is another east-west connection located further north of US 302 but is not as viable since it is a narrow two-lane roadway with more frequent logging activity. NH 101 intersects with NH 9 and NH 10 in Keene, forming a key crossroads point in the southwestern portion of the state. The small portion of NH 103 in Claremont is located near the New England Central Railroad where transloading activity occurs.

Exhibit 1-18: 2016 AADT Volumes

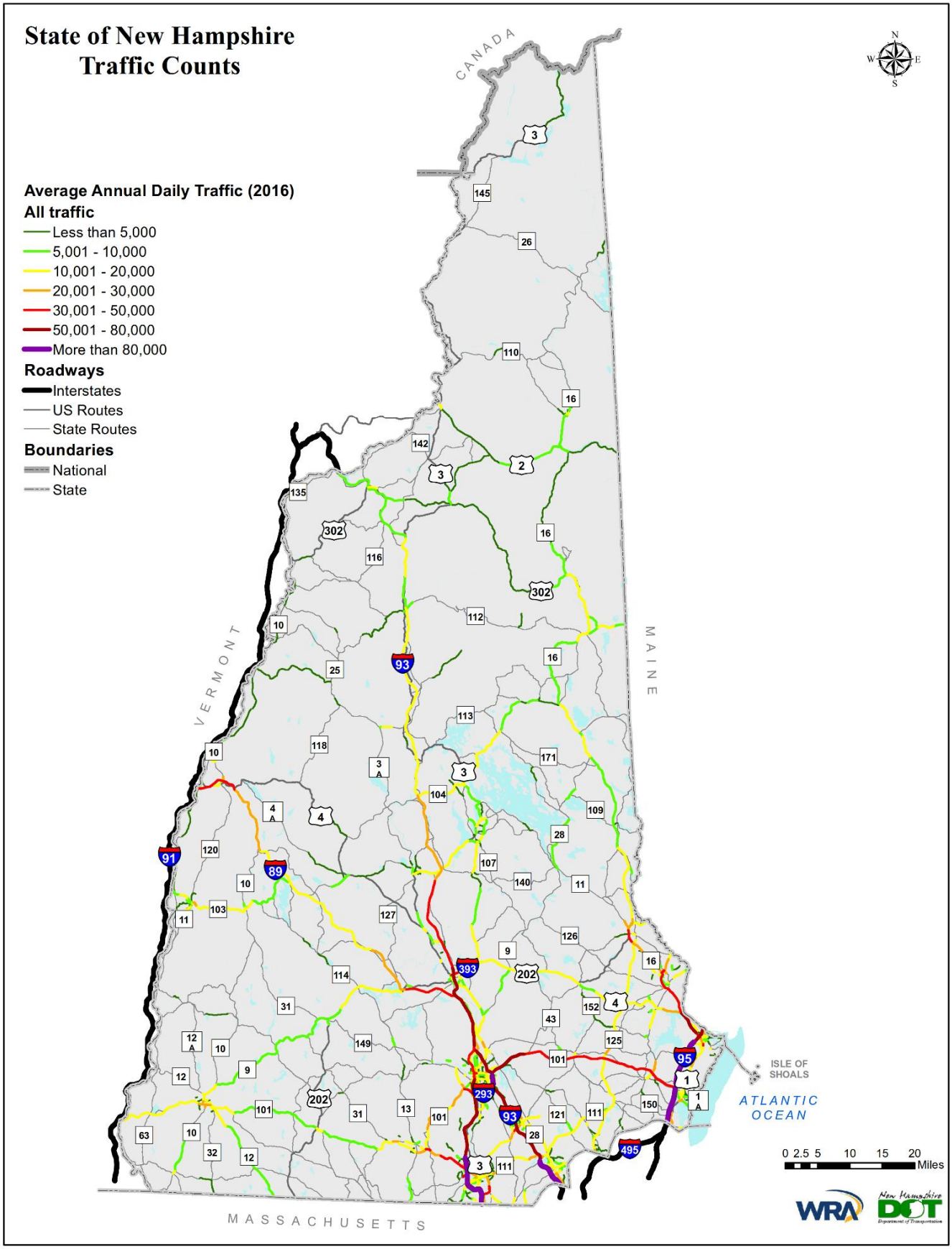
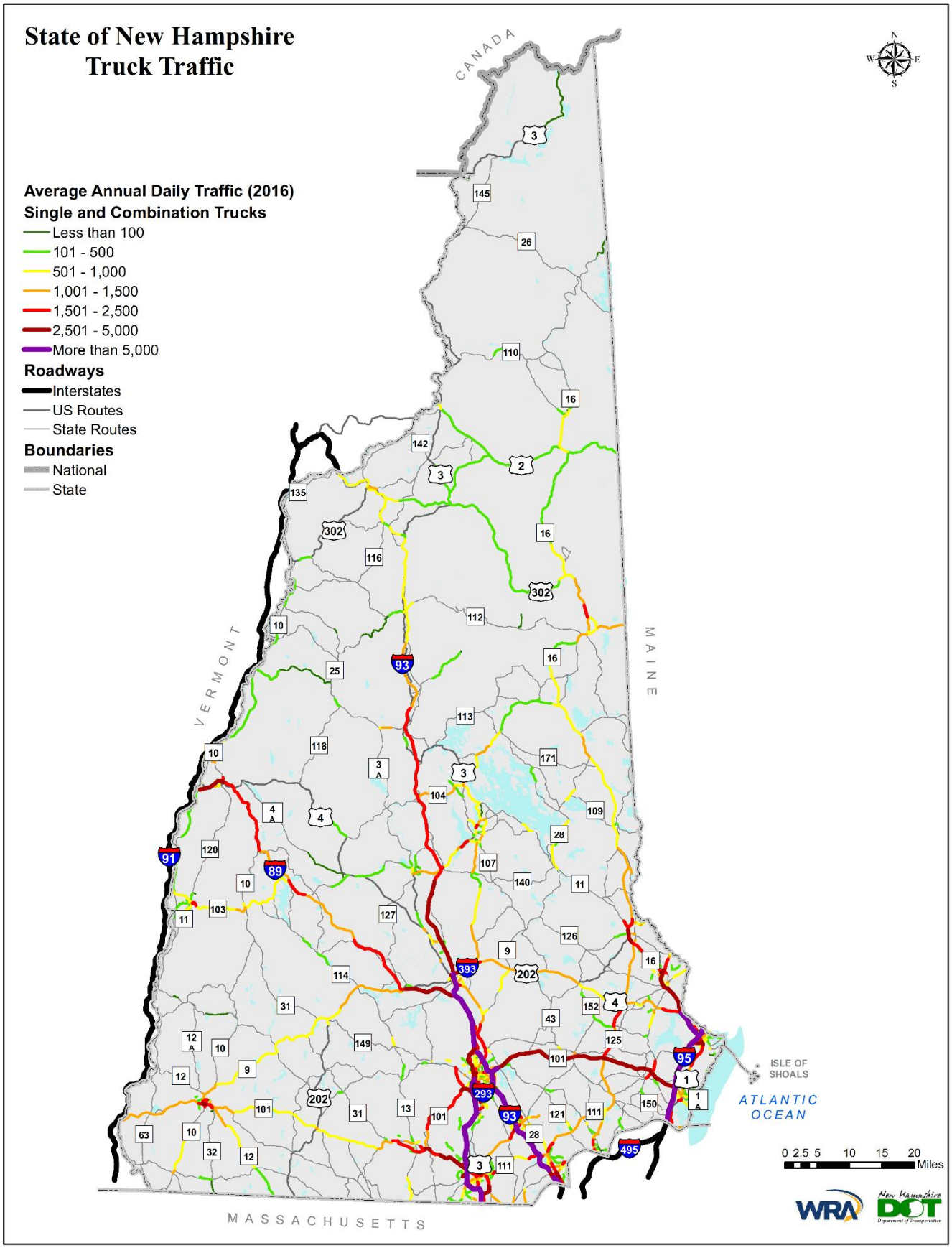


Exhibit 1-19: 2016 Truck Volumes



Intelligent Transportation Systems

New Hampshire has begun the development of a comprehensive application of intelligent transportation system (ITS) technology to its highway system.[26] The state's TSM&O plan is state-of-the-practice with respect to its coverage and functional scope. ITS features benefit all classes of highway traffic but given the preponderance of truck movements through the state on its limited-access highways, coverage of these roads by ITS technology is particularly beneficial for freight.

Centralized supervision and operations coordination occur at a statewide Traffic Management Center (TMC) providing 24/7 coverage of all state highways. TMC operators provide a number of services that are critical to maintaining safe and reliable traffic operations, including: incident management, service patrol management, special event management, road and weather coordination, emergency operation, and ITS monitoring for equipment and communications.

NHDOT has deployed and established a communications framework for more than 200 highway ITS devices of the following types:

- Closed circuit television (CCTV) cameras
- Dynamic message signs (DMSs, also known as variable message signs)
- Variable speed limit signs (VSLSs)
- Road weather information systems (RWIS)

ITS features benefit all classes of highway traffic, but given the preponderance of truck movements through the state on its limited-access highways, coverage of these roads by ITS technology is particularly beneficial for freight.

The near-term priority for ITS coverage is mainly on the state's limited-access highways. Present ITS device locations are generally indicative of such coverage (*Exhibit 1-20)*. In some cases, multiple devices are represented by one symbol.

Toll collection methods within New Hampshire has a direct impact on truck mobility on New Hampshire's three turnpikes (*Exhibit 1-21)*. The EZ-Pass technology employed is often considered to be within the realm of ITS. Of particular interest to freight movements is open road tolling (ORT), under which a vehicle need not slow or stop to pay a toll. With their lower horsepower-to-weight ratio relative to light vehicles, time and fuel savings for trucks from ORT can be substantial. ORT is presently in place at the Hampton mainline toll plaza on I-95 and the Hooksett mainline toll plaza on I-93. New Hampshire's Turnpike System is expected to continue its expansion to ORT or all electronic tolling (AET) in the future.

There are four weigh station locations covering 225 miles of Interstate highway. This coverage (56 miles per station) is slightly higher than the average for the 10 northeastern and mid-Atlantic states (67 miles of Interstate per weigh station). Weigh stations are potential locations for new technology including weigh-in-motion, which allows a truck to avoid stopping completely to be weighed, and electronic weigh station bypass. At present, New Hampshire's weigh stations operate similarly to those in adjacent states, where they are open on an irregular basis and have provisions to accommodate at least some forms of electronic bypass.

[26] *NHDOT 5-Year Strategic Plan, Transportation Systems, Management, & Operations (TSM&O), July 2014*

Exhibit 1-20: ITS Device Locations

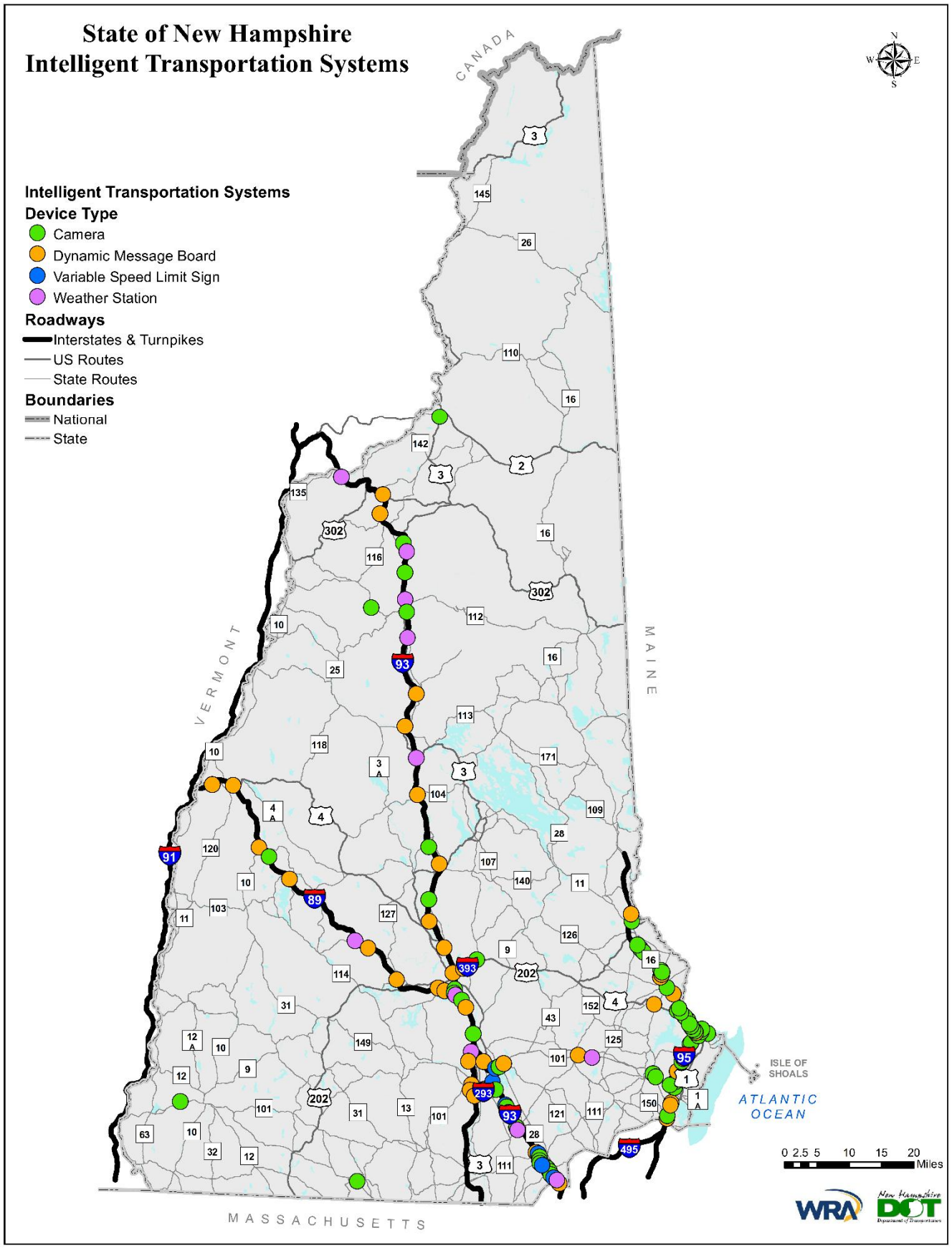
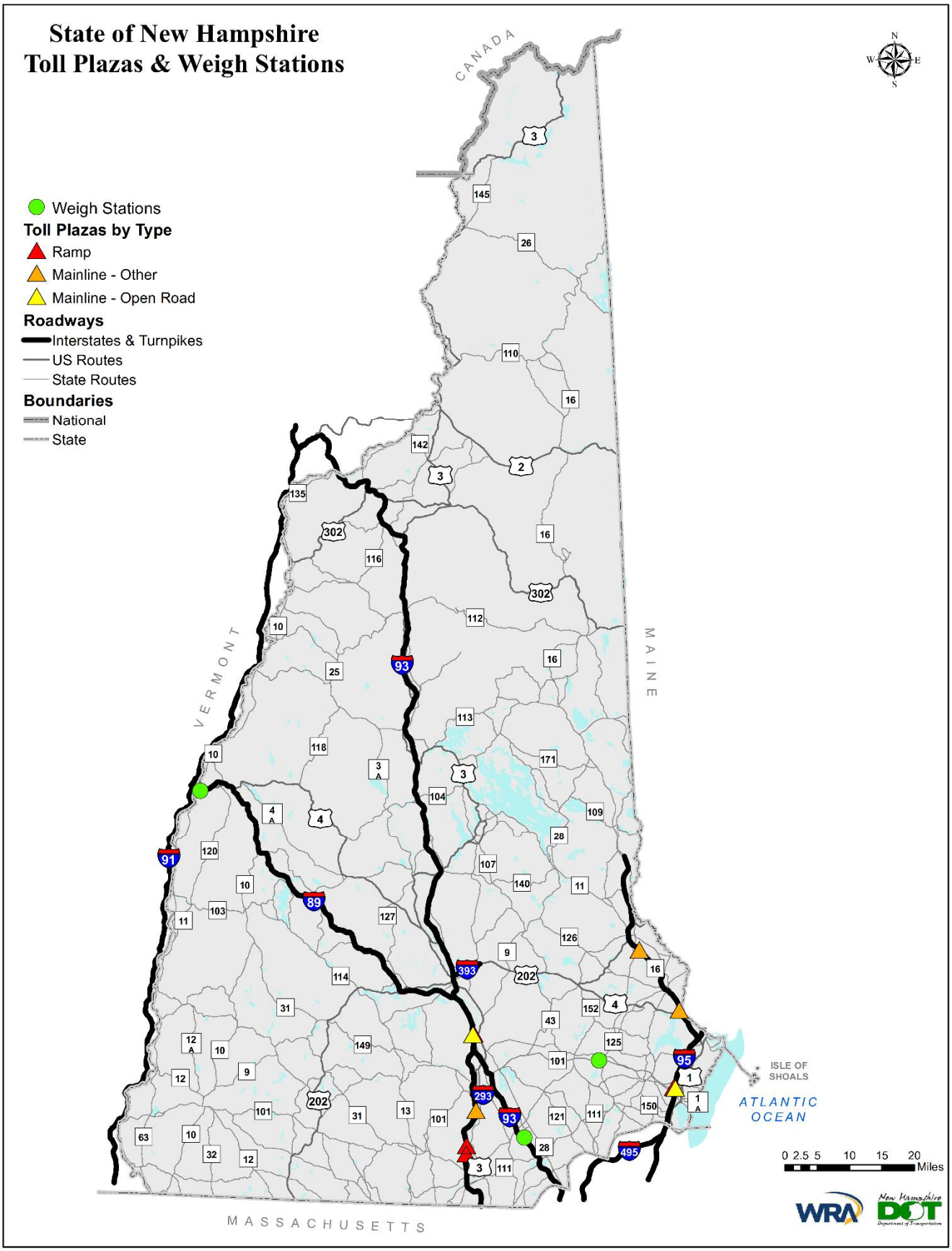


Exhibit 1-21: Toll Plazas and Weigh Stations



Truck Facilities

New Hampshire's roadways currently include at least three distinct classes of facilities that offer conveniences to the operators of commercial highway vehicles (*Exhibit 1-22*):

- State-operated rest areas (RAs)
- State operated Welcome & Information Centers (WICs) which also offer visitor information
- Commercially-operated truck stops

Further research was conducted to verify truck stop information offered to truck operators. There is no formal definition of these truck stops, but the selected ones are based on Google Earth checks to verify that these locations included some level of amenity over and above a service station with a convenience store.

An inventory of each welcome center and rest area was taken to document information such as travel statistics, building conditions, parking availability, and driver survey results. A series of statewide recommendations were developed (*Exhibit 1-23*), including specific locations cited for truck parking expansion, demolition of existing facilities, and formation of public-private partnerships to develop new facilities.

Key recommendations[27] include the following:

- ***Recommendation 19:*** *Investigate the potential of forming a partnership between the State and an existing visitor/information center, Chamber of Commerce or private commercial business located along I-93 between Campton and Franconia.*
- ***Recommendation 20:*** *Investigate the potential to form a partnership between the State and a local Chamber of Commerce, the Monadnock Tourism Region, or a private commercial business, to provide a new RA/WIC along Route 9 between Chesterfield and Hillsboro.*
- ***Recommendation 21:*** *Investigate the potential to form a partnership between the State and the Androscoggin Valley Chamber of Commerce or a private commercial business to provide a new RA/WIC on Route 2 in Gorham that will replace the closed Shelburne facility.*
- ***Recommendation 22****: In the short-term, it is recommended that State keep operating Colebrook as a seasonal RA/WIC (closed in winters). It is difficult to justify keeping the Colebrook facility open. However, it is the northern most facility, serving as a gateway entering NH on Route 3 from VT and Canada.*

[27] *NHDOT Statewide Rest Area and Welcome Center Study*, June 2016

- ***Recommendation 23:*** *The State should demolish the existing Rumney building and retain ownership*
- ***Recommendation 24:*** *The State should demolish the existing Epsom building and retain ownership*
- ***Recommendation 25:*** *The State and Bureau of Turnpikes should perform a due diligence/feasibility study for locating/developing a new RA/WIC facility along the Spaulding Turnpike (Route 16) in Dover/Newington; the Blue Star Turnpike (I-95 in Portsmouth); or US 202 in Rochester.*
- ***Recommendation 26:*** *Because the newly redeveloped Hooksett North RA/WIC has state-of-the-art tourist and traveler information center, it is recommended that a new northbound RA/WIC on Everett Turnpike south of Hooksett not be pursued at this time.*
- ***Recommendation 39a:*** *The State should develop a long-term plan to identify potential areas where additional truck parking can be provided. This will improve safety for truckers & general motoring public.*
- ***Recommendation 39b:*** *The State should consider developing a map of truck parking locations (including the RA/WICs) that can be made available electronically and through social media. This would help direct truckers to designated areas and reduce the time truckers spend looking for facilities.*
- ***Recommendation 39c:*** *The State should restripe the Seabrook RA/WIC truck parking lot to provide adequate space for large trucks and maximize the use of the existing space.*
- ***Recommendation 39d:*** *The State should consider providing additional truck parking at the Seabrook RA/WIC. A preliminary review indicates there is available State right-of-way at the rear of the site.*

Exhibit 1-22: Welcome and Information Centers

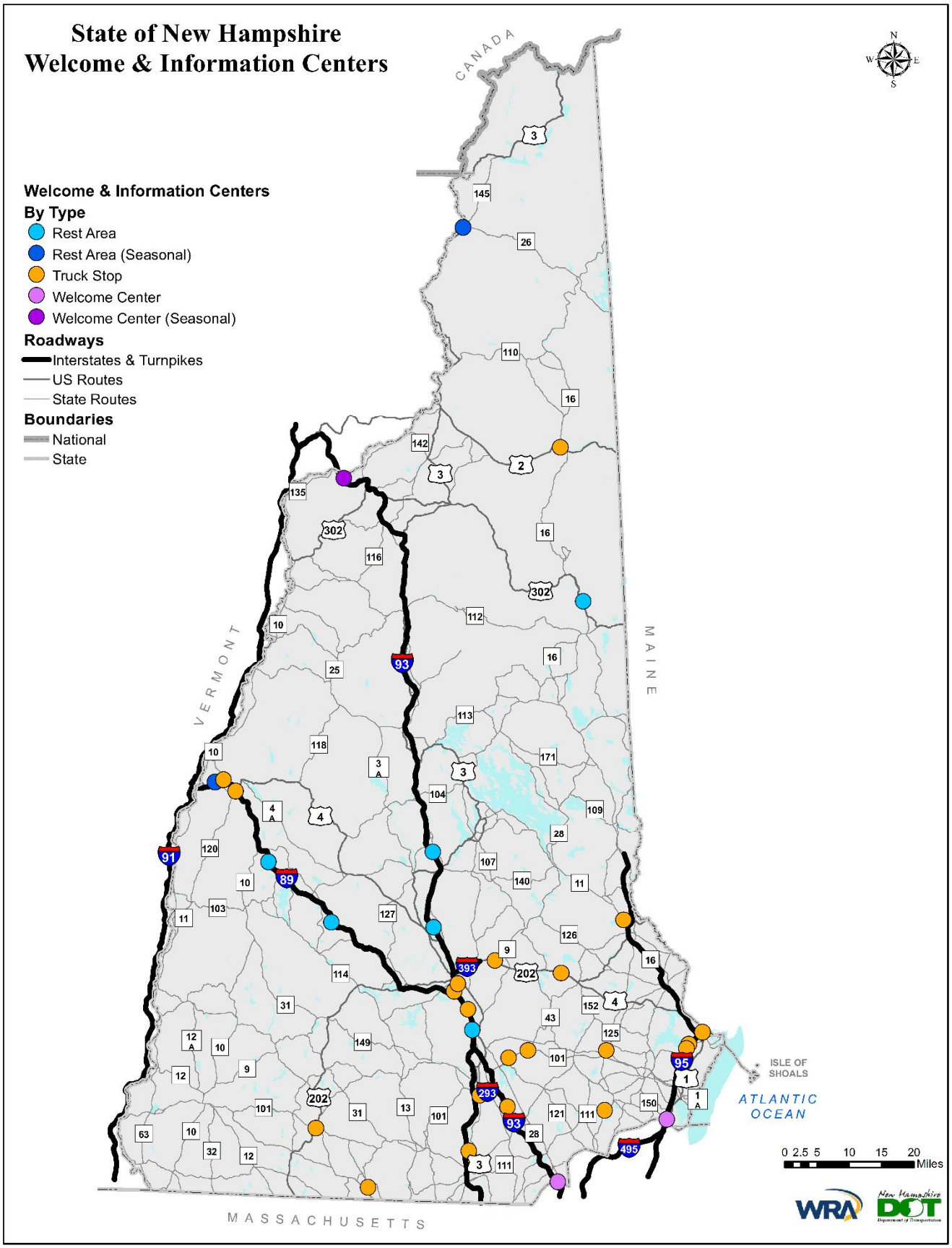
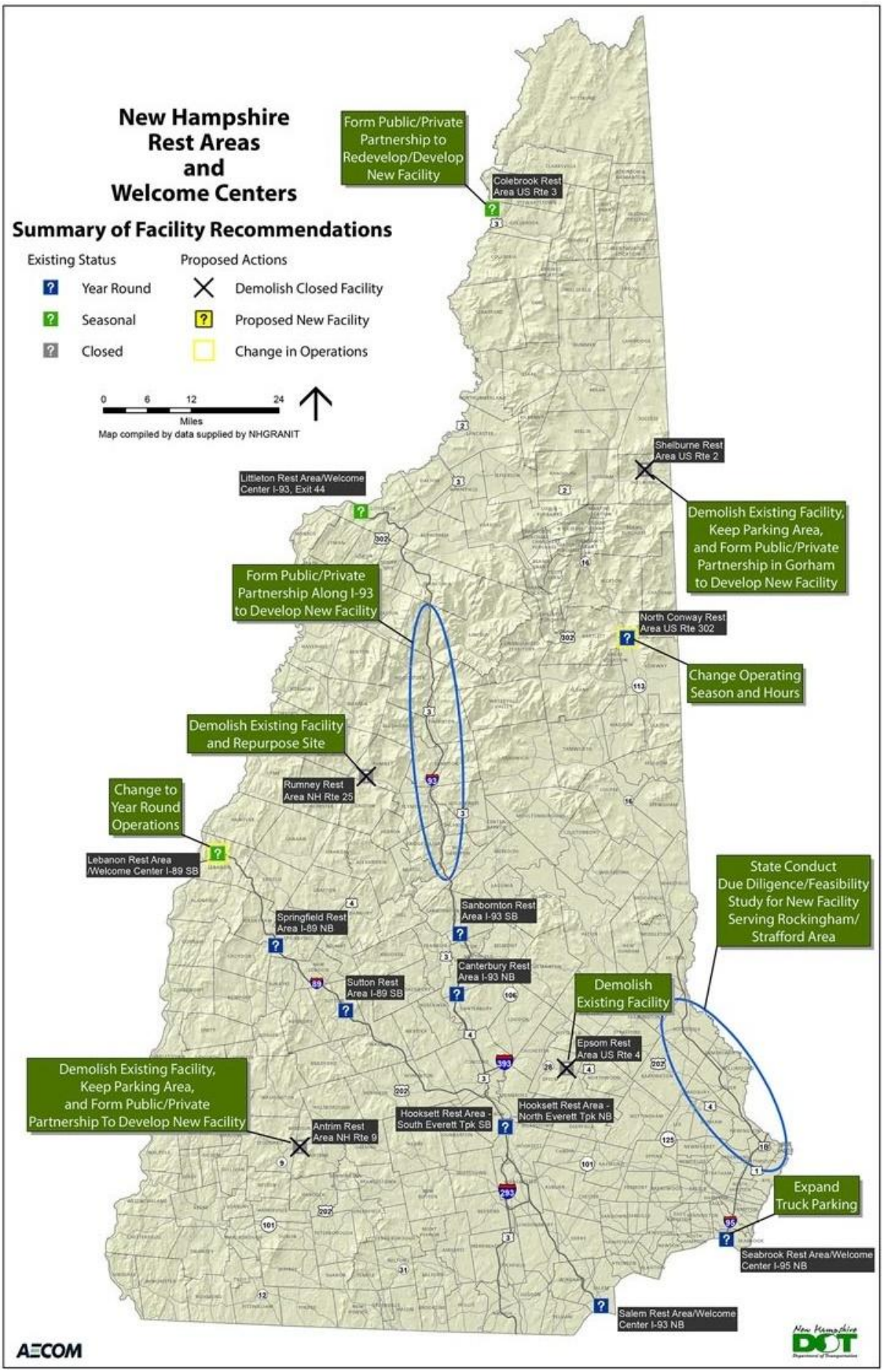


Exhibit 1-23: Statewide Rest Area and Welcome Center Recommendations



1.2.3 Statewide Freight Infrastructure – Rail System

State Rail Network

The NH Rail System (*Exhibit 1-24)* is comprised of five primary owners of the railroad lines, four of which are also railroad operators. These include: (1) New England Central Railroad, (2) New Hampshire Northcoast Corporation, (3) Pan Am Railways, (4) St. Lawrence & Atlantic Railroad and (5) State of New Hampshire. Rail transportation will be addressed from a regional perspective, including regional gateways and connections to neighboring states. *Exhibit 1-25* shows the rail system, including all active railroads by owner.

Exhibit 1-24: Miles of Rail Operated in New Hampshire[28]

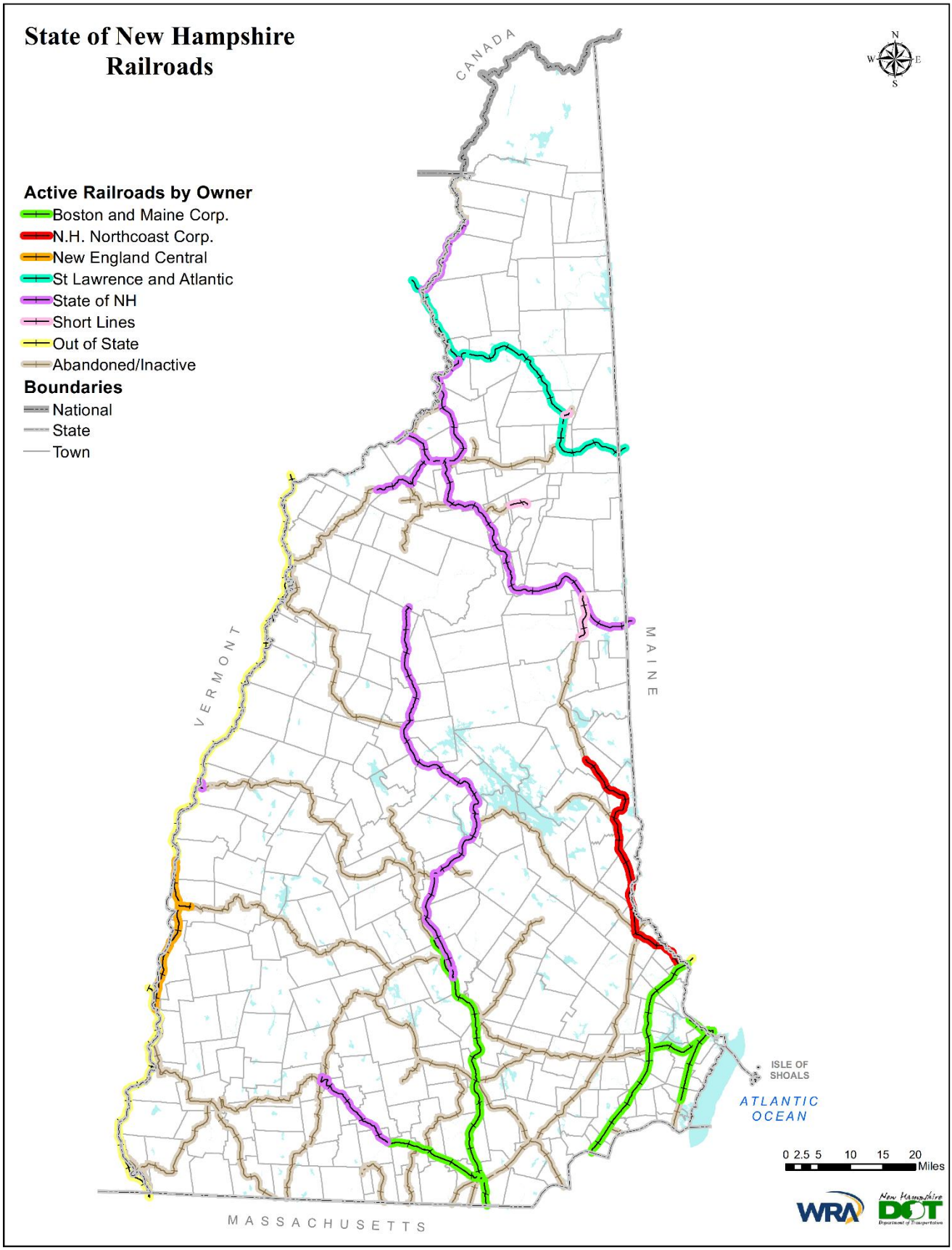
Class	Railroad	Miles of Railroad Principally Operated	Percent of New Hampshire Rail System	Percent of Rail by Class
Class I	**NONE**			
Regional Railroads	Pan Am Railways (PAR)	121	27.31%	46.96%
	New England Central (NECR)	29	6.56%	
	St. Lawrence & Atlantic (SLR)	58	13.09%	
Short Line Railroads (Freight)	Green Mountain (GMRY)	1	0.23%	29.11%
	Milford-Bennington (MBRR)	18	4.06%	
	New England Southern (NESR)	18	4.06%	
	New Hampshire Central (NHCR)	44	9.93%	
	New Hampshire Northcoast (NHN)	42	9.48%	
	Twin State (TSRR)	6	1.35%	
Tourist Railroads	Conway Scenic (CSRR)	51	11.51%	23.93%
	Plymouth & Lincoln (PLRR)	55	12.42%	
TOTAL		**443**	**100%**	**100%**

Rail Abandonments and Potential for Future Rail Use

Over the past few decades, NH has purchased over 400 miles of rail corridors for preservation. Currently, the state owns 330 miles of abandoned railroad corridors, which are managed for possible future recreational or rail use. Since the 2001 New Hampshire State Rail Plan, only three line segments have been officially abandoned due to minimal or no traffic, including the Manchester & Lawrence (M&L) Line, a portion of the former Concord to Claremont Line, and a segment of the former Lakeshore Line in Laconia. As economic development initiatives progress in the future, further investigation of freight rail service along currently abandoned corridors should be taken into consideration.

[28] *New Hampshire State Rail Plan, 2012*

Exhibit 1-25: Railroad System



1.2.4 Statewide Freight Infrastructure – Airport System

There are 25 public use airports located throughout the state of New Hampshire (*Exhibit 1-26*). Key summary information[29] regarding airport roles and statuses are outlined below:

- *As of calendar year 2014, the following airports have been defined as Primary Commercial Service Airports: Lebanon Municipal Airport, Manchester-Boston Regional Airport, and Portsmouth International Airport at Pease.*
- *With regard to passenger volume, Manchester's annual enplanements of 1.2 million in 2013 make it the fourth largest airport in New England. Manchester-Boston Regional Airport is the third largest in New England in terms of cargo with 167.3 million pounds of enplaned and deplaned cargo in 2013.*
- *In 2013, the number of enplanements at Portsmouth International Airport at Pease for air taxi and commercial service was 22,543, a 66.8% increase compared to 2012.*
- *Twelve (12) airports are listed in the FAA's National Plan of Integrated Airport Systems (NPIAS).*
- *According to the FAA's Airport Master Records (form 5010), as of January 2014, there are a total of 140 airports in the State of New Hampshire, which includes all privately-owned airports, landing fields, and heliports.*

Several airports have enhanced their facilities to better serve and enhance aviation demand. At primary airports, MHT improvements include the rehabilitation of taxiway infrastructure to improve the flow and safety of aircraft taxiing to and from the runway. At general aviation airports, runway reconstruction projects have been completed at Boire Field in Nashua, Dillant Hopkins Airport in Keene, and Skyhaven Airport in Rochester, NH.

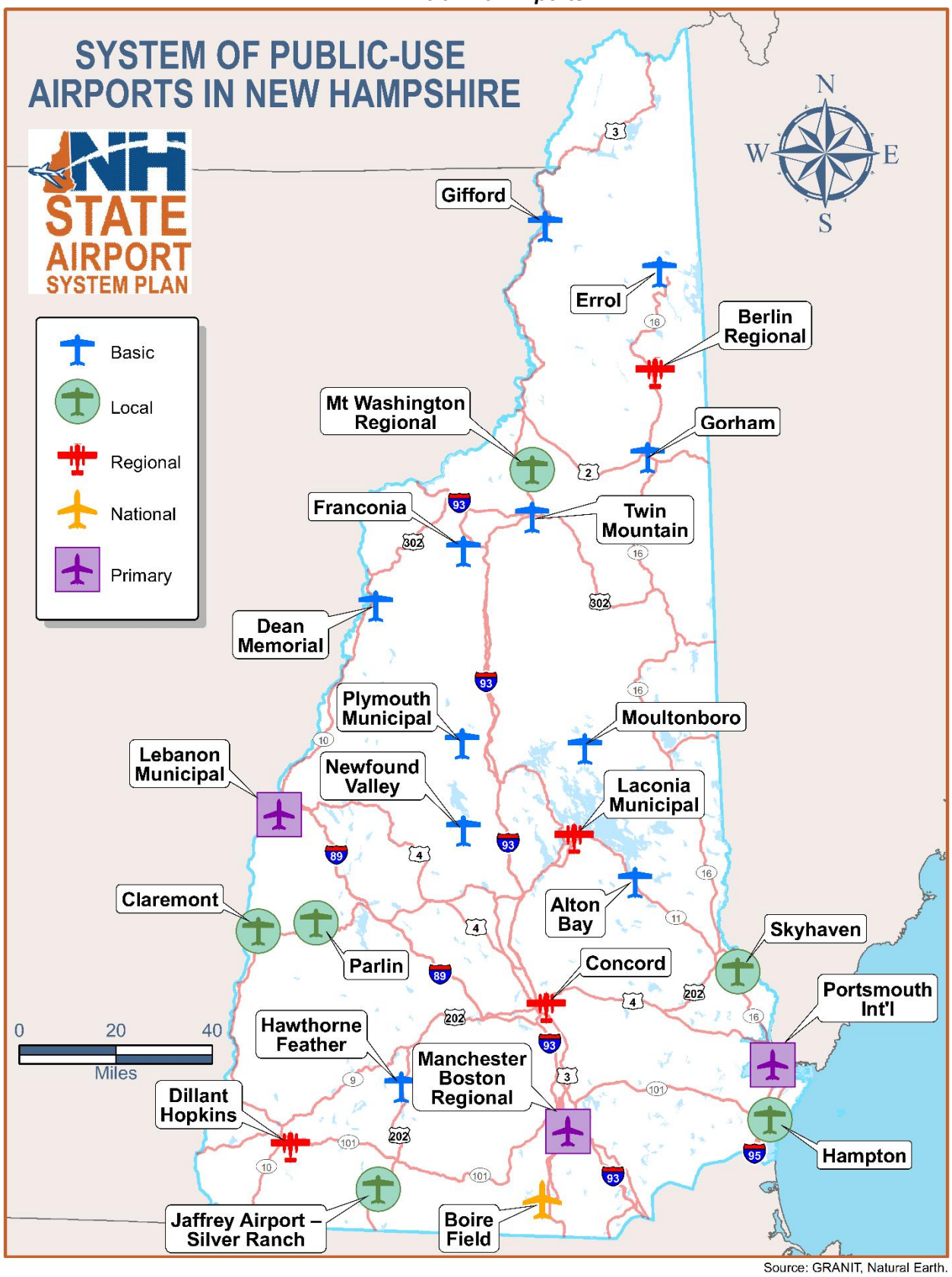
In terms of airport economic contributions, the three primary airports provide higher contributions since they employ more people, serve more tenants, and have larger operations & maintenance (O&M) budgets. Based on the latest totals in the 2015 NH Airport Plan, primary airports support 8,451 jobs, $341.15 million in labor income, and $25.20 million in tax revenues. Manchester Airport generates the largest operating revenue stream due to their passenger and cargo services. However, general aviation airports still make a significant contribution to the State's economy, providing 769 jobs, $38.02 million in labor income, and $1.31 million in tax revenues.

Cargo services are available at two of the three primary commercial service airports in NH. The Manchester Airport serves as a regional cargo hub for both FedEx and UPS, and there are regional truck warehouses located in the vicinity, while the Pease International Tradeport handles and clears international cargo.

Air freight is usually reserved for high value items for which a premium is placed on the delivery schedule, and the local transfer of these materials is usually transported via truck for cost efficiency purposes. There is currently no rail service (cargo or passenger) with stops at any of the 25 public use airports in New Hampshire. However, recent studies have been conducted to connect the primary airports with future regional commuter rail service. Changes are not anticipated in the short-term, but the future considerations have been noted.

[29] *New Hampshire Statewide Airport Plan*, *2015*

Exhibit 1-26: Airports[30]



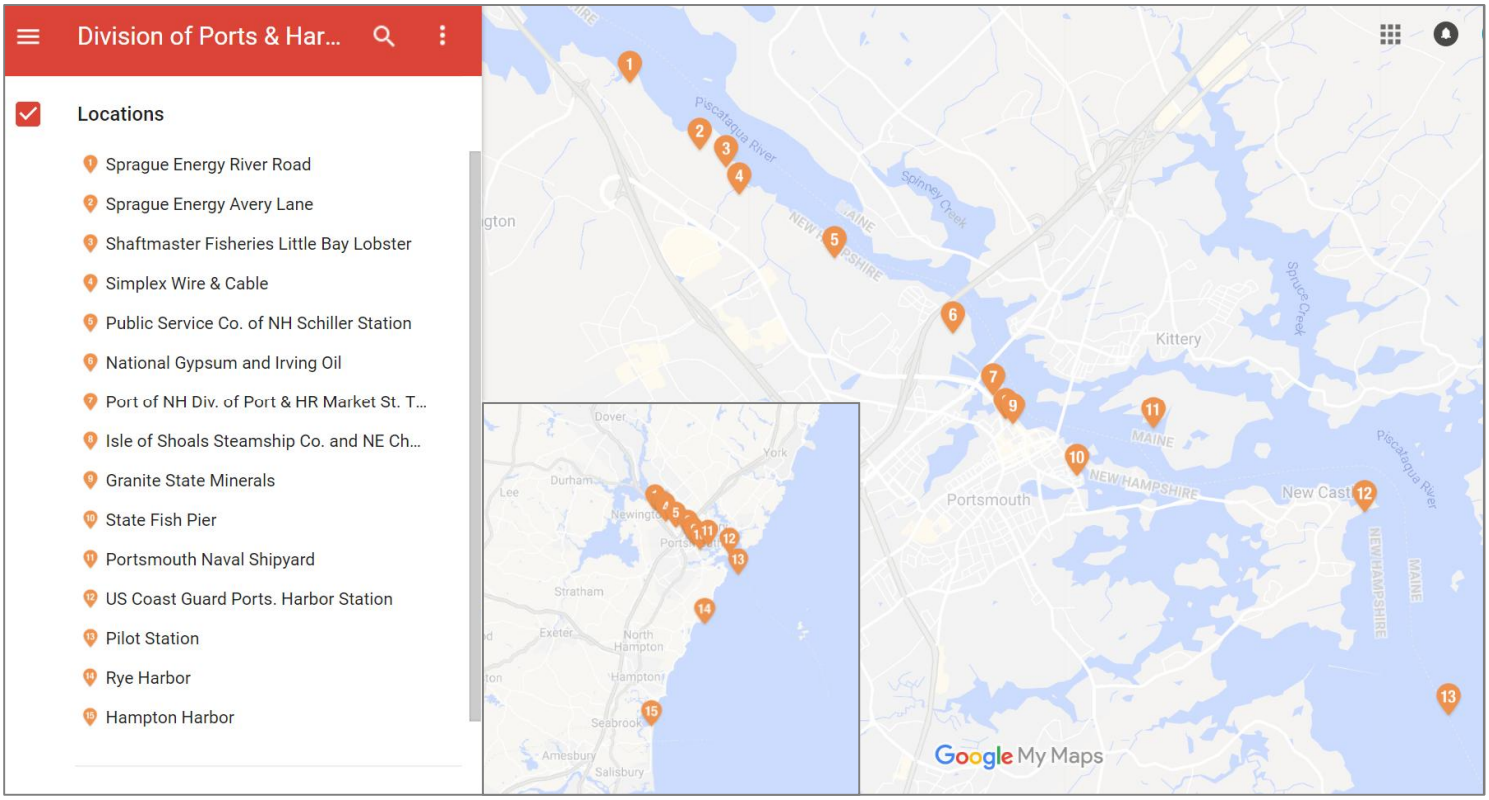
[30] *https://www.nh.gov/dot/org/aerorailtransit/aeronautics/documents/SystemofAirports-NHPoster7-7-15.pdf*

1.2.5 Statewide Freight Infrastructure – Marine System

Port of Portsmouth

Portsmouth Harbor, located at the mouth of the Piscataqua River, is the state's only ice-free, deep-water port with year-round service availability. The Portsmouth Harbor and the Piscataqua River is host to marine terminals and other marine entities (commercial offshore lobstering fleet, boat yards, marine laboratory, marine construction company, aquaculture facility), which are all located on the New Hampshire side of the Piscataqua River *(Exhibit 1-27).* Except for the Portsmouth Naval Shipyard, the Maine side does not have any other major commercial or industrial facilities and is primarily residential use.

