Preliminary Review Draft

Connecticut State Rail Plan (2022-2026)

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Cover photo, top: Tom Mik
Cover photo, middle: Carl Talley
Cover photo, bottom: Carl Talley

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Acronyms

AADT	Average Annual Daily Traffic
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	Alternate Concepts, Inc.
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
ARPA	American Rescue Plan Act
ARSA	Amended and Restated Service Agreement
ASRS	Automated Storage and Retrieval System
AUP	Advanced Utility Project
BRT	Bus Rapid Transit
BSRR	Branford Steam Railroad
Btu	British thermal unit
BUILD	Better Utilizing Investments to Leverage Development
C&D	Construction and Demolition
CAGR	Compound Annual Growth Rate
CalSTA	California State Transportation Agency
CARES	Coronavirus Aid, Relief, and Economic Security
CCO	Component Change Out
CCRS	Central Connecticut Rail Study
CCTV	Closed-Circuit Television
CEPA	Connecticut Environmental Policy Act
CES	Comprehensive Energy Strategy
CFR	Code of Federal Regulations
CIG	Capital Investment Grant
CMAQ	Congestion Mitigation and Air Quality
CMV	Catenary Maintenance Vehicle
CNZR	Central New England Railroad
COG	Council of Government
CPA	Connecticut Port Authority
CPU	Centralized Processing Unit
CRA	Connecticut Railroad Association
CRCOG	Capitol Region Council of Governments
CRISI	Consolidated Rail Infrastructure and Safety Improvements
CSI	Customer Service Initiative
CSO	Connecticut Southern Railroad
CSS	Context Sensitive Solutions
CSX	CSX Transportation
CTC	Centralized Traffic Control
CTDOT	Connecticut Department of Transportation
CTOL	Connecticut Operation Lifesaver
CT*rail*	Passenger rail service in Connecticut
DECD	Department of Economic Community Development
DEEP	Department of Energy and Environmental Protection
DESPP	Department of Emergency Services and Public Protection

DHS	Department of Homeland Security
DMV	Department of Motor Vehicles
DVMT	Daily Vehicle Miles Traveled
EA	Environmental Assessment
EIA	Energy Information Administration
EIE	Environmental Impact Evaluation
EMU	Electric Multiple Unit
EO3	Connecticut Executive Order 3
FAF	Freight Analysis Framework
FAST Act	Fixing America's Surface Transportation Act
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal Year
GC3	Governor's Council on Climate Change
GCT	Grand Central Terminal
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GHMS	Greater Hartford Mobility Study
GSP	Gross State Product
GWI	Genesee & Wyoming Inc.
HFD	Hartford Amtrak Station
HRRC	Housatonic Railroad Company
HSIP	Highway Safety Improvement Program
HSR	High-Speed Rail
Hz	Hertz
IIJA	Infrastructure Investment and Jobs Act
INFRA	Infrastructure for Rebuilding America
IRAP	Industrial Rail Access Program
IWT	Independent Wheel Truing
LQ	Location Quotient
MassDOT	Massachusetts Department of Transportation
MAT	Middletown Area Transit
MBB	Messerschmitt-Bolkow-Blohm
MBTA	Massachusetts Bay Transportation Authority
MDBF	Mean Distance Between Failures
MNR	Metro-North Railroad
MOE	Maintenance of Equipment
MOW	Maintenance of Way
MP	Milepost
mph	miles per hour
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MTA	Metropolitan Transportation Authority
MTST	Mass Transit Security Team
NAAQS	National Ambient Air Quality Standards

NAUG	Naugatuck Railroad
NEC	Northeast Corridor
NECR	New England Central Railroad
NEPA	National Environmental Policy Act
NHHS	New Haven-Hartford-Springfield
NHPA	New Haven Port Authority
NHTSA	National Highway Traffic Safety Administration
NS	Norfolk Southern Railway
NYNH&H	New York-New Haven and Hartford Railroad
OLI	Operation Lifesaver, Inc.
OPM	Office of Policy and Management
OTP	On-Time Performance
P&W	Providence & Worcester Railroad
PAR	Pan Am Railways
PARCS	Parking Access and Revenue Control System
PAS	Pan Am Southern Railway
PD	Police Department
pmpg	passenger-miles per gallon
PMT	Passenger Miles Traveled
PRIIA	Passenger Rail Investment and Improvement Act of 2008
PSNY	Penn Station, New York
PTC	Positive Train Control
PTMS	Public Transportation Management System
PVPC	Pioneer Valley Planning Commission
PVTA	Pioneer Valley Transit Authority
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
REMI	Regional Economic Models, Inc.
ROW	Right-of-Way
RPA	Regional Planning Agency
RRIF	Railroad Rehabilitation and Improvement Financing
RSIP	Rail Service and Investment Program
RTSWG	Regional Transit Security Working Group
SAP	State Action Plan
SBC	State Bond Commission
SOD	Special Operation Division
SRPAA	State Rail Plan Approval Authority
SRTA	State Rail Transportation Authority
STC	State Traffic Commission
STCC	Standard Transportation Commodity Code
STF	Special Transportation Fund
STIP	Statewide Transportation Improvement Program
STO	Special Tax Obligation
TAM	Transit Asset Management
TAMP	Transportation Asset Management Plan
TASI	TransitAmerica Services, Inc.
TEP	Tax Exemption Program
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIGER	Transportation Investment Generating Economic Recovery

TIME	Track Improvements and Mobility Enhancements
TOD	Transit-Oriented Development
TSA	Transportation Security Administration
TSGP	Transit Security Grant Program
TVM	Ticket Vending Machine
U.S.C.	United States Code
UPS	Uninterrupted Power Supply
USDOT	United States Department of Transportation
VIPR	Visible Intermodal Prevention and Response
VMT	Vehicle Miles Traveled
VRR	Valley Railroad
VTrans	Vermont Agency of Transportation
YOE$	year-of-expenditure dollars

1. Overview of the Role of Rail in Statewide Transportation

This chapter provides a general orientation of Connecticut's rail system. Additionally, it reviews the role of rail in Connecticut's Statewide Long-Range Transportation Plan (CTDOT 2018) and other current or recent plans.

Connecticut's rail system reflects the state's position as a gateway to New England. More than 43 million people (CTDOT 2020) and 2.9 million tons of freight (Association of American Railroads [AAR] 2021) move by rail within and through the state annually. Intrastate rail travel between dozens of the state's cities and towns continues to grow as the state has enhanced and expanded its local commuter services over the past decade. Regional rail service has also grown, through Amtrak, Metro-North Railroad, and CT*rail* services, which take passengers to points north towards Canada and south towards New York City and beyond.

Figure 1-1. Images of Connecticut's Rail System

Source: Carl Talley

The Connecticut Department of Transportation (CTDOT) developed this state rail plan in compliance with Federal Railroad Administration (FRA) guidelines (FRA 2013). The plan presents an annotated inventory of the existing system and identifies the necessary steps to enhance and improve this vital system through 2035. This plan also provides a framework and steps to maintain and further enhance Connecticut's rail system, which includes one of the busiest commuter rail lines in the nation. As a growing number of people depend on rail to get to work, school, healthcare, shopping, and

entertainment within the state, the need to maintain and improve the state's rail network has never been greater.

National transportation policy ultimately guides and strongly influences the success of state rail policy. Federal policy guiding rail planning efforts as outlined in the Passenger Rail Investment and Improvement Act of 2008 (PRIIA)[1] outlines that states should have an FRA-accepted state rail plan to identify projects potentially eligible for federal passenger rail funding. The Connecticut State Rail Plan complies with the structure, organization, and contents specified by PRIIA and adheres to guidance issued by the FRA in September 2013 and modified subsequently in the Fixing America's Surface Transportation (FAST) Act (FRA 2013). Connecticut's previous State Rail Plan covered the period from 2012 to 2016. This 2022 edition updates the state's prior plan and covers the period 2022 to 2026.

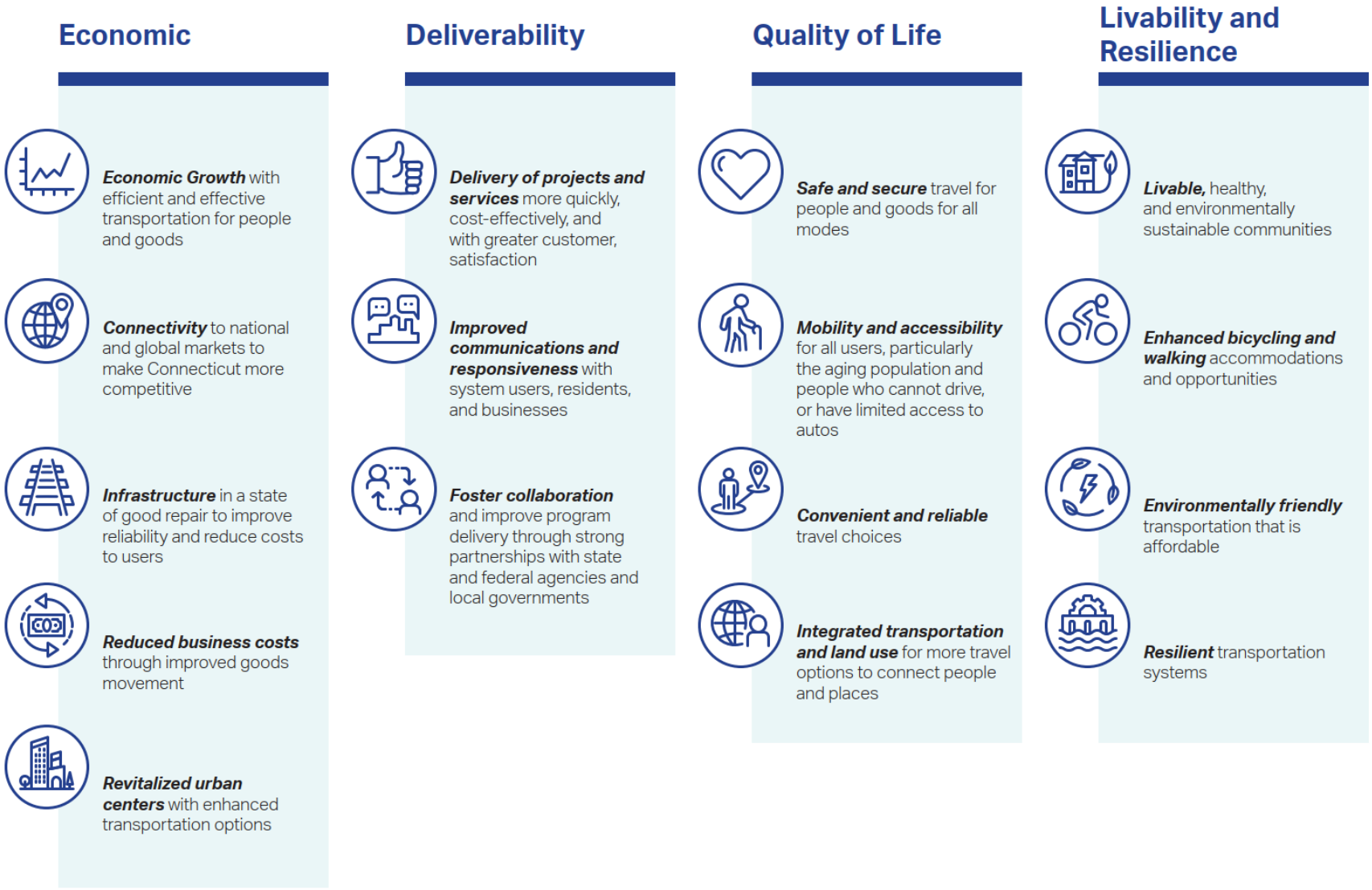
1.1 CTDOT's Long-Range Transportation Goals

Operating a multimodal transportation system is critical to providing equal access to opportunity, reducing greenhouse gas (GHG) emissions, and offering mobility alternatives that support all adults who may not be able to drive, as well as low income/disadvantaged families who cannot afford a car. In its 2018 Connecticut Statewide Long-Range Transportation Plan CTDOT identified goals that guide future investments. While this plan focuses on the state's rail system, made up of freight and passenger rail, Connecticut's rail system offers multiple layers of connectivity to other transportation modes. The goals of the Connecticut State Rail Plan reflect the multimodal system needs and are consistent with the broader transportation goals in *Connecticut's Statewide Long-Range Transportation Plan 2018-2050* (CTDOT 2018). These goals are organized around the following four categories (**Figure 1-2**):

- **Economic**. Economic goals focus on ensuring that Connecticut remains competitive regionally, nationally, and internationally. CTDOT achieves these goals through developing and maintaining infrastructure that allows the free movement of people and goods throughout the state. Benefits associated with this approach include providing connectivity with other markets, revitalizing the state's urban centers, and reducing business costs.
- **Deliverability**. While important to set goals, it is equally essential that CTDOT manages expectations and delivers on the promises and visions it sets. Successful delivery requires clear communications among CTDOT, its partners, and other stakeholders. This communication fosters collaboration and ensures that the best ideas for the future are achievable and agreed-upon by the larger community.
- **Quality of Life**. Transportation is essential for all who live and work in Connecticut. It is important that CTDOT ensures the state's infrastructure not only meets minimum standards, but also improves people's lives through creating safe connectivity to places that serve a variety of Connecticut's diverse population needs.
- **Livability and Resilience**. Effective multimodal transportation systems are easy to use and enable people to freely live their lives. They also lessen the climate change challenges that will come in the next few decades.

[1] Public Law No. 110-432, which was passed for the purpose of improving passenger rail service throughout the nation.

Figure 1-2. CTDOT 2018 Long-Range Transportation Plan Goals



1.2 Conceptual Analysis of Rail Transportation's Role within the State's Transportation System

Connecticut's transportation infrastructure includes a broad array of multimodal elements that are both publicly and privately owned and operated. The transportation system consists of pedestrian and bicycle facilities and regional pathways, local roadway and highway facilities, private and public transit and rideshare systems, freight and passenger railways, ferries, seaports, and airports. This system is interconnected with the national transportation system and economy and provides for efficiency in freight and personal mobility.

Connecticut's freight rail system is strategically located between the major northeastern urban and economic centers of New York City, New York, and Boston, Massachusetts. Nine railroads operate within the state, moving 2.9 million gross tons of freight annually. Freight inbound shipments on average have a higher value-to-tonnage ratio compared to outbound shipments. The state of Connecticut measures less than 500 miles across, and through shipments make up about 20 percent of rail freight by tonnage and 25 percent by value. The most common good inbound through the state is primary metal products, including galvanized; except coating or other allied processing. The most common outbound good is waste or scrap materials not identified by producing industry. Chapter 2 and **Appendix H** contain additional information on freight railroads, including tonnages and other statistics.

Connecticut's passenger rail system consists of two intercity services: Amtrak and the CT*rail* Hartford Line. The state also has two commuter rail services: the state-owned Metropolitan Transportation Authority (MTA) Metro-North New Haven Line and CT*rail* Shore Line East. Annually, 1.8 million people use intercity passenger rail over the Northeast Corridor (NEC) lines operated by Amtrak and 41.4 million rail passengers use the New Haven Line, Shore Line East, and Hartford Line services (CTDOT 2020). Rail accounts for a small percentage of mode share within Connecticut, with 2.1 percent of the state's worker population commuting via rail (**Table 2-1**). This rail-using population largely exists in southwest Connecticut. Chapter 2 provides an in-depth review of passenger rail systems operating within Connecticut, including a summary of rolling stock, ridership, and expenses.

In addition, due to its strategic location within New England's Knowledge Corridor (**Figure 1-3**), which runs from New Haven, Connecticut, to Greenfield, Massachusetts, Connecticut is positioned at the forefront of the national economy in science and technology, aviation manufacturing, and financial services. New England's Knowledge Corridor is an interstate partnership dedicated to advancing economic progress in the region. Key to the state's competitiveness in the global economy is stewardship and development of a transportation network that can keep pace and support an attractive business environment, quality of life, living standards, services, and mobility options. Government has an important responsibility to maintain and invest in the transportation network to keep Connecticut moving forward with a vital and modern rail system that can sustain and support growth.

Table 1-1. Means of Transportation to Work

Statistical Area	Total Working Population	Commuter/ Long Distance Rail Users	Percentage of Total Population
Bridgeport-Stamford-Norwalk, CT Metro Area	468,102	31,898	6.8%
Hartford-East Hartford-Middletown, CT Metro Area	602,791	782	0.1%
Norwich-New London, CT Metro Area	420,922	3,205	0.8%
Torrington, CT Micro Area	94,278	419	0.4%
Worcester, MA-CT Metro Area [a]	472,216	3,855	0.8%
Connecticut (statewide)	1,777,570	36,724	2.1%

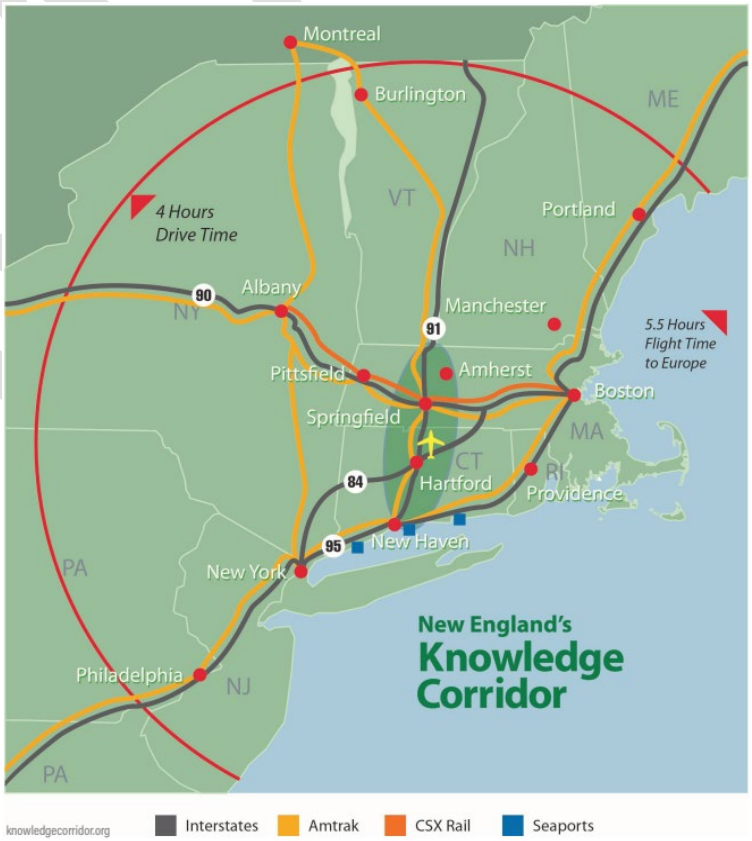
Source: American Community Survey 2020 5-Year Estimates, Table B08301: Means of Transportation to Work. Note: The 2020 ACS 5-year estimates cover the years 2016-2020, so while they factor in the first 9.5 months of the pandemic, they are weighted towards capturing pre-COVID conditions.

[a] This area is largely concentrated in Massachusetts with a small percentage of Connecticut residents, and it is likely many of these users travel on Massachusetts rail corridors serving Boston.

A well-planned, attractive rail network offers the potential to improve connectivity while helping to provide residents with alternatives to relying on congested roads and airports. Within Connecticut's Interstate 95 (I-95) highway corridor between New Haven and the New York state line, congestion delays occur during high commuting periods in the AM and PM on weekdays, covering a stretch of highway more than 25 miles long. Decreasing congestion can help reduce highway delays, lower crash rates, save time and money, and most important help reduce traffic fatalities (NEC 2014).

Moving people and goods by rail reduces congestion around populated urban centers. Rail plays an even more important role in helping states to achieve their air quality and GHG emission goals since rail service contributes less to air pollution than automobiles and other modes of freight delivery.

Figure 1-3. Knowledge Corridor in Context



Source: New England's Knowledge Corridor

The role of rail in the state represents an essential opportunity for people and goods movement that strategically connects to key destinations and other modes. Improving the productivity of the rail transportation network is essential to the competitive advantage of Connecticut and the surrounding region.

1.3 Institutional Governance Structure of State Rail Programs

CTDOT is designated by the Connecticut Legislature as the department in charge of maintaining Connecticut's full transportation system, including its roads and rails. As part of this role, it prepares a state rail plan that reflects input from members of the community, including operators, freight companies, the legislature, and the public at-large.

49 United States Code (U.S.C.) Section 22102 guides states to, among other things, prepare an adequate plan for rail transportation in the state and a suitable process for updating, revising, and modifying that plan. Section 13b-3 of the Connecticut General Statutes states that CTDOT "shall be responsible for all aspects of the planning, development, maintenance, and improvements of transportation in the state." Given this legislative authority, CTDOT, via its Bureau of Public Transportation and Office of Rail, plans for, maintains, and improves the state's rail systems. The Commissioner of Transportation acts as the official State Rail Transportation Authority (SRTA) and is responsible for preparing, maintaining, coordinating, and administering the rail plan.

Recognizing the many lives touched by its rail network, CTDOT develops its rail plan in collaboration with its rail partners, community groups, and stakeholders. This includes various interest groups such as the Connecticut Commuter Rail Council, an independent Governor-appointed board that advocates for commuters throughout the state. Additionally, CTDOT works with Regional Councils of Governments (COGs)/Metropolitan Planning Organizations (MPOs) and private rail providers to help shape and direct programs and services.

Section 13b-200a of the Connecticut General Statutes requires the State Rail Plan to be reviewed by the Connecticut General Assembly's Transportation and Finance, Revenue, and Bonding Committees before it is submitted to the federal government. Per statute, CTDOT must submit the Plan to these committees at least 60 days before submitting it to the federal government. The committees must hold a joint hearing on the proposed plan within 30 days after receiving it, and within 14 days after the hearing, they must advise CTDOT about any suggested modifications. Given this legislative authority, the Connecticut General Assembly's Transportation and Finance, Revenue and Bonding Committees act as the State Rail Plan Approval Authority (SRPAA) and are responsible for reviewing and approving the plan. This arrangement is in compliance with the requirements of 49 U.S.C. Section 22103 and 49 U.S.C. Section 22075.

1.4 Authority for Grant, Loan, and Public/Private Partnership Financing

In addition to planning, development, maintenance, and improvements of transportation in Connecticut, CTDOT also secures grants, loans, and financing as part of nearly all transportation planning, development, and maintenance projects. The Connecticut Legislative assembly grants the authority to handle such matters in the General Statues of Connecticut, Volume 4, Title 12b, Chapter 242, Section 13b-21.

CTDOT's revenue sources are largely public funding sources. In some cases, these resources can be leveraged through public financing to accelerate the expenditure of funds, and other sources of public

financing are available to enhance the leverage of any available stream of reliable funding. The two primary programs are Transportation Infrastructure Finance and Innovation Act (TIFIA) and Railroad Rehabilitation and Improvement Financing (RRIF), which are available tools for CTDOT and Amtrak to finance project needs. For some major projects, there is also the possibility of private sources of financing under public/private partnerships, which are often repaid over the life of the asset. Chapter 5 describes funding sources in greater detail. They include:

- Special Tax Obligation (STO) Bonding, a process where the State Legislature passes bond Authorizations that allow CTDOT to utilize bond funds for transportation purposes.
- Dedicated Special Transportation Fund (STF) used for transportation purposes.
- Four major sources of federal funding, all of which fall under the umbrella of the U.S. Department of Transportation (USDOT): the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the FRA, and the National Highway Traffic Safety Administration (NHTSA).
- Competitive and Discretionary Grants including highway funding for the Intercity and High-Speed Rail, FRA's State of Good Repair Partnership Grant Program; FRA's Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program, as well as FTA's Low or No Emissions Program supporting the purchase of electric buses; Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants that support surface transportation projects of local and/or regional significance; Capital Investment Grants (CIG) Program; Mega Projects; and FTA All Station Accessibility Program.

1.5 Summary of Freight and Passenger Rail Services, Initiatives, and Plans

The State Rail Plan is a stand-alone document that identifies the current system and plots a future for maintaining and improving it. The plan is iterative, and it aligns with *Connecticut's Statewide Long-Range Transportation Plan 2018-2050* (CTDOT 2018).

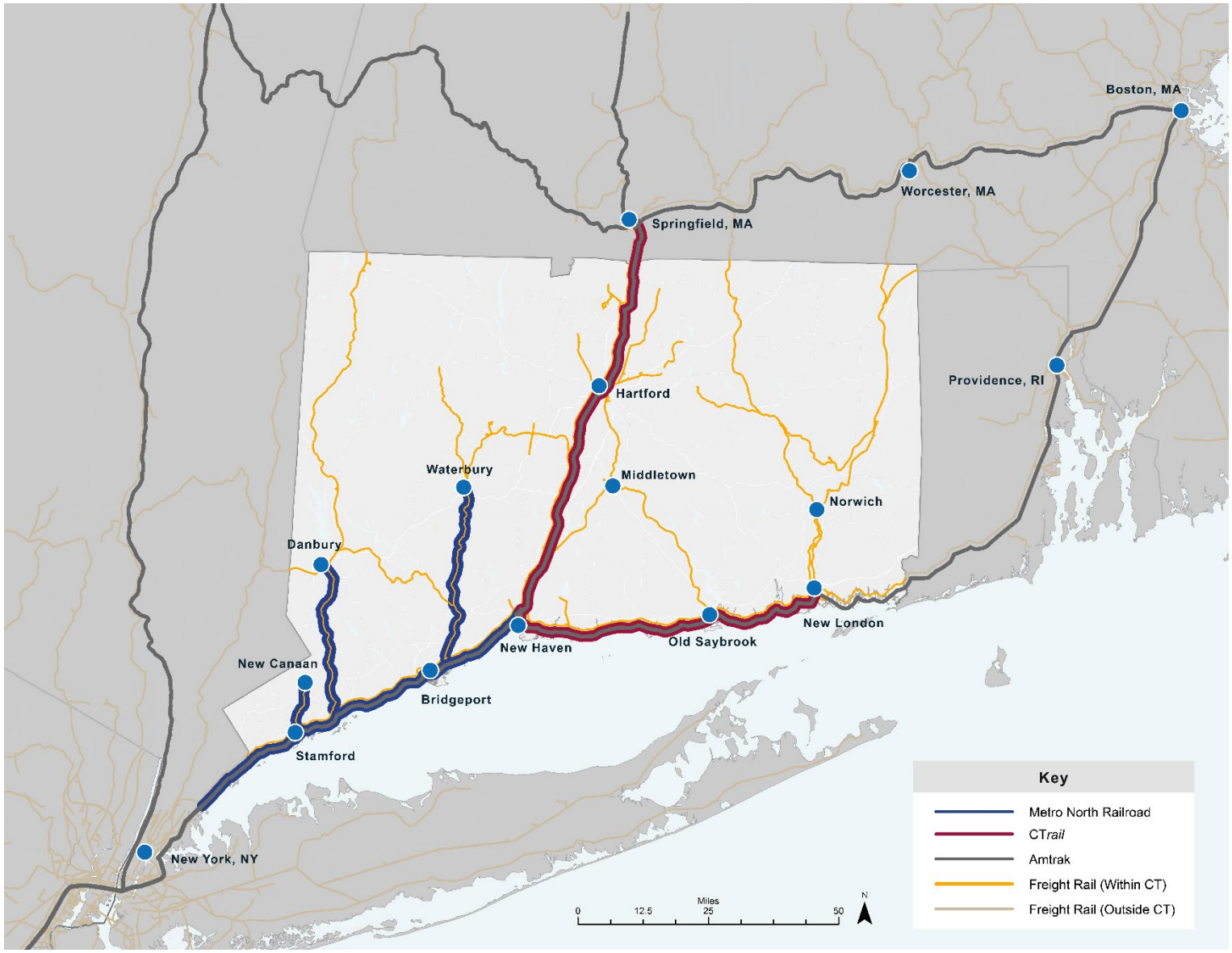
1.5.1 Services

Connecticut's rail system consists of rail corridors utilized both exclusively and jointly by freight, intercity passenger, and commuter systems. The lines are chiefly owned and operated by private rail carriers, Amtrak, and the State of Connecticut. The lines are used by a variety of freight and passenger services, each of which is summarized below and further explained in Chapter 2.

Freight Services

Connecticut's rail freight industry is operated by the private sector for profit and for public benefit under federal common carrier regulations. The State of Connecticut owns five freight rail routes, and its nine freight operators operate over 577 right-of-way miles (AAR 2021). These are depicted, along with passenger rail, on **Figure 1-4**. Collectively, more than 2.9 million gross tons of rail freight move in and through Connecticut each year.

Figure 1-4. Passenger and Freight Rail in Connecticut



Source: AECOM

Passenger Services

Connecticut's primary passenger service is the New Haven Line, a commuter rail service operating between New Haven, Connecticut, and Grand Central Terminal in New York City. The system benefits from its proximity to the New York City metropolitan market area and has been the most heavily traveled commuter rail line in the country. The New Haven Line is owned by the states of Connecticut and New York. The service is operated under agreement by MTA Metro-North Railroad, and it includes New Haven Line main line service as well as service on three branch lines: the New Canaan Line, the Danbury Line, and the Waterbury Line. The New Haven Line is also a critical link in Amtrak's NEC, allowing connections between Washington, DC, Philadelphia, New York City, Stamford, New Haven, and Boston.

Connecticut also has a separate Amtrak-operated commuter service between New Haven and New London (via Shore Line East). Intercity services consist of the four Amtrak services (Acela, Northeast Regional, Hartford Line [formerly Springfield Shuttle], and Vermonter) and the CT*rail* Hartford Line, operated by the state's service provider Transit America Services, Inc. The State of Connecticut contributes financially to the operation of all services. A summary of the routes in the Connecticut passenger rail system is shown in **Figure 1-4**.

Table 1-2. Summary of Primarily Connecticut-Funded Services

	Length (Route Miles)	Number of Stations	Start-End	Equipment Operated	Number of Tracks
New Haven Line					
New Haven Main Line	73	21	Grand Central to New Haven	Electric	4
New Canaan Line	7.9	4	Stamford to New Canaan	Electric	1
Danbury Line	24.2	7	Norwalk to Danbury	Diesel	1
Waterbury Branch Line	27.1	6	Milford to Waterbury	Diesel	1
CT*rail* Lines					
Shore Line East	49.8	6	New Haven to New London	Electric	2
Hartford Line	62	6	New Haven to Springfield	Diesel	2 [a]

Source: Passenger Rail Timetables. Information on current timetables is available at new.mta.info/schedules, shorelineeast.com/schedules, www.hartfordline.com/fares-schedules.

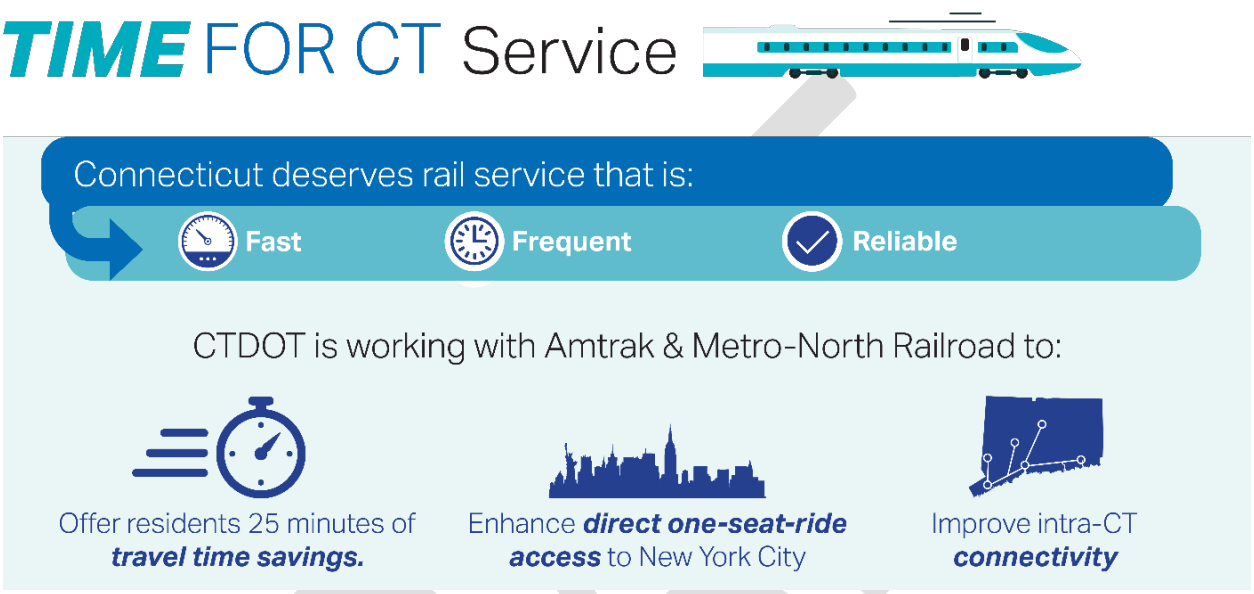
[a] The Hartford Line is mostly doubletracked except for three sections of single track.

1.5.2 Initiatives

The state's major rail initiative is called TIME FOR CT (**Figure 1-5**). TIME FOR CT is an actionable initiative for safe, reliable, and fast train service for Connecticut based on a comprehensive speed and capacity study. The vision includes an $8 to $10 billion comprehensive investment program (introduced June 2021) that, when fully funded, can provide additional capacity and improve needs, frequency, and

reliability of trains throughout Connecticut. Initial benefits vary by line, and they primarily focus on reducing travel times through a targeted series of infrastructure and fleet investments. The projects reduced travel times between New Haven and New York City by up to 10 minutes in 2022 and will further reduce travel times by up to 25 minutes by 2035. In addition to saving time, these investments will also improve system access to jobs, increase resiliency to climate change, and through mode shift, decrease transportation emissions generated within Connecticut.

Figure 1-5. TIME FOR CT Service Goals



1.5.3 Plans, Studies, and Executive Orders

Several plans and studies have been undertaken since the completion of the previous state rail plan that evaluate opportunities to improve system performance, understand the needs and deficiencies of the system, and help to expand mobility.

New Haven Line Capacity and Speed Analysis Study (2021)

The *New Haven Line Capacity and Speed Analysis Study* provides a complete assessment of the line's rail infrastructure, equipment, and service plans to identify opportunities to create a more dynamic commuter rail network (CTDOT 2021b). The study includes a comprehensive look at the commuter rail travel market in southwestern Connecticut and both the role and capability of the New Haven Line to service that market. The Hartford Line and Shore Line East were also studied as their connectivity to the New Haven Line represents a key component of the Connecticut rail network. The study contains recommendations for both near-term and long-term schedule, infrastructure, and equipment enhancements to better serve the needs of the Connecticut rail travel market.

Connecticut's Statewide Long-Range Transportation Plan 2018-2050

CTDOT created this plan in 2018 as a framework for near- and long-term decision-making within CTDOT (CTDOT 2018). This plan identifies funding needs and policies to accomplish ambitious goals and objectives for a 32-year time horizon. It covers all modes: highways and bridges, freight and passenger rail, ports and waterways, aviation, trucking, public transportation, and non-motorized transportation. An extensive outreach campaign from public and private sector partners and communities throughout

the state was instrumental in helping to develop the plan. The plan identifies roughly $100 billion in transportation needs for all modes, emphasizing preservation of the existing system.

Transportation Capital Infrastructure Program Annual Capital Plan Report (2021)

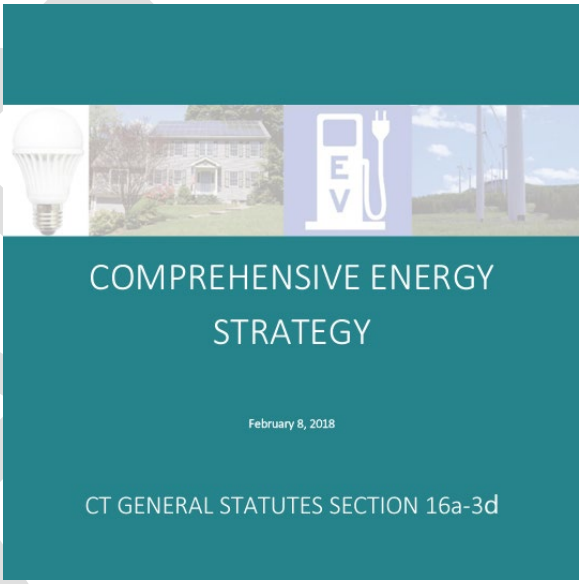
The Annual Capital Plan Report is updated each year. The latest report covers the 2021 Capital Infrastructure Program (for state advertised and administered contracts) (CTDOT 2021c). It outlines capital investments for the following 5 years, in this case 2022 to 2026. It covers all modes and describes CTDOT's plan to address critical transportation needs and the current challenges of maintaining aging transportation infrastructure. Due to the Bipartisan Infrastructure Law, and an increase in federal funding of $1.6 billion, this plan outlines unprecedented investments in the state's transportation infrastructure, including bringing rail assets into a state of good repair.

Connecticut Comprehensive Energy Strategy (2018)

First published in 2013, the Comprehensive Energy Strategy (CES) is prepared by the Department of Energy and Environmental Protection (DEEP) to advance the state's goal to create a future with less expensive, cleaner, and more reliable energy for residents and businesses (DEEP 2018). This document is required to be updated every 4 years to aid in assessing and planning for the state's energy needs. The most recent CES was published in 2018 and contains eight comprehensive energy strategies. Two of the strategies directly pertain to transportation:

- **Strategy 6**: Reduce transportation GHG emissions by accelerating adoption of low- and zero-emission vehicles and strengthening alternative-fueling infrastructure.
- **Strategy 7**: Increase mobility, connectivity, and accessibility by advancing smart growth, mixed-use transit-oriented development (TOD), and innovative transportation partnerships.

Figure 1-6. Connecticut Energy Strategy Cover



Source: DEEP 2018

Connecticut Statewide Freight Plan (2017)

The CTDOT Statewide Freight Plan reviews the state's multi-faceted and interconnected freight system and sets a direction for policies, technologies, and investments that will ensure a thriving future freight system (CTDOT 2017b). The Freight Plan considers highway, freight rail, aviation, port, and waterway needs. The Freight Plan also describes the pipeline system but does not provide investment or policy recommendations for it. The Freight Plan is prepared in accordance with, and pursuant to the FAST Act (Pub. L. No. 114-94). The Plan is required for Connecticut to receive funding under the National Highway Freight Program (23 U.S.C. 167) and must comprehensively address the state's freight planning activities and investments.

The Freight Plan is a long-term (25-year) perspective on the needs and issues of the freight transportation system. How and where freight move depends on many factors, including infrastructure condition and capacity, economic conditions and competitiveness, consumer demand, government regulations, transport technologies, international politics, and trade policies. These factors are in flux,

making long-term predictions and recommendations more useful as a guide for establishing general priorities than as specific prescriptions.

Updates to the Freight Plan began in spring 2021 and will be submitted to FHWA in December 2022.

Central Connecticut Rail Study (2017)

The Central Connecticut Rail Study (CCRS) focuses on the Central Connecticut rail corridor between Waterbury and Berlin. It is a needs and feasibility study, and includes an examination of existing freight rail service, the existing/potential market if track improvements are made, and how this could improve the overall freight rail market in Connecticut and its connectivity to the region. The study assesses existing rail freight activities and the potential for growth of the industry within the Study Corridor. In addition, the study evaluates the feasibility of implementing passenger rail or new bus transit service within the corridor (CTDOT 2017a).

Waterbury Branch Line Master Plan (Ongoing)

The Waterbury Branch Line Master Plan is currently under development. It will identify existing conditions on the Waterbury Branch Line, including a description of existing conditions and challenges, and an assessment of the rail infrastructure, equipment, and service plans required to create a more attractive and dynamic commuter service on the rail line. This plan will include a strategy to modernize the equipment operated on the line, expand commuter rail service to 30-minute headways in the AM peak and PM peak, identify new rail storage and maintenance facility sites to be located along the Waterbury Branch Line as well as other improvements. The plan will provide near-term, mid-term, and long-term recommendations for improvements with the focus on improving the rail infrastructure, equipment (rail cars and locomotives), and service levels.

Eastern Connecticut Rail and Transit Feasibility Study (2022)

In the spring 2021, the Connecticut General Assembly approved Committee Bill 5423 requesting that CTDOT conduct a feasibility study of the Shore Line East (section 20) regarding the following items: (1) extending the Shore Line East rail line to the State of Rhode Island, (2) establishing a new passenger rail service from the City of New London to the City of Norwich, (3) establishing a new passenger train station in the Town of Groton and the Borough of Stonington, and (4) extending other ground transportation systems in the eastern region of the state and providing interconnection between such systems and rail lines. The study was initiated in February 2022 and is expected to be complete by 2024.

Environmental Impact Statements for Proposed/Built Rail Projects

The Walk Bridge Program consists of several inter-related rail and infrastructure projects in Norwalk, Connecticut. The centerpiece of the program is the replacement of the 125-year-old Norwalk River Railroad (Walk) Bridge. The new bridge enhances the safety and reliability of rail service, offers operational flexibility, and provides for increased capacity and efficiencies of rail transportation along the NEC, while maintaining and improving navigational capacity and dependability in the Norwalk River.

The environmental review for the Walk Bridge Replacement Project was conducted in accordance with the requirements of the National Environmental Policy Act (NEPA) and the Connecticut Environmental Policy Act (CEPA). Under this joint NEPA/CEPA process, a combined Environmental Assessment/Environmental Impact Evaluation (EA/EIE) was prepared (FTA and CTDOT 2016). The goal of the environmental review was to promote informed decision-making by considering a range of reasonable alternatives and facilitate analysis which eventually led to the selection of the preferred alternative, the 240' Vertical Lift Span Bridge. Project design on this alternative was also completed.

Connecticut Executive Order 3

Signed in September 2019, this executive order includes climate change mitigation and adaptation provisions (Governor Lamont 2019). Executive Order 3 directs the following:

- Expands the responsibilities of the Governor's Council on Climate Change (GC3) to include assessment and preparation for climate change impacts in areas such as infrastructure
- Requires state agencies to include climate change mitigation and adaptation strategies into their relevant planning processes for the state to achieve a 45 percent GHG reduction by 2030
- Directs the Connecticut DEEP to evaluate pathways to transition to a 100 percent clean energy grid by 2040

Under these directives, each state agency is required to create a vulnerability assessment for assets and operations while incorporating resilience efforts into state operations and investments.

Connecticut Executive Order 21-3

In December 2021, Executive Order 21-3 was signed by the Governor (Governor Lamont 2021). This executive order calls for 23 actions supporting 30 plus recommendations proposed by the Governor's Council on Climate Change and directs State executive branch agencies to take significant actions within their authority to reduce carbon emissions. The actions include those that cover clean transportation as well as the first state government assets and operation climate vulnerability assessment. Specifically, the Executive Order 21-3 directs CTDOT to set a 2030 vehicle miles traveled (VMT) reduction target and develop a plan of investments to influence the reductions.

Additional Studies and Plans Considering Rail in Connecticut

Several other ongoing planning efforts are being conducted by USDOT, CTDOT, Connecticut MPOs, neighboring states, and regional stakeholders. These efforts are listed in **Appendix G**.

1.6 COVID-19

Beginning in 2020, the COVID-19 pandemic touched virtually every aspect of life in Connecticut and the nation. Starting with the initial first wave of infections, public transportation ridership plummeted, supply chains were disrupted, and social norms transformed. Connecticut's rail system – both passenger rail and freight – has not been spared from this unprecedented event.

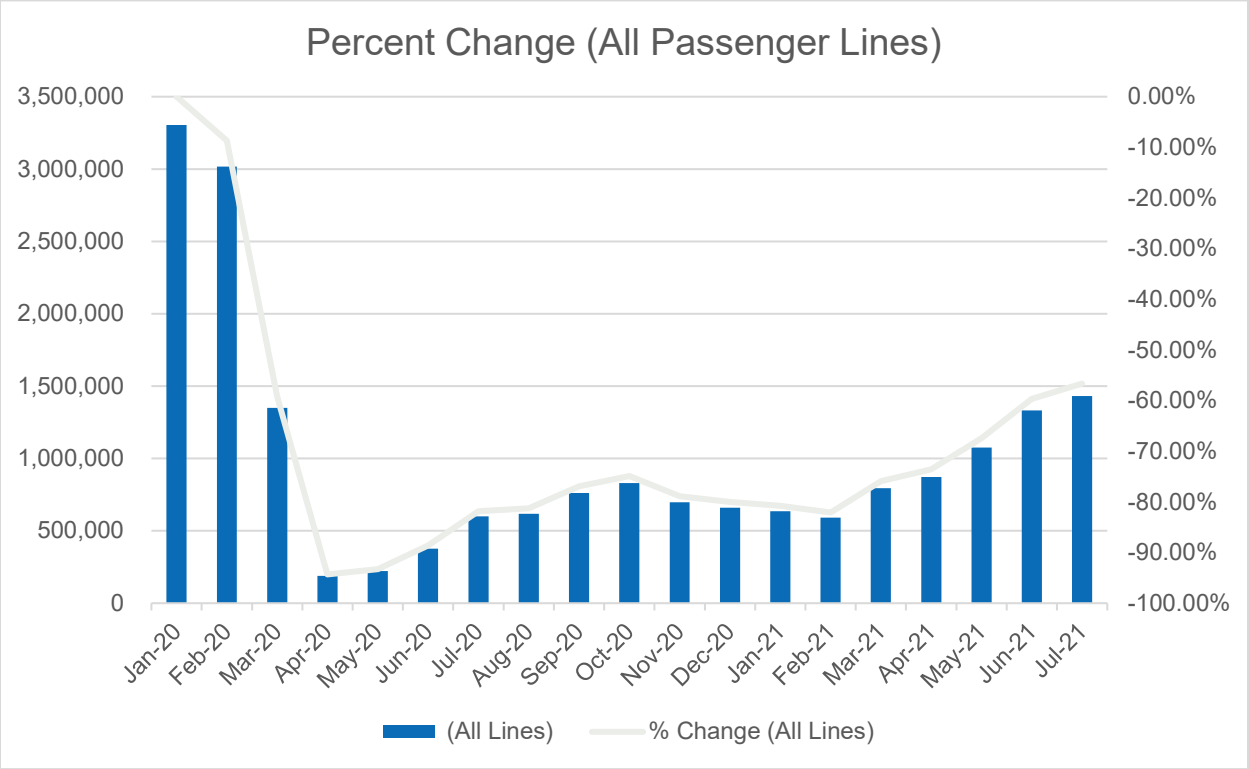
The public health status of Connecticut is critical context for understanding the impacts of COVID-19 on the rail system. As of the drafting of this report, Connecticut is a national leader in the proportion of its population that is fully vaccinated, at over 95 percent having received the first vaccine dose as of August 2022 (Centers for Disease Control [CDC] 2022). The increasing vaccination rates in Connecticut have been accompanied by a decreasing number of infections, hospitalizations, and deaths, though that number increased modestly with the rise of different variants.

The sweeping initial measures taken to contain COVID-19, as well as the ongoing efforts to contain the spread of new and potentially more potent variants will continue to have disruptive impacts for the coming months and years. As the pandemic transitions into an endemic, some travel patterns have reverted to or exceeded pre-pandemic status (**Figure 1-7**).

The modes used to take these trips have changed in a variety of ways. Connecticut has seen a gradual return of rail ridership, but is still below the 2019 level. The severe travel restrictions taken in spring of 2020 to reduce the spread of infection drove rail ridership to just a fraction of what it was before the pandemic (**Figure 1-7**). In response to significantly lower ridership, CTDOT reduced service levels, using

this period as an opportunity to accelerate improvements along different lines, including track and signal improvements along the Waterbury Branch Line.

Figure 1-7. Change in Connecticut Rail Ridership (January 2020 to July 2021)



Source: CTDOT

Since spring 2020, the New Haven and Hartford Lines have recovered approximately 53 and 72 percent of their ridership, respectively, while the Shore Line East remains approximately 72 percent below its pre-pandemic ridership. As ridership has slowly started to rebound, CTDOT has increased service along the New Haven and Hartford Lines, and as of summer 2022, service is close to pre-pandemic levels. Shore Line East service continues to operate on a reduced schedule.

Ridership declines have also had negative impacts on fare revenue, though that was offset by the multiple rounds of Coronavirus impact funding released by the federal government. Connecticut was apportioned nearly $480 million in 2020 through the Coronavirus Aid, Relief, and Economic Security (CARES) Act funding and an additional $437 million in 2021 through American Rescue Plan Act (ARPA) funding. These infusions of funding helped to make up for the dramatic loss of farebox revenues, which typically pay for nearly 60 percent of commuter rail operating costs.

However, future rounds of federal funding are unclear. Additionally, a shift away from in-person working could permanently change ridership. If fare revenue and ridership remain depressed for several years, then the ability to continue providing the same level of passenger rail service could be jeopardized.

The freight rail system in Connecticut may benefit from some of the market impacts of the pandemic in the short term due to the composition of its main shipping products. Pandemic-related supply chain disruptions and strong consumer demand caused steel prices to rise approximately 200 percent.[2] Given

[2] Prices were a low of $460 per ton in 2020 and $1,500 per ton in May 2021.

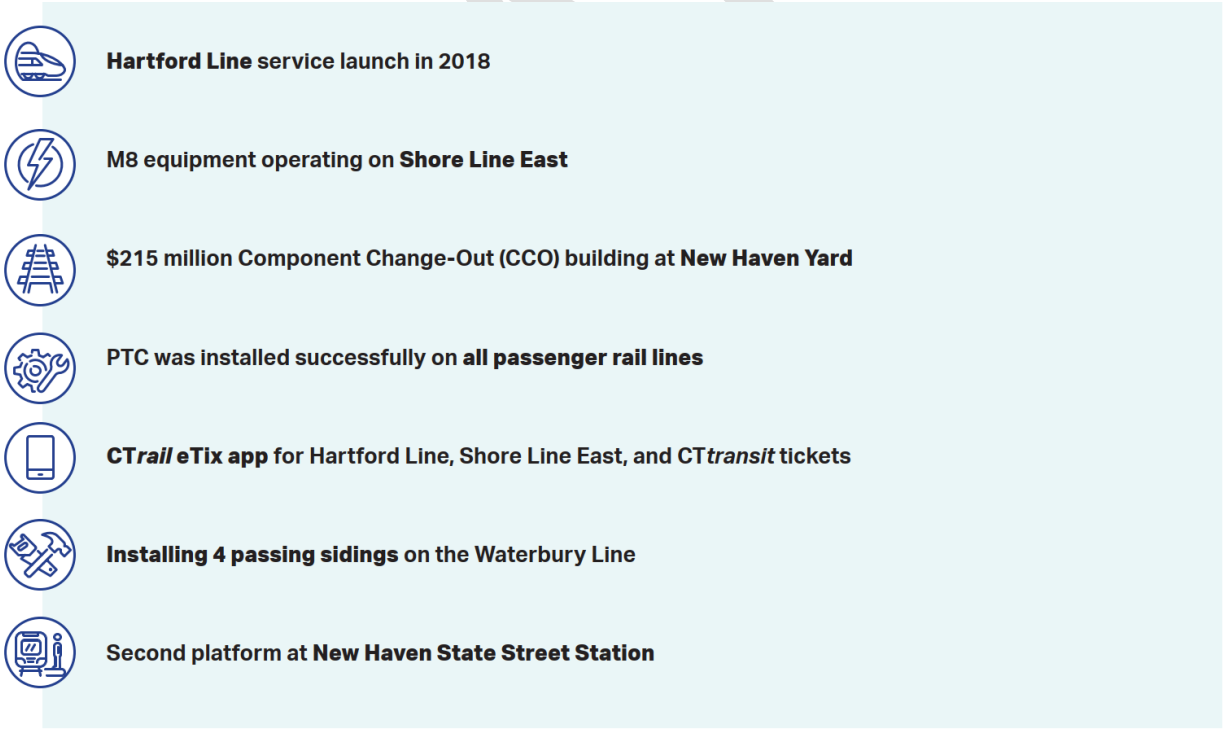
that approximately 415,000 tons of primary metal products, worth about $23.2 million, were shipped via rail into Connecticut in 2019, there is a likelihood that freight companies benefitted from these higher prices. This noted, the pandemic may not have an impact on the long-term trends on primary goods shipped into the state via rail; price increases on commodities often are corrected for in the long run through substitutions, increases in production, and/or decreases in consumption.