Exhibit 1-27: Marine Terminals of the Portsmouth Harbor and the Piscataqua River[31]



Truck is the primary intermodal connection at the port due to cost efficiency. There is direct rail access using Pan Am Railways' Portsmouth Branch, which connects to their main line at Newfields, NH and passes through the Market Street Terminal. The Market Street Terminal is the only public access, general cargo terminal on the Piscataqua River. With onsite rail access, close proximity to I-95 (1/2 mile), and close proximity to Pease International Airport (2 miles), the port is capable of handling imports and exports, along with specialty on-demand services.

[31] *State of New Hampshire, Division of Ports & Harbors, https://peasedev.org/government/division-of-ports-harbors/*

https://www.google.com/maps/d/viewer?mid=1at3Vhl9aIkMHWRTlyiFJoiL72x_zIK9a&hl=en&ll=42.97359961512778%2C-70.74863353393692&z=10

The Market Street Terminal also offers[32]:

- 8 acres of paved access outside lay down area
- 20,000 sq. ft. of covered warehouse
- Onsite rail access
- 600-foot berth, 35 ft/MLW
- 3 NM from open sea
- Fresh water

The cargo handled at the Market Street Terminal and other marine terminals of the Portsmouth Harbor and Newington handle cargo ranging from road salt to kerosene *(Exhibit 1-28).*

Exhibit 1-28: Cargo Handled at the Marine Terminals Along the Piscataqua River[33]

Terminal	Cargo Handled
Granite State Minerals	Road Salt
New Hampshire State Pier (Market Street Terminal)	Bulk cargo (scrap metal, road salt, gypsum), and general, project and container cargo
National Gypsum / Irving Oil	Gypsum and fossil fuels (kerosene and oil)
Granite Shore Power	Fossil fuels (coal and oil)
Tyco Wire and Cable	Special Cargo (Cable)
Sprague Avery Lane / Sea-3 Newington	Liquid asphalt, oil and propane
Sprague River Road	Bulk cargo (road salt, cement, gypsum), liquid cargo (tallow) and fossil fuels (kerosene)

The New Hampshire Division of Ports and Harbors is designated as a Foreign-Trade Zone (FTZ #81), in which goods entering the zone are considered outside of US commerce regulations, therefore no duty must be paid while in the zone. The FTZ includes terminal sites and two manufacturing subzones, which include the following:

- Market Street Terminal, 11 acres
- Portsmouth Industrial Park, 75 acres
- Manchester Airport, 1400 acres
- Pease International Tradeport, 1900 acres
- Millipore Corporation (in Jaffery)

As of November 2018, New Hampshire has received federal approval to expand foreign trade zone service areas in the state[34]. The expanded boundary stretches east from the Vermont state line along US 4 (near Lebanon), north on I-93 along the Belknap and Grafton county line, to NH 25 (near Freedom) east to the Maine state line. This expansion will allow more businesses access to benefits that include lessening duties on imported goods, which can help to retain and attract businesses and jobs.

[32] *State of New Hampshire, Division of Ports & Harbors, https://peasedev.org/government/division-of-ports-harbors/*

[33] *Portsmouth Harbor and Piscataqua River Navigation Improvement Project, July 2014*

[34] *http://www.unionleader.com/news/business/nh-receives-federal-approval-for-wider-federal-trade-zone-service/article_f6425b6b-b596-5ec5-b164-51cca29573d3.html*

Infrastructure Needs & Future Opportunities

Regional shipping activity has been declining in northern New England since 2005, where the decline in cargo activity has been observed in Portsmouth Harbor and in neighboring ports[35]. The decline in Portsmouth from 2005 to 2009 was over 30%. Between 2011 and 2012, tonnage handled at the Main Street Terminal increased by more than 50 percent; but due to physical deterioration, port activity is constrained and has declined in recent years. From 2013 to 2015, tonnage activity has decreased from 304,500 tons to 92,000 tons. Without viable improvements, these declining trends are expected to continue.

To enhance economic vitality for the port and its freight services, maintenance needs and repairs were identified, and a series of federal grant applications were submitted in previous years to attain funding. Applications[36] were submitted by NHDOT, Pease Development Authority Division of Ports and Harbors, and Maine DOT for the following projects (*Exhibit 1-29)* for the Port of Portsmouth:

- Memorial Bridge Replacement (Complete in 2013)
    - Awarded TIGER II Discretionary Grant (TIGER II) funding in 2010
    - Complete superstructure replacement of the structurally deficient vertical lift bridge, providing a viable connection of continued operations for all users and modes of travel
- Sarah M Long Bridge Replacement (Complete 2018)
    - Awarded TIGER VI Discretionary Grant (TIGER VI) funding in 2014
    - Construction of a wider bridge lift opening, enabling larger ships to access upstream port facilities and expected to better support and increase the Port's competitiveness
- Main Street Terminal Wharf Repairs

  Grant applications are currently in progress to obtain funding for future expansion and repairs (*Exhibit 1-30*)

[35] *The Economic Impact of the Piscataqua River and the Ports of Portsmouth and Newington, June 2012*

[36] *TIGER II Discretional Grants – Memorial Bridge Replacement Project – Portsmouth, NH – Kittery, Maine, 2010*

Exhibit 1-29: Funding Applications and Grants Awarded for Maintenance and Repair Needs[37]

Exhibit 1-30: Market Street Terminal Main Wharf Repair Components[38]

Component	Outcome
Deck over existing open water	• Facilitate improved freight movement between water & land
Repair deteriorated caissons	• Restore structural integrity • Extend service life
Recoat portions of the steel sheet bulkhead	• Extend service life
Repair deteriorated concrete superstructure elements	• Restore structural integrity • Extend service life
Resurface deteriorated concrete deck	• Restore structural integrity • Drainage
Miscellaneous top of deck repairs including recoating mooring hardware, replacing mooring hardware and associated concrete pedestals, and replacing deteriorated units	• Extend service life

[37] *TIGER II Discretional Grants – Memorial Bridge Replacement Project – Portsmouth, NH – Kittery, Maine, 2010*

[38] *FY 2018 BUILD Grant Application – Market Street Marine Terminal Main Wharf Rehabilitation, July 2018*

1.2.5 Statewide Freight Infrastructure – Pipeline Transportation

The New Hampshire Public Utilities Commission – Safety Division oversees more than 3,100 miles of intrastate pipelines within the state. Other details include the following[39]:

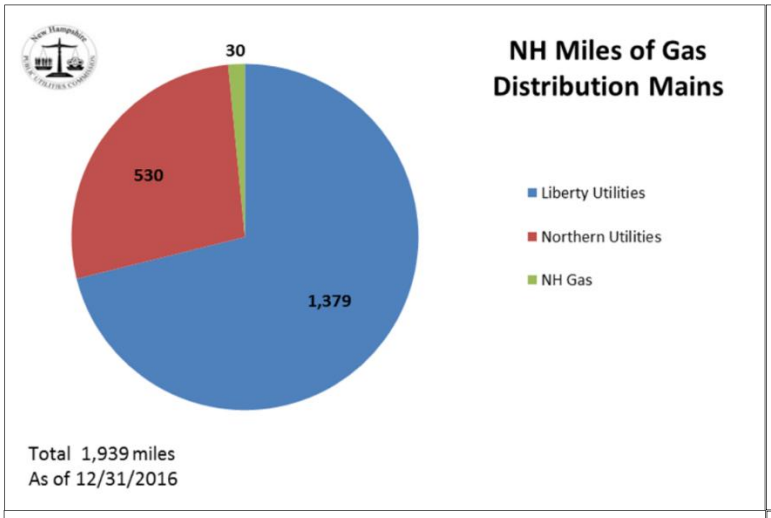
- *These intrastate pipelines serve over 127,500 customers within 53 communities in New Hampshire. These figures do not include pipelines served by jurisdictional propane systems.*
- *Two natural gas utilities, two transmission operators, over 21 liquid propane gas operators, one propane-air distribution company, one master meter operator, and two methane operators are inspected at least once per biennium, although most are inspected annually.*
- *Typical gas distribution pipelines such as mains and services are often located in public right of ways such as streets and sidewalks and on occasion, private drives.*
- *Any pipeline, whether it is a service, distribution main, or interstate and intrastate transmission pipeline, needs a state issued license to cross over, under or through a state property such as state-owned land, or state owned public water body.*
- *An exception to this is highway crossings such as bridge crossings and pipelines located in Rights of Way owned and maintained by the New Hampshire Department of Transportation (DOT). The New Hampshire DOT requires a standard Use and Occupancy Agreement be completed as outlined in the New Hampshire Utility Accommodation Manual.*
- *Large transmission pipelines and compressor stations often fall under the authority of the New Hampshire Site Evaluation Committee (SEC).*

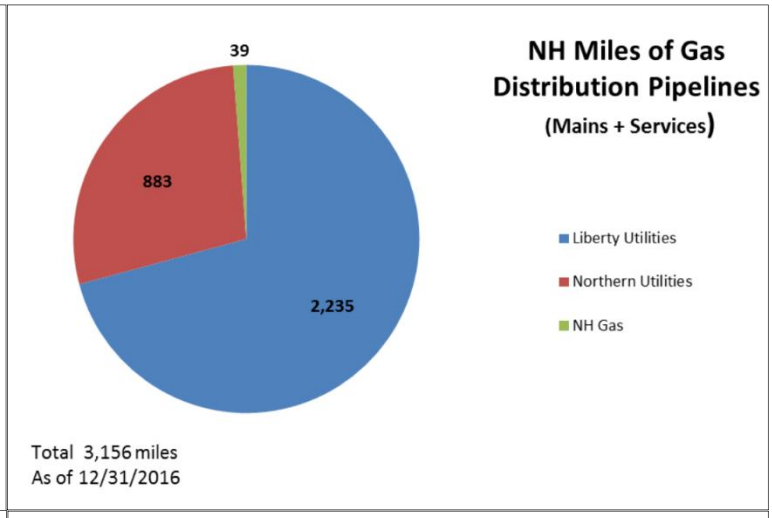
There are a number of pipeline operators that are not inspected by the New Hampshire Public Utilities Commission – Safety Division. The exclusion list includes four interstate natural gas transmission pipeline operators (totaling 232 miles) and one interstate oil transmission pipeline operator (totaling 75 miles).

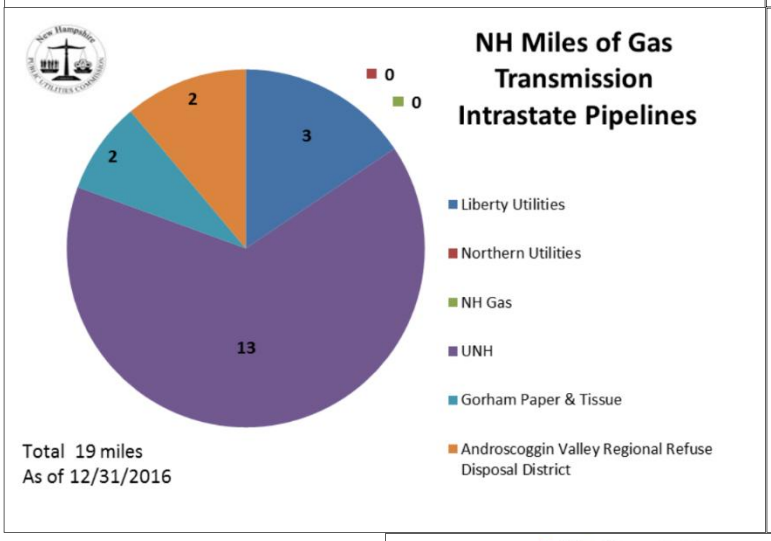
New Hampshire pipeline mileage statistics as of December 31, 2016 are shown in *Exhibit 1-31*. Gas and pipelines operating in excess of 100 psig (pounds per square inch gauge, relative to atmospheric pressure) are shown in *Exhibit 1-32.*

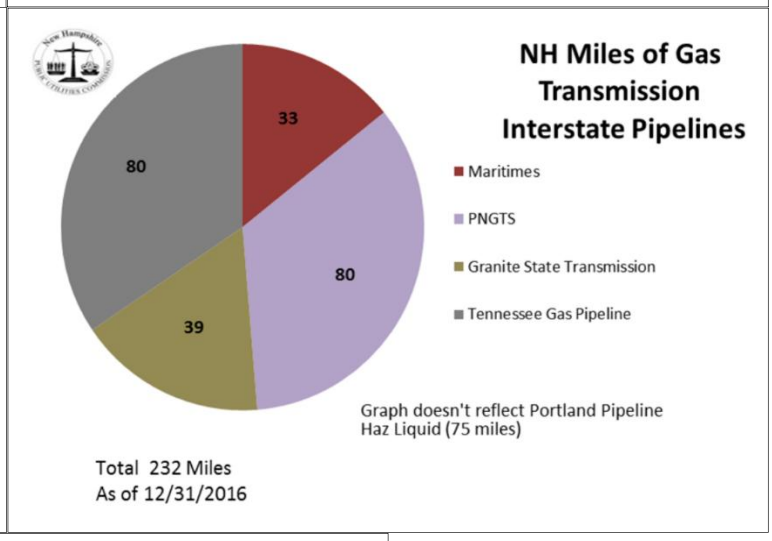
[39] *New Hampshire Public Utilities Commission Website, https://www.puc.nh.gov/Safety/Pipeline_Safety_Overview.htm*

Exhibit 1-31: New Hampshire Pipeline Statistics[40]









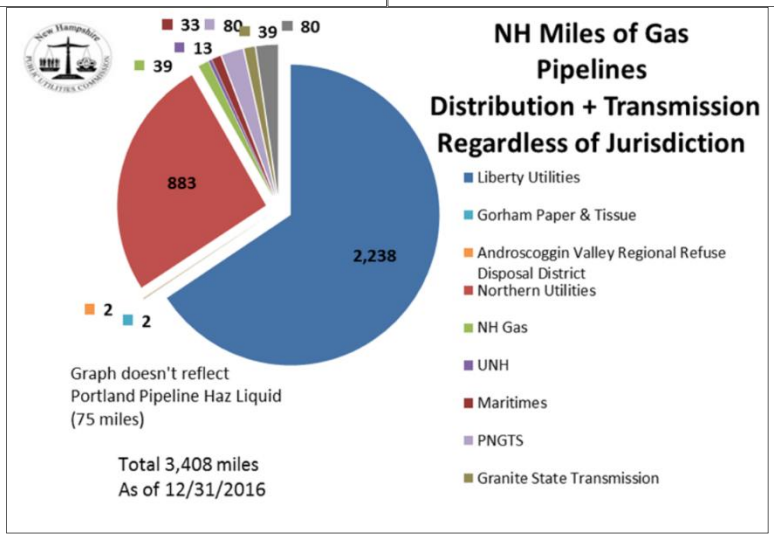
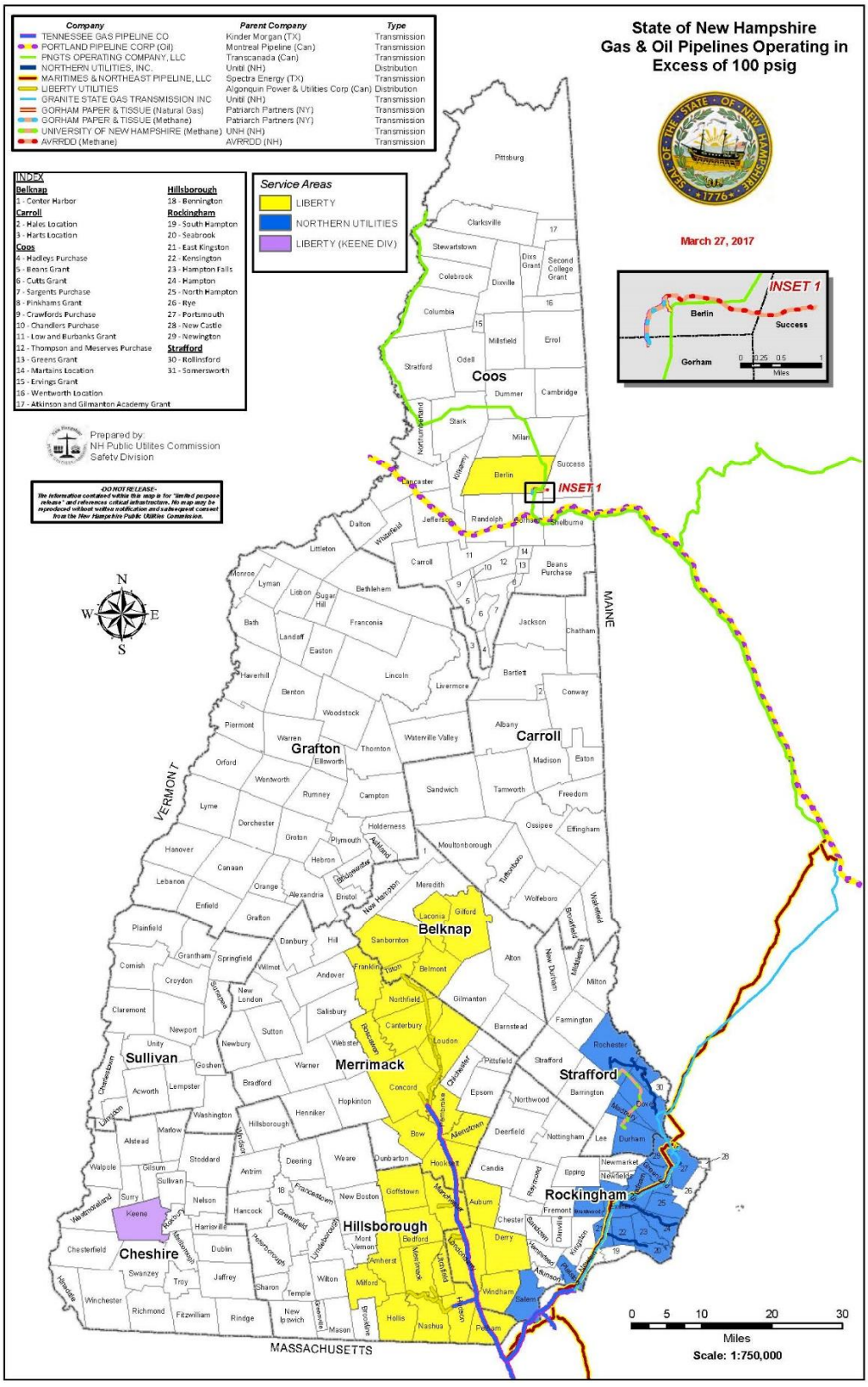


Exhibit 1-32: New Hampshire Gas & Oil Pipelines[41]



[41] *New Hampshire Public Utilities Commission Website*
https://www.puc.nh.gov/Safety/images/Stateview_Gas_Utilities_11%20x%2017WEB.jpg

1.3 Freight Institution and Roles

1.3.1 Agency/Stakeholder Roles

New Hampshire's key agencies and stakeholder freight institutions, roles, and perspectives are summarized below. Key players on the state and regional levels are also identified in this section.

NHDOT

The New Hampshire Department of Transportation (NHDOT) in partnership with US Department of Transportation (USDOT), Federal Highway Administration (FHWA) and other state and federal agencies is responsible for the planning, programming and implementation of the transportation infrastructure within the State. The transportation network includes roadways (including bridges), airports, railways, waterways and pipelines. The waterways (port) are under the authority of the NH Division of Port and Harbors. Pipelines are under the authority of the NH Public Utilities Commission (PUC) and NH Site Evaluation Committee (SEC). The NH Bureau of Rail and Transit works to preserve and efficiently manage railroad corridors and improve rail safety, as rail corridors are owned by both the State and private entities.

NH Division of Ports and Harbors (DPH)

DPH of the Pease Development Authority pursuant to NH State Statute is responsible for the planning for the maintenance and development of the ports, harbors, and navigable tidal rivers of the State from the head of navigation to the seaward limits within the jurisdiction of the state, in order to foster and stimulate commerce and the shipment of freight through the state's ports and as an agency of the state, to assist shipping and commercial and industrial interest that may depend on the sea for transport of products.

The DPH is located within two miles of the Pease International Tradeport and airport, manages the development of the Market Street Marine Terminal and other public assets, and is the US Department of Commerce, Grantee of Foreign-Trade Zone # 81 which includes 5 sites and 2 subzones (Westinghouse Electric in Newington and Millipore Corporation in Jaffery). The five (5) foreign trade zone sites include the Market Street Terminal, Portsmouth Industrial Park, Dover Industrial Park, Manchester Airport and the Pease International Tradeport.

NH Public Utilities Commission (PUC)

PUC is responsible for miles of distribution main, interstate and intrastate transmission pipeline lines. Large transmission pipelines and compressor stations often fall under the authority of the NH SEC. The U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety audits the Division's Safety Program each year. The safety, development and maintenance of all pipelines is coordinated through responsible local, state and federal permitting authorities.

Executive Council and GACIT

The Executive Council of the State of New Hampshire has the authority and responsibility, together with the Governor, over the administration of the affairs of the State as defined in the New Hampshire Constitution, the New Hampshire statutes, and the advisory opinions of the New Hampshire Supreme Court and the Attorney General. There are five Executive Councilors with each representing one fifth of the population. The Councilors participate in the active management of the business of the state.

The Executive Council plays a vital role in improving the state's infrastructure, especially roads and bridges, via management and oversight of the Ten Year Transportation Improvement Plan. They approve the expenditures of state and federal funds; they approve the spending of a major portion of the approximately 5.2 billion dollars that is appropriated annually by the legislature; they serve as watchdogs of the state treasury to ensure state departments do not spend more than was authorized by the legislature, nor allocate funds for items or services which the legislature has not sanctioned; they make certain that those appointed to various State positions are responsible to

the citizens of New Hampshire, including the Commissioner of the NHDOT; and they serve as the conduit to citizen representation in the State.

The Executive Councilors serve on the Governor's Advisory Council on Intermodal Transportation (GACIT), which also includes the New Hampshire Commissioner of Transportation. GACIT conducts public hearings and prepares a draft Ten Year Plan which is submitted to the Governor and then ultimately to the NH Legislature for approval.

NHDOT Legislature

The NH Legislature is the fourth- largest English speaking legislative body in the world. It consists of 424 members, made of up the NH House and Senate. Because of its size and emphasis on local participation, the NH Legislature process affords local communities, advocacy groups and all others engaged in legislative issues an opportunity to comment and participate in the future planning of issues facing the State, including transportation projects and transportation policy issues.

The final steps in the TYP process are for the Governor to submits he/her version of the draft Ten Year Plan to the NH Legislature. The Legislature ultimately decides which transportation projects will included in the TYP and funded, the Legislature also sets transportation policy for the State via the projects that are ultimately include in the Plan. Both the Governor and Legislature determine what projects will be implemented. Once the Plan is approved by the Legislature, the Governor, has veto authority. Generally, the Plan is signed into law in summer of even numbered years (2018). Once signed into law a process begins again, and it approval of the Ten Year Plan is every two-years.

Regional Planning Commission- MPOs/TMA

There are nine (9) Regional Planning Commissions (RPCs); four of which are designated as Metropolitan Planning Organizations (MPO)s - Southern NH Planning Commission (SNHPC), Nashua Regional Planning Commission (NRPC), Rockingham Planning Commission (RPC) and Strafford Regional Planning Commission (SRPC); and two are Transportation Management Areas (TMA- Nashua and Boston) which include communities located within three of the designated MPOs.

Based on population data from the 2010 U.S. Census, two of the RPCs have been designated Transportation Management Areas (TMA) and are now part of the Boston Urbanized Area (UZA). A TMA is defined as a large urbanized area with a population over 200,000. The TMA federal certification process required input and certifies the MPO's planning process is in compliance with federal regulations. The certification process documents planning activities of the Unified Planning Work Program (UPWP), fiscal analysis and fiscal constraint processes, funding for transportation planning studies in the region, and documents other specific roles and tasks to be completed. This expanded role will require a more cooperative and integrated approach to addressing regional transportation planning issues and concerns, including freight planning.

Each of the Regional Planning Commissions works in cooperation with the NHDOT through their Unified Planning Work Program (UPWP) agreement. The UPWP defines specific tasks to be completed at the regional level to develop a broader and comprehensive analysis of the transportation network, to assist in developing both short and long-range plans and initiatives and to advance the development of an intermodal transportation network, to serve the region and ultimately the collective statewide transportation network.

Each RPC has developed a Long-Range Transportation Plan (LRTP) or Metropolitan Transportation Plan (MTP). Each of these plans serve as the foundation, building block to identifying specific transportation projects and studies which are important to the towns/cities and region. The long-range plans provide an abundance of data and information to assist the various transportation committees including but not limited to the Policy Committee and Technical Transportation Advisory Committee (TTAC) and communities in discussions to advance specific projects and studies through the Transportation Improvement Plan (TIP), Statewide Transportation Improvement Plan (STIP) process and ultimately to be included in the Ten Year Plan.

1.3.2 State Freight Perspectives

Document Reviews

Statewide freight perspectives were gathered through discussions with staff at NHDOT, as well as document reviews. Document reviews included reviewing New Hampshire statewide plans, studies, and project specific documents (*Exhibit 1-33, Exhibit 1-34*).

Exhibit 1-33: New Hampshire Statewide Plans and Studies

Document	Date
New Hampshire Long Range Transportation Plan (2010 – 2030)	Jul 2010
New Hampshire State Rail Plan	2012
New Hampshire State Airport System Plan	2015
The Economic Impact of the Piscataqua River and the Ports of Portsmouth and Newington	Jun 2012
Portsmouth Harbor and Piscataqua River Navigation Improvement Project	Jul 2014
Development of Commercial Transportation Services Between Portsmouth, NH and Atlantic Canada	Sept 2017
NHDOT Statewide Rest Area and Welcome Center Study	Jun 2016
NHDOT Ten Year Transportation Improvement Plan (2017-2026)	Jun 2016
NHDOT Ten Year Transportation Improvement Plan (2019-2028)	Jul 2018
The New Hampshire Climate Action Plan	Mar 2009
Climate Change in Northern New Hampshire: Past, Present, and Future	2014
Climate Change in Southern New Hampshire: Past, Present, and Future	2014
Sea-Level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire	2015
Potential Impacts of Climate Change on Transportation Infrastructure	April 2014

Exhibit 1-34: Other Data Sources (Grant Applications, Presentations, Facts & Figures, etc)

Document	Date
TIGER II Discretionary Grants Application – Memorial Bridge Replacement Project	Aug 2010
2014 TIGER Discretionary Grant Application – Sarah Mildred Long Bridge	Apr 2014
State of New Hampshire Department of Transportation – 2016 State Owned Red List Bridges	Feb 2017
State of New Hampshire Department of Transportation – 2016 Municipally Owned Red List Bridges	Feb 2017
2017 Roads and Highways Facts & Figures	Jan 2017
NHDOT GIS Portal (Mapping & Statistics)	Varies
Division of Ports and Harbors – Portsmouth, New Hampshire Presentation	2017
USDOT Bureau of Transportation Statistics – Port Performance Freight Statistics Program	2017
USDOT FHWA Freight Analysis Framework 4	2017
FY 2018 BUILD Grant Application – Market Street Marine Terminal Main Wharf Rehabilitation	Jul 2018

1.3.3 Public, Industry, and Stakeholder Perspectives

The NH Freight Plan included extensive public and stakeholder outreach. Based on FAST Act compliance recommendations, a state freight advisory committee (SFAC) was also established to discuss current freight concerns and solicit feedback during each phase of the NH Freight Plan. For additional details, public meeting summaries, web-based freight survey results, interviews, and SFAC meeting minutes can be found in *Appendix B*.

Public Outreach

Public outreach included a web-based freight survey and four public meetings held on the dates below in different portions of the state. A conscious effort was made in choosing different meeting locations with ample accommodations to allow individuals from all parts of the state the opportunity to share their concerns with the project team. The public meetings were set up as open houses with a project presentation, display boards, and a series of interactive exercises to solicit feedback from attendees.

- Open House #1 – Nov 15, 2017 (Concord, NH)
- Open House #2 – Mar 22, 2018 (Claremont, NH)
- Open House #3 – May 24, 2018 (Berlin, NH)
- Open House #4 – Jun 21, 2018 (Newington, NH)

The web survey was launched on August 10, 2017 and closed on December 11, 2017. During this timeframe, a total of 107 respondents answered at least a portion of the questionnaire, and 37% of the participants completed the entire survey.

For stakeholder outreach, the web-based freight survey was also distributed to both public and private sector entities to solicit additional feedback on current freight needs and challenges. Individuals from local organizations and businesses, as well as regional planning commissions and other governmental agencies were contacted to conduct a more detailed interview. Interview efforts resulted in 3 in-person interviews and 10 phone interviews. The organizations and agencies that participated are shown in *Exhibit 1-35*.

Exhibit 1-35: Phone/In-Person Interviews

Organizations / Businesses	Associated Grocers of New England
	Business & Industry Association
	KMT Freight
	New Hampshire Timberland Owners Association
RPC / Other Governmental Agencies	Belknap County Economic Development Council
	Central New Hampshire Regional Planning Commission
	Nashua Regional Planning Commission
	New Hampshire Port Authority
	North Country Council
	Pease Development Authority
	Portsmouth International Airport at Pease
	Strafford Regional Planning Commission
	Upper Lake Sunapee Regional Planning Commission

To develop and expand broader stakeholder outreach efforts, Freight Summits were held on Mar 22, 2018 in Claremont, NH and June 21, 2018 in Newington, NH. Freight industry representatives, local businesses, state regional planning commission staff, and freight planning officials from neighboring states were invited to join the forum. A series of guest speakers were invited to share their insights regarding the future of freight, upcoming technologies that will affect freight activity, and potential impacts to both NH and the New England region.

Through the course of New Hampshire's first two statewide freight summits, the following information was presented by the project team and a series of guest speakers:

Continuing efforts to promote interregional and intraregional collaboration will help advance potential freight projects with regional significance and impacts.

- An overview of the NH Freight Plan, including existing conditions of the infrastructure, insights from public and stakeholder outreach, and current challenges and opportunities that affect the state's economy and quality of life.
- General updates from the Federal Highway Administration, (FHWA) including national trends in freight and potential impacts to the region.
- Port updates (by Captain Geno Marconi, Director of the New Hampshire Port Authority), including project updates regarding the Sarah M. Long Bridge construction and future investment plans to upgrade the facilities at the Port of Portsmouth.
- The latest developments in connected autonomous trucking, which has the potential to change the trucking industry significantly. Information was provided by Vince Mantero, Team Leader for Freight Research and Analysis at the FHWA Office of Freight Management and Operations.
- Private sector insights and perspectives on freight operations and logistics (by Oscar DeVlaminck, President and Adam Manley, Director of Operations from Demanko HLC Logistics), including insights regarding the impacts of policies and technologies on freight mode choices and logistics in the private sector.
- The economics of autonomous trucking (by Dale Lewis, former VP of Finance, AVP Trucking, & Director of Strategic Analysis, CSX Corp), including insights on how autonomous trucks could improve the delivery of goods, lower shipper costs, and impact state and local roadway networks. A range of driver cost, fuel tax, and truck equipment cost scenarios were also presented.

In addition to freight guest speakers, opening remarks from the local municipal leaders (Ryan McNutt, City Manager for the City of Claremont and Martha Roy, Town Administrator for the Town of Newington) introduced each of the freight summits.

By providing an opportunity to learn and discuss freight issues and trends with industry experts and give input on the plan's development, the state has taken first steps to promoting multi-jurisdictional collaboration across public and private sectors in the New Hampshire region. Continuing efforts to promote interregional and intraregional collaboration will help advance potential freight projects with regional significance and impacts.

Field Views

A series of field views (*Exhibit 1-36*) were conducted for the project to gain a better understanding of the current infrastructure and existing challenges and opportunities that exist among the freight modes serving New Hampshire.

Exhibit 1-36: Field Views

Date	Locations
Nov 14, 2017	• US 202 & US 4 between Concord & Dover
Nov 15, 2017	• US 202 & Route 9 between Hopkinton & Keene • Route 101 between Keene & Bedford
Nov 16, 2017	• Route 101 between Auburn & Hampton • Port of Portsmouth • Portsmouth International Airport at Pease
Nov 17, 2017	• Laconia

State Freight Advisory Committee

Using federal State Freight Advisory Committee Guidance (*Appendix A-9*), a committee was established to help guide the development and implementation of the NH Freight Plan. The New Hampshire State Freight Advisory Committee (SFAC) was established to participate in the development of the NH Freight Plan and provide direction and guidance regarding: (1) freight areas of concern and opportunities, (2) freight stakeholders and areas of interest, (3) policies/strategies and action plans, and (4) project prioritization and the statewide freight investment plan.

Through the course of the project, four SFAC meetings were conducted to discuss current freight challenges and opportunities, and solicit feedback for various plan components, such as project mapping and related information, critical freight corridor needs, potential policies and strategies, and implementation considerations for the NH Freight Plan. The meetings were held at NHDOT's main offices in Concord, NH on the following dates:

- SFAC #1 – Jun 8, 2017
- SFAC #2 – Nov 14, 2017
- SFAC #3 – Mar 21, 2018
- SFAC #4 – Sept 19, 2018

The committee will be encouraged to hold regularly scheduled meetings to carry forth the action plan and discuss future freight needs and concerns.

1.3.3 MPO Freight Perspectives

Regional Planning Commissions

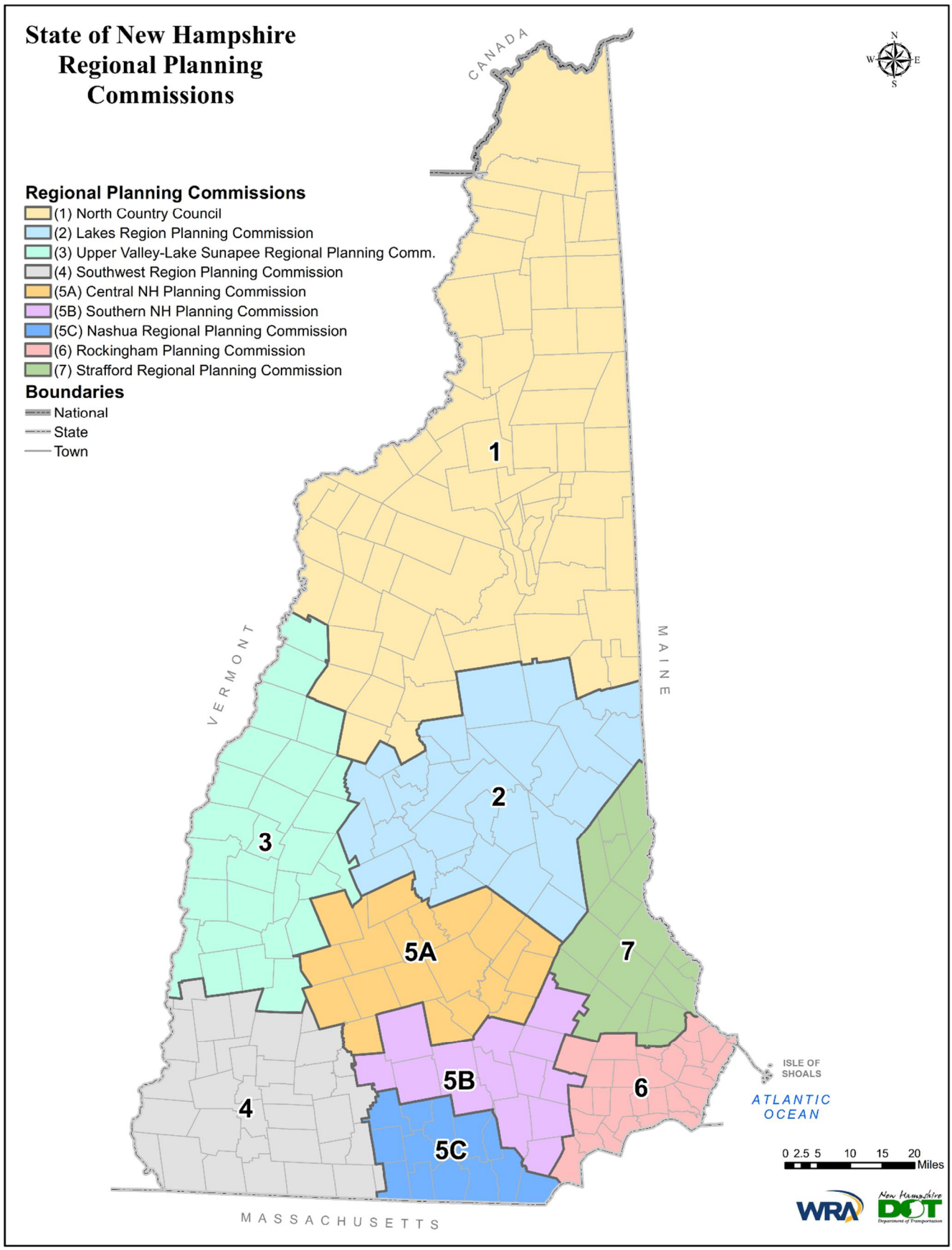
New Hampshire is divided into nine regional planning service areas, each served by a regional planning commission (RPC). Regional plans are developed by each RPC to address transportation issues, prioritize transportation needs, and collaborate with the NHDOT to meeting the regional goals and objectives. The RPCs receive funding through from the State for their Unified Planning Work Programs (UPWPs), which allows them to fund transportation-planning activities to meet regional and state needs. The nine regional planning commissions in New Hampshire are:

(1) Central New Hampshire Regional Planning Commission (CNRPC)
(2) Lakes Region Planning Commission (LRPC)
(3) Nashua Regional Planning Commission (NRPC)
(4) North Country Council (NCC)
(5) Rockingham Planning Commission (RPC)
(6) Southern New Hampshire Planning Commission (SNHPC)
(7) Southwest Region Planning Commission (SWRPC)
(8) Strafford Regional Planning Commission (SRPC)
(9) Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC)

Metropolitan Planning Organizations

In addition to the RPCs, New Hampshire has four Metropolitan Planning Organizations (MPO) to coordinate transportation planning within areas with a population of 50,000 people or more. Each MPO must prepare a Long Range Metropolitan Transportation Plan (LRTP) and a four-year Transportation Improvement Program (TIP) of regional projects. The state TIP must be consistent with the MPO TIP. In New Hampshire, the four MPOs are located in: (1) Southern NH Region, (2) Nashua Region, (3) Rockingham Region, and (4) Strafford Region. New Hampshire's RPCs and MPOs are shown in *Exhibit 1-37.*

Exhibit 1-37: Planning Partners



Document Reviews

Document reviews included reviewing New Hampshire statewide and planning partner plans, studies, and project specific documents (*Exhibit 1-38*).

Exhibit 1-38: Planning Partners Plans and Studies

Document	Date
Central New Hampshire Regional Plan	Apr 2016
The Lakes Region Plan 2015-2020	Sept 2014
The Nashua Region: A Story Worth Telling	Dec 2014
Nashua Region Metropolitan Transportation Plan 2015-2040	Dec 2014
Nashua Region Metropolitan Transportation Plan 2017-2040 – A Minor Update to the 2015-2040 Plan	Dec 2016
North Country Council Regional Transportation Plan 2015 Update	Jun 2015
2015 Regional Master Plan for the Rockingham Planning Commission Region	Dec 2014
2040 Long Range Transportation Plan Rockingham Regional Commission	Apr 2015
FY 2015 – FY 2040 Regional Transportation Plan for the Southern New Hampshire Planning Commission	Dec 2014
Monadnock Region Future: A Plan for Southwest New Hampshire	Jan 2015
Southwest Connects: Southwest Region Transportation Plan 2014-2035	Jan 2015
A Profile of Freight Transportation in Southwest New Hampshire	Jun 2015
Local Solutions for the Strafford Region Regional Master Plan	Jan 2015
Strafford MPO 2015 -2040 Metropolitan Transportation Plan	Jun 2016
Upper Valley Lake Sunapee RPC Regional Plan 2015	Jun 2015
NH Regional Planning Commissions – A Granite State 2013 Statewide Survey	Jul 2013
Summary Report – Public Engagement for Granite State Future	Oct 2013
Granite State Future – Statewide Existing Conditions and Trends Assessment	Nov 2013
The Collaborative MPO Approach to Performance Based Planning in New Hampshire	Feb 2016

Freight Related Concerns

After a series of document reviews, there are several common themes that have been raised within RPC and MPO planning documents. The MPOs usually identify a project list, from which freight-related projects will be considered. *Exhibit 1-39* summarizes the high-level issues identified as concerns in these documents. There is a noticeable difference in emphasis between the more and less urbanized regions. Each of the high-level issues is discussed below.

Exhibit 1-39: Freight Related Concerns

	Highway Bridges (Red List, E-2)	Rail Car Weight & Clearance	Highway Shoulder Widths	Trucks on Urban Streets	Right-of-Way Preservation	Intermodal Connections	East-West Highway Access
North/Central/Western New Hampshire (RPCs only)							
North Country Council		X	X	X			
Lakes Region Planning Commission	X						
Upper Valley – Lake Sunapee RPC		X					
Central New Hampshire PC	X						
Southwest Region Planning Commission					X		
Southeastern New Hampshire (RPCs and MPOs)							
Southern New Hampshire Planning Commission				X		X	
Strafford Regional Planning Commission	?	X			X	X	
Rockingham Planning Commission	X	X			X	X	
Nashua Regional Planning Commission				X			X

Highway bridge issues include the statewide 'Red List' bridges discussed previously, and E-2 bridges which exclude heavier single and combination unit trucks. The E-2 issue is of most importance to more northerly RPCs where there is significant logging activity. With their sparser road networks, these RPCs are more sensitive to the effects of a bridge closure.

Rail car weight (ability to handle 286k lbs.) and *clearance* (double-stack container height) are active concerns with respect to specific short lines and connections. Considerations for existing conditions and possible future use were discussed in the planning documents.

Highway shoulder widths relate to concerns on roadways carrying heavy truck traffic. It was identified as a major concern by one RPC and is likely to be an active factor elsewhere in the state.

Trucks on urban streets was an issue raised by several RPCs. There appears to be an underlying challenge between the goals for 'complete streets' with livable & walkable communities in urban areas, and the need to move trucks through smaller urban areas. More than one RPC has identified operational issues with heavy trucks at new urban roundabouts.

Preservation of existing right-of-way references were made for unused and abandoned railroads. It was voiced as a concern for the more urbanized RPCs, which experience more congestion and recognize the possible value of reviving these railroads in the future.

More southerly RPCs expressed an interest in provisions for *intermodal connections*, also likely related to their experience of congestion, and being host to major facilities such as the Pease International Tradeport and the Port of New Portsmouth.

In the Nashua RPC's jurisdiction, *east-west highway* congestion is an issue. Other RPCs note the lack of good east-west connections, but do not identify mitigating that as a priority.

1.3.4 Public/Private Freight Perspectives

Public-private partnerships allow for the sharing of resources to finance, design, build, operate, and maintain transportation infrastructure projects and are especially effective when limited financial resources are available.

In 2016, the New Hampshire Legislature passed Senate Bill 549, establishing a Public-Private Partnership Infrastructure Oversight Commission. This Commission shall consider and recommend to the Commissioner of Transportation projects that may be suitable for delivery using design-build-finance-operate-maintain or design-build-operate-maintain services. The Commission shall also act as an advisory board during the execution of a public-private partnership project, supporting the Department in the development of a request for proposals and in the preparation of agreements for public-private partnership projects.

NH public-private partnerships for future consideration include strategic infrastructure investments for rail corridors and freight intermodal facilities, acquisition of abandoned rail lines, port infrastructure improvements, and bridge improvements along key critical freight corridors.

The duties of the Commission state that a process for the submission and evaluation of public-private partnership projects must be established, for both projects proposed by the Department of Transportation (solicited proposals), and by other entities (non-solicited proposals).

As a first step in the process, the Public-Private Partnership Infrastructure Oversight Commission solicited project proposals that may be suitable candidates for design-build-finance-operate-maintain or design-build-operate-maintain services. Interested applicants submitted a Letter of Interest (LOI). These letters are completely non-binding, but are used by the Commission to establish the appropriate process and framework by which to evaluate and advance projects.

At the writing of this plan the commission has commenced with the review of proposals and will contact applicants to communicate the next steps in the process.

New Hampshire will be encouraged to continue developing public-private partnerships in efforts to establish funding for freight network and infrastructure improvements. Freight rail in the state is mostly owned and operated by the private sector. Warehousing and distribution centers, trucking companies and supply chain operations also depend on private sector.

The NH Freight Plan was developed in collaboration with freight stakeholders, consisting of state and federal representatives, industry leaders, regional planning commission staff, and representatives from each transportation mode. During SFAC meetings and discussions, the following was noted:

- Currently, there are difficulties in planning and executing projects, especially due to the challenges in aligning public and private interests and funds.
- Primary topics of interest include increased freight tonnage, underinvestment in freight, the need to leverage funding (such as discretionary grants), and emerging new technologies, including connected autonomous vehicles and trucking.

New Hampshire public-private partnerships for future consideration include strategic infrastructure investments for rail corridors and freight intermodal facilities, acquisition of abandoned rail lines, port infrastructure improvements, and bridge improvements along key critical freight corridors.

1.3.5 Overarching Themes

After completing a series of outreach efforts involving the public, regional planning commission, and NHDOT staff, reoccurring comments related to New Hampshire's infrastructure system, freight opportunities, and areas of traffic and congestion problems were noted. The main issues and concerns included:

- Truck driver shortage and poor driver retention rates
- Truck parking
- Bottleneck locations (I-93, Spaulding Turnpike, I-95)
- General need for east-west corridors
- New intermodal facility in NH
- Weight restrictions on bridges
- Lack of double stack clearance bridges
- Lack of 286k rail load capacity
- Potential freight development opportunities
- Implementation of adaptive signal control to help mitigate congestion
- Rail freight carrier coordination to develop new customers
- Better rail facilities for intermodal freight use
- Port upgrades to enable larger shipments
- Inter-regional and intra-regional coordination among municipalities, MPO, and state
- Traffic congestion and safety concerns at identified locations throughout the state
- Planning for autonomous trucking and CAV technology
- Impacts of changes to electronic logging device (ELD) rules for commercial vehicles

Highways

New Hampshire puts an emphasis on maintaining a state of good repair for its infrastructure system, including roadways and bridges. Pavement conditions, red list bridges, and height/weight restricted bridges are reevaluated and updated on a periodic basis. The state's Ten Year Plan is an extensive process dedicated to addressing roadway and infrastructure needs in the most efficient manner with available federal and state funding. Areas of traffic congestion and safety concerns are also noted and prioritized accordingly.

Since Interstates carry the highest traffic volumes, both passenger cars and trucks, measures have been taken to ensure that the Interstates operate at acceptable levels of service and provide a safe and reliable route for the movement of freight and goods.

Rail

Through traffic makes up the highest share of New Hampshire's rail freight activity, with approximately 81% based on tonnage and 95% based on value. Even if there are major infrastructure improvements to existing rail lines, such as upgrades to allow 286K load capabilities and double-stack clearances along key freight corridors, it is hard to say whether rail service providers will experience a large increase in demands for service.

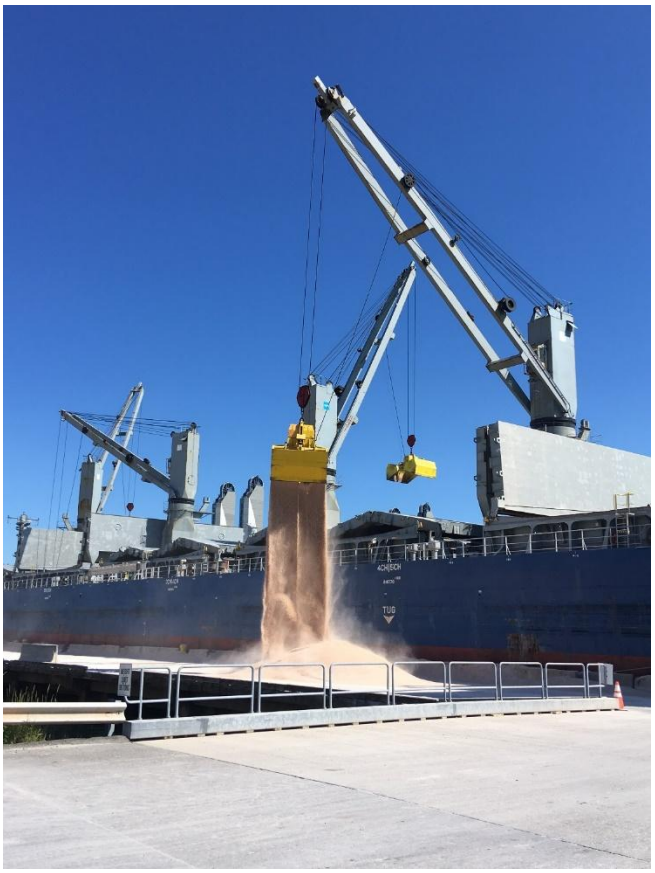
Through traffic makes up the highest share of New Hampshire's rail freight activity, with approximately 81% based on tonnage and 95% based on value.

For through rail freight flows, the commodities that use rail as the primary mode of transport to origins and destinations outside of New Hampshire are currently using these services already. For inbound and outbound rail flows with origins and destinations within the state, most New Hampshire rail customers are located on branch lines that cannot handle heavier cars. As a result, these customers are oftentimes faced with issues such as shipping delays, additional transloading fees, or penalty costs for partially filling higher capacity cars to stay within track limitations.

Upgrading the rail network system within the state will require a feasibility study with market research efforts, along with a cost-benefit analysis. In addition to significant and costly upgrades, new niche markets would have to be developed in order for the benefits of these upgrades to outweigh the costs. Outside of potential improvements to target market expansion, it is always recommended practice to continue the support of track and bridge maintenance efforts to maintain current rail operations in the state.

Waterways

As container trade is expanding in size and operations worldwide, regional ports in the New England area have also experienced growth – it is evident based on the increasing amount of freight traffic between the United States and Canada in recent years.



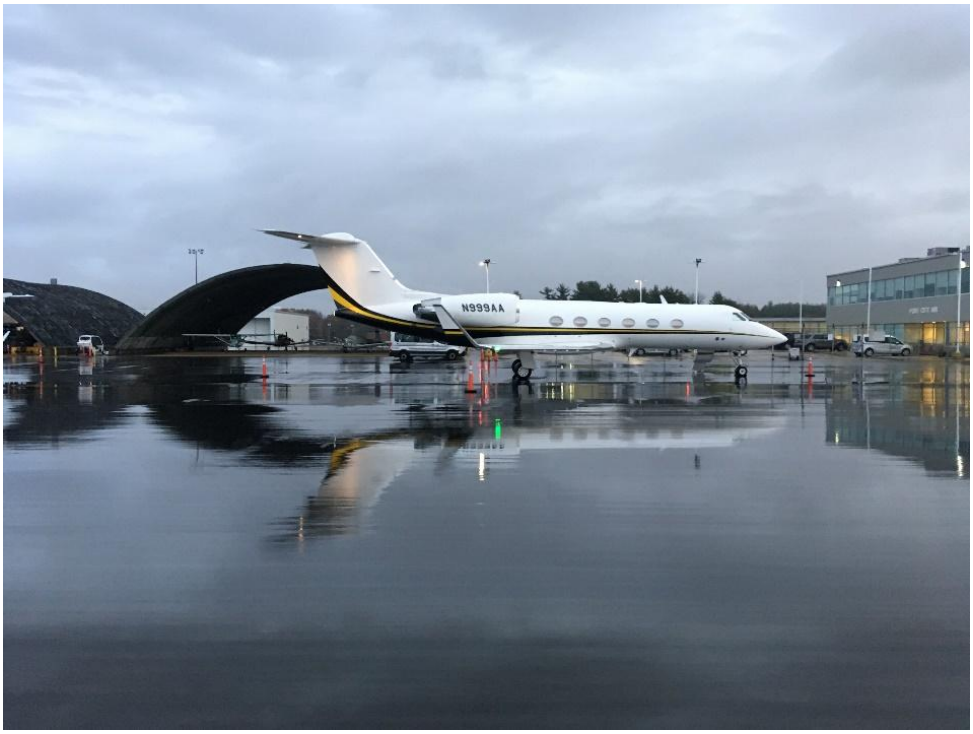
The Port of Portsmouth has been operating in limited capacity since 2015 while a large portion of the facility was used as a staging area for the Sarah M. Long Bridge construction project. With construction now complete (as of June 2018), the Port of Portsmouth is interested in improvements to the Main Wharf Terminal to increase operations and potentially offer year-round cargo service to and from Nova Scotia. The biggest freight challenges and needs across all modes that affect future growth opportunities for the Port of Portsmouth are the need for additional property to expand its facility and the growth effects of urban encroachment. Currently, the Port is at a disadvantage when compared to ports in neighboring states due to its small footprint, lack of shore crane equipment, and the need for pavement repairs and rehabilitation. Other New England ports are more advanced and ahead in their planning and development of future waterway operations.

However, if funding can be secured to financially support flexible operations and rehabilitation of the Main Wharf Terminal, the Port will be in a better position to grow its business of New England – Canadian cargo. For general cargo operations to be successful, it is imperative to be able to offer flexible, reliable, and convenient services. The Port of Portsmouth's proximity to I-95 and other north-

south highway connections, its geographic proximity to key markets for fresh products and rail service, and the Port's drive to continue and grow operations will help make the Port an attractive location for the expansion of transportation services between the United States and Canada[42].

Airports

Cargo services are available at two of the three primary commercial service airports in New Hampshire. Most commercial packages and shipments are transported through the Manchester-Boston Airport, while Pease International Airport at Portsmouth handles primarily international cargo and single/unique items of higher value that require faster delivery times.



For Pease International Airport, future freight growth and economic development opportunities that would impact New Hampshire's economy include seafood and E-commerce air cargo service. There has been recent interest from the Seafood Lobster Coalition for airport cargo services with a potential demand to support direct flights to and from Asia. Outbound commodities would include lobster, scallops, blueberries, and beef, while inbound return shipments would be E-commerce goods. E-commerce would potentially go through a distribution center at either a tradeport or airport in the New England region.

There are currently no cargo rail service stops at the airports in New Hampshire. Changes are not anticipated in the foreseeable future due to lack of demand. However, if these future development opportunities come to fruition over time, cargo rail service stops can be revisited to see if future demands support these additional rail services.

[42] *Development of Commercial Transportation Services Between Portsmouth, NH and Atlantic Canada, Sept 2017*

2.0 New Hampshire Freight System

2.1 Economic Context

2.1.1 Economic and Demographic Trends and Forecasts

New Hampshire's economic outlook is mildly optimistic. Payrolls are scheduled to expand 0.8% on average annually through 2022, 0.3 percentage points below the national average. Professional and business services are expected to make a notable contribution, supplying roughly half of the 17,000 jobs estimated to be added by the end of the five-year period. The health services sector is also projected to help drive the economy. An increasingly older population, however, will likely suppress labor-force participation, effectively restraining economic growth. This will be a challenge for New Hampshire, which is currently experiencing below-average population growth.

Professional, business, and health services will likely help drive NH's economy over the next 5 years. An estimated 17,000 jobs will be added by 2022.

Nonfarm payrolls in New Hampshire increased 1.1% year over year (y/y) in the fourth quarter of 2017, bringing annual employment growth for the state to 1.0%—the second highest in the New England census division. Hiring activity in leisure and hospitality services accelerated as employers prepared for the tourist season, with payrolls up 2.5% y/y. Retail trade received a boost on a quarterly basis thanks to the winter holiday season, although there was only a slight uptick compared with a year earlier. Other major sectors advancing payrolls at a solid pace included manufacturing (up 2.0% y/y), education and health services (up 1.3% y/y), and financial services (up 1.4% y/y). Thanks to tightening labor markets, the state unemployment rate declined throughout 2017 and is inching closer to historical lows, measuring 2.6% in February 2018.

Solid payroll gains are anticipated throughout 2018, measuring 1.3% y/y in the first quarter and 1.6% y/y in the second quarter. Stagnation in professional and business services will be largely offset by robust growth in the state's major sectors, including retail trade, manufacturing, and health services. The unemployment rate will remain among the nation's lowest at 2.6%, although its decline is projected to slowly come to a halt due to weak labor force growth. Exacerbating the situation is the state's inability thus far to attract a younger, working-age population. If the issue persists beyond the near term, New Hampshire could face a serious structural labor supply shortage.

2.1.2 Economic Impacts of Freight

New Hampshire's top commodities and trading partners have direct impacts to freight transportation. The origin or destination of a product, the type of product, and shipment quantities are factors that will largely determine how goods will be shipped. As mentioned previously, the cost of transportation accounts for approximately 10% of the cost of the product. Improving freight efficiency and connectivity will help New Hampshire's industries compete in statewide, regional, national and global markets. As changes occur within each industry over time, it is imperative to consider these economic impacts to freight infrastructure and related shipping logistics.

The New Hampshire economy is driven primarily by its high-tech manufacturing, retail trade, and financial services sectors. Key industries include computers, electrical equipment, industrial machinery, plastics, and paper products. However, the professional and business services (PBS) sector has recently emerged as another important source of growth over the last decade. The state's PBS employment growth accelerated well beyond the national average in the years prior to the Great Recession—strength that helped the Granite State become one of the fastest-growing economies in New England.

The NH economy is driven primarily by its high-tech manufacturing, retail trade, and financial services sectors. Key industries include computers, electrical equipment, industrial machinery, plastics, and paper products. Other important sectors include professional and business services (PBS) and healthcare.

Also, worth noting is the prominent role of the healthcare sector. It remains one of the state's largest sectors by employment and an essential generator of payroll growth. The aging population and heavy demand for services have paved the way for a systematic expansion of the state's healthcare network. As for other key aspects of New Hampshire's economic environment, the absence of a general sales tax helps to attract shoppers from neighboring states, namely Massachusetts (MA). This can in part explain the state's above-average concentration of retail trade employment. Also, with its proximity to Boston (about 60 miles) and the state's more favorable overall tax environment relative to other parts of New England (including the lack of a personal income tax), southern New Hampshire has developed into an area of healthy economic growth.

In 2016, New Hampshire was the 41st-largest state by population. From 2015 to 2016, the state's total population increased 0.3%, to 1.3 million, behind the national growth rate (0.7%), making New Hampshire the 28th-fastest growing state. The state experienced a net influx of 2,100 new residents from foreign countries and 3,200 new residents from surrounding states. The proportion of the state's population aged 25 and over that has completed high school (93.1% in 2015) is among the highest in the United States. The state's postsecondary attainment is also quite strong, as its 45.4% share of residents possessing an associate's, bachelors, or advanced degree is more than 6 percentage points above the national average. Such high educational attainment rates are essential for the development of industries that offer high-quality, high-wage services jobs. Looking ahead, forecasts indicate that New Hampshire's total population will grow approximately 0.4% per year through 2026, while the labor force will expand approximately 0.5% per year.

Per-capita energy consumption in New Hampshire is low relative to national averages, courtesy of the state's non-energy-intensive economy. For electrical power generation, New Hampshire relies heavily on nuclear

power and natural gas, which are used to generate approximately 40% and 30% of the state's electricity, respectively. Nuclear power is provided by the Seabrook nuclear power station located in the coastal region of the state. New Hampshire also possesses great potential for renewable energy production, including significant opportunities for wind power generation in the White Mountains, hydroelectric dams along the Connecticut River, and biomass power plants fueled by wood from the state's forests. At present, 14% of New Hampshire's electricity generated is produced from renewable fuels.

Electricity prices in New Hampshire are among the highest in the country, with residential, commercial, and industrial prices all ranking as the eighth-highest in the United States or higher. High energy prices are not unique to New Hampshire, however, as most states in the Northeast contend with similar issues due to high heating demand and generally high costs of living. Fortunately, as of midyear 2013 (the most recent data available), electricity for residential and commercial customers showed little growth, while the industrial sector earned some relief with a 3.3% year-over-year decline.

Demand for home heating oil—used to heat half of New Hampshire's private residences—is a third key component of the Granite State energy market. Like the rest of the New England region, the state is extremely vulnerable to heating oil price fluctuations during the winter months when demand for heating oil (in what is a very small market) is at its peak. Price volatility is particularly severe during harsh winters, the unexpected costs of which can weigh heavily on consumer budgets and disposable incomes. As for price performance heading into the heating season, the four-week moving average price is down approximately 6% year over year.

Financial jobs account for a relatively small percentage of total employment in NH (approximately 5–6%), but their high value-added-nature allows them to contribute more than one-fifth of total real gross state product. A successful finance sector is extremely beneficial to the economy, as its high wage and high productivity nature adds value and jobs, and significantly boosts personal income. NH's financial payrolls maintain healthy concentrations in both finance and insurance firms (80% of sector payrolls) and real-estate-related industries (20% of sector payrolls). Although most of the jobs in finance and insurance are concentrated in insurance firms, NH is home to a modest number of securities trading and asset management companies as well.

Healthcare has been a major source of NH's employment growth over the past several years. In the long term, payroll growth in the healthcare industry is projected to decelerate to less than 1% per year by 2020. NH will have to rely on other industries for statewide growth progression.

Healthcare has been a major source of NH's employment growth over the past several years, leading all sectors in terms of jobs added by a significant margin. Recent payroll gains within the sector have been dominated by hospital hiring. Steadily rising demand for healthcare services has been the catalyst for a large-scale expansion of the healthcare system, providing excellent opportunities for new employment. The one drawback of healthcare's tremendous influence on New Hampshire's economy is that overall employment growth becomes tightly connected to one sector; slowing expansion in the healthcare industry will likely drag on the state's economic growth potential. Over a longer-term forecast horizon, the current boom in the healthcare industry is expected to ultimately lose momentum—annual sector payroll growth is projected to decelerate to less than 1% per year by 2020.

New Hampshire's manufacturing sector still maintains a significant presence in the state economy, accounting for 10% of total employment and 12% of output. Within the sector, a large majority of industrial production consists of durable goods manufacturing, particularly computers, electronics, navigational equipment, and a modest segment in semiconductors. Similar to the national economy, New Hampshire's manufacturing industries have seen consistent declines in employment—the aforementioned share of total employment represents an 8-percentage-point decline relative to 1990. Productivity gains realized through the adoption of more automated manufacturing processes have kept contributions to gross state product in a stable range, but the job losses are nevertheless quite problematic for the economy.

Anticipated changes in economic trade growth and the evolution of technology will likely affect the future of freight transportation. By bringing awareness to anticipated changes in technology and growth in certain sectors, New Hampshire can plan accordingly to accommodate future freight transportation needs.

2.1.3 Trade Perspectives

NHDOT has announced goals for the next three years of work, which include the following: widening 20 miles of I-93, the modernization five exits, repairs to 43 existing bridges, and the construction of 21 new spans. These future expansions and improvements will help maintain and enhance New Hampshire's connection to neighboring states, as well as the rest of the country.

New Hampshire is located at northeastern part of the US and its far east location is not expected to carry as much freight as some other parts of the country. Furthermore, some parts of New Hampshire are very rural and without large consuming economies. Despite its location and connections, transportation and logistics remains an important component of the regional economy and a potential source of future growth opportunities. The state's economy and freight flows are heavily connected to local markets of surrounding states. Most freight is shipped from or to New England states and New York and New Jersey. Massachusetts is the largest origin/destination state and it is important for construction, high tech, pharmaceuticals, food and consumer industries.

New Hampshire maintains highway connections with its surrounding areas via the I-95 corridor, which runs along the coastline and connects the state with Massachusetts and Maine. A great deal of transportation within the state is supported by heavily traveled I-93, which runs through the center of the state, connecting key cities such as Concord and Manchester and offering a link to nearby Boston. Future expansions of the local transportation network have included plans to widen the I-93 corridor in the southern half of the state, a major project with an expected completion date of 2020. NHDOT has announced goals for the next three years of work, which include the following: widening 20 miles of I-93, the modernization five exits, repairs to 43 existing bridges, and the construction of 21 new spans.

The Granite State maintains water transportation connections via the Port of Portsmouth and receives passenger rail service from Amtrak's Downeaster railroad line. Freight railroad capacity is provided by the Pan-Am railroad, which passes along the coastline. The Manchester-Boston Regional Airport is New Hampshire's most prominent air transportation hub. Many residents from northern Essex and Middlesex counties in Massachusetts have often used the airport as a convenient and lower-cost alternative to Boston's Logan Airport, and this had helped drive a robust expansion in passenger volumes through the mid-2000s. However, circumstances have changed in recent years, as the number of domestic flights at Manchester-Nashua fell a total of 40% between 2007 and 2012, compared with 14% nationwide. Manchester was especially hard hit as airlines have consolidated service at larger airports.

New Hampshire is, of course, not simply a conduit of trade but also a producer and consumer. Interregional goods movement traversing the state's transportation infrastructure falls into three primary categories:

- Through traffic consists of goods moving between origin and destination pairs that are both located outside the region, but traversing New Hampshire while en route. Through traffic is generally not handled or transshipped in New Hampshire.
- Inbound traffic consists of goods shipped from outside of the study region into New Hampshire. Some goods can be consumed locally, while other goods can be transshipped to other destinations.
- Outbound traffic consists of goods either produced in New Hampshire or transshipped through New Hampshire that are transported to destinations outside the state.

Through traffic in New Hampshire is not expected to change by 2040 and will likely be heavily dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England. New Hampshire was the 39th-largest exporting state in 2017. Export performance strengthened over the year, with export value increasing 24.3% from 2016 to $5.1 billion. The jump was primarily attributed to three of the state's top export sectors—computer and electronic products ($1.6 billion), transportation equipment ($612 million), and electrical equipment ($592 million). Exports in nonelectrical machinery, another major sector, dropped slightly to $668 million. NH's main trading partners included Canada ($576 million), Mexico ($481 million), and China ($423 million).

There are four types of freight movement. Interregional goods movement falls into three primary categories: (1) through traffic, which is not handled or transshipped in NH (2) inbound traffic, where goods are either consumed locally or transshipped to other destinations, and (3) outbound traffic, where NH products or transshipped goods are transported to out-of-state destinations. Intraregional goods movement, the fourth type, consists of goods both produced and consumed within NH and the movement of goods within the state.

A fourth type of freight movement, intraregional traffic, affects mainly local transportation infrastructure and logistics and warehousing operations. This freight traffic consists of goods both produced and consumed within NH as well as the movement of goods between regional intermodal and distribution centers and local businesses and households. Regional intermodal and distribution centers will be discussed in the context of inbound and outbound traffic. Discussions regarding efficient intra-regional or truck freight movement are generally confined to local road system and traffic management policies, land use, zoning, and other more local policy realms outside the primary scope of this assessment of goods movement trends.

2.2 Freight Profile

2.2.1 Freight Demand and Commodity Group Insights Overview

Despite New Hampshire's location and relatively small area, 91 million freight tons were carried on its transportation network in 2015 with a total value of $88 billion (*Exhibit 2-1*). Highway (truck) is the dominant mode of freight transport, followed by rail. Marine freight includes mostly imports and exports from the Port of Portsmouth, with the exception of some domestic inbound shipments from New Jersey and Maine. Marine freight makes up the lowest share by value (1.1%), while air freight makes up the lowest share by tonnage (0.9%). However, air freight values exceed both rail and water combined due to cargo shipments of higher value.

Exhibit 2-1: Freight Flows by Mode, 2015

	2015 Tons (000)	2015 Share of Total Tons	2015 Value (Million $)	2015 Share of Total Value
Truck	82,443	90.7%	75,858	85.8%
Rail	5,698	6.3%	4,798	5.4%
Marine	2,648	2.9%	967	1.1%
Air	85	0.1%	6,777	7.7%
Total	90,874		88,400	

Freight flows in New Hampshire are projected to grow at 1% CAGR by 2040 overall and 1.8% in terms of value. The mode split is not expected to change significantly in the foreseeable future as truck flows will likely dominate freight flows with 105 million tons or 91% of total 117 million tons in the state (*Exhibit 2-2*). Rail is projected to have the highest tonnage increase by 2040 with 1.7% CAGR, followed by air with 1.5% increase. The value of freight moved by water is projected to increase significantly to $2 billion from $967 million in 2015 (a 3.7% increase) mainly due to growth in exports of high value goods like machinery and electrical equipment.

Exhibit 2-2: Freight Flows by Mode, 2040

	2040 Tons (000)	CAGR 2015-2040	2040 Value (Million $)	CAGR 2015-2040
Truck	104,604	1.0%	117,699	1.8%
Rail	8,746	1.7%	6,210	1.0%
Marine	3,206	0.8%	2,371	3.7%
Air	125	1.5%	11,452	2.1%
Total	116,681	1.0%	137,733	1.8%

By 2040, mode split is not expected to change significantly as highway travel will likely continue to dominate freight flows. With the projected increases in value for freight moved by air and water, these factors should be taken into account for future infrastructure investments.

The top ten commodities by weight across all modes in New Hampshire in 2015 total 53 million tons (*Exhibit 2-3)*. Construction material like broken stone and gravel comprise over half of these flows with over 27 million tons of New Hampshire freight traffic. Petroleum products and waste and scrap account for about 10% each of the top ten commodities. Warehouse and distribution center commodities, mostly comprised of consumer goods are the next most important commodity by weight at 7%. The remaining top 10 commodities represent 20% of the total, with construction commodities accounting for 10%.

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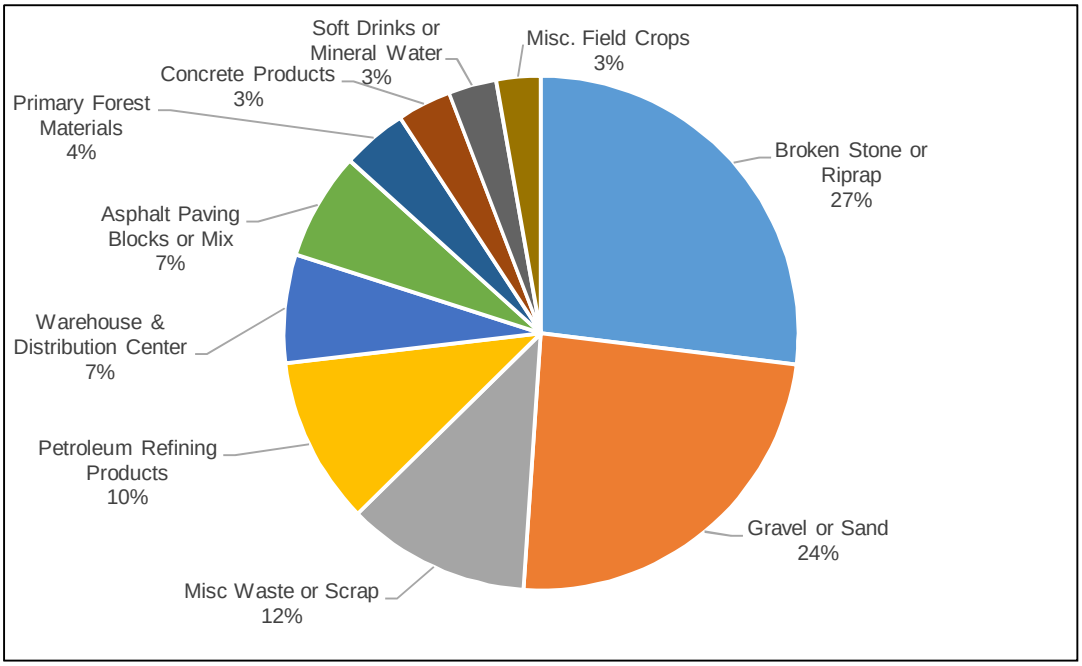
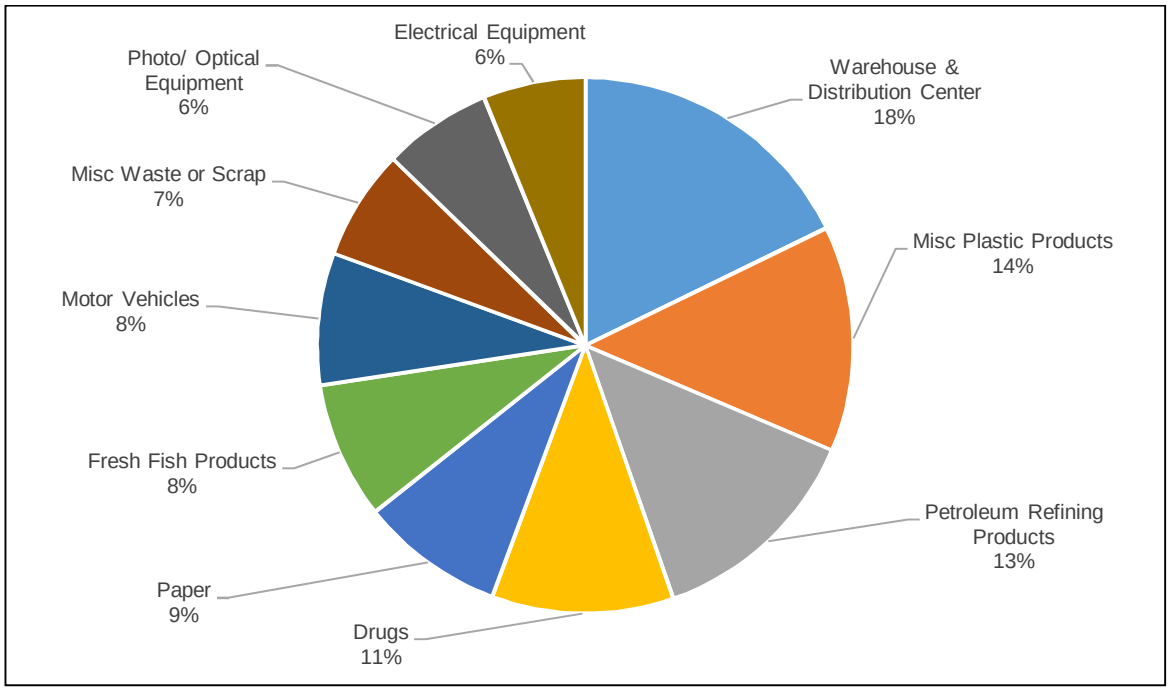
Exhibit 2-3: Through Truck Traffic Flows, 2015



The ten commodities in terms of value (*Exhibit 2-4)* have a total worth of $24 billion. The highest value commodity moved on New Hampshire's network in 2015 are consumer goods (warehouse and distribution center) worth over $4 billion. Plastics and petroleum products are also significant in value with a total worth of about $3 billion each.

Exhibit 2-4: Top Ten Commodities by Value, 2015



2.2.2 Truck Freight and Commodity Insights

Truck Freight Flows Overview

Close to 82.5 million tons of freight valued $76 billion are carried by truck in New Hampshire in 2015 (*Exhibit 2-5*). Through traffic has the highest share of truck traffic in the state (37.3%) and represents an even higher percentage of the total share when measured by value, accounting for about 47% of all cargo in 2015. Since the percentage share by value is higher than the percentage share by weight, the data suggests that cargo moving through New Hampshire is generally of high value per ton.

Exhibit 2-5: Truck Flows – Tons, and Value

	2015		2040	
	Thousand Tons	Millions USD	Thousand Tons	Millions USD
Through	30,713	35,439	40,894	54,356
Outbound	22,702	15,619	28,839	25,019
Inbound	19,616	20,038	24,983	32,089
Local	9,411	4,762	9,889	6,236
Total	82,443	75,858	104,604	117,699

Long-haul transport by truck is more likely where cargo has higher value since transportation costs for these goods make up a less important share of overall costs of producing and bringing goods to market. Outbound flows in 2015 totaled 22.7 million tons (27.5%) and $15 billion (20.6%) making the third highest movement by weight and third highest by value.

Furthermore, inbound truck traffic value (26.4%) is higher than outbound truck traffic value even though it represents lower share in terms of tons (23.8%). This is because New Hampshire imports higher value goods, such as motor vehicles or pharmaceuticals, than it exports. The lowest share of freight traffic on the New Hampshire road network comes from local flows within the state. In 2015 local freight flows surpassed 9 million tons (11.4% of total) or $75 billion. By 2040 freight value is expected to grow between 1 and 2% annual compound growth with inbound and outbound traffic having the highest growth and local the lowest at 1.1%.

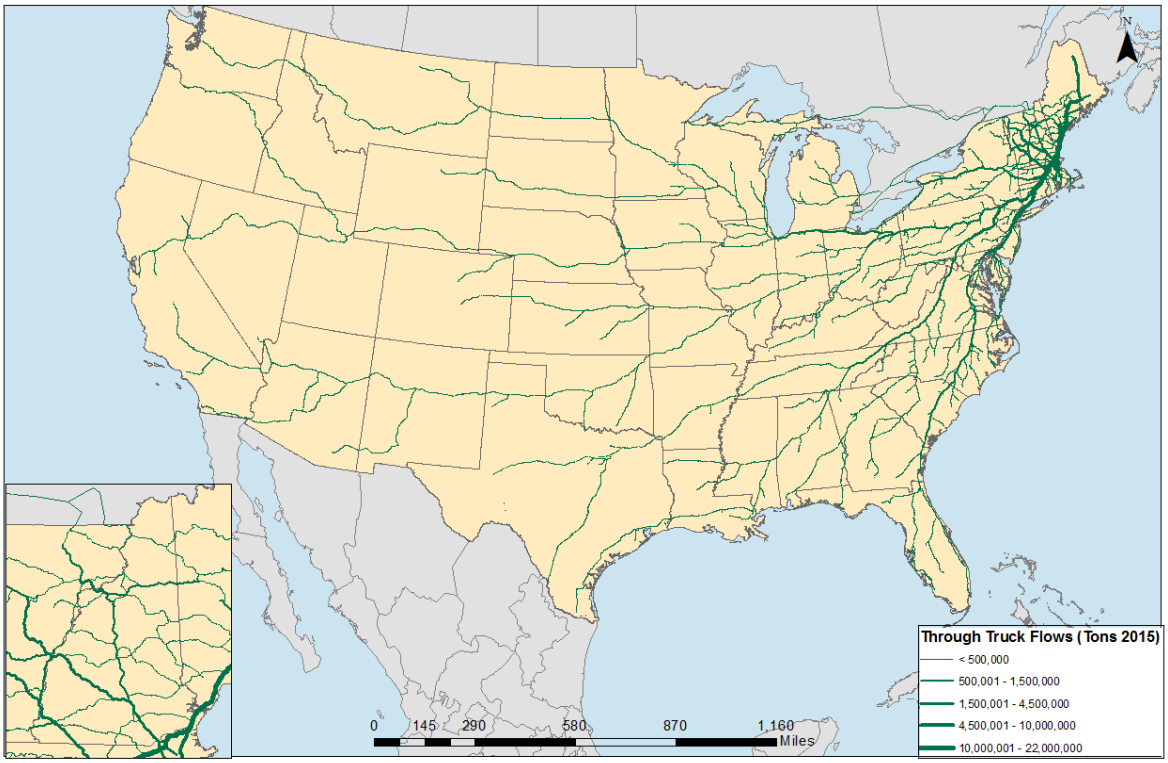
Through Truck Freight Flows

Of the total truck traffic in 2015, through truck traffic accounted for about 37% of freight activity by tonnage and 47% by value. Through traffic generally originates in Vermont and Maine and is mainly destined to eastern Massachusetts. The top commodities shipped through New Hampshire are mainly fresh fish, plastic products, and pharmaceuticals, while construction materials such as stone and sand are more significant by tonnage.

For through truck flows, the distribution of origins and destinations spans the entire country (*Exhibit 2-6*). Massachusetts was either the origin or destination for all major pairs, while Vermont and Maine also contributed significantly. This is not expected to change by 2040 and through traffic for New Hampshire will likely be heavily dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England.

Of the total truck traffic in 2015, through truck traffic accounted for about 37% of freight activity by tonnage and 47% by value. Through traffic generally originates in Vermont & Maine and is mainly destined to eastern Massachusetts.

Exhibit 2-6: Through Truck Traffic Flows, 2015



Through truck traffic in NH is not expected to change by 2040 and will likely be heavily dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England.

The top ten most important origin-destination (OD) state pairs ranked by tons and value carried captures 65% of total tonnage and 40% of value *(Exhibit 2-7)*. The Maine to Massachusetts path is the most significant through route with a 22% share, followed by Vermont to Massachusetts and Maine to New York.

Exhibit 2-7: Through Truck Traffic Flows by Tonnage and Value, 2015

Origin State	Destination State	Thousand Tons	Million USD
Maine	Massachusetts	6,750	3,624
Vermont	Massachusetts	4,683	1,135
Maine	New York	2,404	2,277
Massachusetts	Maine	1,394	2,039
New York	Maine	939	1,160
Maine	Connecticut	930	812
Quebec	Massachusetts	864	1,597
Maine	New Jersey	754	737
Vermont	Maine	636	211
Maine	Pennsylvania	574	552
All Others		10,785	21,295
Top 10 Share of Total		**65.0%**	**40.0%**

Through traffic in New Hampshire is not anticipated to change by 2040 and will likely be heavily dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England. Through truck traffic growth in New Hampshire is forecasted to grow at 1.2% annually from 2015 to 2040 in terms of weight and 1.2% in terms of value reaching 41 million tons and $54 billion respectively (*Exhibit 2-8*).

Exhibit 2-8: Through Truck Traffic Flows by Tonnage and Value, 2040

Origin State	Destination State	Thousand Tons	Million USD
Maine	Massachusetts	9,031	5,373
Vermont	Massachusetts	6,344	1,732
Maine	New York	2,873	3,143
Massachusetts	Maine	1,817	2,814
Quebec	Massachusetts	1,292	2,521
Maine	Connecticut	1,112	1,141
New York	Maine	1,081	1,741
New Jersey	Maine	919	3,303
Maine	New Jersey	917	1,008
Pennsylvania	Maine	718	1,231
All Others		14,790	30,349
Top 10 Share of Total		**64.0%**	**44.0%**

Combining top origin-destinations and commodities by tonnage further illustrates the relative importance of construction goods transportation though New England states (*Exhibit 2-9*). Low-value commodities, mostly tied to construction, such as stone and gravel, make disproportionate contributions to truck tonnage compared to their value. Most of the construction materials are destined for Massachusetts to support a growing need for construction activity. Other flows include miscellaneous waste, field crops and dairy products, all destined to Massachusetts. Soft drinks from Maine to New York complete the top ten of through commodities in the state.

Exhibit 2-9: Through Truck Flows by Top Origin, Destination and Commodity (Tons), 2015

Origin State	Destination State	Commodity	Thousand Tons
Vermont	Massachusetts	Broken Stone or Riprap	2,777
Maine	Massachusetts	Gravel or Sand	1,870
Maine	Massachusetts	Broken Stone or Riprap	793
Maine	Massachusetts	Misc. Waste or Scrap	708
Vermont	Massachusetts	Gravel or Sand	396
Vermont	Massachusetts	Misc. Waste or Scrap	368
Maine	Massachusetts	Misc. Field Crops	349
Massachusetts	Maine	Misc. Waste or Scrap	311
Vermont	Massachusetts	Dairy Farm Products	289
Maine	New York	Soft Drinks or Mineral Water	276
All Others			22,576
Top 10 Share of Total			**26.5%**

In terms of total value (*Exhibit 2-10),* a more diverse picture is seen. Massachusetts is again either an origin or destination for all but one through movement. Canadian states like Ontario, Nova Scotia, and New Brunswick gain importance in goods moved by value, with a very diverse span of commodities, such as metal products, tires, motor vehicles and fish products. Most of the commodities moved are consumer goods and most come from imports arriving at ports, but also from other transportation modes, especially rail, which are then loaded onto trucks. Fresh fish products are shipped from Canada and Maine to be consumed in Massachusetts. Tires from the Nova Scotia Michelin plant are shipped to South Carolina for auto manufacturing industries. Two other important commodities are pharmaceuticals shipped from Maine to Massachusetts and metal products from Ontario to Massachusetts.

Exhibit 2-10: Through Truck Flows by Top Origin, Destinations & Commodity (Value), 2015

Origin State	Destination State	Commodity	Million USD
Ontario	Massachusetts	Fabricated Metal Products	430
Nova Scotia	South Carolina	Tires or Inner Tubes	409
New Brunswick	Massachusetts	Canned or Cured Sea Foods	404
Maine	Massachusetts	Fresh Fish Products	349
Massachusetts	Maine	Motor Vehicles	323
Massachusetts	Quebec	Aircraft	323
Maine	Massachusetts	Drugs	246
New Brunswick	Massachusetts	Processed Fish Products	225
Maine	Massachusetts	Warehouse & Distribution Center	219
Nova Scotia	Massachusetts	Processed Fish Products	200
All Others			32,311
Top 10 Share of Total			**8.8%**

Through traffic in New Hampshire is not expected to change by 2040 and will likely be dependent upon demand and production in southeastern Massachusetts, particularly when the origin or destination is outside of New England. Through truck traffic growth in New Hampshire is forecasted to grow at 1.2% annually from 2015 to 2040 in terms of weight and 1.2% in terms of value reaching 41 million tons and 54 billion respectively Construction industry products are the main drivers of this growth by weight (*Exhibit 2-11)*, while plastics, metal products and fish are driving growth in terms of value (*Exhibit 2-12*). Massachusetts will likely continue to be the major origin and destination state for through traffic with 38% of total tonnage and 24% of value.