While the long-term impacts of COVID-19 on rail in Connecticut remain undetermined at this time, CTDOT continues to monitor and respond to current trends as observed. Aside from altered ridership levels, some early observations include evolving trip purpose patterns, which appear to potentially be shifting from predominantly commuting to reflect more discretionary trips in a regional rail network. As CTDOT continues to plan for future investments in the rail system, it anticipates using scenario planning tools to project and assess the impact of different variables affected by the pandemic on the long-term outlook of rail in Connecticut.

1.7 Rail Accomplishments Since Last Plan

Since the completion of the 2012-2016 State Rail Plan notable accomplishments and investments have benefited the state's rail systems for both freight and passenger services. Some of these accomplishments include launching the Hartford Line intercity passenger service in 2018, upgrading the Shore Line East to zero-emission M8 trains, and investing in New Haven Yard (**Figure 1-8**).

Figure 1-8. Passenger and Freight Accomplishments Since Last Plan



2. The State's Existing Rail System

The rail system in Connecticut consists of 629 miles of active rail corridors. Three passenger rail lines operate in the state: the CT*rail* Hartford Line, the CT*rail* Shore Line East, and the MTA Metro-North Railroad New Haven Line. Amtrak provides intercity passenger service along each of these lines. Several freight railroads, ranging from a large Class I railroad to shorter regional and local services, provide for the shipment of goods. Safe, reliable, and efficient passenger and freight rail infrastructure provides opportunities to divert the movement of people and goods from cars and trucks to rail, saving fuel and reducing emissions.

This chapter is comprised of three main sections:

- 2.1 Description and Inventory
- 2.2 Trends and Forecasts
- 2.3 Needs and Opportunities

2.1 The State's Existing Rail System: Description and Inventory

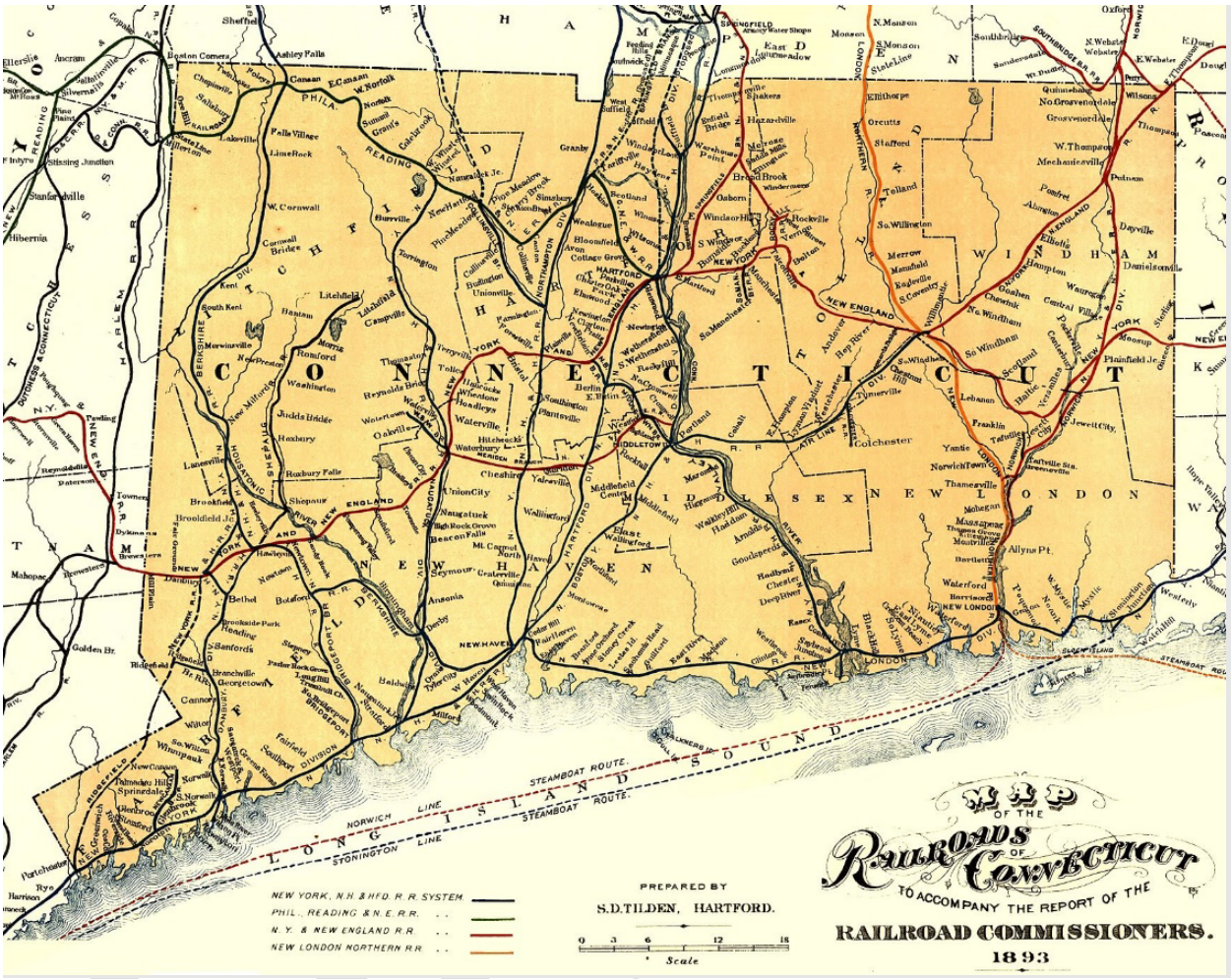
Section 2.1 describes existing conditions including:

- Existing Systems, Services, Operating Objectives, and System Performance
- Intermodal Connections (Passenger and Freight)
- Intercity Passenger Rail Objectives
- Intercity Rail Performance Evaluation
- Public Financing for Rail Projects and Services
- Safety and Security Programs
- Economic and Environmental Impacts

2.1.1 Existing Systems, Services, Operating Objectives, and System Performance

The State of Connecticut has a historic (**Figure 2-1**) and extensive rail system that many residents and visitors rely on every day.

Figure 2-1. Historic Map of the Railroads of Connecticut in 1893



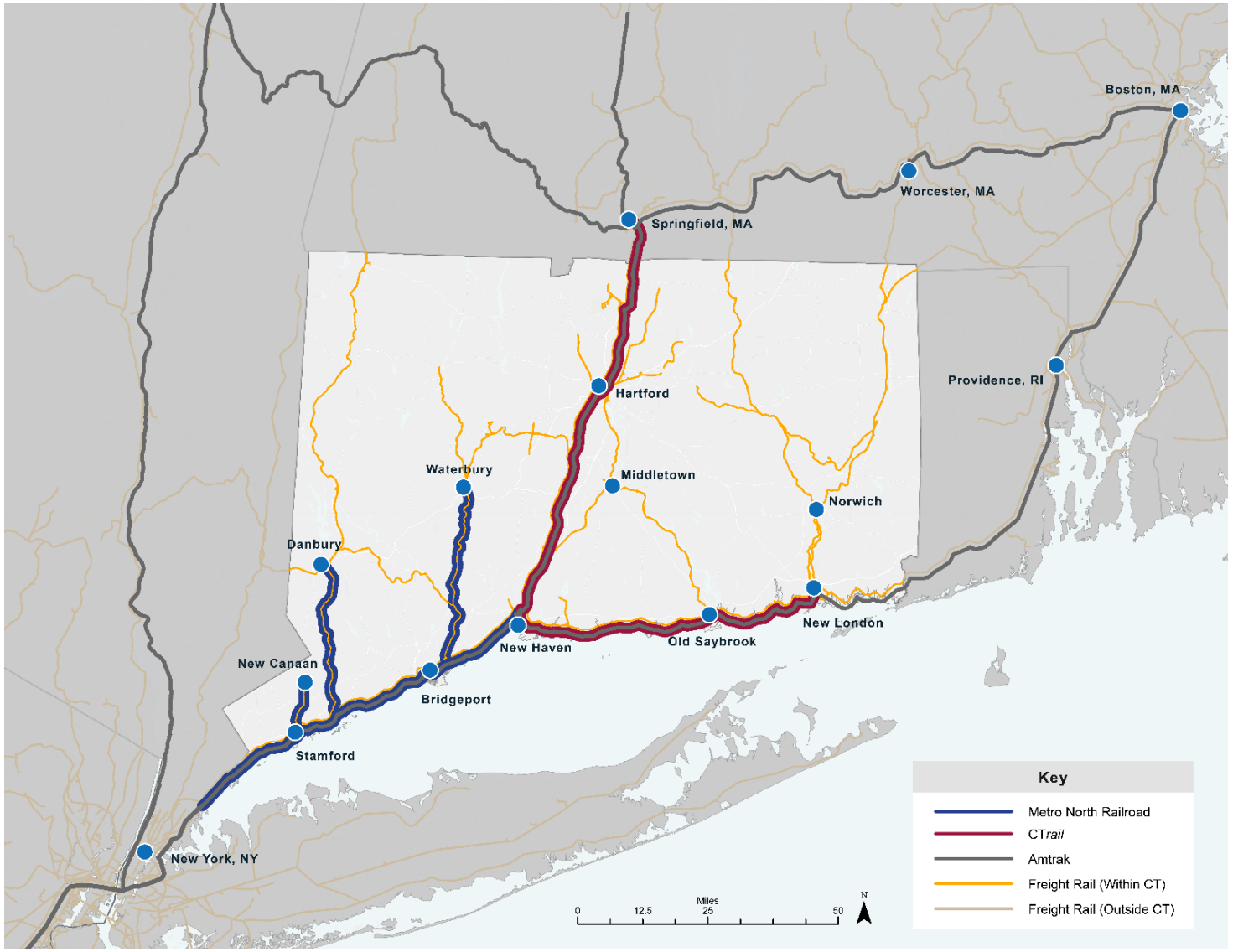
Source: S.D. Tilden, Hartford (1893)

Existing Systems

The Connecticut rail system consists of active rail corridors utilized by freight, intercity passenger, tourism, and commuter systems.[3] The lines are chiefly owned and operated by private rail carriers, Amtrak, and the State of Connecticut (**Figure 2-2**). There are 40 rail line branches covering a total of 629 miles of track. For additional details, see **Appendix H**.

[3] A railroad system consists of two elements: the physical tracks/corridor (the line) and the railroad services that operate on the tracks (the operators). In some instances, a railroad both owns and operates on a line. In other instances, a railroad may reach an agreement to only operate on a separate railroad's line.

Figure 2-2. Connecticut's Rail Network



Source: AECOM

Freight Systems

Connecticut's rail freight industry is operated by the private sector for profit and for public benefit under federal common carrier regulations. Connecticut has approximately 581.9 miles of freight railroads, with CTDOT owning 40 percent of all right-of-way mileage (**Table 2-1**). This percentage includes five freight rail routes. Additionally, Connecticut's 9 freight operators own a combined 200.1 right-of-way miles. For a complete, detailed list of the different freight lines within Connecticut and their operators, see **Appendix A**.

Table 2-1. Freight Rail Right-of-Way Miles

Type	Owner	Description	Right-of-Way Miles
Public	Federal Amtrak-Owned	Shore Line/Hartford Line	122.5
Public	CTDOT	New Haven Line and Feeder Lines	128.2
Public	CTDOT	Freight Rail Lease Agreements	129.1
Public	City of Bristol	Freight Rail Lease Agreements	2.0
Private	Freight Railroad Companies	Privately Owned	200.1
		Total	**581.9**

Source: CTDOT Rail Ownership Map, 2013

Rail tracks are maintained at FRA standards (**Table 2-2**). As of 2020, tracks in Connecticut ranged in FRA classification from Class 7 (maximum allowable operating speeds of 125 miles per hour (mph) for passenger trains) along the electrified Amtrak NEC route between New Haven and Boston to Class 1 (maximum allowable operating speeds of 15 mph for passenger trains and 10 mph for freight trains) on some freight line corridors. Lines with limited freight service are usually maintained to FRA Class 1 or 2 standards, while passenger lines owned by CTDOT or Amtrak are maintained at Class 3 through Class 7. Connecticut's freight-only lines are dispatched using FRA-approved methods of operation in non-signaled territory.

Major yards and facilities for freight operations in Connecticut include New Haven (CSX Transportation [CSX], Providence & Worcester Railroad [P&W]), Hartford (Connecticut Southern Railroad [CSO], Central New England Railroad [CNZR]), Middletown (P&W), Willimantic (New England Central Railroad [NECR], P&W), Plainfield (P&W), Plainville (Pan Am Southern Railway [PAS]), and Canaan (Housatonic Railroad Company [HRRC]).

Table 2-2. FRA Classifications

Classification	Maximum Allowable Speed (miles per hour)	
	Freight	Passenger
Class 1	10	15
Class 2	25	30
Class 3	40	60
Class 4	60	80
Class 5	80	90
Class 6	110	110
Class 7	NA	125
Class 8	NA	160
Class 9	NA	200

Source: CTDOT 2021

Intercity Passenger Rail Systems

Connecticut's intercity passenger rail system mostly consists of the electrified NEC, a larger regional network of rail that connects Boston to Virginia through Amtrak, and commuter rail services. The main line of the Amtrak NEC is 457 miles long traversing major cities in the northeast region including Washington, DC, Baltimore, Philadelphia, New York City, and Boston (**Figure 2-3**). With the addition of connecting corridors to Harrisburg, Pennsylvania; Springfield, Massachusetts; Albany, New York; and Richmond, Virginia, the NEC spans a total of 899 miles. Amtrak owns, maintains, and operates the NEC between Boston and New Haven, in addition to operating service on the Connecticut/New York-owned New Haven Line between New Haven and New Rochelle, New York.

Figure 2-3. Full Amtrak Northeast Corridor

Source: AECOM

In the state context, the NEC is divided into two sub-corridors: the main NEC route running east-west along the coastline and another inland route running north-south, through central Connecticut.

- Connecticut owns 47 miles of the Boston-Washington NEC main line corridor, known as the New Haven Line.[4] The New Haven Line is mostly a four-track railroad, but is reduced to three in certain areas. It is maintained to FRA Class 4 standards and permits maximum passenger train speeds of up to 75 mph. The NEC on the coastline east of New Haven has FRA Class 7 designation, supporting passenger rail speeds of up to 125 mph in certain locations on Shore Line East in Connecticut.
- The inland New Haven-Hartford-Springfield (NHHS) corridor is owned by Amtrak and is mostly double-tracked and is used for Hartford Line service (one of the new services operating since completion of the last State Rail Plan). The Hartford Line has FRA Class 6 designation, supporting passenger rail speeds of up to 110 mph in certain locations.

Additionally, the entire NEC has centralized traffic control (CTC) signalization, cab signals, and positive train control (PTC).

[4] This line is also used by the New Haven Line commuter service.

Commuter Rail Systems

Shore Line East

Shore Line East is an Amtrak-operated service running 50.6 miles of Amtrak-owned track between New London and New Haven.[5] The line has electrified propulsion capabilities and CTDOT recently finished upgrades that allow its current electric fleet of self-propelled M8 vehicles (**Figure 2-4**) to operate on the line. The line has two, continuously welded rail tracks and it is maintained at FRA Class 6 and 7 track standards, meaning top speeds are either 110 mph or 125 mph. This noted, current Shore Line East operating speeds, due to M8 equipment requirements, are 90 mph.

Figure 2-4. M8s in Bridgeport

Source: Carl Talley

New Haven Line

The New Haven Line is a Metro-North Railroad-operated service consisting of one main service (New Haven Line[6]) and three feeder services that operate on several Connecticut-owned lines (**Table 2-3**). Together, these lines allow people to travel from southwest Connecticut towards New York City.

[5] This track is part of the larger Amtrak NEC.

[6] The commuter rail service and the physical line on which it operates have the same name (New Haven Line). The New Haven Line is part of the large Amtrak NEC.

Table 2-3. Summary of New Haven Line Services

Line	Type	Distance (miles)	Line Owner	Line Operator	End Point	Track Class (maximum)	Speed (mph)
New Haven Line	Main Line	46.9	CTDOT	Metro-North Railroad	Grand Central/ Penn Station [a]	4	75
New Canaan Line	Feeder Line	7.9	CTDOT	Metro-North Railroad	Stamford	3	60
Danbury Line	Feeder Line	24.2	CTDOT	Metro-North Railroad	South Norwalk	3	60
Waterbury Line	Feeder Line	27.1	CTDOT	Metro-North Railroad	Bridgeport	3	60

Source: Carl Talley
[a] Penn Station access occurs via the New York Hell Gate Line.

All lines use CTC signal systems with cab signals and PPTC. An upgrade program along the Waterbury Branch Line with four new sidings and the new signals became fully operational during 2022.

For the New Haven Line, Metro-North Railroad manages the railroad maintenance of way (MOW) for CTDOT. Metro-North Railroad has condition measures for evaluating rail track structure. Metro-North Railroad bases these measures on a cyclical program for replacement of track, ties, and surfacing. Rail replacement on tangent track and curves one degree and under have a 40-year replacement cycle; track with curves over one degree has a 20-year replacement cycle. Metro-North Railroad has a 7-year renewal program for maintaining and replacing existing ties on the Main Line and a 10-year renewal program for addressing existing ties on branch lines. There is a 30-year replacement schedule for new wood ties and a 50-year replacement schedule for new concrete ties. On average, 50 percent of the track needs to be resurfaced every 4 years. Metro-North Railroad tracks run over 217 bridges, including 5 movable bridges: Cos Cob (Greenwich), Walk (Norwalk), Saga (Westport), Peck (Bridgeport), and Devon (Stratford).[7] A major capital project is underway to replace the Walk Bridge over the Norwalk River. The project purpose is to restore and eventually replace the existing deteriorated bridge with a resilient bridge structure that enhances the safety and reliability of rail service, offers operational flexibility and ease of maintenance, and provides for increased capacity and efficiencies of rail transportation along the NEC, while maintaining or improving navigational capacity and dependability in the Norwalk River.[8]

Inactive or Abandoned Rail Systems

Connecticut's rail network was significantly compromised by wholesale rail line abandonments during the 20th century. This practice was essentially halted by CTDOT's policy of purchasing virtually all rail corridors that became available, and either rail banking them or land banking them. Rail banking involves

[7] Both the Saga and Devon Bridge are slated for improvements and are in various NEPA/design/permitting stages.
[8] The FTA and CTDOT published the Environmental Assessment/Section 4(f) Evaluation/Environmental Impact Evaluation (EA/EIE) on September 6, 2016. This document includes a more detailed description of the purpose and need.

the acquisition of the tracks, structures, etc., as well as the right-of-way, whereas land banking involves the acquisition of only the rail right-of-way with tracks removed but bridge structures in place. The goal of rail banking and land banking is to preserve contiguous portions of rail right-of-way for future transportation use.

CTDOT Office of Property Management acquires abandoned rail lines when they connect major urban centers, are part of a line that connects urban centers, or have potential for future freight use. **Table 2-4** contains the rail line segments not in service, which should be preserved because there may be future opportunities for freight service development.

Table 2-4. Out of Service Freight Lines

Rail Line	Owner	Length (miles)
Southbridge Secondary	Genesee & Wyoming	2
Manchester-Willimantic	State	19.6
Portland Willimantic	State	22.7
Willimantic-Putnam	State	37.6
Middletown-Old Saybrook	State	8
Plainville-Suffield	State	22.3
Farmington-Canton	State	8.3
Hamden-Cheshire-Southington	State/CSX	14.2
Plainfield-Sterling	State	6.8
Torrington, Watertown, Cheshire, Plainville	CTDOT	Various

Source: CTDOT Rail Ownership Map, 2013

Existing Services

The following sections summarize freight and passenger rail services operating in the state.

Freight Service

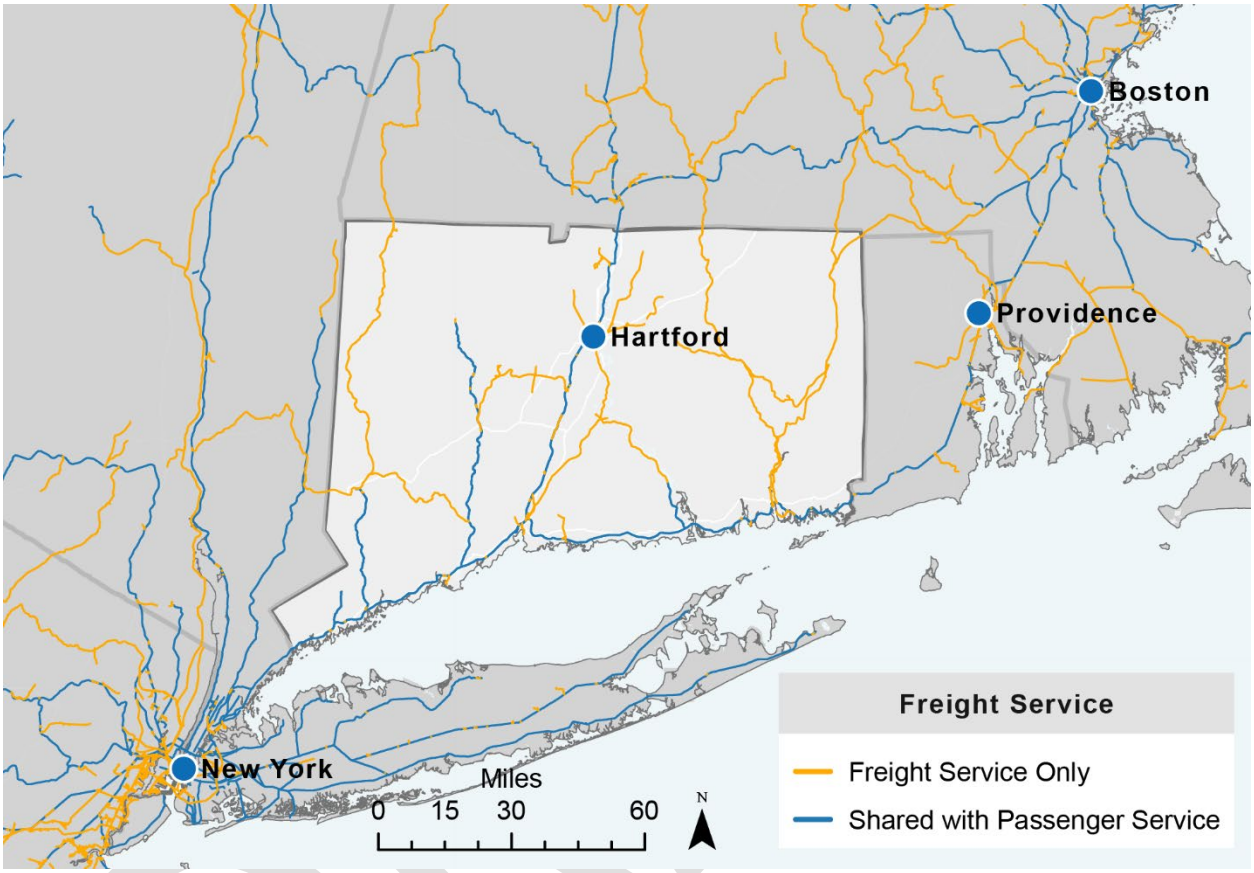
There are nine private freight railroad companies operating in Connecticut and they originated 1.5 million tons and terminated 1.4 million tons of freight in 2019 (**Figure 2-5**). The primary freight commodities handled by Connecticut's railroads include non-metallic minerals, food and consumer products, waste and scrap, primary metals, lumber and wood, and petroleum products. Railroads have different freight capacities and while the national standard is 286,000 (286K) pound rail cars, the majority of Connecticut's freight system does not meet the 286K standard, limiting the types and quantities of goods shipped through the state. For a more detailed list of specific railroads and their clients, see **Appendix A**.

Branford Steam Railroad

Operating over seven route miles between North Branford and Pine Orchard on Long Island Sound, the Branford Steam Railroad (BSRR) is a private industrial railroad. It serves the Tilcon Connecticut stone quarry in North Branford. Traffic consists of about 7,000 carloads of construction aggregate outbound from North Branford to an interchange with the P&W on Amtrak's NEC in Branford and at a barge transload facility in Pine Orchard. Operations on the railroad's route are limited to 10 mph. The carload

weight limit on the line is 286,000 pounds. The railroad has a repair shop, a pit scale, and a motion scale in North Branford. Despite its name, the railroad operates with diesel-electric locomotives.

Figure 2-5. Freight Service in Connecticut



Source: AECOM

Central New England Railroad

CNZR is a Class III railroad[9] operating two sections of track: the 8.7-mile former Griffin Secondary from Hartford Union Station northwest to industrial areas in Bloomfield and 4.4 miles of the Armory line from East Windsor Hill to the Broad Brook vicinity. The remaining 8.8 miles of the Armory line to the Massachusetts state line are out of service. Traffic consists of 2,400 carloads of fertilizer and other agricultural products, lumber and building products, and construction debris for recycling. The railroad interchanges traffic with CSO in East Windsor Hill and with Pam Am Railways (PAR) in Hartford. Operations on the railroad's routes are limited to 10 mph. The carload weight limit on the line is 263,000 pounds.

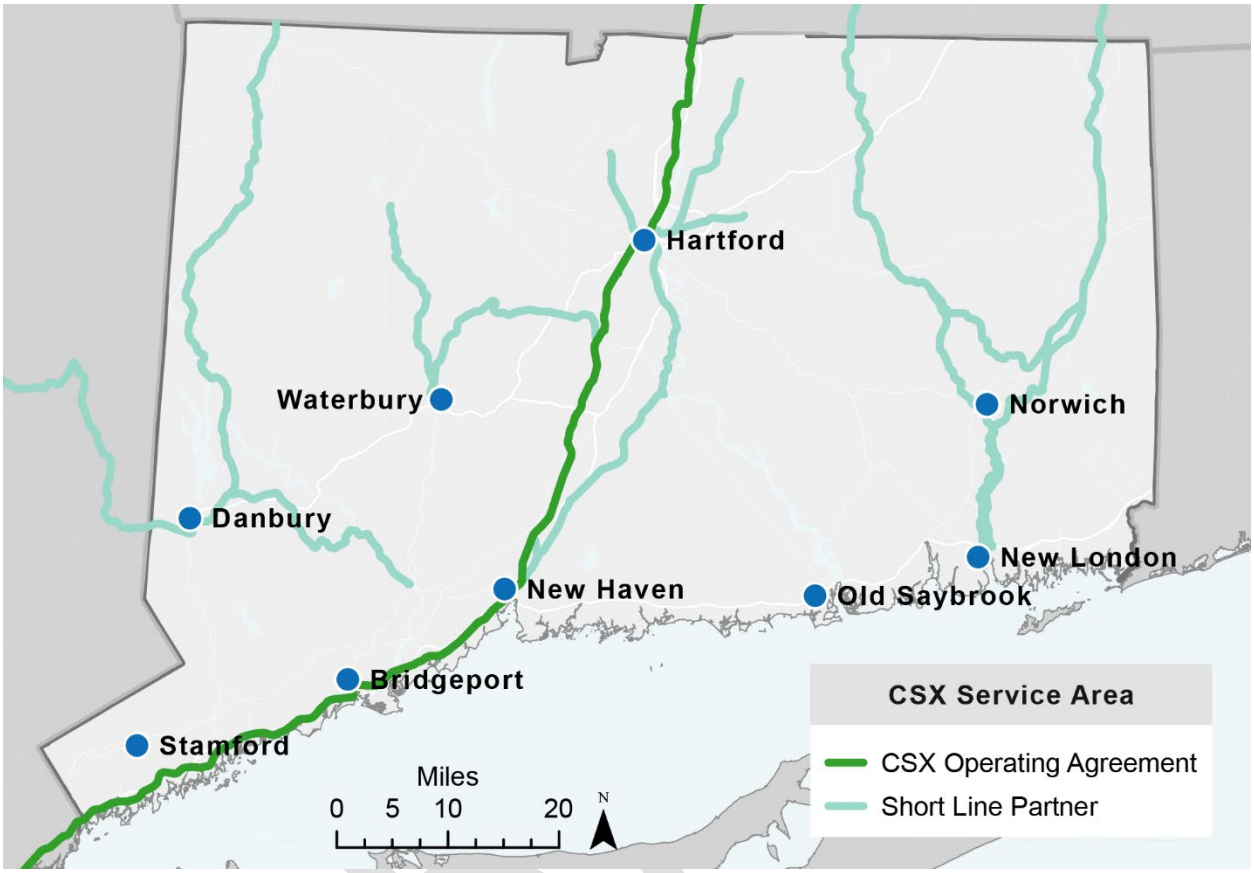
CSX Transportation

CSX operates over a 21,000 route-mile rail network (**Figure 2-6**). CSX serves 23 states, the District of Columbia, and the Canadian provinces of Ontario and Quebec. It serves every major population center east of the Mississippi River, including Atlanta, Boston, New York, and Chicago, among others. In

[9] The FRA classifies freight railroads based on their total revenue. This classification uses roman numerals and is separate from FRA track classification.

Connecticut, CSX ships products like lumber, municipal and construction waste, plywood, limestone, and wood pulp.

Figure 2-6. CSX Service Area



Source: CSX

In 2022, CSX acquired PAR, the Northeast's largest regional railroad along with PAS, a subsidiary. With operations in Maine, New Hampshire, Massachusetts, Vermont, Connecticut, New York, and Canada, PAR interchanges traffic with 15 railroads throughout its network. The combined system, including haulage rights, totals 1,700 route miles. Connecticut route mileage, apart from PAS, is 14 miles. Primary commodities handled include grain, coal, sand and gravel, food products, lumber, paper and pulp, chemicals and plastics, petroleum, processed minerals, metals, scrap metal, finished automobiles, and intermodal trailers and containers.

Prior to 2022, PAS was a freight railroad jointly owned by PAR and Norfolk Southern Railway (NS). Under the PAS operating structure, the Springfield Terminal Railway provides all rail services for the joint venture. PAS operates in Connecticut on 59 route miles over the Amtrak Hartford Line between Springfield and the Waterbury Branch in Berlin; then on the 24-mile Waterbury Branch between Berlin, Plainville, and Waterbury; and on its 3-mile Canal Branch (also known as Canal Industrial Track) between Southington and Plainville. This Class II railroad's traffic consists of 2,500 carloads of steel, liquid propane gas, lumber, plywood, dispersant base, construction and demolition debris, and scrap. The railroad interchanges traffic with the Naugatuck Railroad (NAUG) in Waterbury. Operations on the railroad's routes are limited to 10 mph. The carload weight limit is 263,000 pounds. The railroad has a switching yard in Plainville.

Housatonic Railroad Company

A Class III railroad, the HRRC operates over two lines: the 50-mile Berkshire Branch between Danbury and North Canaan and the 32-mile Maybrook Branch between Derby and Danbury (**Figure 2-7**). Traffic consists of 7,500 carloads of lumber, plastic, wood pulp, and alcohol inbound as well as limestone and construction debris outbound. HRRC interchanges traffic with the PAS in Derby and with P&W in Danbury via the latter railroad's overhead rights. Maximum operating speeds on the lines vary between 10 mph and 25 mph. The carload weight limit is 286,000 pounds. Trains are dispatched from the Dispatching and Operations Center in Canaan, and equipment is maintained at the Engine Repair and Maintenance Facility also in Canaan. The railroad has a lumber distribution facility in Hawleyville.

Figure 2-7. HRRC Locomotive

Source: Parker Rodriguez

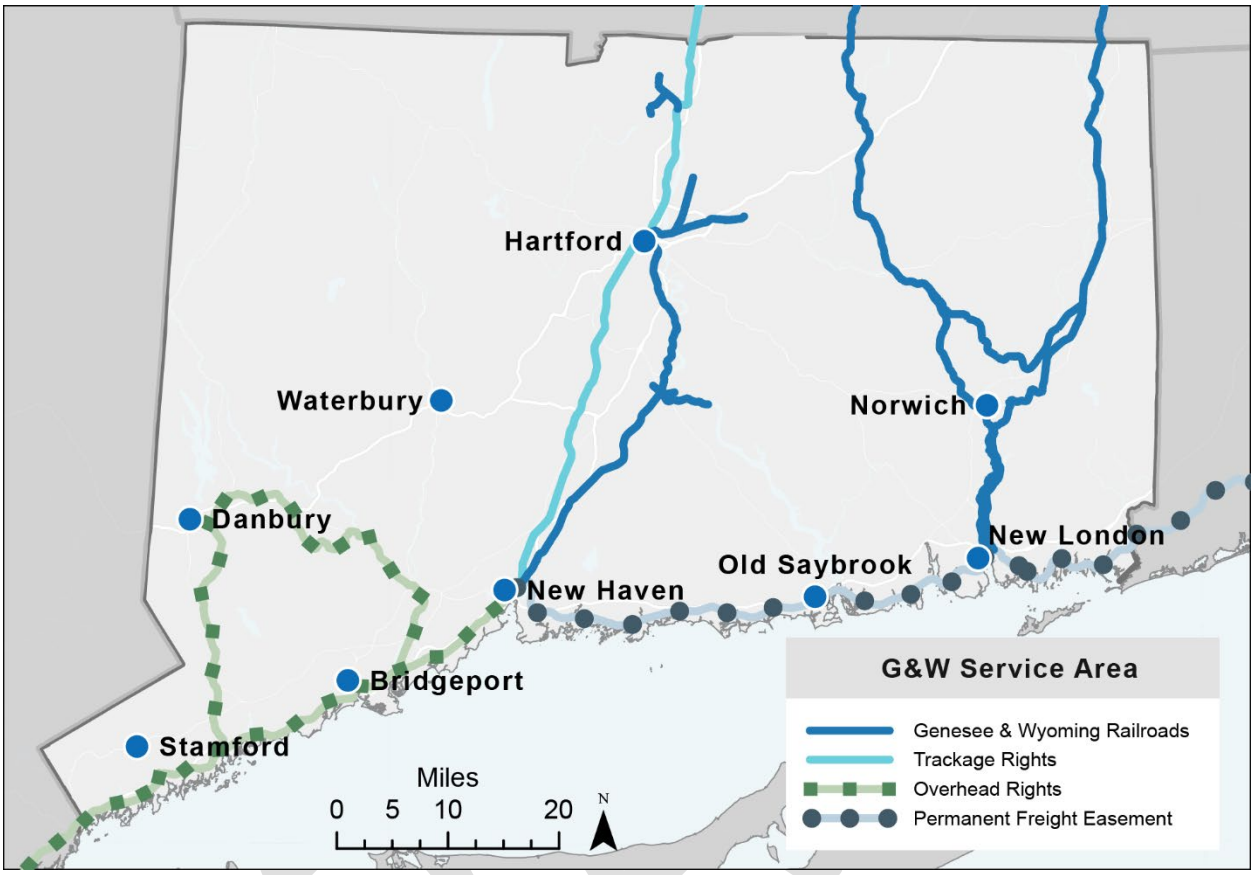
Providence and Worcester Railroad Company

A Genesee & Wyoming Inc. (GWI) subsidiary, P&W is a regional FRA designated Class II railroad operating in Massachusetts, Rhode Island, Connecticut, and New York (**Figure 2-8**). It handles about 18,000 carloads of chemicals, transformers, plastics, steel, oil, minerals and stone, building materials, chemicals, salt, and malt, among other commodities. Mineral and stone shipments make up 66 percent of P&W's business in Connecticut, which is home to 6 out of the railroad's top 11 customers. In Connecticut, P&W interchanges traffic with the NECR in Willimantic and New London; with CSX in New Haven; with the HRRC in Danbury via P&W overhead rights; and with the BSRR on Amtrak's NEC in Branford. The carload weight limit is typically 286,000 pounds. It has classification yards in Plainfield and Willimantic.

Connecticut Southern Railroad

Operating in Connecticut and Massachusetts, CSO is a Class III railroad and a subsidiary of the GWI family of railroads. It operates on the Amtrak Hartford Line and hauls CSX traffic between West Springfield, Massachusetts and CSX's Cedar Hill Yard in North Haven. It owns four short branch lines in central Connecticut: the Manchester Subdivision consisting of 3.6 route miles; the Suffield Subdivision at 2 miles; the East Windsor Subdivision at 6.8 miles; and the Wethersfield Subdivision at 3 miles. Traffic consists of about 18,500 annual carloads of cullet, lumber, lube oil, wood pulp, plastic, construction debris, residual waste, argon gas, carbon dioxide, military equipment, melamine, methyl methacrylate, formaldehyde solution, butanol, and isobutanol. It interchanges traffic with CNZR in East Windsor Hill. Its maintenance shop is in Hartford. The carload weight limit on the lines is 263,000 pounds.

Figure 2-8. P&W Service Area



Source: P&W

New England Central Railroad

Operating in Connecticut, Massachusetts, New Hampshire, and Vermont, NECR is a 384-mile Class II railroad and a subsidiary of the GWI family of railroads. It owns and operates on 61 route miles running north-south in Connecticut between New London and the Massachusetts state line south of Monson. Its traffic consists of about 19,000 carloads of general freight, including lumber and stone products, metals, and chemicals. In Connecticut, it interchanges traffic with P&W in Willimantic and New London. The carload weight limit is 263,000 pounds.

Naugatuck Railroad Company

NAUG, a Class III railroad, runs on 19.6 route miles from Waterbury to the end of track in Torrington. Operated by the Railroad Museum of New England, it provides regular seasonal passenger excursions between Thomaston, Waterville, and Thomaston Dam, with occasional trips to Torrington. It also operates freight service and interchanges freight traffic with the PAS in Waterbury. It has a maintenance shop in Thomaston and can perform contract maintenance for other railroads and rail car fleets.

Intercity Passenger Service

Two intercity passenger services operate in Connecticut: CT*rail* Hartford Line and Amtrak. The Hartford Line is an intercity passenger rail system that opened in June 2018, providing expanded CT*rail* service between New Haven, Hartford, and Springfield, Massachusetts (**Figure 2-9**). The service provides up to 17 round trips per day along the 62-mile route. The CT*rail* Hartford Line along with complementary Amtrak trains offers 34 daily Hartford Line trains; passengers can use any ticket to ride any train. The fares are the same whether purchased through CT*rail* or Amtrak. The Hartford Line is operated by TASI, a subsidiary of Herzog Company, under an agreement with the State of Connecticut.

Figure 2-9. CT*rail* Hartford Line Service

Source: AECOM

Amtrak intercity services within Connecticut include Northeast Regional intercity trains between Boston/Springfield and Washington, DC, plus high-speed Acela service between Boston and Washington, DC. In August 2019 Amtrak, in partnership with the Massachusetts DOT (MassDOT), initiated the Valley Flyer. This project extended select Hartford Line trains north of Springfield adding station stops in Holyoke, Northampton, and Greenfield. Amtrak, in partnership with CTDOT, MassDOT, and the Vermont Agency of Transportation (VTrans), also operates the state-supported Vermonter via the Hartford Line daily between St. Albans, Vermont, and Washington, DC. See **Appendix H** for a table that summarizes key statistics about the Amtrak services and routes in Connecticut. Some stations are served by more than one route.

Amtrak provides dispatching services and electric propulsion power and maintains and improves the infrastructure and facilities used by commuter and freight rail services. The NEC is an intricate railroad system and one of the most complex and heavily used railroad territories in the world. Amtrak is a minority user of the NEC but the only operator to provide end-to-end service.

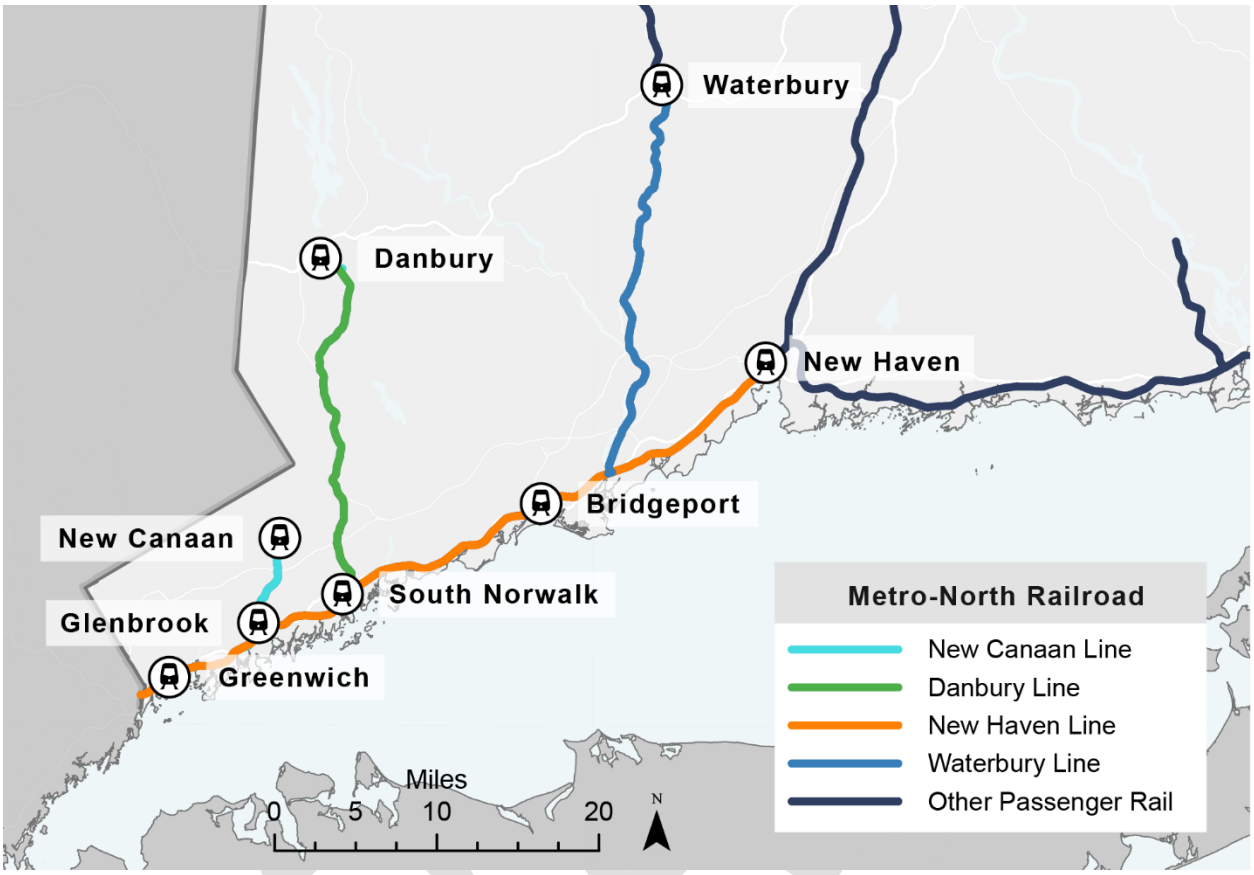
Figure 2-10. Amtrak Service in Connecticut

Source: AECOM 2022

Commuter Rail Service

The New Haven Line is a commuter rail service that has been in existence in its current form since 1983. It is operated under an agreement called the Amended and Restated Service Agreement (ARSA). The original New Haven Line and its corporate ancestor, the New York-New Haven and Hartford Railroad (NYNH&H) date back to 1872. ARSA serves as the joint operating agreement between CTDOT, the MTA, and Metro North Railroad. MTA established Metro-North Railroad in part to operate service along the New Haven Line and maintain infrastructure along the 72-mile portion between New Haven and Grand Central Terminal in New York, along with three additional feeder lines (New Canaan, Danbury, and Waterbury). As part of the agreement, each agency owns fixed infrastructure along the route within their respective states, and splits ownership of the rolling stock that operates along these routes. Metro-North Railroad additionally operates service and maintains infrastructure along the Harlem Line and Hudson Line in New York State for the MTA. CTDOT and Metro-North Railroad are subject to FTA's Transit Asset Management (TAM) requirements for infrastructure they own.

Figure 2-11. Metro-North Railroad Service



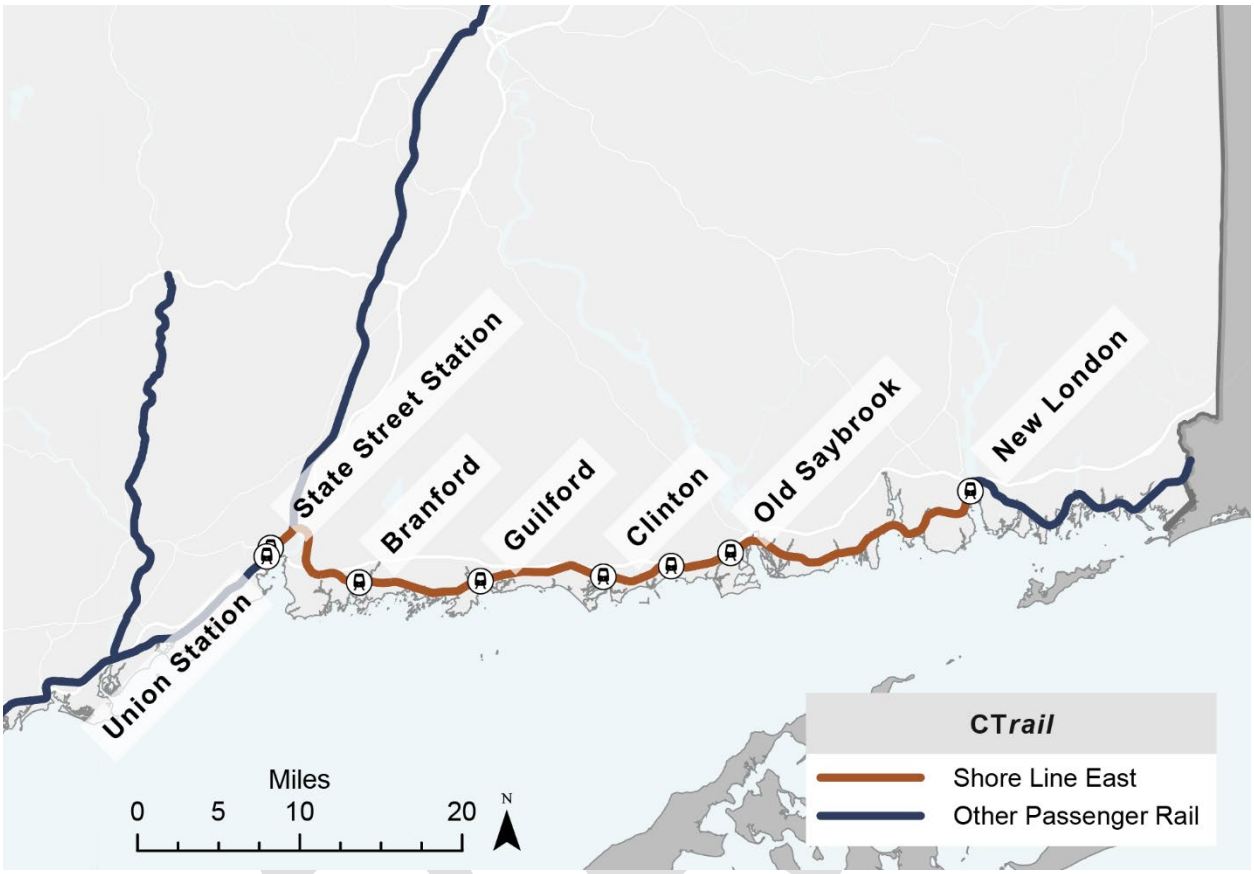
Source: AECOM

Shore Line East is a CT*rail* commuter rail service that began operation in 1990 and provides service along a portion of the NEC from New Haven to New London (**Figure 2-12**). The service is fully subsidized by CTDOT, with Amtrak under contract to operate the service, and perform maintenance throughout the system. Amtrak owns all fixed infrastructure along this route, while CTDOT owns the rolling stock and is the lessee to five of the seven Shore Line East stations that are owned by Amtrak. While Amtrak is not subject to FTA regulations for the TAM program, CTDOT is still obligated to report on its owned rolling stock and stations that are leased to them.

Non-Traditional Services

Seasonal tourist train operations are conducted on the NAUG in which trains leave the historic Thomaston station and take a 20-mile round trip along the Naugatuck River through the Mattatuck State Forest. The Valley Railroad Company operates a tourist passenger service called the Essex Steam Train between Old Saybrook and Haddam. Peak season is offered during the summer and fall foliage season, with up to 15 trains per week.

Figure 2-12. Shore Line East Service



Source: AECOM

2.1.2 Intermodal Connections: Major Freight and Passenger Terminals and Stations

Freight Terminals

Connecticut's intermodal services focus on containers and highway trailers transferred between ship and rail at ports or between trucks and rail at terminals. Intermodal freight is the largest source of revenue for Class I railroads nationally, but New England is unique in that much of the rail network is operated by smaller Class II and Class III railroads. There are currently no intermodal rail connections coming from Connecticut airports or Connecticut ports, though a rail link exists in New Haven. All intermodal rail connections happen outside state lines, and freight is transported by motor carrier in/out of Massachusetts, New York, and New Jersey rail intermodal facilities.

Transload Facilities

Transload operations focus on transferring freight between railcars and trucks to access rail shippers and receivers that do not have direct rail access (**Figure 2-13**). Connecticut has 13 transload facilities (see **Appendix H** for more detail), and key transload commodities in Connecticut include lumber, oil, chemicals, limestone, bulk materials such as gravel, plastics, sand, scrap metal, and an assortment of goods shipped by boxcar. Because these transfers require some degree of handling, these facilities often provide direct truck access to railcars, cross dock warehouses, or other storage facilities.

Figure 2-13. Transload Facility in New London

Source: Genesee & Wyoming Railroad

Ports

The three deep-water ports in Connecticut are in New London, New Haven, and Bridgeport. Ports can function as transload or intermodal yards for the transfer of freight from rail to ship or truck. The state has adopted a maritime policy that promotes and supports projects that will facilitate the intermodal connection of water, rail, bus, and highway systems in cooperation with the industry, utilizing public-private resources. In alignment with this policy, in 2017, Connecticut built a rail link to the Port of New Haven. See **Appendix H** for detailed descriptions of the deep-water ports.

Additional Freight Facilities

There are several major rail yards and facilities for freight operations in Connecticut. This includes New Haven (CSX, P&W), Hartford (CSO, CNZR), Middletown (P&W), Willimantic (NECR, P&W), Plainfield (P&W), Plainville (PAS), and Canaan (HRRC).

Passenger Terminals and Stations

Over 50 stations serve various passenger rail lines in Connecticut. Ownership, maintenance responsibility, and other conditions vary among the New Haven Line, Shore Line East, and Amtrak intercity rail stations. The New Haven Line and its feeder lines have 20 stations. CTDOT owns most New Haven Line stations and leases them to the city or town where they are located. The Shore Line East has nine stations, and CTDOT leases five of the seven Shore Line East stations that are owned by Amtrak. A private facility management contractor and the railroad provide maintenance. Parking is free at all Shore Line East stations except New London and Union Station in New Haven (**Figure 2-14**). Amtrak separately

manages its stations and conditions vary by facility. The Hartford Line currently has eight stations in use between New Haven and Windsor Locks. Several possible infill stations are being evaluated including Enfield, North Haven, Newington, and West Hartford.

Figure 2-14. New Haven Union Station

Source: Carl Talley

Intermodal Connections

Most Connecticut train stations are near local bus routes with several stations accessible to intercity bus lines. For a detailed list of intermodal connections, see **Appendix H**. Several notable intermodal connections include:

- Intercity passenger motorcoach services are available at Bridgeport Station, Hartford Union Station, New Haven Union Station, New London Station, South Norwalk Station, and Stamford Station.
- Bradley International Airport in Windsor Locks is available via the CT*transit* 30-Kennedy Road (Bradley Airport) bus serving Hartford Union Station.
- Bus services are available at all stations on the Hartford Line. However, routes and schedules vary by station. Connecting services include CT*transit*, CT*fastrak*, Pioneer Valley Transit Authority (PVTA), and Middletown Area Transit (MAT). Intercity carriers such as Greyhound, Peter Pan, and Megabus provide connections at some stations.
- CT*fastrak* is bus rapid transit (BRT) service that connects to/from Waterbury, Cheshire, Southington, Bristol, Plainville, New Britain, Newington, West Hartford, Hartford (Union Station), and Manchester.
- Free commuter shuttles available in downtown Hartford facilitate connections to places including:
  - Asylum Hill Shuttle linking Central Row and Pearl Street with Union Station, Asylum Hill, and Capitol Avenue.
  - Columbus Boulevard Shuttle linking Pearl Street and Central Row with Market Street and Columbus Boulevard.
- Hartford dash shuttle, CT*transit*'s free circulator bus in downtown Hartford.

New Haven Union Station free shuttle connects rail passengers using Union Station to additional off-site parking locations, including the Temple Street Garage and the parking lot at the former Coliseum site. All

shuttle trips extend to the New Haven Green, creating easy connections to all other CT*transit* local bus routes in New Haven.

Major Hubs

Several rail stations and terminals are major hubs serving intercity rail, commuter rail, and above-mentioned bus routes. These include Bridgeport Station, Hartford Union Station, New Haven Union Station, New London Station, South Norwalk Station, and Stamford Station. See **Appendix H** for detailed descriptions of these hubs.

Rail Yards

CTDOT owns four rail yards that support commuter and intercity passenger rail service. MTA Metro-North Railroad, CTDOT's contracted operator of the New Haven Line, operates and maintains most facilities at each yard location. Amtrak maintains the Hartford Line equipment in the New Haven Yard.

New Haven Yard

This yard supports New Haven Line electric multiple units (EMUs), as well as diesel equipment, including the newly purchased M8 rail equipment. The New Haven Component Change-Out Facility (CCO) opened in 2016 as part of the larger New Haven Yard capital project. Most Main Line and Shore Line East trains are comprised of EMU equipment. All Metro-North Railroad equipment operating into New Haven is serviced and maintained by Metro-North Railroad. Hartford Line equipment is serviced and maintained by Amtrak under an agreement with CTDOT. Amtrak also has a small facility that allows for locomotive servicing and basic running repairs to intercity trains using Amtrak equipment.

Stamford Yard

Stamford Yard supports New Haven Line EMU and diesel equipment (**Figure 2-15**). Danbury and Waterbury Branch Line service is provided with diesel-powered equipment. The repair facility is three floors with offices and two tracks that can accommodate three cars on each for six cars total. Cars are driven into the repair facility for short-term repairs so that they may be returned to the fleet quickly and put back into service. Damaged trains are repaired at this location in a separate building. The Stamford Yard has the only car wash operation for New Haven Line and has coach-cleaning operations.

East Bridgeport Yard

This yard has a two-story facility housing Metro-North Railroad offices for Track, Structures, Communications and Signals, and coach cleaning operations. Bridgeport yard supports New Haven Line EMU and diesel equipment for the Waterbury Branch Line.

Danbury Yard

This yard supports diesel equipment operated on the Danbury Line.

Figure 2-15. Stamford Yard

Source: Carl Talley

2.1.3 Passenger Rail Objectives

In running, managing, and maintaining these rail systems, services, and notable infrastructure components, CTDOT follows a set of objectives that guide its efforts to reduce single-occupant vehicle use. These objectives include:

- Improve travel times between destinations
- Increase service frequencies
- Increase system capacity
- Increase ridership

Improve Travel Times Between Destinations

TIME FOR CT is a comprehensive actionable improvement vision for passenger rail in Connecticut. The overall TIME FOR CT objective is for CTDOT and its rail partners to identify and implement strategies for decreasing travel times between New Haven and New York City by up to 10 minutes in 2022 and 25 minutes by 2035. In addition to this overarching objective, the vision also has specific service-level improvements for each of Connecticut's commuter and intercity services (**Table 2-5**):

- New Haven Line Improvements
  - Super Express Service –18 fewer minutes between New Haven and Grand Central Terminal
  - 5 fewer minutes between Bridgeport and Grand Central Terminal
  - At least 2-minute reductions between most New Haven Line stations and Grand Central Terminal
- Hartford Line Improvements
  - New Hartford Line commuter rail service between Hartford/Springfield and Penn Station, New York (PSNY)
  - 27 fewer minutes between Hartford and PSNY with introduction of one-seat-ride service

- Shore Line East Improvements:
  - New Shore Line East commuter rail service to Grand Central Terminal
  - 13 fewer minutes between Old Saybrook and Grand Central Terminal with introduction of one-seat-ride service
- Waterbury Branch Line Travel Time Improvements
  - 25 fewer minutes between Waterbury and Grand Central Terminal with introduction of one-seat-ride service

Table 2-5. TIME FOR CT New Haven Line Travel Time Savings

Corridor	Trip Time Today	Objective in 2035	Time Savings
New Haven to Bridgeport	26 minutes	20 minutes	6 minutes
Bridgeport to Stamford	34 minutes	22 minutes	12 minutes
Stamford to New York City	52 minutes	45 minutes	7 minutes

Increase Service Frequencies

TIME FOR CT also has objectives related to increasing rail frequencies. Plans for future service include increasing service during peak and off-peak periods. Increased frequencies will occur throughout the system and will largely be created through running complementary additional CT*rail*, Amtrak, and Metro-North Railroad branch line trains on the New Haven Line. Specific frequency objectives by line include the following:

- Increase morning Hartford Line headways from Penn Station, as well as headways throughout the rest of the day
- Increase Shore Line East AM peak period frequencies from New London to Grand Central Terminal during the AM peak and Old Saybrook to Grand Central Terminal during the PM peak
- Increase Amtrak morning frequencies on the New Haven Line
- Increase morning Metro-North Railroad frequencies on the New Haven Line
- Increase inter-Connecticut frequencies between Shore Line East and New Haven Line stations

Increase Service Capacity

The TIME FOR CT approach will also likely increase the line capacity through a series of investments in facilities like yards that store trains between runs, as well as add additional signaling and passing sidings that can increase capacity on the New Haven Line.

Increase Ridership

TIME FOR CT (and other) service improvements are projected to generate significant increases in ridership demand compared to a no-build scenario. See Section 2.2.3 for details.

2.1.4 Commuter and Intercity Rail Performance Evaluations

FRA state rail plan guidance references PRIIA Section 207, which identifies several key metrics and standards for intercity passenger railroads.[10] As previously defined, commuter rail refers to the New Haven Line (including feeder lines) and Shore Line East. Intercity rail refers to the Hartford Line and

[10] These guidelines only apply to intercity rail service. In the interest of being thorough, this plan includes similar metrics for commuter service, where data are available.

Amtrak services. Below are performance evaluations for each type of passenger rail service in Connecticut.

Commuter Rail Performance Evaluation

Commuter Rail On-Time Performance

On-time performance refers to how often a train arrives at or just after its scheduled arrival. Commuter rail on-time performance varies by line. New Haven Main Line trains have an approximate 95.5 percent on-time performance rate, meaning they are late less than 5 percent of the time. On-time performance on the branch lines is somewhat lower at Danbury and Waterbury, with on-time performances between 89 and 85 percent. Shore Line East performs similarly to the New Haven Line with a 96.6 percent on-time performance in October 2021.

Commuter Rail Ridership

The New Haven Line is the state's busiest commuter line, with more than 40,000,000 annual trips taking place prior to the COVID-19 pandemic. During the first year of the pandemic, New Haven Line ridership quickly declined by 70 percent as travel patterns changed and service was reduced. It has since begun to return, though it is still well below pre-pandemic levels. Shore Line East ridership is lower than the New Haven Line, with approximately 660,000 annual trips taking place in 2019 and 76 percent decline during the pandemic. Unlike the New Haven Line, Shore Line East ridership continued to decline in 2021 (**Table 2-6**).

Table 2-6. Commuter Rail Ridership (2016-2021)

Year	New Haven Line		Shore Line East	
	Total Annual Ridership	Annual Percent Change	Total Annual Ridership	Annual Percent Change
2016	40,483,793	--	828,721	--
2017	40,169,325	−0.8%	786,331	−5.1%
2018	40,298,686	0.3%	601,158	−23.5%
2019	40,234,512	−0.2%	660,447	9.9%
2020	12,186,256	−69.7%	155,957	−76.4%
2021	14,160,598	16.2%	122,019	−21.8%

Source: CTDOT

Commuter Rail Schedules

Service along the New Haven Line is formed by a complex set of train stopping patterns and schedules. They have been established to provide both travel opportunities to and from Grand Central Terminal and to provide reasonable travel options to and from intermediate stations and destinations. Schedules have been constructed around a "Zone Schedule" strategy, which can offer travel time and seat availability benefits compared to other scheduling strategies. The number of zones varies by time of day and includes up to nine discrete New Haven Line zones in the AM peak period. Shore Line East follows a similar model where schedules and fares are broken up by zones.

Slow Orders and Delays

As stated above, the commuter services, except for the Waterbury Line and Danbury Line, are only late approximately 5 percent of the time. This noted, some portions of the commuter line in New Haven have been documented as areas with speed restrictions or slow orders. The slow orders range in impact, and as of 2018, the New Haven Line slow orders typically reduced speeds by 42 percent. Sources of these speed restrictions vary, with one example being ties that require replacement.

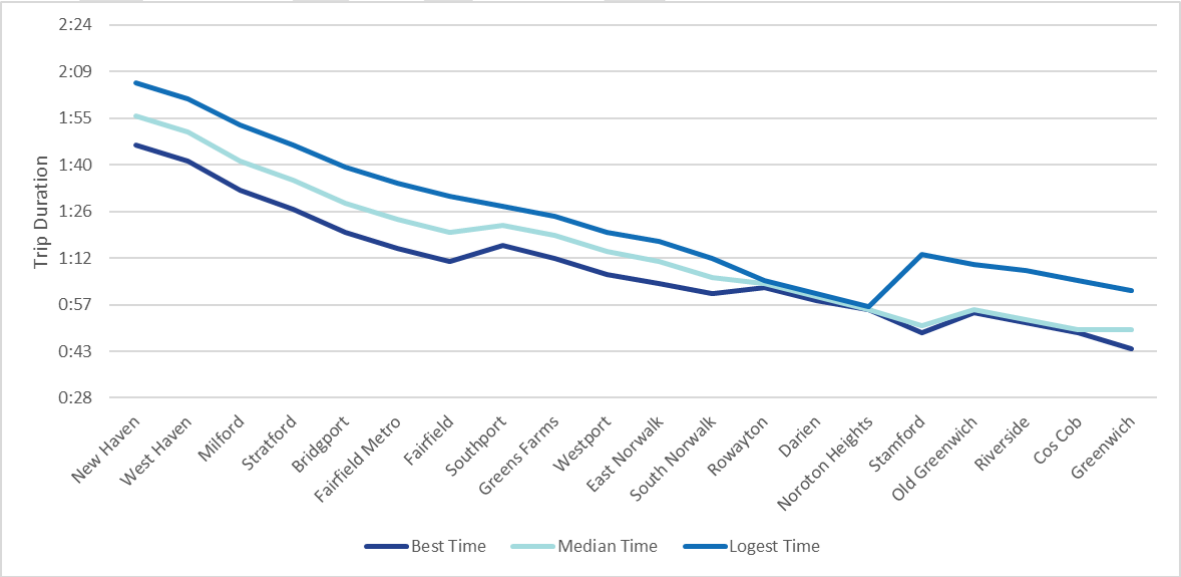
Mean Distance Between Failures

One source of train delays involves equipment failures. Mean distance between failures (MDBF) is the rail industry standard for fleet reliability. It is calculated by dividing the total miles operated by the total number of confirmed primary failures. A confirmed primary failure is defined as a failure of any duration for mechanical cause that occurs to a revenue train that is reported late at its final terminal by more than 5 minutes, 59 seconds (see **Appendix H** for more details). The New Haven Line, Shore Line East, and New Canaan Line primarily utilize an electric M8 fleet. Since 2017, the distance between failures ranged from 138,000 miles to 1,138,637 miles between failures. The Waterbury Line and Danbury Line use P-32 or BL-20 locomotives and several coaches. Over the same period, P-32-locomotives ranged from 13,402 to 55,206 miles between failures. BL-20 locomotives have a wider range, going between 8,867 and 128,012 miles between failures. Coach cars were more reliable in similar ways to the electric M8s, ranging between 94,283 and 535,728 miles between failures.

Running Times

New Haven Line running times are controlled by the number of stops over a given segment and the time of day. However, despite variation in both of these variables throughout the day, the differences between the slowest and fastest trips are relatively minimal (except for Stamford, where the difference between the shortest and longest trip is approximately 30 minutes). During the morning peak period, service in general is more concentrated to the peak hour period, whereas service during the evening peak is extended over a longer period, reflecting a wider variance in return trips from Grand Central Terminal during the evening.

Figure 2-16. New Haven Line Run Times



Source: New Haven Line Capacity and Speed Analysis (CTDOT 2021)

Shore Line East operates at lower-level frequencies, and it has run times that are approximately one hour and fifteen minutes, with a low of one hour and ten minutes and a high of one hour and fifteen minutes.

Financial

Measuring commuter rail financial performance involves comparing the operational and cost recovery abilities of Metro-North Railroad service on the New Haven Line and Shore Line East.

Operational Funding

Operational funding for the New Haven Line and Shore Line East varies. New Haven Line operational funding consists of state subsidies, MTA subsidies, fares, and other revenues. In the period between Fiscal Year (FY) 2015 and FY 2019, funding increased from $463 million to $516 million (**Table 2-7**). For Shore Line East (**Table 2-8**), in the same time period, funding increased from $32 million to $37 million.

Table 2-7. New Haven Line Operational Funding (FY 2015-2019) (rounded to the nearest million $)

Funding Source	2015	2016	2017	2018	2019
Fare and Other Revenue	$332,000,000	$343,000,000	$349,000,000	$356,000,000	$361,000,000
State Subsidy	$93,000,000	$98,000,000	$133,000,000	$126,000,000	$110,000,000
MTA Subsidy	$38,000,000	$40,000,000	$46,000,000	$51,000,000	$45,000,000
Total	**$463,000,000**	**$481,000,000**	**$528,000,000**	**$533,000,000**	**$516,000,000**

Source: CTDOT Fast Facts

Table 2-8. Shore Line East Operational Funding (FY 2015-2019) (rounded to the nearest million $)

Funding Source	2015	2016	2017	2018	2019
Fare and Other Revenue	$2,000,000	$3,000,000	$3,000,000	$2,000,000	$2,000,000
State Subsidy	$30,000,000	$27,000,000	$26,000,000	$32,000,000	$35,000,000
Total	**$32,000,000**	**$30,000,000**	**$29,000,000**	**$34,000,000**	**$37,000,000**

Source: CTDOT Fast Facts

Cost Recovery

Although the New Haven Line has among the highest recovery ratios of any commuter rail line in the nation, it is not capable of being sustained through ticket sales alone. MTA, Metro-North Railroad, and CTDOT subsidize operating expenses (operating costs minus revenue) on an apportioned basis: 65 percent CTDOT and 35 percent MTA/Metro-North Railroad. The New Canaan Branch Line, Danbury Branch Line, and Waterbury Branch Line services are funded 100 percent by CTDOT. In terms of capital expenditures, non-moveable assets such as stations and facilities are capital-funded according to the state in which they are located. Moveable assets such as rolling stock are funded according to the 65 percent to 35 percent split described above. Administrative assets, such as field vehicles and office equipment, are allocated to CTDOT according to the ARSA New Haven Line operating cost share formula of the entire Metro-North Railroad system. This includes the Harlem and Hudson Lines as well the New Haven Line and its three branches.

Changes in the budget are chiefly driven by service changes, equipment acquisition/fleet growth, and labor and materials inflation. Between state FY 2016 and FY 2017 expenses grew 5.8 percent, while revenues grew only 2 percent; the result of this is that the deficit and the CTDOT subsidy grew by 15 percent. The largest increase in cost was for operating and maintenance, equaling $13.8 million; this increase was largely due to an increase in fleet size and an expansion of services. Over a 20-year period, the New Haven Line CTDOT subsidy payment has risen at an average rate of less than 7 percent per year.

Public Benefits

The commuter railroad brings a variety of public benefits in terms of safety, fuel efficiency, connections, congestion reduction, and air quality.

Connectivity

Connecticut's commuter rail network provides a variety of connectivity options (see **Figure 2-1**, which shows the option to transfer to a CT*transit* bus at Hartford Union Station). The New Haven Line connects with other services in Grand Central Terminal. This includes the MTA New York City Subway (S-, 4, 5-. 6-, and 7 Trains), as well as the Metro-North Railroad Harlem and Hudson Lines, commuter lines servicing New York City and its northern suburbs. Soon, with the completion of the East Side Access project, New Haven Line trains will be able to connect with the MTA Long Island Railroad, a commuter railroad serving commuter and leisure communities on Long Island. Additionally, New Haven Line service connects with several Amtrak services, allowing users to travel as far south as Virginia or north towards Boston using a two-seat ride.

Figure 2-17. Hartford Union Station Transportation Center

Source: Carl Talley

Community Access and Service Availability

There are 29 commuter rail stations spanning four counties. Many of these stations have connections to other modes, including bike facilities, local and intercity buses, rideshare services, and traditional taxis. Additional information on these intermodal connections is available in Section 2.1.2. Commuter service availability depends on where an individual boards. New Haven Line service consists of approximately 262 trains per weekday traveling to and from Grand Central Terminal. Shore Line East service is smaller in scope, and it consists of 27 daily trains.

Intercity Rail Performance Evaluation

The following section provides an evaluation of intercity passenger services with operations in Connecticut. The evaluation is based on metrics established under PRIIA Section 207. Additional information is available in **Appendix H**.

Intercity On-Time Performance

The *Quarterly Report on the Performance and Service Quality of Intercity Passenger Train Operations* for the second quarter of FY 2021 (FRA 2021) shows Amtrak on-time performance two ways: on-time performance at endpoint stations and on-time performance at all stations. High-speed Acela Express trains (serving three stations in Connecticut) operating on the length of the NEC had greater than 85 percent for both metrics in the period (**Table 2-9**). The top causes of delay were slow orders, signal delays, and commuter train interference. Northeast Regional spine trains, operating in the Boston-New York-Washington DC corridor and including through trains on the New Haven-Hartford-Springfield line (also known as Hartford Line), performed somewhat better than Acela trains. The top causes of delay were slow orders, commuter train interference, signal delays, and locomotive failure.

The on-time performance for the Amtrak Hartford Line (formerly Springfield Shuttles), operating in the New Haven-Hartford-Springfield corridor with a cross-platform transfer to other Amtrak NEC trains in New Haven, was even higher. Causes for delay included holds for connections and locomotive failure.

Table 2-9. Amtrak On-Time Performance (2021)

Service	On-time at Endpoint	On-time at All Stations
Acela Express	85.8%	87.7%
Northeast Regional - Spine	90.0%	91.1%
Hartford Line [a]	93.8%	94.1%

Source: Amtrak 2021
Note: For all stations, a train arriving within 10 minutes of schedule for Acela Express and within 15 minutes of schedule for all other services is considered on-time. Amtrak Hartford Line trains are on time if they arrive at the final destination within 10 minutes of scheduled travel time.
[a] These measurements refer only to Amtrak-operated Hartford Line service and do not include other TransitAmerica Services (CTrail)-operated Hartford Line service. On-time performance information by endpoint and station is not available for CTrail. This noted, data from November 2021 indicate that Amtrak-operated trains between Springfield and New Haven achieved a general 82.7 percent on-time performance, while CTrail trains achieved 91.5 percent on-time performance. The top three causes of delay were passenger train interference, locomotive failure, and weather-related delays.

Intercity Rail Ridership

Amtrak reports ridership on a year-to-year basis. Prior to the COVID-19 pandemic, ridership was approximately 12.9 million people, with the majority (approximately 8.7 million) using the Northeast Regional service (**Table 2-10**). As with other rail systems in the United States and around the world, ridership dipped in 2020 when travel patterns shifted, and Amtrak reduced service.

Table 2-10. Amtrak Annual Ridership (2018–2021)

Year	Acela		Northeast Regional		Hartford Line		All Routes	
	Total Annual Ridership	Annual Percent Change	Total Annual Ridership	Annual Percent Change	Total Annual Ridership	Annual Percent Change	Total Annual Ridership	Annual Percent Change
2018	3,428,300	--	8,686,900	--	286,500	--	12,401,700	--
2019	3,577,455	4.4%	8,940,745	2.9%	362,442	26.5%	12,880,642	3.9%
2020	1,656,764	−53.7%	4,486,837	−49.8%	271,048	−25.2%	6,414,649	−50.2%
2021	897,639	−45.8%	3,508,766	−21.8%	192,584	−28.9%	4,598,989	−28.3%

Source: Amtrak

These service cuts included an 8 percent cut in daily Northeast Regional and Acela departures. The service with the largest decrease in ridership was the Acela service, decreasing 115 percent. In 2021, Amtrak ridership continued to be well below pre-pandemic levels, with ridership approximately 63 percent lower than the 2019 level.

As stated in Section 2.1.1, Amtrak serves 13 stations in Connecticut. Data from 2019 indicate that the top three stations with the largest amount of Amtrak boardings and alightings are New Haven Union Station, Stamford Transportation Center, and Hartford Union Station. Stations with the lowest volume of Amtrak boardings and alightings include Windsor, Wallingford, and New Haven State Street Station. See **Appendix H** for a detailed table.

Hartford Line intercity service began in June 2018 and doubled ridership in 2019 (**Table 2-11**). Like Amtrak, Hartford Line ridership declined during the first year of the pandemic, though it did so at a higher rate than total Amtrak services (60 percent). In response to the uncertainties associated with COVID-19, CTDOT reduced service by 10 daily trains. The Hartford Line reinstituted its full-service model in 2021 and ridership increased at a higher rate than CTDOT's two commuter services, indicating that a larger percentage of its riders depend on the service for travel.

Table 2-11. Hartford Line Ridership (2018-2021)

Year	Total Annual Ridership	Annual Percent Change
2018	350,000	--
2019	730,000	108.6%
2020	279,613	−61.7%
2021	357,423	27.8%

Source: CTDOT

Certified Schedule

A final rule for the metrics and minimum standards for intercity passenger rail service set forth in 49 CFR Part 273 was published in November 2020. It requires Amtrak to report to the FRA the number of certified Amtrak schedules, uncertified schedules, and disputed schedules, by train, route, and host railroad (see **Appendix H**). A certified schedule means a published train schedule that Amtrak and the host railroad jointly certify is aligned with the customer on-time performance metric and standard. Over 90 percent of schedules were certified by the end of the fourth quarter of 2021.

Train Delays

Intercity rail delays occur for a variety of reasons, and some are within an operator's control while others are not. The train delays metric measures the minutes of delay for all Amtrak-responsible delays, host-responsible delays, and third-party delays, for the host railroad territory within each Amtrak route. Amtrak's FY21 Q4 Delay Metrics report indicates that in the final 2021 quarter, there were approximately 12,686 delay minutes, or 211 hours of delays, on either the Acela, Northeast Regional, or Vermonter routes.[11] There are a variety of reasons for these delays with the top five including infrastructure challenges, weather, and passenger-related delays. **Table 2-12** identifies the top five Amtrak service delays for routes that include Connecticut.

[11] This data reflect the entire line; information on Connecticut-only delays is unavailable.

Table 2-12. Top 5 Amtrak Service Delay Types for Routes that Include Connecticut (Fourth Quarter FY 2021)

Delay Type	Total Minutes
Slow Order Delays	6,610
Miscellaneous Delays	1,161
Weather-Related	740
Passenger Train Interference	599
Signal Delays	445

Source: Amtrak FY21 Q4 Delay Metrics

Different Amtrak services have different levels of delays. Amtrak's FY21 Q4 Delay Metrics report indicates that in the fourth quarter of FY 2021, the Acela Express was delayed for a total of 30,458 minutes, or approximately 507 hours (**Table 2-13**).

Table 2-13. Amtrak Service Delays by Route (Fourth Quarter FY 2021)

Route	Total Minutes
Acela Express	30,458
Northeast Regional	121,676
Springfield Shuttles (now Hartfield Line)	12,645
Vermonter	12,686

Source: Amtrak FY21 Q4 Delay Metrics

Train Delays per 10,000 Train Miles

Train delays per 10,000 train miles is a statistic that measures the minutes of delay, in 10,000-mile increments, for all Amtrak-responsible and host-responsible delays, for the host railroad territory within each route. According to its FY21 Q4 Delay per 10k TM report, Amtrak intercity services operating within Connecticut averaged approximately 769 delay minutes per 10,000 miles (**Table 2-14**).

Table 2-14. Average Amtrak Delay Minutes per 10,000 Miles (Fourth Quarter FY 2021)

Amtrak Service	Average Delay (minutes) per 10,000 miles
Acela	382
Northeast Regional	799
Hartford Line	880
Vermonter	928
All Services	769

Source: Amtrak FY21 Q4 Delay per 10k TM

Host Running Time

The host running time metric is the average actual running time and the median actual running time compared to Amtrak's scheduled running time. The metric is measured for each of Amtrak's host railroads. Amtrak's FY21 Q4 Run Time Metrics report indicates that in general, the Amtrak Northeast Regional performs the worst, running almost 25 percent longer than anticipated. This noted, the Vermonter and Acela services run close to their anticipated scheduled times (**Table 2-15**).[12]

Table 2-15. Amtrak Actual and Anticipated Run Times by Service (Fourth Quarter FY 2021)

Service	Average Actual Route Run Time (minutes)	Average Anticipated Route Run (minutes)	Ratio
Acela Express	359.13	355.33	1.01
Northeast Regional	391.81	314.50	1.25
Hartford Line	120.64	103.72	1.16
Vermonter	704.26	701.03	1.00

Source: Amtrak FY21 Q4 Run Time Metrics

Customer Service

Customer satisfaction is measured by tabulating the percentage of Amtrak customer satisfaction survey respondents who provided a score of 70 percent or greater for their "overall satisfaction" on a 100-point scale for their most recent trip. Amtrak's FY21 Q4 *Quarterly Report on the Performance and Service Quality of Intercity Passenger Train Operations* indicates that riders of all four intercity routes are overall 86 percent to 88 percent satisfied (**Table 2-16**). For nearly all services, the lowest ranked element of Amtrak service is the on-board food service.

Table 2-16. Amtrak Survey Responses by Line

Service	Overall Satisfaction	Amtrak Personnel	Information Given [a]	On-Board Comfort	On-Board Cleanliness	On-Board Food Service
Acela	88	90	86	89	90	70
Northeast Regional	86	88	82	89	89	66
Hartford Line	87	91	81	92	91	68
Vermonter	87	92	76	92	87	61

Source: Amtrak's FY21 Q4 Quarterly Report on the Performance and Service Quality of Intercity Passenger Train Operations
[a] This measurement refers to the average score from respondents to the Amtrak customer satisfaction survey for their overall review of information provided by Amtrak on their most recent trip, by route.

[12] This refers to the full version of each service. The full Acela and Northeast Regional services run between Boston and Washington, DC and the full Vermonter service runs between Washington, DC and St. Albans, Vermont.

Financial

Financial metrics include several measurements including the following:[13]

- **Cost recovery**, a metric that divides adjusted operating revenue by Amtrak's adjusted operating expenses.
- **Avoidable operating costs covered by passenger revenue**; a measurement that is the percentage of avoidable operating costs divided by passenger revenue for each route.
- **Fully allocated core operating costs covered by passenger revenue**, a measurement that calculates the percentage of fully allocated core operating costs divided by passenger revenue for each route.
- **Average ridership**, the number of passenger-miles divided by train-mile for each route.
- **Total ridership**, the total number of passengers on Amtrak trains, reported by route.

Cost Recovery

Of the four Amtrak intercity rail services operating in Connecticut, the Vermonter has the best cost recovery ratio, bringing in 26 percent more revenue than its expenses. Generally, all intercity rail services have a cost recovery ratio of approximately 77 percent or higher. The Amtrak Acela has the lowest recovery ratio, and the Northeast Regional brings in and expends the most (**Table 2-17**).

Table 2-17. Cost Recovery by Amtrak Intercity Line

Service	Adjusted Operating Revenue	Fully Allocated Adjusted Operating Expense	Cost Recovery
Acela Express	$60,764,570	$78,587,142	77%
Vermonter	$2,397,222	$1,906,816	126%
Northeast Regional	$108,749,020	$124,033,044	88%
New Haven - Springfield	$7,068,002	$7,979,346	89%

Source: Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Avoidable Operating Costs Covered By Passenger Revenue

As with cost recovery, the Amtrak Vermonter service is the most effective at addressing avoidable operating expenses with its passenger revenue. Once adjusted for state aid, the Amtrak Northeast Regional is the most effective, generating $0.05 in avoided operating expenses for every $1.00 spent on the service (**Table 2-18**).

Fully Allocated Core Operating Costs Covered by Passenger Revenue

Once adjusting for state subsidies, the Amtrak Northeast Regional proves to be the most efficient service at covering fully adjusted operating expenses with passenger revenue. The least efficient service is the New Haven - Springfield Shuttle (**Table 2-19** and **Table 2-20**).

[13] All of these metrics have been assessed using Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Table 2-18. Avoidable Operating Expenses Covered by Passenger Revenue

Route	Adjusted with State Operating Payments	Avoidable Operating Expense	Passenger Revenue	Avoidable Operating Expenses Covered by Passenger Revenue
Acela Express	Yes	$65,587,469	$58,780,840	$0.90
Acela Express	No	$65,587,469	$58,780,840	$0.90
Vermonter	Yes	$1,705,339	$2,338,898	$1.37
Vermonter	No	$1,705,339	$1,327,452	$0.78
Northeast Regional	Yes	$100,260,359	$105,110,486	$1.05
Northeast Regional	No	$100,260,359	$105,110,486	$1.05
New Haven - Springfield	Yes	$6,692,302	$6,717,202	$1.00
New Haven - Springfield	No	$6,692,302	$2,009,560	$0.30

Source: Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Table 2-19. Amtrak Fully Allocated Core Operating Costs Covered by Passenger Revenue (Adjusted with State Operating Payments)

Route	Fully Allocated Adjusted Operating Expense	Passenger Revenue	Fully Allocated Adjusted Operating Expenses Covered by Passenger Revenue
Acela Express	$78,587,142	$58,780,840	$0.75
Vermonter	$1,906,816	$2,338,898	$1.23
Northeast Regional	$124,033,044	$105,110,486	$0.85
New Haven – Springfield	$7,979,346	$6,717,202	$0.84

Source: Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Table 2-20. Amtrak Fully Allocated Core Operating Costs Covered by Passenger Revenue (Not Adjusted with State Operating Payments)

Route	Fully Allocated Adjusted Operating Expense	Passenger Revenue	Fully Allocated Adjusted Operating Expenses Covered by Passenger Revenue
Acela Express	$78,587,142	$58,780,840	$0.75
Vermonter	$1,906,816	$1,327,452	$0.70
Northeast Regional	$124,033,044	$105,110,486	$0.85
New Haven - Springfield	$7,979,346	$2,009,560	$0.25

Source: Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Average and Total Ridership

Ridership estimates factoring in passenger miles and train miles indicate that the Northeast Regional has the highest average and total ridership followed by the Amtrak Acela. This is logical as these routes travel through dense, major cities to destinations beyond Connecticut and its immediate neighbors. Notably, the Vermonter service, a service much longer in distance but lower in train miles (less frequencies), has higher average ridership than the New Haven – Springfield service (**Table 2-21**).

Table 2-21. Amtrak Average and Total Ridership

Route	Passenger Miles	Train Miles	Average Ridership	Total Ridership
Acela Express	89,739,594	494,480	181	442,026
Vermonter	4,665,362	34,559	135	18,468
Northeast Regional	252,383,792	1,107,910	228	1,542,912
New Haven - Springfield	6,218,572	103,934	60	73,481

Source: Amtrak's FY21 Q4 Financial Metrics – Revised (April 2022) report.

Public Benefits

Measuring intercity rail public benefits focuses on the ability for people to travel easily and efficiently. In this context, the four specific measurements are connectivity, missed connections, community access, and service availability.

Connectivity

Connecticut's Amtrak connectivity benefits largely come from the Acela and Northeast Regional service. Given that these allow individuals the chance to travel north towards Boston and south towards Roanoke, there are many opportunities for connections. According to Amtrak's FY22 Q1 Public Benefits FY21 report, Acela connects with more than 4,961 trips to state corridors; 3,112 trips with Northeast Regional; and 904 trips with long-distance routes. The Northeast Regional generates even more connections, linking 153,486 trips with state corridors and 31,565 trips with long distance services.

Missed Connections

Missed connections are an important statistic to measure as a missed connection, especially when chronic, can dramatically decrease the benefits a service brings. Data from Amtrak's FY22 Q1 Public Benefits FY21 report indicates that 0 percent of Acela, 0 percent of Vermonter, 5 percent of Northeast Regional, and 1 percent of New Haven – Springfield Shuttle, trips result in a missed connection. These low numbers indicate there is decent reliability when traveling from one Amtrak service to another.

Community Access

Community access is a measurement that tracks the percentage of Amtrak passenger trips to and from not well-served communities.[14] Amtrak's FY22 Q1 Public Benefits FY21 report demonstrates that for its entire system, including services not operating in Connecticut, ridership from not well-served

[14] This is defined as rural communities: within 25 miles of an intercity passenger rail station; more than 75 miles from a large airport; and more than 25 miles from any other airport with scheduled commercial service or an intercity bus stop.

communities has decreased, with 67,830, or 0.56 percent, of Amtrak's passengers coming from underserved areas.

Service Availability

Service availability measures the total number of daily Amtrak trains per 100,000 residents in a metropolitan statistical area (MSA) for each of the top 100 MSAs in the United States. According to Amtrak's FY22 Q1 Public Benefits FY21 report, Connecticut has three top 100 MSAs serviced by three stations: Hartford, Stamford, and New Haven (**Table 2-22**).

Table 2-22. Amtrak Service Availability

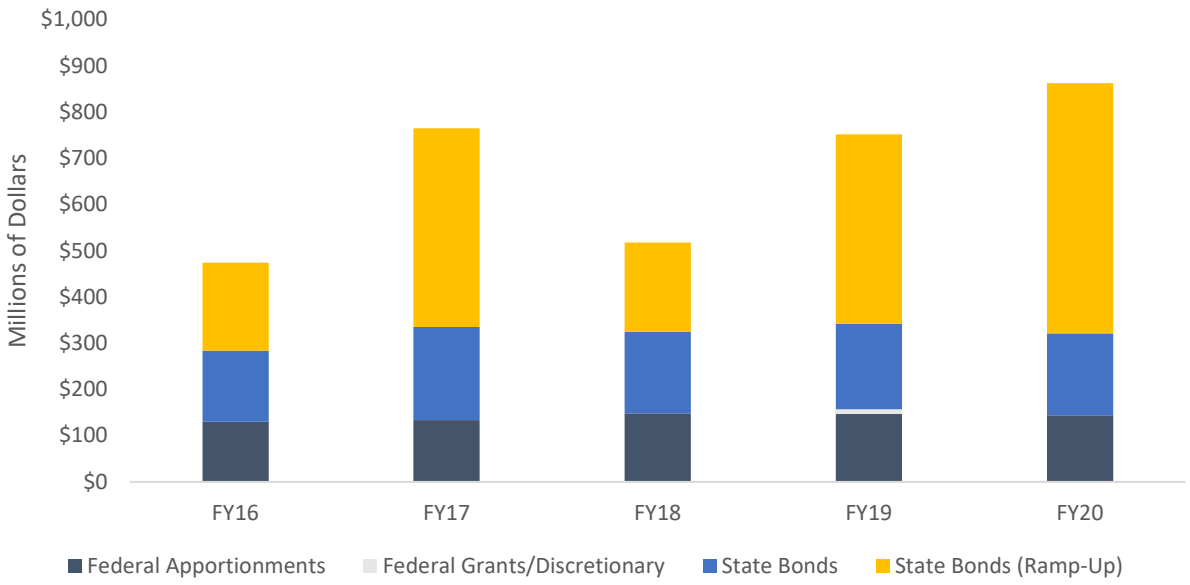
Metropolitan Statistical Area	Total Population	Average Daily Trains (Adjusted for Time of Day) [a]
Hartford-East Hartford-Middletown, CT Metro Area	1,213,531	1.35
Bridgeport-Stamford-Norwalk, CT Metro Area	957,419	3.22
New Haven-Milford, CT Metro Area	864,835	4.29

Source: FY22 Q1 Public Benefits FY21
[a] This refers to trains running between 5:00 AM and 11:00 PM.

2.1.5 Public Financing for Rail Projects and Services

This section provides an overview of the sources available for funding rail passenger and freight rail projects in Connecticut. Connecticut's rail infrastructure network is older than the state's highway network, and rail investment needs over the next 10 years are projected to require securing additional funding. Needs include continued investment in infrastructure and safety technology, freight rail infrastructure investment, historical rehabilitation, system resiliency, and significant capital investments in future passenger rail service and corridor development.

Figure 2-18. Rail Capital Funding (FY 2016–FY 2020)



Source: CTDOT 2020 Fact Sheet

Financing for Freight Projects and Services

Connecticut's freight railroad network is maintained and operated with freight lines paying for all operating expenses and most of their capital expenses through their own revenues. In general, for Class I railroads,[15] public funding or financing helps to support capital projects in instances where the public sector seeks to provide an incentive for railroads to provide or improve services beyond what would have otherwise been possible. Class II and Class III railroads in contrast rely more heavily on public funding and financing for capital investments.

Financing for Passenger Projects and Services

Amtrak services in Connecticut are funded in part by passenger ticket revenues. Passenger services are also supported by federal appropriations, assisting with both operating and relevant capital expenditures. In FY 2019, Amtrak employed 715 Connecticut residents. Total wages were $70,533,986, while Amtrak spent over $30 million on goods and services during this time (Amtrak 2020).

Available Federal Funding Sources

Generally, federal funding for rail is provided in two forms: federal apportionments and federal grants, which include loans and loan guarantees.

Since the state's last rail plan in 2015, two notable federal funding laws were authorized: the 2016 FAST Act and 2021 Bipartisan Infrastructure Law. The FAST Act, the first long-term federal transportation bill in more than 10 years, authorized funding for surface transportation infrastructure planning and investment from FY 2016 through 2020. It authorized $305 billion over this timeframe for all USDOT programs. The FAST Act also marked the first time intercity passenger rail programs were included in a comprehensive, multimodal surface transportation authorization bill, with more than $10 billion for intercity passenger and freight rail grants. The FAST Act's 5 years of predictable formula funding enabled CTDOT to better manage long-term assets and address the backlog of state of good repair needs. In total Amtrak received $8.1 billion for FY 2016-2020, with $2.6 billion going to the NEC and $5.45 billion for the national network (**Table 2-23**).

The Bipartisan Infrastructure Law was signed into law by President Biden on November 15, 2021. By authorizing $1.2 trillion in total funding over 10 years (including $550 billion in new spending during FY 2021-2025), it constitutes a once-in-a-generation investment in intermodal transportation and other core infrastructure in the United States (a 56.4 percent increase over FAST Act funding). Of the $550 billion in new spending, $284 billion is dedicated to improving the surface transportation network (McKinsey and Company 2021). In total, passenger and freight rail will receive $102 billion in funding, $66 billion of which is in the new spending category. This funding has the potential to eliminate the Amtrak maintenance backlog, modernize the NEC, as well as bring world-class rail service to areas outside the northeast and mid-Atlantic. Of this funding, $41 billion is allocated as grants to Amtrak and $43.5 billion for grants for intercity passenger rail service (USDOT 2022). This constitutes the largest investment in rail since the creation of the rail system, representing an 11-fold increase in historical funding levels (McKinsey and Company 2021). Additionally, Connecticut will receive $5.38 billion over the FY 2021-2025 timeframe, representing a $1.63 billion increase over the most recent transportation bill enacted in 2015 (the FAST Act) (Governor Lamont 2021b).

[15] For regulatory purposes, the Surface Transportation Board categorizes rail carriers into three classes: Class I, Class II, and Class III. The classes are based on the carrier's annual operating revenues. Current thresholds establish Class I carriers as any carrier earning revenue greater than $943.9 million, Class II carriers as those earning revenue between $42.4 million and $943.9 million, and Class III carriers as those earning revenue less than $42.4 million.

Table 2-23. Federal Discretionary Grants Awarded to Connecticut Since Last Rail Plan

Program	Year	Railroad	Project Description	Federal	State	Total
Transportation Investment Generating Economic Recovery (TIGER) Grant Program	2011	New Haven Line	Stamford Multi-Modal Improvement	$10,500,000	$10,250,000	$20,750,000
Transit Security Grant Program (TSGP)	2013	New Haven Line	FY 2011 TSGP	$4,648,909	–	$4,648,909
TIGER	2013	New Haven Line	Construct a second platform and make improvements to New Haven's State Street Rail Station	$10,000,000	–	$10,000,000
TIGER	2014	New England Central Railroad	Upgrade 55 miles of weight and speed-restricted track along NECR	$8,183,563	–	$8,183,563
Transit-Oriented Development (TOD)	2014	New Haven Line	Creating TOD Opportunities for New Stations within the New Haven-Hartford-Springfield Rail Corridor	$700,000	$200,000	$900,000
TIGER	2015	New Haven Line	Construct a new State Street commuter rail station and widen the existing tracks	$10,000,000	$4,524,100	$14,524,100
TSGP	2015	Multiple Railroads	FY 2015 TSGP	$2,048,216	–	$2,048,216
TSGP	2016	Multiple Railroads	FY 2016 TSGP – “See Something, Say Something”	$2,000,000	–	$2,000,000

Program	Year	Railroad	Project Description	Federal	State	Total
Better Utilizing Investments to Leverage Development (BUILD) Grant Program	2018	New Haven Line	Stamford Station Elevators and Escalators Improvement Project	$9,160,000	$13,740,000	$22,900,000
Consolidated Rail Infrastructure and Safety Improvements (CRISI) Grant Program	2019	NHHS	Windsor Locks Station	$17,490,000	$40,810,000	$58,300,000
State of Good Repair	2019	New Haven Line	Walk Bridge Replacement Project	$29,000,000	–	$29,000,000
Restoration and Enhancement	2020	Hartford	Provides two additional weekday trains between New Haven, CT and Springfield, MA and includes adding a customer service representative in Hartford Union Station	$4,395,616	–	$4,395,616
State of Good Repair	2020	New Haven Line	Walk Bridge Replacement Project	$79,700,000	–	$79,700,000
Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program	2021	New Haven Line	Derby-Shelton Multimodal Transportation Center	$12,600,000	$11,900,000	$24,500,000
TSGP	2021	Multiple RRs	FY 2021 TSGP	$334,463	–	$334,463
CRISI	2021	Hartford	Enfield Station and Track Improvements	$13,860,000	$15,860,000	$29,720,000

Source: CTDOT

In addition to the $40 billion in competitive grants that will be available for the NEC to improve rail performance, a total of $100 billion in national competitive grants will be made available, including:

- $7.5 billion in RAISE grants for projects of local or regional significance
- $5 billion in MEGA project grants for multimodal, multi-jurisdictional projects of national or regional significance
- $3.2 billion in Infrastructure for Rebuilding America (INFRA) grants for highway/rail projects of regional and national economic significance
- $8 billion in Capital Investment grants for new and expanded high-capacity rail and bus service (Governor Lamont 2021b)

Federal Credit Assistance Programs

There are also federal credit assistance programs that states can utilize to help finance project costs without significantly impacting state budgets. Federal assistance can be in the form of a loan guarantee, or direct loans that have low-interest rates, long payback periods, and/or payment schedules that do not begin until completion of a project. Examples of these federal financing programs include:

- **Railroad Rehabilitation and Improvement Financing (RRIF)**. The RRIF Program provides direct federal loans and loan guarantees up to $35 billion to finance development of railroad infrastructure. Eligible borrowers include railroads, state and local governments, government-sponsored authorities and corporations, joint ventures, and limited option freight shippers that intend to construct a new rail connection. Eligible projects include improvements to, rehabilitation of, or acquisition of freight and passenger railroad equipment, track and structures, and new multimodal facilities, and refinancing of associated debt. Direct loans can fund up to 100 percent of a railroad project with repayment periods of up to 35 years and interest rates equal to the cost of borrowing to the government.
- **Transportation Infrastructure Finance and Innovation Act (TIFIA)**. This program provides credit assistance for large projects up to $50 million or 33 percent of a state's annual apportionment of federal-aid funds, whichever is less. Eligible applicants include state and local governments, transit agencies, railroads, special authorities, special districts, and private entities. The program has a rolling application process, and projects must satisfy statutory eligibility requirements to move forward.

State Funding Sources

Connecticut's rail program receives funding through the state's STF. The STF is a state-appropriated fund that finances most of the state capital and operating dollars that CTDOT receives each year. The predominant source of STF revenues comes from state motor fuel taxes, including gas tax, diesel tax, motor carrier tax, and the petroleum products gross earnings tax. Other STF revenues include general sales and use taxes, motor vehicle sales taxes and receipts, licenses, permits and fees, interest income, and other sources.

The STF funds state transportation programs that receive revenues from transportation-related taxes, fees, and revenues, as well as from the proceeds of STO Bonds. The STF pays the debt service cost for state bonds issued as a means of providing funds for the state's share of transportation projects; supports a small program of Pay-As-You-Go activities; and finances the capital projects, operations, and services of CTDOT. Between FY 2016 and FY 2019, state appropriations for rail averaged about $485 million.

2.1.6 Safety and Security Programs

Railway/Highway Grade Crossing Program

CTDOT's Division of Traffic Engineering is responsible for the implementation of the Railway/Highway Grade Crossing Program within the Highway Safety Improvement Program (HSIP). Historically, the program's emphasis has been to provide active warning devices at a minimum.

Successful implementation of a program depends in part upon efficient and effective procedures. The Railway / Highway Grade Crossing Program strives to enhance the safety of these crossings at both state and town roads on a statewide basis.

There are approximately 616 at-grade crossings in the state with 358 of these crossings considered active. Some of the 358 have active warning devices (flashing lights, gates) and some have passive warning devices (signs, pavement markings). The remaining 258 crossings are considered inactive (no train activity over the crossing).

The Office of Rail is working on a Highway-Rail Grade Crossing State Action Plan (SAP) and a new railroad crossing inventory system. The inventory system will be used to update the current priority list, and the SAP's recommendations will be considered to program future projects. Both SAP recommendations and the new priority list should be available in early 2023. Grade crossing improvements are funded with a combination of state and federal funding. FHWA Section 130 has been the main federal funding source. CTDOT is also eligible for grade crossing improvements funded through the Bipartisan Infrastructure Law, including the Rail Crossing Elimination Grant Program.

Connecticut Operation Lifesaver

Figure 2-19. Operation Lifesaver Logo

Source: Operation Lifesaver Inc.

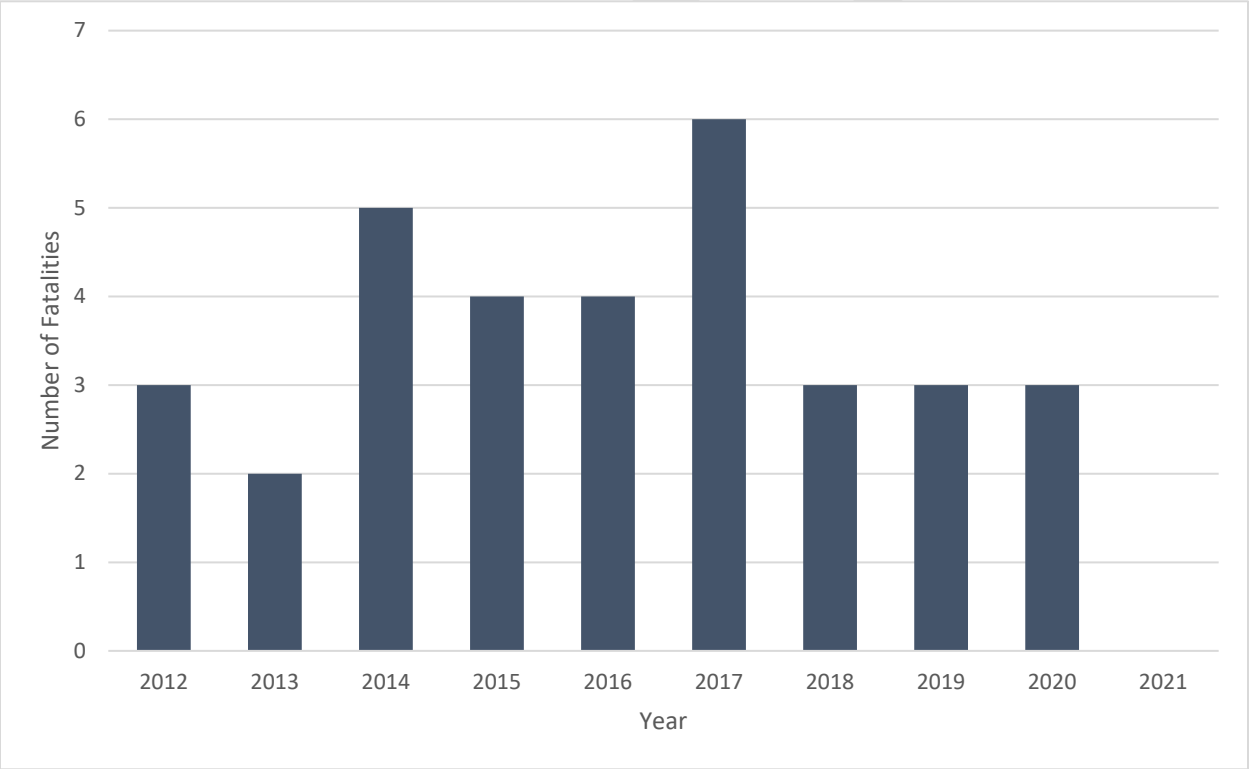
Connecticut Operation Lifesaver (CTOL), which was established through Section 13b-376 of the Connecticut General Statutes, provides a public education program dedicated to reducing and preventing incidents at highway-rail grade crossings, and to making the public more aware of inherent dangers that may be encountered at highway-rail at-grade crossings and when trespassing on railroad property. CTOL is a charter member of the national program Operation Lifesaver, Inc. (OLI) and is funded by CTDOT. OLI is a federally funded non-profit organization. An OL Committee is appointed by the State Legislature to administer and promote the program at the local level by coordinating with law enforcement and educating the public. The Committee also encourages the development of engineering and safety improvements with CTDOT.