Exhibit 2-11: Through Truck Flows Top Origin - Destination by Commodity (Tonnage), 2040

STCC4	STCC Description	Thousand Tons
14 21	Broken Stone or Riprap	5,239
14 41	Gravel or Sand	4,114
40 29	Misc. Waste or Scrap	3,297
01 19	Misc. Field Crops	1,613
50 1	Warehouse & Distribution Center	1,529
29 51	Asphalt Paving Blocks or Mix	1,491
20 86	Soft Drinks or Mineral Water	1,311
26 11	Pulp or Pulp Mill Products	1,271
32 71	Concrete Products	1,036
24 21	Lumber or Dimension Stock	912
All Others		19,081
Top 10 Share of Total		**53.3%**

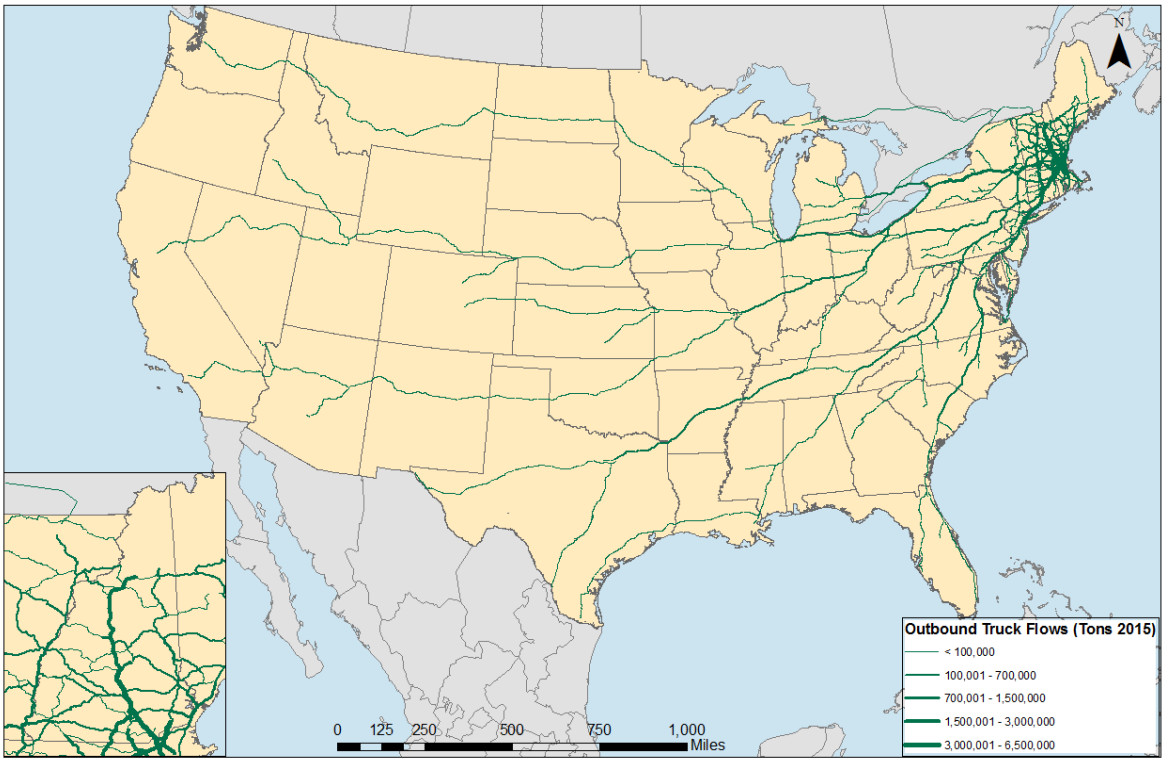
Exhibit 2-12: Through Truck Flows Top Origin - Destination by Commodity (Value), 2040

STCC	STCC Description	Million USD
30 71	Misc. Plastic Products	2,680
28 31	Drugs	2,528
30 11	Tires or Inner Tubes	2,466
09 12	Fresh Fish Products	2,184
34 99	Fabricated Metal Products, NEC	1,893
50 1	Warehouse & Distribution Center	1,790
20 31	Canned or Cured Sea Foods	1,286
20 36	Processed Fish Products	1,225
46 11	FAK Shipments	1,116
37 11	Motor Vehicles	1,020
All Others		36,168
Top 10 Share of Total		**33.5%**

Outbound Truck Freight Flows

Outbound freight does not differ from through freight significantly in terms of top commodities transported, but it is much lower. Most of outbound traffic is destined to New England and other northeastern states, but some outbound flows are destined for western states like California and Washington (*Exhibit 2-13*). A major source for outbound truck traffic are shipments of sand and stone that are used in construction. Top outbound commodities in terms of value are candy, electrical equipment and petroleum refining products.

Exhibit 2-13: Outbound Truck Traffic Flows, 2015



Over half of the New Hampshire's exports are construction materials such as gravel, sand, broken stone, asphalt etc. Merrimack County is the main origin, with many other production sites throughout the state. Petroleum refining products, which account for 6% of New Hampshire's outbound truck flows, originate in Rockingham County, mainly at the Port of Portsmouth. Heating oil is shipped from the port to other parts of the state and neighboring states on truck. New Hampshire is the second most forested state in the US after Maine, and not surprisingly forest materials are one of the top most exported commodities. Timber shipments in New Hampshire have continued to increase since 1948 but since there are no operating pulp mills in New Hampshire, all harvested pulp is shipped to mills in surrounding states or Canada.[43]

[43] *Forests of Vermont and New Hampshire, https://www.fs.fed.us/nrs/pubs/rb/rb_nrs95.pdf*

The top ten destination states ranked by weight and value are northeastern states, with MA at the top by both value and weight (*Exhibit 2-14)*. More specifically, flows to Massachusetts comprise 57.5% of total outbound traffic in terms of tons and 34.1% in terms of value. Other top destinations for outbound freight are ME, NY, CT, and VT. Top ten outbound flows by weight and value, represent 94% of outbound flows in terms of weight and almost 72% in terms of value.

New Hampshire's top outbound trading partners via truck mode are its neighboring states: (1) Massachusetts, (2) Maine, (3) New York, (4) Connecticut, and (5) Vermont. These trade partnerships are expected to continue through 2040.

Exhibit 2-14: Outbound Truck Flows by Top Destination, 2015

Destination State	Thousand Tons	Million USD
Massachusetts	13,049	5,321
Maine	2,309	740
New York	2,159	2,008
Connecticut	1,017	889
Vermont	1,015	324
New Jersey	564	610
Pennsylvania	478	543
Rhode Island	427	252
Michigan	162	251
Maryland	161	241
All Others	1,361	4,440
Top 10 Share of Total	**94.0%**	**71.6%**

By 2040 very little is expected to change in truck outbound traffic *(Exhibit 2-15)*. Freight from New Hampshire will likely still flow to neighboring states, though small changes in the ranking will occur. Share of total traffic to Massachusetts in terms of weight is projected to increase to 60% and slightly decrease in terms of value to 64.6% due to slow growth of construction industry commodities.

Exhibit 2-15: Outbound Truck Flows by Top Destination, 2040

Destination State	Thousand Tons	Million USD
Massachusetts	17,442	7,970
Maine	2,996	958
New York	2,358	2,784
Connecticut	1,035	1,285
Vermont	1,000	345
New Jersey	651	840
Rhode Island	590	342
Pennsylvania	576	807
Maryland	207	402
Michigan	199	433
All Others	1,785	8,853
Top 10 Share of Total	**93.8%**	**64.6%**

Top ten outbound commodities are estimated to reach 77% of total tons shipped from New Hampshire by truck increasing by 0.9% year over year from 2015 to 2040. Top commodities shipped from New Hampshire are expected to remain the same as in 2015, only in a different ranking. Broken stone or riprap is projected to reach 40% of outbound flows by weight, increasing by 4.2% from 2015 to 2040. On the other hand, gravel and sand is estimated to decline by 4.3% from 2015 to 2040 (*Exhibit 2-16, Exhibit 2-17*).

New Hampshire's top outbound commodities by tonnage via truck mode are: (1) gravel/sand, (2) broken stone or riprap, (3) waste/scrap, (4) asphalt, and (5) petroleum refining products. In 2040, no top commodity type changes are anticipated, only their ranking order.

Exhibit 2-16: Outbound Truck Flows by Commodity and Tonnage, 2015

STCC4	Commodity	Thousand Tons	Percent
14 41	Gravel or Sand	5,625	24.8%
14 21	Broken Stone or Riprap	4,138	18.2%
40 29	Misc. Waste or Scrap	1,977	8.7%
29 51	Asphalt Paving Blocks or Mix	1,525	6.7%
29 11	Petroleum Refining Products	1,360	6.0%
24 11	Primary Forest Materials	904	4.0%
50 1	Warehouse & Distribution Center	561	2.5%
14 71	Chem. or Fertilizer Minerals Crude	515	2.3%
32 71	Concrete Products	479	2.1%
14 91	Misc. Nonmetallic Minerals	393	1.7%
All Others		5,225	23.0%
Top 10 Share of Total			**77.0%**

Exhibit 2-17: Outbound Truck Flows by Commodity and Tonnage, 2040

STCC4	Commodity	Thousand Tons	CAGR 2015-2040
14 21	Broken Stone or Riprap	11,471	4.2%
40 29	Misc. Waste or Scrap	3,067	1.8%
14 41	Gravel or Sand	1,875	-4.3%
29 51	Asphalt Paving Blocks or Mix	1,523	0.0%
29 11	Petroleum Refining Products	1,000	-1.2%
50 1	Warehouse & Distribution Center	879	1.8%
24 11	Primary Forest Materials	779	-0.6%
32 71	Concrete Products	568	0.7%
14 71	Chem. or Fertilizer Minerals Crude	488	-0.2%
14 91	Misc. Non-metallic Minerals, NEC	481	0.8%
All Others		6,708	1.0%
Top 10 Share of Total		**76.7%**	**1.0%**

For 2015, New Hampshire's top outbound commodities by value via truck mode are: (1) candy, (2) electrical equipment, (3) petroleum refining products, and (4) plastic products. By 2040, the state is expected to diversify into new sectors of high value electronic equipment.

The top outbound commodities by value and their share of the total are diverse (*Exhibit 2-18)*. Candy, electrical equipment, petroleum, and plastics are particularly important outbound moves, and are destined mostly to the northeastern states such as New York and New Jersey. Candy production in New Hampshire is particularly high because of the Lindt Chocolate plant in Stratham, which is the only factory of the company outside of Switzerland that can process its ingredients from start to finish. New Hampshire doesn't produce or refine petroleum. The outbound petroleum refining products are shipped by sea to Portsmouth from Middle Atlantic and Gulf of Mexico refineries. The Port has storage facilities for heating oil, propane, and other refined products which are then shipped to distribution centers in the state (local traffic) or nearby New England states.

Exhibit 2-18: Outbound Truck Flows by Commodity and Value, 2015

STCC4	Commodity	Million USD	Percent
20 71	Candy or Other Confectionery	795	5.1%
36 29	Misc. Electrical Industrial Equipment	764	4.9%
29 11	Petroleum Refining Products	725	4.6%
30 71	Misc. Plastic Products	667	4.3%
50 1	Warehouse & Distribution Center	657	4.2%
36 61	Telephone or Telegraph Equipment	605	3.9%
40 29	Misc. Waste or Scrap	488	3.1%
50 32	Air Freight Drayage from Airport	483	3.1%
36 79	Misc. Electronic Components	449	2.9%
36 62	Radio or Tv Transmitting Equipment	409	2.6%
All Others		9,577	61.3%
Top 10 Share of Total			**38.7%**

For 2040, New Hampshire will likely continue to produce high-value goods and diversify into new sectors *(Exhibit 2-19)*. Radio or TV transmitting equipment is projected to grow the fastest at 4.2% from 2015 to 2040 and is estimated to reach $1.9 billion by 2040. This equipment originates in Hillsborough County, where manufacturing accounted for 13.7% of total employment in 2015. Other manufacturing commodities like telephone/telegraph equipment and semi conducts are expected to increase at 4.5% and 5.1% respectively by 2040.

Exhibit 2-19: Outbound Truck Flows by Commodity and Value, 2040

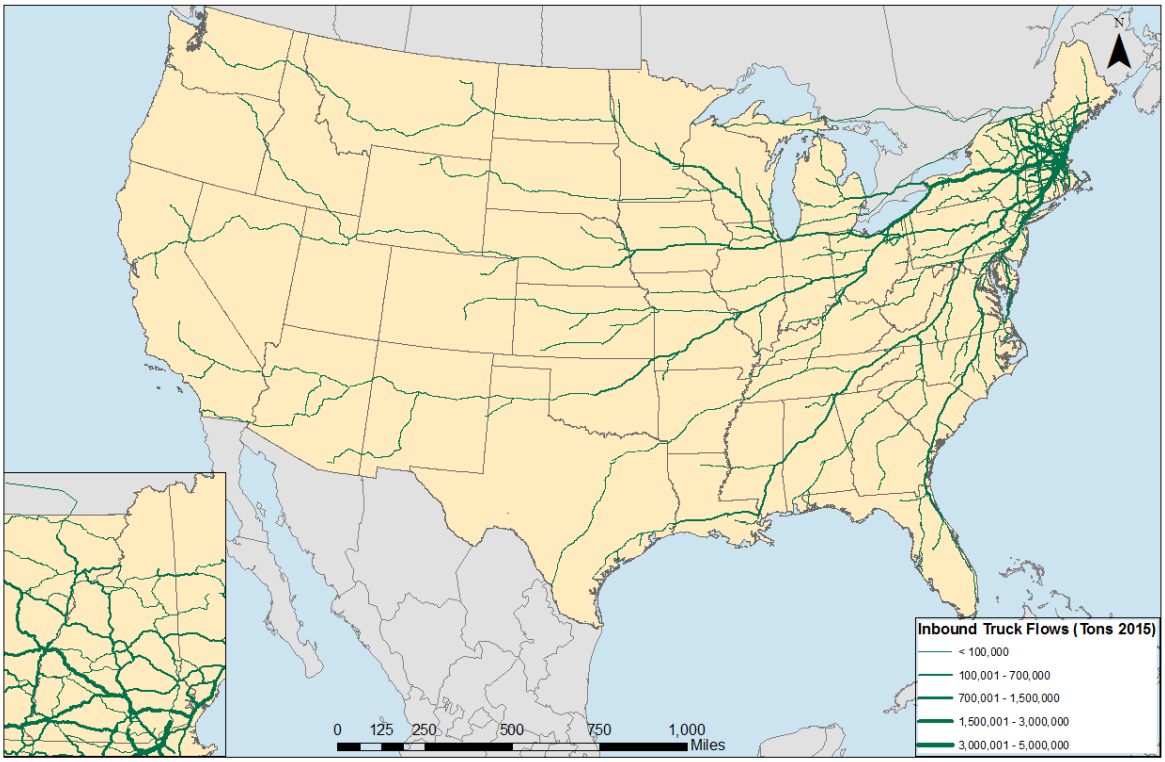
STCC4	Commodity	Million USD	CAGR 2015-2040
36 62	Radio or Tv Transmitting Equipment	1,868	6.3%
36 61	Telephone or Telegraph Equipment	1,824	4.5%
36 29	Misc. Electrical Industrial Equipment	1,650	3.1%
20 71	Candy or Other Confectionery	1,293	2.0%
36 74	Solid State Semi conducts	1,070	5.1%
50 1	Warehouse & Distribution Center	1,029	1.8%
50 32	Air Freight Drayage from Airport	984	2.9%
36 79	Misc. Electronic Components	924	0.8%
40 29	Misc. Waste or Scrap	761	1.8%
30 71	Misc. Plastic Products	833	0.9%
All Others		12,783	1.2%
Top 10 Share of Total		**48.9%**	**1.9%**

Inbound Truck Freight Flows

Inbound truck freight does not differ much from outbound or through freight (*Exhibit 2-20*). Inbound flows account for about 24% of total traffic by weight in New Hampshire and 26% by value of goods carried. Inbound freight traffic originates across the nation, with higher value goods coming from the east. New Hampshire imports from California include electronics and apparel coming from Asia to ports of Los Angeles Long Beach which are then moved by truck across country. Plastics and chemicals are the top inbound commodities from the Gulf Coast, while warehouse and distribution center goods are among the highest value goods coming to the state from New York and New Jersey.

Furthermore, imports from Canada include lumber and other wood products that are not shipped to the state by rail. Not surprisingly, the greatest source of inbound truck volume is from Massachusetts and it includes construction material, consumer goods such as motor vehicles, and warehouse and distribution center goods.

Exhibit 2-20: Inbound Truck Traffic Flows, 2015



New Hampshire's top inbound trading partners via truck mode are its neighboring states: (1) Massachusetts, (2) Maine, (3) Vermont, (4) New York, and (5) New Jersey. These trade partnerships are expected to continue through 2040.

Compared to outbound freight, the concentration of freight originated in neighboring states is lower *(Exhibit 2-21)*. Massachusetts, Maine, and Vermont account for 55% of New Hampshire's truck inbound traffic, which is much lower than the 72% of share observed in outbound freight traffic. New York and New Jersey, and Midwest states, in particular Ohio and Michigan, represent the majority of the top ten origins which account for 85% of total inbound traffic.

Exhibit 2-21: Inbound Truck Flows by Origin, 2015

Origin State	Thousand Tons	Million USD
Massachusetts	5,001	4,908
Maine	3,073	787
Vermont	2,798	481
New York	2,604	2,024
New Jersey	762	2,117
Pennsylvania	721	1,144
Connecticut	696	724
Ohio	402	875
Quebec	385	665
Michigan	229	611
All Others	2,945	5,702
Top 10 Share of Total	**85.0%**	**71.5%**

Inbound truck traffic in 2040 is not expected to change significantly compared to 2015 *(Exhibit 2-22)*. The share of the top ten states for total inbound traffic is estimated to reduce 2% by weight and 5% by value. Massachusetts will likely continue to lead the inbound flows followed by Maine and New York. Neighboring states will likely continue to account for over half of the truck traffic entering the state. Inbound flows from Michigan are forecasted to grow 1% from 2015 to 2040, while flows from Florida will grow 2.6% from 2015 to 2040. Michigan drops to 12th place overall in 2040. Slow growth in inbound tons is due to slow growth in sand and stone commodities, paper, wood/forest materials, and food. Growth in inbound flows from Florida is mainly due to growth of construction materials, sugar, fresh fruits, electronics, and consumer goods.

Exhibit 2-22: Inbound Truck Flows by Origin, 2040

Origin State	Thousand Tons	Million USD
Massachusetts	6,535	6,876
Maine	3,643	1,053
New York	3,102	2,806
Vermont	3,053	617
New Jersey	1,238	4,411
Pennsylvania	984	1,637
Connecticut	820	1,196
Quebec	554	913
Ohio	509	1,174
Florida	329	572
All Others	4,216	10,834
Top 10 Share of Total	**83.1%**	**66.2%**

New Hampshire's top inbound commodities by tonnage are very similar to outbound commodities. By 2040, construction related imports are expected to decline while liquefied gas shipments trucked from Massachusetts are expected to double.

A breakdown by top commodity groups by tonnage in 2015 is summarized in *Exhibit 2-23*. As mentioned previously, construction materials are of the highest importance for the state's freight flows. They dominate through traffic mainly for flows from Vermont and Maine to Massachusetts but are very important for outbound flows since New Hampshire has many sand and stone production sites. Based on *Exhibit 2-23* they also lead the inbound truck traffic, but at a much lower volume. Petroleum refining products are also a significant inbound commodity group, generally from Massachusetts.

Exhibit 2-23: Inbound Truck Flows by Top Commodity and Tonnage, 2015

STCC4	Commodity	Thousand Tons	Percent
14 21	Broken Stone or Riprap	3,873	19.7%
14 41	Gravel or Sand	2,291	11.7%
40 29	Misc. Waste or Scrap	1,432	7.3%
29 11	Petroleum Refining Products	1,381	7.0%
50 1	Warehouse & Distribution Center	613	3.1%
29 51	Asphalt Paving Blocks or Mix	509	2.6%
32 71	Concrete Products	505	2.6%
29 12	Liquefied Gases, Coal or Petroleum	504	2.6%
24 11	Primary Forest Materials	412	2.1%
01 42	Dairy Farm Products	363	1.9%
All Others		7,733	39.4%
Top 10 Share of Total			**60.6%**

The commodity mixes in 2040 will likely have nominal changes (*Exhibit 2-24*). Construction goods are expected to have the highest importance by weight, but their share of inbound traffic will likely decline. Petroleum products are expected to remain important, while liquified gas, mainly trucked from Massachusetts after it has been imported, are estimated to increase 3.1% from 2015 to 2040. All other commodities are expected to increase between 1.3 to 2.5%, at a higher compound annual growth rate than total inbound freight traffic, which is projected to grow 1%.

Exhibit 2-24: Inbound Truck Flows by Top Commodity and Tonnage, 2040

STCC4	Commodity	Thousand Tons	CAGR 2015-2040
14 21	Broken Stone or Riprap	3,831	0.0%
14 41	Gravel or Sand	2,631	0.6%
40 29	Misc. Waste or Scrap	2,105	1.6%
29 11	Petroleum Refining Products	1,692	0.8%
29 12	Liquefied Gases, Coal or Petroleum	1,088	3.1%
50 1	Warehouse & Distribution Center	940	1.7%
32 71	Concrete Products	835	2.0%
32 73	Ready-mix Concrete, Wet	662	2.5%
28 18	Misc. Industrial Organic Chemicals	477	1.3%
28 21	Plastic Mater or Synth Fibers	426	1.7%
All Others		10,296	1.2%
Top 10 Share of Total		**58.8%**	**1.0%**

When looking at the ten most important commodities by value a very different list emerges (*Exhibit 2-25)*. Motor vehicles are the largest commodity by value shipped in 2015, accounting for 5% of total inbound flows by value or $1 billion. Over 65% of motor vehicles imported to New Hampshire by truck are from Massachusetts as vehicles are loaded to rail and carried long distances from their manufacturing plants to trans-loading facilities in Ayer, MA (Pan AM/NS) and Worcester, MA (CSX). Plastics and petroleum products are the next most important commodity by value with 4.8% and 3.7% of truck inbound freight respectively. Warehouse and distribution center goods, pharmaceuticals, iron and steel products, and motor vehicle parts are also important high value goods carried by truck to New Hampshire. The origin state for most of these commodities is Massachusetts which serves as the transloading point to truck for commodities like motor vehicles or petroleum products. Iron or steel products mainly originate in Pennsylvania and Ohio, motor vehicles parts in Michigan and Ohio and plastic materials in states that are big plastics manufacturers like New Jersey, Texas, and Louisiana.

Exhibit 2-25: Inbound Truck Flows by Top Commodity and Value, 2015

STCC4	Commodity	Million USD	Percent
37 11	Motor Vehicles	1,000	5.0%
30 71	Misc. Plastic Products	952	4.8%
29 11	Petroleum Refining Products	737	3.7%
50 1	Warehouse & Distribution Center	718	3.6%
28 21	Plastic Mater. or Synth Fibers	631	3.1%
28 31	Drugs	504	2.5%
33 12	Primary Iron or Steel Products	425	2.1%
50 31	Air Freight Drayage to Airport	418	2.1%
37 14	Motor Vehicle Parts or Accessories	371	1.9%
40 29	Misc. Waste or Scrap	344	1.7%
All Others		13,938	69.6%
Top 10 Share of Total			**30.4%**

Inbound truck freight value is projected to increase 1.9% from 2015 to 2040. Motor vehicles and petroleum refining products are expected to increase slowest at 0.7% and 0.8% from 2015 to 2040 respectively. Electronics, which are generally imported at ports in California and New Jersey, are anticipated to increase at the highest rate. Warehouse and distribution center goods, which are associated with e-commerce goods, are expected have the third highest share of inbound value at 3.4% of total and will likely increase 1.7% from 2015 to 2040 (*Exhibit 2-26*).

Exhibit 2-26: Inbound Truck Flows by Top Commodity and Value, 2040

STCC4	Commodity	Million USD	CAGR 2015-2040
30 71	Misc. Plastic Products	1,510	1.9%
37 11	Motor Vehicles	1,192	0.7%
50 1	Warehouse & Distribution Center	1,101	1.7%
28 21	Plastic Mater or Synth Fibers	975	1.8%
35 73	Electronic Data Proc. Equipment	920	5.4%
29 11	Petroleum Refining Products	901	0.8%
28 31	Drugs	843	2.1%
36 74	Solid State Semi conducts	647	4.4%
50 31	Air Freight Drayage to Airport	565	1.2%
37 14	Motor Vehicle Parts or Accessories	536	1.5%
All Others		22,899	2.0%
Top 10 Share of Total		**28.6%**	**1.9%**

Truck Freight Key Takeways

The key findings from the analysis of New Hampshire's truck freight flows include:

- Through, outbound and inbound truck traffic make up about 31%, 26%, and 14% of truck traffic by tonnage respectively. Local traffic is lower due to New Hampshire's small geographic size. Projections show through tonnage growing at 1.2% CAGR from 2015 through 2040, with outbound and inbound traffic grows at 1%.

- Through traffic has the greatest per unit value, due to the high-value goods like fish products and consumer goods sent from Canada and Maine to Massachusetts and automobiles from Massachusetts to Maine. High tonnage commodities include construction material from Vermont and Maine, lumber and other wood products from Canada and Maine, and dairy products from Vermont, all destined to Massachusetts.

- Inbound truck traffic has the second highest per unit value due to high-value products imported to New Hampshire such as automobiles, petroleum products, and consumer goods. Major origins for inbound traffic is Massachusetts where commodities imported by other modes get further distributed to New England by truck.

- Outbound traffic is generally composed of lower value goods, mainly construction materials that are produced in the state and are carried to the rest of the country through Massachusetts. High value commodities exported by truck include candy, petroleum products imported to New Hampshire from port of Portsmouth, and consumer goods.

- The distribution of general consumer goods will likely continue to be an important source of road freight for New Hampshire. Warehouse and distribution center goods mainly originate in Massachusetts and are sent by truck to New Hampshire or other New England states through the state. Other commodities imported to New Hampshire are consolidated in distribution centers in the state and distributed to neighboring states.

- The production, consumption and distribution of construction materials will likely continue to be the highest New Hampshire truck tonnage through 2040. Currently, the state produces large quantities of sand and gravel, broken stone and riprap, and distributes the production of same materials from neighboring states. The most important flows by tonnage are sand and gravel and broken stone and riprap from New Hampshire to Massachusetts.

2.2.3 Rail Freight and Commodity Insights

Rail Freight Flows Overview

Almost 5.7 million tons were transported within New Hampshire by rail in 2015. Of those, 4.6 million tons or 81% was through traffic (*Exhibit 2-27)*. Inbound traffic accounted for a little over 13% of the total or 769 thousand tons, while the 335 thousand tons of outbound traffic accounted for just 6% of the total. The share of rail through traffic is higher in terms of value exceeding 95% or $4.6 billion from total $4.7 billion carried on New Hampshire railways in 2015.

Exhibit 2-27: Rail Flows – Tons, and Value

	2015		2040	
	Thousand Tons	Millions USD	Thousand Tons	Millions USD
Outbound	335	10	708	17
Inbound	769	201	979	332
Through	4,594	4,587	7,059	5,862
Total	5,698	4,798	8,746	6,210

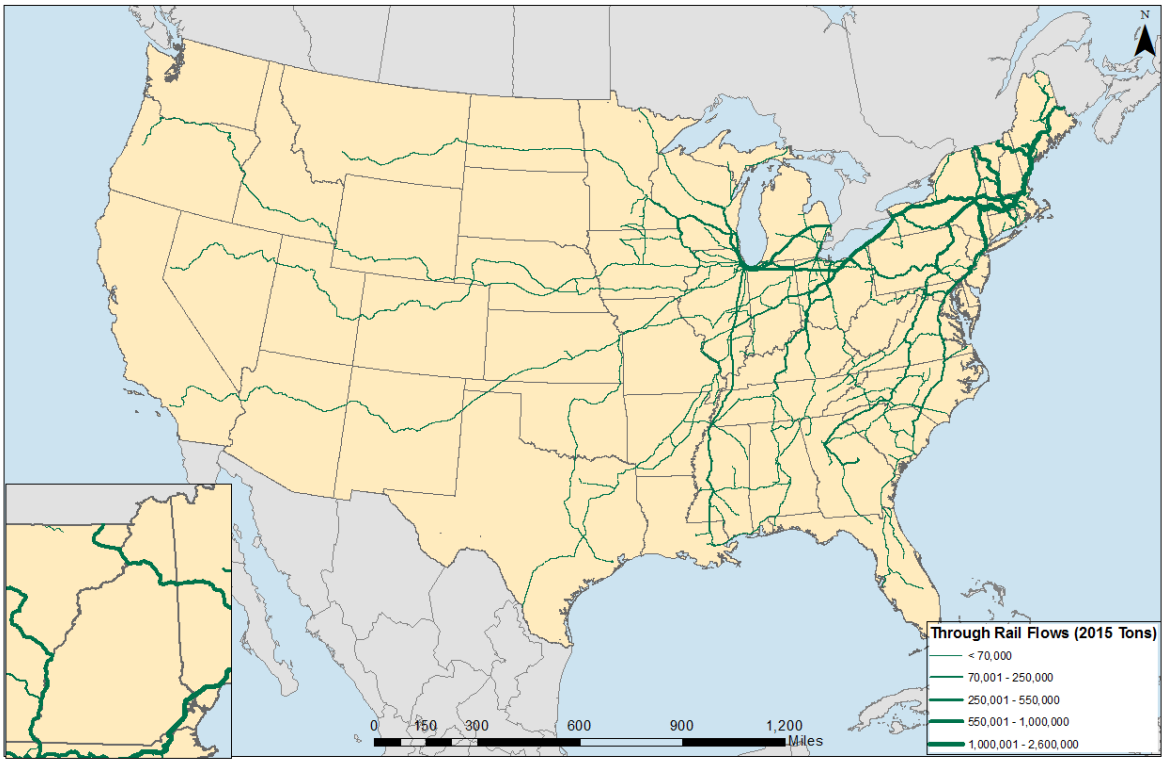
Inbound rail valued at $201 million constitutes 4.2% of rail value in the state while outbound flows are worth just $10 million, which is 0.2% of the total. The distribution of rail traffic in the state is anticipated to remain consistent through 2040. Outbound rail tonnage is estimated to grow quicker at 3% followed by through at 1.7% and inbound at 1% from 2015 to 2040.

Total rail traffic is projected to grow at 1.7%. Rail traffic value is expected to grow at a slower rate of 1% from 2015 to 2040, with outbound traffic growing fastest at 2.2%, followed by inbound at 2%. Through traffic value is estimated to increase from $4.6 billion to $5.9 in 2040.

Through Rail Freight Flows

Through traffic makes up the highest share of New Hampshire's rail flows. Through rail traffic originates/destines all over the country, but highest volumes are from New England, Mid-Atlantic and some Mid-Western states *(Exhibit 2-28)*. Goods mainly originate in Canada, Maine and Vermont and are carried through New Hampshire to southern parts of the country on local rail lines.

Exhibit 2-28: Through Rail Traffic Flows, 2015



Commodities moved by rail include paper and pulp products, lumber and some minerals. In 2016, Poland Spring Water started shipping bottled water by train from Maine to Massachusetts through New Hampshire on Pan Am Railways to reduce their carbon footprint. The company, which currently ships 4 to 5 thousand containers (about 92 to 115 thousand tons) annually by rail, aims to increase its use to deliver to other markets like New York and New Jersey and to potentially use a new plant in Lincoln, Maine. Low rail speeds in the area are currently restricting rail growth.

In 2015, 4.6 million tons traversed New Hampshire by rail with final destinations in other states in the US and Canada. The top ten through origin-destination state pairs for New Hampshire account for 46% of the total *(Exhibit 2-29)*. The highest share of through rail traffic is from Maine to Massachusetts at 6.2%, followed by Quebec to Massachusetts at 6.1% and Vermont to Maine at 6%. A large portion of the goods transferred to Massachusetts by rail are further distributed to New England by truck. Goods are hauled from Maine to Massachusetts on Pan Am's tracks while rail flows from Quebec to Massachusetts enter the US on the St. Lawrence/Quebec and St. Lawrence/Atlantic rail, then follow on Pan Am tracks in New Hampshire and New England Central Railway Company in Massachusetts. Rail freight connections from Vermont to Maine uses short lines starting on Vermont Railway, switching to Pan Am Southern and finally to Pan Am.

Exhibit 2-29: Through Rail Flows by Tonnage, 2015

Origin State	Destination State	Thousand Tons	Percent
Maine	Massachusetts	286	6.2%
Quebec	Massachusetts	278	6.1%
Vermont	Maine	274	6.0%
Maine	Wisconsin	265	5.8%
New Brunswick	Massachusetts	212	4.6%
Quebec	Maine	187	4.1%
Maine	Pennsylvania	176	3.8%
Ontario	Maine	176	3.8%
Maine	New Jersey	149	3.2%
Georgia	Maine	111	2.4%
All Others		2,480	54.0%
Top 10 Share of Total			**46.0%**

Rail through traffic is estimated to increase from 4.6 million tons in 2015 to 7 million tons in 2040 which represents 1.7% compound annual growth rate (*Exhibit 2-30*). For 2040, the route with the highest rail flow is New Brunswick to Massachusetts, followed by Vermont to Maine. The main commodities for both routes are minerals like gypsum and nonmetallic minerals. Quebec to Massachusetts is expected to be the third most important route in 2040 based on weight, and it will likely carry paper products.

Exhibit 2-30: Through Traffic Rail Flows by Tonnage, 2040

Origin State	Destination State	Thousand Tons	Percent
New Brunswick	Massachusetts	654	9.3%
Vermont	Maine	536	7.6%
Quebec	Massachusetts	490	6.9%
Ontario	Maine	325	4.6%
Quebec	Maine	312	4.4%
Maine	Wisconsin	226	3.2%
Georgia	Maine	212	3.1%
New Brunswick	New Jersey	208	2.9%
New York	Vermont	195	2.8%
Minnesota	Connecticut	194	2.7%
All Others		3,707	52.5%
Top 10 Share of Total			**47.5%**

The Maine to Massachusetts rail route is also the most important in terms of value with $521 million or 11.4% of total through rail. It is mostly used to carry paper from paper mills in Somerset and Franklin Counties to Middlesex County in Massachusetts (99% of flow). In terms of value, 46% of rail freight are paper products from Maine. Total through rail freight originated in Maine accounts for a little less than 50% of all through flows. Other important through rail traffic flows originate in Quebec and Ontario and are destined to Maine either on CN and Pan Am Southern or CN and SLR (*Exhibit 2-31*).

Exhibit 2-31: Through Traffic Rail Flows by Value, 2015

Origin State	Destination State	Million USD	Percent
Maine	Massachusetts	521	11.4%
Maine	Wisconsin	379	8.3%
Maine	Pennsylvania	333	7.3%
Quebec	Massachusetts	293	6.4%
Maine	New Jersey	266	5.7%
Quebec	Maine	187	4.1%
Ontario	Maine	163	3.5%
Maine	Kentucky	154	3.4%
Maine	Illinois	148	3.2%
Alabama	Maine	109	2.4%
All Others		2,034	44.3%
Top 10 Share of Total			**55.7%**

In terms of value, rail flows from Quebec to Massachusetts is estimated to have the highest value in 2040 at $461 million growing at a 1.8% rate from 2015 to 2040. The second most important route is the Maine to Wisconsin route at a 6.1% share. Both routes are used to carry mainly paper products (*Exhibit 2-32*).

Exhibit 2-32: Through Traffic Rail Flows by Value, 2040

Origin State	Destination State	Million USD	Percent
Quebec	Massachusetts	461	7.9%
Maine	Wisconsin	360	6.1%
Quebec	Maine	321	5.5%
Ontario	Maine	307	5.2%
Maine	Pennsylvania	265	4.5%
Maine	Massachusetts	228	3.9%
New Brunswick	Massachusetts	200	3.4%
Louisiana	Illinois	170	2.9%
Maine	Illinois	169	2.9%
Pennsylvania	Maine	164	2.8%
All Others		3,217	54.9%
Top 10 Share of Total			**45.1%**

Cargo moving on rail through New Hampshire is not very diverse. The top ten commodities represent a little less than 80% of total through flows (*Exhibit 2-33*). Paper and pulp products have the highest share of through commodities at around 38%. These flows originate in Maine and Quebec. Other commodities moving on rail are various minerals like gypsum, lumber from Canada and Maine and chemicals.

Exhibit 2-33: Through Rail Flows by Commodity and Tonnage, 2015

STCC4	Commodity	Thousand Tons	Percent
26 21	Paper	1,372	29.9%
32 95	Nonmetal Minerals, Processed	405	8.8%
26 11	Pulp or Pulp Mill Products	374	8.1%
24 21	Lumber or Dimension Stock	363	7.9%
29 12	Liquefied Gases, Coal or Petroleum	270	5.9%
28 19	Misc. Industrial Inorganic Chemicals	205	4.5%
28 21	Plastic Material or Synth Fibers	189	4.1%
32 75	Gypsum Products	162	3.5%
28 18	Misc. Industrial Organic Chemicals	131	2.9%
28 13	Industrial Gases	102	2.2%
All Others		1,021	22.2%
Top 10 Share of Total			**77.8%**

In 2015, paper was the top commodity transported through the state via rail in terms of both tonnage and value.

The top commodities (*Exhibit 2-34*) represent 87% of the value moved through New Hampshire by rail. As paper has a higher value compared to other commodities moved by rail, its share in terms of value is higher than its tonnage share, at a little under 59%. Plastics and chemicals have also high per ton value and come at a second and third place, respectively.

Exhibit 2-34: Through Rail Flows by Commodity and Value, 2015

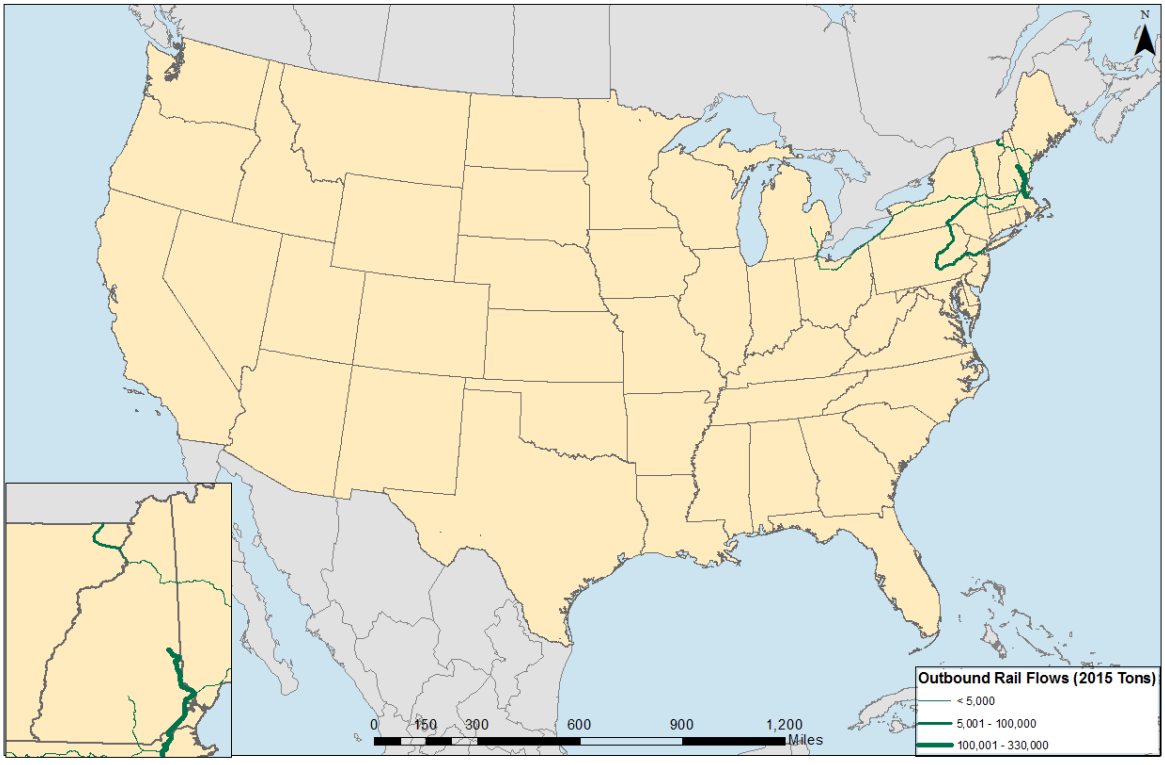
STCC4	Commodity	Million USD	Percent
26 21	Paper	2,681	58.4%
28 21	Plastic Material or Synth Fibers	421	9.2%
28 19	Misc. Industrial Inorganic Chemicals	371	8.1%
26 11	Pulp or Pulp Mill Products	136	3.1%
29 12	Liquefied Gases, Coal or Petroleum	80	1.7%
28 18	Misc. Industrial Organic Chemicals	75	1.6%
33 12	Primary Iron or Steel Products	68	1.5%
26 31	Fiber, Paper or Pulpboard	56	1.3%
24 21	Lumber or Dimension Stock	53	1.1%
28 99	Chemical Preparations, NEC	52	1.1%
All Others		594	12.9%
Top 10 Share of Total			**87.1%**

Outbound Rail Freight Flows

New Hampshire rail service is limited with only a few local railroads operating in the state and no Class I service. Low speeds and limited rail network are the main reasons for low rail utilization of outbound flows in the state. In general, rail traffic is the second highest in New Hampshire but with a very low share of 6.2% or 5.7 million tons. Of these, only 335 thousand tons (or 6%) originate in New Hampshire. Additionally, outbound traffic comprises of low value commodities, predominately construction materials, and therefore has the lowest per ton carried value.

Outbound New Hampshire rail flows have limited reach in the country *(Exhibit 2-35)*. Most commodities are carried out of the state on Pan Am rail to Massachusetts for further distribution and a smaller percentage on SLR/CN to Canada.

Exhibit 2-35: Outbound Rail Traffic Flows, 2015



Liquified gases through Coos County destined to New Jersey follow two different routes. The first, through Maine, Massachusetts, New York and Pennsylvania on SLR, Pan Am, Pan Am Southern and finally NS and the second via Vermont, Canada, New York and Pennsylvania on SLR/CN, CPRS and NS. Liquified gases are also hauled to Quebec on SLR/CN rail. Finally, consumer goods are destined to Michigan on CSX rail. The latter, which has the lowest share of weight, has the highest share of freight value with $4.8 million as consumer goods have the highest per ton value of the commodities moved on rail from New Hampshire.

The share of outbound rail traffic (326 thousand tons out of 335 thousand tons) to MA is substantial (*Exhibit 2-36*) and predominately includes sand from Strafford County loaded on Pan Am to Suffolk County for internal construction use.