Rail Safety, Regulatory, and Compliance Unit

CTDOT's regulatory authority extends to all matters pertaining to railroad construction and operations that are not specifically governed by federal law or regulation. The major statutory responsibilities of the program include, but are not limited to, matters concerning public and private railroad/highway at-grade crossings, railroad traffic control signals, fencing along railroad rights-of-way, and railroad land rights and trespassing concerns. The Rail Regulatory and Compliance Unit is responsible for ensuring all requirements as stated in Chapters 245, 245a, and 245b of Connecticut General Statutes are abided by.

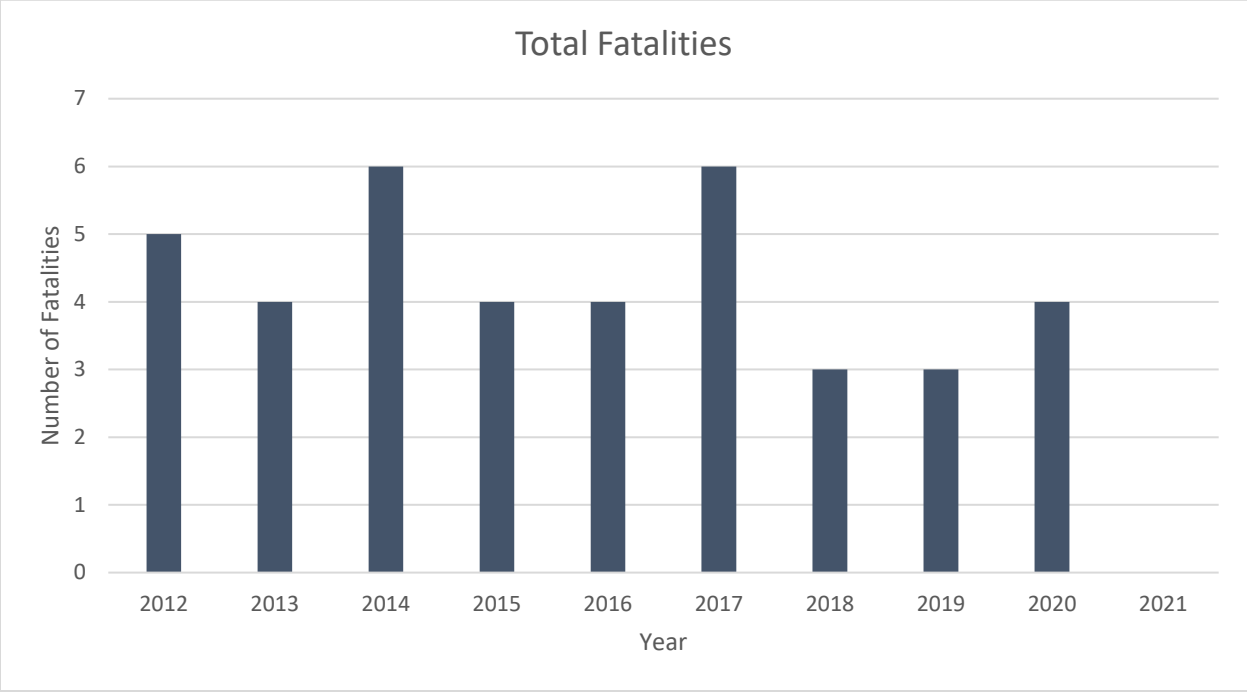
The Rail Regulatory and Compliance Unit provides investigation and testimony for all rail regulatory hearings and public informational meetings; inspects all new and reconstructed public and private at-grade crossings; provides technical support for the State Traffic Commission (STC) for traffic generators involving at-grade railroad crossings in the State of Connecticut; performs periodic inspections of the freight lines in Connecticut; monitors railroad related accidents within the state; and provides coordination between other department units and various railroad companies during planning and design related to railroad at-grade crossings. As mentioned above, the Rail Regulatory and Compliance Unit is responsible for monitoring railroad-related accidents within the State of Connecticut. **Figure 2-20** and **Figure 2-21** show total accident fatalities from 2012 to 2020 and total trespasser fatalities (not at highway-rail grade crossings) for the same time period, respectively. The data reveal that the number of accidents at railroad/highway at-grade crossings, while low, remains consistent and, that suicide and trespassing incidents, in terms of fatalities, present the greatest safety challenge on Connecticut railroads.

Figure 2-20. Trespasser Fatalities on Connecticut Railroads (2012–2021)



Source: CTDOT Rail Regulatory and Compliance Unit

Figure 2-21. Total Fatalities on Connecticut Railroads (2012–2021)



Source: CTDOT Rail Regulatory and Compliance Unit

CTDOT System Safety Program Plan

CTDOT has a System Safety Program Plan that is CTDOT's principal rail equipment safety document. It defines how the safety effort is implemented and identifies the staff and/or procedures required to maintain it. The plan is a living document that tracks changes in the system. Specifically, the plan addresses fire protection, inspection and testing, maintenance and repair of equipment, employee training and qualification, system modifications, configuration management, internal safety management assessment, and the safety certification process. The plan ensures that safety issues are treated equally with cost and performance issues when design tradeoffs are made.

Commuter Rail Security Program

CTDOT has implemented a security program in cooperation with Metro-North Railroad; Amtrak; and other federal, state, and local partners. CTDOT priorities include increasing public awareness of security issues, improving emergency preparedness, and investing in capital projects that enhance security and harden critical infrastructure at rail stations and facilities.

Transit Security Grant Program

The federal TSGP provides additional opportunities for CTDOT to implement many of its security priorities with the supplementation of state funding. The purpose of the TSGP is to create a sustainable, risk-based effort to protect critical surface transportation infrastructure and the traveling public from acts of terrorism, major disasters, and other emergencies. The Department of Homeland Security (DHS) has identified priority project types and placed them into groups based on their effectiveness to reduce risk. Certain types of projects that are effective at addressing risk are given priority consideration for funding. These groups are prioritized based upon departmental priorities and their ability to elevate security on a system-wide level, to elevate security to critical infrastructure assets, and to reduce the risk of catastrophic events and consequences.

CTDOT is a member of the Regional Transit Security Working Group (RTSWG) that comprises transit agencies and their security providers in the tri-state region (Connecticut, New York, and New Jersey). RTSWGs are comprised of eligible transit agencies in the highest risk urban areas in the nation and are a requirement of DHS to apply for TSGP funding. As the highest risk transit regions in the country, Tier I regions receive the vast majority of TSGP funding. Tier I regions are Atlanta, Boston, Chicago, Los Angeles, the National Capital Region, New York, Philadelphia, and the San Francisco Bay Area. DHS meets with the RTSWG in each region to identify projects that will have the greatest security impact based on national priorities.

The TSGP infrastructure projects have included the installation of fencing, access-controlled gates, guard posts, and other security features at rail yards and closed-circuit television video cameras at rail stations, rail yards, and bridges on rail lines. Other projects include funding to implement a public awareness campaign specific to the New Haven Line and Shore Line East service areas, conducting law enforcement operations dedicated to transit security, and the planning of emergency preparedness exercises. CTDOT has also tasked members of the Connecticut Department of Emergency Services and Public Protection (DESPP) Critical Infrastructure Protection Unit to conduct a comprehensive physical security and vulnerability assessment of commuter rail operations and to develop risk mitigation and security planning strategies. CTDOT is involved in several regional projects with New York and New Jersey transit agencies and Amtrak. One such regional interoperable communication project funded through the TSGP will link MTA communication centers to all public safety answering points along the New Haven Line rail corridor.

Visible Intermodal Prevention and Response Teams

The Transportation Security Administration (TSA) utilizes Visible Intermodal Prevention and Response (VIPR) teams to leverage resources quickly and to increase visible security in all modes of transportation, throughout the country. VIPRs are DHS's top anti-terrorism initiative.

In Connecticut, VIPRs are utilized on the rails in collaboration with MTA Police Department (PD), Amtrak PD, and State Police. Typical Connecticut rail VIPRs include TSA, MTA PD, Amtrak PD, State Police MTST, local police, and Connecticut National Guard personnel. VIPR teams are flexible in size and response. A VIPR at smaller platforms consist of 4 to 6 personnel, while the larger stations typically consist of 10 to 15 personnel. In addition to visible deterrence, VIPRs in Connecticut also provide specially trained State Troopers assigned within the Office of Counter Terrorism of the Connecticut DESPP who have advanced radiological and nuclear detection capabilities.

Metropolitan Transportation Authority Police

The MTA PD is the primary law enforcement agency for the Metro-North Railroad, Long Island Railroad, and Staten Island Rapid Transit System. The primary mission of the MTA PD is to ensure a safe environment within the transit system, reduce fear, and promote confidence of the riding public through station-based policing.

The MTA PD is responsible for policing 36 rail stations in the state of Connecticut that Metro-North Railroad services and patrolling the railroad right-of-way in Connecticut from Greenwich to New Haven and the New Canaan, Danbury, and Waterbury Branch Lines. The MTA PD provides the primary response to all incidents on the New Haven Line and coordinates response efforts with the Connecticut State Police and local police agencies in Connecticut.

The MTA PD has facilities in Stamford, Bridgeport, and New Haven. Patrol officers, K-9 officers, and detectives are staffed at these locations, and a detective is assigned to the Joint Terrorist Task Force in New Haven. The MTA PD has taken proactive steps to reduce crime and to provide a safe environment. A

Directed Patrol program is being used that places officers at stations at key times. Officers on Directed Patrols perform station-based policing by interacting with commuters. They also perform "Step-On Step-Off" inspections of trains that arrive and depart the stations. A random bag inspection program is being used in which officers randomly check items such as luggage, packages, or carry-on items at various stations on the New Haven Line.

MTA PD partners with the TSA and other law enforcement to perform VIPR team operations at various rail stations in Connecticut. The VIPR teams supplement existing security measures and provide a deterrent and detection presence to disrupt potential terrorist planning activities.

MTA officers have received Patriot training, which increases the detection of possible terrorist threats. The Patriot system trains officers in behavioral assessment that enhances their ability to detect and apprehend terrorists. MTA officers are equipped with personal radiation detectors and receive the detectors after receiving training provided by the Federal Emergency Management Agency (FEMA).

The MTA PD also provides traditional law enforcement services that have been provided by transit police. Uniformed police officers respond to calls for service that include trespassing, thefts, assaults, disorderly persons, and other complaints. They also provide traffic enforcement at stations and railroad grade crossings. The MTA PD has taken a proactive approach to railroad crossing safety and target three crossings per month where additional enforcement is taken.

The MTA PD Detective Division has investigators assigned to Connecticut and augments them with staff from other commands. The primary function of the Detective Division is to conduct follow-up investigations of crimes. The Detective Division also investigates major rail traffic accidents, fatalities, and other incidents. The MTA PD Special Operation Division (SOD) consists of an Emergency Service Unit, Canine Unit, and Highway Unit. SOD routinely assigns units to patrol in Connecticut. The Canine Unit has explosive detection canines, some that are cross-trained for patrol that includes tracking, criminal apprehension, and evidence recovery.

Amtrak Police

Amtrak Police is the primary law enforcement agency for the Shore Line East commuter service and Amtrak intercity passenger service in Connecticut on the Springfield Line and Shore Line East. Amtrak has a program that includes a variety of security measures aimed at improving passenger rail security. Some of these measures are noted on Amtrak's website and are conducted in stations or aboard trains to include:

- Uniformed police officers or Mobile Security Teams
- Random passenger and carry-on baggage screening
- K-9 units
- Checked baggage screening
- On-board security checks
- Identification checks

Amtrak exchanges intelligence with the Federal Bureau of Investigation's Joint Terrorism Task Force. Amtrak Police also partner with TSA, state, and local police to conduct VIPR operations along Shore Line East, the Springfield Line, as well as the New Haven, Bridgeport, and Stamford stations along the New Haven Line.

State and Local Police

State and local governments, passenger rail operators, and private industry are also important stakeholders in the state's rail security efforts. The state owns and operates a significant portion of the

passenger rail system. Municipalities are directly affected by the rail systems that run within and through their jurisdictions. Consequently, the responsibility for responding to emergencies involving the passenger rail infrastructure often falls to state and local governments. State and local police participate in the VIPR initiatives in coordination with TSA, MTA PD, and Amtrak PD and respond to incidents along the rail line.

Mass Transit Security Team

Beginning in 2011, the Connecticut State Police's newly created five member MTST conducts proactive explosive detection sweeps with canines at passenger rail and bus stations/terminals and critical locations related to the mass transit system in Connecticut. The MTST liaisons and coordinates with CTDOT, MTA PD, Amtrak Police, various mass transit officials, federal agencies, and local police agencies involved in mass transit operations, and works to develop effective terrorism prevention strategies. Most of this MTST was funded through the federal TSGP.

2.1.7 Economic and Environmental Impacts

Many industries in Connecticut depend on rail to ship products and receive goods in a consistent, reliable, and efficient way. Passenger rail service, including Amtrak and Connecticut's scenic railroads, provides significant direct economic benefits to communities that are near rail stations. Rail also provides significant environmental benefits compared to moving people by automobiles and freight by trucks. Improving and expanding rail in Connecticut can offset investment and maintenance needs of the highway system, reduce congestion, offer safe and resilient travel options, and provide flexibility for shippers and the traveling public.

Rail and the Economy

Freight and passenger rail provide significant direct economic benefits to Connecticut. In 2019, freight rail in Connecticut originated and terminated more than 31,400 freight carloads, or 2.9 million tons (AAR 2021). Rail is one of the most fuel-efficient modes to ship freight. Shippers who use rail to move freight rather than trucks can save costs and then pass along a portion of these savings to consumers and potentially expand operations and, in turn, create more employment opportunities within their business.

Combined, Amtrak, CT*rail,* and scenic rail operators moved an estimated 41.3 million passengers in and through Connecticut in 2019. If rail services were not available, rail users could switch to other modes of transportation, but other modes are potentially more expensive and congested and may not be as efficient. Connecticut's scenic railroad, run by the Valley Railroad Company regularly carries in excess of 130,000 passengers per year and provides a critical link to Connecticut's past and attracts hundreds of visitors a year to surrounding communities. Spending from out of state tourists and in-state visitors can generate significant economic impact in local sales and lodging tax revenues and boost induced visitor spending and indirect employment in the towns along the scenic rail line.

On the intercity and commuter side, Amtrak service links Connecticut communities within the state and throughout the country. New York residents are easily able to board a train in New York City or at other New York stations and plan visits to Connecticut, which in turn brings tourist revenues to towns within the state. Many Connecticut residents, especially on the New Haven Line, utilize the rail as a commuter service to access their worksites and schools. Residents rely on the trains to bring them to their jobs in an efficient affordable manner so that they can maximize their productivity at work, avoid congestion, and enjoy improved mobility between major metropolitan centers.

The railroads directly employ thousands of workers in Connecticut, improve connectivity across the state, and create vital transportation alternatives for shippers and passengers. In FY 2019 Amtrak

employed 715 Connecticut residents, which helps run the CT*rail* systems. A report from the Towson University's Regional Economic Studies Institute found that in 2017 alone, Class 1 railroads' operations and capital investment supported over 1.1 million jobs, $219.5 billion in economic output, and $71.3 billion in wages, while also creating nearly $26 billion in total tax revenues (AAR 2018).

Connecticut communities have seen an increase in TOD near passenger rail stations, which provide new services to residents and businesses and support job growth.

Rail and the Environment

Rail transportation takes pressure and traffic off Connecticut's constrained highway network and provides environmental benefits through increased fuel efficiency, and lower air pollutants and emissions and encourages a more sustainable travel option. Freight and passenger rail are energy efficient modes of transport and they play a critical role in Connecticut's multimodal transportation system. Additionally, nationally Amtrak has set the long-term goal to reduce carbon emissions 40 percent by 2030 (Amtrak 2021).

Fuel Efficiency

Rail is a more fuel-efficient mode of transportation than truck or automobile, as shown in **Table 2-24**. On average, freight railroads can transport one ton of freight for 470 miles per gallon, also referred to as ton-miles (AAR 2020). On the other hand, the fuel efficiency of a fully loaded semitrailer truck is 128 ton-miles per gallon (ATRI 2019).[16] Freight railroads are on average three to four times more fuel-efficient than trucks (AAR 2020), suggesting that one rail car can move four trucks of tonnage while consuming the same amount of fuel. Fuel efficiency is also higher for passenger rail compared to automobiles and air. On average, passenger rail can achieve fuel efficiencies averaging 51.6 passenger-miles per gallon (pmpg)[17] compared to passenger vehicles operating on highways with a pmpg of 36.0[18] and air travel with a pmpg of 50.3 (DOE 2020).

Table 2-24. Fuel Efficiency of Rail and Highway Modes

Measurement	Rail	Truck	Auto	Air
Ton-miles per gallon	470.0	128.0	--	--
Passenger-miles per gallon	51.6	--	36.0	50.3

Source: AECOM 2020

Because of its advantage in fuel efficiency, freight rail offers a cost-effective option, which allows shippers to transfer the same amount of goods while incurring lower expenditures on fuel. Moreover, moving freight by rail creates broader economic and environmental benefits by reducing heavy truck traffic, diesel fuel consumption, and carbon emissions. On the passenger side, there has been evidence of ridership trending with gasoline prices, suggesting the shift in passengers' travel preference when driving is more costly. Passenger rail offers a fuel-efficient way to mitigate peak vehicle congestion by offering a competitive alternative to driving, particularly for commuters from Connecticut to the New York City economy where parking is limited and costly.

[16] Assuming a 6.4 MPG semitrailer carrying a load of 20 tons.

[17] Passenger-miles per gallon (pmpg) is a metric for comparing mass transit and rideshare with typical passenger vehicle travel. Transportation system efficiency increases as the number of passengers increases or as the vehicle fuel economy increases for each transportation mode. All fuel converted to gallons of gasoline on an energy content basis. For trains, most of this fuel is electricity.

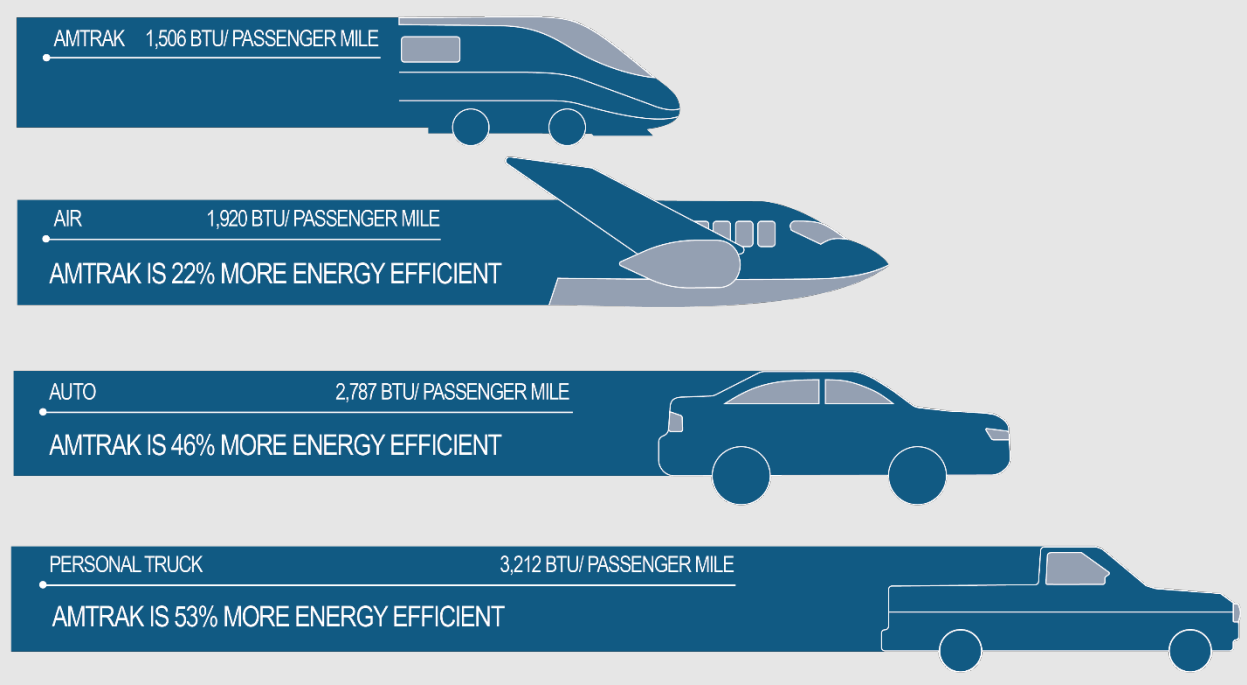
[18] Assuming on average there are 1.5 passengers travelling in one car.

Lower Emissions

Connecticut air quality monitors record some of the highest ozone levels in the eastern United States, especially along heavily traveled transportation corridors where criteria air pollutants are most densely concentrated. Nonattainment with the 2008 and 2015 ozone National Ambient Air Quality Standards (NAAQS) is one of the most critical air quality and public health challenges facing the state, with pollution from the transportation sector being one of the main contributors. Transportation accounts for 38 percent of carbon emissions in Connecticut and is generally one of the largest segments of an individual's carbon footprint. Nationally, transportation accounts for 29 percent of GHG emissions, of which rail makes up only 2 percent (EPA 2022). Due to fuel efficiency, moving freight by rail lowers GHG emissions, of which carbon dioxide is the primary component, by 75 percent compared to trucking.

The *Transportation Energy Data Book* (ORNL 2022) estimates that in 2019 the average British thermal unit (Btu) per passenger mile of Amtrak trains was 1,506 compared to the average Btu per passenger mile of 2,787 for passenger cars (**Figure 2-22**). According to the International Council on Clean Transportation, if an individual took a train instead of a car for medium-length distances (over 50 miles), emissions for that trip would be reduced by about 80 percent. If an individual took a train instead of a domestic flight, emissions would be reduced by approximately 84 percent. The margin between train and plane emissions varies substantially and is dependent on several factors, including the type of train and how full the train is. A peak time commuter train will have much lower emissions per person than a late-night rural one. For electric trains, the way the electricity is generated is used to calculate carbon emissions. In 2020, 38 percent of Connecticut's electricity net generation came from the Millstone Nuclear Power Station (EIA 2021). So for any trains that use electricity in-state, they are considerably cleaner and more efficient than a train that runs in other parts of the country.

Figure 2-22. 2021 Energy Use by Mode Compared to Amtrak



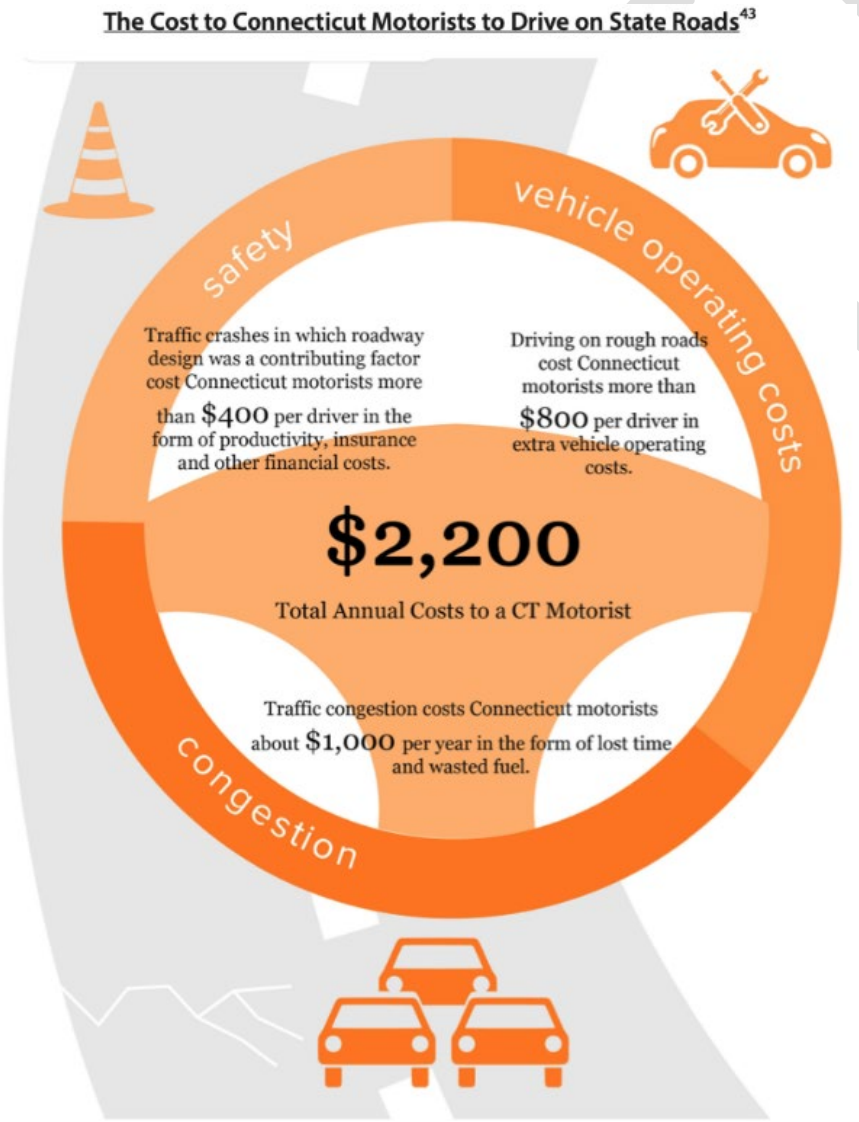
Source: Amtrak

Reduced Highway Maintenance and Congestion

Prior to the COVID-19 pandemic, the average Connecticut driver spent more than 40 hours a year stuck in traffic (TRIP 2017). This cost the average Connecticut motorist about $2,200 in total safety, congestion, and vehicle operating costs per year (**Figure 2-23**). Rail services offer alternative transportation and commuter options that can reduce these costs. For daily rail commuters and business travelers, those lost hours and direct cost can be transformed into productive time.

Moving people by rail is less land intensive than the highway system. Each new line of rail track provides more passenger capacity and uses less land area than the addition of a highway lane. By diverting freight to rail and off existing roadways, highway maintenance costs are reduced and space on highways is freed up for other motorists. Tractor trailers typically carry 80,000 pounds of freight, which over time wears down the pavement and certain bridge components on interstates, but a train can carry more than 100 trailer size containers in one trip.

Figure 2-23. Congestion Costs (2017)



Source: CT Transportation by the Number (TRIP 2017)

2.2 The State's Existing Rail System: Trends and Forecasts

This section includes discussion of trends and forecasts to help predict demand for rail service—both passenger and freight—in the future.

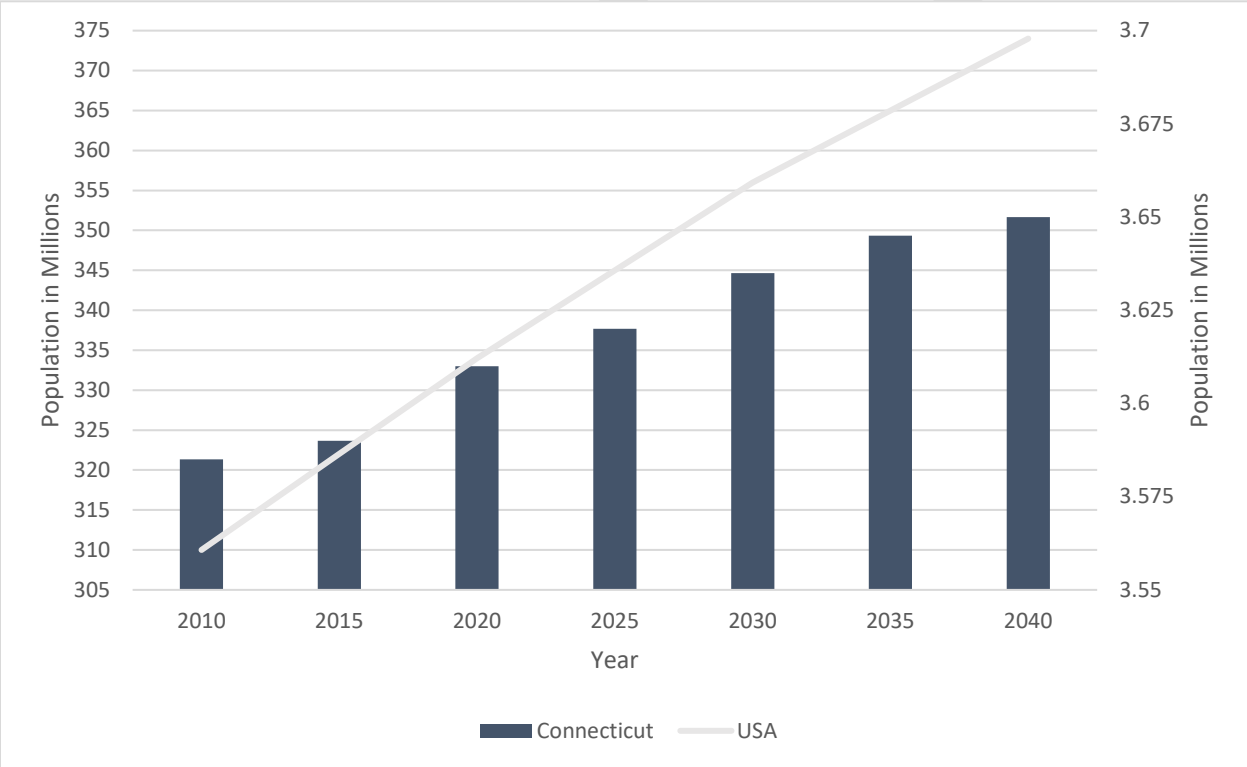
2.2.1 Demographic and Economic Growth Factors

The existing and forecasted demographic conditions of Connecticut were examined to help determine how industrial forecasts suggest directions for future rail passenger and freight mobility.

Population Trends

Populations are anticipated to grow nationally and within Connecticut. The U.S. Census Bureau anticipates that by 2040, the United States and Connecticut populations are projected to reach approximately 373.5 million and 3.7 million **(Figure 2-24)**, respectively. In Connecticut, Fairfield County, Hartford County, and New Haven County are the three largest counties by population, making up approximately 75 percent of the state population.

Figure 2-24. National and Connecticut Trends in Population (2010-2040)



Source: U.S. Census Bureau; Connecticut Open Data Portal

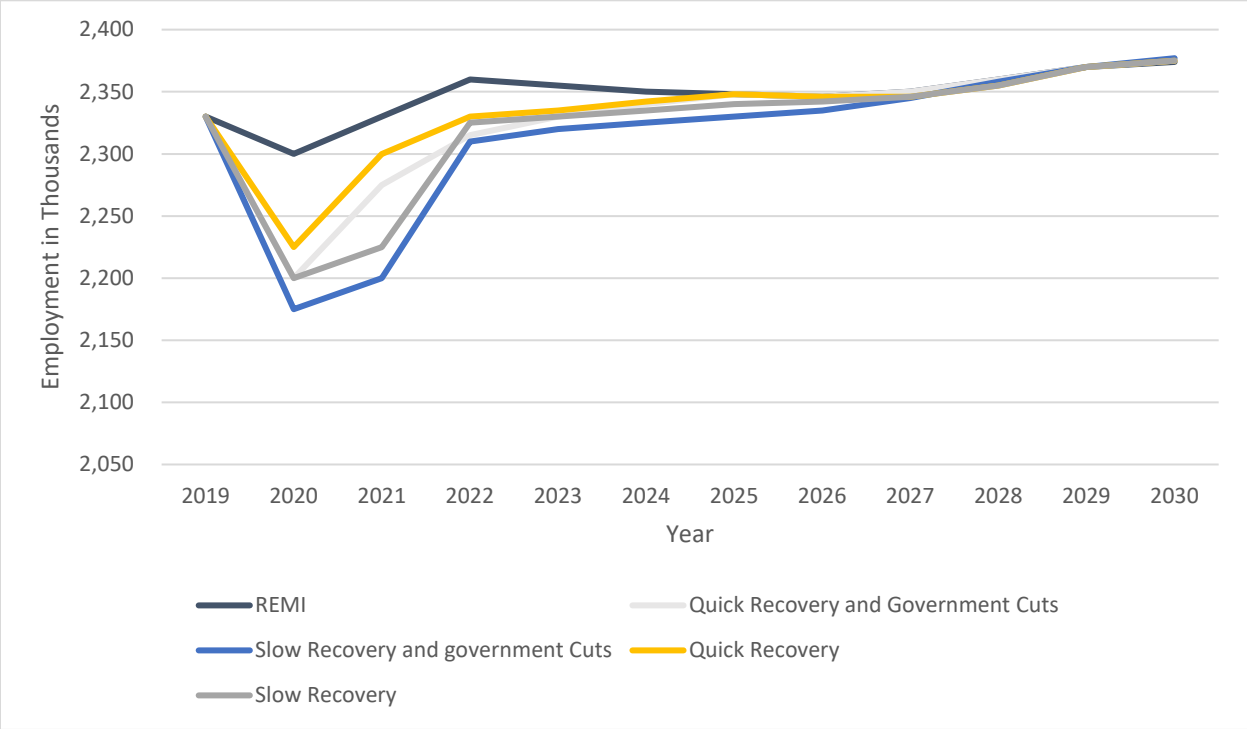
Employment Trends

Prior to the COVID-19 pandemic, the top five industries with the highest employment in Connecticut were Heath Care and Social Assistance, Retail Trade, Educational Services, Manufacturing, and Accommodation and Food Services (see **Appendix H** for details). Three of these industries (Health Care and Social Assistance, Educational Services, Manufacturing) have a location quotient (LQ) greater than 1.0, illustrating Connecticut's local comparative advantages in these sectors. The sub-industries within manufacturing with the highest employment include Transportation Equipment Manufacturing,

Fabricated Metal Product Manufacturing, Machinery Manufacturing, and Computer and Electronic Product Manufacturing, which are supported by freight rail that transports inputs for manufacturing. Connecticut also hosts several white collar industries including Finance and Insurance, Other Services, Public Administration, and Management of Companies and Enterprises. These industries have traditionally relied on passenger rail service for travel to and from workspaces.

Connecticut's commute flows vary with most people who are employed in Connecticut (91.9 percent) live in the state. Similar statistics apply to Connecticut's residential population as the majority (90 percent) also work within the state. This noted, travel patterns may change as the COVID-19 pandemic continues to take place.[19] While data on the number of jobs in the state at present are not yet available, data on the virus' immediate impact indicates that employment in Connecticut decreased from approximately 2.3 million in 2019 to 2.2 million in 2020. Depending on the rate of recovery illustrated by the five scenarios shown in **Figure 2-25**, employment is predicted to recover to pre-COVID levels between 2022 and 2025.

Figure 2-25. Employment Forecast Scenarios in Connecticut (2019–2030)



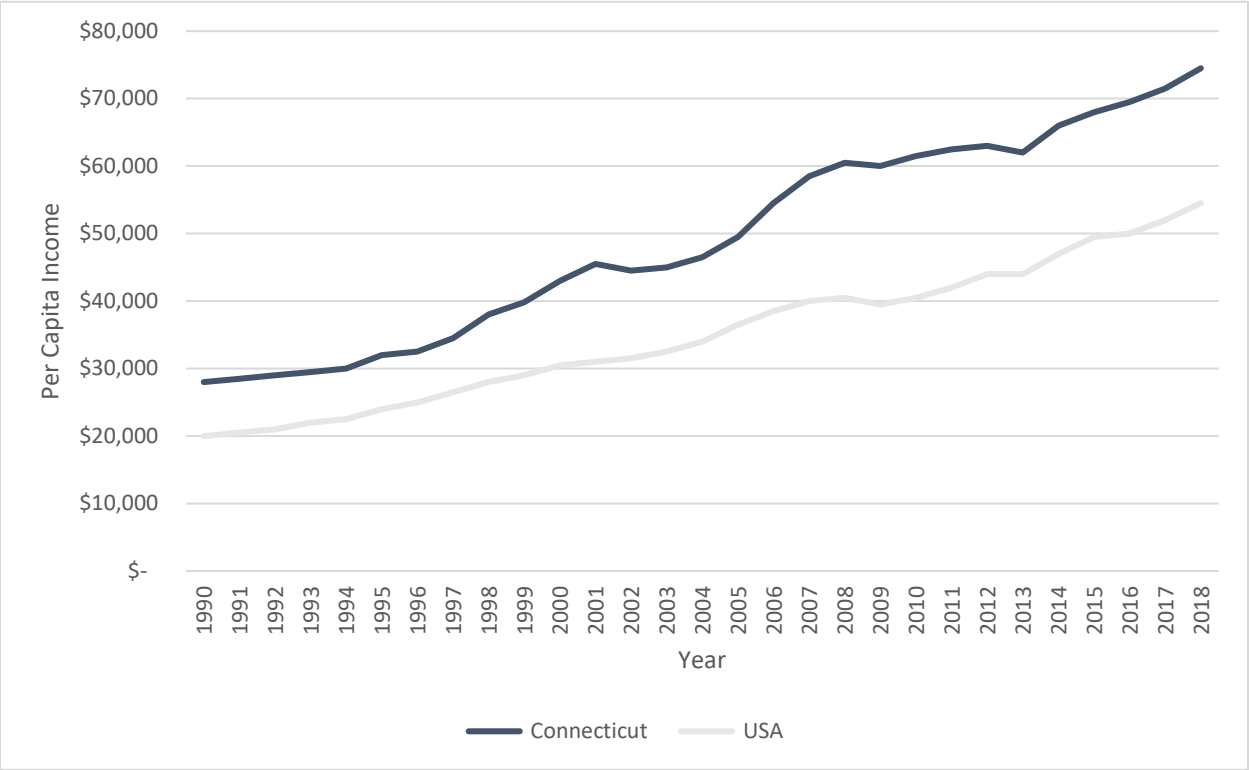
Source: Connecticut Center of Economic Analysis (CCEA), University of Connecticut

Per Capita Personal Income

Connecticut's per capita personal income more than doubled from 1990 to 2018 and was consistently above the national average over the same period (**Figure 2-26**). Connecticut's per capita personal income is $77,289, which ranks second in the United States, and was 36.8 percent above the national average of $56,490.

[19] For additional information on the COVID-19 pandemic and its impact on transportation, see Chapter 1. As stated in the beginning of this plan, data continues to emerge and where possible/available, incorporated into these analyses.

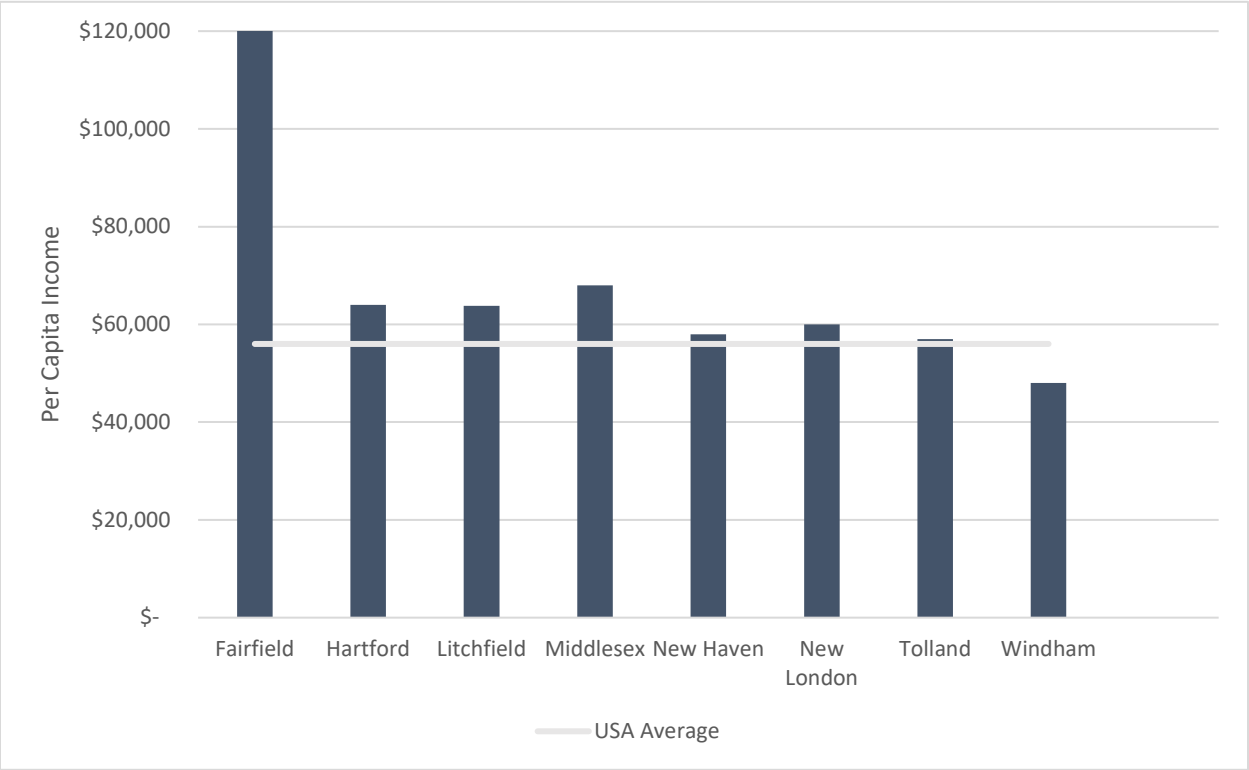
Figure 2-26. National and Connecticut Trends in Per Capita Personal Income (1990 to 2018)



Source: U.S. Bureau of Economic Analysis

Of the eight counties in Connecticut, all counties except Windham County had a per capita personal income above the 2019 national average (**Figure 2-27**). Fairfield County had a per capita personal income of $121,397, which is the highest in the state, and almost double the per capita personal income of the other counties. As part of the metro New York economy, Fairfield County is the home to 19 Fortune 1000 corporations and a growing number of small businesses, with manufacturing, financial services, professional services, and healthcare being its top industries. The high level of economic exchange between New York City and neighboring regions in Connecticut highlights the importance of having reliable and efficient passenger rail service to connect commercial landscapes. While the COVID-19 pandemic is ongoing and travel patterns continue to shift, passenger rail remains an effective option for bringing commuters from affordable housing options in suburbs to regional employment centers. This remains the case as gas prices and vehicle costs continue to grow.

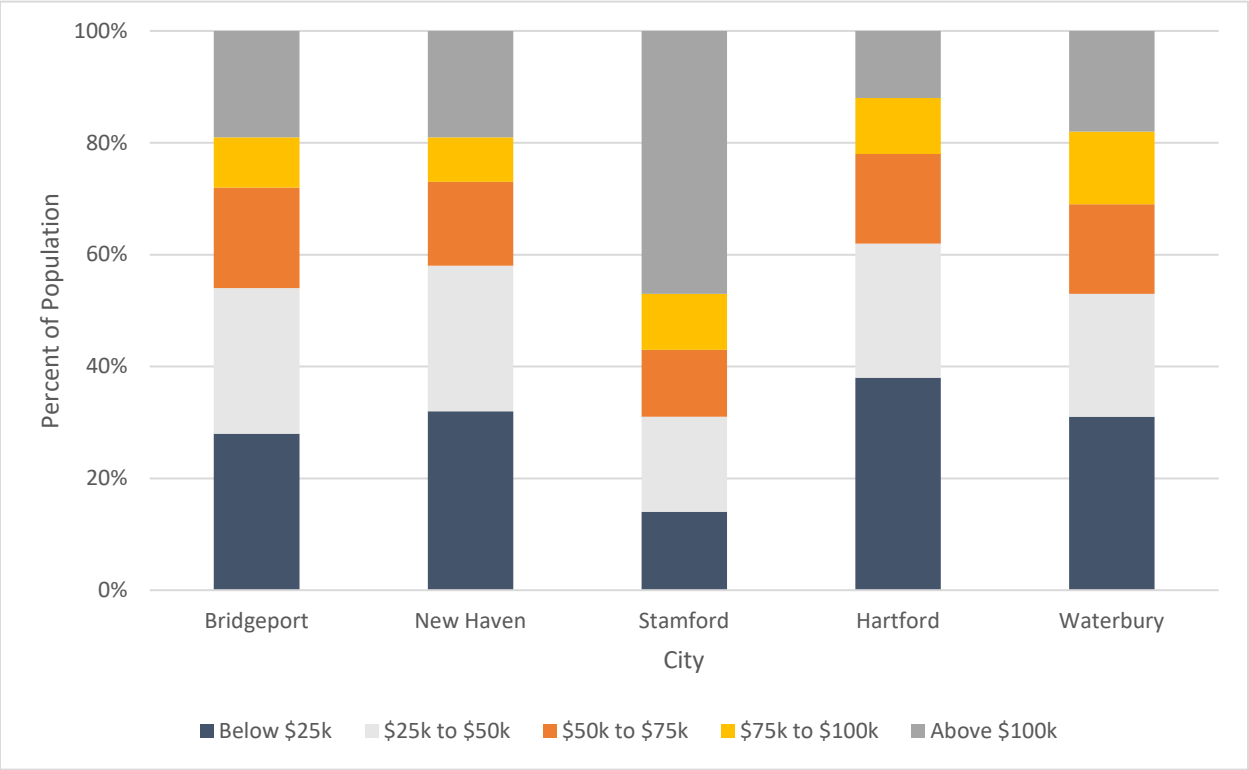
Figure 2-27. Connecticut Counties and U.S. Average 2019 Per Capita Personal Income



Source: U.S. Bureau of Economic Analysis

As of 2019, 10.0 percent of the state's population lived below the poverty line. Notably, over 20 percent of the populations of four of the five most populous cities in Connecticut live below the poverty line (**Figure 2-28**). Passenger rail offers additional accessibility to employment and educational opportunities, but because it is typically priced higher than intercity bus services, low income populations may choose bus over rail. Freight rail is an efficient mode to transport commodities and the expansion of freight rail in the state and offers two opportunities for shippers: first, they may pass along transportation cost savings to consumers, making some purchases more affordable, and second, they may turn the savings into additional employment opportunities in rail-supported sectors.

Figure 2-28. Percentage of Population by Median Household Income and Percentage Below Poverty Line



Source: U.S. Census, ACS 2015-2019

Industrial Outlook by Sector

Connecticut hosts 13 Fortune 500 company headquarters, spanning the Aerospace and Defense, Entertainment, Healthcare, Finance and Insurance, and Manufacturing industries (**Table 2-25**). Connecticut has long been a pioneer of the insurance industry, with the highest concentration of actuaries in the country; universities and colleges in the state offer specialized educations in finance, producing more recruits for the finance and insurance industries that are already well-established in the region. In the healthcare industry, the Bioscience Connecticut Initiative invested $1 billion to expand the University of Connecticut's Health Center and to develop the Jackson Laboratory Genome Research Facility, further contributing to the strong tradition in biomedical research.

Although Connecticut has seen a decline in manufacturing jobs in recent decades, manufacturing remains a major contributor to the State Gross Domestic Product (GDP) and provides approximately 75,000 job opportunities statewide. Connecticut is home to more than 4,400 manufacturers, including the world's leading manufacturers in aerospace, shipbuilding, and thousands of leading component manufacturers. Connecticut manufacturers export $15 billion in goods each year, representing more than 92 percent of the state's exports. Opportunities for freight rail arise from the need to support the supply chain of the manufacturing industry, accelerating the growth of manufacturing businesses.

Table 2-25. Top Employers by Number in Connecticut (2021)

Rank	Employer	City	Number of Employees
1	Pratt & Whitney	East Hartford	8,000
2	Sikorsky Aircraft Corp	Stratford	7,000
3	General Dynamics Electric Boat	Groton	6,100
4	Hartford Hospital	Hartford	6,053
5	Foxwoods Resort & Casino	Mashantucket	5,561
6	Eversource Energy	Berlin	5,001
7	Yale New Haven Health System	New Haven	5,001
8	Hartford Financial Svc Group	Hartford	5,000
9	Waterbury Board of Education	Waterbury	5,000
10	St Francis Hospital & Med Ctr	Hartford	4,545

Source: careeronestop

In 2018, 337.7 thousand tons of rail-hauled freight valued at $39.6 million was delivered to New York, with inputs to manufacturing and construction (such as gravel, base metals, and nonmetal mineral products) being the top commodity types. In 2045, freight to New York from Connecticut is forecasted to increase by 60.4 percent and 127.6 percent in tonnage and value, respectively. The proximity to the nation's largest population center, New York City, as well as other metropolitan areas on the east coast, unlocks numerous opportunities for Connecticut's rail to support the broader regional and national economy.

2.2.2 Freight Demand and Growth by Type of Service[20]

Recent and forecasted rail freight demand was assessed using data from the U.S. Surface Transportation Board's 2019 Carload Waybill Sample. The data were analyzed to help understand recent rail freight demand in Connecticut, and data from the Freight Analysis Framework version 4.5.1 (FAF4.5.1) were used to develop rail freight growth factors. The growth factors were applied to rail freight tonnage from the 2019 Waybill Sample data to forecast rail freight demand in 2045. The analysis assumes freight impacts during the pandemic are not long-term, as the AAR data shows 2021 and 2022 traffic has nearly recovered to pre-pandemic levels (AAR 2022).

In addition, a review of the Gross State Product (GSP) in Connecticut is presented to provide a better understanding of the primary industries in Connecticut, particularly those industries reliant on rail freight. Other highlights presented here include recent rail freight demand in Connecticut, the top commodities shipped via rail, and forecasted rail freight demand in 2045.

Recent Rail Freight Demand in Connecticut

Table 2-26 shows the tonnage and value of rail freight transported to, from, within, and through Connecticut in 2019. Outbound shipments account for approximately one-half of rail freight by tonnage

[20] As stated elsewhere in this document, this data largely reflect information from before the COVID-19 pandemic. During the COVID-19 pandemic, many different supply chain shortages and shifts in demand occurred throughout the country.

and only about one-third of rail freight by value. Values are shown in 2019 dollars. In contrast, inbound shipments account for approximately one-fourth of rail freight by tonnage and 40 percent of rail freight by value, indicating that inbound shipments on average have a higher value-to-tonnage ratio compared to outbound shipments. Shipments within the state (i.e., intrastate) comprise only about 7 percent of the total rail freight by tonnage and are relatively low-value commodities, while "through" shipments comprise about 14 percent of rail freight tonnage and more than 21 percent of rail freight value.

Table 2-26. 2019 Rail Freight Tonnage and Value in Connecticut by Direction for Shipments of All Distances

Direction	Tons		Value (2019 $)	
	Amount	Percent	Amount	Percent
Inbound	1,112,928	26.9%	61,410,448	40.0%
Outbound	2,177,708	52.6%	57,246,360	37.3%
Intrastate	280,164	6.8%	1,823,692	1.2%
Through	573,148	13.8%	33,037,520	21.5%
Total	**4,143,948**	**100.0%**	**153,518,020**	**100.0%**

Source: 2019 Waybill Sample data

Data in **Table 2-27** is a subset of data in **Table 2-26** and reflects rail shipments of greater than 500 miles. As is the case with the summary in **Table 2-27**, inbound rail freight shipments are smaller in tonnage but higher in value compared to outbound shipments. There were no intrastate shipments greater than 500 miles due to the small size of Connecticut (ranked as the third smallest state in the United States). Through shipments make up about 20 percent of rail freight by tonnage and 25 percent by value.

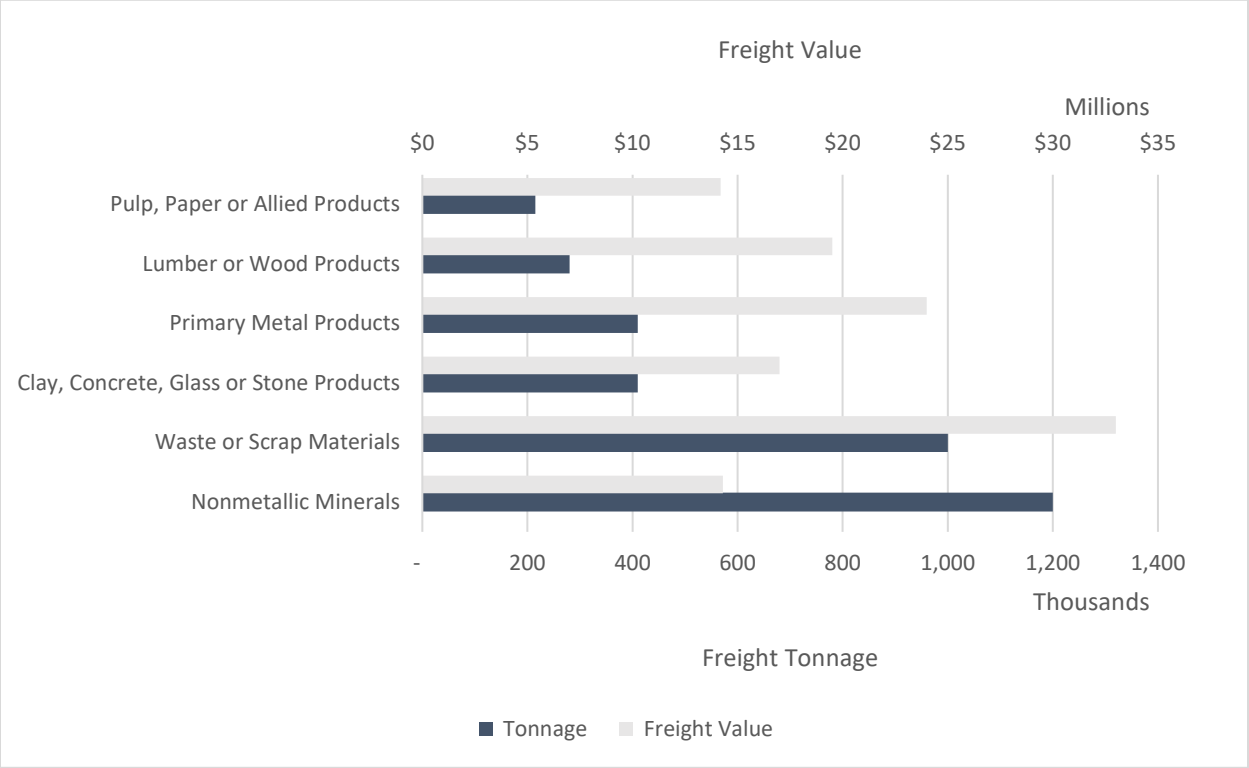
Table 2-27. Summary of Connecticut Freight Movements (2019)

Direction	Tons		Value (2019 $)	
	Amount	Percent	Amount	Percent
Inbound	885,548	35.9%	52,278,156	43.7%
Outbound	1,070,416	43.4%	37,648,252	31.4%
Intrastate	--	0.0%	--	0.0%
Through	508,016	20.6%	29,814,572	24.9%
Total	2,463,980	100.0%	119,740,980	100.0%

Source: 2019 Waybill Sample data

Figure 2-29 shows the top six commodities by both tonnage and value for all Connecticut rail freight shipments, with the commodities on the vertical axis sorted by tonnage. Tonnage is shown on the top axis and freight value on the bottom axis. Nonmetallic minerals are the top commodity by tonnage, though the freight value is relatively low. Waste/scrap materials are the second greatest commodity by tonnage and the greatest commodity by value. Other notable commodities include primary metal products, lumber/wood products (excluding furniture), and pulp/paper/allied products, which all have relatively high freight value-to-tonnage ratios.

Figure 2-29. Connecticut Rail Shipments of Top Commodities: Tonnage and Value (2019)



Source: 2019 Waybill Sample Data

Top Commodities by Shipment Direction

The following subsections highlight the top commodities shipped by rail in terms of tonnage and value based on shipment direction, which include shipments within (intrastate), to, from, or through Connecticut. Some commodities are commonly shipped in multiple directions, while other commodities chiefly flow into, out of, or through Connecticut.

Intrastate Rail Freight

Within the 2019 Waybill Sample, only one commodity was reported as being shipped within Connecticut: nonmetallic minerals. About 280,000 tons and $1.8 million worth of nonmetallic minerals were shipped within Connecticut in 2019. Ballast rock/stone accounted for about 192,000 tons of all nonmetallic minerals shipped via rail freight, followed by mixed gravel and sand, which accounted for about 41,000 tons. **Table 2-28** shows the top commodities (within the nonmetallic minerals category) shipped within Connecticut by tonnage and includes the origin county and destination county of the largest rail freight movements in the state. Nearly 70 percent of intrastate rail by tonnage is ballast rock/stone shipped from New Haven County to either Fairfield County or Middlesex County. Another 14.5 percent of intrastate rail by tonnage is mixed gravel and sand shipped from Windham County to Fairfield County.

Table 2-28. Top Commodities Shipped Within Connecticut in 2019

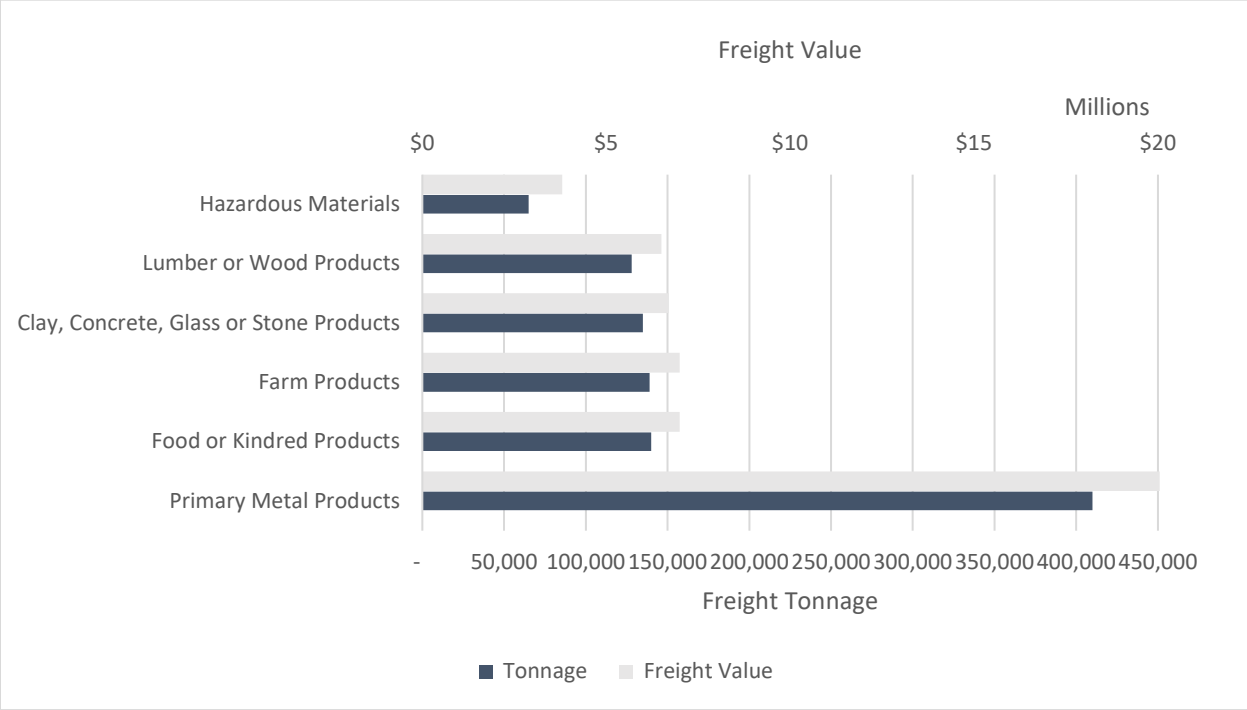
Origin County	Destination County	Commodity	Tonnage	Percentage of Total
New Haven	Fairfield	Ballast Rock or Stone	153,100	54.6%
Windham	Fairfield	Gravel and Sand Mixed	40,612	14.5%
New Haven	Middlesex	Ballast Rock or Stone	39,372	14.1%
New Haven	New London	Natural Stone (excluding limestone)	23,644	8.4%
		Other	23,436	8.4%
		Total	**280,164**	**100.0%**

Source 2019 Waybill Sample data

Inbound Rail Freight

The total tonnage and value of inbound rail freight to Connecticut in 2019 was about 1.1 million tons and $61.4 million, respectively. Inbound rail freight accounts for about one-fourth of all Connecticut rail freight by tonnage. **Figure 2-30** shows the top six commodities for rail freight inbound to Connecticut in terms of both tonnage and value, sorted by tonnage. By far, the top commodity by tonnage and value is primary metal products, which mostly consists of iron or steel billets and items like ingots, cathodes, and slabs. Approximately 415,000 tons of primary metal products worth about $23.2 million were shipped via rail into Connecticut in 2019. Other notable inbound commodities exceeding 100,000 tons in 2019 included food and farm products; clay, concrete, glass, or stone products; and lumber or wood products (excluding furniture).

Figure 2-30. Connecticut Inbound Rail Shipments of Top Commodities: Tonnage and Value (2019)



Source: 2019 Waybill Sample data

Table 2-29 lists the commodities and destination counties of the largest inbound rail freight by tonnage in 2019. The commodities in **Table 2-29** are subcategories of more general commodity categories. For example, "Billets, Iron or Steel, other than Copper Clad" is part of the more general category "Primary Metal Products" (**Figure 2-31**). One-fifth of inbound rail freight is billets being shipped to New Haven County, and nearly one-half of all inbound rail freight consists of four sub-commodities shipped to New Haven County and New London County.

Table 2-29. Top Inbound Sub-Commodities by Tonnage and Destination County (2019)

Destination County	Sub-commodity	Tonnage	Percentage of Total
New Haven	Billets, Iron or Steel, other than Copper Clad	224,400	20.2%
New London	Cakes, Cathodes, Ingots, Pigs or Slabs, Copper	123,080	11.1%
New Haven	Cement, Hydraulic, Portland	113,800	10.2%
New London	Corn or Maize	90,352	8.1%
Other Commodities	Other sub-commodities	561,296	50.4%
	Total	**1,112,928**	**100.0%**

Source: 2019 Waybill Sample data

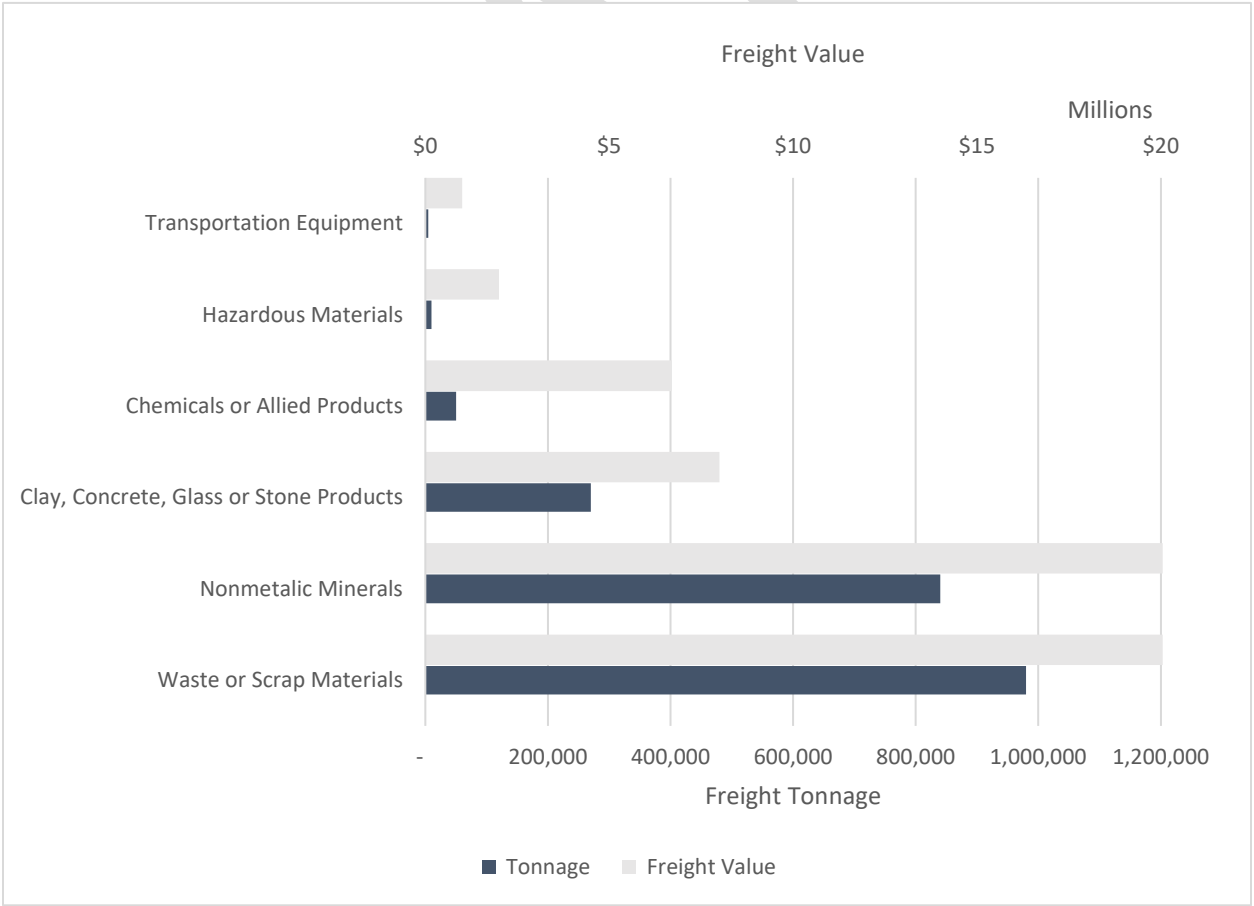
Outbound Rail Freight

The total tonnage and value of outbound rail freight from Connecticut in 2019 was about 2.2 million tons and $57.2 million, respectively. Outbound rail freight makes up a little more than half of all rail freight by tonnage. **Figure 2-32** shows the top six exports from Connecticut in terms of tonnage and value, sorted by tonnage. The greatest outbound rail freight movement by tonnage and value was waste/scrap materials, which chiefly consisted of construction and demolition debris, followed by automobile shredder residue. Nearly 1 million tons of waste/scrap materials with a value of over $30 million were exported from Connecticut in 2019. The second greatest outbound rail freight movement was for nonmetallic minerals, of which natural stone is the predominant material exported. Shipments of nonmetallic minerals from Connecticut generally have low value-to-tonnage ratios. One other notable export includes products made from clay, concrete, glass, or stone, which accounted for more than 200,000 tons of rail freight exports in 2019.

Figure 2-31. P&W Loaded Freight Train

Source: Genesee & Wyoming

Figure 2-32. Connecticut Outbound Rail Shipments of Top Commodities: Tonnage and Value (2019)



Source: 2019 Waybill Sample data

Table 2-30 lists the sub-commodities and origin counties of the largest outbound rail freight by tonnage in 2019. Approximately one-fourth of Connecticut exports via rail freight are natural stone shipped from New Haven County, and another 11.6 percent of exports are Natural Stone shipped from Windham County. Construction and demolition debris shipped from Hartford County and New Haven County comprise over 27 percent of exports via rail freight. More than 6 percent of freight rail exports consist of Automobile Shredder Residue shipped from New Haven County.

Table 2-30. Outbound Sub-Commodities and Origin Counties (2019)

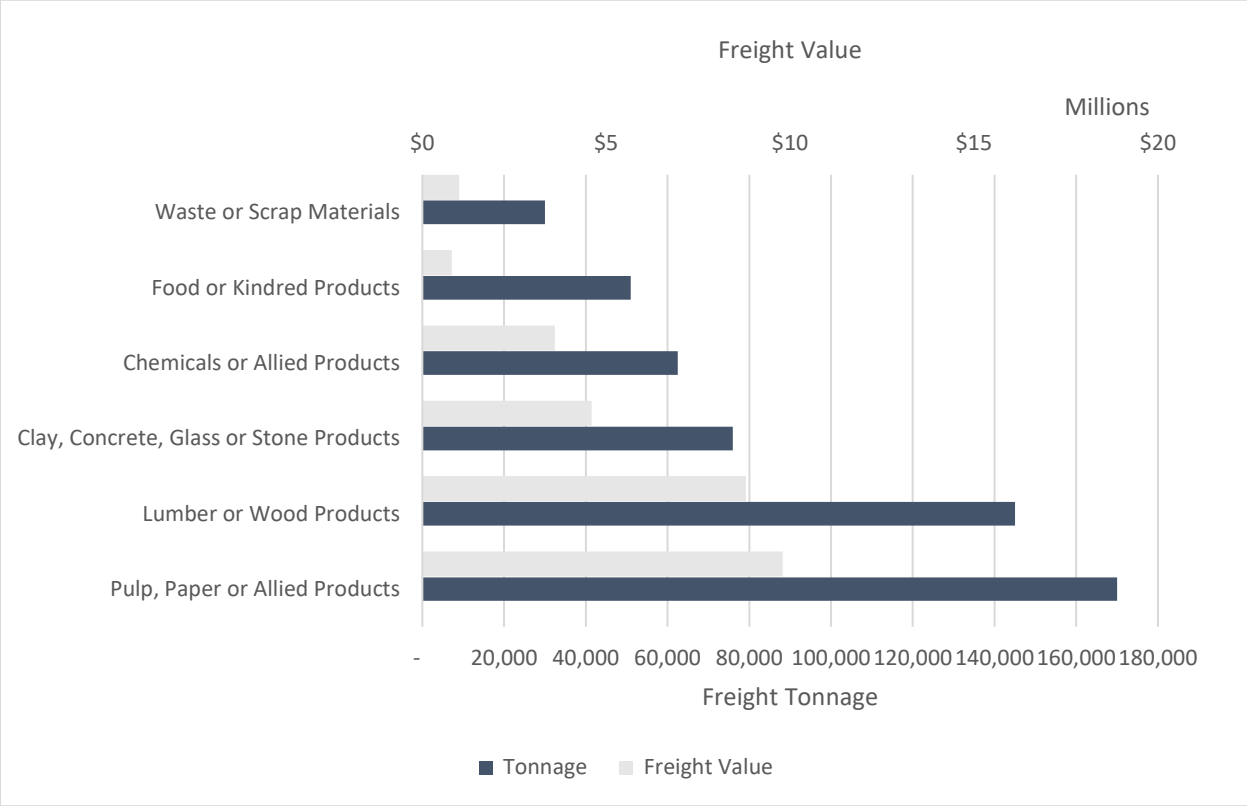
Origin County	Sub-commodity	Tonnage	Percentage of Total
New Haven	Natural Stone (excluding limestone)	555,092	25.5%
Hartford	Construction and Demolition Debris	315,780	14.5%
New Haven	Construction and Demolition Debris	280,244	12.9%
Windham	Natural Stone (excluding limestone)	251,588	11.6%
Litchfield	Limestone	159,560	7.3%
New Haven	Automobile Shredder Residue	143,640	6.6%
	Other commodities	471,804	21.7%
	Total	**2,177,708**	**100.0%**

Source: 2019 Waybill Sample data

Through Rail Freight

The total tonnage and value of rail freight passing through Connecticut in 2019 was about 573,000 tons and $33.0 million, respectively. Through shipments account for only about 14 percent of all Connecticut rail freight by tonnage, which is about half the amount of inbound rail freight and about one-fourth the amount of outbound rail freight. **Figure 2-33** shows the top six commodities that were shipped through Connecticut in 2019 in terms of tonnage and value, sorted by tonnage. The two most common commodities shipped through the state included pulp, paper, or allied products and lumber or wood products, followed by clay, concrete, glass, or stone products.

Figure 2-33. Connecticut Through Rail Shipments of Top Commodities: Tonnage and Value (2019)



Source: 2019 Waybill Sample data

Forecasted Rail Freight Growth

Rail freight demand forecasts for 2045 were developed by calculating rail freight growth rates by shipment direction based on FAF4.5.1 forecasts and by applying the rates to the 2019 rail freight tonnage figures presented in **Table 2-31**. As mentioned previously, the 2019 tonnage figures are based on the 2019 Waybill Sample data. FAF4.5.1 data included both 2012 rail freight tonnage figures and rail freight forecasts for 2045. The analysis assumes freight impacts during the pandemic are not long-term, as the AAR data show 2021 and 2022 traffic has nearly recovered to pre-pandemic levels (AAR 2022).

A compound annual growth rate (CAGR) was calculated from the FAF4.5.1 forecasted growth from 2012 to 2045 for each shipment direction (i.e., inbound, outbound, within, and through). The CAGR for each shipment direction was applied to 2019 rail freight tonnage to forecast rail freight tonnage by direction for 2045. FAF4.5.1 does not have data available for determining through rail freight tonnage for Connecticut, so a nationwide rail freight CAGR was calculated and used for forecasting through rail freight for 2045.

Table 2-31 shows the 2045 rail freight forecasts and the projected absolute and percent growth in rail freight tonnage for 2019 to 2045. Inbound rail freight tonnage is forecasted to increase by 75 percent – the most of any shipment direction, with its share of total rail freight tonnage increasing from 27 percent in 2019 to 34 percent in 2045. In contrast, outbound rail freight is forecasted to grow by only about 24 percent, and the share of outbound rail freight to total rail freight is projected to decrease from about 53 percent to 47 percent. Though intrastate and through rail freight are forecasted to grow by 45 percent and 19 percent, respectively, the changes in tonnage are relatively small compared to changes in inbound and outbound rail freight.

Table 2-31. Forecasted Growth in Rail Freight by Shipment Direction from 2019 to 2045

Direction	2019		2045		Growth (2019 - 2045)		
	Tons	Percent	Tons	Percent	Change	Percent Change	CAGR (%)
Inbound	1,112,928	26.9%	1,943,921	34.0%	830,993	74.7%	2.2%
Outbound	2,177,708	52.6%	2,689,338	47.0%	511,630	23.5%	0.8%
Intrastate	280,164	6.8%	406,669	7.1%	126,505	45.2%	1.4%
Through	573,148	13.8%	684,331	12.0%	111,183	19.4%	0.7%
Total	**4,143,948**	**100.0%**	**5,724,259**	**100.0%**	**1,580,311**	**38.1%**	**1.3%**

Source: 2019 Waybill Sample data and FAF4.5.1

The 2045 rail freight tonnage forecasts for commodities were similarly developed by applying growth factors for commodities from FAF4.5.1 to the 2019 tonnage figures for commodities in **Figure 2-33**. The following list highlights notable forecasted changes in rail freight by direction and commodity.

- Inbound Rail Freight
  - 75 percent increase in food products (134,000 tons to 235,100 tons)
  - 120 percent increase in Lumber/Wood Products (111,400 to 245,500 tons)
  - 260 percent increase in Clay/Concrete/Glass/Stone Products (121,400 to 436,700 tons), driven by a five-fold increase in Natural Sand shipments
  - 68 percent increase in Primary Metal Products (415,600 to 699,900 tons)
- Outbound Rail Freight
  - 107 percent increase in Nonmetallic Minerals (864,300 to 1,792,200 tons)
  - 42 percent decrease in Waste/Scrap Materials (980,900 to 573,200 tons)
- Intrastate Rail Freight
  - 47 percent increase in Nonmetallic Minerals (280,200 to 413,000 tons)

The two largest forecasted changes are (1) outbound shipments of nonmetallic minerals, which are forecasted to increase by 928,000 tons, and (2) outbound shipments of waste/scrap materials, which are forecasted to decrease by 408,000 tons.

Diverting Freight from Truck to Rail

Diverting freight from truck to rail can create economic benefits through lowering the cost of shipping and reducing congestion on highways. Reducing truck miles also reduces the cost of highway maintenance, accidents, and emissions. There are two metrics to consider when assessing the feasibility of diverting commodities from truck to rail. First, goods may be candidates for diversion if the commodity already uses truck and rail modes, as it indicates that this type of commodity does not solely rely on truck for shipping and has the potential for rail to increase its share as an alternative mode for shipping. **Table 2-32** shows examples of commodities with diverting potential from truck to rail based on this criterion. For example, Nonmetallic Minerals, which makes up 29 percent of total rail tonnage (**Table 2-32**), is currently shipped by truck and rail with 71.1 percent and 23.2 percent, respectively, showing the potential for more to be diverted from truck to rail. Existing infrastructure can support some of these shifts, though the freight investments listed in Chapter 4 will further enable a larger adoption.

Table 2-32. Potential Commodities for Diversion from Truck to Rail

Commodity	Percentage of Tonnage by Truck	Percentage of Tonnage by Rail	Value per Ton (2021$)
Gasoline	92.1%	5.2%	$682
Waste or Scrap	91.1%	8.6%	$80
Cereal Grains	76.2%	22.9%	$452
Nonmetallic Minerals	71.1%	23.2%	$194
Coal	7.9%	88.4%	$39

Source: Freight Analysis Framework Version 5 (FAF5)

Second, goods that have low unit costs per ton are also ideal candidates for diversion from truck to rail because truck deliveries tend to be more time-sensitive, resulting in higher unit costs per ton. As shown in **Table 2-32**, the commodities that are highest in tonnage in Connecticut, including coal, nonmetallic minerals and waste/scrap, all have low unit costs per ton, indicating the potential to use rail to ship an even higher percentage of freight instead of truck. In addition, Gasoline and Cereal Grains also have low unit prices per ton, making rail an economically feasible mode to transport.

Rail and the Offshore Wind Industry

One specific opportunity to grow freight rail involves the offshore wind industry, especially as it relates to site construction. Wind turbines, which are large and heavy, are difficult to transport via truck due to their size and weight, as well as the need for special permits and escorts. Rail's advantage in shipping larger and heavier loads provides opportunities for railroads that have dedicated rights-of-way and access to ports, like New London. Connecticut is already taking steps to encourage wind-farm development, and freight rail investments would strongly support the efforts.

2.2.3 Passenger Travel Demand and Growth

Figure 2-34. Passengers at New Haven Union Station

Source: Carl Talley

The intercity passenger rail and commuter rail service in Connecticut includes four services across multiple lines, including:

- Amtrak (state-supported, long-distance, and NEC service)
- Hartford Line operating in conjunction with the Amtrak service (owned and operated by CT*rail*)
- Shore Line East (owned and operated by CT*rail*)
- New Haven Line (owned by CT*rail* but operated by Metro-North Railroad under an agreement between the states of New York and Connecticut)

CT*rail* and Amtrak operations serve 18 stations across the state of Connecticut. Metro-North Railroad operations serve 38 stations within Connecticut.

Ridership Projections

To develop ridership and growth projections, CTDOT utilized the NEC FUTURE Intercity Model developed by FRA, calibrated specifically for Connecticut services with a base year of 2019[21] the provides projections for ridership levels in 2035 and 2050. Then, two scenarios were modeled. The first assumes a no-build scenario, in which service levels remain the same as those that existed in 2019, without any improvements. The second scenario assumes that TIME FOR CT improvements are funded and constructed.

COVID-19 and Other Ridership Impacts

The COVID-19 pandemic began impacting ridership of all services starting in 2020; trends specific to each service include:

- **Amtrak**: Increased ridership levels in 2022 allowed for fares collected to begin to return to pre-pandemic levels, with ridership expected to have reached full capacity in 2023, along with shifting travel patterns (purpose and time of day).
- **Hartford Line**: Ridership gained in 2021 but remained in early 2022 at about half of what it was pre-pandemic, with steady month-to-month increases over the year.
- **Shore Line East**: A major track rehabilitation project led to disruptions in service in 2018 causing sections of the rail route to be replaced by buses and led to a reduction of ridership that did not improve prior to the pandemic, falling 25 percent from 2017 ridership levels.

2035 (No Build versus Improved Service Scenarios)

The no build scenario ridership levels differ significantly from the improved service scenario ridership levels in the 2035 forecast. For Amtrak, this is especially the case with the improved service scenario, resulting in a 134 percent increase in ridership (from 2019 levels) compared to only a 6 percent increase in ridership for the no build scenario. Shore Line East, Hartford Line, and Danbury Branch Line all show significant ridership increases when comparing the no build to the improved service scenarios (**Table 2-33**), while the New Haven Line and New Canaan Branch Line projected ridership numbers are nearly the same between the two scenarios. Like Amtrak, where major service increases are anticipated, the Waterbury Branch Line also shows large gains in ridership with the improved service versus the no build scenarios—145 and 7 percent increases, respectively.

2050 (No Build versus Improved Service Scenarios)

For the 2050 forecast, the model also generated significantly different ridership projections for the no build scenario compared to the improved service scenario (**Table 2-34**). Again, the model indicates that additional planned Amtrak service (as well as other factors) generate a large ridership increase (135 percent compared to an 11 percent increase in the no build scenario). The percent increase for Shore Line East is 21 percent in the improved service scenario compared with 10 percent in the no build. Likewise, the Hartford Line is projected to have a 34 percent increase in ridership in the improved service scenario compared to an 11 percent increase in the no build.

[21] This accounts for pre-Covid levels.

Table 2-33. 2035 Total Connecticut Ridership by Service Level

	2019 Existing Service	2035 No Build Service	2035 Improved Service	No Build Percent Increase	Improved Service Percent Increase
Amtrak	232,700	246,800	543,800	6%	134%
Shore Line East	427,500	448,500	484,300	5%	13%
Hartford Line	723,400	758,200	877,800	5%	21%
New Haven Line	35,735,000	38,782,300	39,126,800	9%	9%
New Canaan Branch Line	2,191,900	2,331,500	2,301,800	6%	5%
Danbury Branch Line	1,862,200	1,981,000	2,168,100	6%	16%
Waterbury Branch Line	555,400	594,000	1,360,300	7%	145%

Source: NEC FUTURE Intercity Model

Table 2-34. 2050 Total Connecticut Ridership by Service Level

	2019 Existing Service	2050 No Build Service	2050 Improved Service	No Build Percent Increase	Improved Service Percent Increase
Amtrak	232,700	258,000	568,100	11%	135%
Shore Line East	427,500	466,300	504,000	10%	21%
Hartford Line	723,400	787,900	912,700	11%	34%

Source: NEC FUTURE Intercity Model
Note: 2050 projections for New Haven Line, New Canaan Line, Danbury Branch Line, and Waterbury Branch Line is not available.

Passenger Miles Traveled Projections

In addition to the ridership, the forecasting also projected passenger miles traveled (PMT) for both 2035 and 2050 for the existing and improved service scenarios. **Table 2-35** and **Table 2-36** show the total annual PMT for all trips that start or end in Connecticut (including those traveling to New York and points south). For existing service, the commuter rail and Amtrak services see a similar percentage increase in passenger miles, with an increase over the 2019 passenger miles of approximately 6 percent in 2035 and approximately 10 to 11 percent in 2050. The improved service scenario shows a higher increase in Amtrak passenger miles, which matches the pattern seen in ridership as well, and more than doubles the amount of passenger miles, while commuter rail (Shore Line East and Hartford Line) sees a smaller increase. In 2035, the model shows an increase of 16 percent for the improved service scenario

(compared to 5 percent in the no build) for Shore Line East and an increase of 28 percent (compared to 6 percent in the no build) for the Hartford Line. In 2050, the model shows an increase of 21 percent for the improved service scenario (compared to 10 percent in the no build) for Shore Line East and an increase of 34 percent (compared to 11 percent in the no build) for the Hartford Line. As with the ridership projections, all increases are modeled from the 2019 baseline.

Table 2-35. 2035 Total Connecticut Passenger Miles Traveled by Service Level

	2019 Existing Service	2035 No Build Service	2035 Improved Service	No Build Percent Increase	Improved Service Percent Increase
Amtrak	21,948,000	23,329,000	49,184,000	6%	124%
Shore Line East	29,677,900	31,283,900	34,319,200	5%	16%
Hartford Line	55,163,900	58,355,300	70,629,600	6%	28%

Source: NEC FUTURE Intercity Model

Table 2-36. 2050 Total Connecticut Passenger Miles Traveled by Service Level

	2019 Existing Service	2050 No Build Service	2050 Improved Service	No Build Percent Increase	Improved Service Percent Increase
Amtrak	21,948,000	24,427,000	51,477,000	11%	135%
Shore Line East	29,677,900	32,622,300	35,814,800	10%	21%
Hartford Line	55,163,900	61,008,400	73,873,000	11%	34%

Source: NEC FUTURE Intercity Model

CT State Rail Plan Ridership COVID Sensitivity Analysis

The ridership forecasts are based on pre-pandemic trends, anticipating returning to previous ridership trends by 2035. These forecasts will help frame the potential for passenger demand growth in the state and will allow for the necessary project planning for service improvements that will support and be necessary for full ridership recovery. As pandemic impacts and associated changes to work and travel patterns are ongoing and ridership has not yet fully returned to pre-pandemic levels, this section details a scenario planning analysis that looks at potential ranges of ridership based on low, medium, and high long-term recovery trends.

Pandemic travel trends, both nationally and calibrated to recent recovery by Connecticut service and lines, were applied to both the no build and build forecasts, as seen in **Table 2-37**, to calculate these potential ranges for future ridership, versus the forecast based solely on 2019 ridership trends. In all cases, the high scenario for 2035 is assumed to be a full recovery to pre-pandemic ridership trends, or 100 percent of the 2035 forecast values. The low and medium recovery rates vary by service (and line for Metro-North Railroad) depending on the 2022 recovery rate and were calculated based on national

trends regarding recovery by trip purpose, from examining data produced by the Bureau of Transportation Statistics.

The recovery rates for 2021 actual counts and 2022 estimates counts (projected out from the January through June counts) are the percentage recovery versus 2019 counts and indicate how well the individual services have recovered to date. Amtrak, Hartford Line, and the Waterbury Branch Line have had dramatic increases in ridership in 2022 and therefore have the most optimistic of 2035 ranges, with the low estimate being 5 to 12 percent below the 2035 forecast value. The rest of the Metro North Railroad lines have a range of approximately 20 percent between the low and high rates, while Shore Line East has the broadest range.

2050 forecasts are more than 25 years into the future and are not expected to be as impacted by COVID-associated current trends.

Table 2-37. Connecticut Rail Recovery Rate by Service (versus Forecast Based on Pre-Pandemic Conditions)

Line	2021 Actual (Percentage of 2019 Ridership)	2022 Estimated (Percentage of 2019 Ridership)	2035 Low (Percentage of 2035 Forecast)	2035 Medium (Percentage of 2035 Forecast)	2035 High (Percentage of 2035 Forecast)
Amtrak (NHV-SPG)	64%	90%	95%	97%	100%
Shore Line East	20%	46%	71%	83%	100%
Hartford Line	49%	77%	88%	93%	100%
New Haven Line	35%	64%	80%	89%	100%
New Canaan Branch Line	26%	66%	82%	90%	100%
Danbury Branch Line	22%	61%	79%	88%	100%
Waterbury Branch Line	50%	85%	92%	95%	100%

Source: CTDOT, Amtrak, and AECOM calculations

2.2.4 Fuel Cost Trends

In Connecticut, the transportation sector accounts for 70 percent of the total state petroleum (primarily gasoline and diesel) consumption. Tracking changes in fuel prices and demand can aid in understanding consumers' and shippers' transportation choices. This section compares fuel costs, consumption trends, and fuel efficiency across alternative modes of transport.

Gas Prices

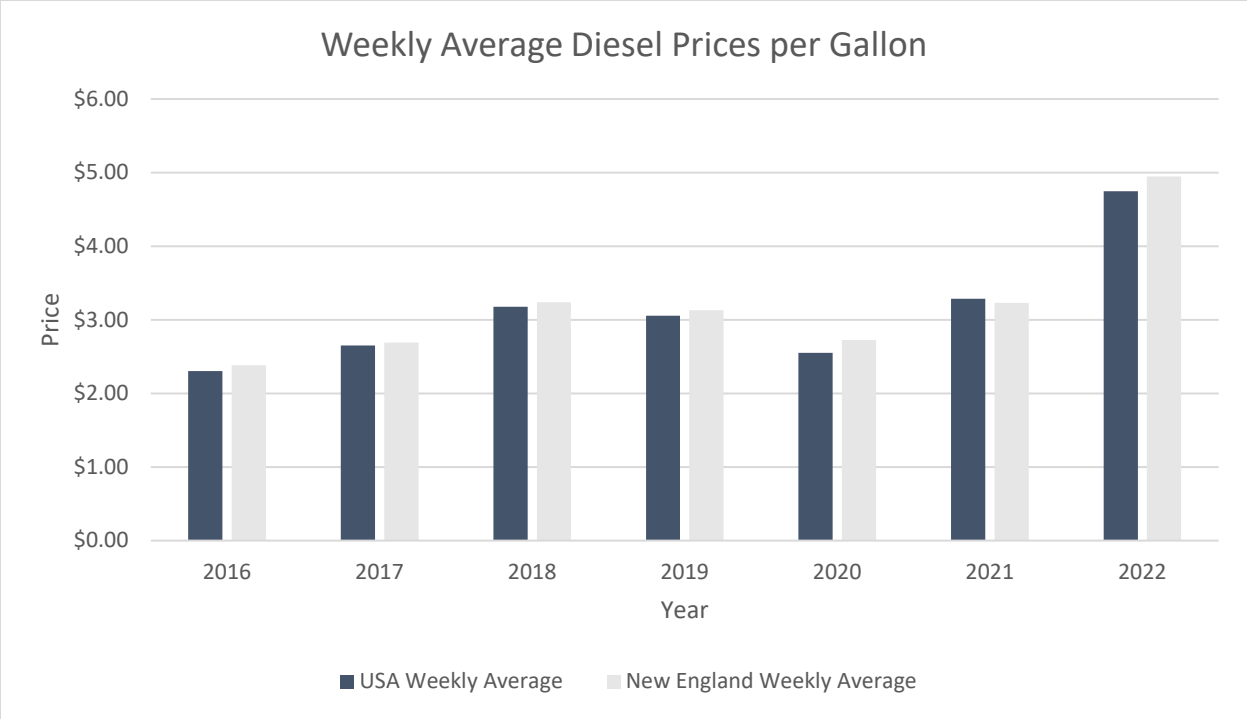
The average retail gas price trends in Connecticut and the United States closely mirror each other, with Connecticut's prices consistently trending higher than the U.S. average. Prior to the beginning of the COVID-19 pandemic (late 2019-March 2020), gas prices hovered between $2.35 and $2.72. Once the pandemic began, prices dropped to $1.74 before slowly rising to $4.97 per gallon price in June 2022 (though have declined since then).

According to the U.S. Energy Information Administration (EIA), retail gas prices in the New England region also closely mirrored U.S. averages. From October 2010 to October 2020, New England's highest average gas price was $4.00 per gallon in May 2011 and the lowest gas price was $1.82 per gallon in February 2016.

Diesel Prices

In the period between January 2016 and June 2022 the average weekly price for a gallon of diesel gas has risen both nationally and within New England. Prices in 2016 were approximately $2.35 per gallon in 2016 and in June 2022 were approximately $4.85 a gallon (**Figure 2-35**). Within this period is a 2020 drop in prices as demand for fuel plummeted during the early stages of the COVID-19 pandemic. Prices have since risen due to an increase in demand and the region's dependance on foreign oil, a commodity impacted by Russia's invasion of Ukraine.

Figure 2-35. United States and Connecticut Average No. 2 Wholesale Diesel Prices (2016–2022)



Source: U.S. EIA

2.2.5 Rail Line Congestion Trends

Rail line congestion affecting intercity passenger trains, commuter trains, and freight trains in Connecticut is the subject of this section.

Passenger Rail Congestion

Rail congestion is a challenge for all intercity and commuter services on the line. Congestion on the NEC in Connecticut stems in large part from the density of rail service along the state-owned New Haven Line main line. Passenger service on this line includes both Metro-North Railroad commuter service, as well as Amtrak intercity NEC service. In the pre-COVID era the New Haven Line handled more than 130,000 weekday passenger trips and a total of 119 trains eastbound and westbound between New York and Connecticut during the 4-hour morning peak hours from 6 AM to 10 AM. This level of service rivals some of the busiest rail systems in the world.

Congestion is exacerbated by the near-continuous regular maintenance and construction along the New Haven Line's aging infrastructure, often restricting a four-track railroad to only a two-track operation along portions while work is ongoing. In addition, the number of stations (a total of 21 stations on the New Haven Line main line in Connecticut and 8 stations on the New Haven Line in New York) on the New Haven Line impacts travel time due to dwell times and acceleration/deceleration of the train required at each stop. All of these factors impact the travel time and on-time performance of passenger trains on the corridor and reflect a congested rail system.

Freight Rail Congestion Trends

The increase in passenger service resulting from the start-up of the Hartford Line in 2018 has also impacted freight rail service. According to representatives of the Connecticut Railroad Association (CRA), the nonprofit trade group for Connecticut's freight railroads, the partially single-track Amtrak Hartford Line (New Haven-Hartford-Springfield) is noted by the CRA as a chokepoint due in part to the volume of passenger trains – both Amtrak and CT*rail* trains. The Connecticut Southern Railroad is limited to night-time operations, but even so it is incurring delays due to Amtrak night-time maintenance work on the line, according to the CRA.

Potential delays on the New Haven Line due to the planned replacement of the four-track Walk Bridge in Norwalk is another cause of concern identified by the CRA. Construction of the moveable bridge replacement is an iterative process with some work anticipated to begin in 2023.

2.2.6 Highway and Airport Congestion Trends

The following sections describe Connecticut's highway and airport congestion trends.

Highway Congestion Trends

Traffic volumes are an indicator of congestion and can be measured by the daily vehicle miles traveled (DVMT) and average annual daily traffic (AADT). In 2018, total annual VMT was 31.6 billion. This averages about 10,973 VMT per vehicle. Total DVMT is 86.6 million or about 30 miles VMT per vehicle. Major highways generate significant VMT, and as of 2018, I-84 has the highest average daily traffic (ADT) volume (**Table 2-38**). Total DVMT decreased by almost 7 percent in 2021 due to the COVID-19 global pandemic and associated economic and social reductions in trips.

Table 2-38. Highest Average Daily Traffic Volumes by Route (2018)

Interstate/Expressway (2018)	Community	ADT
I-84	Hartford	175,100
I-95	Bridgeport	158,200
I-91	Hartford	157,300
Route 8	Bridgeport	109,600
Route 15	Milford	93,200

Source: CTDOT Roadway Inventory Data 2018

Airport Congestion Trends

The system of airports across Connecticut and New England provides an alternative transportation mode that is typically complementary to rail. For the movement of freight, shippers typically move cargo by air when it is time-sensitive, whereas railroad shipping typically moves heavier commodities that are not time-sensitive.

Statewide, Connecticut has Bradley International Airport and five general aviation airports that are owned and operated by the Connecticut Airport Authority, as well as various other municipal and privately owned public-use airports that are located across the state. Of those, Bradley International Airport in Windsor Locks is by far the largest in terms of passenger and freight traffic.

Most freight tonnage is moved at Bradley International Airport, with other Connecticut airports moving much less cargo by weight. Air cargo service at Bradley International Airport is provided by Federal Express, United Parcel Service, Amazon Prime Air, DHL, U.S. Postal Service, and airline belly cargo. In 2019, at Bradley International Airport 367,188,466 pounds of cargo were transported through the airport with mail making up 13,211,927 pounds and freight making up 353,976,539 pounds of the cargo.[22] Total freight/mail at Bradley International Airport has increased since 2012, when it totaled 245,240,773 pounds. Bradley International Airport does not have a direct freight rail connection, so possible future investments creating one would provide the opportunity to further expand the volume of freight passing through the airport.

New England produces nearly 80 percent more trips per person than the rest of the nation (2.5 air passenger trips per year compared to the national rate of 1.4) (Connecticut Airport Authority 2016). The latest Airport Master Plan Update), which was finalized pre-pandemic, anticipates total enplanements at Bradley International Airport to grow to approximately 3,858,679 by 2025 and 4,527,750 by 2035. In 2019, Bradley served more than 6.75 million passengers. Per the Airport Master Plan Update, long-term Bradley International Airport demand is expected to increase 1.91 percent over the forecasted period from 2017 to 2037. Bradley International Airport has land available to add gates and terminal capacity to meet passenger demand, as well as available parcels to meet future air cargo service needs.

Bradley International Airport is ranked the second largest airport in New England and does not suffer from the congestion and delays seen at the larger hub airports in the Northeast. Other commercial airports in surrounding states, including Boston-Logan International Airport, T.F. Green Airport near Providence, Rhode Island, and LaGuardia Airport and John F. Kennedy International Airport in New York City, provide passenger and freight services to Connecticut residents and businesses. Highway

[22] Connecticut Airport Authority Data Accessed April 28, 2020; Kevin Dillon

congestion, to which airport passenger traffic contributes, may be relieved by expanding passenger rail connectivity to Bradley International Airport.

2.2.7 Land Use Trends

In Connecticut, individual municipalities have the greatest influence on land use because they hold the power to zone, create other related regulations, and issue permits. Due to greater public demand and legislative support for equitable and responsive land use planning, there is more focus on providing mobility options through better coordination of land use and transportation planning. There is also an interest in better integrating transportation services as well as designing and improving facilities to enable use by individuals using non-motorized, as well as motorized, means of transportation.

Transit-Oriented Development

"Responsible Growth" refers to development efforts that focus on integrating land use planning with transportation, affordable housing, retail, and employment in a manner that discourages sprawl. It calls for a focus on concentrating growth in the center of a city or suburb where the required infrastructure already exists and advocating for mixed-use developments in areas that are compact, higher density, walkable, bicycle-friendly, transit-oriented, and offer a range of housing choices.

Taking this concept further, Transit Oriented Development is a form of Responsible Growth that is designed to facilitate access and maximize use of public transportation. TOD provides housing, employment, retail, recreation, and transportation options in a manner that enables people to meet their mobility needs in a more cost-effective and environmentally friendly way. TOD can be an effective tool in curbing sprawl, limiting vehicular traffic, reducing environmental footprint, expanding housing choices, and encouraging a sense of place. Successful TOD projects often include both private and public investment.

CTDOT recognizes that TOD around stations can be integral to the success of a transit service and strong ridership. While CTDOT's direct role to facilitate TOD is providing transit service and infrastructure, it also encourages TOD through coordination with municipalities, other state agencies, and developers.

Additionally, CTDOT explores opportunities to participate in public private partnerships that can result in TOD. An example of a successful partnership occurred across the street from the Hartford Line's Meriden Station. In 2017, construction was completed on a mixed-income, mixed-used development that includes structured parking. The developer partnered with CTDOT for the construction of a 275-space parking garage with 225 spaces dedicated for commuter parking. This public-private partnership between CTDOT and the developer satisfied mutual parking needs, while demonstrating efficient project delivery and use of land.

2.3 The State's Existing Rail Services: Needs and Opportunities

2.3.1 Passenger Rail

The state rail system has a variety of infrastructure issues that need to be addressed to properly maintain the existing system and to accommodate the regional goals of doubling the passenger system volume and increasing rail freight volume by 20 percent over the next 20 years.

Major Infrastructure Constraints and Needs

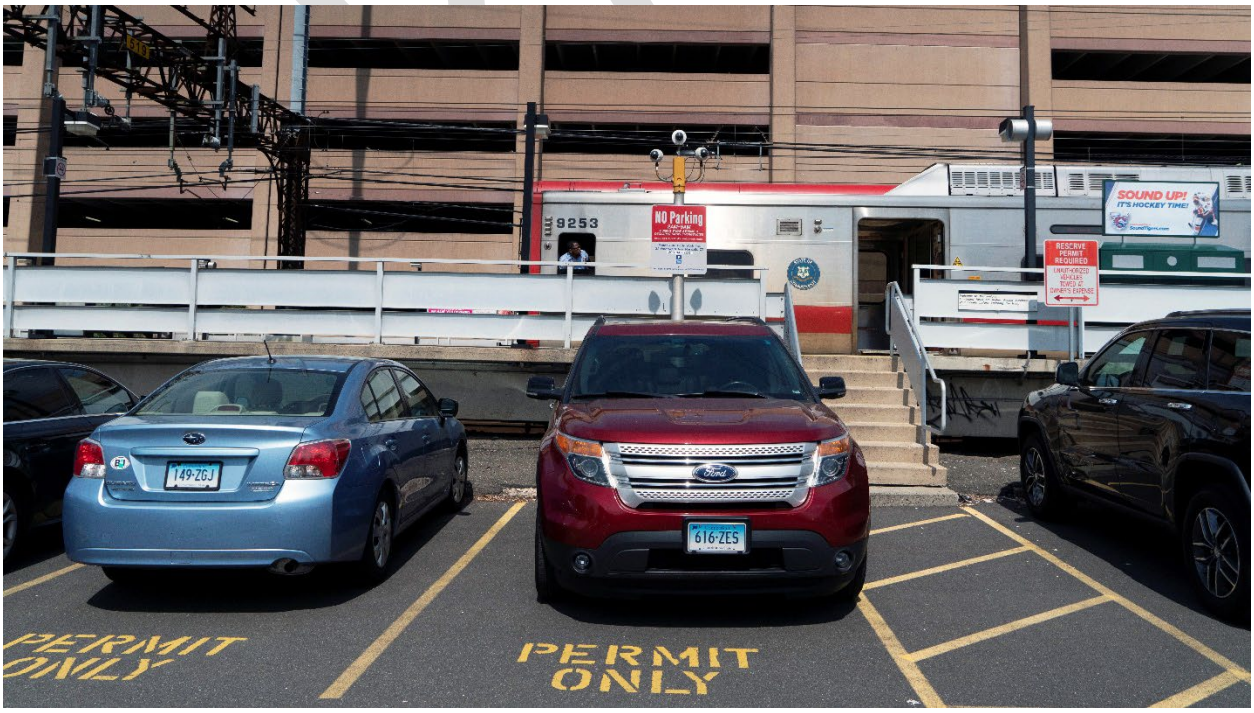
The rail passenger system in Connecticut is an important resource in meeting transportation demand. The state of the commuter rail system infrastructure remains strong and is adaptable to increased traffic levels. To ensure that CTDOT manages and monitors all transit assets to provide safe, reliable, and efficient public transportation, CTDOT developed performance measures as part of the Public Transportation Management System (PTMS).

CTDOT oversees the maintenance of the rights-of-way infrastructure, tracks, catenary, signals, stations, rail yards, and associated structures on the New Haven main line and the three New Haven Line feeder lines (New Canaan Branch Line, Danbury Branch Line, and Waterbury Branch Line). The goal is to bring the entire network to a state-of-good repair through a cyclical replacement of infrastructure elements. Once complete, the below improvements will enhance mobility, economic development, economic competitiveness of the state, and safety.