Exhibit 2-36: Outbound Rail Flows by Top Destination, 2015

Destination State	Thousand Tons	Thousand USD
Massachusetts	326	2,787
New Jersey	5	1,530
Quebec	3	765
Michigan	1	4,765
TOTAL	335	9,847

Outbound rail is projected to grow 3% in terms of weight from 2015 to 2040. Construction materials to Massachusetts are expected to remain the top commodity and are estimated to double and grow 3.1% CAGR from 2015 to 2040. In terms of value, miscellaneous freight to Michigan will likely account for a 47% share of total value in 2040 at $8 billion and is projected to grow 2.1% from 2015 to 2040 (*Exhibit 2-37*)

Exhibit 2-37: Outbound Rail Flows by Top Destination, 2040

Destination State	Thousand Tons	Thousand USD
Massachusetts	695	5,755
New Jersey	7	2,005
Quebec	4	1,236
Michigan	2	8,040
TOTAL	708	17,036

As mentioned previously, the share of outbound rail tonnage to Massachusetts is substantial. However, by value, miscellaneous freight shipments to Michigan have a higher value by almost 50% (*Exhibit 2-38)*.

Exhibit 2-38: Outbound Rail Flows by Commodity Tonnage and Value, 2015

Destination State	Commodity	Thousand Tons	Thousand USD
Massachusetts	Gravel or Sand	325	2508
New Jersey	Liquefied Gases, Coal or Petroleum	5	1530
Quebec	Liquefied Gases, Coal or Petroleum	3	765
Michigan	Misc. Freight Shipments	1	4765
Massachusetts	Metal Scrap or Tailings	1	279

Outbound rail is projected to grow at 2.2% in terms of value from 2015 to 2040. Miscellaneous freight to Michigan will likely account for 47% share of total value in 2040 at $8 billion and is projected to grow at 2.1% from 2015 to 2040 (*Exhibit 2-39).*

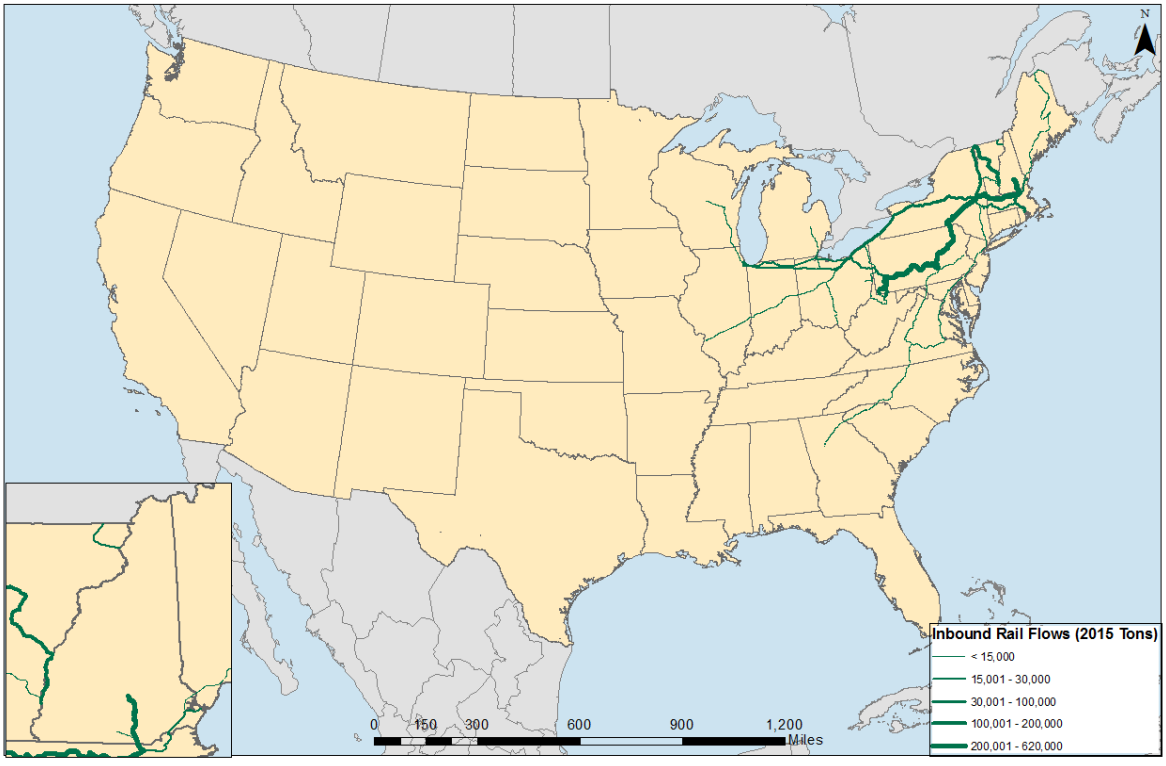
Exhibit 2-39: Outbound Rail Flows by Commodity Tonnage and Value, 2040

Destination State	Commodity	Thousand Tons	Thousand USD
Massachusetts	Gravel or Sand	693	5347
New Jersey	Liquefied Gases, Coal or Petroleum	7	2005
Quebec	Liquefied Gases, Coal or Petroleum	4	1236
Michigan	Misc. Freight Shipments	2	8040
Massachusetts	Metal Scrap or Tailings	2	408

Inbound Rail Freight Flows

Inbound rail freight traffic is more diverse when compared to outbound rail traffic. Inbound rail originates in states east of the Mississippi, with most of flows originating in the Mid-Atlantic region, where coal production is high (*Exhibit 2-40)*. About 20% of inbound rail tons are imports from Canada, and the highest percent of these flows are lumber products from British Columbia. Generally, commodities carried by rail are not high value and inbound flows to New Hampshire are no exception. Coal, cement, lumber, and other wood products are some of the commodities imported to the state by rail.

Exhibit 2-40: Inbound Rail Traffic Flows, 2015



New Hampshire's top inbound trading partners via rail mode are: (1) West Virginia, (2) Pennsylvania, (3) Quebec, (4) British Columbia, and (5) Illinois. By 2040, almost 50% of rail imports are expected from Canada (Quebec and British Columbia).

In 2015, 769 thousand tons worth $201 million entered New Hampshire by rail. Almost all inbound rail traffic originated in the top ten states (*Exhibit 2-41)*. Imports from West Virginia and Pennsylvania add up to 407 thousand tons or 20% of the total and are mainly composed of coal from regional mines. Illinois volumes are ranked fifth by weight but have the highest share in terms of value. Main commodity shipped from Illinois are wood products, originated in Cook and St. Clair counties and are destined to Merrimack and Rockingham counties on NS and CSX rail lines respectively. The remaining origins are distributed among Canada, Mid-Atlantic and New England states.

Exhibit 2-41: Inbound Rail Flows by Origin, 2015

Origin State	Thousand Tons	Million USD
West Virginia	207	10
Pennsylvania	200	24
Quebec	132	37
British Columbia	68	10
Illinois	46	64
Rhode Island	37	4
New York	32	16
Georgia	9	5
Virginia	7	5
Maine	7	1
All Others	24	25
Top 10 Share of Total	**96.9%**	**87.6%**

Top rail inbound flows in 2040 are imports from Canada at a 49% share, growing at a higher rate than total rail volumes (3.4% compared to 1.6% year over year). Composition of the top ten inbound states is not expected to differ much, with the exception of Alberta, which is projected to grow 2.8% from 2015 to 2040 and surpass Maine inbound rail. West Virginia and Pennsylvania are anticipated to drop due to slow growth of coal shipments from 2015 to 2040 (*Exhibit 2-42*).

Exhibit 2-42: Inbound Rail Flows by Origin, 2040

Origin State	Thousand Tons	Million USD
Quebec	320	59
British Columbia	144	21
West Virginia	122	9
Pennsylvania	118	31
Illinois	75	118
Rhode Island	72	7
New York	56	28
Virginia	19	13
Alberta	12	2
Georgia	12	7
All Others	29	37
Top 10 Share of Total	**97.0%**	**88.9%**

In 2015, the top inbound rail commodity by tonnage was bituminous coal at 50% of all inbound flows. By 2040, projections reveal a 47% reduction in coal imports as environmental groups push for a switch to clean energy.

For top inbound rail commodities by weight, bituminous coal originating in the mid-Atlantic states represents half of the inbound flows (*Exhibit 2-43*). Coal is destined to the largest coal power plant in New Hampshire at Bow in Merrimack County. The Shiller plant in Portsmouth (second coal burning plant in the state) directly imports coal from Colombia and Indonesia by water. The second largest commodity by weight is lumber or dimension stock. It is mainly imported from British Columbia and Alberta, on CN and NECR tracks, to a local warehouse in Charlestown, Sullivan County for further local distribution on trucks. Portland cement and petroleum products constitute 8% and 7% respectively.

Exhibit 2-43: Inbound Rail Flows by Top Commodity and Tonnage, 2015

STCC4	Commodity	Thousand Tons	Percent
11 21	Bituminous Coal	384	49.9%
24 21	Lumber or Dimension Stock	87	11.3%
32 41	Portland Cement	58	7.5%
29 11	Petroleum Refining Products	54	7.1%
29 12	Liquefied Gases, Coal or Petroleum	39	5.1%
32 95	Nonmetal Minerals, Processed	37	4.8%
24 39	Structural Wood Prod, Nec	28	3.6%
28 12	Potassium or Sodium Compound	19	2.5%
20 83	Malt	17	2.2%
24 91	Treated Wood Products	9	1.2%
All Others		37	4.8%
Top 10 Share of Total			**95.2%**

Inbound rail is estimated to increase 1% from 2015 to 2040 but with some shifts in top ten commodities *(Exhibit 2-44)*. As coal-fired plants are closing across the country, coal burning electricity has been reduced by 13% since the early 2000s in New England. Projections call for a further 47% reduction (2.5% CAGR) of coal by rail to New Hampshire by 2040 as environmental groups push for a switch to clean energy. Construction materials and organic chemicals, which are consumed for chemical manufacturing in Manchester, are expected to increase fastest from 2015 to 2040.

Exhibit 2-44: Inbound Rail Flows by Top Commodity and Tonnage, 2040

STCC4	Commodity	Thousand Tons	CAGR 2015-2040
32 41	Portland Cement	228	5.6%
11 21	Bituminous Coal	204	-2.5%
24 21	Lumber or Dimension Stock	167	2.7%
32 95	Nonmetal Minerals, Processed	72	2.7%
29 12	Liquefied Gases, Coal or Petroleum	62	1.9%
29 11	Petroleum Refining Products	56	0.1%
24 39	Structural Wood Prod, NEC	53	2.6%
28 12	Potassium or Sodium Compound	32	2.1%
20 83	Malt	24	1.3%
28 18	Misc. Industrial Organic Chemicals	19	4.1%
All Others		62	2.1%
Top 10 Share of Total		**93.7%**	**1.0%**

Coal volumes account for half of the total rail tons imported to New Hampshire in 2015, but in terms of value its share does not exceed 6% due to low per ton value. Structural wood products imported from Illinois to Portsmouth and Concord are inbound commodity with the highest value share at 28%, followed by petroleum products (diesel fuel) at 12% destined to North Walpole, Cheshire County, for internal railroad consumption and reload (*Exhibit 2-45*).

Exhibit 2-45: Inbound Rail Flows by Top Commodity and Value, 2015

STCC4	Commodity	Million USD	Percent
24 39	Structural Wood Products, NEC	57	28.3%
29 11	Petroleum Refining Products	25	12.3%
28 21	Plastic Mater or Synth. Fibers	16	8.0%
11 21	Bituminous Coal	13	6.5%
24 21	Lumber or Dimension Stock	13	6.5%
41 11	Misc. Freight Shipments	13	6.5%
29 12	Liquefied Gases, Coal or Petroleum	11	5.5%
26 21	Paper	10	5.0%
20 83	Malt	9	4.5%
28 12	Potassium or Sodium Compound	6	3.0%
All Others		28	13.9%
Top 10 Share of Total			**86.1%**

In 2015, the top imports by value were structural wood products, plastics, and petroleum products. By 2040, structural wood imports are expected to almost double.

The top ten inbound rail commodities by value in 2040 account for 86% of the total *(Exhibit 2-46)*. Structural wood is expected to account for the majority of inbound rail freight by value, with increased share up to 33% of total rail inbound flows. Plastics are anticipated to slightly surpass petroleum products in terms of total value shipped with $26 million for plastics, compared to $25 million for petroleum products, as they are projected to grow at a higher rate of 1.8% from 2015 to 2040 The importance of coal drops and it is no longer included in the top ten commodities in 2040.

Exhibit 2-46: Inbound Rail Flows by Top Commodity and Value, 2040

STCC4	Commodity	Million USD	CAGR 2015-2040
24 39	Structural Wood Prod, Nec	110	2.6%
28 21	Plastic Mater or Synth. Fibers	26	1.8%
29 11	Petroleum Refining Products	25	0.1%
24 21	Lumber or Dimension Stock	24	2.7%
32 41	Portland Cement	23	5.6%
41 11	Misc. Freight Shipments	21	2.1%
29 12	Liquefied Gases, Coal or Petroleum	18	1.9%
28 18	Misc. Industrial Organic Chemicals	13	4.1%
20 83	Malt	13	1.3%
28 12	Potassium or Sodium Compound	10	2.1%
All Others		49	2.1%
Top 10 Share of Total		**85.2%**	**1.0%**

Rail Freight Key Takeways

Based on the long-term rail forecasts in the New Hampshire region, key observations include:

- Through traffic makes up the largest share of rail freight movement within New Hampshire. It represents 81% of total rail traffic. Through rail traffic is projected to grow at 1.7% per year from 2015 to 2040 by weight (total value is estimated to grow at 1.0%). This is mainly due to growth of construction materials.

- Inbound traffic accounts for only 13% of total rail traffic and it is projected to grow 1.0% per year from 2015 to 2040 by weight (total value is estimated to grow at 2.0%). The growth will likely be slow mainly due to the reduction in coal demand, the highest inbound commodity in 2015.

- Outbound traffic accounts for smallest share of total traffic, 6% in terms of tons and 0.2% in terms of value. Outbound traffic is estimated to grow 3.0% in terms of weight and 2.2% in terms of value, due to growth in sand and gravel shipments to Massachusetts.

- Bituminous coal is essential to inbound flows, accounting for half of the total. The ongoing reduction of coal-fired energy in the country is expected to result in reduced tons by 2040 as power plants switch to clean energy solutions.

- Cement, lumber and other wood make up about a quarter of inbound rail in terms of tons in 2015. In terms of value this share is closer to 40% as these commodities have higher dollar per ton value. Increase in construction in the Northeast and New England states will likely drive the growth of these flows by 2040 and total share is projected to reach 46%. Portland cement is estimated to increase fastest at 5.6% from 2015 to 2040.

- Outbound flows are limited to four states and commodities. The largest flow is sand and gravel moving to Massachusetts to support the booming local construction industry.

- Through shipments predominately originate in neighboring New England states. The core commodity moving through New Hampshire is paper from paper mills in Maine destined to Northeast states.

2.2.4 Marine Freight and Commodity Insights

Marine Freight Flows Overview

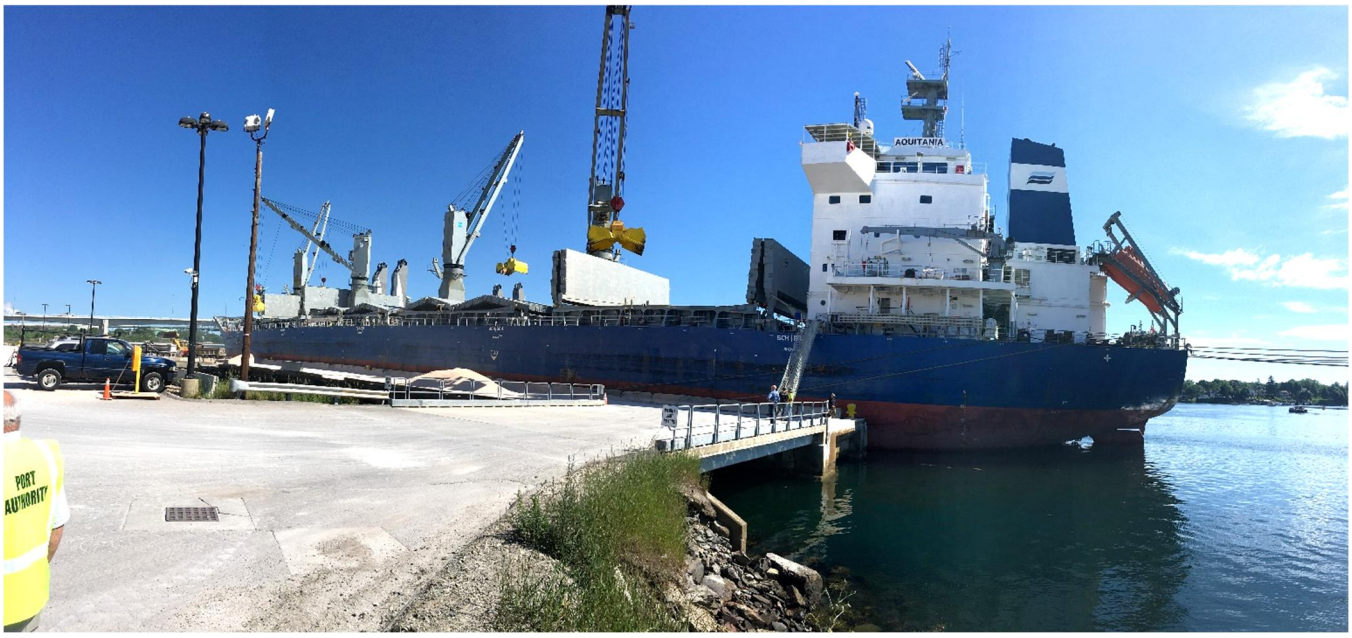
In 2015, 2.65 million tons of freight valued at $967 million moved by water to and from New Hampshire (*Exhibit 2-47*). Of these totals, approximately 98% or 2.6 million tons are imports and 58 thousand tons are exports. The Port of Portsmouth does not handle domestic outbound flows, but there are 428 thousand tons of domestic inbound flows, worth $185 million. These products are predominately petroleum products from New Jersey refineries and alcohol from Portland, Maine. Marine traffic is projected to grow 0.8% CAGR by 2040, with exports increasing by 1.4%.

By 2040, marine freight exports by value are expected to increase by almost 4 times the 2015 value from $327 million to $1.62 billion.

For 2015 freight values, import values were $640 million (66% of the total) and export values were $327 million (34% of the total). Exports are expected to increase by almost 4 times the 2015 values, growing from $327 million to $1.62 billion in 2040

Exhibit 2-47: Marine Freight Tonnage and Value, 2015 and 2040

	2015		2040	
	Thousand Tons	Millions USD	Thousand Tons	Millions USD
Imports	2,590	640	3,123	756
Exports	58	327	82	1,615
Total	2,648	967	3,206	2,371



Marine Exports

Out of 58 thousand tons shipped by water from New Hampshire in 2015, 38 thousand tons are animal or vegetable byproducts destined primarily to the United Kingdom and Netherlands. Other commodities shipped from the Port of Portsmouth are nonferrous wires, pulp and other forest materials (*Exhibit 2-48*). These commodities account for approximately 95% of total marine exports.

Exhibit 2-48: Marine Exports Freight Tonnage by Commodity, 2015

STCC4	Commodity	Thousand Tons	Percent
20 93	Animal or Vegetable Byproducts	38.0	65.5%
33 57	Nonferrous Wire	9.0	15.6%
26 11	Pulp or Pulp Mill Products	7.0	12.1%
24 11	Primary Forest Materials	1.0	1.7%
40 22	Textile Scrap or Sweepings	0.3	0.5%
20 99	Misc. Food Preparations, NEC	0.3	0.5%
33 91	Iron or Steel Forgings	0.2	0.3%
35 61	Industrial Pumps	0.2	0.3%
20 42	Prepared or Canned Feed	0.1	0.2%
20 33	Canned Fruits, Vegetables, Etc.	0.1	0.2%
All Others		1.8	3.1%
Top 10 Share of Total			**96.9%**

Marine exports by tonnage are expected to grow from 58,000 tons to 82,000 tons by 2040. The top exports will likely continue to be animal or vegetable by- products and nonferrous wire.

Total exports are projected to reach 82 thousand tons or 1.4% CAGR from 2015 to 2040. Animal and vegetable byproducts and nonferrous wire is projected to grow at 1.0% and 2.6% CAGR, respectively, and will likely account for 81% of total exported tons. Other commodities completing the top ten exports are garden equipment, soft drinks, petroleum products and plastics (*Exhibit 2-49).*

Exhibit 2-49: Marine Exports Freight Tonnage by Commodity, 2040

STCC4	Commodity	Thousand Tons	Percent
20 93	Animal or Vegetable byproducts	49.0	59.8%
33 57	Nonferrous Wire	17.0	20.7%
35 24	Lawn or Garden Equipment	2.0	2.4%
20 86	Soft Drinks or Mineral Water	1.0	1.2%
29 11	Petroleum Refining Products	1.0	1.2%
28 21	Plastic Mater or Synth Fibers	0.7	0.9%
26 11	Pulp or Pulp Mill Products	0.7	0.9%
20 85	Distilled or Blended Liquors	0.7	0.9%
20 82	Malt Liquors	0.6	0.7%
39 99	Manufactured Prod, NEC	0.6	0.7%
All Others		8.7	10.6%
Top 10 Share of Total			**89.4%**

Animal and vegetable byproducts valued a $20 million account for only 6% of total exports in terms of value, despite their high tonnage share (*Exhibit 2-50).* Nonferrous wire, valued at $155 million or 47% of total value, is exported primarily to Ireland and the UK. Machinery like industrial pumps and data processing equipment make up 42% of total value with $136 million. These commodities are mainly exported to United Arab Emirates, UK and Ireland.

Exhibit 2-50: Marine Exports Freight Commodity Value, 2015

STCC4	Commodity	Million Dollars	Percent
33 57	Nonferrous Wire	155.0	47.4%
35 61	Industrial Pumps	82.0	25.2%
35 73	Electronic Data Proc. Equipment	55.0	16.8%
20 93	Animal or Vegetable Byproducts	20.0	6.1%
26 11	Pulp or Pulp Mill Products	5.0	1.5%
35 31	Construction Machinery or Equipment	4.0	1.2%
33 91	Iron or Steel Forgings	1.0	0.3%
20 99	Misc. Food Preparations, NEC	0.7	0.2%
37 11	Motor Vehicles	0.5	0.2%
20 33	Canned Fruits, Vegetables, Etc.	0.4	0.1%
All Others		3.4	1.0%
Top 10 Share of Total			**99.0%**

By 2040, total marine exports by value are expected to increase due to high value goods like machinery and electric equipment, namely electronic data processing equipment. Spain, China and Japan are expected to be the top importers of electronics and electrical equipment.

The total value of goods exported by water from New Hampshire is projected to increase by 6.6% CAGR from 2015 to 2040, mainly due to growth in exports of high value goods like machinery and electrical equipment (*Exhibit 2-51*). The value share of these commodities is estimated to exceed 56% in the future with electronic data processing equipment accounting for the highest share of a single commodity with $469 million total. Nonferrous wire is estimated to have the highest value share overall with a 36% share, or $585 million. The countries importing nonferrous wire from New Hampshire in 2040 are expected to differ from 2015, with China and New Zealand accounting for highest share. Spain, China and Japan are anticipated to be the top importers of electronics and electrical equipment.

Exhibit 2-51: Marine Exports Freight Commodity Value, 2040

STCC4	Commodity	Million Dollars	Percent
33 57	Nonferrous Wire	585	36.2%
35 73	Electronic Data Proc. Equipment	469	29.0%
36 99	Electrical Equipment, NEC	261	16.2%
35 61	Industrial Pumps	121	7.5%
20 93	Animal or Vegetable byproducts	32	2.0%
36 21	Motors or Generators	28	1.7%
35 24	Lawn or Garden Equipment	22	1.4%
28 15	Cyclic Intermediates or Dyes	15	0.9%
28 21	Plastic Mater or Synth Fibers	10	0.6%
35 22	Farm Machinery or Equipment	6	0.4%
All Others		66	4.1%
Top 10 Share of Total			**95.9%**

Marine Imports

Imports account for the majority of the marine traffic in NH with 98% of the total or 2.6 million tons. By 2040, the top import commodities will likely remain the same (petroleum refining products, nonmetallic minerals, and chemicals).

Imports account for the majority of the marine traffic in New Hampshire with 98% of the total, or 2.6 million tons. International imports in 2015 totaled 2.2 million tons and 455 million dollars while domestic inbound traffic was 428 thousand tons, valued at $185 million. Major domestic traffic commodities include petroleum products from New Jersey refineries and alcohol from Portland, Maine. Petroleum products, salt, and gypsum are the main commodities shipped to New Hampshire by water. In 2015, they accounted for 1.9 million tons of total imports (*Exhibit 2-52*).

Exhibit 2-52: Marine Imports Freight Tonnage by Commodity, 2015

STCC4	Commodity	Thousand Tons	Percent
29 11	Petroleum Refining Products	1,243	46.8%
14 71	Chem. or Fertilizer Minerals Crude	611	23.1%
14 91	Misc. Nonmetallic Minerals, NEC	449	17.0%
11 21	Bituminous Coal	133	5.0%
29 12	Liquefied Gases, Coal or Petroleum	74	2.8%
28 99	Chemical Preparations, NEC	12	0.5%
29 91	Misc. Coal or Petroleum Products	1	0.04%
34 52	Bolts, Nuts, Screws, Etc.	1	0.04%
33 12	Primary Iron or Steel Products	0.3	0.01%
33 34	Primary Aluminum Smelter Products	0.2	0.01%
All Others		65.8	2.5%
Top 10 Share of Total			**97.5%**

By 2040, total marine imports are projected grow by only 0.5% CAGR (*Exhibit 2-53).* Petroleum products, salt, and gypsum are projected to account for 94% of total tons imported or 2.3 million tons. Other commodities include coal, liquefied natural gas (LNG), and other chemicals.

Exhibit 2-53: Marine Imports Freight Tonnage by Commodity, 2040

STCC4	Commodity	Thousand Tons	Percent
29 11	Petroleum Refining Products	1,449	46.4%
14 91	Misc. Nonmetallic Minerals, NEC	763	24.4%
14 71	Chem. or Fertilizer Minerals Crude	701	22.4%
29 12	Liquefied Gases, Coal or Petroleum	138	4.4%
29 51	Asphalt Paving Blocks or Mix	47	1.5%
28 18	Misc. Industrial Organic Chemicals	20	0.7%
35 44	Special Dies, tool, jigs, etc.	1	0.04%
28 21	Plastic Mater or Synth Fibers	1	0.04%
34 43	Fabricated Plate Products	0.4	0.01%
36 21	Motors or Generators	0.3	0.01%
All Others		2	0.1%
Top 10 Share of Total			**99.9%**

In terms of value in 2015 petroleum products accounted for 82% of the total. Its share of the total value is double its share of total tons (82% versus 41%). LNG is the second highest value commodity with $26 million and 6% of total value (*Exhibit 2-54*).

Exhibit 2-54: Marine Imports Freight Commodity Value, 2015

STCC4	Commodity	Million Dollars	Percent
29 11	Petroleum Refining Products	546	85.3%
29 12	Liquefied Gases, Coal or Petroleum	26	4.2%
14 71	Chem. or Fertilizer Minerals Crude	10	1.6%
28 99	Chemical Preparations, NEC	9	1.4%
11 21	Bituminous Coal	8	1.2%
14 91	Misc. Nonmetallic Minerals, NEC	7	1.1%
35 48	Metalworking Machinery	2	0.3%
37 14	Motor Vehicle Parts or Accessories	2	0.3%
34 52	Bolts, Nuts, Screws, Etc.	2	0.3%
35 64	Ventilating Equipment	1	0.2%
All Others		27	4.1%
Top 10 Share of Total			**95.9%**

Total imported value in 2040 is projected to decline from $455 million in 2015 to $437 million in 2040 due to a small reduction in petroleum product volumes. Petroleum products are projected to account for 71% of total in 2040, versus 82% share in 2015 at $312 million, followed by LNG with $53 million and gypsum with $13 million. The decline in petroleum products imports is driven mostly by the overall decline in petroleum products use in the United States and globally, due to efficiency gains and lower projected use for oil heating in state (*Exhibit 2-55*).

Exhibit 2-55: Marine Imports Freight Commodity Value, 2040

STCC4	Commodity	Million Dollars	Percent
29 11	Petroleum Refining Products	616	81.4%
29 12	Liquefied Gases, Coal or Petroleum	53	7.0%
14 91	Misc. Nonmetallic Minerals, NEC	13	1.8%
34 43	Fabricated Plate Products	13	1.7%
14 71	Chem. or Fertilizer Minerals Crude	12	1.6%
28 18	Misc. Industrial Organic Chemicals	10	1.3%
36 21	Motors or Generators	8	1.0%
35 44	Special Dies, tools, jigs, etc.	7	1.0%
29 51	Asphalt Paving Blocks or Mix	5	0.6%
23 31	Women or Children Clothing	5	0.6%
All Others		14	2.0%
Top 10 Share of Total			**98.0%**

Marine Freight Key Takeways

Based on the long-term marine forecasts in New Hampshire region, key observations include:

- The Port of Portsmouth is the only deep-water port with year-round service for New Hampshire.
- Inbound freight accounts for 98% of all marine tonnage, and 100% of domestic traffic (all domestic traffic is inbound).
- Approximately 16% of marine freight destined to New Hampshire originates within the US and 82% of marine freight originates outside the US.
- Petroleum products are the primary commodity moved by water into the State. The majority of petroleum is imported from Canada, Russia, and Japan, but some is originated domestically in New Jersey.
- Other commodities imported by water are salt and gypsum, which along with petroleum products account for 90% of imported tons.
- New Hampshire mainly exports three commodities by water: animal or vegetable byproducts, nonferrous wires, and pulp. Electronics are exported in lower volumes but make a significant share by total value.
- Due to New Hampshire's transportation network characteristics, marine transport is likely to continue to dominate low-value density commodities, relative to other regions.
- Domestic marine freight will likely continue to be small compared to imports.

2.2.5 Air Freight and Commodity Insights

Air Freight Flows Overview

Total New Hampshire air freight tonnage in 2015 was 85 thousand including domestic and international flows (*Exhibit 2-56).* Outbound tonnage represents approximately 46% and inbound 54% of total. The total value of air freight in 2015 was $6.6 billion with outbound and inbound flows split equally at $3.3 billion. The most significant commodity flow is small packaged freight shipments or mail, principally being shipped by UPS and FedEx.

Air freight tonnage is projected to grow robustly through 2040, increasing by 47% from $6.6 billion to $11.5 billion.

Exhibit 2-56: Air Freight Tonnage and Value

	2015		2040	
	Thousand Tons	Millions USD	Thousand Tons	Millions USD
Imports	39	3,247	64	5,497
Exports	45	3,399	61	5,955
Total	85	6,646	125	11,452

Besides small packages shipped by UPS and FedEX, Southwest Airlines Cargo and the local Wiggins Airways also operate at Manchester-Boston Regional Airport. Air cargo is also handled at Portsmouth International Airport at Pease by SeaCoast Air Cargo. Air freight tonnage is projected to grow robustly through 2040 increasing by 47%, representing an average annual growth rate of 1.6%. Outbound tonnage is forecasted to increase at 63% and inbound at 33%. Annual average growth rates through 2040 for outbound and inbound air freight are 2.0% and 1.1%, respectively.

Outbound Air Freight Flows

Air freight from New Hampshire is dominated by small packaged freight shipments or mail. 19 thousand tons or 49.5% of the total tons moved by air are small packages. Since the contents of private mail cannot be reliably estimated, the total value of this group is unknown. Besides small packaged freight, optical equipment, electrical equipment, and industrial chemicals are the next three commodity groups by weight, and they constitute about 27% of total outbound tonnage. Machinery and printed materials, also represent important commodities shipped by air, and they constitute approximately 4% and 2% of total outbound tonnage, respectively (*Exhibit 2-57*).

Exhibit 2-57: Outbound Air Freight Tonnage by Commodity, 2015

STCC4	Commodity	Thousand Tons
47 11	Small Packaged Freight Shipments	19.5
38	Instruments, Photo Equipment, Optical Equipment	4.8
36	Electrical Equipment	3.1
28 1	Industrial Chemicals	2.5
35	Machinery	1.6
27	Printed Matter	0.8
37	Transportation Equipment	0.7
20 1	Meat or Poultry, Fresh or Chilled	0.7
46 11	Freight of All Kind Shipments	0.7
34	Fabricated Metal Products	0.7
	All Others	4.3
	Total	**39**

Commodity groups other than small packaged freight are predominately specialty items with a high value density, ranging from about $0.01 per ton for meat and poultry to approximately $0.28 per ton for transportation equipment. The highest value share belongs to optical equipment with $1 billion or 16% of the total, followed by electrical equipment with $753 million or 11% of total value.

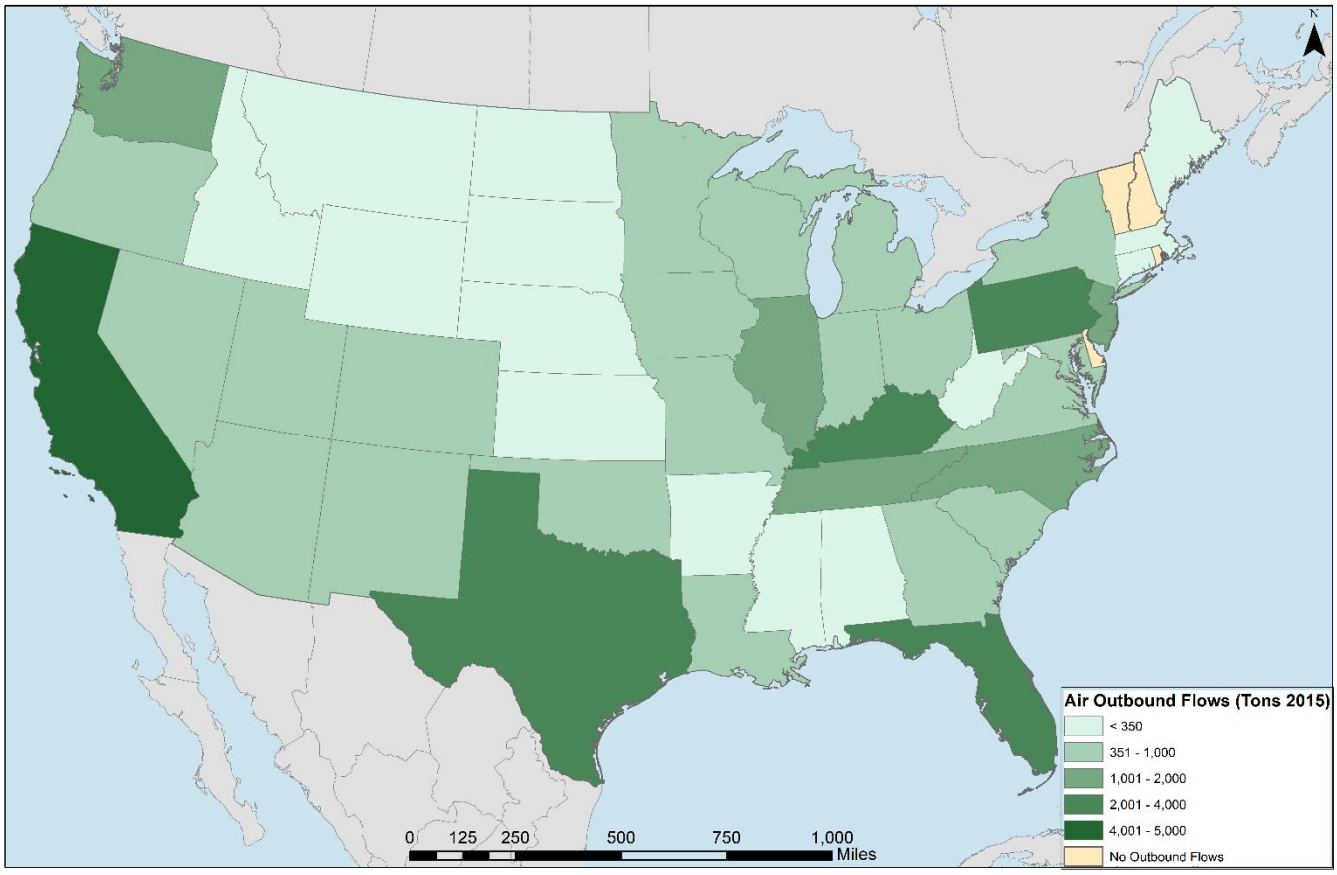
Through 2040 the commodity distribution of outbound air freight is expected to remain relatively constant (*Exhibit 2-58*). Small packaged shipments and specialized equipment and machinery and other equipment is projected to represent approximately 50% and 29% of total and outbound tons, respectively. Industrial chemicals are the only commodity expected to decline, with an estimated 1.0% decrease from 2015 to 2040. Pet food are anticipated to increase significantly and be one of the top outbound commodities in the future.

Exhibit 2-58: Outbound Air Freight Tonnage by Commodity, 2040

STCC4	Commodity	Thousand Tons	Percent Share
47 11	Small Packaged Freight Shipments	31.8	49.4%
38	Instruments, Photo Equipment, Optical Equipment	9.5	14.8%
36	Electrical Equipment	6.3	9.8%
28 1	Industrial Chemicals	2.0	3.0%
35	Machinery	1.9	2.9%
20 47	Dog, Cat or Other Pet Food, NEC	1.7	2.6%
20 1	Meat or Poultry, Fresh or Chilled	1.7	2.6%
37	Transportation Equipment	1.2	1.9%
27	Printed Matter	1.1	1.7%
46 11	Freight of All Kind Shipments	1.0	1.6%
	All Others	6.3	9.7%
	Total	**64**	

The destinations of air freight originating in New Hampshire span the entire country and have particularly high volumes in states where small packaged delivery services have their hubs. *Exhibit 2-59* illustrates the importance of California in the air freight of New Hampshire, followed by Texas, Florida and Kentucky. Both carriers operating in New Hampshire have hubs in California and Texas, hence the high shares of 13% and 9% of total tons respectively. UPS has facilities in Miami, Florida for UPS Latin America and Caribbean hub and headquarters in Louisville, Kentucky.

Exhibit 2-59: Destinations of Outbound Air Freight by State and Tonnage, 2015



From 2015 to 2040, total outbound air tonnage is projected to grow at an average annual growth rate of about 2.0% and 2.1% by total value. Meat and poultry is forecasted to grow at an average annual rate of 3.4%, followed by photo and electrical equipment growing at about 2.8% each. The states with the highest growth are KY and FL, with 2.5% and 2.1% increase respectively. The share of top ten states is not expected to change significantly and are projected to remain at 2015 levels, at 58% of total tonnage.

For outbound air freight, New Hampshire's top trading partners are: (1) California, (2) Texas, (3) Florida, (4) Kentucky, and (5) Pennsylvania.

In addition to air traffic from New Hampshire to other states in the country, 132 tons were recorded as international cargo. The value corresponding to New Hampshire exports by air is particularly high as it includes commodities of high value per ton such as printer parts and diagnostic or lab reagents. Total air exports in 2015 reached $95 billion and main export countries include China, Spain, Saudi Arabia, and Hong Kong.

Inbound Air Freight Flows

By 2040, New Hampshire's top air freight commodities will likely continue to be small packaged freight shipments, meat & poultry, and electrical equipment. Commodities related to manufacturing is estimated to increase by 3.7% while the demand for textile mill products is expected to decline.

Inbound air traffic is not particularly different from outbound traffic. Small packaged freight and mail dominates inbound flows with 50% share of the total 45 thousand tons imported to New Hampshire by air (*Exhibit 2-60*). Meat and poultry is the second highest import commodity by air with 3.4 thousand tons or 7.4% of total inbound air traffic. Shipments of different types of equipment (electrical, photo, optical, transportation and machinery) constitute 20% of total tonnage. Additional commodities shipped to New Hampshire by air include textile products, pharmaceuticals, and plastics with 5.8%, 2.4%, and 1.8% share of the total, respectively.

Exhibit 2-60: Inbound Air Freight Tonnage by Commodity, 2015

STCC4	Commodity	Thousand Tons
47 11	Small Packaged Freight Shipments	22.7
20 1	Meat or Poultry, Fresh or Chilled	3.4
36	Electrical Equipment	3.1
22	Textile Mill Products	2.6
38	Instruments, Photo Equipment, Optical Equipment	2.5
37	Transportation Equipment	1.9
35	Machinery	1.7
28 31	Drugs	1.1
34	Fabricated Metal Products	0.8
30	Rubber or Misc. Plastics	0.8
	All Others	5.0
	Total	**45**

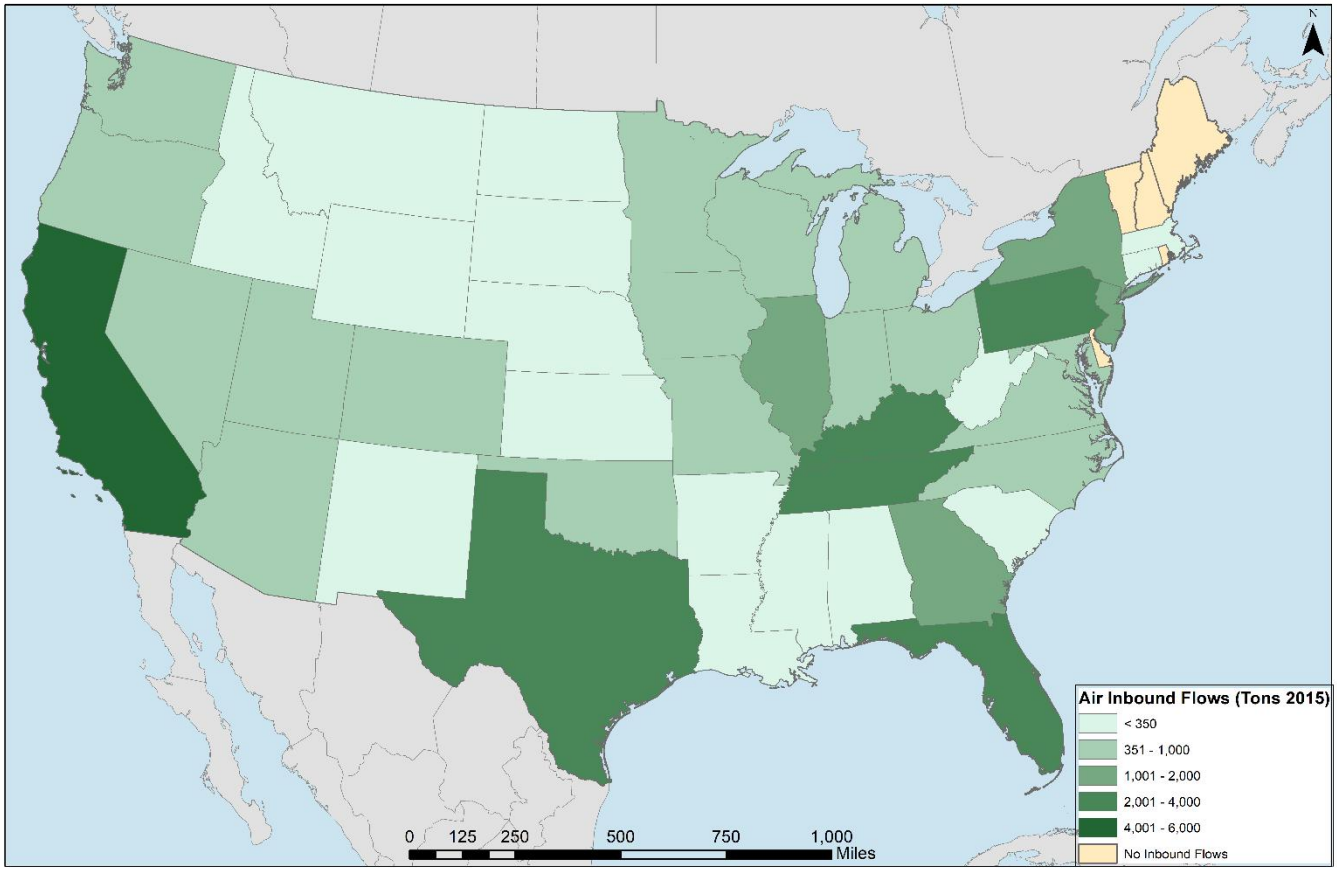
The commodity distribution of inbound air traffic is not expected to change drastically (*Exhibit 2-61*). Small packages and mail are estimated to increase 2.0% from 2015 to 2040 while commodities related to local manufacturing are estimated to increase 3.7% by 2040, constituting 28% of total air cargo. Textile Mill Products exports are the only commodity estimated to decrease by 1.2% CAGR, with 1.9 thousand tons in 2040.