Rail Parking

Parking constraint at rail stations is a significant issue for CTDOT as the New Haven Line and Shore Line East rail services continue to expand schedules and grow in ridership and popularity (**Figure 2-36**). The need for affordable, adequate, and convenient parking and other station access remains a challenging issue for CTDOT to address. The Main Line in Fairfield County has the largest need for expanded parking, and potential sites are unavailable or extremely limited in that area. Another issue is the varied parking ownership. Typically, all state-owned rail parking on the New Haven Line system is leased to local government for operation and maintenance. However, CTDOT operates parking at the Bridgeport and Stamford Transportation Centers, and at West Haven and Fairfield Metro through a contracted facility management company. Municipalities and private businesses own and operate other commuter parking supporting many of the New Haven Line stations.

Figure 2-36. Parking at a New Haven Line Station



Source: AECOM

The varied parking ownership issue has led to a wide range of parking rates being charged as well as policies in place to regulate the same. Examples include local resident only parking at certain town-owned properties and higher fees charged at privately owned locations. Most station parking areas do not have parking access and revenue control systems in place and limited use of technology to support lot operations. Structured garage facilities do have parking access and revenue control systems (PARCS) systems in place but are not standardized from one location to another. Improvements are needed to develop policies and regulate parking statewide.

Parking and TOD must be balanced appropriately. Stations located a walkable distance to a downtown suitable for a mixture of land uses are suitable for TOD. These locations will add ridership to the system and maximize the economic benefits of rail access. Stations with easy highway and road access in low-density areas are best suited for expanding surface parking areas and building structured parking.

Rail Stations

CTDOT programs funding annually in CTDOT's Capital Plan to ensure that all facilities owned or controlled by CTDOT are maintained, upgraded, or overhauled as industry standards and equipment life cycles require. The municipal leases for the New Haven Line rail stations require that the towns maintain the facilities in a state of good repair. Parking revenues and rental fees are used to offset operating expenses. CTDOT generally funds major building improvements and repairs.

Over the past two decades, the state has expended millions of dollars to upgrade many New Haven Line, Hartford Line, and Shore Line East rail station facilities. Part of this effort was a result of the passage of the Americans with Disabilities Act of 1990 (ADA) that required accessibility improvements, while CTDOT initiated other projects to expand parking and address facility related life cycle and code compliance issues.

Typically, long-term maintenance needs of rail stations will include bituminous pavement renewal/replacement, platform canopy repairs and painting, concrete-related repairs and replacement (sidewalks, station platforms, stairs), lighting upgrades (parking lots/garages, station buildings and platforms), comprehensive parking garage improvements, including electrical, revenue/access control, security and structural systems, as well as other station building elements (roofs, HVAC systems, flooring, exterior siding, elevator and escalator systems).

Rail Yards – Maintenance Facilities

Maintenance facilities are a critical element to maintaining, servicing, and storing the rail fleet. The four yards are located in New Haven, Stamford, Bridgeport, and Danbury. Having adequate maintenance facilities is an important parallel path in the fleet replacement plan. Stamford Yard needs several investments including updated yard leads catenary and improvements to the car wash and Maintenance of Equipment (MOE) facilities. Danbury needs an additional fueling facility. Lastly, other lines including the Hartford Line and Waterbury Branch Line do not currently have facilities, which are required to implement service expansions.

New Haven Rail Yard

The present New Haven Maintenance Facility ("EMU Shop") is 30 years old and was designed to maintain the initial order of 144 EMU cars. It is severely over-burdened and is operating 24/7 (around-the-clock). After extensive study by CTDOT and Metro-North Railroad, the preferred approach and location was determined to be further expansion of the existing maintenance facilities complex in the New Haven Rail Yard.

The New Haven Rail Yard Facilities Master Program

The New Haven Rail Yard Facilities Master Program is transforming the existing New Haven Rail Yard into a fully functional facility that provides for efficient and effective storage, dispatching, inspection, maintenance, and cleaning of an increasing fleet of rail cars. The improvements will provide the space, equipment, and administrative support structures needed to operate and maintain a new generation of rail cars and will coordinate the new facilities with existing facilities. The facilities are being built on approximately 74 acres of state-owned land that comprises the existing New Haven Rail Yard.

The major objectives of the program include:

- Provide inspection and repair facilities for the increasing rail fleet that will allow for efficient and safe replacement and repair of components and subsystems, storage and retrieval of parts, and inspection and testing of components and vehicles.
- Increase the wheel truing capacity. Provide the offices, shops, and facilities required for support of the rail car fleet and service lines by Metro-North Railroad and CTDOT.
- Increase the number of electrified and non-electrified storage tracks needed for the increasing rail fleet.
- Modify the yard to main line connections that will facilitate efficient train movement by all service lines.
- Install the utility systems, roads, and site work required to support the overall campus.
- Provide the infrastructure and systems to ensure a safe and secure facility.
- Provide a wash facility for the rail cars.
- Increase train storage capacity.

Rail Tracks

Track conditions vary throughout the system and CTDOT plans, where appropriate, to modify and invest in new tracks than can handle higher speeds and are more resilient to the impacts of climate change. This includes improving existing tracks on portions of the New Haven Line and Shore Line East, as well as adding second tracks on portions of the Hartford Line. Many components will continue to require a General Rail Asset Conditions and Needs assessment.

Power System

The catenary wires (conductors) between New Haven and the Connecticut-New York state line are up to 100 years old. New catenary wire auto-tension (constant-tension) technology has been implemented to preclude the continually declining reliability of the catenary system and the lack of replacement components. Additionally, the space between wires supporting the contact wire (system depth) will allow a lower contact wire elevation, thus reducing the number and severity of hard spots. The catenary line replacement project is ongoing and it separates the New Haven Line into four corridors, with each being incrementally repaired.

It is CTDOT's goal to have all commuter rail lines electrified. Electrification of all commuter rail lines will have fleet management and environmental advantages, and will increase reliability, reduce commute times, and allow for more one-seat rides into New York and other employment centers. Currently, the New Haven Main Line, the New Canaan Line, and Shore Line East are electrified. The Waterbury Branch Line and Danbury Branch Line and the Hartford Line are not electrified.

Signal System

Factors affecting the condition of the signal system are the characteristics and reliability of the signal power feed, the environment, electromagnetic fields (introduced by 115/345 kV transmission line and

12.5 kV traction power systems), limited access to components, normal wear and tear, and limited forward compatibility of hardware and software components.

A mechanical relay system traditionally lasts about 30 years. Technological advances have demanded the use of electronics for more recent system modifications. These components can be expected to have an operating life of 15 years. The following are the expected and useful life of some of the other signal components: a switch machine should be rebuilt every 9 years and replaced every 30 years; signal cable can last about 30 years; batteries, battery chargers, and related systems last about 15 years. For the CTC office equipment, the following applies: the centralized processing unit (CPU) needs to be replaced every 5 years; uninterrupted power supply (UPS) batteries last about 10 years; the control software and program logic, about 10 years; and the operating consoles, about 5 years.

There are other high-cycle replacement parts such as continuous-working code relays, 100 Hz converters, code-following relays, flasher relays, lights, and control panels. Wayside buildings and cases need repair and support every 15 years with possible replacement at 30 years of age.

The current system is sufficient to operate according to the rules and regulations in effect with the present train sets. The new M8 train sets are equipped with appropriate signal codes to reach its full operating potential. Assuming the 30-year expected life, replacement was completed during the 2011-2015 period. Many components will continue to require General Rail Asset Conditions and Needs.

2.3.2 Railroad Bridges

The bridge program is a significant expenditure in CTDOT's capital program. The purpose of the bridge program is to develop a comprehensive schedule of maintaining the structural integrity and safety of the railroad bridges.

Railroad Bridge Inspections

The FRA has established federal safety requirements for railroad bridges. Title 49 of Code of Federal Regulations (CFR) Part 237 requires the track owner to implement a Bridge Management Program that includes annual inspection of railroad bridges. The Office of Rail has required that each railroad perform a safety inspection of each bridge annually, and CTDOT will continue inspections and prepare a report. The owner must have adopted the new FRA regulations by March 14, 2011. CTDOT utilizes consultant selection services to inspect railroad structures. The primary goal of the inspection program is to identify deficiencies and recommend repairs, rehabilitation, or replacement in a timely manner.

Factors Affecting the Condition of Railroad Bridges

CTDOT regularly inspects and monitors the condition of all railroad assets, especially bridges. The primary factors that lead to deterioration of bridges are weather, loads, volume of railroad traffic, and deicing operations. As a bridge deteriorates its condition ratings over time gradually declines to a poor rating. Preventive maintenance can extend the useful life of a structure substantially; however, major repairs, rehabilitation, or replacement will be required.

Experience has shown that initiating repair and replacement processes early, before serious safety concerns arise, allows sufficient time for design and construction of the required repairs, rehabilitation, or replacement.

Notable Bridges Needing Repair or Replacement

Several bridges have been identified by CTDOT as priority bridges in need of repair or replacement. In their current state, there are limitations on service and resiliency. These bridges include:

- Connecticut River Bridge (Old Saybrook)
- Connecticut River Bridge (Windsor Locks)
- Indian River Bridge (Clinton)
- Middletown Swing Bridge (Middletown)
- Saugatuck Bridge (Westport)
- Walk Bridge (Norwalk)
- Cos Cob Bridge (Greenwich)
- Devon Bridge (Stratford) **(Figure 2-37)**

Figure 2-37. Devon Bridge

Source: Carl Talley

3. Proposed Passenger Rail Improvements and Investments

Chapter 3 identifies projects that address the passenger rail needs and opportunities that were identified in Section 2.3.[23]

Starting in August 2021, CTDOT initiated a public engagement campaign that included conversations with a variety of stakeholders, including railroad operators, regional leaders, and members of the public, that revealed several general needs:

- **Speed**: The New York - New Haven portion of the rail system was originally a 90-mph corridor but with aging infrastructure and increased rail traffic in the past, speeds declined to as low as 60 mph in the 1970s, impacting all services traveling to/from New York. As of 2022, the maximum allowable speed for the majority of the New Haven Line main line is 70 mph or better. Through infrastructure and operations improvements like eliminating a locomotive change at New Haven, Amtrak is able to reduce its scheduled intercity arrival times by 15 minutes.
- **Intercity Access**: Americans need improved and extended intercity rail service. Amtrak published a nation-wide corridor vision in May 2021, titled "Amtrak Connects US." This vision included extending services to New York via Bronx stations and access to Grand Central Terminal.[24]
- **Rail Fleet**: The Hartford Line, Waterbury Branch Line, and Danbury Branch Line have aging coaches that need to be replaced to meet existing and future service needs to bring Connecticut's rail system into the 21st Century.

Below is a summary of proposed passenger rail improvements, arranged by corridor and operating service. In addition to these descriptions, more information, including costs and schedule information, is available in Chapter 5 and **Appendix E**.

3.1 Northeast Corridor Improvements and Investments

There are several planned and programmed improvements and investments on Connecticut's portions of the NEC that are north and east of New Haven. Below is a summary of improvements arranged by intercity and commuter services.

3.1.1 Intercity Services

Amtrak[25]

Like CTDOT, Amtrak conducts its own planning process for addressing its infrastructure and operations needs and deficiencies.[26] It has a variety of ongoing projects that will improve intercity service throughout the Northeast, including bridges, studies, and more.

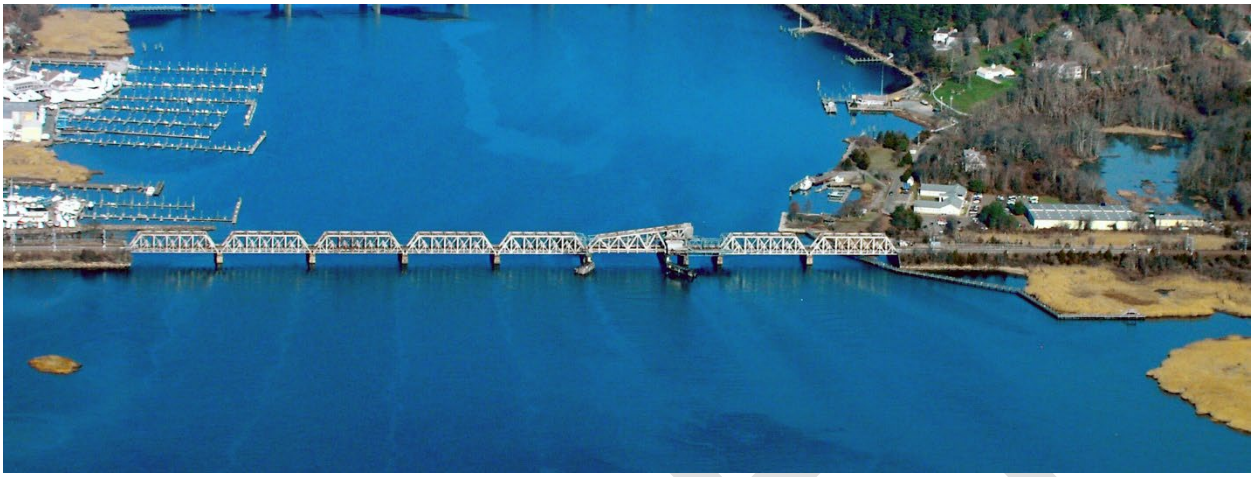
Connecticut River Bridge Replacement Project

The Connecticut River Bridge Replacement Project is scheduled to replace the existing 107-year-old bridge between Old Saybrook and Old Lyme, Connecticut. The existing 3.4-mile bridge opened in 1907

[23] The listing and organization of projects in this Plan is solely for the purpose of identifying the projects, and is not intended to indicate any other meaning, purpose or conclusion.
[24] PSNY (East Side Access) has been mentioned by Connecticut stakeholders.
[25] Information in this section largely comes from the Amtrak and Northeast Corridor Commission.
[26] Where appropriate, Amtrak coordinates plans with CTDOT.

and is the oldest rolling lift bascule span bridge between New Haven and Boston (**Figure 3-1**). The bridge is a critical piece of infrastructure as approximately 38 Amtrak trains, 12 CT*rail* trains, and six P&W freight trains travel across the bridge each weekday. The project is currently at 90 percent design and is awaiting several federal and other pre-permitting approvals.

Figure 3-1. Connecticut River Bridge



Source: Amtrak

Replacing the Connecticut River bridge will improve its resiliency to climate change. The current bridge is nearing the end of its useful life, meaning it could be more susceptible to high water levels, flooding, and other climate change impacts like sea level rise. The new bridge will also improve functionality and increase serviceability to a useful life of 150 years. The bridge replacement will improve gaps in service by allowing higher track speeds (a 30 mph increase) on the structure.

Fitter Interlocking Project

In addition to the Connecticut River Bridge, Amtrak also plans to construct a new, wired universal interlocking in Clinton, Connecticut that would subdivide a 16-mile interlocking-to-interlocking segment (Guilford and View Interlockings) into two shorter segments, allowing single track operation over a shorter distance during maintenance with less operational disruption. This will improve reliability and increase the flexibility of Shore Line East and Amtrak operations. The new interlocking would enable Shore Line East trains to service the existing and future platforms at Clinton and Madison stations and make greater use of the Clinton siding, a short stretch of third track along the south side of the NEC. By enabling Shore Line East trains to use all platforms and tracks in the area, the interlocking would enable Amtrak and Shore Line East to expand services while reducing train conflicts and their resulting delays.

Brook Interlocking Project

This project will address service gaps and improve reliability through adding a westbound Track 2 to Track 1 right-hand crossover at Brook Interlocking. When combined with the existing Saybrook Interlocking, this will provide full universal interlocking functionality (Brook Interlocking “12” crossover).

Veltri Interlocking Project

This project will address service gaps and improve frequencies through designing and installing a new universal interlocking VELTRI at milepost (MP) 133 in Mystic, Connecticut. Construction would include the installation of turn-outs, rail, ties, sub-grade, ballast, overhead catenary, signal transformers, signals

cables, signal bridges, switch heater, switch machines, switch houses, instrument houses, and interlocking lighting. This new interlocking will be for Amtrak use at present.

New England Grade Crossing Elimination Program: Latimer Point Road

This project will improve safety and indirectly reduce travel times by building a bridge to close one of several alternatives being considered. This is part of the New England Grade Crossing Elimination Program, which includes Elihu Island Road Grade Crossing Closure, Wamphassuc Road Grade Crossing Closure, Latimer Point Road Grade Crossing Closure, New London Station Safety Improvements, and Miner Lane Grade Crossing Closure. The intent of this program is to prioritize and eliminate these grade crossings to improve safety.

New England Grade Crossing Elimination Program: Elihue Island Road

This project will indirectly reduce travel times by closing Elihu (Freeman's) Island Road Grade Crossing by building a connection to one of several alternatives being considered. This is part of the New England Grade Crossing Elimination Program, which includes Elihu Island Road Grade Crossing Closure, Wamphassuc Road Grade Crossing Closure, Latimer Point Road Grade Crossing Closure, New London Station Safety Improvements, and Miner Lane Grade Crossing Closure. The intent of this program is to prioritize and eliminate these grade crossings to improve safety.

Vision 2050

Improvements to the Connecticut rail network's service, infrastructure, and fleet to achieve a high-speed all-electric rail network with speeds up to 150 mph on the Hartford Line (New Haven - Hartford) and New Haven Line Mainline; double track on the New Canaan Line; new service between Waterbury Branch Line and Hartford Line; Shore Line East extension east to Rhode Island; a new high-speed route in central Connecticut between Hartford and Providence; and an expanded fleet, shops, and yard to support new, high-speed, electric, and express services.[27]

These improvements are in various stages of planning or under consideration for study.

Notable Non-Connecticut-Based Projects

Beyond this specific work in Connecticut, Amtrak has several ongoing non-Connecticut-based projects that will improve service for all NEC users. These projects take place over the planning horizons featured within the Connecticut State Rail Plan an include the following:[28]

- Springfield Yard storage expansion in Massachusetts
- New England On-Time Performance/Capacity Improvements: Attleboro Area Part 2 in Massachusetts
- New England On-Time Performance/Capacity Improvements: Providence Station in Rhode Island
- Pelham Bay Bridge Replacement in New York
- Sunnyside Yard Improvements in New York
- East River Tunnel Rehabilitation in New York
- The Gateway program of projects in New York/New Jersey
- New Jersey HSR Improvement Program: New Brunswick to Newark in New Jersey
- Philadelphia 30th Street Station District Plan Implementation in Pennsylvania
- Hook Interlocking Improvements in Pennsylvania
- Landlith Interlocking – Wine Interlocking NEC Section Improvement Project in Delaware

[27] These are in various stages. Waterbury Branch Line and Hartford Line service is being analyzed as part of the ongoing Waterbury Line Master Plan.
[28] Amtrak and Northeast Corridor Commission

- Bayview, Maryland to Newport, Delaware NEC Section Capacity & Performance Planning Study in Maryland/Delaware
- Susquehanna River Rail Bridge in Maryland
- Edgewood Capacity Expansion: Four Track Extension in Maryland
- Baltimore Penn Station Infrastructure/Capacity projects in Maryland
- B & P Tunnel Replacement in Maryland
- Hanson Interlocking in Maryland
- Anacostia Interlocking in Washington, DC
- Washington Union Station Long-Term Station Expansion in Washington, DC
- New Acela, Northeast Regional, and Long-Distance Fleets

Hartford Line

Future improvements along the Hartford Line include adding a second track; rehabilitating or replacing bridges (including the Connecticut River Bridge[29]), elevated track structures, and culverts; and improving/constructing/studying stations at Hartford (**Figure 3-2**), West Hartford, North Haven, Newington, Windsor Locks, and Enfield. This also includes new and expanded storage and MOE facilities to accommodate CT*rail* service enhancements. It also includes grade crossing and fiberoptic communication system improvements on the Connecticut section of the Hartford Line.

Collectively, these improvements will increase service through improving safety, reliability and track capacity, improve station accessibility through ADA improvements, and increase connectivity by improving connections with other passenger modes.

Figure 3-2. Hartford Union Station

Source: CTDOT

[29] This bridge is different from the Connecticut River Bridge in Old Saybrook. It is sometimes referred to as the Warehouse Point Railroad Bridge.

3.1.2 Commuter Rail Services

Shore Line East

Planned Shore Line East improvements largely involve station enhancements including improved parking, new public information display systems, ADA accessibility enhancements, and track/platform work. The Shore Line East power supply system will also be upgraded. Specific station improvements include:

- Guilford Railroad Station - Supplemental Parking
- Madison Railroad Station Parking Garage
- Madison Railroad Station Pedestrian Bridge & North Platform
- Shore Line East Stations Design

Furthermore, CTDOT is studying portions of the Shore Line East corridor in its *Eastern Connecticut Rail and Transit Feasibility Study*. This study will address gaps in service by identifying opportunities for improved service along the existing corridor, as well as locations for possible infill stations and service extensions towards Norwich. The study is currently underway, and a version of the plan will be available for public comment in 2023.

3.2 New Haven Line Corridor Improvements and Investments

As noted in previous chapters, a mixture of intercity and commuter rail services utilize the New Haven Line corridor.[30] To this end, several general and service-specific improvements are planned for this corridor. Below is a summary of improvements arranged by intercity and commuter services.

3.2.1 Intercity Services

Amtrak

New Haven to New Rochelle Capacity & Trip Time Planning Study

The *New Haven to New Rochelle Capacity & Trip Time Planning Study* will assess investment options from New Haven, Connecticut to New Rochelle, New York to accommodate future segment capacity and performance (on-time performance and speed) requirements. This study will investigate on-NEC versus off-NEC alignment options for feasibility and highest value for NEC stakeholders.

3.2.2 Commuter Rail Services

Commuter rail investments and improvements will utilize strategies like new service, station improvements, speed enhancements, interagency coordination, new rolling stock, and state of good repair projects to fill gaps, address climate change, and improve financial deficits. Below is an overview of each program, by line, describing its benefits. Specific information on each program, including funding, benefit types, and project timelines is available in **Appendix E**.

Metro-North Railroad – New Haven Line

New Haven Line Bridge Program

The New Haven Line Bridge Program includes ongoing improvements to ballasted and timber bridges as well as freight bridge repair programs in coordination with Metro-North Railroad. The bridge program includes repair and rehabilitation to the Indian River Bridge and the Middletown Swing Bridge. These

[30] This corridor includes the Danbury Line, New Canaan Line, and Waterbury Line.

repairs will address gaps in service by allowing bridges to handle higher train speeds, decreasing travel times, and providing schedule-makers more operational flexibility. Additionally, these repairs will adapt the railroad to climate change by improving their useful lives and adding infrastructure designed to handle the region's changing weather patterns.

New Haven Line Signals and Communications Program

Signal upgrades include a redesign of the New Haven Line signal system to support higher capacity and safety. This ongoing project also includes upgrades to the communications network infrastructure along the New Haven Line by installing fiber optic communication cable and equipment to support security cameras at vulnerable passenger stations and bridges. This system will also be capable of supporting passenger information displays and other amenities at passenger stations. These investments, often invisible to the everyday rider, will improve travel times and the customer experience through reducing delays and providing additional opportunities to increase train speeds.

New Haven Line Station Improvement Program

The New Haven Line station improvement program includes improvements to Darien, South Norwalk, State Street, and New Haven Union stations,[31] as well as customer service initiatives, real-time passenger information system upgrades, and fare collection improvements. These programs ensure stations are ADA-accessible, are safe, and have an effective user experience.

New Haven Line Stations – Stamford Program

Improvements at Stamford Transportation Center including new elevators and escalators, station platforms, yard access, and parking upgrades. This will improve safety and accessibility for people using this station.

New Haven Line Track and Speed Improvements

The New Haven Line Track & Speed Improvements program includes several projects that will improve gaps in service by increasing travel speeds and line capacity. Improvements include new electrified tracks, interlockings, and freight sidings that will raise the maximum speed profile for passenger trains. The package also includes drainage improvements, switch tower rehabilitation, the introduction of a fourth mainline track and relocation of Milford Station, and new sidings on the New Canaan Line. In addition to improving gaps, these investments will improve resiliency through developing infrastructure that is better equipped to handle flooding and other climate change impacts.

New Haven Line Traction Power Program

This program seeks to improve system reliability through the replacement of traction and signal power substations along the New Haven Line in six locations over four phases from 2022 to 2029 (**Figure 3-3**).

[31] Stamford has numerous components and is described separately.

Figure 3-3. New Haven Line Electric Infrastructure in Vicinity of Westport and Saga Bridge

Source: Carl Talley

New Haven Line Shops and Yards Program

This program will address service gaps by increasing line capacity. It aims to do so through upgrading and expanding of shops and yards on the New Haven Line to meet existing and future needs (**Figure 3-4**). Projects include a fueling facility at Danbury Yard, improvements to the Stamford MOE facility and passenger yard, as well as catenary maintenance vehicle sheds at Stamford and Bridgeport. These improvements will increase capacity by investing in infrastructure that allows CTDOT to store, maintain, and service trains more efficiently.

Figure 3-4. Current Stamford MOE Facility

Source: CTDOT

New Haven Yards Master Program

Like the improvements in Stamford, the New Haven Yard Master Program is part of an ongoing effort that will address gaps in service by improving system capacity and safety. New Haven Yard is unique because it is the terminus for three different railroads: Metro-North Railroad, CT*rail* Shore Line East, and the CT*rail* Hartford Line (**Figure 3-5**). The program includes active and planned improvements to multiple components of the yard, including the East End Connection and West End Yard projects, adding increased flexibility for operations in and out of the CCO Shop (anticipated to be complete in 2023) and additional electrified storage/maintenance tracks, as well as demolition/replacement of the Old Wheel Mill Facility to provide a second reliable wheel truing facility and rehabilitation of the Car and Diesel Maintenance Facility. The Old Wheel Mill facility is under design to build a new modern wheel true facility. The current Car and Diesel Shop are under design to modernize them for CTrail operations (Shore Line East and Hartford Line). A new Service and Inspection Shop has been located adjacent to the CCO Shop and will be in design in early 2023. The current M2 Shop east end tracks will be reconnected in the interim. Once the new S&I is built and operational the current M2 Shop footprint will be reproposed to a new Train Washer Site and Inspection Site.

Figure 3-5. New Haven Yard Facilities

Source: CTDOT

Track Improvements & Mobility Enhancements (TIME) Projects

The TIME projects are a multi-part series of innovative approaches to project delivery that will enable more service, faster trains, and fewer delays.[32] The approach involves track, station, bridge, and other critical infrastructure enhancements to efficiently deliver improved service while minimizing customer and community disruption and improving safety.

Saugatuck Bridge Interim Repairs

The Saugatuck Bridge is a rail bridge crossing the Saugatuck River in Westport, Connecticut (**Figure 3-6**). CTDOT plans to make near-term interim repairs that maintain bridge operation until the bridge is fully replaced with a fixed span bridge.

[32] Chapter 2 discusses TIME FOR CT. The TIME projects are different from TIME FOR CT. TIME FOR CT is a strategic vision, whereas the TIME projects are a set of specific tasks that help achieve the TIME FOR CT vision.

Figure 3-6. Saugatuck Bridge

Source: CTDOT

Walk Bridge Replacement

The purpose of the Walk Bridge Project (**Figure 3-7**) is to replace the existing 125-year old bridge with a resilient bridge structure that enhances the safety and reliability of rail service, offers operational flexibility and ease of maintenance, and provides for increased capacity and efficiencies of rail transportation along the NEC, while maintaining or improving navigational capacity and dependability in the Norwalk River. Upgrades will increase bridge reliability, and incorporate bridge redundancy, thereby accommodating current and future rail and marine traffic.

Figure 3-7. Walk Bridge

Source: CTDOT

Walk Bridge Supporting Program

This is a package of projects necessary to replace the Walk Bridge, including Danbury Branch Dockyard improvements, interlocking improvements, and utility work.

Cos Cob Bridge Program

This project group includes both interim repairs and replacement of the Cos Cob Bridge, an existing four-track bridge over the Mianus River in Greenwich, Connecticut (**Figure 3-8**). Interim repairs also include replacing the miter rails and deck timber.

Figure 3-8. Cos Cob Bridge

Source: CTDOT

Devon Bridge

This project group includes both interim repairs and replacement of the Devon Bridge, a functionally obsolete 111-year-old bridge (**Figure 3-9**). The bridge, which carries four New Haven Line tracks over the Housatonic River, has experienced serious deterioration, and is the next most critical movable bridge for replacement on the New Haven Line portion of the NEC after the Walk Bridge Program. Interim repairs are included to maintain operation until the bridge is replaced.

Figure 3-9. Existing Devon Bridge

Source: CTDOT

Phase 13 - New Haven Line High Speed Study - Fairfield to Stratford

CTDOT plans to identify additional speed improvement options on the Fairfield-Stratford corridor. This study will produce recommendations that, if implemented, could address gaps in service by increasing speeds and reliability.

Metro-North Railroad – Waterbury Branch Line

Modernizing the Waterbury Branch Line includes design and construction of high-level platforms for five stations (Derby-Shelton, Ansonia, Seymour, Beacon Falls, Naugatuck) and the conversion of the former baggage room at Waterbury Station to a customer waiting area (**Figure 3-10**). It also includes the rehabilitation of four bridges north of Waterbury Station. These improvements build on the recently completed signal upgrades and the addition of new sidings. CTDOT is also in the process of developing a master plan that evaluates opportunities for service extensions, higher frequencies, and the construction of the new rail yard. Together, these improvements will address gaps in service, improve safety, and increase accessibility.

Figure 3-10. Ansonia Station

Source: CTDOT

Metro-North Railroad – Danbury Branch Line

In addition to a fueling facility identified in the New Haven Line Shops & Yards Program, CTDOT plans to make several additional investments on the Danbury Branch Line in the form of slope and track stabilizations and reconstructing Merritt 7 Station (**Figure 3-11**) to include a high-level platform. In concert, these projects will improve accessibility and the customer experience

3.3 Cross-Corridor Passenger Rail Improvements and Investments

In addition to the corridor-specific improvements, several CTDOT plans involve multiple corridors and services. Some improvements focus on safety and communications including a 5G program. Additionally, CTDOT plans to improve reliability and customer experience through targeted investments in its Metro-North Railroad and CT*rail* fleets. Like the safety and communications investments, these fleet improvements will improve reliability, service, and the customer experience. In addition to physical investments, CTDOT also continues to produce statewide studies, including a concept-level electrification study.

Figure 3-11. Merritt 7 Station

Source: CTDOT

3.3.1 Rail Fleet

CTDOT plans to replace aged and outdated push-pull rail cars operating on the Hartford Line, starting with an initial procurement of 60 diesel-hauled rail cars with the option to purchase an additional 72 to support long-term growth. This investment also includes the procurement of new dual-mode locomotives to support one-seat ride service for non-electrified segments of the Connecticut rail network (Waterbury Branch Line, Danbury Branch Line, Hartford Line). CTDOT also plans to replace the Metro-North Railroad fleet (push-pull rail cars and dual-mode locomotives) operating on the Waterbury Branch and Danbury Branch Lines.

3.3.2 Planning Studies

In addition to the studies noted above, long-term studies are being conducted to improve and expand passenger rail in Connecticut and neighboring states. These initiatives, outlined in Chapter 1 and **Appendix G**, are critical to future service improvements.

4. Proposed Freight Rail Improvements and Investments

It is important that Connecticut and its freight rail partners continue to update and invest in critical infrastructure. This chapter identifies proposed freight investments under consideration, including track repairs, intermodal connections, and facilities.[33] It also includes information, where pertinent, about how freight rail investments leverage and are leveraged by investments to highway, transit, port, and air facilities. Finally, this chapter includes a discussion of how the proposed investments to the state's freight rail system integrate into Connecticut's larger freight and passenger rail networks.

4.1 Planned Freight Railroad Improvements

The following section provides a summary of all planned freight railroad improvements. Where possible, it identifies how these improvements address gaps in service and financial needs.[34] Additional information on each of these projects, including formal names and costs, is available in **Appendix F**.

4.1.1 CSX/Pan Am Southern

CSX has one safety project planned for the short-range on the Waterbury to Berlin corridor. The project will maintain the safety and integrity of crossing warning signals and signs, which is essential for public safety at all at-grade rail/highway crossings.

4.1.2 Branford Steam Railroad

Planned Branford Steam Railroad improvements consist of track maintenance and expansion, as well as rolling stock investments. These repairs will address service gaps by improving reliability.

4.1.3 Central New England Railroad

CNZR has a number of programs planned in the short-range as described below. Additionally, it plans two other projects including purchasing two "green" low emission locomotives. Other plans include acquiring right-of-way to Bradley Field and supporting federal grant applications with CTDOT to FRA and FTA as needed.

- **Rail Track Program**. Proposes to improve the railbed between MP 3.6 and MP 5.7 (Hartford and Bloomfield), install sidings, road, rail, and crossties; and rebuild track switches.
- **Bridges Program**. This program will replace bridge decks at Scantic and Broad Brook, and repair three other bridges based on current bridge inspection reports.
- **Communications and Signals Program**. This program will add a communications repeater on the Griffin Line.
- **Crossings Program**. This program will install crossing signals at 13 crossings, add flashers and gates at Route 190 and Route 220, and renew the highway-rail grade crossing at Troy Road.
- **Facilities/Yard Program**. This program involves designing and constructing a locomotive repair facility with offices in East Windsor.

[33] The listing and organization of projects in this plan is solely for the purpose of identifying the projects, and is not intended to indicate any other meaning, purpose, or conclusion.

[34] Private railroads are under no obligation to provide information on their capital improvement plans, thus the information in this chapter is limited to broad project descriptions.

- **Security Program**. This program will add fencing, security cameras, and improved communications systemwide.
- **Studies Program**. This program plans for CNZR to partner with the Connecticut Department of Economic Community Development (DECD) to conduct a feasibility study to attract new rail freight shippers systemwide.

4.1.4 Connecticut Southern

CSO has several system-wide improvements including track, bridge, and switch upgrades. These improvements span Priority 3, 4, 6, and 9 lists (below) and allow the railroad to increase reliability due to new equipment and improved safety at crossings (**Figure 4-1**).

Figure 4-1. Connecticut Southern Railroad in Middletown, Connecticut

Source: Genesee & Wyoming

- **The Priority 3 Rail Track Program**. This program includes the replacement of approximately 13,500 crossties and 13,640 tons of new ballast, 27.5 miles of surfacing, installation of 110-pound-per-yard relay rail (replacing 80 pound and smaller rail), a bolt tightening program, and rebuilding six track switches.
- **The Priority 4 Switch Tie Program**. This program plans to restore track switches to maintenance level on the Bradley/Suffield and Manchester subdivisions.
- **The Priority 6 Yard**. This program plans to install new switch timbers and repair or replace switch points at north and south ends of the yard.
- **The Priority 9 Crossings**. This program plans to rebuild seven at-grade road crossings, including the rehabilitation of two grade crossings on the Bradley-Suffield subdivision.

4.1.5 Housatonic Railroad Company

HRRC has a series of projects divided into Priority 1 and Priority 2 lists. The Priority 1 Program includes rail track projects. The Priority 2 Program includes rail track and facilities/yards. Collectively, these will address safety, and improve reliability, resiliency, and capacity.

Figure 4-2. Housatonic Railroad Company in Canaan, Connecticut

Source: Parker Rodriguez

Priority 1 Rail Track Program

The Priority 1 Rail Track Program includes repairs on approximately 44 miles of track between Canaan and Brookfield, installation of approximately 65,000 new crossties, some switch improvements, some ballast, and associated work.

Berkshire Line – Canaan

HRRC plans to rebuild the main track between the Massachusetts State Line and Orchard Street, Canaan. Improvements include upgrades in Massachusetts from the state line, North and other at-grade highway-rail crossing work in Canaan. This includes three turnouts and six crossings for a total length of 6,000 feet. Additionally, it plans to construct a new customer lead track and road crossing surface at North Elm Street for a length of 745 feet. It also plans to reconstruct the CTDOT maintenance facility at-grade crossing, replacing the bridge deck on the Blackberry River Bridge, and adding a pedestrian walkway for safety. This project would connect with the current Canaan at-grade crossings over a length of 600 feet. Finally, at the Canaan Yard/Millers Siding, HRRC plans to rebuild the parallel passing siding, storage track, public delivery track, and additional storage tracks. HRRC plans to reconfigure the Berkshire Junction, remove a track switch, install crossovers, replace 1 mile of jointed rail with welded rail, and install approximately 22,500 crossties.

Priority 2 Program

Under the Priority 2 Rail Track Program, HRRC plans for full rehabilitation and replacement of approximately 32.5 miles of rail between Canaan and New Milford; renewal of three railroad crossings in Canaan; installation of approximately 80,000 new crossties, track switches, and ballast; and associated work. Similar work on 13.65 miles of rail between New Milford and Berkshire Junction will include renewal of railroad crossings as needed, installation of approximately 30,000 new crossties, switches and ballast, and associated work. Additionally, HRRC plans to modernize or relocate and improve the dispatching and operations center in Canaan.

4.1.6 Naugatuck Railroad

NAUG has projects planned in their Bridge, Track, and Rail Replacement Programs for the short-range. These investments will support the line financially by allowing it to provide more reliable freight and tourist railroad service.

The Bridge Program

The Bridge Program includes replacing deteriorated wood timber deck and performing any needed masonry and steel repairs on the Jericho Bridge over the Naugatuck River between Watertown and Thomaston. This is their top priority project. In addition, they have plans to replace the deteriorated wood timber deck and perform any needed masonry and steel repairs on the Chase Bridge over the Naugatuck River between Waterbury and Watertown. This is their second priority project.

Track Program

The Track Program includes replacement of 25,000 ties.

Rail Replacement Program

The Rail Replacement Program includes replacing the 100-year old rail with new heavy rail between MP 0-2.4 and MP 9-15.6.

4.1.7 New England Central Railroad

NECR has four projects in the short-range, three of which also extend into the long-range. These programs will improve infrastructure and increase reliability. Additionally, they will consider climate change challenges like intensified storms and water flows at crossings.

Rail Track Program

Two projects fall under the Rail Track Program with the first project consisting of replacing an estimated 30,000 crossties, 23,000 tons of new ballast, 55.7 miles of surfacing, bridge work, and rebuilding 10 track switches. The second project is to conduct annual capital needs to sustain track conditions including crosstie replacement, ballast, surfacing, switch ties, and bridge work.

The Rail Bridges Program

This project addresses annual capital needs to sustain existing bridge conditions at three bridges. Needs include piles, abutments, stringers, and decks.

The Culverts/Drainage Program

This is a drainage project that will clean out ditches and repair culverts.

Figure 4-3. New England Central Railroad Locomotive

Source: NECR

4.1.8 Providence & Worcester Railroad

Via its Track Program, P&W will install 10,000 linear feet of 136-pound rail on the Norwich Branch and install 1,200 crossties per mile on the Middletown Branch. Lastly, it will pursue the "Maximizing Middletown " freight corridor upgrade, a project that will lay 5.7 miles of new of new 115 lb. continuous welded rail, install 12,600 new crossties, rebuild 3 public at grade crossings, cut canopy vegetation and replace 21 miles of ballast and surfacing. These investments will improve service, reliability, and safety.

Figure 4-4. Providence & Worcester Railroad in Middletown, Connecticut

Source: Tom Mik

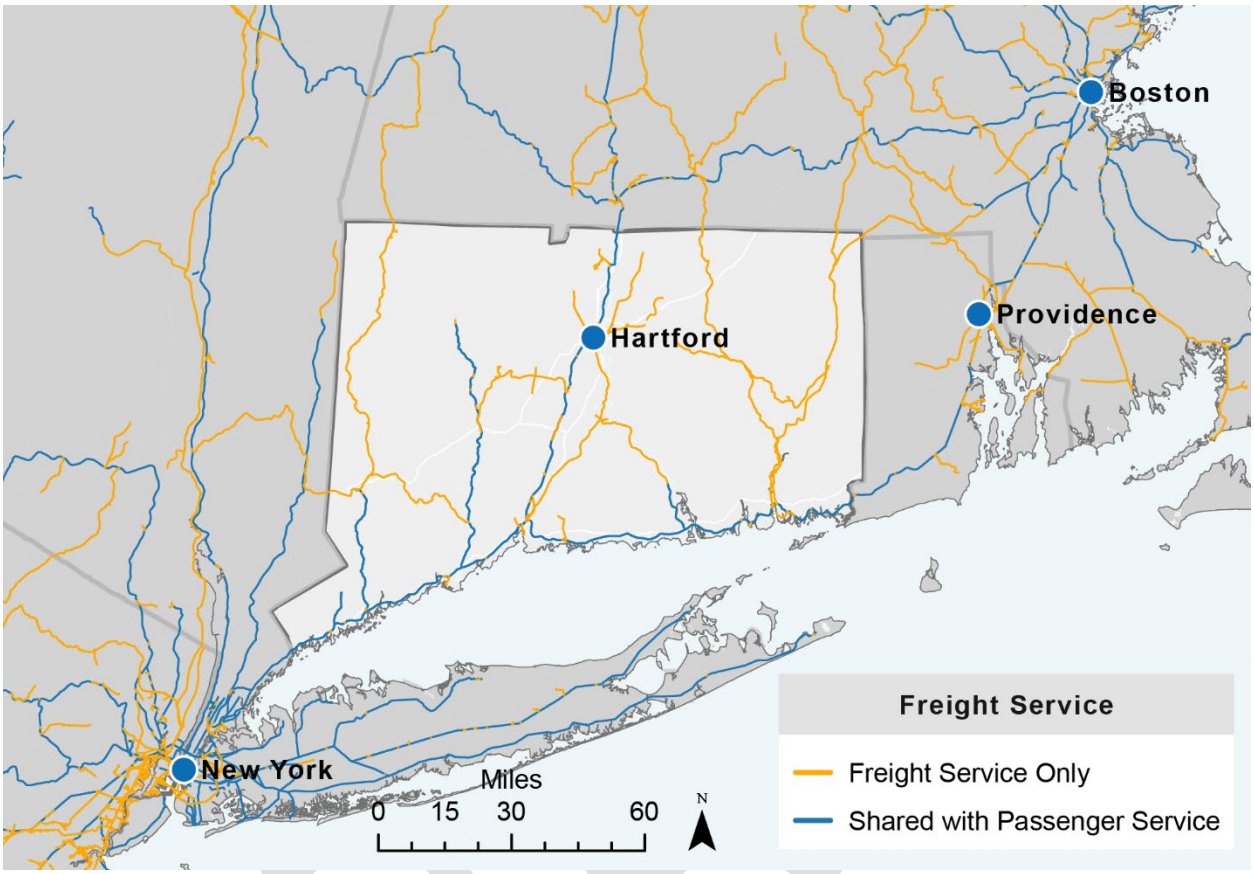
4.1.9 Valley Railroad

Planned VRR improvements will consist of numerous projects that are ongoing through both the short- and long-range horizons. These improvements advance safety and improve gaps in service through reducing the likelihood of track failures. Financially, this makes the line a more competitive option for customers.

4.2 Integration with the Larger Freight Network

Many of the proposed freight rail projects leverage other freight modes and their resources. The investments and identified yard improvements leverage the freight network through improving the transfer between railroads and other modes. For example, P&W's yard improvement will allow the Branford Steam Railroad to better connect its only rail-served customer (Tilcon) with the larger freight network (**Figure 4-5**).

Figure 4-5. Freight Network



Source: AECOM

4.3 Integration with the Passenger Rail Network

Many of Connecticut's railroads are shared by passenger and freight operators. Because the tracks are shared, there are opportunities to maximize the return on investment through developing plans and improving infrastructure that benefit both types of rail operators. These types of complementary plans may yield incremental results like improved tracks, clearances, and weight limits, but also may have other impacts, like the CNZR Hartford Viaduct and Connecticut River Bridge plans. These two structures are included in several studies like the New Haven-Hartford-Springfield (NHHS) Rail Program and the Greater Hartford Mobility Study (CTDOT 2021).

CNZR's plans improve the railroad's ability to serve customers while also realizing these respective programs and studies.

5. The State's Rail Service and Investment Program

This chapter describes Connecticut's Rail Service and Investment Program (RSIP), which includes three components: a strategic vision for rail service and its role in the statewide multimodal transportation system; a description of the public and private benefits realized in the proposed passenger and freight projects; and a summary of the passenger and freight capital projects making up the RSIP. Finally, this chapter also includes a listing of rail studies to be completed over the next 4 years.

5.1 Vision

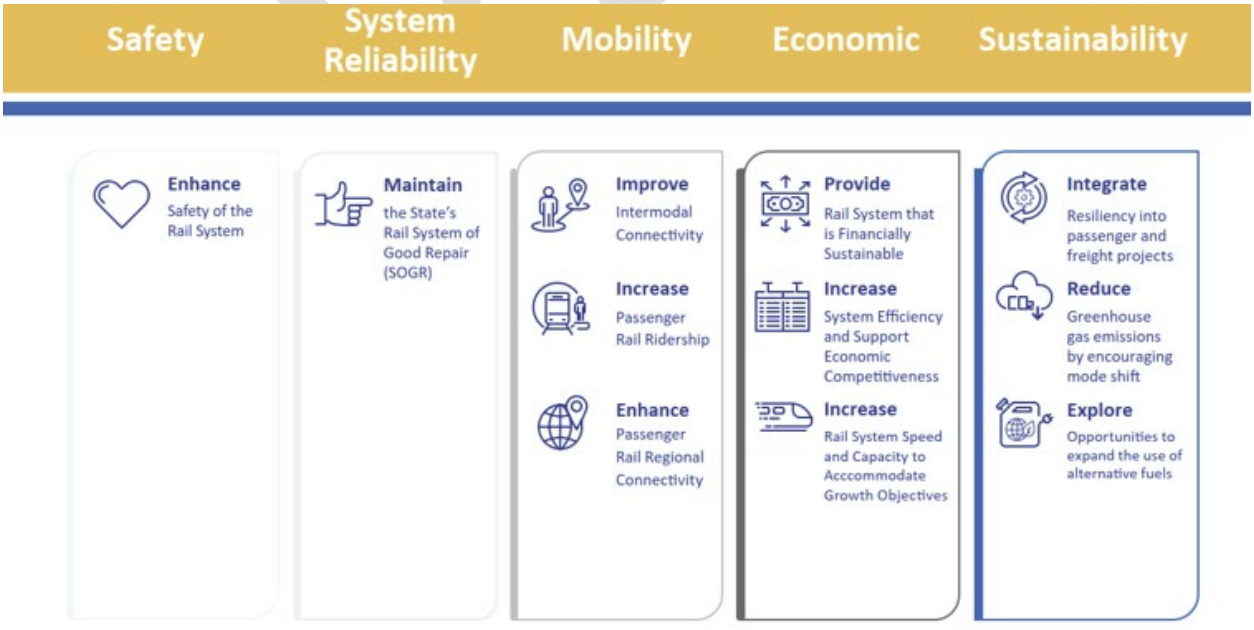
The 20-year vision of the Rail Plan is to ***facilitate a robust and vibrant rail system that is safe, connects communities, generates sustainable economic growth, helps build energy independence, and provides links to travel corridors and markets within and beyond the region***.

5.1.1 Goals and Objectives

The goals and objectives designed to fulfill CTDOT's rail vision reflect significant collaboration with stakeholders, including rail industry representatives, state and local officials, metropolitan planning organizations, rail passengers, disability rights representatives, as well as various interest groups, and residents over the last several years. This collaborative effort is described in detail in Chapter 6.

The overarching goals of the Rail Plan are organized under five categories: Safety, System Reliability, Mobility, Economic, and Sustainability. These five categories provide structure to the individual goals and capture the critical ideas set forth in Connecticut's Rail Plan vision statement (depicted on **Figure 5-8**). The Rail Plan's objectives are tightly bound to the goals and help to define the specific actions that CTDOT needs to undertake to achieve each goal (**Figure 5-1**).

Figure 5-1. State Rail Plan Goals



Safety Goals

Safety is a top CTDOT priority, and it is the goal that informs all other goals and objectives. CTDOT plans to achieve this goal through a variety of actionable objectives:

- Continue to support grade crossing improvement projects to enhance safe conditions.
- Work towards achieving the goals established in the Highway-Rail Grade Crossing Action Plan to comply with new Federal requirements under CFR Part 234.11.
- Continue to support Connecticut Operation Lifesaver (CT OL) programs.
- Continue to support disaster and hazard response planning in partnership with local, state, and federal authorities.
- Enhance signal and communications to promote safe operations.
- Continue to support fully ADA accessible facilities and services (**Figure 5-2**).

Figure 5-2. Temporary ADA Ramp Construction at Windsor Station (Construction Complete in July 2022)

Source: CTDOT

System Reliability Goals

As stated in previous chapters, Connecticut has an extensive passenger and freight railroad network. Many different stakeholders depend on this network for jobs and economic opportunity. Connecticut's State Rail Plan addresses this through ensuring system reliability. In doing so, Connecticut's system reliability goal is to ensure user confidence by maintaining the rail system in a state of good repair. Several actions that deliver on this goal include:

- On-time performance of 95 percent or better for all passenger rail services through equipment and capital investments.
- Upgrade and expand both CT*rail* and MTA Metro-North Railroad passenger fleets, associated storage and maintenance facilities.
- Advance priority state of good repair projects, such as the Walk Moveable Bridge Project (**Figure 5-3**), projects identified in the 2022-2026 Capital Program and NEC Commission's CONNECT NEC 2035.

Figure 5-3. Walk Bridge in Norwalk, Connecticut

Source: CTDOT

Mobility Goals

Goals that exist within the mobility category focus on improving inter- and intra-Connecticut connectivity. Access to jobs and economic opportunity is critical to people and businesses who live and work in Connecticut. The state's large passenger and freight railroad network is an asset that enables individuals and businesses opportunities to move freely, cost-effectively, and sustainably. There are three mobility goals:

- Improve intermodal connectivity;
- Expand passenger rail ridership; and
- Enhance passenger rail regional connectivity.

Each of these goals, applied individually and collectively, will lead to a Connecticut rail network that increases mobility with more convenient, faster, and better-connected service that supports statewide environmental and equity objectives.

Improve Intermodal Connectivity

A railroad is successful if it provides people and goods an easy, seamless, route from their origins to their destinations. Railroads are very effective at moving large volumes of people and goods over long distances, but their success is largely dependent on the other transportation modes providing access to terminals and stations. The opposite can also be said as railroads provide opportunities for increased use on other modes. Recognizing this symbiotic relationship between rail and other transportation modes, Connecticut's first mobility goal focuses on improving connectivity between them. Several specific actionable objectives were identified to achieve improved connections:

- Enhance Metro-Hartford connectivity through constructing connections and facilities that improve the link between CTfastrak and Hartford Line.
- Improve non-automotive access to Bradley International Airport through enhancing connections with the Hartford Line.
- Utilize active transportation, like bicycle infrastructure (**Figure 5-4**), as a tool for removing last-mile barriers to passenger rail stations.
- Procure new passenger railroad cars that increase reliability, are fully ADA-compliant.
- Improve the customer experience and raise service performance on non-electrified passenger railroad service.
- Improve system compatibility and sustainability by taking steps towards electrifying Connecticut's entire passenger rail system.
- Construct infrastructure that creates and enhances freight railroad connections at Connecticut's ports.