Exhibit 2-61: Inbound Air Freight Tonnage by Commodity, 2040

STCC4	Commodity	Thousand Tons	Percent Share
47 11	Small Packaged Freight Shipments	25.6	42.4%
38	Instruments, Photo Equipment, Optical Equipment	6.1	10.1%
36	Electrical Equipment	5.0	8.3%
20 1	Meat or Poultry, Fresh or Chilled	3.8	6.4%
35	Machinery	3.6	6.0%
28 31	Drugs	2.5	4.1%
37	Transportation Equipment	2.2	3.6%
22	Textile Mill Products	1.9	3.2%
30	Rubber or Misc. Plastics	1.4	2.4%
28	Chemicals or Allied Products	1.4	2.3%
	All Others	6.8	11.3%
	Total	**61**	

The origin states for air freight travel are very similar to outbound air traffic since air cargo usually moves through larger hubs *(Exhibit 2-62)*. The main difference is that the most air cargo originates from California and Alaska, with 6 thousand tons each. The largest commodity from California are small packages, while imports from Alaska are small packages and meat and poultry (about 3 thousand tons each). International inbound air cargo to New Hampshire is higher than outbound, but significantly lower in terms of value. In 2015, 226 trade tons entered New Hampshire by air, worth $35.5 billion, with the majority originating in Europe (France and United Kingdom). The vast majority of imported commodities (96%) are aircrafts and aircraft parts.

Exhibit 2-62: Origins of Inbound Air Freight by State and Tonnage, 2015



Air Freight Key Takeaways

The New Hampshire airborne freight takeaways are:

- Manchester-Boston Regional Airport is the primary airport for freight in New Hampshire.
- Small packaged freight shipments are the leading commodity group accounting for about half of air freight. In general, it includes mail and is carried by major mail carriers, like UPS and FedEx.
- Mail goes to and comes from one of the major distribution hubs in Kentucky, Tennessee or Pennsylvania. Important mail destinations include California, Texas and Florida.
- Electrical, manufacturing and optical equipment compose a large share of air freight volume. These commodities reflect the high-value manufacturing activity of the State.
- Overall air freight tonnage is projected to grow 1.6% CAGR with outbound shipments gaining 2.0% CAGR and inbound shipments gaining 1.1% CAGR. Outbound tonnage is expected increase relative to inbound over the forecast horizon.

2.2.6 Economic Summaries & Key Takeaways

Specific action items or ways that New Hampshire can use the forecasted data to help make informed investment decisions:

- The majority of freight destined and originated in New Hampshire is from neighboring New England and northeastern states. Freight from these states travels mostly on trucks which puts stress on the highways connecting them. New Hampshire should continue investing in highways to keep up with growing freight demand.
- New Hampshire is also highly dependent on truck inbound traffic from neighboring intermodal ramps in Massachusetts – Ayer and Worcester on CSX and NS rail lines; Mechanicsville in NY and Montreal, Canada intermodal terminals. New Hampshire is also highly dependent on truck inbound traffic from neighboring intermodal ramps. Investment in an intermodal terminal may be beneficial to transport some of these commodities, in particular consumer goods and automobiles.
- The production, consumption and distribution of construction materials will likely continue to be the highest New Hampshire truck tonnage through 2040. Currently, the state produces large quantities of sand and gravel, broken stone and riprap, and distributes the production of same materials from neighboring states. Growth in construction material will benefit business in state, but will also have the highest impact on roads, since these commodities are bulky and can damage roads quickly. Shipping on rail may be more beneficial due to lower cost and lower use of highways, which will in turn reduce roadway congestion.
- Rail lines should be updated to accommodate heavier rail cars of 286,000 lbs. and to potentially allow for double-stack clearance. Coordination with rail companies is essential for this development.
- Continue to invest in the port facility and perform maintenance and dredging.
- Explore new port investment opportunities, in particular a new crane, at the port which will allow for shipping additional commodities. Explore top producing goods from the state and opportunities to ship them from the port.

2.2.7 Regional Market and Supply Chain Perspectives

Goods arriving to New Hampshire on any of the four modes are in most cases part of a larger supply chain with final or intermediate destinations in the state. Similarly, commodities that originate in New Hampshire might move to their ultimate destination on one or multiple modes. Supply chains can be particularly complicated and in many cases it is difficult to distinguish origin/destination of a shipment. A few examples of supply chains specific to commodities and modes moved in and out of New Hampshire are discussed below.

Petroleum products: Refined products arrive from the Mid-Atlantic and Gulf of Mexico on crude tankers to the port of Portsmouth or are imported from Canada. These products are stored in port storage facilities and then shipped on truck to consumers inland.

***Consumer product*s:** Consumer products manufactured in large production factories in Asia are shipped in containers on ships. Containers typically travel for 4-6 weeks and are delivered to US ports, mostly on the West Coast. Consumer products are then shipped to New Hampshire on trucks or rail to major intermodal terminals, and then to distribution centers in the state, where they are stored and distributed to customers by truck.

Lumber products: Wood is cut in forests in British Columbia and transferred by truck to local plants where it is processed (sawed, dried, and finished). Once processed it is loaded on rail in Canada and shipped to a wholesale lumber distributor in Charlestown, Sullivan county.

Motor vehicles: Vehicles are loaded on rail and carried long distances from their manufacturing plants to trans-loading facilities in Ayer, MA (Pan AM/NS) and Worcester, MA (CSX). Motor vehicles are then imported to New Hampshire by truck for distribution to local car dealerships.

2.3 Freight Focus Areas and Needs

2.3.1 Mobility and Congestion

Mobility and Congestion

New Hampshire's highway network provides a generally good level of mobility for commercial vehicle movements. Portions of the state's Interstate, Turnpike, and primary arterial highway networks have been identified which experience the highest levels of truck delays attributable to recurrent traffic congestion *(Exhibit 2-63)*.

To calculate a measure for truck delays, two general roadway classes were estimated for freeways (Interstates and Turnpikes) and non-freeways (principal arterials) using total and truck average annual daily traffic (AADT) data provided by NHDOT. It was assumed that general traffic would have a characteristic distribution by hour and direction, and trucks would have a distinctly different one, generally less peaked[44]. Typical relationships were constructed between the hourly general traffic volume per lane and general recurrent traffic delay with reference to both the techniques of the *Highway Capacity Manual (HCM)* and empirical data on speed, density, and operating speeds. A substantial portion of total highway delay is due to incidents rather than congestion that recurs at similar times each day. Because the delay impacts of an incident are correlated with traffic intensity, using recurrent delays as a basis is appropriate for screening purposes. Using these results for each hour of the operating day for both types of highway, non-linear relationships between truck AADT per lane and minutes of truck delay per mile were formulated. The truck delay relationships are similar to general traffic delay but reflect the relative tendencies of trucks to avoid major recurrent highway congestion and to operate at night.

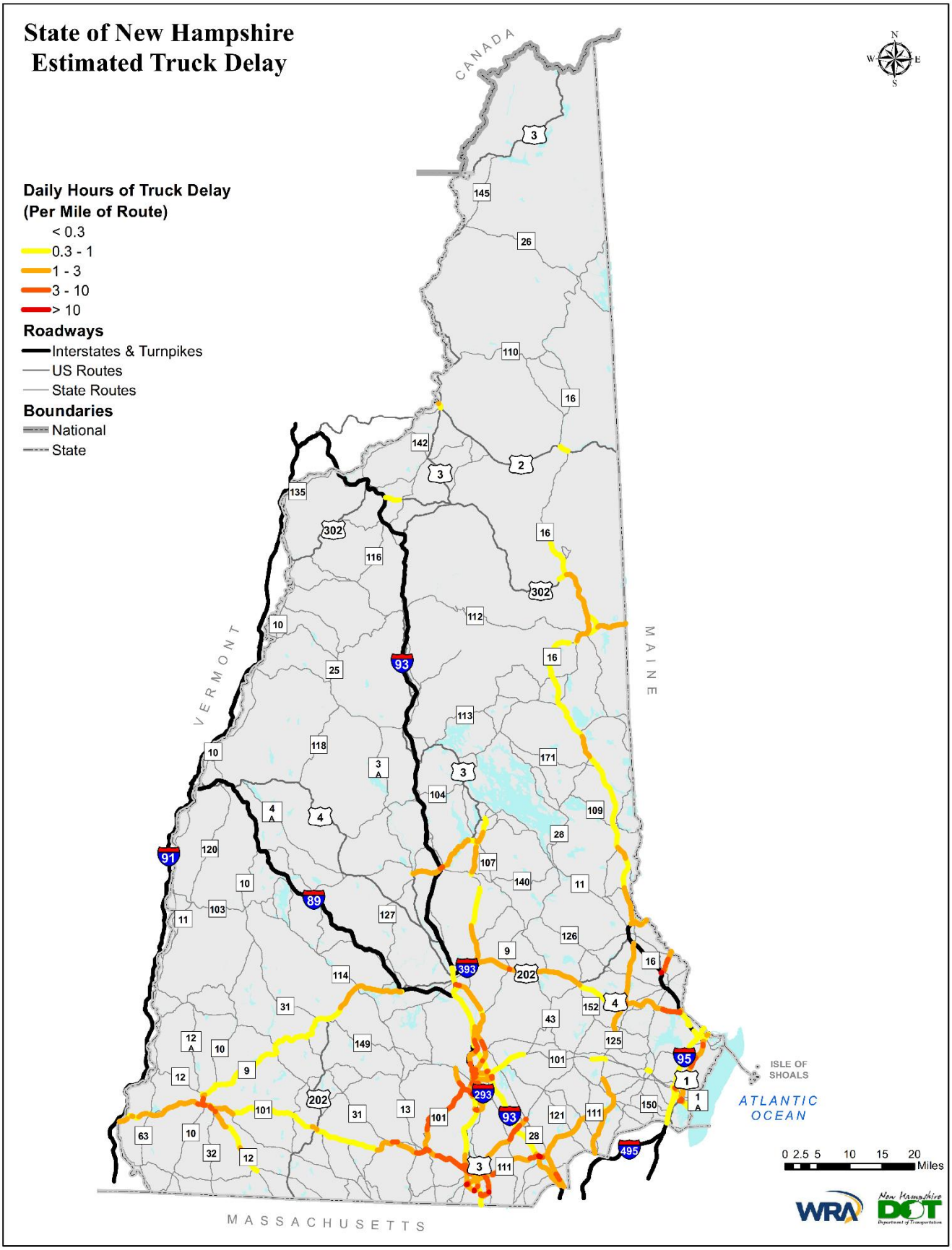
Although the Interstate network generally carries the highest truck volumes, it is not regularly congested outside of urban areas, and truckers have some flexibility to avoid the peak travel times in these areas. Nevertheless, the sections of these highways south of Concord are significant sources of truck delay. The primary arterial highways which pass through developed areas present some level of congestion throughout the day and are therefore prominent among the high-delay links. Among these, several high-delay corridors can be identified:

- US 1 between Seabrook and Portsmouth
- Routes between Laconia and both I-93 and I-393
- NH 125 and NH 16 corridors running north-south in the eastern part of the state
- US 4 and US 202 between I-393 and Dover
- NH 3A between Nashua and Manchester
- NH 3 between Manchester and Concord
- NH 9 between I-89 and Wilmington, VT
- NH 101 and NH 111 between Keene and Salem
- NH 101 between Amherst and Manchester
- NH 12 between Keene and Fitzwilliam
- NH 114 between Bedford and Goffstown
- NH 102 between Nashua and Derry

This overall evaluation does not mean that there are no local hot spots where concentrations of truck traffic cause significant delays or trucks incur significant delays moving through specific intersections or settled areas. Many of these have been identified by the RPCs and MPOs and through the freight summits and public comment processes conducted as part of the NH Freight Plan.

[44] *Texas Transportation Institute's 2015 Urban Mobility Scorecard*

Exhibit 2-63: Estimated Truck Delay Hours



With respect to connectivity, a lack of sufficient east-west highway connections has been noted. Two principal connections of this class are US 2 between Lancaster and Shelburne, and US 302 between Conway and I-93 in Bethlehem. Certain portions have been estimated to have high truck delays when volume is taken into account, but a more significant factor is likely the average speeds attainable over these routes even under uncongested conditions (about 48 mph for US 302 and 43 mph for US 2) [45], and the need to navigate through developed areas.

The state's railroad network is appropriately configured and maintained for its predominant function of providing through freight service on its main lines linking it to the national rail network and Canada. After considerable shrinkage up to the year 2000, it appears sustainable overall. Much of the network is not, however, ideally equipped in two respects:

- Accommodating car weights of 286,000 pounds, an emerging national industrial standard higher than the minimum of 263,000 pounds.
- Providing vertical clearance for double-stack container cars, which require a clearance of 20'8" above top of rail, or about 22 feet above ground level.

A portion of the St. Lawrence & Atlantic Railroad's route across northern New Hampshire has recently been improved to these levels to accommodate through movements between Portland, ME and Canada, but in much of the rest of the state the lack of one or both features makes the network less attractive for large-scale shippers. The state's Rail Plan supports mitigating both of these limitations as opportunities present themselves.

New Hampshire's railroad branch lines provide low-speed connections to local customers appropriate to the volumes of traffic handled. They are generally not capable of handling double-stack cars or cars over 263,000 pounds.

The Port of Portsmouth will be poised to make any number of landside and wharf improvements to respond to emerging maritime cargo markets once an approved plan to increase the radius of the upper turning basin near Newington is completed. For the present, specific improvements, such as the proposed upgrading of capacity to load propane into railcars, are also feasible. Access to the components of the port complex from I-95 is not always convenient, but congestion has not been identified as a major issue in and of itself.

Trucks picking up or dropping off air cargo at Pease International Airport have a good connection via NH 4 to/from I-95 south, which connects with major origins and destinations for air cargo. Localized congestion may cause some delays at peak times.

[45] *Google Maps - Uncongested estimates derived from times and distances between the center of Conway, NH and I-93 in Bethlehem, NH for US 302, and the centers of Lancaster, NH and Shelburne, NH for US 2.*

Truck Freight Bottleneck Reporting

Based on recent guidelines for identifying truck freight bottleneck locations for system performance measures (PM3) baseline reporting[46], a screening process was developed to identify truck freight bottlenecks using both quantitative and qualitative methodologies. Quantitatively, both truck reliability and truck delay were used to identify truck bottleneck locations. Previous data assessments and public outreach comments were used qualitatively to verify those locations.

As a measure of truck travel reliability, NPMRDS data was used to compare actual truck travel speeds to corresponding reference speeds for each TMC segment in the state. This approach involved analyzing and sorting NPMRDS data to identify how far and how often the hourly truck travel speed dipped below the NPMRDS reference speed. It should be noted that data is based only on the available observation points that were captured within the NPMRDS data set – it does not include any unrecorded data. Per recommendations from the guidebook, a full year of NPMRDS data was used, covering January to December 2017.

NPMRDS Data Details

- ***NPMRDS (National Performance Management Research Data Set) data has been designated by FHWA as the preferred baseline dataset to use for monitoring system performance and calculating performance measures.***
- ***Real-time speed is based on travel speeds recorded from probe, GPS, or other real time sources.***
- ***Reference speed is based on the typical free flow speed and is usually related to the speed limit. It is constant across all times, and varies only by TMC segment.***
- ***TMC (Traffic Message Channel) refers to a defined segment of roadway and is often referred to as a "TMC segment" or "TMC link."***

Raw data was filtered to exclude very short segments (less than 1/10 of a mile) and segments with insufficient available data. This initial filter eliminated some outlying data that could potentially produce skewed results (e.g. segments at intersections with reduced speeds due to mandatory red light stops or segments where only a few data points are available). Based on speed comparisons and percentage of observations, engineering judgement was used to determine the appropriate thresholds reflective of potential truck bottleneck locations. The thresholds shown below can also serve as a prioritization tool, capturing locations where trucks were *very slow* at least *some* of the time (High) versus locations where trucks are *somewhat* slow *most* of the time (Low).

- ***High***: More than 25% of observations were less than 40% of the reference speed (e.g. traveling less than 26 mph in a 65-mph zone)
- ***Medium***: More than 50% of observations were less than 60% of the reference speed (e.g. traveling less than 39 mph in a 65-mph zone)
- ***Low***: More than 75% of observations were less than 80% of the reference speed (e.g. traveling less than 52 mph in a 65-mph zone)

[46] *Truck Freight Bottleneck Reporting Guidebook (FHWA-HOP-18-070) – July 2018*

Using the estimated truck delay hours per mile of route (described in the previous section), a second quantitative screening was conducted to assist in identifying areas of recurrent traffic congestion. The areas of highest truck delay (greater than 5 hours per day) were overlaid upon the initial truck bottlenecks identified from the NPMRDS data analysis described above. Almost all the areas of high truck delay were coincident with the NPMRDS bottlenecks, confirming that they are areas of significant concern. Segments with high truck delays that were not already part of the bottleneck list were added, and other segments already identified as Low Priority bottlenecks were increased to High Priority based on the truck delay dataset.

The final step in identifying truck bottlenecks was to compare other data sources and outreach efforts qualitatively to the bottleneck locations. The initial bottleneck locations were overlaid with commodity flows, truck volumes, RPC comments, and public outreach such as the online survey and public meeting comments. Although the bottleneck locations generally do not carry the highest commodity tonnage or truck volumes, the public outreach comments generally confirmed that there is significant congestion in the bottleneck areas.

The truck freight bottleneck locations are shown by priority level (*Exhibit 2-64, Exhibit 2-65, Exhibit 2-66)*, with a corresponding map (*Exhibit 2-67).* A full-size map labeled with ID numbers is available for cross reference purposes in *Appendix D*.

Some truck bottleneck locations may not have feasible infrastructure type improvements due to cost and topography. However, these locations are “potentially improvable" on other levels such as ITS, incident recovery, incident management, seasonal maintenance, educational components, operations & maintenance related policies, etc. Future studies will need to be conducted to determine the appropriate mitigation steps and measures for performance monitoring. Creating awareness to these locations, especially for the more rural portions of the state, will serve to be a great first step in identifying current issues or to lookout for potential issues that may arise in the future.

Key findings and insights include the following:

- The truck bottlenecks identified are located almost exclusively along non-interstate corridors, such as arterials and collectors. The few interstate locations that have been identified are mainly near major interchange junctions. This does not mean that there is no congestion on the interstate mainlines, but rather that there are no obvious bottlenecks for trucks based on the travel speed and delay data used for this screening exercise. As discussed previously, truck freight traffic has more flexibility to operate during non-peak hours to avoid interstate congestion. And since interstates are primarily designed to maximize through traffic, they logically carry the largest share of commodities and truck volumes.
- The fact that the bottlenecks are mostly located along non-interstates with less through traffic means they represent issues with first/last mile connections for freight. There are opportunities for significant improvements in truck access and travel time by focusing on these bottleneck locations.

Exhibit 2-64: Truck Freight Bottleneck Locations – High Priorities

ID	ROADWAY	LOCATION	TOWN(S)	MILES*
1002	CANAL ST	MAIN ST TO MERRIMACK RIVER	NASHUA	1.8
1003	CANDIA RD	EAST OF I-93	MANCHESTER	0.7
1004	CIRCUMFERENTIAL HWY	US 3 TO NH 3A	HUDSON, NASHUA	2.8
1005	DANIEL WEBSTER HWY	AT CIRCUMFERENTIAL HWY	NASHUA	0.3
1009	INDIAN BROOK RD	NH 16 / SPAULDING TPKE TO MAINE BORDER	DOVER, SOMERSWORTH	7.3
1010	KILTON RD	CONNECTION BETWEEN US 3 AND NH 101	BEDFORD	0.2
1011	MARKET ST	DANIEL ST TO WOODBURY AVE	PORTSMOUTH	2.8
1013	NH 101	I-293 / EVERETT TURNPIKE INTERCHANGE TO WALLACE RD	BEDFORD	6.1
1016	NH 101A	MAIN ST NASHUA TO NH 101	AMHERST, NASHUA, MILFORD, MERRIMACK	18.0
1017	NH 101D / N HAMPTON RD	AT NH 101	EXETER	0.2
1019	NH 102 / NASHUA RD	NH 128 TO NH 28	LONDONDERRY, DERRY	6.4
1020	NH 102 / FREETOWN RD	AT NH 101	RAYMOND	0.7
1022	NH 108 / PORTSMOUTH AVE	AT NH 101	STRATHAM	0.4
1023	NH 11 / BROAD ST	DOWNTOWN CLAREMONT	CLAREMONT	0.8
1027	NH 111 / E HOLLIS ST	DOWNTOWN NASHUA TO US 3	NASHUA, HUDSON	6.4
1028	NH 111 / MAIN ST	E HOLLIS ST TO DANIEL WEBSTER HWY	NASHUA	3.1
1029	NH 111 / SALEM RD	NH 128 TO NH 28	WINDHAM	8.7
1031	NH 114	NH 101 TO NH 114A	GOFFSTOWN, BEDFORD	7.1
1032	NH 125 / CALEF HWY	NH 87 TO NORTH ROAD	EPPING, BRENTWOOD	6.1
1033	NH 125 / PLAISTOW RD	MASS BORDER TO KINGSTON TL	PLAISTOW	6.5
1036	NH 28 / ROCKINGHAM RD	NH 128 TO I-93	LONDONDERRY	1.5
1037	NH 28 / S WILLOW ST	NH 28A TO S BEECH ST	MANCHESTER	5.6
1038	NH 28 / S BROADWAY	MASS BORDER TO NH 111	SALEM, WINDHAM	11.0
1043	NH 3A / LOWELL RD	MASS BORDER TO NH 111	HUDSON	11.6
1045	NH 3A / BROWN AVE	AIRPORT RD TO I-293	MANCHESTER	2.9
1046	NH 97 / MAIN ST	WEST OF NH 28	SALEM	1.1
1047	QUEEN CITY AVE	ELM ST TO WILLOW ST	MANCHESTER	0.3
1050	SOMERSET PKWY	US 3 TO NH 101A	NASHUA	1.5
1053	US 1 / US 1 BYP	I-95 TRAFFIC CIRCLE TO SARAH LONG BRIDGE	PORTSMOUTH	1.9
1058	US 202 / WASHINGTON ST	AT NH 16 / SPAULDING TPKE	ROCHESTER	0.5
1061	US 3 / HOOKSETT RD	BEECH ST TO W ALICE AVE	HOOKSETT, MANCHESTER	2.7
1062	US 3 / QUEEN CITY AVE	MERRIMACK TL TO W BRIDGE ST	MANCHESTER, BEDFORD	14.3
1064	US 3	US 3 / EVERETT TURNPIKE SPLIT	NASHUA	0.3
1072	VALLEY ST	EAST OF S MAPLE ST	MANCHESTER	0.9
1073	W BRIDGE ST	ELM ST TO MCGREGOR ST	MANCHESTER	1.0

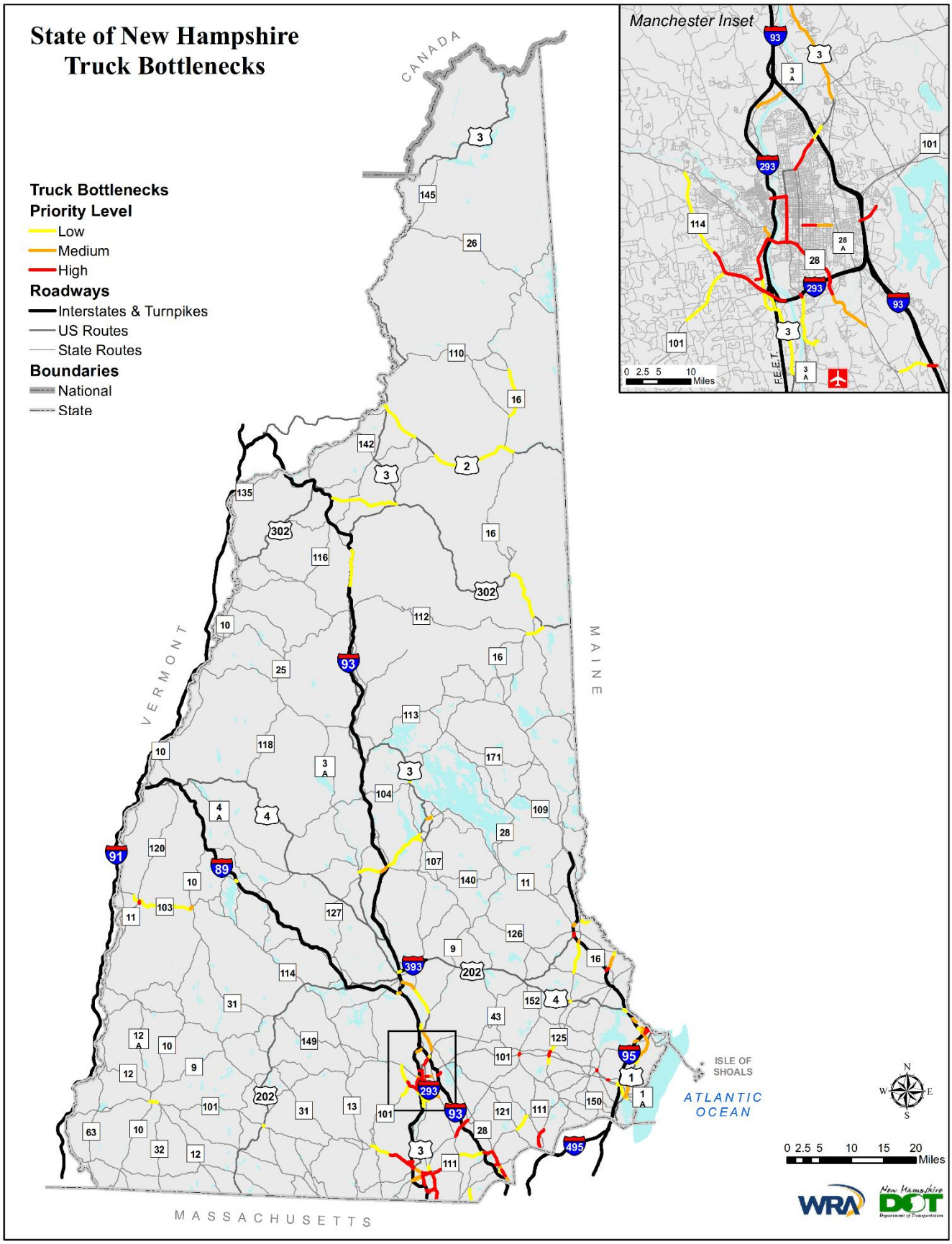
Exhibit 2-65: Truck Freight Bottleneck Locations – Medium Priorities

ID	ROADWAY	LOCATION	TOWN(S)	MILES*
1007	I-89	AT INTERCHANGE WITH I-93	BOW	0.5
1021	NH 103 / MAIN ST	NH 10 TO NORTH ST	CLAREMONT, NEWPORT	21.5
1025	NH 11	AT INTERSECTION WITH US 202 / NH 16	ROCHESTER	0.5
1034	NH 125 / GONIC RD	NH 9 TO NH 16 / SPAULDING TPKE	ROCHESTER, BARRINGTON	5.4
1039	NH 33 / GREENLAND RD	AT I-95	PORTSMOUTH	1.2
1042	NH 3A / W RIVER RD	HACKET HILL RD TO I-93	HOOKSETT, MANCHESTER	1.7
1044	NH 3A / W HANCOCK ST	SECOND ST TO VARNEY ST	MANCHESTER	0.4
1051	US 1 / LAFAYETTE RD	NH 101 TO NH 111	HAMPTON, NORTH HAMPTON	6.4
1052	US 1 / LAFAYETTE RD	I-95 TO WASHINGTON RD	PORTSMOUTH, RYE	9.3
1059	US 3 / LAKE SHORE RD	US 3 CONCURRENT WITH LAKE SHORE RD	GILFORD	2.1
1060	US 3 / HOOKSETT RD	NH 28A TO MAIN ST	HOOKSETT	6.9
1065	US 3 / PEMBROKE ST	NH 9 TO I-93	PEMBROKE, ALLENSTOWN, CONCORD	8.7
1066	US 3 / MAIN ST	NH 3A TO NH 106	FRANKLIN, TILTON, LACONIA, BELMONT	18.5
1071	US 4	NORTH OF I-95	PORTSMOUTH	3.2
1074	WOODBURY AVE	SOUTH OF US 4	NEWINGTON	0.8

Exhibit 2-66: Truck Freight Bottleneck Locations – Low Priorities

ID	ROADWAY	LOCATION	TOWN(S)	MILES*
1001	AIRPORT RD	EAST OF NH 3A	LONDONDERRY	0.5
1006	I-393	AT INTERCHANGE WITH I-93	CONCORD	0.7
1008	I-93	NB ONLY, MERGE WITH US 3 TO NH 18	FRANCONIA, LINCOLN	5.8
1012	NH 10 / NH 12	NH 9 / 10 / 12 INTERSECTION TO NH 10 / 101 INTERSECTION	KEENE	1.7
1014	NH 101	I-95 TO US 1	HAMPTON	2.5
1015	NH 101	NH 10 TO NH 12	KEENE	3.2
1018	NH 102 / NH 3A / DERRY ST	NORTH OF FERRY ST (DOWNTOWN HUDSON)	HUDSON	1.7
1024	NH 11	RAMP ONTO I-89 SB	NEW LONDON	0.3
1026	NH 111	NH 121 TO NH 121A	HAMPSTEAD	2.7
1030	NH 113 / MAIN ST	NH 112 TO US 302	CONWAY	7.3
1035	NH 16 / RIVERSIDE DR	NH 110 TO NH 110B	BERLIN, MILAN	8.0
1040	NH 38 / BRIDGE ST	JUST NORTH OF MASS BORDER	PELHAM	2.1
1041	NH 3A / W RIVER RD	HACKET HILL RD TO MAIN ST (DOWNTOWN HOOKSETT)	HOOKSETT	1.2
1048	RAMP NH 101 @ I-95	WEST OF NH 101 @ I-95	HAMPTON	0.6
1049	ROCKINGHAM PARK BLVD	WEST OF NH 28	SALEM	0.4
1054	US 2 / MAIN ST	NH 115 TO NH 16	JEFFERSON, RANDOLPH, GORHAM	18.0
1055	US 2 / MAIN ST	NH 116 TO VT BORDER	LANCASTER, JEFFERSON	10.5
1056	US 202 / WILTON RD	US 202 / NH 101 INTERSECTIONS	PETERBOROUGH	0.3
1057	US 202	NH 125 TO MAINE BORDER	ROCHESTER	3.9
1063	US 3 / DANIEL WEBSTER HWY	NH 104 TO NH 25	MEREDITH	0.8
1067	US 302 / MAIN ST	I-93 TO US 3	BETHLEHEM, CARROLL	10.9
1068	US 302 / WHITE MOUNTAIN HWY	NH 16 (CONWAY) TO NH 16 (BARTLETT)	BARTLETT, CONWAY	32.3
1069	US 4	AT NH 16 / US 4 / SPAULDING TPKE SPLIT	DOVER	0.7
1070	US 4 / CONCORD RD	AT NH 125	LEE	0.3

Exhibit 2-67: Truck Freight Bottleneck Locations



2.3.2 Environmental Impacts

Existing and projected impacts of climate change are expected to result in significant and serious implications for New Hampshire's transportation infrastructure and operations. Some of these impacts are already being observed and others are being predicted by complex climate models, but all have the potential to dramatically change the quality of life for New Hampshire residents.

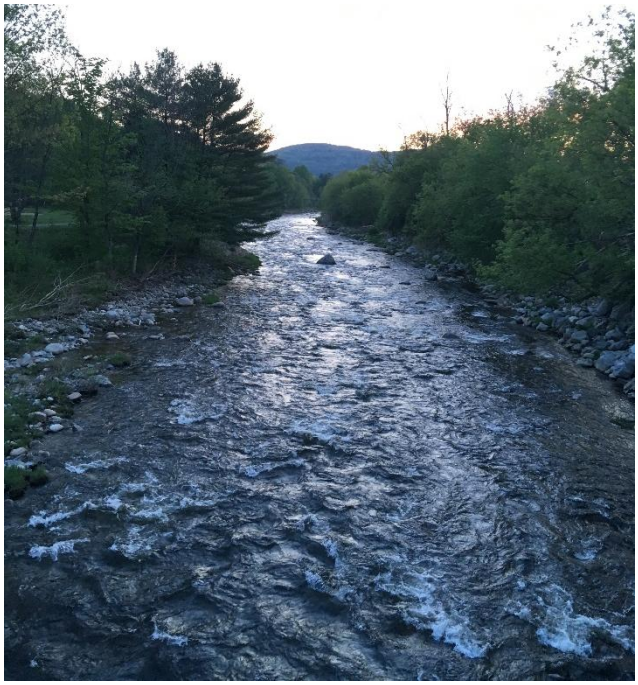
In addition to warmer average temperatures, the potential effects of climate change in the state will likely include[47]:

- *increased frequency of short-term droughts (1-3 months) during the summer months*
- *an increase in instances of extreme heat days*
- *earlier ice out on lakes, extended length of growing season*
- *fluctuations in freeze/thaw cycles*
- *a rise in storm frequency and intensity*
- *increases in annual precipitation*
- *less snow and more rain during the winter months*
- *evaporation and evapotranspiration*
- *increased risk of fire, pests, and invasive species*
- *changes in runoff and stormwater volumes*
- *reduced snowpack (density, duration, extent)*
- *reduced soil moisture*
- *an increase in the frequency of severe weather events (hurricanes, ice storms, intense rain)*
- *rising sea levels along coastal areas*

NHDOT has identified four climate change variables that are considered most significant to transportation issues: (1) increases in extreme precipitation events, (2) sea-level rise and coastal storm surge, (3) warming winters and associated changes in precipitation freeze/thaw cycles, and (4) general temperature increase.

Extreme Precipitation

Precipitation is expected to increase in both frequency and intensity in the northeast region, likely in the form of rain during the winter months. Precipitation levels could increase as much as 30%, while intense rain fall events could increase by over 12%. These changes will likely lead to an increase in runoff/streamflow and ice formation, which have various effects depending on the time of year.



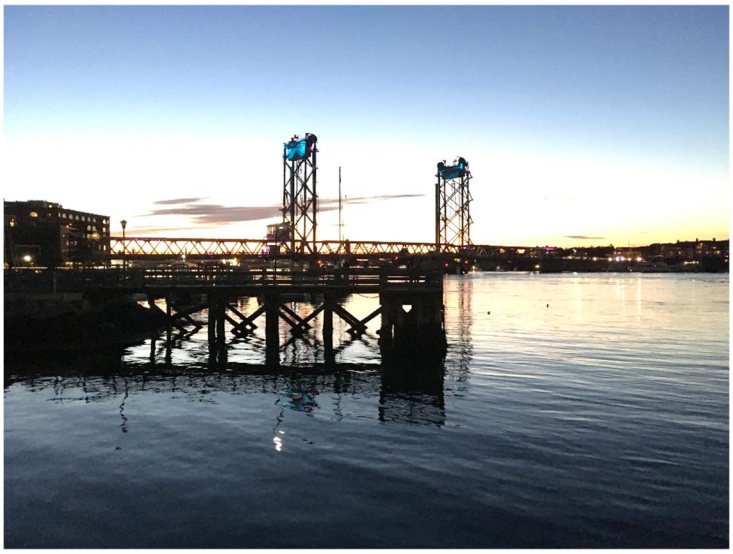
In the winter months, frozen ground prevents infiltration, which results in increased run off and risk of winter flooding. With predicted reductions in snowfall, the lack of snow will likely cause ice buildup and reduce the capacity of culverts and drainage ways. Combined with more frequent winter rainfall, this can lead to flooding and ice accumulation on roadways, resulting in higher levels of road salt application. In the summer months, the combination of reduced soil moisture, increased evapotranspiration, and more intense rainfall can lead to issues with flooding, erosion, and sedimentation.

Assets vulnerable to the impacts of runoff, streamflow, and ice

[47] *Potential Impacts of Climate Change on Transportation Infrastructure – Assessment of Vulnerability and Recommendation of Adaptive Strategies, April 2014*

accumulation include roads, bridges, culverts, and storm water drainage and management structures along highways and waterways, and structures built in already flood prone areas. Intense precipitation resulting in higher and faster flows could increase bridge scour potential. Scouring occurs when riverbed sediment is removed from around bridge abutments and piers, potentially causing instability in the bridge's structure.

Sea Level Rise and Coastal Storm Surge



Sea levels are generally rising around the world due to the impacts of global warming on climate change. By 2100, sea levels are predicted to rise an additional two to six feet, depending on the level of greenhouse gas emissions over the next 80 years. Sea level rises of this magnitude can have significant impacts to New Hampshire's coastline, which is approximately 18 miles. Some of the state's most densely populated communities, such as Portsmouth and Seabrook, are located along the coastline. Some of the most heavily used highways, such as Spaulding Turnpike and I-95, are critical evacuation routes in the event of extreme weather emergencies.

The state has significant infrastructure assets in the coastal area including already stressed sea walls, roads, bridges, and culverts. Increases in sea-level rise and coastal storm surge from intense storms can impact low-lying roads, bridges, and culverts as they will be at increased risk to flooding and damage. Both flooding and asset damage will result in more frequent traffic delays and associated impacts to the local and regional economy. Sea wall damage will threaten both public and private assets along the coastline.

Warming Winters

The extent of snow cover and the amount of time it remains on the ground will likely decrease. By 2100, the snow season may be reduced by 25% (if lower emissions) to as much as 50% (if higher emissions). Warming winters will have effects such as earlier spring peak flows, reduced ice formation in rivers, and modified stream flow patterns, but the direct impacts to transportation are not significant. However, it is anticipated that warmer winters will likely cause an increase in freeze/thaw events, which are the primary culprits of pavement failure and potholes.

Warming winters are expected to result in reduced snowfall which would in turn result in reduced snowpack. NHDOT assets that are commonly snow covered during the winter may experience increased damage during warm winter fluctuations. In addition, reduced snowfall can lead to increased icing and winter flooding in small streams and drainage ways. Assets and operations that are vulnerable to the direct and indirect impacts of warming winters includes roadways, streams, drainage ways, and stormwater management structures.

Temperature

Temperatures in the northeast have incrementally increased since 1970. Projections reveal that over the next several decades, temperatures will rise approximately 2.5 °F to 4 °F during the winter months and -1.5 °F to 3.5 °F during the summer months. Under a higher emissions scenario, winters in the Northeast could warm 8°F to 12°F and summers by -6°F to 14°F above historic levels.

Annual temperatures will likely continue to increase, but the impacts to transportation infrastructure will not be significant. Higher maximum temperatures may increase the risk of pavement buckling and rutting. However, these temperatures are not expected to exceed pavement temperature thresholds. From an operations standpoint, summer maintenance schedules maybe impacted to accommodate safer work conditions in the event of extreme summer weather temperatures.

Priorities & Adaptive Strategies

NHDOT has recognized the importance in evaluating the state's infrastructure assets and programs and have developed a series of short/mid/ long term adaptive strategies based on a set of overall challenges that have been identified. From a freight perspective, these identified challenges (*Exhibit 2-68*) will also be taken into consideration when developing freight specific policies and strategies for the NH Freight Plan.

Exhibit 2-68: Challenges Identified by NHDOT[48]

Climate Change Challenges
Availability of funding: Adequate funding should be provided for proactive measures for climate changes, rather than for disaster response when extreme events occur.
Update Drainage Design Manuals: The outline of drainage design principals does not "look ahead" and use predictive models under a "rise in sea level" scenario or projected rainfall data.
Regulatory enforcement: Consistency from and collaboration is needed with state and federal permitting agencies for NHDOT, municipalities, and private developers.
Risk areas: Identify potential assets and areas that are downstream and at risk from dams and detention basin failures.
Land use changes: Address the effects of increasing stormwater runoff, exacerbated by climate change. Prepare for upstream activities and land use changes outside of NHDOT jurisdiction, that impact downstream hydraulic/drainage systems, including areas in and around wetlands. The Department does not have a policy to size infrastructure to accommodate potential future land use.
Wetlands: Permitting/impacts is guided by NHDES. Towns have their own separate ordinances (wetland-watershed protection districts). Wetland setbacks vary by individual towns.
Availability of staffing resources: Ability to have sufficient staff and resources to address maintenance and project development needs as related to climate change impacts.

[48] *Potential Impacts of Climate Change on Transportation Infrastructure – Assessment of Vulnerability and Recommendation of Adaptive Strategies, April 2014*

2.3.3 Land Use, Community, and Quality of Life Impacts

From input received by the NH Freight Plan's process from RPCs, MPOs, meetings attended by the public, and online surveys, an incompatibility between high truck volumes (particularly of heavy combination trucks) and emerging quality of life preferences in urban communities is apparent. RPCs and their constituents frequently articulate an interest in:

- Encouraging the use of rail freight transportation, with expectations of decreasing the use of trucking and increasing the efficiency of freight movement.
- Encouraging growth in the use of existing intermodal freight facilities and protecting opportunities for the development of new ones.
- Reducing the use of local roads for transporting through freight.
- Preserving and encouraging opportunities for the siting of new freight customers, with an aim of local economic development, including the preservation or provision of good access to such sites.
- Encouraging the use of active transportation (walking and bicycling) for passenger transportation, including walkable and bike-able environments and complete streets policies.

The trucking industry also expressed a desire to avoid congested urban conditions where possible. However, most businesses need to rely on trucks to pick up and deliver all their shipment. So, these local situations where trucks are perceived to be part of traffic problems, create conflicts with the interests listed above. Some of these locations have been identified during the outreach process.

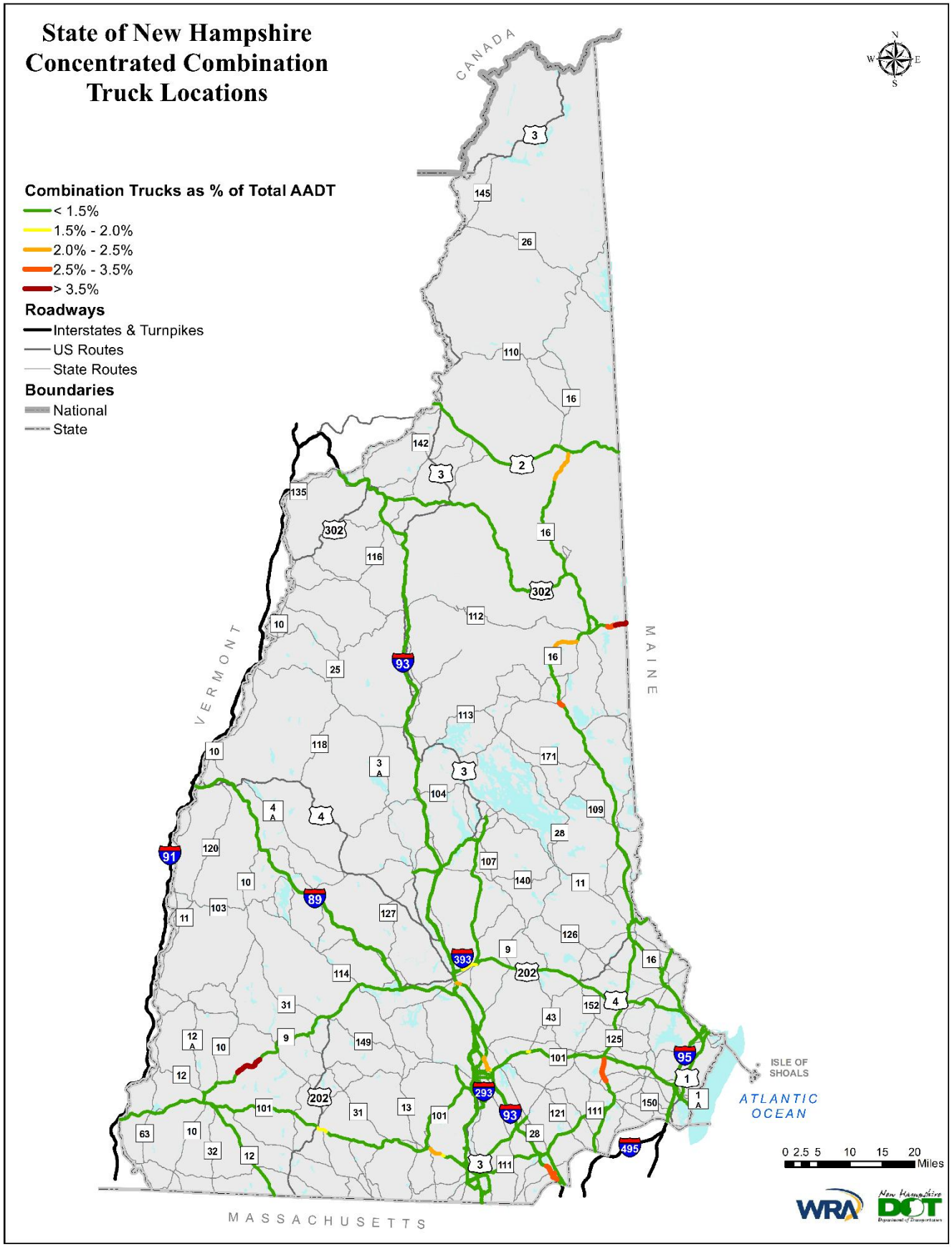
At a more regional level, specific corridors have been identified as possibly warranting improvement. Highways links have been identified from available data as carrying more than 1.5 % of their total average annual daily traffic (AADT) as combination trucks *(Exhibit 2-69)*. This suggests that high ratios are relatively limited in extent and are likely tied to specific major origins and destinations for combination trucks rather than to concentration of this traffic onto specific functional classes of roadway.

Through the NH Freight Plan process, the following locations were identified as needing new roadways to provide possible separation of truck traffic:

- NH 103 (through or around downtown Claremont)
- NH 125 (Rochester)
- NH 1 (from NH 101 north to NH 151 in Hampton)

The frequency of truck operational difficulties at urban roundabouts was identified as an issue. The areas swept out by a combination truck making a 90-degree turn can be challenging to reconcile with the tight geometry advocated for roundabouts and urban intersections where a value is placed on the quality of pedestrian connections or urban placemaking. This may warrant development of some additional statewide guidance by NHDOT.

Exhibit 2-69: Combination Truck Ratio



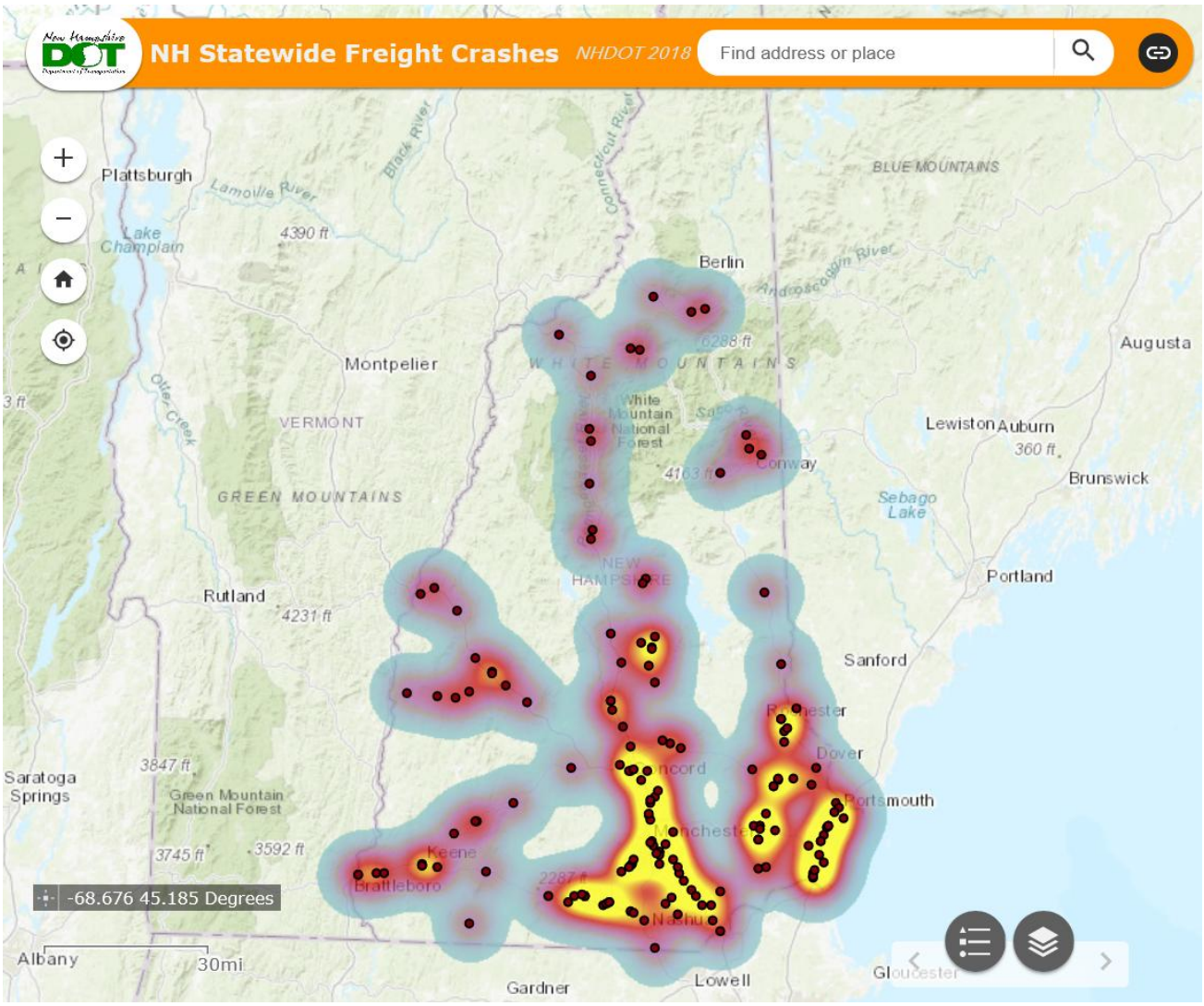
2.3.4 Safety

Highway Network

NHDOT strives to maintain an updated database of historically reported crashes involving trucks along New Hampshire's highway network. It should be noted that most of these freight-related crashes have occurred on the more congested routes where there is higher variability in speed, such as intersections and interchanges. As shown in *Exhibit 2-70*, many of these locations are concentrated in the southern portion of the state where the population is denser and freight activity levels are higher. And based on other qualitative data, these freight related crash locations also coincide with corridors of high truck volumes, high commodity flows, and comments received from public and stakeholder outreach.

A series of policies, strategies, and implementation next steps will be recommended as part of the NH Freight Plan. To help achieve the freight goal of safety and security along New Hampshire's freight infrastructure system, collaboration between local and state entities to compile freight crash data involving trucks will be recommended. Based on findings from further analysis, countermeasures can be developed to help improve areas with freight related crash histories.

Exhibit 2-70: NH Statewide Freight Crashes Heatmap



Rail Network

New Hampshire's railroad network is generally safer than the national network as a whole and compares favorably with the neighboring states of Vermont and Maine. *Exhibit 2-71* shows comparative safety statistics reported to the Federal Railroad Administration (FRA) for the combined years 2014 to 2017 inclusive.

In general, the three northern New England states account for a very small share of the nation's railway operations and have accident rates that reflect low rail traffic levels, low traffic volumes at rail-highway grade crossings, and generally low operating speeds. New Hampshire's safety experience compares well with its two neighboring states because much of its network has low operating speeds, because there are extensive rail-highway grade separations, and because most of one of the busiest rail lines in northern New England, the New England Central, actually lies in the state of Vermont.

Exhibit 2-71: Safety Statistics for 2014 to 2017 Inclusive

	USA	VT & ME (Combined)	NH	Fraction of USA in NH, VT, ME	Fraction of Northern New England in NH
Train Accidents (Excluding Highway-Rail Crossing Incidents)	7,201	19	0	0.26%	0.00%
Highway-Rail Crossing Incidents	8,532	24	2	0.28%	7.69%
Highway-Rail Crossing Incident Casualties	4,432	13	0	0.29%	0.00%
Trespasser Casualties	3,719	16	3	0.43%	15.79%
Other Casualties	30,261	152	15	0.50%	8.98%
Miles of Route (2011)	138,565	1,741	443	1.26%	20.28%
Total Casualties (Per Thousand Miles of Route)	277	104	41	37.50%	28.10%

2.3.5 Truck Parking, Rest Area, Fueling, and Maintenance Facilities

The 2016 *Statewide Rest Area and Welcome Center Study* identified two gaps in coverage for these facilities: along I-93 between Sanbornton and Lincoln, and on NH 16 (Spaulding Turnpike) between Portsmouth and Rochester. The gap on I-93 exceeds federal guidance of 60 miles, and addressing it was a subject of a 2017/2018 call for Public-Private Partnerships (PPP) issued by NHDOT. A proposal has been advanced for a PPP-developed rest area along I-93 in New Hampton. Spaulding Turnpike is only 33 miles long and is not a federal facility - no proposals for a new rest area here appear to be active. Given the more local nature of trucking on NH 16, and the presence of commercial truck stops, a clear need may not exist for a new rest area here.

The Federal Motor Carrier Safety Administration has mandated the use of electronic logging devices (ELDs) to assist in monitoring compliance with the Hours of Service (HOS) requirements, effective December 18, 2017. Due to this new mandate, the demand for truck parking and amenities in the state may be increasing and need to be reassessed.

The 2016 study also identified a need to expand truck parking at the northbound Seabrook RA/WIC; this has been completed. Certain other locational and operating changes were recommended, some of which are planned. The PPP model presently appears to be the preferred approach to developing such projects.

The Southwest Regional Planning Commission has identified a possible need for a rest area along NH 9 in Antrim to replace a facility that has been closed.

The demand for truck parking and amenities may be changing along the Interstate highway system in the state as a result of the requirement for electronic logging devises (ELDS). The Federal Motor Carrier Safety Administration has mandated the use of electronic logging devices (ELDs) to assist in monitoring compliance with the HOS requirements. All motor carriers were required to comply effective December 18, 2017. Because some carriers were already using some form of electronic logging in lieu of paper logs, the extent to which there has been, or will be, an increase in the demand for rest areas and truck parking cannot be readily determined. Any increase is most likely to show up along the Interstate network, where most of the through-state trucking occurs. If it is determined that a marked increase is occurring, the adequacy of the parking supply may need to be reassessed.

2.3.6 Seasonal Maintenance Activities

NHDOT assigns a snow plow code to each highway facility in the State system; this system accounts for about 2/3 of the truck vehicle-miles traveled in the state. *Exhibit 2-72* identifies the types of roadways included in each plow code, the State's intended snow clearing treatment for each, an estimate of median truck AADT, and an estimated fraction of the state's truck vehicle-miles operating on the facilities included in each code. Plow codes 1 and 2, which call for full bare pavement as soon as practicable after the end of a storm, are assigned to roadways carrying the vast majority (almost 94%) of the truck vehicle-miles traveled on the state's system.

Exhibit 2-72: Intended Snow Cleaning by Snow Plow Codes

Plow Code	General Definition and Intended Snow Cleaning	Estimated Median Truck AADT	Estimated Fraction of Statewide Truck Vehicle-Miles
1	Highways on the Interstate and Turnpike systems, and those highways carrying 15,000 or more vehicles daily. These should have full width bare pavement as soon as practicable after the end of a winter storm.	2,513	47.1%
2	Highways on the State system carrying 5,000 to 15,000 vehicles daily. These should have full width bare pavement as soon as practicable after the end of a winter storm.	988	17.0%
3	Highways on the State system carrying 1,000 to 5,000 vehicles daily. These should have some bare pavement as soon as practicable after the end of a winter storm.	369	3.5%
4	Highways on the State system carrying less than 1,000 vehicles daily, plus highways carrying less than 500 vehicles daily of which snow-covered pavement is deemed acceptable. These should have bare pavement in the left wheel tracks near the center of the highway as soon as practicable after the end of a winter storm.	208	0.8%
0	Highways not plowed by the State	757	31.6%

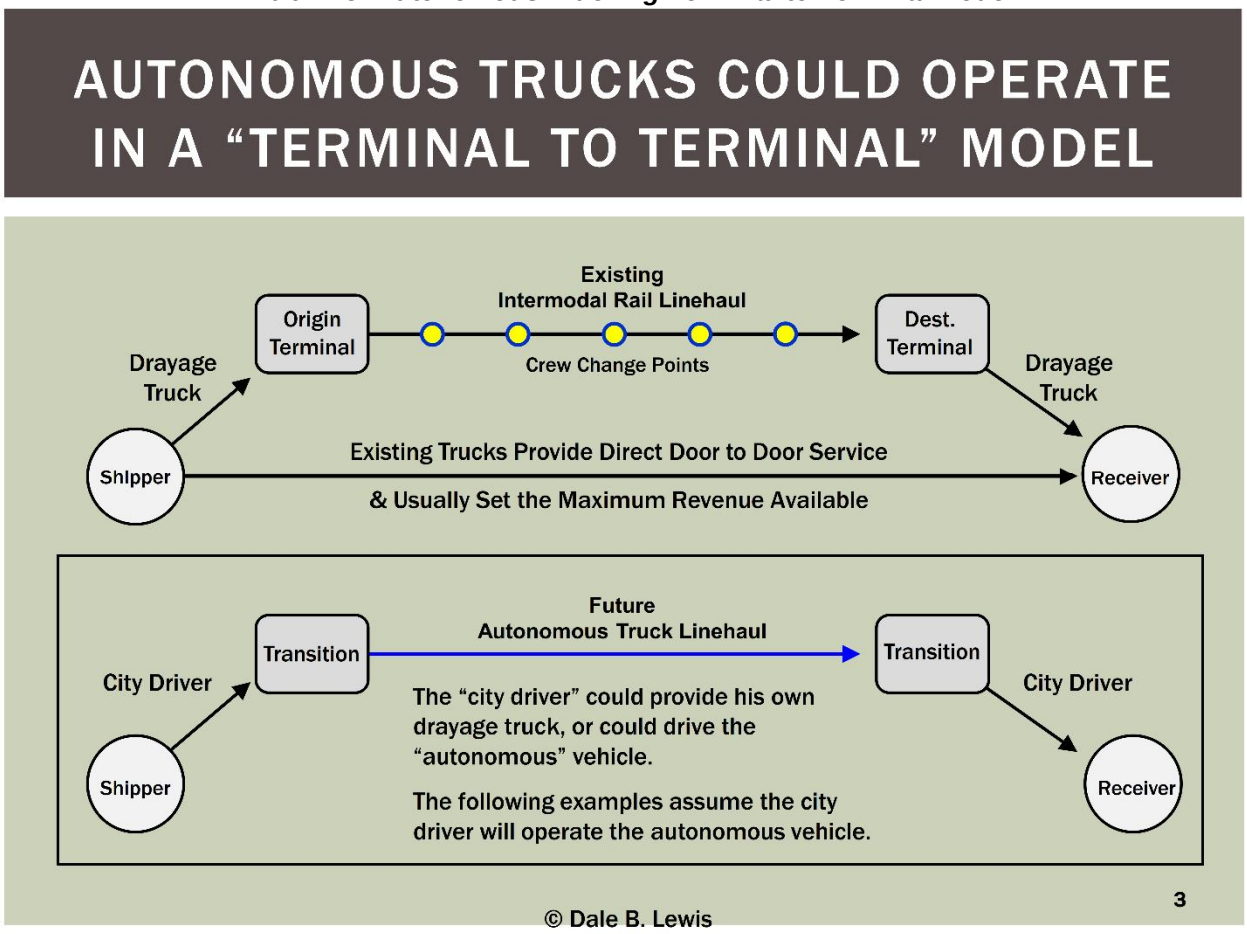
2.3.7 ITS Considerations

The status of ITS on New Hampshire's limited-access highway system will be state-of-the-practice in the near future as coverage is completed. NHDOT should maintain an awareness of emerging technology, especially with regards to weigh stations, safety enforcement, and methods to provide more useful and timely advice to truck operators and/or dispatchers. Annual or biennial review of the state of the art is suggested.

The extension of the present ITS capabilities along the primary truck routes beyond the Interstates and turnpikes warrants consideration. However, given the relatively consistent level of truck versus automobile use of these roads, and the fact that the underlying technologies are common to both classes of vehicle, there does not seem to be a need to study the coverage of ITS capability for freight separate from general traffic.

Further on the planning horizon is the prospect of autonomous trucking, where trucks would be able to navigate themselves between origins and destination without a driver aboard. As presented at NH Freight Summit #2, a possible near-term capability might be trucks that could make trips between designated staging areas on the Interstate system (*Exhibit 2-73*), leaving the complex task of traveling on arterial and local roads to human drivers. The economics of this would likely be more favorable for very long hauls which might be able to compete with intermodal (truck-rail-truck) transport. Further studies should be considered to determine if this mode of operation might be practical and economic in New Hampshire, and if so, develop a strategy for potential terminal locations to act as staging areas.

Exhibit 2-73: Autonomous Trucking Terminal to Terminal Model[49]



[49] *Operating Economics of Autonomous Long-Haul Trucks Presentation, Dale Lewis, July 2018*

2.3.8 Modal/Multimodal/Intermodal Details

Intermodal freight flows in New Hampshire have a potential to increase if certain modal issues in the state get addressed. Some modal details prohibit any increase in freight activity and economic development. Rail traffic faces the biggest challenge in the state since the lack of Class I railroads keeps the volumes low. Regional and short line railroads operate on low speeds increasing transit times and uncertainty in deliveries.

Besides low speeds, rail tracks in New Hampshire cannot handle heavy cars of 286,000 pounds that are carried on major railroads with the current limit being much lower. This issue causes extra delays and additional transloading costs for shippers, dropping railroad efficiency compared to truck. This, in conjunction with the vertical bridge clearance which limits the use of intermodal double stack container trains makes rail a less attractive mode for shippers to move their goods.

The limited use of rail in the state results in high utilization of trucks transferring goods that are traditionally moved on rail where rail access is limited, or service is unreliable. The increase in truck traffic leads to bottlenecks, longer travel times that in turn lead to higher costs for shippers. Road congestion may create problems for drivers who can't make a trip from the northern parts of the state to Massachusetts and back without violating the hours of service rule.

Furthermore, New Hampshire does not have intermodal facilities and goods that move on trucks from the closest intermodal facilities in Ayer and Worcester, Massachusetts experience significant delays along highly congested routes, such as I-495 and I-95. A new intermodal facility in Rockingham County could significantly reduce transit times and allow for better distribution of goods in New Hampshire.

The Port of Portsmouth cannot accommodate ships larger than 800 feet with 35 feet draft due to operational restrictions. The ever-increasing size of ocean vessels and their reduced transportation costs compared to smaller ones call for changes in the Piscataqua River navigation channel with a wider turning basin and increased draft to accommodate these vessels.

2.3.9 Summary of Key Needs and Issues

New Hampshire's highway network provides a generally good level of mobility for commercial vehicle movements and is not regularly congested outside of urban areas, since truckers have some flexibility to avoid peak hour travel. However, there are high delay segments and truck bottlenecks that have been identified where trucks either experience heavy congestion a portion of the time or experience lower levels of congestion most of the time. For locations where infrastructure type improvements are not feasible due to cost and topography, future studies will be needed to determine the appropriate mitigation steps. Non-infrastructure type improvements (e.g. ITS, incident recovery and management, seasonal maintenance, operations, maintenance related policies) should be considered as way to bring awareness to current and developing issues.

For the other freight modes, rail speed and weight limitations are the main reasons for low rail share in New Hampshire compared to the rest of the country. The only port in the state has restrictions that prohibit larger vessel mooring and keep marine freight transportation share low for both weight and value. And air freight is currently limited to small packages, high value goods, and goods that require faster shipping speeds. Demand for these modes are expected to increase over time, but the highway mode will likely continue to have the dominating share of freight traffic in the state due to convenience and cost.

Existing and projected climate changes will likely have significant impacts to transportation infrastructure. Extreme precipitation can result in runoff, streamflow, and ice accumulation, making assets such as roads, bridges, culverts and stormwater drainage & management structures more vulnerable to damage. Intense precipitation resulting in higher and faster flows could increase bridge scour potential, causing instability in the bridge's structure over time. Increases in sea-level rise and coastal storm surge can impact low-lying roads, bridges, and culverts due to increased risk to flooding and damage. Both flooding and asset damage can result in more frequent traffic delays and associated impacts to the local and regional economy. Warming winters can cause an increase in freeze/thaw events, which are the primary culprits of pavement failure and potholes. Higher temperatures may increase the risk of pavement buckling and rutting and impact summer maintenance schedules. These climate change impacts will be taken into consideration during the development of freight specific policies and strategies.

Concerns for heavy truck traffic within urban areas have been expressed by both the local community and the trucking industry. The local community attributes heavy commercial trucks as part of their traffic problem, while the trucking industry has expressed a desire to avoid congested urban conditions where possible, especially urban roundabouts. However, many businesses rely on these truck services for their deliveries and shipments. At a more regional level, certain corridors have been identified as carrying more than 1.5 % of their total average annual daily traffic (AADT) as combination trucks. This suggests that high ratios are relatively limited in extent and are likely tied

to specific major origins and destinations for combination trucks rather than to concentration of this traffic onto specific functional classes of roadway.

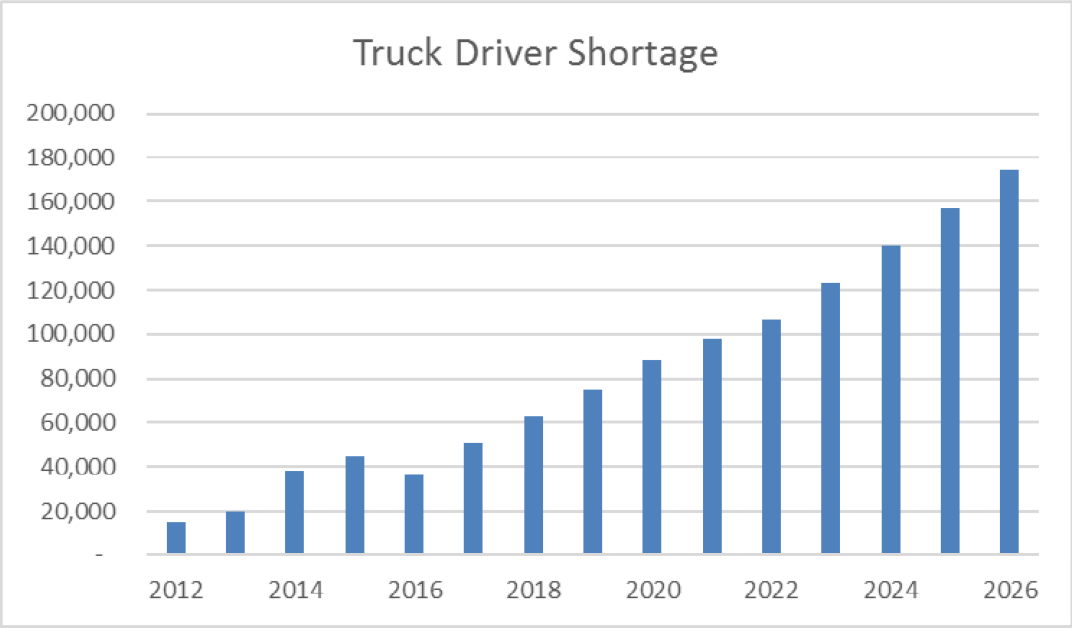
Two gaps in coverage for rest area facilities have been identified along I-93 between Sanbornton and Lincoln, and on NH 16 (Spaulding Turnpike) between Portsmouth and Rochester. Exceeding federal guidance of 60 miles, a proposal has been advanced for a rest area along I-93 in New Hampton. The Federal Motor Carrier Safety Administration has mandated the use of electronic logging devices (ELDs) to assist in monitoring compliance with the Hours of Service (HOS) requirements, effective December 18, 2017. Due to this new mandate, the adequacy of the parking supply may need to be reassessed.

The status of ITS on New Hampshire's limited-access highway system will be state-of-the-practice in the near future as coverage is completed. NHDOT should maintain an awareness of emerging technology, especially with regards to weigh stations, safety enforcement, and methods to provide more useful and timely advice to truck operators and/or dispatchers.

For the future of autonomous trucking, a possible near-term capability might be trucks that could make trips between designated staging areas on the Interstate system. The economics of this would likely be more favorable for very long hauls which might be able to compete with intermodal (truck-rail-truck) transport. Further studies should be considered to determine if this mode of operation might be practical and economic in New Hampshire, and if so, develop a strategy for potential terminal locations to act as staging areas.

One other overarching theme that has been expressed on several occasions is the issue of truck driver shortages. The shortage of truck drivers was approximately 45,000 in 2015 (*Exhibit 2-74*). In 2016, the shortage of truck drivers improved to 36,500 but increased to 50,700 in 2017. If trends continue at the current rate, the driver shortage will likely surpass 175,000 by 2026. As presented in Sections 2.1 and 2.2, the highway network will likely continue as the dominating mode for freight transportation in the state in 2040. Without the supply of truck drivers to meet the expected future demand, there could be significant impacts to related costs and logistics in the future.

Exhibit 2-74: Truck Driver Shortage[50]



[50] *American Trucking Associations (ATA) Truck Driver Shortage Analysis, October 2017*

3.0 Freight Projects and Solutions

3.1 Freight System Analysis and Project Development

With a better understanding of current and future freight needs for the state, this section of the NH Freight Plan will quantitatively and qualitatively assess the overall freight transportation system alongside the development of projects and solutions to address the previously identified needs.

3.1.1 Freight Performance Measures, Analysis, & Evaluations

Priortization Criteria & Freight Analysis

A series of project ranking criteria have been developed, which incorporate insights from New Hampshire's established planning/prioritization methodologies and addresses the individual goals and objectives established for the NH Freight Plan (*Appendix C-1*). The project prioritization criteria were used to conduct a limited, yet objective, evaluation of the freight needs being met and project readiness using available data and resources. The criteria include:

- Infrastructure Conditions (red list bridges, pavement conditions, truck prohibitions)
- Level of Travel Time Reliability (LOTTR)
- Safety (improvements to safety and incorporates truck crash quartiles)
- Resiliency (posted detour route)
- Innovation (incorporation of advanced technology)
- Economic Value (value of commodity flow along corridor)
- Modal Choices (intermodal connections)
- Project Partners (sponsoring parties, including private sector, municipalities, state agencies)
- Environmental Impacts (level of impact)
- Feasibility (project readiness, ROW needs, local/state/federal planning consistencies)

NHDOT Project Candidates & New Projects

Using project information from existing/available planning programs & documents within the state, an initial list of NHDOT project candidates with potential freight benefits was compiled. A list of proposed new projects was also developed to help address the overarching infrastructure needs of the state, as noted through various outreach efforts throughout the project such as RPC outreach, SFAC input, the online freight survey, and public meeting comments. With additional input from NHDOT, the list was further refined into a list of projects that would potentially improve freight mobility and safety.

Using the project ranking criteria, the list of NHDOT projects and proposed new projects were scored under the same criteria and ranked amongst each other. At the end of the process, approximately 90 projects were analyzed, ranked, and scored. *Exhibit 3-1*, *Exhibit 3-2*, and *Exhibit 3-3* are location maps to show the above-mentioned projects and outreach comments.

The prioritized list of NHDOT & new projects, RPC outreach comments, and public outreach comments are shown in *Appendices C-2* thru *C-5* and accompanied by full size maps with greater detail in *Appendix D*.

Exhibit 3-1: Projects for Prioritization Scoring (NHDOT Projects & New Projects)

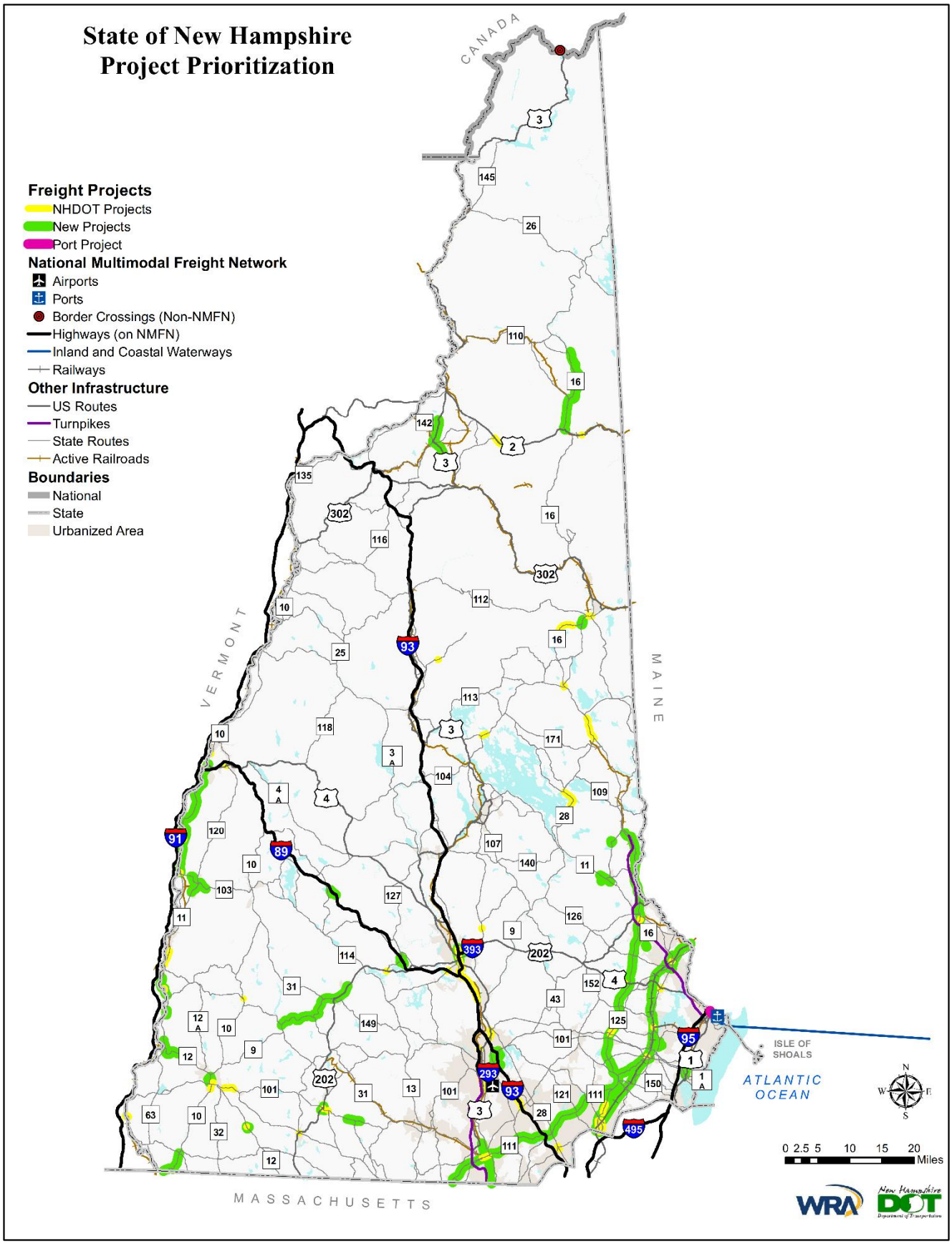


Exhibit 3-2: RPC Outreach Comments

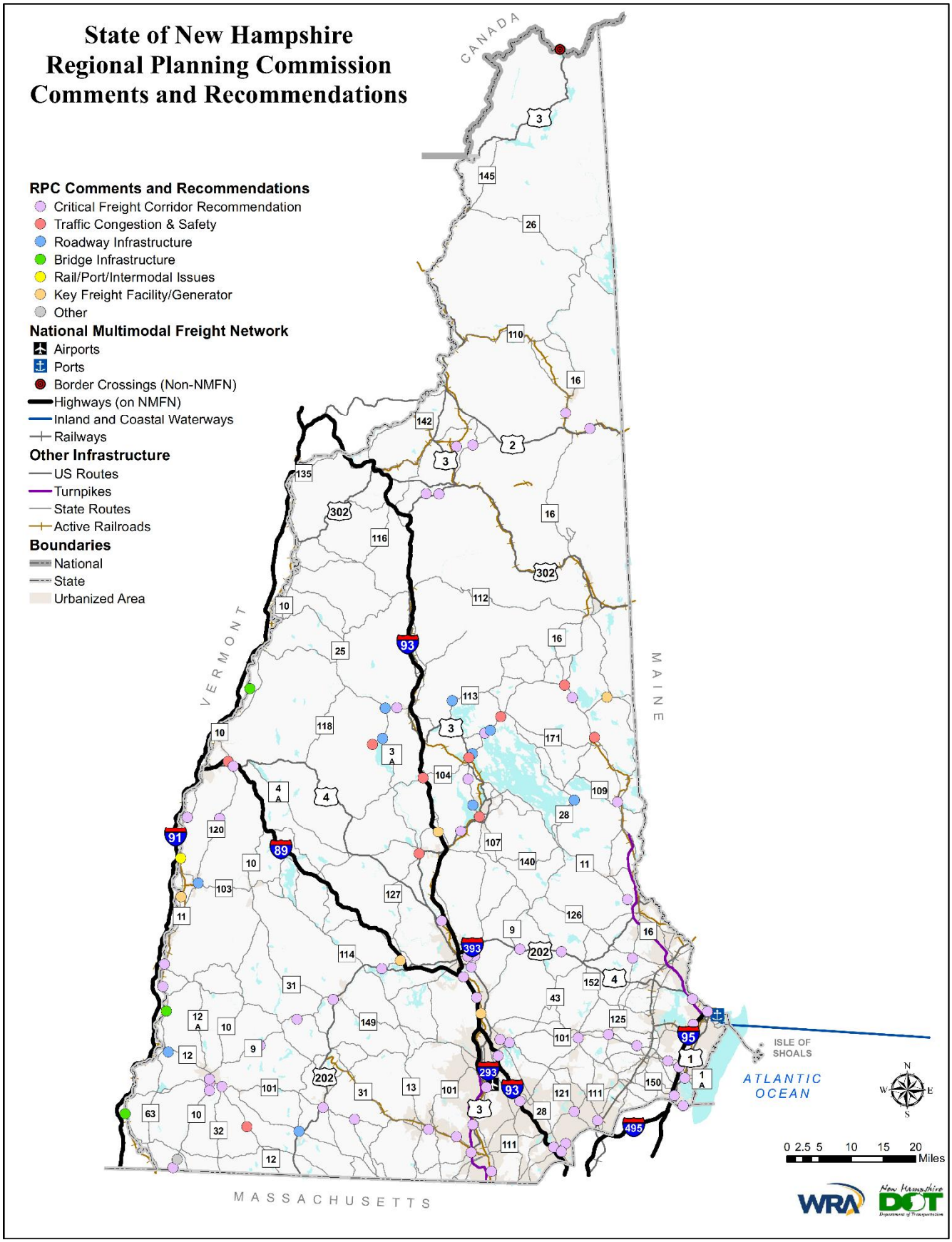
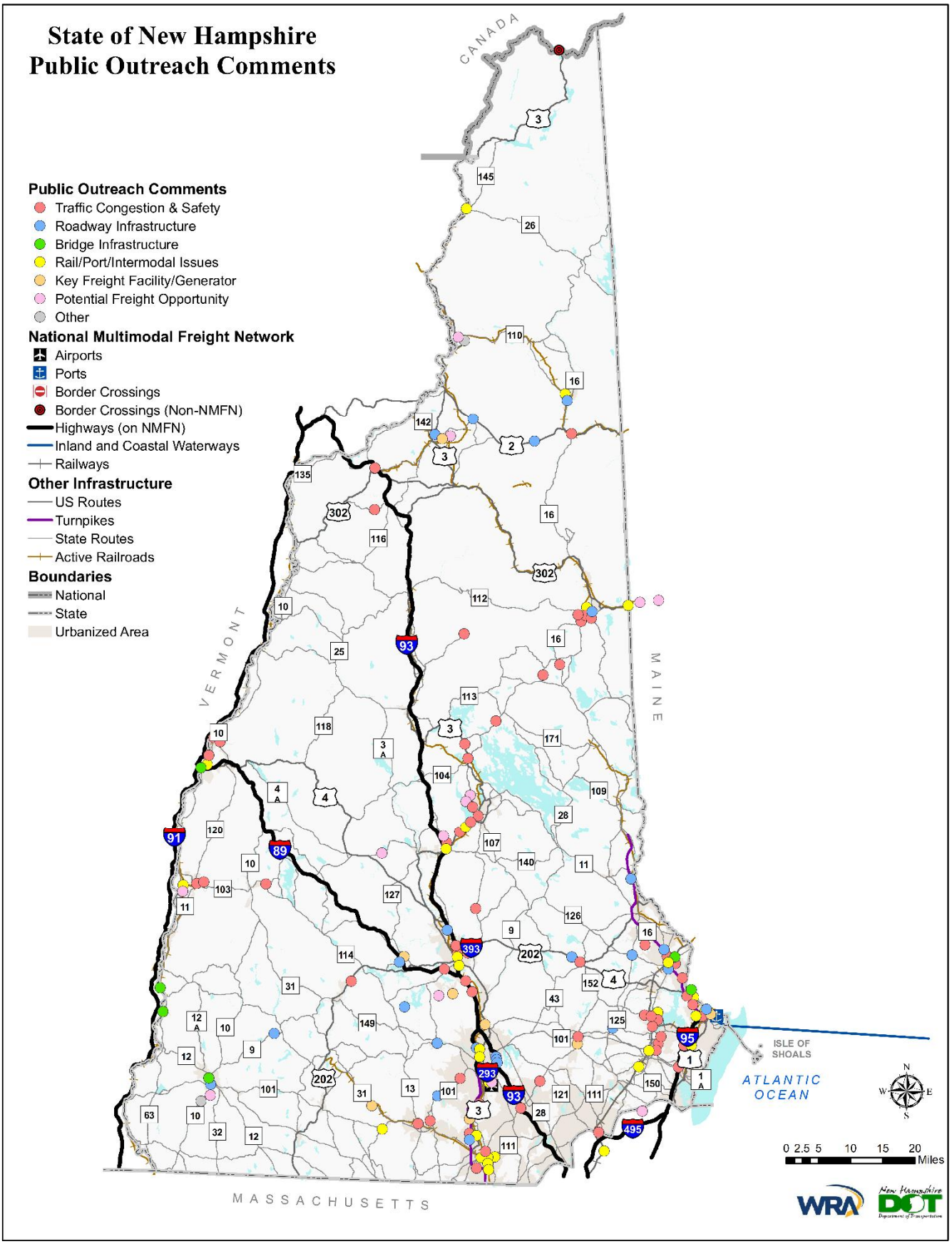


Exhibit 3-3: Public Outreach Comments



3.1.2 Scenario Planning Perspectives

A series of planning scenarios were developed to analyze the potential economic impacts of freight. Scenario planning techniques were incorporated to qualitatively assess a number of "what-if" circumstances for the following scenarios:

- Scenario 1: The Impact of Trade Tariffs on New Hampshire's Economy
- Scenario 2: Multimodal Investments for Port, Rail, & Air
- Scenario 3: Multimodal Dis-Investments
- Scenario 4: East-West Corridor Investments

Scenario 1: The Impact of Trade Tariffs on New Hampshire's Economy

The recently imposed tariffs on both import and export products are expected to have some level impact on New Hampshire's economy. According to a recent study by the U.S. Chamber of Commerce, approximately $30 million in New Hampshire exports could be impacted by tariffs[51]. China, Canada, European Union, and Mexico are the top export destinations for New Hampshire products. The following exports to these top trading destinations could be affected:

- China - $15 million in exports, mainly lobster and other seafood
- Canada - $11 million in exports, mainly aluminum
- European Union & Mexico - $4 million in exports, mainly apparel and steel

Other than the potential impact on exported goods, tariffs may also affect New Hampshire's imports since goods will likely become more expensive for consumers. The state primarily imports oil, salt, and lumber from Canada while surgical and medical instruments worth approximately $85 million are imported from Mexico. According to the National Association of Home Builders, the proposed 20% tariff on imported Canadian lumber will add approximately $9,000 to the cost of single-family homes in the United States[52]. Like lumber tariffs, additional imposed costs on oil or medical equipment will likely burden consumers.

If cost impacts are significant, domestic markets could be an alternative for consideration. Lumber products imported from British Columbia could be imported from some of the top US lumber producers instead, including Oregon, Washington, Georgia, California, and Alabama. Since there is rail access from New Hampshire to these states, transportation costs can remain low while transit times may differ. The state of New Hampshire is not likely to be the only market to move toward domestic lumber consumption. Further market research would be recommended to examine the feasibility of increased lumber consumption in the US due to reduced Canadian imports.

[51] https://www.uschamber.com/sites/default/files/tariff_data/one_pagers/nh.pdf

[52] https://www.nahb.org/en/news-and-publications/press-releases/2018/06/builders-discuss-rising-lumber-prices-with-commerce-secretary-ross.aspx

Scenario 2: Multimodal Investments for Port, Rail, & Air

In this scenario, future investments are assumed for the port, rail, and air modes of transportation. Investments in freight infrastructure will benefit the movement of freight and minimize disruption of traffic flow for all modes. In order to efficiently handle growth in cargo, infrastructure must keep up with the pace of demand. Further, if freight infrastructure investments are made, such as the creation of an intermodal facility, then freight can be more easily transferred from one mode to another and the overall freight system will be able to function more optimally. Assumed freight investments and their associated impacts by each mode are listed below.