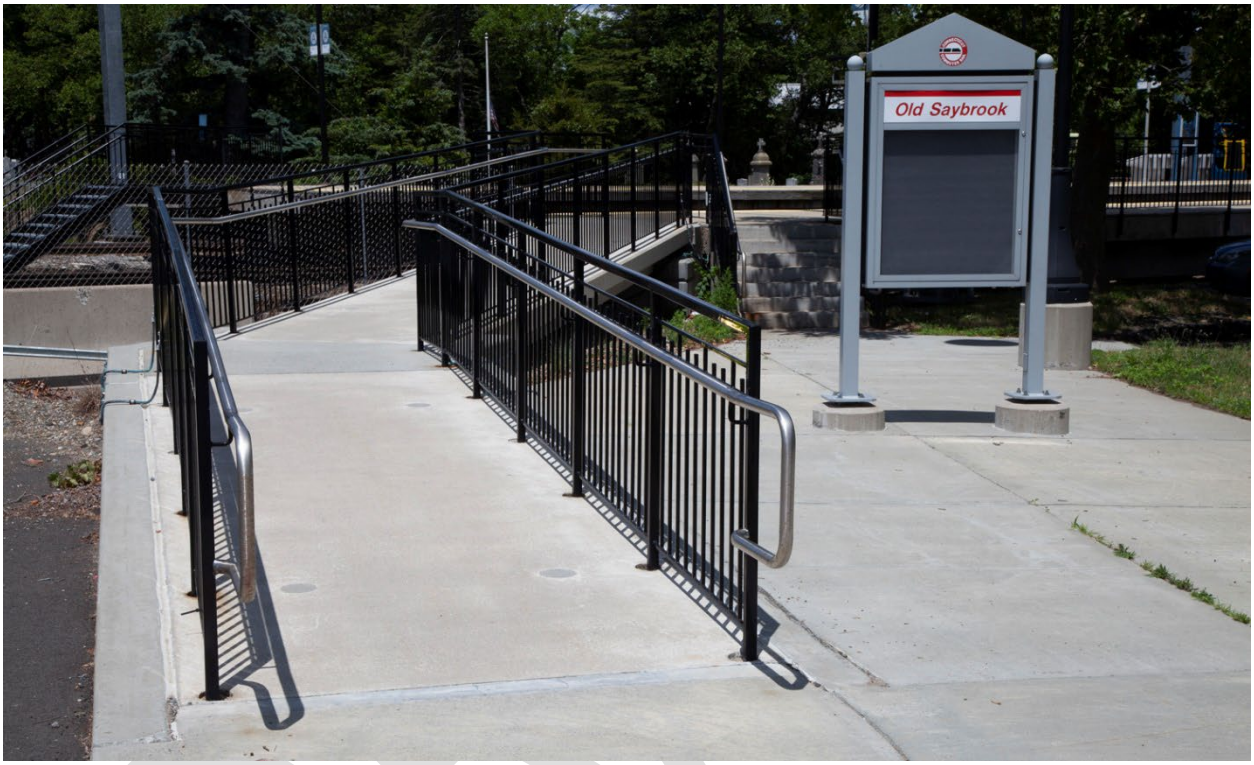
Figure 5-4. Bicycle Parking Facilities at New Haven Union Station

Source: CTDOT

Increase Passenger Rail Ridership

- Create a fully accessible rail network with station and related infrastructure investments.
- Improve station amenities, such as real time-information technology (**Figure 5-5**), that make train travel easy for regular users and first-time riders.
- Enhance the on-board customer experience with an accessible, clean, safe, and modern rail fleet.

Figure 5-5. Accessible Pedestrian Ramp in Old Saybrook



Source: CTDOT

Enhance Passenger Rail Regional Connectivity

System compatibility allows the easy movement of people and goods throughout Connecticut and the larger Northeast region. Connecticut has several passenger rail services that operate in neighboring states. Additionally, many of Connecticut's freight operators run service in to other states. Given the larger regional rail networks, there are opportunities to improve these services and reduce the need for single-occupant vehicle traffic between states. In turn, these improvements will allow Connecticut and its neighbors to advance towards their mobility and climate sustainability goals. Specific objectives to achieve this goal include:

- Collaborate with NEC states to develop plans for regional higher-speed, more direct rail service.
- Expand the existing Amtrak Valley Flyer service to Greenfield (**Figure 5-6**).
- Explore opportunities to partner with Rhode Island to extend NEC rail service or develop new routes.
- Decrease travel times, increase frequencies, and implement direct service to major destinations such as New York City and Connecticut's economic centers. An example of this is the State's plan to reduce travel times between New Haven and New York City by up to 10 minutes in 2022 and by up to 25 minutes by 2035. A first step, New Haven-Grand Central Super Express one-stop service, began in July 2022 with three round-trips daily.

Figure 5-6. Existing Hartford Line Train

Source: CTDOT

Economic Goals

Connecticut's economy can be strengthened by its reliable, fast, effective passenger and freight railroad transportation. In its Rail Improvements Economic Impact Study (Capitol Region Council of Governments [CRCOG] 2021), the CRCOG and the Pioneer Valley Planning Commission (PVPC) noted disinvestment in rail connectivity that occurred over three decades beginning in the 1980s correlated to a loss of "20,000 to 40,000 jobs in information technology, finance, and professional services. The study notes that jobs are "missing" from Metro Hartford-Springfield because of the lack of regional and intercity rail connectivity and that in similar Northeast areas where rail was well supported, these jobs fueled growth and employees were particularly attracted to rail transit availability. Finally, the study further revealed that investment in regional rail between Massachusetts and Connecticut could lead to a 10-1 return on investment over a 30-year period.

As Connecticut continues to rebuild its rail system with significant investments in new services, such as the Hartford Line there are already signs of new economic development around rail. To continue these efforts, Connecticut has established the following rail-based economic goals:

- Provide a rail system that is financially sustainable.
- Leverage the rail system to support economic competitiveness.
- Increase system capacity and accommodate growth.

Provide a Rail System that is Financially Sustainable

To achieve financial sustainability for Connecticut's passenger and freight rail system, CTDOT has the following objectives:

- Reduce public expenditures through transportation efficiency and infrastructure preservation.
- Support a rail freight investment program through ongoing targeted investments.

Increase System Efficiency and Support Economic Competitiveness

Connecticut's existing economic centers and its proximity to New York City create a competitive economic environment. The state's existing railroad system gives it an economic advantage as it allows people and businesses efficient movement throughout the northeast region. Recognizing this advantage, and to support its economic competitiveness goal, CTDOT has the following objectives:

- Collaborate with municipalities and businesses to invest in areas that will encourage the most employment growth and economic development through transit-oriented development (TOD).
- Create a parking management plan for stations to optimize revenue collection and balance supply and demand through pricing.
- Increase freight rail usage to reduce truck traffic and energy consumption (**Figure 5-7**).
- Utilize existing railroad bridge management programs to identify and develop freight corridors that support 286,000-pound gross-weight-on-rail (286K) freight service.
- Coordinate with freight railroads to identify a strategy to that increases bridge clearances to a minimum of 19'06", where possible, permitting the movement of larger cars in Connecticut to support increased freight market capture.
- Revitalize intermodal facilities and inland ports in the state to reduce long-haul trucking by accommodating new freight technology innovations and goods.
- Develop transportation demand management plans that wholistically evaluate and manage travel to/from rail stations.

Figure 5-7. Existing Freight Operations in Middletown, Connecticut

Source: Carl Talley

Increase Rail System Speed and Capacity to Accommodate Growth Objectives

The rail system inventory identified in Chapter 2 demonstrates that Connecticut's current rail network is operating at capacity, and it is unable to achieve many of the state's ridership, freight, and economic growth goals. To help address this, CTDOT's goal is to make infrastructure investments and develop service plans that increase system capacity and accommodate growth. This will be achieved through the following plans to:

- Invest in rail-capacity projects such as track and signal improvements, rail yard facilities and other new capacity-increasing projects.
- Study the feasibility and cost of implementing new commuter rail service where viable on existing corridors that do not currently provide passenger service.
- Update service plans that more quickly respond to COVID-19 endemic travel patterns.
- Improve and construct new stations that have sufficient parking and also address sustainable first-mile/last-mile solutions.
- Identify projects that link state of good repair goals with potential for increasing track speed to access new markets.
- Initiate the New Haven – Providence Capacity Study to identify a possible higher-speed route between Hartford and Boston.

Sustainability Goals

Rail transportation in Connecticut supports sustainability goals by integrating resiliency into project planning and construction, reducing greenhouse gas emissions by encouraging mode shift, and incorporating the use of alternative fuels.

Integrate Resiliency into Passenger and Freight Rail Projects

Connecticut is integrating resiliency into its project planning and construction efforts. CTDOT plans to modify and invest in new tracks that can handle higher speeds and are more resilient to the impacts of climate change. When the state's transportation investments are hardened against more frequent and severe weather events, disruptions to the overall state economy are reduced.

Reduce Greenhouse Gas Emissions by Encouraging Mode Shift

Rail is a more fuel-efficient mode of transportation than truck or automobile, as shown in Chapter 2. Freight railroads are on average three to four times more fuel-efficient than trucks, suggesting that one rail car can move four trucks of tonnage while consuming the same amount of fuel. Fuel efficiency is also higher for passenger rail compared to automobile and air travel (AAR 2020). On average, passenger rail can achieve fuel efficiencies averaging 51.6 passenger miles per gallon (pmpg)[35] compared to passenger vehicles operating on highways with a pmpg of 36.0[36] and air travel with a pmpg of 50.3 (DOE 2020). Rail transportation therefore reduces greenhouse gas emissions that accompany diesel and gasoline combustion. By encouraging freight to shift from truck to rail, and passengers to shift from auto to rail, greenhouse gases and other harmful pollutants are reduced.

Connecticut air quality monitors record some of the highest ozone levels in the eastern United States, especially along heavily traveled transportation corridors where criteria air pollutants are most densely concentrated. Nonattainment with the 2008 and 2015 ozone NAAQS is one of the most critical air quality and public health challenges facing the state with pollution from the transportation sector being one of the main contributors to the state not meeting attainment status. Transportation accounts for 38 percent of carbon emissions in Connecticut and is generally one of the main contributors to a person's carbon footprint. Nationally, transportation accounts for 29 percent of GHG emissions of which rail makes up only 2 percent (EPA 2022). Due to fuel efficiency, moving freight by rail lowers greenhouse gas emissions, of which carbon dioxide is the primary component, by 75 percent compared to trucking.

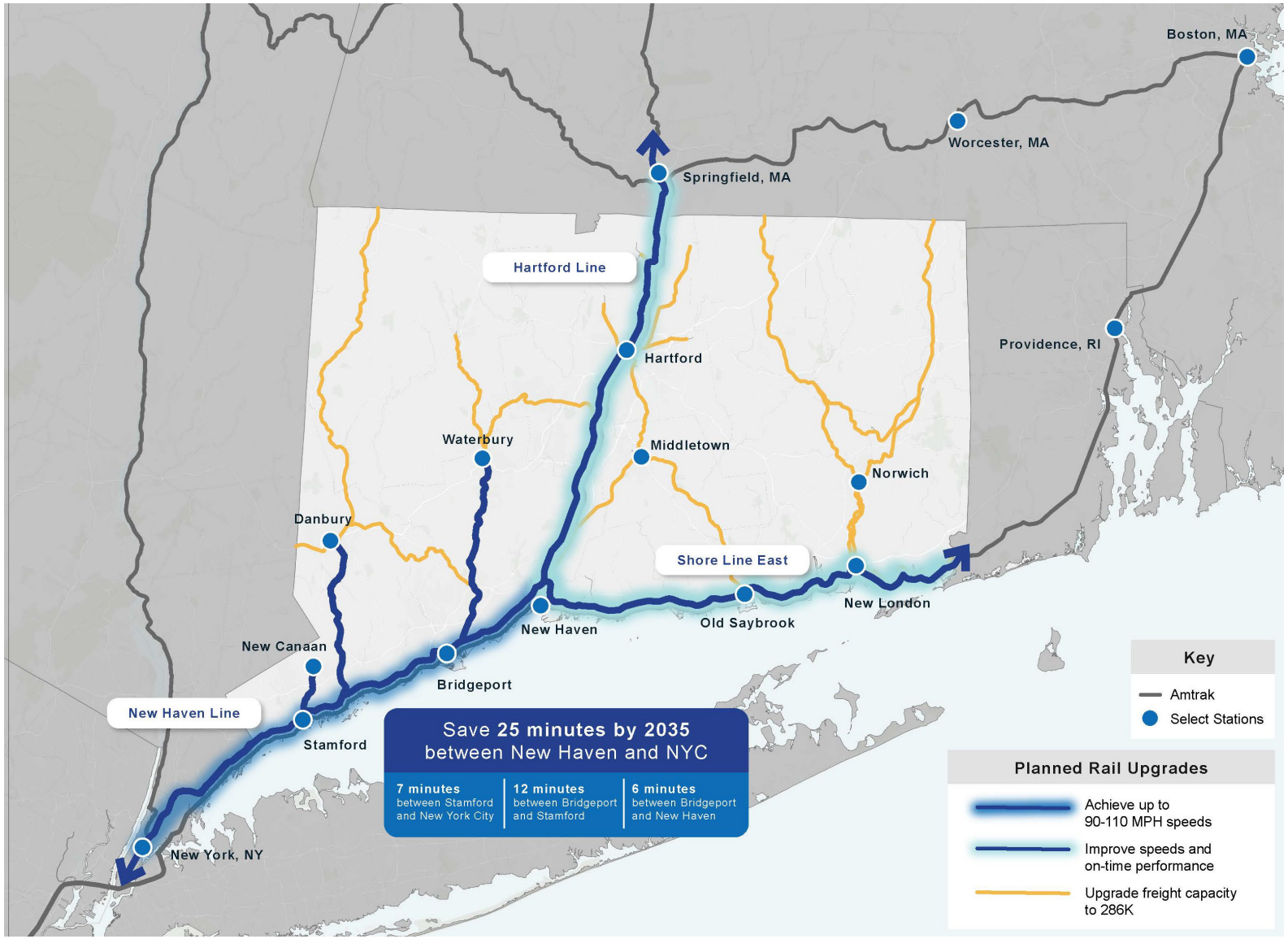
Explore Opportunities to Expand the Use of Alternative Fuels

As Connecticut rail operations continue to expand and serve passengers and freight, incorporating environmentally sustainable practices, including the use of alternative fuels, will become increasingly important. In fact, it is CTDOT's goal to have all commuter rail lines electrified. Electrification of all commuter rail lines would have fleet management and environmental advantages, and it would increase reliability, reduce commute times, and allow for more one-seat rides into New York and other employment centers. CTDOT will continue to pursue electrification and explore the use of other alternative fuels.

[35] Assuming on average there are 1.5 passengers travelling in one car.

[36] Passenger-miles per gallon (pmpg) is a metric for comparing mass transit and rideshare with typical passenger vehicle travel. Transportation system efficiency increases as the number of passengers increases or as the vehicle fuel economy increases for each transportation mode. All fuel converted to gallons of gasoline on an energy content basis. For trains, most of this fuel is electricity.

Figure 5-8. Proposed Passenger and Freight Rail Vision



Source: AECOM

5.2 Program Coordination

Connecticut's long-range vision was developed through coordination with other state entities, agencies, rural and metropolitan planning organizations, passenger and freight rail industry representatives, and other stakeholders. The resulting vision is integrated with other transportation planning efforts regionally and nationally. See Chapter 6 for more details on how stakeholders were involved in the development and coordination of the plan. Additionally, CTDOT consulted several existing and recently completed plans, summarized in Chapter 2.

The projects listed in this chapter align with goals in several neighboring state's plans, as well as regional planning efforts discussed here.

5.2.1 CONNECT NEC 2035

CONNECT NEC 2035 is the first phase of the long-term vision for the Northeast Corridor (NEC) established in the Federal Railroad Administration's 2017 NEC FUTURE Plan (**Figure 5-9**). The state governments of the Northeast, the federal government, eight commuter rail agencies, and Amtrak are working through the Northeast Corridor Commission (NEC Commission) to develop a detailed and efficient sequencing of infrastructure investments over 15 years. CONNECT NEC is an ongoing, iterative process that will be refined as new projects, resources, and funding is identified. Many of the bridge and track improvements along the Hartford Line, New Haven Line and Amtrak-owned Shore Line East align with proposed projects in CONNECT NEC 2035. This will result in an inventory of projects eligible for Bipartisan Infrastructure Law funding.

Figure 5-9. CONNECT NEC 2035 Logo

Source: NEC Commission

5.2.2 Massachusetts Freight Plan (2018)

The Massachusetts Freight Plan includes elements that align with those in the Connecticut State Rail plan, including upgrading Massachusetts' freight lines to 286K capacity. This plan seeks the same for Connecticut's freight lines, meaning the plans are complimentary.

5.2.3 Massachusetts State Rail Plan (2018)

Several Massachusetts State Rail Plan project priorities align with Connecticut, including support for adding service between New Haven and Springfield (Hartford Line) and the extension of service to Greenfield. Like the Massachusetts Freight Plan, the Massachusetts State Rail Plan also expresses

support for 286K freight capacity. A follow-on plan published in 2020, the MBTA's Rail Vision, also includes goals and objectives that reflect Connecticut's rail vision.

5.2.4 Rhode Island State Rail Plan (2014)

The Rhode Island State Rail Plan notes ongoing studies on the prospect of Shore Line East running into Rhode Island. Additionally, the plan sets a policy that Rhode Island will support initiatives to increase reliable and timely access to passenger commuter rail service, including connections to complementary rail service in Massachusetts and Connecticut. This aligns with CTDOT goals for improving track speeds and travel times along the Northeast Corridor.

5.2.5 State of Rhode Island Freight and Goods Movement Plan - Interim Update (2022)

The State of Rhode Island Freight and Goods Movement Plan has several elements that align with the Connecticut State Rail Plan, mainly in terms of increasing regional freight capacity. The plan proposes a series of passing sidings, yard investments and improved clearances. If completed together, this further opens New England's freight system, giving both states access to new freight routes and customers.

5.2.6 New York State Rail Plan (2009)

Like Massachusetts, the New York State Rail Plan includes projects that are complimentary to those in the Connecticut State Rail Plan. New York State also seeks to increase freight rail capacities to 286K. If completed, in tandem with the Connecticut and Massachusetts investments, the northeast freight railroad system would be dramatically improved, removing trucks from the region's congested roads.

5.2.7 New York State Freight Plan (2019)

The New York State Freight Plan also discusses the need for 286K capacity and its positive impact on relieving congestion. The plan notes that the I-84/I-287 interchange is a source of congestion. While this is outside of Connecticut, I-84 is a major highway in Connecticut, meaning the reduction of congestion and freight trucks on I-84 in Connecticut would contribute to the reduction in congestion on I-84 in New York.

5.3 Rail Agencies

CTDOT serves as the primary rail agency via its Bureau of Public Transportation, which oversees the following:

- Office of Rail
- Office of Transit and Ridesharing
- Customer Experience Unit
- Regulatory & Compliance Unit

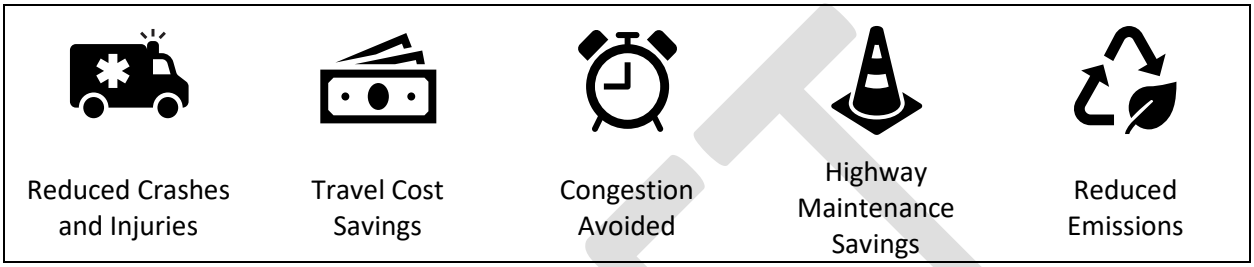
Within the Office of Rail there are three functions: Rail Operations, Rail Capital Programs, and Rail Safety. There are currently no planned State rail agency organizational changes or proposed policy or legislative changes and new programs within the short- and long-term horizons.

5.4 Program Effects

The proposed passenger and freight projects would result in both public and private benefits across the state of Connecticut. When choosing rail, passengers and freight shippers are committing to a more cost-effective and environmentally friendly mode of transport. As the movement of passengers and freight

becomes more efficient, the industries in Connecticut that rely on rail benefit through expanded markets and can capture transportation cost savings. The potential effects of modal diversion are shown in **Figure 5-10**. For passengers, diverting ridership from auto to rail directly supports rail-related employment, encourages tourist spending, improves travel safety, and reduces highway congestion and emissions from motor vehicles. For freight, diverting from truck to rail helps achieve reductions in shipping costs, avoids deterioration of the region's highway infrastructure, decreases congestion-related delays, as well as reduces emissions. Collectively, these changes may result in growth in jobs or productivity that support Connecticut's economy.

Figure 5-10. Potential Effects of Switching Modes from Automobiles and Trucks to Rail



This section describes the expected effects of the program of rail projects presented in Chapters 3 and 4. The potential program effects include increased rail capacity, reduced congestion, improved safety, state of good repair, improved environmental quality, and regional economic development benefits that result from market responses to these changes. The costs by project type are also displayed. **Table 2-1** and **Table 5-2** show the program effects by project type for the short-range, long-range, and vision passenger and freight rail programs, respectively.

5.4.1 Passenger Program

A summary of proposed passenger rail projects is found in Chapter 3 and **Appendix E**. To summarize the effects of the passenger rail program, many individual projects in the list were combined into a larger project group based on the common purpose. The project groups, benefits and associated costs are described in the following sections. At a general level, they consist of fleet, track, interlocking, and bridge replacements and repairs. This applies for both intercity and commuter lines.

The passenger rail program includes projects that benefit Connecticut's transportation system through providing public and private benefits to users and non-users alike. Because of rail's comparative advantage in fuel efficiency and the ability to transport large numbers of passengers more safely, implementing the planned passenger rail projects will create a wide range of program effects summarized in **Table 2-1**. The program effects are cumulative and demonstrate the quantifiable benefits for packages of projects.

Table 5-1. Passenger Rail Program Effects

Effect Categories	Description of Effects
Travel Time Savings	Infrastructure investments (such as straightening track curves) allow for service and operations improvements that will save commuters up to 25 minutes of travel time between New Haven and Grand Central Terminal. Of these 25 minutes, ***18 minutes represent travel time savings directly attributable to infrastructure improvements and service changes***. The remaining 7 minutes are attributable to operational improvements (see "Improved Reliability" for more information). Of those 18 minutes, 10 minutes of travel time savings are possible in the short-term, translating to up to ***82 hours a year*** for a daily Connecticut commuter; the additional 8 minutes accrue over time eventually saving daily commuters ***148 hours a year***.
Improved Reliability	The infrastructure investments referenced in "Travel Time Savings" also allow for a reduction in trip time by reducing scheduled pad time (or recovery time). This can be achieved through improved on-time-performance made possible by those infrastructure improvements. ***These reliability improvements will save up to 57 hours per year for a daily Connecticut Commuter***.
Increased Service	An expanded rail fleet will enable new express services from every rail line to New York City including new direct service to Penn Station. The expanded fleet and infrastructure upgrades will add ***an additional 30 trains per day throughout the rail system, including a 30 percent increase in service on the Shore Line East, 44 percent increase on the Hartford Line, 80 percent increase on the Waterbury Branch Line, and 25 percent increase on the Danbury Branch Line***.[a]
Increased Capacity	Projections for growth in rail trips on the Connecticut Rail Network (Commuter Rail & Intercity Rail) predict a growth of 11,880 daily trips or 3,559,170 annual trips from pre-COVID to 2035 (assuming no investments listed in the CT State Rail Plan). The capacity improvements achieved through the projects listed on the CT State Rail Plan (and the service enhancements they enable) could draw an additional 4,690 daily trips (1,412,180 annual trips) on Commuter Rail services (CT*rail* and Metro-North Railroad) or an additional 8,710 daily trips (2,838,100 annual trips) on Commuter Rail & Intercity Rail combined. This represents an overall increase of 20,590 daily trips (6,397,270 annual trips) on Commuter Rail & Intercity Rail combined when comparing a 2035 scenario including the investments laid out in the CT State Rail Plan to pre-COVID trip numbers.[b]
Customer Experience	New, fully accessible cars, spacious seating with powered outlets and Wi-Fi, and worktables and task lighting are some of the amenities customers can expect.

Effect Categories	Description of Effects
Accessibility	***Investments included in the State Rail Plan will make 100 percent of stations and 100 percent of the rail fleet fully accessible by 2035. That includes 9 stations that will be made fully accessible.***
Improved Connectivity	An expanded rail fleet will enable new express services from every rail line to NYC including new direct service to Penn Station. New service patterns will also provide improved connections between Bridgeport, Stamford, New Haven, and Hartford. ***There will be 22 additional westbound trains between New Haven and Stamford, 11 additional westbound trains between Hartford and Bridgeport, 8 additional westbound trains between Old Saybrook and New Haven, 16 additional westbound trains between Bridgeport and Stamford***.
Safety	Reducing VMT and diverting trips from automobiles means fewer preventable deaths as ***rail travel saw 1 passenger fatality nationally in 2019 as compared to 36,800 motor vehicle fatalities***. The safety of the rail system itself will also be improved through upgrades like Amtrak's grade crossing elimination program. [c]
Environmental Benefits	New, additional ridership on commuter and intercity rail services means 906,100 fewer average weekday VMT (288,070,800 fewer annual VMT) in 2035. This reduction in VMT means a reduction in C02 emissions as car travel emits 0.96 pounds of CO2 per passenger-mile compared to 0.33 pounds for commuter rail. [d]

[a] Trains are defined as daily westbound trains.
[b] Annual trips are defined as "annual one-way person trips"; daily trips are defined as "average weekday one-way person trips". Pre-COVID is defined as a baselined base year using ridership counts from 2016, 2018, and 2019. Additional trips beyond the baseline growth are determined by comparing Service Plan #4 2035 trip numbers with 2035 Baseline (no-build scenario) trip numbers.
[c] Turbli, "The Safest Transportation Modes, Ranked by Statistics from 10 Years of Data," January 10, 2022, Accessed on 06/20/2022, https://turbli.com/blog/the-safest-transport-modes-ranked-by-statistics-from-10-years-of-data/
[d] USDOT, Public Transportation's Role in Responding to Climate Change, 2010, Accessed on 06/10/2022 at https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/PublicTransportationsRoleInRespondingToClimateChange2010.pdf

Table 5-2 summarizes the program effects of each project category. The planned projects are expected to achieve multiple benefits (program effects) as outlined in **Table 2-1**.

Table 5-2. Passenger Rail Program Effects by Project

Project	Travel Time Savings	Improved Reliability	Increased Service	Increased Capacity	Customer Experience	Accessibility	Improved Connectivity	Safety	Environmental Benefits
New Haven Line									
TIME-1 - 5[a]	X	X	X	X			X	X	
Walk Bridge Replacement		X		X				X	
Walk Bridge Supporting Program		X						X	
Devon Bridge		X						X	
Saugatuck Bridge Interim Repairs		X						X	
Cos Cob Bridge		X						X	
New Haven Line Bridge Program	X	X							
New Haven Line Signals & Comms	X				X				
New Haven Line Stations					X	X		X	
New Haven Line Stations - Stamford					X	X		X	
New Haven Line Track & Speed	X	X		X					
New Haven Line Traction Power		X							
New Haven Line Shops & Yards			X	X					
New Haven Yard Master Program			X	X					
Waterbury Branch Line									
Waterbury Branch Line Improvements		X	X	X	X	X	X	X	
Danbury Branch Line									
Danbury Branch Line Improvements	X	X			X	X		X	
Hartford Line									
Hartford Line Improvements			X			X	X		
Shore Line East									
Shore Line East Improvements		X			X	X	X		

Project	Travel Time Savings	Improved Reliability	Increased Service	Increased Capacity	Customer Experience	Accessibility	Improved Connectivity	Safety	Environmental Benefits
Systemwide									
Statewide		X			X				
Related Projects (Amtrak)	X	X		X				X	
Vision 2050	X		X	X			X		X
Planning Studies			X	X					
CT*rail* Fleet		X	X	X	X				
Metro-North Railroad Fleet		X	X		X				

[a] *For a full description of the TIME-series programs, see Chapter 4.*

Table 5-3 presents the costs for passenger rail including previously funded projects, projects funded in the 2022-2026 Capital Plan, and funding beyond 2026. Short-range projects are expected to occur over the first five years of the program (2022 to 2026). Long-range and Vision projects are expected to occur after 2026. The total cost of passenger rail projects is $12.6 billion.[37] Short-range projects comprise approximately 46 percent of the total budget. At this time, no funding has been allocated for the Walk Bridge Supporting Program, Vision 2050 projects, and Planning Studies. Implementing short-range projects will generate all types of benefits presented in **Table 2-1**. See **Appendix E** for a complete list of passenger rail projects.

Table 5-3. Passenger Rail Project Costs by Project (in millions of 2022$)

Project	Previously Funded	Funded in 2022-2026 Capital Plan	Funding Beyond 2026	Total Budget
New Haven Line				
TIME 1-5	$0	$319.40	$1,682.00	$1,682.00
Walk Bridge Replacement	$0	$795.50	$204.50	$1,000.00
Walk Bridge Supporting Program	$0	$0		$0
Devon Bridge	$0	$15.00	$2,085.00	$2,100.00
Saugatuck Bridge Interim Repairs	$0	$0	$26.50	$26.50

[37] Only projects with estimated costs or identified funding are presented in the table.

Project	Previously Funded	Funded in 2022-2026 Capital Plan	Funding Beyond 2026	Total Budget
Cos Cob Bridge	$0	$0	$1,213.80	$1,213.80
New Haven Line Bridge Program	$0	$166.10	$11.00	$177.10
New Haven Line Signals & Comms	$23.40	$55.00	$247.10	$325.50
New Haven Line Stations	$48.50	$326.90	$34.60	$410.00
New Haven Line Stations - Stamford	$0	$14.00	$91.30	$105.30
New Haven Line Track & Speed	$0	$123.70	$48.70	$172.40
New Haven Line Traction Power	$0	$152.00		$152.00
New Haven Line Shops & Yards	$0	$168.80		$168.80
New Haven Yard Master Program	$0	$221.30	$908.80	$1,130.00
Waterbury Branch Line				
Waterbury Branch Line Improvements	$14.80	$105.50		$120.30
Danbury Branch Line				
Danbury Branch Line Improvements	$0	$12.50		$12.50
Hartford Line				
Hartford Line Improvements	$0	$567.20	$353.60	$928.60
Shore Line East				
Shore Line East Improvements	$0	$5.00	$137.20	$142.20
Systemwide				
Statewide	$190.90	$21.50		$212.40
Related Projects (Amtrak)	$0	$0	$1,263.40	$1,263.40
Vision 2050	$0	$0		$0
Planning Studies	$0	$0		$0
CT*rail* Fleet	$660.00	$280.00		$940.00
Metro-North Railroad Fleet	$90.00	$0	$250.00	$340.00
Total	**$1,027.50**	**$3,349.20**	**$8,238.20**	**$12,622.70**

Table 5-4 displays the regional balance of the passenger rail projects by program effect for each passenger rail line. The passenger rail system in Connecticut provides services connecting major population centers within the state including Danbury, Waterbury, New London, Hartford, New Haven, Bridgeport, and Stamford as well as intra-state. CT*rail* has drafted a High-Speed Rail Vision plan which

includes projects that improve travel times along the New York-Rhode Island-Massachusetts corridor.[38] The planned projects are expected to achieve all of the program effects outlined in **Table 2-1**.

Table 5-4. Regional Distribution of Benefits by Passenger Rail Line

Program Effect	New Haven Line	Danbury Branch Line	Waterbury Branch Line	Hartford Line	Shore Line East	System-wide
Travel Time Savings	X	X				X
Improved Reliability	X	X	X	X	X	X
Increased Service	X		X	X		X
Increased Capacity	X		X			X
Customer Experience	X	X	X		X	X
Accessibility	X	X	X	X	X	
Improved Connectivity	X		X	X	X	X
Safety	X	X	X	X		X
Environmental Benefits						X

5.4.2 Freight Program

A summary of freight projects, by operator, exists in Chapter 4 and **Appendix F**. The majority of the projects presented pertain to the short lines. Project types were assigned based on the primary purpose of the project for each short line. The typical benefits associated with the project types are described in detail below and summarized in **Table 5-5**. For freight projects, the five project types are:

- **Safety**: Safety benefits are generated from projects that construct or improve protective devices such as ties and ballast, cameras and fencing, and warning signals. These projects aim to reduce injuries, fatalities, and property damage along freight railroads in Connecticut.
- **Control Systems**: Freight rail control system project descriptions and the benefits associated with this project type are similar to those of passenger rail projects, as described in the Passenger Program section.
- **Track and Bridges**: Freight rail track and bridge project descriptions and the benefits associated with this project type are similar to those of passenger rail projects, as described in the Passenger Program section.
- **Facilities and Equipment**: In addition to the purchases of new equipment (described in the Passenger Program section), freight rail facilities and equipment projects also include the construction and improvement of freight facilities such as operations centers and rail yards for the efficient movement of goods.
- **Studies**: Analyses that help inform strategic decisions in transportation investments, such as feasibility studies and grant applications.

Similar to the benefits that the passenger rail program generates, the freight rail program also provides Connecticut's transportation system with public and private benefits to users and non-users. As rail is a

[38] 2050 High Speed Rail Vision, CT*rail*.

more fuel efficient, economical, and safer mode for transporting goods, freight rail users realize the economic, environmental, and safety benefits by diverting shipments from trucking and potentially air and maritime modes. On average, one rail car can take three to four trucks off the road, freeing up highway capacity, allowing non-users to benefit from the modal diversion through reduced highway congestion, highway maintenance costs, and emissions.

The freight rail program effects are summarized in **Table 5-5**, based on each project type. The most common projects entail new track or other facility and system improvements that improve integration and operations, leading to benefits in congestion reduction, safety, and greater access for shippers and employment in the state, further supporting Connecticut's economy.

Table 5-5. Freight Rail Program Effects by Project Type

Program Effect	Project Type				
	Safety	Control Systems	Track and Bridges	Facilities and Equipment	Studies
The State's Transportation System	X	X	X	X	X
Public and Private Benefits	X	X	X	X	
Rail Capacity and Congestion		X	X	X	
Transportation System Capacity, Congestion, Safety, and Resiliency	X	X	X	X	
Local Transit, Highway, Aviation, and Marine Modes	X	X	X	X	
Environmental, Economic, and Employment Impacts	X	X	X	X	X

In total, there are 137 freight rail projects with a total cost of $534.6 million. **Table 5-6** presents the costs of freight rail short-, long-range, and vision projects for each project type. Short-range projects comprise approximately 42 percent of the total project costs. These projects primarily include stabilizing soft roadbed, rehabilitating and replacing sidings, spurs, switches, ties, track, purchasing new freight cars and maintenance vehicles, and improving security devices, signals, and communications systems at grade crossings, spanning all types of benefits outlined in **Table 5-5**.

Table 5-6. Freight Rail Short-Range, Long-Range, and Vision Project Costs by Project Type

Project Type Total Cost (2021$M)	Short-Range (2022-2025)	Long-Range (2026-2035)	Vision (2036-2050)
Safety	$13.5	$2.5	$2.7
Control Systems	$20.3	$9.6	$3.2
Track and Bridges	$179.7	$170.6	$110.8
Facilities and Equipment	$8.4	$7.1	$1.6
Studies	$0.9	$0.0	$3.9
Total (Approximate)	$222.8	$189.7	$122.1

The planned freight rail projects were provided by Branford Steam (BRFD), Central New England Railroad (CNZR), Housatonic Railroad Company (HRRC), Naugatuck Railroad Company (NAUG), Pan Am Southern Railroad (PAS) [now CSX], Connecticut Southern Railroad (CSOR), New England Central Railroad (NECR), Providence and Worcester Railroad (P&W), and Valley Railroad (VRR), benefiting freight corridors in west, south, and central Connecticut and serving population and economic development centers such as New Milford, Waterbury, Hartford and New Haven. **Table 5-7** displays the project types associated with each railroad and the regional balance of benefits associated with the project types. These projects are expected to achieve the types of benefits (program effects) outlined in **Table 5-5**.

Table 5-7. Regional Distribution of Benefits by Freight Rail Line

Railroad	Project Type				
	Safety	Control Systems	Track and Bridges	Facilities and Equipment	Studies
Branford Steam			X	X	
Central New England Railroad	X	X	X	X	X
Housatonic Railroad Company	X	X	X	X	
Naugatuck Railroad Company			X		
Pan Am Southern Railroad		X	X	X	
Connecticut Southern Railroad	X		X	X	X
New England Central Railroad		X	X		X
Providence and Worcester Railroad	X		X	X	
Valley Railroad (VRR)		X	X	X	

5.5 Passenger Element

This section describes the capital and operating financing plans for the passenger rail program. More detailed information on project costs, funding sources and potential partners is provided for short-range projects, and information is summarized for long-range projects. The full list of projects can be found in **Appendix E**.

5.5.1 Passenger Rail Project Summary

This section summarizes the passenger rail capital projects for the State Rail Plan. The plan consists of 28 project groups that have sub-projects organized as either short-range (2022 to 2026) or long-range (2027 to 2035) projects. Vision projects, which are expected to improve the Connecticut rail network's service, infrastructure, and fleet for a high-speed rail all-electric rail network, are planned to be implemented between 2036 and 2050, with project costs to be determined. The total known estimate for the passenger rail projects is approximately $8.0 billion, as shown in **Table 5-3**. Total funding allocated to projects that are planned to occur from 2022 to 2026 amounts to approximately $3.3 billion.

5.5.2 Capital Financing Plan

The passenger rail projects and programs listed in Chapter 3 were evaluated for their potential ridership, revenue, expenses, and how well they meet the CTDOT goals and vision.

Short-Range Capital Financing Plan

In the recently concluded FY21, the Department programmed approximately $1.9 billion for all transportation modes – road and bridge, railroad and bus and other public transit – in the Capital Program. The methodology for developing the Capital Program is described in Section 5.8.1. This included $593 million for bus and rail and $1.25 billion toward the State's highway and bridge infrastructure. There was also roughly $55.1 million assigned for facilities.

The Department anticipates utilizing approximately $2.25 billion in total Capital Program funding for all transportation modes in FY22. The robust program in 2022 reflects the fact that several large transportation initiatives are planned for release to construction. The 2022 capital program includes approximately $844 million for bus and rail, $1.36 billion toward the State's highway and bridge infrastructure, and $49 million in support of the Facilities Program.

Table 5-8 summarizes the funding sources of the short-range projects in 2022 dollars. Cost estimates for near term projects, where scopes and estimates are more refined, are estimated in year of expenditure dollars (YOE$) dollars. For long-term projects, scopes and estimates will continue to be refined over time. Generally, projects programmed in outer years have been escalated to the midpoint of construction.

Table 5-8. Funding Sources for Short-Range Passenger Rail Capital Projects (in millions 2022$)

Core Funding Sources	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
State funding	$248.1	$270.8	$270.8	$270.8	$270.8
Federal funding	$376.4	$254.5	$260.7	$278.1	$272.0
Total	**$624.5**	**$525.3**	**$531.5**	**$548.9**	**$542.8**

Note: The Connecticut public transportation program funding includes both bus and rail projects. Approximately 70 - 80 percent of the total program funding is attributable to rail.

Long-Range Capital Financing Plan

Like the short-range capital costs, long-range capital costs for passenger rail projects in Connecticut is expected to be funded through a mixture of state funds, Federal funding, and assistance from partners like Amtrak and MTA/Metro-North Railroad. The capital needs over the long-range (beyond 2026) total $4.3 billion in 2022 dollars, or approximately $6.4 billion in YOE dollars.[39] Funding for projects in the long-range will be consistent with the next Long Range Transportation Plan.

Capital Financing Programs

The Capital Program is funded with a mix of state and federal funding. Historically, Federal monies accounted for seventy to eighty percent (70-80 percent) of the Department's capital program. However, this has changed in recent years with an influx of state bond funding for programs.

These additional state investments have increased the State's participation percentage to approximately fifty to sixty percent (50-60 percent) of the total Capital Program funding, depending on the year.

Available Capital Program funding includes any carry forward balances, or funds made available in a previous year but not yet committed to a specific project. It is common for funding to be made available for use on specific projects that may take multiple years to construct, or for the procurement of items

[39] Escalated to 2035 using 3 percent inflation annually.

such as rail cars or busses that may take several years to be delivered. Available Capital Program funding can also include funds released from completed projects, which become available to re-use.

Special Tax Obligation Bonding Process

The process begins when the State Legislature passes bond Authorizations that allow the CTDOT to utilize bond funds for transportation purposes. Before the CTDOT can utilize the bond funds, the State Bond Commission (SBC) must Allocate the funds at one of its monthly meetings. After the SBC has approved the allocation of funds, the CTDOT can request the funds be Allotted to a specific project, through the submission of an allotment request to the Office of Policy and Management (OPM). Once OPM has approved the allotment request and forwarded it to the Office of the State Comptroller, where it is posted in CORE-CT, the funds are available for expenditure on the project.

It is the CTDOT's practice to ensure that Authorization, Allocation and Allotment of sufficient funds for each project occurs prior to advertising and awarding the construction contract. This is accomplished by establishing the budget before work commences. The process can result in the appearance that money is not being spent since the actual draw-down of funds will not occur immediately, but rather as the work is completed and accepted.

However, the CTDOT is always financially ready to reimburse valid contract expenses. Undertaking large capital projects such as the installation of a new rail interlocking and reconstruction in Norwalk at $250 million is just one example of many on-going multi-year projects. Similarly, the purchase of high value rail cars and buses are budgeted upfront, have small payments when the order is placed and larger payments during production, delivery, and acceptance.

The sale of bonds by the Office of the Treasurer does not occur until the money is required to pay project costs. The amount of bonds sold for the Capital Program is based on the estimated cash flow requirements of current projects, not on the amount of bond authorizations or bond allocations. Annually, the Office of the State Treasurer has typically issued $850 million of STO Infrastructure bonds. Bonds are sold to investors and bond proceeds are used to pay for project costs. The cost to the State (the taxpayer) occurs as the State makes principal and interest payments on the bonds that were sold. Bonds sold are typically 20-year bonds, which means that 1/20th of the cost is paid back the first year after the bonds are sold, 1/20th the second year, and so on, for 20 years. The funding required to make the payments is called debt service, which is paid for with revenue from the Special Transportation Fund (STF). The STF is funded with state gas taxes, motor vehicle license, registration and other fees, and a portion of the motor vehicle sales tax. As vehicles are becoming increasingly more fuel efficient and electrifying, gas tax revenues are anticipated to decrease, emphasizing the need for new or altered revenue streams to support an increasing demand for transportation funding. It is important to note that the issuance of bonds and associated debt service is administered by the Office of the Treasurer.

Special Transportation Fund

The STF is a dedicated fund used for transportation purposes. The primary purpose of the fund is to support the financing of state highway and public transportation improvements, as well as the ongoing operations of the CTDOT and the Department of Motor Vehicles (DMV). For several years annual STF expenditures (operating plus capital) have exceeded the annual STF revenues; therefore, the STF had been realizing a net annual deficit. Recently, the STF has realized an increase in revenues due to higher than anticipated sales tax and oil company receipts and a decrease in expenditures due to temporary Federal support for transportation operations.

Role of Federal Formula Funds

While state funding has taken on a more prominent role in recent years, Federal funds still play a critical role in transportation funding for Connecticut. CTDOT has four major sources of Federal funding, all of which fall under the umbrella of USDOT: FHWA, FTA, FRA, and NHTSA.

The CTDOT prepares a Statewide Transportation Improvement Program (STIP) in collaboration with stakeholders. The STIP lists all proposed highway and public transit projects to be undertaken utilizing FHWA and FTA funding.

The Capital Plan assumes a federal funding level of approximately $1.0 billion. This includes anticipated FHWA, FTA, and NHTSA funding. Total new Federal funding received for FY 2021 was $811 million. In 2022, Connecticut secured approximately $85.2 million in FRA funding for NEC improvements.

Competitive and Discretionary Grants

Federal earmarks and discretionary program funding have both played a significant role in the past for the CTDOT's Capital Program. Examples include highway funding for the Intercity and High-Speed Rail funding for the Hartford Line, FRA's State of Good Repair Partnership Grant Program supporting the WALK Moveable Bridge Replacement; FRA's CRISI Program supporting the construction of the Windsor Locks Station on the Hartford Line, as well as FTA's Low or No Emissions Program supporting the purchase of electric buses.

The federal Bipartisan Infrastructure Law continues and expands the role of discretionary and competitive grant programs. State and local governments can look forward to many new and expanded competitive grant programs. Programs specific to the Connecticut passenger rail program include:

- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grants** ($15B, expanded): RAISE grants support surface transportation projects of local and/or regional significance.
- **Capital Investment Grants (CIG) Program** ($23B, expanded): The Bipartisan Infrastructure Law guarantees $8B, and authorizes $15B more in future appropriations, to invest in new high-capacity transit projects.
- **MEGA Projects** ($15B, new): This new National Infrastructure Project Assistance grant program supports multi-modal, multi-jurisdictional projects of national or regional significance.
- **FTA All Station Accessibility Program** ($1.75B, new): This competitive grant program provides funding to legacy transit and commuter rail authorities to upgrade existing stations to meet or exceed accessibility standards under the Americans with Disabilities Act.
- **Railroad Crossing Elimination Grant Program.** This provides funding for highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods.

As a result of the NEC Commission efforts over the past 15 years, an ambitious reinvestment program in the corridor is on the horizon. Additional federal funds through the Federal Railroad Administration are expected in the coming years. The state governments of the Northeast, the federal government, eight commuter rail agencies, and Amtrak worked together through the NEC Commission to develop a detailed and efficient sequencing of infrastructure investment covering 150 projects along the corridor.[40]

[40] Many of these projects are listed in Chapter 4.

Management of FTA Funding

The FTA is the primary Federal funding source for the CTDOT's Public Transportation Infrastructure program. Annual funding from FTA exceeds $250 million and has five annual program apportionments. The strategic management and utilization of FTA funds, paying close attention to funding eligibility requirements, is critical to the Public Transportation Capital Program.

FTA requirements and procedures for the management of all FTA grant programs are governed by FTA's Master Agreement. This is the official FTA document containing Federal requirements applicable to the FTA recipient and the administration of FTA grants. The Master Agreement is incorporated by reference and is made part of each FTA grant.

The CTDOT is the designated recipient for all FTA programs and is responsible for service and planning decisions for rail, fixed-route bus, and complementary paratransit service in the urbanized areas of the State.

For most regular formula funds authorized, FTA allows four years for funds to be obligated so the funding may be carried forward. This allows for larger projects to be financed with two or more years of apportionment. Additionally, as the designated recipient, the CTDOT programs and plans the formula funding from Section 5307 (the largest FTA source of funds) and creates a funding pool from which capital projects in regions around the State are funded.

CTDOT does not utilize a formula to reallocate Section 5307 formula funds to the operators, rather the funding pool allows for a cooperative, non-discriminatory allocation of funds to different regions based on annual needs. The disbursement of these funds is approved by the MPOs in the Statewide Transportation Improvement Program (STIP). Sub-area split agreements that reflect the annual disbursement of funds by region are created by the CTDOT and executed by the operators from each region. This program allows local transit operators to fund major projects for which they may otherwise have never accumulated adequate funds.

FTA requires the recipients of Federal funds to develop a finance plan to complete large projects. To achieve this, the CTDOT uses a Federal financial tool called Pre-Award Authority, particularly for large multi-year programs, providing for a phased approach to project funding. This mechanism allows the state to request and receive approval to construct a Federal-aid project in advance of the availability of authorized Federal funds.

The sources of revenue described in this section are largely public funding sources. In some cases, these resources can be leveraged through public financing to accelerate the expenditure of funds, and there are other sources of public financing available to enhance the leverage of any available stream of reliable funding. The two primary programs are TIFIA and RRIF, which are available tools for CTDOT and Amtrak to finance project needs. For some major projects, there is also the possibility of private sources of financing under P3s which are often repaid over the life of the asset.

5.5.3 Operating Financing Plan

The passenger rail projects outlined in prior sections were identified by CTDOT and Amtrak as having a high likelihood of funding through a combination of Federal, state, and local sources. In Connecticut, state sources currently provide most of this capital and operating funding. In addition to funding the capital projects, ongoing operating funding is needed to offer the services to the state's residents and visitors. This section describes the operators' estimated funding over the short- and long-range.

There are three operators within the state along numerous intercity and commuter rail lines. The operators include CTDOT, Amtrak, and New York MTA. CTDOT funds the operations of CT*rail* services and

provides support with Amtrak and Metro-North Railroad for services in the state. The lines, owners, operators, and route miles are shown in **Table 5-9**.

Table 5-9. Passenger Rail in Connecticut

Passenger Rail	Rail Infrastructure Owner	Service Operator	Route Miles
New Haven Line and Branches	CTDOT	Metro-North Railroad	105
Shore Line East	Amtrak (CT owns cars)	CT*rail* (Amtrak)	67
Hartford Line	CTDOT leases/owns cars	CT*rail* (Transit America Services, Inc.)	62
		Total	**234**

Source: CT 2020 Fast Facts

Amtrak is responsible for maintenance of the Hartford Line railroad infrastructure, including track signals, train dispatching, and security. CTDOT owns the New Haven Line Main Line track from the New York state border to New Haven, the branch line tracks, maintenance facilities, most stations, and over 60 percent of the equipment. Under the operating agreement, Metro-North Railroad maintains the right-of-way, maintenance facilities, and the equipment. The CTDOT uses a combination of state, FTA, and FRA funds to upgrade the right-of-way, build and rehabilitate the maintenance facilities, and purchase the equipment. On the New Haven Line, the state and MTA/Metro-North Railroad divide the operating subsidy. Connecticut's share is 65 percent and New York's share is 35 percent on the New Haven Main line and Connecticut is responsible for 100 percent of the subsidy on the branch lines, in accordance with the New Haven Line Service Agreement. On Shore Line East, the state is responsible for 100 percent of the deficit.

Amtrak NEC service covers a major share of its costs. CTDOT, however, is the primary supporter of the New Haven Line, Shore Line East, and Hartford Lines. CTDOT sets the fares and service levels on the New Haven Line branch lines and participates in setting the service levels on the main line. Amtrak sets the fares and service levels on Amtrak's NEC intercity service routes.

The New Haven Line has been supported by fares and subsidies from the state and MTA. Similarly, Shore Line East has been supported by fares and CTDOT subsidies. The newly operating Hartford Line is supported by fares, CMAQ funds, and state subsidies. Pre-COVID operational funding for the state-supported lines for FY 2017 to FY 2021 are shown in **Table 5-10**.