Port – Marine investments would include rehabilitation and enhancements for the Main Wharf at the Market Street Terminal. Historically, the Main Wharf and adjacent Barge Wharf used to balance the demands of visiting vessels, while the Sarah Mildred Long Bridge bisected the port between these two facilities. However, due to the recent bridge replacement on a revised alignment, the Barge Wharf was impacted by bridge piers and a new rail line. As part of FHWA's functional replacement mitigation, the Port will gain acreage and two piers connecting to the Main Wharf, however this will not address the open water area between the wharf and shore, nor rehabilitate the Main Wharf. The U.S. Army Corps is also expanding the uppermost turning basin from 800 feet to 1,200 feet as part of the overall navigation safety improvement of the Piscataqua River. Combined with the functional replacement, the Port will be able to receive 750-foot ships for the first time ever.

Exhibit 3-4: Market Street Terminal and Sarah Mildred Long Bridge[53]

[53] *American Trucking Associations (ATA) Truck Driver Shortage Analysis, October 2017*

With the FHWA's functional replacement and the US Army Corp of Engineers expansion project coupled with improving the Main Wharf, existing operations can be maintained and there is significant opportunity to increase the domestic and international cargo activity currently utilizing this facility. Potentially, the Port will have the ability to handle commodity overflows from surrounding ports of higher activity, such as Port of Boston and Port of New York/New Jersey. The port is also in close proximity to Canada and it is in a position to capture additional cargo from Canada. The cargo of interest are imports of natural resources from Canada – wood or lumber, petroleum products, agricultural goods or vehicles, parts, machinery and construction materials. Exports from the port could be concentrated on top commodities produced and exported out of state: industrial machinery, computers, electric machinery, medical or surgical instruments and plastics.

Rail - Railway lines should be upgraded to handle heavy cars of 286,000 pounds and double stacked clearances are achieved along all railroads. This option will not only improve the ability to maintain the current rail freight in the state, but also potentially shift additional cargo to rail from other modes such as trucks. This would provide for more opportunity to move freight on rail lines and reduce congestion on busy highways.

Air - Air freight transportation improvements can potentially increase air cargo shipments at the Manchester-Boston Regional Airport and Pease International Airport. The increase can potentially include increasing the amount of air cargo on commercial flights and also in time sensitive goods shipping from UPS and FedEx.

Intermodal - An intermodal facility in the southern portion of the state would have the potential to increase rail traffic and decrease truck traffic. This would also allow goods to bypass Boston congestion on I-95 and I-495 and shift intermodal traffic destined for New Hampshire from the Worcester and Ayer intermodal terminals. If the intermodal terminal is combined with the potential of double stack usage, it will make the facility even more competitive.

Scenario 3: Multimodal Dis-Investments

When transportation improvements are not made, infrastructure deterioration can have a significant impact on the movement of freight. For New Hampshire, there are two sub-scenarios where lack of investments could cause significant impacts to all modes of transportation: (1) if port dredging is no longer supported and the Main Wharf rehabilitation does not occur, and (2) if rail lines further deteriorate without routine maintenance improvements.

In the first case, if dredging is no longer subsidized for the Port of Portsmouth, the impacts on size and number of vessels arriving at the port may be significant, as ships with higher drafts will not have the ability to dock. Navigation at the Piscataqua River is already limited due to channel width which will only worsen without dredging activities. In this case, the Port may become congested as it will receive more smaller vessels, but this could also add to congestion on the surrounding highway and rail networks as a portion of the port traffic may shift to truck or rail.

As mentioned in the previous section, a functional replacement was provided by FHWA due to reconstruction of the Sarah Mildred Long Bridge. If the Main Wharf was in a state of good repair, this replacement would accommodate existing marine cargo and also support new cargo activity and potentially larger vessels. However, the replacement is not sufficiently sized to accommodate even existing cargo vessels and the Main Wharf also has serious structural deterioration. Without significant improvements at the Main Wharf, the Port of Portsmouth is in danger of complete closure by the end of 2021.

Exhibit 3-5: Port of Portsmouth Main Wharf Rehabilition Needs[54]

[54] *FY 2018 BUILD Grant Application – Market Street Marine Terminal Main Wharf Rehabilitation, July 2018*

Top commodities imported by water to New Hampshire include petroleum products, salt, and gypsum. Top exports are animal or vegetable byproducts destined primary to the United Kingdom and the Netherlands which account for 66% of marine exports. In addition, heating oil is shipped by sea to Portsmouth from Middle Atlantic and Gulf of Mexico refineries. If heating oil is unable to arrive at the Port of Portsmouth it will likely have to be shipped through another port close to New Hampshire and then transferred to its final destination by truck. If port operations in the state decline, then most imports/exports will likely shift to other neighboring ports, such as the Port of Boston or Port of New York/New Jersey. This would likely result in additional transportation costs and longer transit times for these commodities while increasing the number of trucks on New Hampshire's roadways.

As in the second case, in the event that there is a lack of rail investment in New Hampshire, it would result in reduced services for a mode that already faces challenges such as delays due to weight limitations and lack of double stack clearance. Reduced rail service would likely cause traffic to decline even more, likely leading to an increase in truck traffic and longer travel times for commodities currently using rail.

Approximately half of inbound rail tonnage is coal from West Virginia and Pennsylvania with the remaining top commodities being lumber and cement. Outbound flows mostly consist of gravel and sand. While coal demand is projected to decline by 21% of total inbound rail commodity flows in 2040, shipping coal on rail is extremely important since coal usually moves on truck only for short trips of 50-100 miles. Construction materials like gravel are transported via truck and rail, which can be more easily transferred on truck if rail becomes less attractive due to reduced service levels. The potential increase in truck usage for construction materials would likely cause higher congestion on roadways, which in turn may cause higher shipping prices.

Scenario 4: East-West Corridor Investments

Building an east-west highway from northern Maine with the purpose of connecting northern New Hampshire to Vermont would likely increase freight demand and connections within New Hampshire. This connection will particularly benefit freight transported from Northern Maine to other parts of New England and Canada. A new east-west highway will particularly be important in connecting I-90 to points further west to help alleviate congestion along I-93 and I-95. A new corridor can potentially provide a better connection from I-91 to the northeastern states, resulting in less congestion on New Hampshire's highways.

Top truck commodities shipped from Maine are gravel and sand, pulp and pulp mill products, and broken stone, while top commodities shipped to Maine are broken stone, forest materials, and metal scrap. These commodities typically travel shorter distances, particularly stone and sand. Other commodities of importance for Maine are waste, food products, chemicals, and farm products. The top origins and destinations for commodities shipped to/from Maine are neighboring New England states, including Massachusetts, New Hampshire and Connecticut, as well as New York and Quebec. Since freight between these states do not necessarily travel via east-west highway connections, it is possible that existing highways may continue to experience the same level of congestion.

Top rail commodities shipped from Maine are paper, lumber, pulp, and pulp mill products, while top rail commodities shipped to Maine are nonmetal minerals, paper, and crude. Rail commodities that can be transported via truck and may potentially use a new east-west connection are forest products, grain and other agricultural goods, paper and pulp, and certain chemicals. The transport of forest products and paper are currently declining as many companies have merged or production has declined. Maine already has existing east-west rail lines via the Eastern Maine Railway and Central Maine & Quebec Railway that are located close to where an east-west highway could be proposed. Crude oil from the Midwest and Alberta is transported on these rail lines in cooperation with New Brunswick and Maine Railways and by Maine Montreal and Atlantic (MMA) Railroad to the Irving refinery in St. John[55], so it is unlikely that these commodities would shift from rail to truck unless rail service declines.

[55] https://www1.maine.gov/mdot/ofbs/docs/FreightStrat.pdf

3.2 Action Plan

3.2.1 Freight Policies, Strategies, and Implementation

The Action Plan has been developed in conjunction with the previously established freight goals and objectives of the NH Freight Plan. A series of freight focused policies and strategies have been developed based on the overarching themes collected through the project's outreach efforts. The recommendations also include implementation next steps to provide feasible action items for the state to continue future freight planning efforts. An excerpt table of freight policies and strategies is shown in *Exhibit 3-6*. The full table of freight policies, strategies and implementation next steps are shown in *Appendix C-7.*

Exhibit 3-6: Freight Policies & Strategies (excerpt only)

Freight Goal Categories	Freight Policies & Strategies
System Preservation, Maintenance & Reliability	Factor in truck traffic considerations (e.g. needs, impacts, etc.) during roadway maintenance and construction activities
	Implement adaptive signal control to help mitigate congestion along key freight corridors with first / last mile considerations
Safety & Security	Assess critical supply chains to ensure that key commodities (like food, fuel, and heating oil) can be distributed in a timely manner if emergency or natural disaster events were to occur
	Identify key freight assets to assist with contingency and response operations, and integrate freight interests within other emergency planning and safety efforts (including Homeland Security)
	Determine truck crash locations and develop standard countermeasures
State of Good Repair	Consider freight impacts and benefits when prioritizing transportation projects, especially for pavement and bridge repair projects
Innovation & Advanced Technology	Implement freight-focused technology solutions to automate trucking requirements and provide real-time travel information
	Expand the use of technologies in freight system management and operations, including connected autonomous trucks
	Educate municipalities on freight business needs and the benefits of preserving / zoning land for freight related industries (e.g. distribution centers, truck stops, intermodal facilities)
	Support planning efforts to increase Interstate truck parking and electrify truck stops - also work with local municipalities to increase truck parking and electrification options in town
Economic Efficiency & Stewardship	Support training opportunities and recruitment efforts for truck drivers to help address driver shortage issues
	Enhance workforce recruitment and retention in the transportation and logistics industries.
	Integrate market access and logistics trends and needs in future planning efforts
	Support trade and market expansion opportunities
	Support opportunities for intermodal facilities and multimodal expansion.
	Provide guidance to analyze & improve multimodal first/last mile connections and access to major intermodal centers and manufacturing hubs.
	Upgrade rail lines to the 286K standard
Movement of Goods & System Resiliency	Account for priority freight bottleneck locations during project prioritization and development of the Ten Year Plan
	Develop delivery areas in urban districts and town centers to help reduce freight traffic impacts
Multi-Jurisdictional Planning	Coordinate with neighboring states in the New England area to discuss freight planning issues and infrastructure improvements
	Promote intermodal coordination between freight modes to address freight planning challenges & optimize growth opportunities
Environmental Sustainability	Partner with local, state, and federal agencies to implement programs that support alternative fuel options for freight transport
	Protect priority freight corridors from climate change impacts by implementing the findings of ongoing climate studies

3.2.2 Critical Freight Corridor Candidates

The most recent FAST Act guidance addresses ten overall requirements/topics to be addressed by statewide freight plans. Critical urban freight corridors (CUFC) and critical rural freight corridors (CRFC) must be designated by the State and MPOs per 23 U.S.C. 167. The critical freight corridor candidates identified in this State Freight Plan will help inform designation efforts, which includes approximately 75 miles of CUFC routes and 150 miles of CRFC routes along various US and State Routes.

The factors used to develop the CUFC and CRFC candidate recommendations include the following:

- RPC priority routes
- Daily truck traffic volumes
- Economic value (level of commodity flow activity by value along each roadway)
- Infrastructure conditions (bridges, pavement, etc.)
- Level of travel time reliability
- Safety concerns
- Detour route designations
- Public & stakeholder outreach (open houses, online survey, interviews)
- NHDOT identified projects (STIP, TYP)

Roadways carrying the highest levels of truck traffic with the most freight activity were considered first. For the highway mode, economic projections reveal that commodity flows are expected to steadily increase over time. Freight traffic growth on these current roadways will likely continue, especially for major arterials that connect New Hampshire to neighboring states. The majority of through/inbound/outbound commodity flows are carried on these roadways to/from New Hampshire's top trading partners (Massachusetts, Maine, Vermont, New York, and New Jersey).

Other infrastructure & operational elements were used as both a second tier and separate parallel screening, coupled with needs identified by public and stakeholder outreach. A second-tier screening example would be the following: a roadway with high truck traffic, high commodity flows, two crash clusters, and one restricted bridge would garner a higher concern than a roadway with only high truck traffic and high commodity flows. A parallel screening example would be the following: a roadway that has low truck traffic, average level of freight activity, but serves as the most viable (or only) route for first-last mile connections in the region. Comments from outreach efforts also helped to verify infrastructure and operational concerns for specific locations and corridors.

Using the screening techniques, the critical freight corridor segment recommendations were chosen based on two remaining factors: the main priorities of each RPC and whether an NHDOT project has been identified along the same segment of roadway. Each RPC has developed a comprehensive plan and based on their projected growth patterns, unique infrastructure, and operational related challenges, they have identified freight needs and priorities for their region.

As a final step, critical corridors lengths were adjusted to meet designated mileage limits. They were categorized based on their respective locations within urbanized or rural boundaries, as defined by FHWA guidelines. With limited urban and rural mileage available for CUFC (75 miles) and CRFC (150 miles) designations, the methodology for choosing critical freight corridor recommendations can be summed up as follows: Maintaining a balance to help improve both high freight traffic corridors and more isolated corridors that serve as a region's only viable route, coupled with the goal to help address RPC freight priorities and expedite current NHDOT project needs that benefit freight.

The list of CUFC and CRFC segments for consideration and the corresponding map are shown in *Exhibit 3-7*, *Exhibit 3-8,* and *Exhibit 3-9.* The list is also located in *Appendix C-7,* accompanied by a full-size map in *Appendix D*.

Exhibit 3-7: Critical Urban Freight Corridors (CUFCs) for Consideration

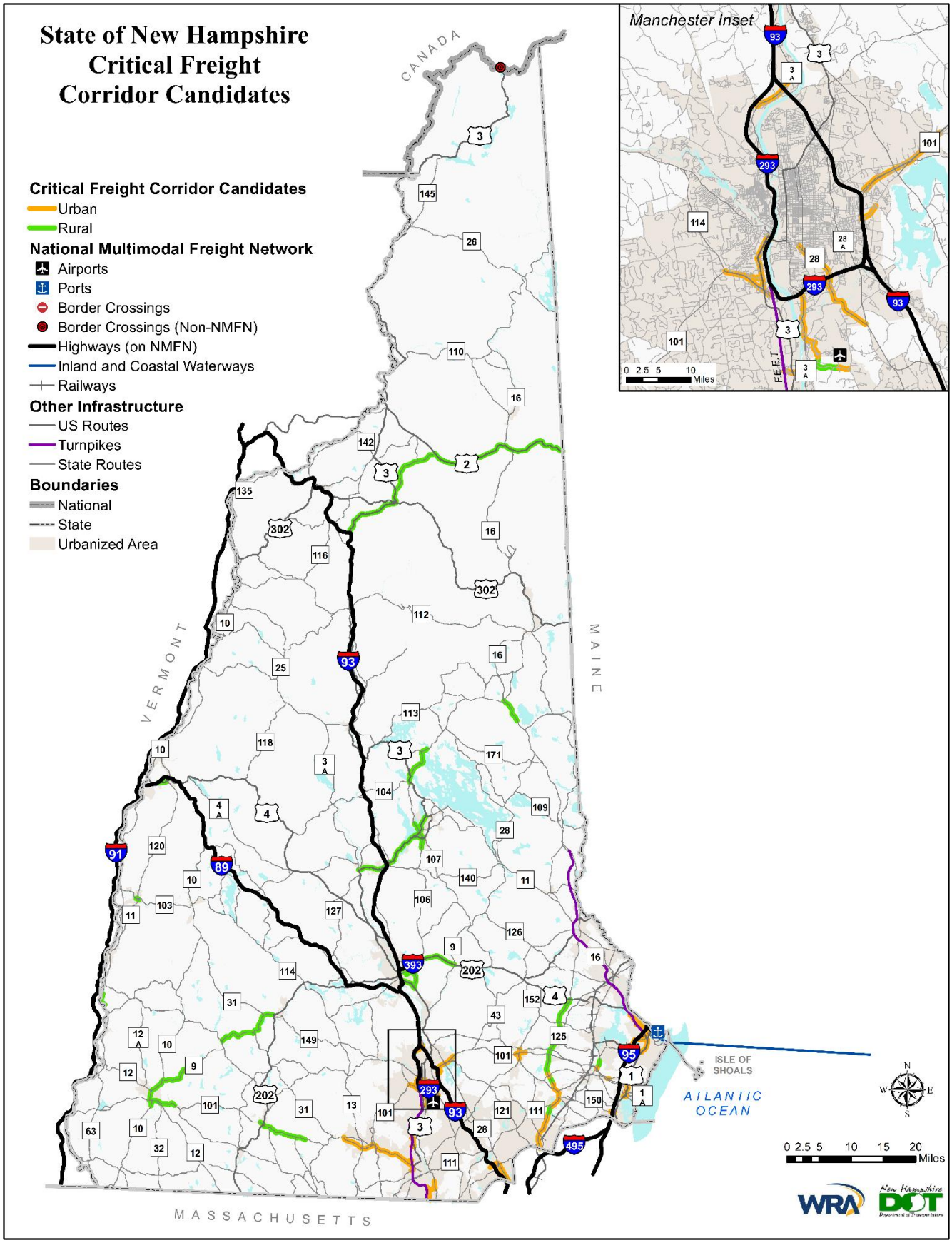
ID	MAIN ROUTE	LOCATION	LENGTH (MILES)
901	CANDIA RD	I-93 TO HANOVER ST, MANCHESTER	0.7
902	CIRCUMFERENTIAL HWY	NH 3A TO DANIEL WEBSTER HWY AND US 3 / EVERETT TURNPIKE, NASHUA AND HUDSON	1.1
903	DANIEL WEBSTER HWY	MASS BORDER TO GRAHAM DR, NASHUA	2.1
904	GOSLING RD / NEWINGTON ST	CONNECTOR FROM WOODBURY AVE TO SPAULDING TURNPIKE AND PORTSMOUTH INTERNATIONAL AIRPORT	0.5
905	KILTON RD	CONNECTION FROM US 3 TO NH 101, BEDFORD	0.6
906	MAIN ST / PELHAM RD	NH 28 TO COMMERCIAL DR IN SALEM, CONNECTS TO I-93	1.5
907	MANCHESTER-BOSTON AIRPORT AREA	RAYMOND WIECZOREK DR, PETTENGILL RD, BROWN AVE, US 3A. MANCHESTER, LONDONDERRY, AND LITCHFIELD	3.8
908	MARKET ST / WOODBURY AVE	FROM DOWNTOWN PORTSMOUTH TO SPAULDING TURNPIKE IN NEWINGTON	4.3
909	NH 101	I-293 / EVERETT TURNPIKE TO SPLIT WITH NH 114, BEDFORD	1.6
910	NH 101	MILFORD AND AMHERST	5.2
911	NH 101	I-93 TO HOOKSETT RD, MANCHESTER AND AUBURN	3.0
912	NH 101 AT NH 107	RAYMOND	1.5
913	NH 101A	EVERETT TURNPIKE IN NASHUA TO NH 101 IN MILFORD AND AMHERST	7.5
914	NH 107	BATCHELDER ROAD TO US 1 (CONNECTION FROM US 1 CORRIDOR TO I-95) IN SEABROOK	0.7
915	NH 107 AT NH 101	NH 27 TO SPLIT WITH NH 102 IN RAYMOND	1.6
916	NH 108	STRATHAM (URBANIZED AREA)	0.2
917	NH 111	NH 101 TO MARIN WAY IN EXETER	0.3
918	NH 125	PLAISTOW AND KINGSTON	6.0
919	NH 125	BRENTWOOD (URBANIZED AREA)	0.3
920	NH 125	KINGSTON (URBANIZED AREA)	4.1
921	NH 130	COLISEUM AVE TO BLUE HILL AVE WITH CONNECTIONS TO US 3 / EVERETT TURNPIKE, NASHUA	0.5
922	NH 28	MANCHESTER	3.6
923	NH 28	MASS. BORDER TO NH 97 IN SALEM	3.3
924	NH 33	OCEAN ROAD TO US 1 BYPASS, GREENLAND AND PORTSMOUTH	2.9
925	NH 3A	HACKETT HILL RD TO QUALITY DR WITH CONNECTION TO I-93, HOOKSETT	1.3
926	NH 3A	WALMART BLVD TO FRIARS DR, HUDSON	1.3
927	ROCKINGHAM PARK BLVD	CONNECTION FROM NH 28 TO I-93 IN SALEM	0.7
928	SHATTUCK WAY	INDUSTRIAL AREA OFF SPAULDING TURNPIKE NEAR PORTSMOUTH AIRPORT IN NEWINGTON	2.3
929	SOMERSET PKWY	CONNECTION FROM US 3 / EVERETT TURNPIKE AND NH 101A, NASHUA	0.8
930	US 1	HERITAGE AVE TO US 1 BYPASS IN PORTSMOUTH	2.2
931	US 1	NH 101 TO POST ROAD IN HAMPTON	2.7
932	US 1 BYPASS	PORTSMOUTH	2.7
933	US 3	GREELEY ST TO INDUSTRIAL DR, PLUS CONNECTIONS TO EVERETT TURNPIKE, MERRIMACK	1.9
934	US 3	NH 101 TO I-293, BEDFORD	1.9
TOTAL (CUFC LIMIT = 75 MILES)			**75.0**

Exhibit 3-8: Critical Rural Freight Corridors (CRFCs) for Consideration

ID	MAIN ROUTE	LOCATION	LENGTH (MILES)
951	MANCHESTER-BOSTON AIRPORT AREA	RAYMOND WIECZOREK DR, PETTENGILL RD, BROWN AVE, US 3A. MANCHESTER, LONDONDERRY, AND LITCHFIELD	1.2
952	NH 101	KEENE	6.2
953	NH 101	PETERBOROUGH AND TEMPLE	8.0
954	NH 103 / NH 11 / MAIN ST	CLAREMONT	0.5
955	NH 106	LACONIA	4.3
956	NH 106	US 3 TO I-393 IN CONCORD AND PEMBROKE	4.2
957	NH 108	STRATHAM (RURAL AREA)	1.2
958	NH 12	WALPOLE	2.1
959	NH 125	US 4 TO NH 111A IN LEE, EPPING AND BRENTWOOD	12.8
960	NH 125	KINGSTON (RURAL AREA)	1.4
961	NH 125	BRENTWOOD (RURAL AREA)	1.4
962	NH 16	AT NH 25 AND NH 41 IN OSSIPEE	4.0
963	NH 25	US 3 IN MEREDITH TO MOULTONBOROUGH*	5.6
964	NH 9	US 202 TO NH 123 IN HILLSBOROUGH, ANTRIM AND STODDARD	11.1
965	NH 9	SULLIVAN, ROXBURY AND KEENE	5.6
966	NH 9 / 10 / 12	KEENE	4.3
967	NH 9 / LOUDON RD	AIRPORT ROAD/HAZEN DRIVE TO NH 106	2.8
968	REGIONAL DRIVE	AIRPORT ROAD TO NH 106 IN CONCORD	1.6
969	US 2	NH 115 TO ME BORDER IN JEFFERSON, RANDOLPH, GORHAM AND SHELBURNE	23.0
970	US 202 / US 4 / NH 9	I-393 IN CONCORD TO NH 9 IN EPSOM	4.8
971	US 3	NH 106 IN LACONIA TO NH 11 IN FRANKLIN	13.0
972	US 3	NH 25 TO NH 106 IN MEREDITH	1.4
973	US 3	I-93 TO SOUTH OF NH 106 IN CONCORD	2.6
974	US 3 / NH 115	I-93 TO US 2 IN BETHLEHEM, CARROLL, JEFFERSON AND FRANCONIA	21.2
975	US 3 BUSINESS	LACONIA	4.1
976	US 4	LEBANON	1.4
TOTAL (CRFC LIMIT = 150 MILES)			**150.0**

**Note: Moultonborough has expressed concerns regarding critical freight corridor designations within their town. These concerns will be taken into consideration.*

Exhibit 3-9: Map of Critical Freight Corridor Candidates



3.2.3 Multimodal Freight Designations

Another major change/addition for FAST Act compliancy includes a multimodal freight component. Multimodal critical rural freight facilities and corridors must be designated by the State per 49 U.S.C. 70103. Beyond the current CRFC routes, NHDOT has not included specific multimodal additions under this provision but will continue to monitor needs/interests into the future. As part of future policies and strategies *(Appendix C-6)*, further studies will be carried out to identify potential transload or intermodal facilities within the state.

The specific policies/strategies and implementation next steps related to multimodal freight designations are noted as below.

- ***Multimodal Freight Policy/Strategy #1***:
  Support opportunities for intermodal facilities and multimodal expansion.

  Multimodal Freight Implementation Next Steps #1:
  Conduct a study to identify key rail, port, and airport intermodal transfer points. Based on cost and feasibility, determine potential transload facilities for intermodal consideration

- ***Multimodal Freight Policy/Strategy #2:***
  Provide guidance to analyze & improve multimodal first/last mile connections and access to major intermodal centers and manufacturing hubs.

  Multimodal Freight Implementation Next Steps #2:
  Develop a general design guide to help improve access to key freight facilities

3.2.4 Conceptual Costs and Funding Perspectives

Conceptual cost estimates were prepared for the top ranked proposed new projects that are not included in the current Ten Year Plan. The estimates are limited to high-level, estimations of probable cost with contingencies variable by project type. When these projects were ranked and prioritized alongside existing NHDOT projects, most of these projects did not rank as high in the project readiness and project partner categories, due to their early stages of project development. As future funding opportunities become available, these cost estimates can be used to help make informed investment decisions.

A summary of cost estimates is shown in *Exhibit 3-10*. Additional line item details for each project are located in *Appendix C-8*.

3.2.5 Fiscally Constrained Freight Investment Plan

A fiscally constrained freight investment plan has been developed for the NH Freight Plan, specifically related to projects that will likely use the new formula-based National Highway Freight Program (NHFP) funds provided under the FAST Act. NHDOT is allocated just over $26 million in total NHFP funds for use in FY 2016-2020.

Previously in 2017 and 2018, NHFP funds were obligated for NHDOT Project #15880, a roadway and bridge rehabilitation project located on I-89. Based on eligible project identification and prioritization efforts carried out as part of the NH Freight Plan, three additional projects have been proposed to receive New Hampshire's remaining NHFP funding allocations, as summarized in *Exhibit 3-11* and *Appendix C-9.*

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Exhibit 3-10: Cost Estimates for Top Ranked Proposed New Projects

ID	LOCATION	MAIN ROUTE	PROJECT DESCRIPTION	SCORE	COST ESTIMATE
823	PLAISTOW - MIDDLETON	NH 125	INSTALL PERMANENT VOLUME AND CLASSIFICATION COUNTERS IN THE NH 125 CORRIDOR	5.70	$600,000
819	TEMPLE	NH 101	REBUILD OR REHAB BRIDGES 99/112 AND 105/112 ON NH 101 TO ELIMINATE E-2 RESTRICTION	4.80	$7,755,800
822	HOLLIS - EXETER	NH 111	INSTALL PERMANENT VOLUME AND CLASSIFICATION COUNTERS IN THE NH 111 CORRIDOR	4.70	$480,000
837	PETERBOROUGH	NH 101 AT US 202	BRIDGE REPLACEMENT AND WIDENING FOR TCP, US 202 & NH 101 OVER CONTOOCOOK RIVER (RED LIST); PROJECT 15879 SCOPE IS BRIDGE ONLY (2021)	4.55	$5,100,550
820	ANTRIM - STODDARD	NH 9	FROM HILLSBOROUGH TL TO NH 123S. ADDITION OF A PROTECTED LEFT TUNING LANE FOR NH 9 EB TRAFFIC, AND EXTENDED ACCELERATION AND DECELERATION LANES FOR NH9 WB TRAFFIC TO IMPROVE SAFETY OF ACCESSING THE REST AREA IN ANTRIM	4.35	$3,367,525
812	WHITEFIELD	US 3	FEASIBILITY STUDY OF MITIGATING GRADE	3.95	$275,000
831	STATEWIDE	STATEWIDE	EVALUATE A STRATEGY TO MEET THE POTENTIAL NEED FOR PROVIDING LOCATIONS TO TRANSITION BETWEEN AUTONOMOUS TRUCK OPERATION ON INTERSTATES AND LOCAL PILOTAGE TO/FROM IN-STATE ORIGINS AND DESTINATIONS	3.95	$325,000
838	TROY	NH 12	BRIDGE REPLACEMENT OF BRIDGE NO 096/091 CARRYING NH 12 OVER NHRR (ABD); PROJECT 40371 SCOPE IS BRIDGE ONLY (2021) - ESTIMATE REFLECTS BRIDGE WORK ONLY (PLEASE SEE APPENDIX C-8 FOR NON-BRIDGE WORK DETAILS)	3.95	$3,282,500
834	KEENE	NH 9/10/12 AND WEST STREET INTERCHANGE	SWRPC 06/28/18 PROGRAMMED PROJECT LIST (DETAILS TBD)	3.85	$3,647,401
829	STATEWIDE	STATEWIDE	INDUSTRIAL RAIL ACCESS PROGRAM. LOGISTICAL ANALYSIS AND SCENARIO PLANNING TO IDENTIFY PROMISING SITES, PROGRAM TO PRESERVE OPPORTUNITIES AND STIMULATE DEVELOPMENT OF TRANSLOAD FACILITIES AND INDUSTRIAL ACCESS	3.70	$901,880
839	WESTMORELAND	NH 12	SWRPC 06/28/18 PROGRAMMED PROJECT LIST (DETAILS TBD)	3.70	$1,893,600
809	STRATHAM	NH 108 AT BUNKER HILL AVENUE	SIGNALIZE OR INSTALL A ROUNDABOUT AT NH 108 AT BUNKER HILL AVENUE	3.20	$891,800
836	WALPOLE	NH 12	SWRPC 06/28/18 PROGRAMMED PROJECT LIST (DETAILS TBD). NH 12 FROM NH 123E TO CHARLESTOWN TOWN LINE	3.20	$1,662,425
835	WINCHESTER	NH 10 AT MANNING HILL	SWRPC 06/28/18 PROGRAMMED PROJECT LIST (DETAILS TBD)	3.15	$14,183,438
802	BARRINGTON	NH 125 AT NH 9	COMPREHENSIVE PLANNING STUDY FOR NH125 BETWEEN TBD AND TBD	2.95	$175,000
815	NEWMARKET	NH 108 AT RR	GRADE SEPARATE RAILROAD AND NH 108	2.95	$13,668,103
818	ROCHESTER	ROCHESTER NECK RD BRIDGE OVER ISINGLASS	REBUILD OR REHAB THE 225/139 ROCHESTER NECK RD BRIDGE OVER ISINGLASS TO PROVIDE WIDER SHOULDERS FOR PEDESTRIANS AND BICYCLISTS	2.95	$2,398,500
804	CONCORD	I-93 AT I-393 INTERCHANGE	INTERCHANGE RECONFIGURATION STUDY	2.85	$175,000

Exhibit 3-11: Freight Investment Plan for National Highway Freight Program (Z460) Funding

Ranking Score	NHDOT Project #	Project	Phase	FY	Federal NHFP Funding	Non-Federal Funding	Expenditures (Per Fiscal Year)	*TOTAL Project Funding Required
(PREVIOUSLY OBLIGATED NHFP FUNDING)	15880	**I-89** FROM NORTH OF HARDY HILL RD BRIDGE NORTH 5 MILES TO SOUTH OF EXIT 20 - REHABILITATE ROADWAY & BRIDGES	CON	2017	9,401,547	-	**9,401,547**	**$16,030,583**
			CON	2018	1,233,815	-	**1,233,815**	
			Project Sub-Total		**10,635,362**	**-**	**10,635,362**	
4.90	16148	**I-89 NB & SB** SUPERSTRUCTURE REPLACEMENT & WIDENING, I-89 NB & SB OVER CONNECTICUT RIVER (BR NO 044/103 & 044/104)	CON	2019	7,936,545	33,012,553	**40,949,098**	**$40,051,898**
				2020	-	-	**-**	
				2021	-	-	**-**	
			Project Sub-Total		**7,936,545**	**33,012,553**	**40,949,098**	
4.85	13742	**I-93** WIDENING FROM I-89 TO BETWEEN EXIT 15 AND 16	PE	2019	7,752,427	9,903,987	**17,656,414**	**$329,723,635 (for PE, ROW, CON)**
				2020	-	-	**-**	
				2021	-	-	**-**	
				2022	-	-	**-**	
				2023	-	-	**-**	
				2024	-	-	**-**	
				2025	-	-	**-**	
				2026	-	-	**-**	
			Project Sub-Total		**7,752,427**	**9,903,987**	**17,656,414**	
					26,324,334	**42,916,540**	**69,240,874**	

**Funding Summary (All Projects)	FY	Federal NHFP Funding	Non-Federal Funding	Expenditures (Per Fiscal Year)	Annual NHFP Apportionments	Unused NHFP Balance at End of FY
FY 2016-2020	2016	-	-	**-**	4,805,235	4,805,235
	2017	9,401,547	-	**9,401,547**	4,596,312	-
	2018	1,233,815	-	**1,233,815**	5,014,159	3,780,344
	2019	15,688,972	42,916,540	**58,605,512**	11,908,628	-
	2020	-	-	**-**		-
Overall 2016-2020		**26,324,334**	**42,916,540**	**69,240,874**	**26,324,334**	**-**

**Total based on funding needs in 2017-2020 STIP, 2019-2028 TYP, & FY 2018 BUILD Grant Application - includes funds secured in previous years not shown.*

***Funding summary shows the federal NHFP funding allocations for each fiscal year, and the remaining balance at the end of each fiscal year (accounts for annual NHFP apportionments through FY 2020).*

3.3 Resources and Applications

3.3.1 Statewide Planning Relationships

NHDOT

The NHDOT is the State's authority for the administration of the State's transportation system. Within the NHDOT there are several Divisions and Bureaus which administer various functions of the Department, including the Division of Aeronautics, Rail and Transit; Division of Finance; Division of Operations which includes Bureau of Bridge Maintenance, Bureau of Highway Maintenance (including 6 NHDOT District Offices), Bureau of Traffic, Bureau of Turnpikes, and Transportation Systems, Management & Operations (TSM&O); Division of Project Development which included eight Bureaus which address specific elements of the transportation planning including- Bridge Design, Construction, Environment, Highway Design, Materials and Research, Planning and Community Assistance, Project Management, and Right-of-Way (ROW).

Through the continuous coordination of these entities and others, the NHDOT plans for the development and improvements to the existing and proposed transportation system to address immediate needs and to address long-range needs within the State. NH State Statute requires the NHDOT propose a plan for improvements to the State's transportation system every two years. The "Plan" is commonly referred to as the Ten Year Transportation Improvement Plan. The purpose of the Ten Year Plan (TYP) is to develop and implement a plan allowing New Hampshire to fully participate in federally supported transportation improvement projects as well as to outline projects and program funded with State transportation dollars.

How NHDOT decides to make transportation investments is developed in cooperation with various stakeholders including the nine (9) Regional Planning Commissions (RPCs), local communities, other State and federal agencies, the NH Legislature, other governmental officials and the general public. The TYP planning process solicits input and participation from numerous stakeholders. The input received during the TYP process facilitates on-going discussion and provides information regarding local, regional and state needs, and informs GACIT member, the Governor and ultimately the NH Legislature, who is responsible for approving the final Ten Year Plan.

RPCs

The nine RPCs communicate with local communities and other community partners to identify transportation needs. There are 10 counties, 13 cities, 221 towns and 25 unincorporated places in NH. RPC solicit input from the local communities on existing and potential projects, and guide the communities in developing regional priorities based on specific criteria and performance measures. The RPC assist the NHDOT in data collection effort and in developing resources, such as the Transportation Chapter of local and Regional Transportation Plans, which serve to document the importance of local and regional transportation needs and investment opportunities to consider.

The NHDOT's ongoing data collection efforts provide valuable information on the various aspects of the infrastructure. This information is used to provide details on the State of Infrastructure Summary, identification of unfunded needs, federal funding limits, and other financial information regarding how the transportation system is funded. With this information a "draft" TYP is prepared and released to begin the formal public hearing process conducted by the five Executive Councilors. Meeting are held in each of five Executive Councilor Districts, as the five Executive Councilors and the Commissioner of Transportation are referred to as the Governor's Advisory Council on Intermodal Transportation (GACIT).

The public testimony received during the GACIT hearing, is considered in the final draft GACIT TYP document which is then submitted to the Governor for review and revisions. The Governor then transmit the his/her version of the draft TYP to the NH Legislature and respective legislative committee process. The NH Legislature then conduct committee hearings (Public Work and Highway Committee) and develops their version of the plan. The final draft TYP may be revised at the Legislative level, and ultimately is approved by the Legislature and signed into law by the Governor.

The financial management of NH's transportation network is a significant responsibility of the NHDOT. The NHDOT's investments in the statewide transportation system provides connectivity to other regional and national transportation investments, such as the National Highway System, airports, ports, bridges and other facilities in adjoining states. The connectivity of the transportation contribute to the economic vitality of the State and connects NH to the world.

The NHDOT is responsible for developing and implementing a fiscally constrained plan to address the transportation needs of the State. The NHDOT collects, analyzes, and prepares a multitude of data resources to assess, monitor and evaluate the transportation system, to aid in making informed decisions regarding the prudent expenditure of both State and Federal financial resources. Both Federal and State legislative regulations guide the NHDOT, in providing the oversight, management, and fiscal responsibilities.

NH's transportation system is an integral component of the broader national transportation network, and thusly NHDOT role in the preservation, maintenance, and vitality is of the utmost importance from a statewide, regional and national perspective. Projects included in the adopted TYP may be funded with federal and or state transportation dollars. There are various funding categories and programs of funding, all of which must be fiscally constrained, meaning the anticipated revenue to complete the project are available in the time frame they are identified in the plan.

Following the adoption of the TYP, the NHDOT then revises the current Statewide Transportation Improvement Program (STIP), which is a document which include any project in the first four (4 year) of the TYP, which utilized federally funding. The develop of the STIP is required per federal regulations, and is developed in coordination with the RPCs. Throughout the development of the TYP, STIP and local Transportation Improvement Plan (TIP), the public is provided opportunity to comment and participate in the public involvement process, which is required by federal regulations.

State Freight Advisory Committee (SFAC)

As outlined in federal regulations, each State was advised to create a State Freight Advisory Committee (SFAC), when preparing a State Freight Plan. The NHDOT followed this guidance and established a SFAC to assist in preparing the first State Freight Plan. This Committee has been instrumental in providing direction and feedback on freight issues of concern, freight stakeholders, strategies, actions and policies, and project prioritization.

The committee includes representatives from the Manchester Airport Authority, Associated General Contractors, State Police, Federal Highway Administration (FHWA), NH Municipal Association, Regional Planning Commissions, NH Motor Transport Association, Logistics company, and the NHDOT Division of Aeronautics, Rail and Transit. The State Freight Plan will identify priority projects, potential investment opportunities, provide a better understanding of the system and how freight impacts and is impacted by conditions of the network.

As trends in freight delivery, federal requirements, funding and other factors continue to change and evolve, the role of the SFAC will not be diminished. It is for these and other issues which emerge, that the NHDOT anticipates utilizing the SFAC in developing potential projects in future TYP cycles. The SFAC can provide input on how projects in the TYP can be augmented to facilitate the improved safety and performance of freight movement in the State and region.

3.3.2 Freight Knowledge Base and Planning Tools

There are a number of opportunities to help increase public and private understanding of system level goods movement and logistics issues. Recommendations include methods to help develop a freight planning knowledge base and interface within NHDOT and can be applied towards current and future projects and activities.

Appoint a state freight coordinator: By establishing the roles and responsibilities of a state freight coordinator, this individual can help engage municipalities in freight related activities and coordinate future SFAC meetings. Even though the development portion of the freight plan has come to a completion, there will be benefits in holding regular scheduled SFAC meetings to address on-going freight related issues in order to keep lines of communication open and maintain freight planning momentum. The state freight coordinator can assist in these efforts, as well as ensure appropriate public and private sector representation, potentially creating the opportunity for future public-private partnerships.

Maintain a database of freight facilities and freight related projects: As freight priorities change over time, it is important to maintain a database of the most current freight related needs for the state. Keeping track of where current freight facilities are located and where potential freight opportunities could be (brownfield sites, potential land use redevelopment near abandoned rail lines, etc.) will help inform funding decisions for future projects and promote freight growth.

Inform future funding and implementation decisions: Incorporate insights from the freight plan's project screening and project prioritization efforts into broader discussions relative to formal project planning, programing, or funding decisions. For key freight project candidates based on NHDOT and RPC priorities, consider pursuing unique freight-eligible funding opportunities, such as TIGER or INFRA grants, public-private partnerships, or similar options.

3.3.3 Public/Private Educational Strategies

The following concept-level recommendations should help enhance public/private educational opportunities for freight related matters:

Continue statewide freight summit efforts: During the course of the project, two freight summits were held to bring public and private sector individuals together to discuss the future of freight and the impacts of upcoming technologies. These efforts should continue in different parts of the state to reach a larger audience of shippers, logistics specialists, warehouse operators, and other industry experts.

Inform and stay informed of technological advancements: As technology continues to evolve and advance, business models and supply chains may change freight needs in the future. Close coordination with the private sector should be considered so that transportation decisions address future freight needs and to ensure that the private and public sector interests are in balance. NHDOT should share these updates with RPCs and MPOs to create an awareness of new technologies that will likely impact freight.

Initiate a program to provide information to shippers on how to utilize rail services[56]: From a shipper's perspective, there is a general lack of understanding on the use of rail services, which limits consideration of rail by existing businesses and those that wish to locate within the state. Collaborating with local railroads, information can be developed regarding the rail shipping process and rail transportation evaluation criteria. This material can be made available to potential rail users that make inquiries regarding transportation services to New Hampshire state and regional agencies. The material should identify specific rail opportunities in each area of the state and provide railroad contact information to allow of subsequent follow up by the prospective rail users.

[56] *New Hampshire Statewide Rail Plan, 2012*

3.3.4 Freight Partnership Opportunities

Moving forward, steps should be taken to help strengthen freight partnerships and coordination between government agencies and the private sector. Concept-level recommendations for future exploration include the following:

Freight carriers and logistics operators – Partner with private sector freight carriers and logistics operators to investigate strategies to improve modal efficiency. This ongoing dialogue regarding multimodal freight system needs and efficient movement of freight will help create future freight related policies or develop potential projects eligible for freight funding.

Private rail investments – Explore public/private partnership opportunities with private railroad owners and operators to improve travel times and reliability. Funding sources may include multistate initiatives, EPA funded opportunities, and funding programs such as the Industrial Rail Access Program (IRAP). Seeking these opportunities will help to engage shippers & railroad owners and encourage project related planning, decision making, and cost sharing.

Rest area and truck stops – Public-private partnerships between trucks stop owners, motor carriers, and NHDOT can be established to potentially help develop and fund new facilities, especially since truck stops are usually privately-owned within the state. The installation of electrification equipment and usage tracking can also be topics of discussion and consideration for these future facilities.

Conclusions

The NH Freight Plan can help serve as the “blue print” to NHDOT and other stakeholders in the development of the statewide freight system. The NH Freight Plan was intended to support the key national freight planning goals and objectives in compliance with the FAST Act, while providing a better understanding of local, regional, and statewide freight planning needs. The plan further included a comprehensive project screening and prioritization process to help evaluate projects with potential freight related benefits. In conjunction with these efforts, a series of freight policies & strategies with implementation next steps were developed to serve as a feasible action plan to help support the state’s future freight planning efforts.

While this document completes the development stages of the NH Freight Plan, it is certainly not the end of the freight planning process. Rather, this plan can help serve as the basis for continued freight and goods movement planning and background knowledge for NHDOT as investment decisions are made for the Ten Year Plan, STIP, and other funding related matters.