Table 5-10. Historical CT*rail* Operating Funding (FY 2017-FY 2021 in $M)

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
New Haven Line					
Fares and Other Revenues	$349.3	$356.2	$361.0	$268.0	$77.7
State subsidy	$117.6	$130.0	$114.6	$135.1	$86.0
Federal Relief Funding	$0.0	$0.0	$0.0	$69.8	$212.1
MTA Subsidy	$40.9	$47.2	$40.9	$71.0	$120.3
Shore Line East					
Fares and Other Revenues	$2.5	$2.3	$1.9	$1.4	$0.2
State subsidy	$26.1	$31.7	$32.9	$27.8	$23.7
Federal Relief Funding	$0.0	$0.0	$0.0	$0.5	$1.7
Hartford Line					
Fares and Other Revenues	$0.0	$0.0	$1.6	$1.5	$0.7
State subsidy	$0.0	$0.0	$8.7	$7.3	$10.1
Federal CMAQ Funding	$0.0	$0.0	$19.8	$18.4	$15.6
Total	$536.4	$567.3	$581.3	$600.7	$548.2

Source: CTDOT

Short-Range Operating Financing Plan

Amtrak's operating budget is funded through a mix of passenger-related revenue, commercial revenue, and contractual contributions. Passenger-related revenue includes tickets, charter/special trains, and food and beverage. Contractual contributions include PRIIA 209 operating payments, PRIIA 212 operating payments, commuter operations, reimbursable contracts, and access revenue. Commercial revenue sources include real estate and parking. A small portion of operating costs may also be covered by other sources such as insurance revenue and co-branded revenues. The Amtrak short-range revenues for Connecticut's state supported services are shown in **Table 5-11**.

Table 5-11. Amtrak Operating Funding for Connecticut-Supported Lines (FY 2022-FY 2025 in $M)

	FY 2022	FY 2023	FY 2024	FY 2025	Total
Passenger-Related Revenues	$7.1	$7.3	$7.5	$7.8	$29.8
Contractual Contribution (state operating deficit)	$6.1	$6.5	$7.1	$7.6	$27.3
Commercial Revenue	$0.0	$0.0	$0.0	$0.0	$0.0
All Other Revenue	$0.3	$0.3	$0.3	$0.3	$1.3
Cost allocations to CT before Revenue*	$13.5	$14.2	$14.9	$15.7	$58.3

Source: Note the Contractual Contribution is the State Operating Deficit; May '22 results used for June '22; Does not Include Federal relief received from ARPA $3,073,755.72, Does not include Federal relief received from CRRSA $3,073,755.72; About $485,090 and $300,000 are left dedicated to Vermonter costs (need to be applied to Amtrak Equipment Capital due to route profitability); Assumes current service; Revenue increase 3 percent by year; Cost Deficit increase 8 percent by year; This does not include Amtrak Equipment Capital

** After MassDOT fixed payment on New Haven – Hartford – Springfield Line.*

CTDOT funds rail through fares, state subsidies, and Federal funding. **Table 5-12** shows the anticipated funding sources for the New Haven Line, Shore Line East, and Hartford Line services for 2022-2026.

Table 5-12. CT*rail* Operating Funding (FY 2022-FY 2026 in $Millions)

	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026
New Haven Line					
Fares and Other Revenues	$176.0	$217.2	$247.2	$259.3	$259.4
State subsidy	$113.5	$161.5	$156.8	$158.4	$171.7
Federal Relief Funding	$138.4	$110.1	$91.2	$88.9	$88.8
MTA Subsidy	$113.5	$124.8	$112.7	$112.0	$118.4
Shore Line East*					
Fares and Other Revenues	$0.5	$0.5	$0.5	$0.5	$0.6
State subsidy	$27.5	$32.5	$33.5	$34.5	$35.4
Federal Relief Funding	$1.1	$1.1	$1.1	$1.1	$1.0
Hartford Line*					
Fares and Other Revenues	$1.7	$1.7	$1.8	$1.9	$2.0
State subsidy	$27.1	$38.4	$41.0	$43.0	$45.0
Federal CMAQ Funding	$0.9	$2.1	$1.2	$0.3	$0.0
Total	**$600.2**	**$689.9**	**$687.0**	**$699.9**	**$722.3**

Note: CTDOT; Shore Line East and Hartford Line assumes 8 percent annual escalation from FY 2021 funding

Long-Range Operating Financing Plan

Like short-term operations, long-range operations of passenger rail in Connecticut is expected to be funded through a mixture of railroad operating revenues such as ticket sales, state funds, Federal funding and grants, and assistance from partners like Amtrak and MTA/Metro-North Railroad. The operating needs over the long-range (beyond 2025) total $3.8 billion in 2022 dollars, or approximately $7.5 billion in YOE dollars.

5.5.4 Public/Private Economic Benefits

Projects in the short-range passenger rail program focus on enhancements and increased access to existing passenger rail service corridors. These improvements are anticipated to result in further mobility, transportation capacity, congestion relief, environmental, and economic benefits along these corridors. In the long-range, major investments in these corridors will contribute to even greater benefits in the state's core population areas, while new services introduced will provide multimodal access, mobility, and economic development opportunities to Connecticut. Individual project and corridor level benefits in the short-range and long-range are further described in Section 5.4.

5.6 Freight Element

This section describes the capital financing plan for the freight rail program. More detailed information on project costs, funding sources and potential partners is provided for short-range projects and information is summarized for long-range projects. The full list of projects can be found in **Appendix F**.

5.6.1 Financing Plan

Investment in the freight rail network would yield significant benefits for the Connecticut economy, as well as the nation at large. The planned short-range, long-range and vision freight rail projects have a total cost of $527.9 million. The following sections present a strategy for financing the planned freight rail projects.

Capital Financing Plan

Connecticut's freight railroad network is privately owned, maintained, and operated with freight lines paying for all operating expenses and most of their capital expenses through their own revenues. In general, for Class I railroads, public funding or financing helps to support capital projects in instances where the public sector seeks to provide an incentive for railroads to provide or improve services beyond what would have otherwise been possible. Class II and Class III railroads in contrast rely more heavily on public funding and financing for capital investments.

The total estimated financial need for the short-range projects is $222.8 million (in 2021 dollars).[41] This amount comprises 6.4 percent ($14.2 million) Class II projects and 93.6 percent ($208.6 million) Class III projects. There are no short-range freight rail needs identified by Class I operators. **Table 5-13** shows a summary of the costs for the short-range freight rail capital needs by project type and railroad class. A significant proportion of the short-range needs is categorized as Track and Bridges, which generate all types of benefits shown in **Table 5-5**.

[41] Freight owners and operators were asked for their project costs in 2021 dollars.

Table 5-13. Short-Range Freight Rail Projects by Project Type and Railroad Class (in millions of 2021$)

Project Type	Class II	Class III	Total Costs
Safety	$2.5	$11.0	$13.5
Control Systems	$0.0	$20.3	$20.3
Track and Bridges	$10.4	$169.4	$179.7
Facilities and Equipment	$1.3	$7.1	$8.4
Studies	$0.0	$0.9	$0.9
Total	**$14.2**	**$208.6**	**$222.8**
Percentage of Total Costs	**6.4%**	**93.6%**	**100%**

Source: Various freight operators

The total estimated financial need for the long-range and vision projects is $311.8 million (in 2021 dollars). This amount comprises 36.4 percent ($113.4 million) Class II projects and 63.6 percent ($198.4 million) Class III projects. There are no long-range freight rail needs identified by Class I operators. **Table 5-14** shows a summary of the costs for the long-range and vision freight rail capital needs by project type and railroad class. Like short-range projects, the majority of projects are for Track and Bridges.

Table 5-14. Long-Range and Vision Freight Rail Projects by Project Type and Railroad Class (in millions of 2021$)

Project Type	Class II	Class III	Total Costs
Safety	$5.0	$0.2	$5.2
Control Systems	$3.7	$9.1	$12.7
Track and Bridges	$93.7	$187.6	$281.3
Facilities and Equipment	$8.0	$0.7	$8.7
Studies	$3.1	$0.9	$3.9
Total	**$113.4**	**$198.4**	**$311.8**
Percentage of Total Costs	**36.4%**	**63.6%**	**100%**

Source: Various freight operators

Table 5-15 and **Table 5-16** present the costs of freight rail projects by type in year-of-expenditure dollars (YOE$), using a 3 percent inflation rate. For short-range projects, the total costs were estimated assuming an even distribution of project costs across 2022-2025 and were escalated to each year accordingly. For long-range and vision projects, the total costs were escalated to the mid-point of the respective time periods (2030 for long-range projects, 2043 for vision projects).

The total costs in YOE$ for short-range, long-range, and vision freight rail projects are estimated to be $240.0 million, $247.5 million, and $234.0 million, respectively.

Table 5-15. Short-Range Freight Rail Projects by Project Type and Year (in millions of YOE$)

Project Type	2022	2023	2024	2025	Total Costs
Safety	$3.5	$3.6	$3.7	$3.8	$14.5
Control Systems	$5.2	$5.4	$5.5	$5.7	$21.8
Track and Bridges	$46.3	$47.7	$49.1	$50.6	$193.6
Facilities and Equipment	$2.2	$2.2	$2.3	$2.4	$9.0
Studies	$0.2	$0.2	$0.2	$0.3	$1.0
Total	**$57.4**	**$59.1**	**$60.9**	**$62.7**	**$240.0**
Percentage of Total Costs	**23.9%**	**24.6%**	**25.4%**	**26.1%**	**100%**

**Assumes a 3 percent per year inflation rate*

Table 5-16. Long-Range and Vision Freight Rail Projects by Project Type (in millions of YOE$)

Project Type	Long-Range	Vision	Total Costs
Safety	$3.3	$5.2	$8.4
Control Systems	$12.5	$6.0	$18.5
Track and Bridges	$222.6	$212.2	$434.8
Facilities and Equipment	$9.2	$3.1	$12.3
Studies	$0.0	$7.5	$7.5
Total	**$247.5**	**$234.0**	**$481.5**
Percentage of Total Costs	**51.4%**	**48.6%**	**100.0%**

**Assumes a 3 percent per year inflation rate; assumes long-range projects are constructed in 2030 and Vision projects are constructed in 2043.*

Figure 5-10 and **Figure 5-11** summarize the short-range, long-range, and vision projects by type to show the distribution of capital needs for freight rail across Connecticut. As discussed above, most of the funding will go towards Track and Bridges projects.

Figure 5-11. Distribution of Short-Range Freight Rail Projects

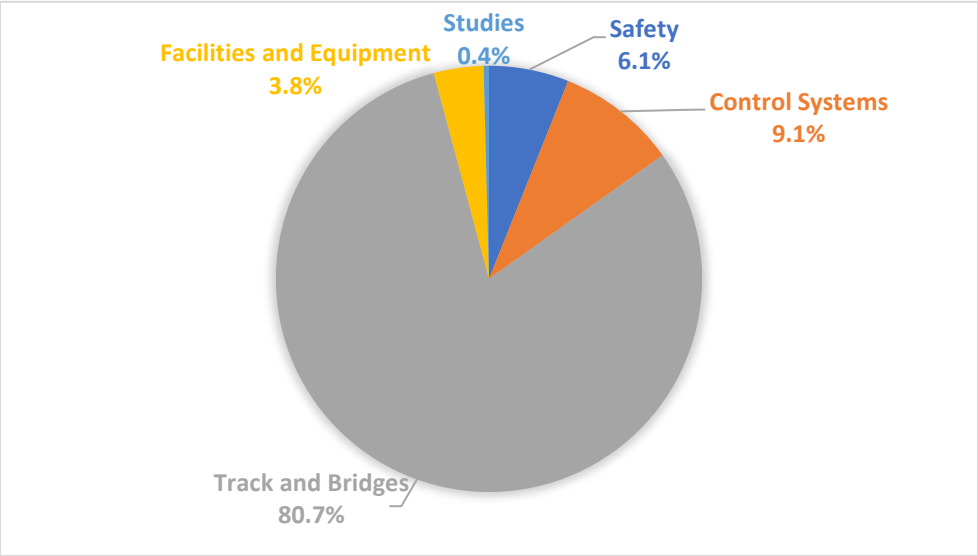
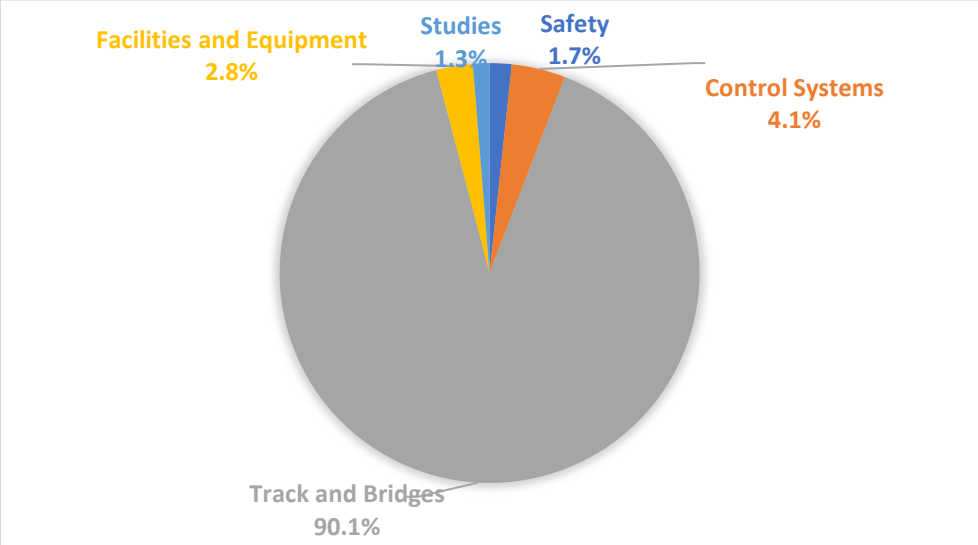


Figure 5-12. Distribution of Long-Range and Vision Rail Projects



Some of the projects listed in the short-range are projects that rely on public funding. Generally, the state's freight railroads finance projects themselves using revenue generated through operations. However, due to direct and indirect benefits of freight rail corridors, as well as shared infrastructure with some public rail operations, public funding may be needed to complement private sources. Furthermore, Class III or short line railroads may not have as much access to private funds as Class I carriers typically do. CTDOT supports freight railroads with the following sources:

- Funds provided through Public Act 15-1,[42] Connecticut's infrastructure improvement program
- STO Bonding process
- Special Transportation Fund[43]

[42] https://www.cga.ct.gov/2015/act/pa/pdf/2015PA-00001-R00SB-01501SS1-PA.pdf
[43] https://portal.ct.gov/-/media/OTT/Doing-Business/Debt-Div-Audit---Accounting-Services---111220/STO-Bond-ProgramState-of-CT-Special-Transportation-Fund-Audited-Financial-Statements-for-June-30-202.pdf

- The Railroad Tax Exemption Program (TEP)[44]
- Rail Freight Infrastructure Program
- Industrial Rail Access Program (IRAP)[45]
- Surplus Rail Material Program
- National Highway Freight Program[46]

Table 5-17 provides an estimate of projected state funding for the short-range projects. These funds are not guaranteed, because some of the freight rail funding programs are competitive. This table is subject to change.

Table 5-17. Available State Funding for Short-Range Freight Rail Projects (in YOE M$)

Funding Source	2022	2023	2024	2025	Total
Railroad Tax Exemption Program	$2.0	$2.1	$2.3	$2.5	$9.0
Rail Freight Infrastructure Program	$10.0	TBD	TBD	TBD	$10.0
Total	**$12.2**	**$2.1**	**$2.3**	**$2.5**	**$19.0**

Source: CTDOT; assumes 8 percent annual escalation

Federal Funding Strategy

Because the demand for funding for freight rail projects in the short- and long-range exceeds the available CTDOT funding, additional sources of funding and/or financing are necessary. This section explores options for Federal funding and financing to support construction of freight rail capital projects.

Federal funding mechanisms may be characterized as (1) funding programs or (2) financing tools. Funding programs target specific types of projects to address freight transportation needs; they include competitive discretionary grant programs. Federal funding through grants generally requires a match from the applicant. Financing tools include options such as loans, credit enhancement, and tax-exempt financing programs. Loans and credit enhancement programs provide a means for public and private resources to be leveraged by states to stimulate capital investment in infrastructure.

Some Federal funding mechanisms are listed below; many programs are new or expanded under the Bipartisan Infrastructure Law. CTDOT and the freight railroads will monitor and assess projects and programs for eligibility and applicability.

- FRA's CRISI Program funds a wide range of eligible rail projects including track, equipment, congestion mitigation, grade crossings, track relocation, and deployment of railroad safety technology. In addition to CTDOT, the state's Class II and III railroads are eligible applicants. For FY 2022 to FY 2026, $1 billion has been appropriated annually.
- The RAISE Grant Program supports surface transportation projects of local and/or regional significance. Over 4 years, $7.5 billion has been appropriated.
- INFRA Grants offer needed aid to freight infrastructure by providing funding to state and local government for projects of regional or national significance.
- The MEGA Program supports multi-modal, multi-jurisdictional projects of national or regional significance. A total of $5 billion is available under the Bipartisan Infrastructure Law.

[44] https://www.cga.ct.gov/current/pub/chap_245.htm#sec_13b-228
[45] From FRA
[46] From FHWA

- The Rural Surface Transportation Grant Program improves and expand surface transportation infrastructure in rural areas, increasing connectivity, improving safety and reliability of the movement of people and freight, and generate regional economic growth.
- The Railroad Crossing Elimination Grant Program through FRA has $3 billion available for highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods.

Financing options include the following programs which are described in more detail in Chapter 2:

- Railroad Rehabilitation and Improvement Financing (RRIF)
- Transportation Infrastructure Finance and Innovation Act (TIFIA)

5.6.2 Public/Private Economic Effects

Projects in the short-range freight rail program focus on state of good repair and upgrades to existing rail corridors. These improvements are anticipated to result in further mobility, transportation capacity, congestion relief, environmental, and economic benefits along these corridors. In the long-range, major investments in these corridors will contribute to even greater benefits to existing customers and rail operators, while new sidings and connections will provide improved access, mobility, and economic development opportunities across Connecticut. Individual project and corridor-level benefits in the short-range and long-range are further described in Section 5.4.

5.7 Rail Studies and Reports

Over the next 4 years, CTDOT anticipates the following rail studies will be completed, as shown in **Table 5-18**. This list is subject to change.

Table 5-18. CTDOT Rail Studies to be Completed in the Next 4 Years

Title	Description	Estimated Total Cost	Anticipated Funding Source(s)	Estimated Completion
Concept-Level Electrification Study for CT Rail System	Study reviewing possibility for electrification on Danbury, Waterbury, and Hartford Lines	$1 million (2022$)	CTDOT	TBD
Eastern Connecticut Corridor Rail and Transit Feasibility Study	Study to evaluate rail extensions of service, new stations, and station connectivity along the Eastern CT shoreline.	$1.9 million (2022$) / $2.0 million (YOE$)	CTDOT	Fall 2023
New Haven Line High Speed Study – Fairfield to Stratford	Study of alternatives to increase speeds up to 150 mph between Fairfield and Stratford	TBD	CTDOT	TBD

Title	Description	Estimated Total Cost	Anticipated Funding Source(s)	Estimated Completion
"CT2030 Rail Strategic Implementation Plan	The CT2030 Strategic Implementation Plan provides CTDOT with a Roadmap for achieving significantly improved travel times on Metro-North Railroad, Amtrak, and/or CT*rail* trains.	$1.9 million (2022$ and YOE$)	CTDOT	Fall 2022
Waterbury Line Master Plan	The Waterbury Branch Line Improvement Plan will provide a strategic transportation plan and identify key projects that are part of the Plan.	$ 1.5 million (2022$ and YOE$)	CTDOT	Fall 2022
TIME FOR CT – 2035 Service and Infrastructure Planning	Planning and analysis and interagency coordination in conjunction with advancing TIME FOR CT	$2.2 million (2022$) / $2.3 million (YOE$)	CTDOT	Summer 2023
New Haven – Providence Capacity Planning Study	Joint study of Amtrak, Massachusetts, Rhode Island, and Connecticut following on the NEC FUTURE EIS to identify alternatives to increase NEC capacity between New Haven – Hartford - Providence	TBD	Federal/State	TBD
Central New England Railroad Feasibility Study	Feasibility Study – Partner with CT DECD to Attract New Rail Freight Shippers	$400,000 (2021$) / $450,000 (YOE$)	Railroad operating revenues, Federal grant, CTDOT	Fall 2025
Central New England Railroad Federal Grant Application	Federal Grant Application Support (FRA, FTA, Etc.)	$500,000 (2021$)/ $600,000 (YOE$)		TBD, various deadlines

5.8 Passenger and Freight Rail Capital Program

The Passenger List of Projects can be found in **Appendix E** and the Freight List of Projects can be found in **Appendix F**.

All short-range passenger rail and freight rail capital projects presented in Section 5.4 through Section 5.6 are shown in the appendices with information on costs and potential funding sources. The passenger projects in the short-range will help increase ridership and revenue with the existing and proposed passenger services, reducing subsidies necessary.

Projects identified in the appendices will be funded through a combination of public and private funds, with freight rail projects mainly funded by the private sector. Public-sector funds will be available through various Federal, state, and local sources, including grants and loans. For all projects, the costs sharing arrangement between CTDOT and its partners will depend upon the funding programs that are in place when these projects are underway, and the funding available in those programs.

5.8.1 Methodology of Prioritization-Transportation Asset Management Plan

CTDOT's capital planning process identifies the major areas for prioritizing and emphasizing investments for all modes of transportation. The points were determined after careful consideration of available resources, and Federal and State mandates and initiatives. The following are the components of this five-point action plan:

- **Preservation**: **Maintain the Existing System in a State-of-Good Repair**. CTDOT has identified preservation and maintenance of the existing system as its highest priority for targeting the limited available resources. CTDOT will invest in maintaining and repairing the transportation system before expanding it or adding new system components.
- **System Modification: Safety & Modernization**. Safety is a major concern for CTDOT. Modification needs identified for improving safety are a high priority when considering the allocation of staff, funding, and equipment. In addition to preserving and maintaining the system to ensure the general safety of the traveling public, CTDOT will continue to consider areas where system modification could significantly improve safety beyond the constraints of the existing infrastructure's limitations.
- **System Productivity: Efficiency**. System productivity refers to maximizing use of the existing system by facilitating travel in and between modes. This is done by applying improved technologies, coordinating the scheduling of maintenance efforts, and providing real-time travel information to the public. The development and application of new technology and improved construction practices, the continued advancement and expansion of Intelligent Transportation Systems (ITS), and the provision of real time information to users of Connecticut's highway system and public transportation services are critical components of CTDOT's plan to address the current and future mobility needs of the State's residents, businesses, and visitors. CTDOT will continue to identify and invest in ways to maximize the use of the existing transportation system. As part of enhancing system productivity, CTDOT is committed to encouraging commuters to use transit and ridesharing options.
- **Economic & Environmental Impact: Quality of Life**. It is critical to the health of the State and its residents that the transportation system has a positive impact on the state's economy, physical environment and, ultimately, quality of life. The availability of multiple options for meeting mobility needs of people and for freight contributes to the development of economically vibrant, sustainable communities that provide residents with the ability to make lifestyle choices that have positive impacts on themselves, others, and their environments. It is essential that CTDOT assists in improving and expanding mobility options throughout the state by considering and addressing the needs of stakeholders such as pedestrians, bicyclists, and users of other non-motorized means of transportation when undertaking projects. CTDOT takes a context sensitive solutions (CSS) approach when undertaking projects to ensure active public participation and implementation of designs that are appropriately scaled to both the community and the need. CTDOT must also facilitate the efficient and cost-effective movement of people and freight within and through the state.

Additionally, CTDOT must ensure the security of the transportation system, as this is directly correlated to community health and economic vitality. Ultimately, it is a responsibility of all State agencies to support efforts of their sister agencies in stimulating the economy and protecting the quality of life of the state's residents; CTDOT is committed to its part in this effort.

- **Strategic Capacity Improvements**. When necessary, CTDOT will pursue strategic capacity improvements to improve the efficiency of the transportation system. When CTDOT evaluates projects in its Public Transportation (PT) -TAMP, an important factor in the decision-making process will be the extent to which a project contributes to providing greater mobility, accessibility, and integration of the various transportation modes. Any improvements to capacity will only be undertaken after seriously considering the availability of funding and resource allocations. Priority will be given to "Fix- it-First" initiatives.

The capital plan is CTDOT's list of planned passenger rail investments and is consistent with the list found in **Appendix E** of this document.

6. Coordination and Review

This chapter discusses coordination and review efforts that CTDOT made with stakeholders and the public.

6.1 Approach to Public and Agency Participation

CTDOT developed the State Rail Plan with input from and in coordination with a variety of stakeholders and the general public. While preparing the State Rail Plan, CTDOT followed the PRIIA legislation requirements, as well as public involvement procedures set forth by CTDOT and Connecticut General Statutes. CTDOT established a multi-phase outreach process beginning with setting up a webpage[47] to store all documents and public meeting links in one location. This made access to information easy for those wishing to stay up-to-date with the State Rail Plan update process. The next step was to schedule and prepare for three kick-off meetings to inform stakeholders and the general public of CTDOT's goal to update the State Rail Plan. CTDOT began seeking public input at the very start of the State Rail Plan update. It was also understood that a second round of outreach would be needed after the draft State Rail Plan was completed to solicit public comment on the plan draft documents. A PowerPoint presentation was developed along with a 3D virtual room, public meeting notices, and freight and passenger outreach documents.

6.1.1 Feedback on Draft Plan

The draft State Rail Plan was posted on CTDOT's website for review and press releases were issued notifying the public of its availability. The first elected officials, state legislators, and other stakeholders were notified of its availability. There was a 45-day comment period and then the Connecticut General Assembly's Transportation Committee and Finance Revenue and Bonding Committee held a joint committee public hearing on the draft State Rail Plan.[48]

6.1.2 Project Website

A 3D virtual room was created to allow access to plan materials such as the timeline of work, accomplishments since the last plan, PowerPoint presentation from the public meetings and information on the state's rail assets and services (**Figure 6-1**). Those that visited the virtual room were able to submit comments and feedback throughout the duration of the 45-day public comment period using a Survey Monkey link provided within the room. The public comment period during the first public outreach phase was from August 31 to October 15, 2021.

[47] The webpage can be accessed at https://portal.ct.gov/DOT/Publictrans/Office-of-Rail/Connecticut-State-Rail-Plan.

[48] This is outside of the traditional CTDOT process as Connecticut General Statutes require CTDOT to provide a copy of the plan to the General Assembly.

Figure 6-1. Connecticut State Rail Plan Virtual Room

Source: CTDOT

6.1.3 Public Meetings

Three virtual public meetings were held on Microsoft Teams and YouTube on August 31, September 2, and September 9, 2021.[49] These meetings were intended for the general public, as well as stakeholders such as the state regional planning agencies (COGs/RPAs), rail operators, neighboring states, and interest groups. The outreach process began by informing the COGs/RPAs of the upcoming virtual public meeting sessions at a monthly COG coordination meeting.

Two of the meetings were held in the evening and one was held in the early afternoon to allow for maximum public participation. The meetings were well-attended, with 99 total attendees (**Table 2-1**).

Table 6-1. Kick-off Meeting Attendance

Date	# of Attendees
August 31, 2021at 6 PM	35
September 2, 2021 at 1 PM	41
September 9, 2021 at 6 PM	23
TOTAL	**99**

Questions and comments were submitted through Teams live chat, email, and phone during each of the meetings and answered during the meetings.

Efforts were made to ensure Title VI requirements were met and that meetings would be translated or captioned for non-English speakers or those with hearing disabilities. Meeting recordings were made available through CTDOT's website.

[49] These meetings were virtual to promote public health and create an environment that allowed people to participate in a safe manner that eliminated the risk of COVID-19 exposure.

The meeting presentation provided an overview of the PRIIA legislation and information on what goes into a rail plan. Participants were encouraged to provide comments and feedback that would be used to inform and help develop the Plan update.

CTDOT explained that the State Rail Plan would be consistent with the Master Transportation Plan, the Long-Range Transportation Plan, Time for CT, and other CTDOT plans and funding documents.

6.2 Coordination with Neighboring States

Planners from CTDOT regularly interact with rail planners in neighboring states. Furthermore, Connecticut is a member of the American Association of State Highway and Transportation Officials' (AASHTO) Council on Rail Transportation, which provides a forum for DOT rail planners to interact, coordinate, and collaborate. The Draft Plan will be shared with DOTs of neighboring states to receive their input on services that cross state lines or may otherwise affect them. Similarly, CTDOT reviewed neighboring states' rail plans to identify where goals aligned.[50]

6.3 Involvement of Key Stakeholders

CTDOT reached out to all the freight railroads operating in the state to confirm details of their current operations, their needs, and their planned projects, as well as the Connecticut Railroad Association (CRA). CTDOT also engaged several passenger rail stakeholders, including Amtrak, Metro-North Railroad, internal CT*rail* staff and rail passenger interest groups. All of this outreach occurred between July 2021 and June 2022.

CTDOT also reviewed the freight and passenger rail service activities and initiatives by regional planning agencies, regional transportation authorities, and municipalities within the state. The Connecticut Commuter Rail Council is a statewide advocacy organization that has a working relationship with CTDOT. They provided a letter proposing passenger improvements and CTDOT worked to include these concepts and ideas into this plan.[51]

While CTDOT developed each chapter, significant input was received from the subject matter experts both within and outside of the agency.

6.4 Issues Raised During Stakeholder/Public Engagement

Stakeholders and members of the public brought up several issues during the kickoff meetings.

6.4.1 General Issues and Comments

There were several topics that were raised multiple times by the public across the kickoff meetings and outreach efforts. These included the following:

- The State Rail Plan should include electrification of the complete passenger rail network in Connecticut.
- Participants recommended expansion of rail services within the State and connecting the western part of the state to Massachusetts and New York City. Attendees also asked if studies were being done to provide more services to get to Boston, MA and Storrs, CT (University of Connecticut main campus).

[50] A summary of these plans is in Chapter 5.
[51] A version of the letter is in Appendix J.

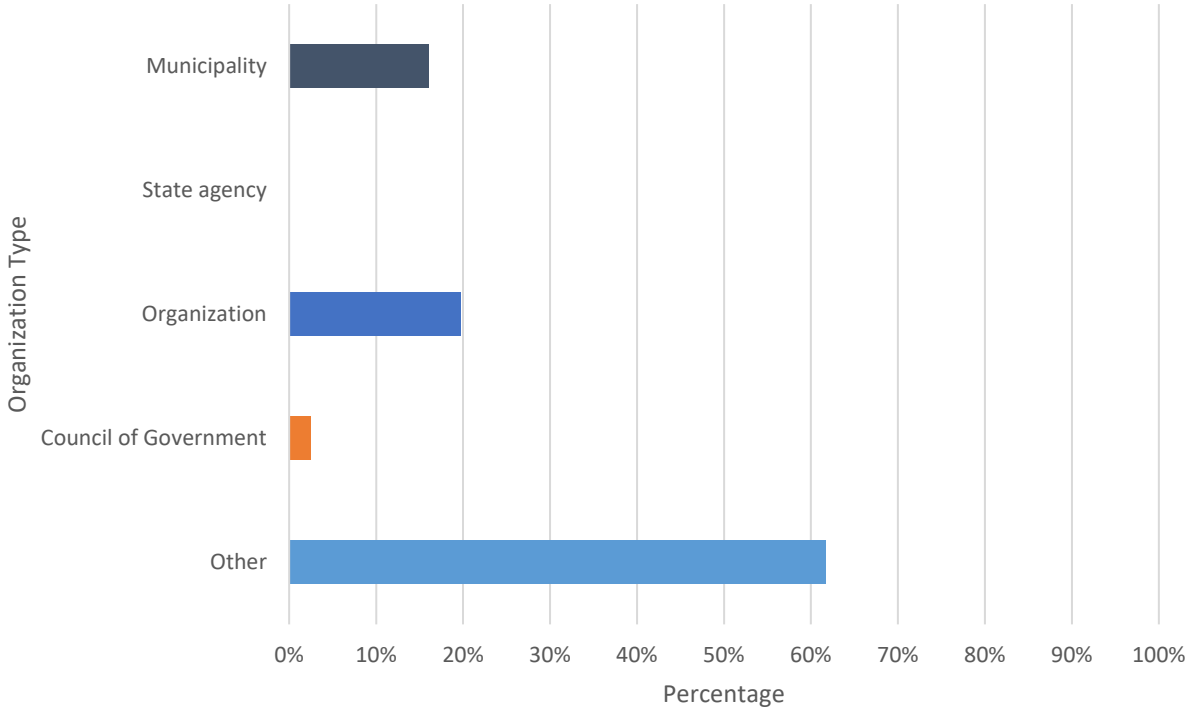
- Questions related to what equipment upgrades, or speed increases that are being considered for the State's rail system.

6.4.2 Kickoff Meeting Survey

During 45-day public comment period, 96 people completed and submitted comments via the survey. There were an additional 20 responses sent through the CTDOT Planning email.

The survey contained four parts. The first survey question asked about the affiliation of the respondent, see **Figure 6-2**.

Figure 6-2. State Rail Plan Kickoff Meeting Attendee Affiliation



Source: CTDOT

While nearly 40 percent of attendees were stakeholders from state agencies, COGs, and local municipalities, the rest of the participants were likely members of the public or other stakeholder groups as they identified in the "Other" category.

The second survey question asked participants how important they think rail is compared to other modes of transportation in the state. This question was set up on a 1-10 scale with 1 being the least and 10 being most important. The responses averaged an 8.5 out of 10, indicating the respondents regard rail as a very important mode of transportation.

The last two parts of the survey allowed participants to write in any concerns, suggestions, or comments about the update to the rail plan. Many entries mirrored questions that were brought up during the kickoff meetings. Respondents indicated that they wanted to see CTDOT focus on sustainable practices, increase connections with neighboring states, and provide equitable services to underserved areas within Connecticut.

6.4.3 Freight Issues and Comments

Outreach to the Connecticut's freight rail operators was carried out in multiple steps. CTDOT staff initially attended a regularly scheduled meeting of the Connecticut Rail Association (representing all of the freight railroad operators in the state) to inform them of the State Rail Plan start-up, purpose of the plan, and that they would be contacted to provide input on their system/operations. As follow-up, the freight operators were sent an inventory survey that asked them to provide data and information about their services as required by FRA guidance. This included company information, commodities, trends in shipments, principal stations, interchange points, route miles owned, and improvement need. In addition, a focus group meeting of several key freight rail operators was held on December 16, 2021 to discuss opportunities for the freight rail operators.

During the engagement for this plan, freight railroads brought up two main issues: acquiring funding generally and addressing congestion points.

Funding

Many freight railroads, particularly regional and short line operators, rely on state and federal grants for funding infrastructure maintenance and improvements. Freight rail operators stressed that a major challenge for freight railroads in Connecticut is securing public funding to maintain railroad infrastructure. Much of the rail operations in the state are on state-owned infrastructure. As such, there is the necessity for public-private-partnership. Freight rail operators expressed that the needs of freight railroads seem to get overshadowed by the state's interest in improving passenger rail and highways. The representatives expressed interest in improving communication with the state regarding securing federal funding.

While this may continue to be the case, the passage of the Bipartisan Infrastructure Law in 2021 means that more funding is now available for freight and passenger rail. The Bipartisan Infrastructure Law devotes an average of $5.55 billion per year over five years to infrastructure grant programs to fund multimodal freight projects to relieve bottlenecks, improve connectivity, and fund projects to connect freight rail to new markets. These projects include public-private partnerships in which railroads will contribute private funding proportionate to the benefits they receive. The Bipartisan Infrastructure Law also includes a $3 billion program dedicated to eliminating or improving the safety of grade crossings, improving the safety and quality of life for the communities in which freight railroads operate. Lastly, the Bipartisan Infrastructure Law increased funding for CRISI from $362 million in fiscal year 2021 to $1 billion per year through 2026. CRISI grants support projects like regional and short line track and infrastructure projects, including major track upgrades and bridge replacements.[52]

Congestion Points

From the perspective of freight rail operators, the partially single-track Hartford Line was identified by some as congested, particularly since the opening of the CT*rail* Hartford Line passenger service in 2018. The line is owned by Amtrak and has a high volume of passenger trains – both state-sponsored CT*rail* trains (Hartford Line service) and Amtrak intercity and shuttle trains. In all, there were 468 Amtrak trains and 492 CT*rail* trains on the line in November 2021. Representatives from CRA noted that with such a high volume of passenger trains requiring maintenance-of-way windows, the line is at times capacity-constrained for freight operators.

[52] https://www.up.com/customers/track-record/tr022222-infrastructure-bill-impact-on-freight-railroads.htm#:~:text=The%20%241.2%20trillion%20Bipartisan%20Infrastructure,even%20the%20planet%20will%20benefit.

On the New Haven Line, the freight representatives from CRA indicated that possible future train delays due to the planned Walk Bridge replacement project in Norwalk, as well as other ongoing or planned construction work, are a congestion concern.

Opportunities

One of the greatest opportunities for Connecticut's freight railroads is developing rail-to-truck and truck-to-rail modal transfer capabilities. During engagement with freight representatives, they noted that for new customers, building a transfer facility is a substantial investment. Customers are looking for access to rail, and with a transfer facility in place, that access can be provided.

The representatives identified four examples of shipments that would benefit from improved modal transfer facilities:

- A utility contractor that installs telephone poles is looking for ways to unload the poles from railcars.
- A shipper seeking to move construction and demolition (C&D) shipments out of the Bridgeport area.
- A shipper seeking to transfer cement products between truck and rail.
- A shipper bringing in heavy transformers, each weighing between 100,000 and 300,000 pounds.

The freight representatives pointed out that, as some landfills in Connecticut are closing, more trash will need to be hauled by rail out-of-state. Lastly, more distribution centers are being built in Connecticut, and these could benefit from modal transfer facilities.

6.4.4 Passenger Rail Issues and Comments

Prior to the COVID -19 Pandemic, robust ridership growth and the promise of increased investment in service improvements across all passenger rail services characterized Connecticut's passenger rail system. During the pandemic (2020-2022), rail ridership across the region plummeted, but planning work conducted by CTDOT continued to identify ways to improve Connecticut's passenger rail service and attract riders.

As the post pandemic period loomed on the horizon in 2022, the focus shifted to addressing areas of concern and outlining plans for improvement going forward, with coordination across operators. CTDOT undertook two initiatives: (1) outreach to the passenger rail operators in the state to identify concerns, trends, and plans to address issues and (2) a comprehensive capacity and speed analysis study of the New Haven Line that also explored possible modifications to enhance the entire Connecticut rail network.

Near-Term COVID-19 Travel Impacts

While the individual ridership trends vary by service, all intercity and commuter rail services have yet to return to pre-pandemic ridership levels. Amtrak anticipates ridership returning to pre-pandemic levels in 2023, while CT*rail* Hartford Line ridership remained at half of the 2019 ridership in early 2022. Shore Line East ridership issues started earlier, with multiple service disruptions in 2018, causing rail service to be replaced with buses, leading to a 25 percent reduction in ridership even after rail service was returned in 2019.

As the pandemic shifts to an endemic, ridership patterns on intercity and commuter rail have not yet stabilized. However, there have been observable shifts in trip purpose and time-of-day distribution, with fewer work-related trips due to teleworking and more of a spreading of trips throughout the day, with more discretionary travel at a regional level.

Operator Coordination

More robust coordination between Amtrak, CTDOT, and Metro-North Railroad was initiated to discuss on-going improvements and priorities in CT. This effort has resulted in Connecticut's proposed addition of dedicated express trains and the recognition of the need for travel time/speed improvements. During the same period, Amtrak asked for different braking patterns by equipment type, which would allow Acela trains to travel at a higher speed, as well as for flexibility on imbalance track sharing between operators due to anticipated operating rule changes within the next five years. CTDOT also implemented a Rail Working Group program with Metro-North Railroad (made up of representatives of both agencies) related to New Haven Line service. Five different committees were formed that meet regularly on the following topics: Service Planning/Operations; Capital Projects; Equipment and Maintenance of Way; Long Range Planning; and Rolling Stock concerns.

Speed

The New York - New Haven portion of the rail system focused on maintenance and achieving a state of good repair would enable all passenger rail services to see travel time improvements.

Amtrak service Improvements

As stated in previous chapter, Amtrak published a nation-wide corridor vision in May 2021, titled "Amtrak Connects US."[53] This vision included plans to extend current corridor services to Long Island and Scranton, expand Penn Station access, and extend services to New York via Bronx stations. Additionally, Amtrak has new trainsets scheduled to arrive in 2024 and they will reduce the need for locomotive changes onto the Hartford Line, saving 15 minutes of travel time.

New Haven Line Speed and Capacity Analysis

Two primary areas of concern were evaluated in this comprehensive study's analysis:

- Recognition that without continued improvements to Connecticut's aging rail infrastructure, key service improvements cannot be effectively implemented. Infrastructure problems include the need to replace several major bridge structures on the New Haven main line; track and maintenance of way improvements, and completion of rail station accessibility improvements, such as the addition of high-level platforms on the Waterbury line.
- An aging fleet of coaches operating on the Hartford Line and Metro North branch lines needs to be replaced to meet existing and future service needs to bring Connecticut's rail system into the 21st Century. New M8 electric equipment was introduced on all Shore Line East service in mid-2022.

Overall travel time improvements for the New Haven Line and planned increased frequency of service on the Waterbury Line and elsewhere are necessary to maintain current ridership and attract new riders. This study resulted in a comprehensive improvement program launched as "TIME FOR CT," which is discussed in detail in Chapter 3.

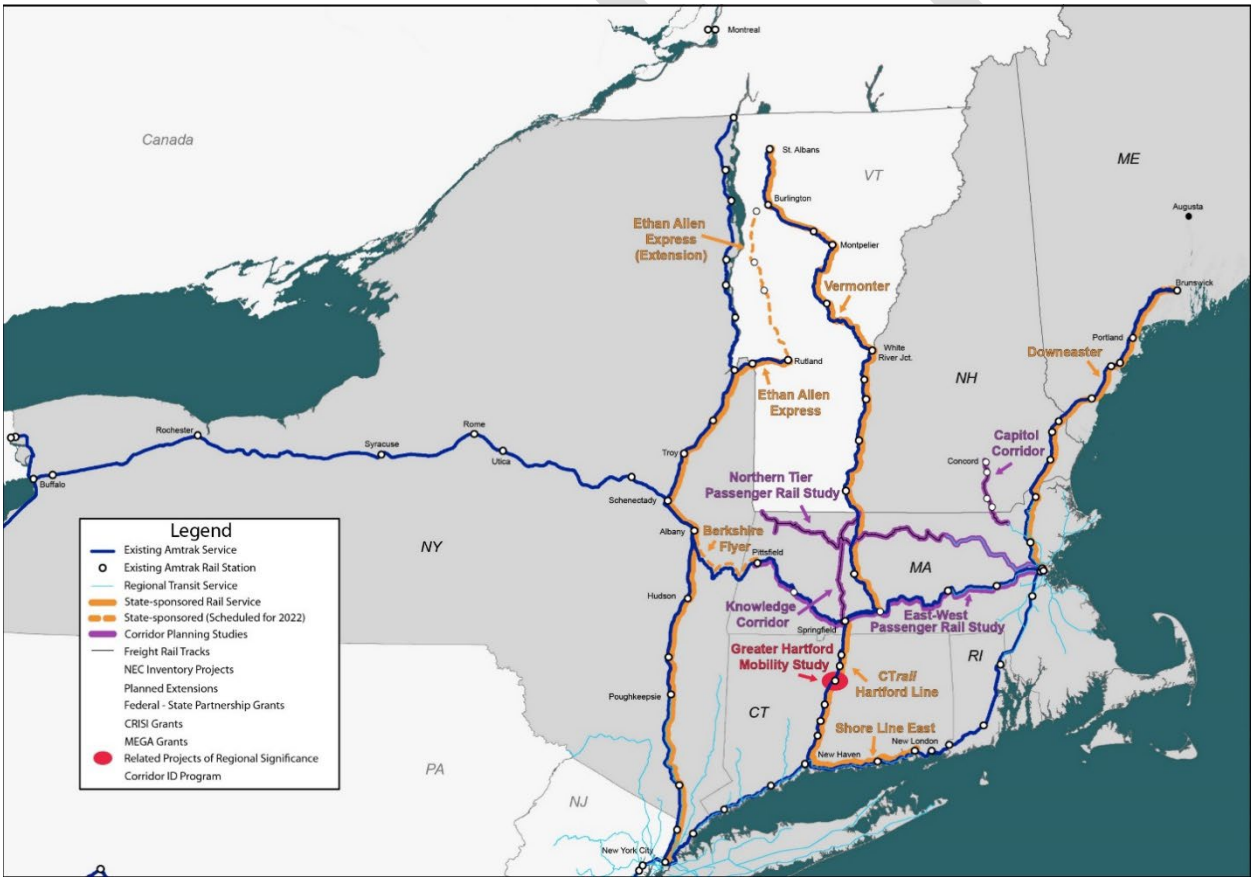
[53] http://media.amtrak.com/wp-content/uploads/2021/05/Amtrak-2021-Corridor-Vision-May27_2021.pdf, accessed 1/25/22

6.5 Consideration of Recommendations by Agencies and Partners

CTDOT has maintained strong communication with regularly scheduled meetings with each of its partners as well as a long list of agencies within Connecticut and neighboring states. The State's list of key partners includes Metro-North Railroad, Amtrak, freight railroad operators and members of the Connecticut Rail Association. In addition, partners CTDOT works with regularly include the state's many municipalities as well as transportation departments in nearby or neighboring states, including Massachusetts DOT, Rhode Island DOT, Maine DOT. New Hampshire DOT, New York State DOT and VTrans (Vermont DOT).

In 2022, Connecticut launched a bi-monthly New England States Rail Forum of participating states including Massachusetts, Rhode Island, New York, New Hampshire and Vermont. The meetings are intended to share the states' rail planning programs and activities and cover topics like expansion of service into bordering states and key projects of interest across state boundaries.

Figure 6-3. Amtrak Projects

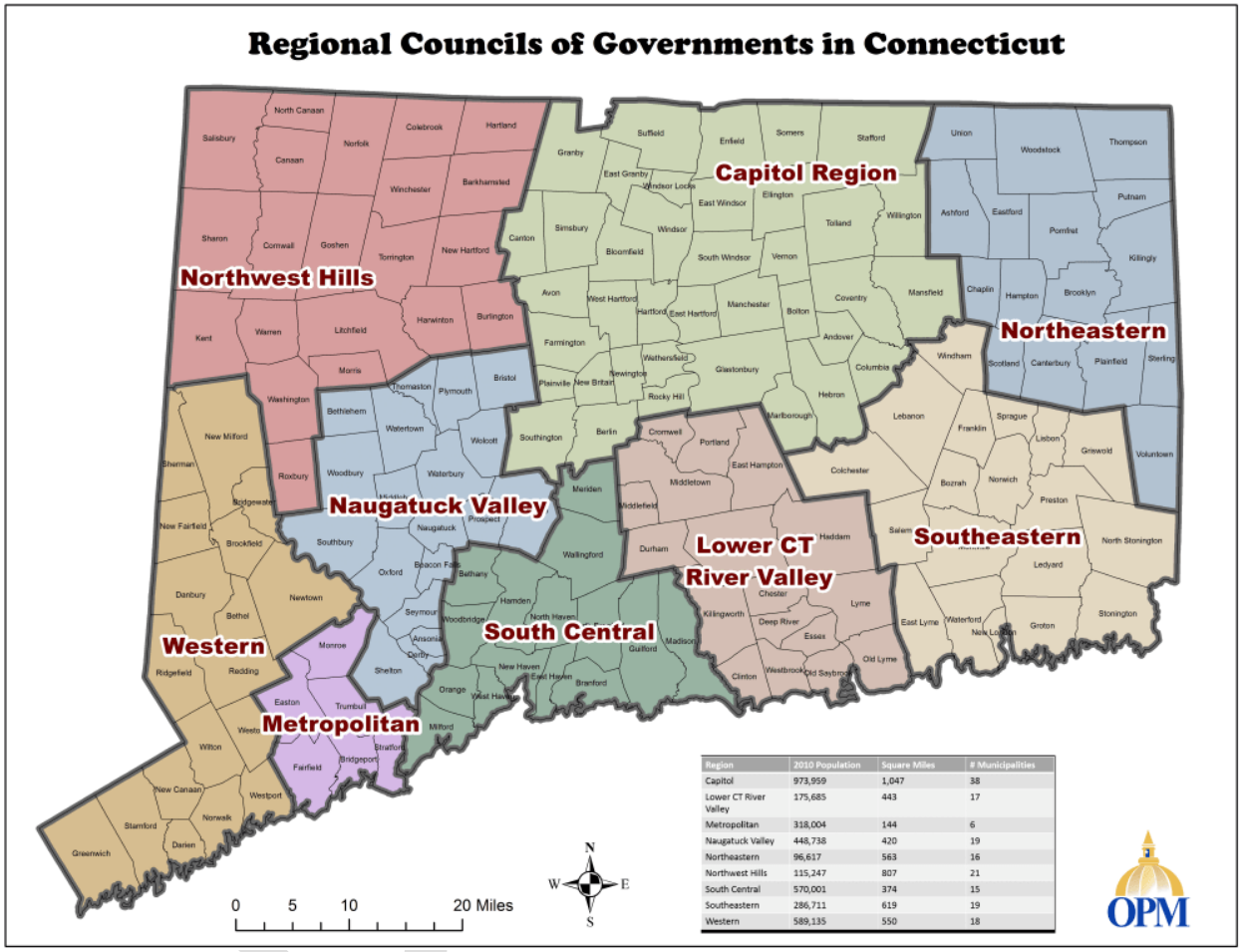


Source: AECOM

6.6 Coordination with other Transportation Planning Programs

CTDOT works closely with Connecticut's regional councils of governments (COGs) (**Figure 6-4**), the majority with operating passenger rail service within their region as well as with active freight rail operations. The agencies are shown in the map below:

Figure 6-4. Regional Councils of Governments in Connecticut



Region	2010 Population	Square Miles	# Municipalities
Capitol	973,959	1,047	38
Lower CT River Valley	175,685	443	17
Metropolitan	318,004	144	6
Naugatuck Valley	448,738	420	19
Northeastern	96,617	563	16
Northwest Hills	115,247	807	21
South Central	570,001	374	15
Southeastern	286,711	619	19
Western	589,135	550	18

Source: CTOPM

CTDOT has implemented a number of programs/services/projects which originated through discussions, planning studies or initiatives with the COGS. These include

- Hartford Line station improvements (Capitol Region Council of Governments).
- Waterbury Line Service Improvements and Master Plan (Naugatuck Valley Council of Governments).
- Stamford Parking garage (City of Stamford).

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Appendix A. Description of Active Freight Railroads

A.1 Armory Branch Line

The Armory Branch Line traverses 20.1 miles through suburban and rural areas serving retail customers between East Hartford and Enfield. In the past, the line continued to Springfield, Massachusetts, but was discontinued north of the CT state line. CSO owns this line from East Hartford to South Windsor (6.8 miles), and the State of Connecticut owns the line from South Windsor to Enfield (13.3 miles). The Line is maintained as FRA Excepted Track from East Hartford to South Windsor, and FRA Class 1 track from South Windsor to Enfield.

There is no passenger or through freight service on this line and local freight service is provided by CSO from East Hartford to South Windsor, and by CNZR from South Windsor to Enfield.

A.2 Berkshire Line

The Berkshire Line traverses 50.0 miles between Danbury and North Canaan. It runs from a junction with the Maybrook Line in Brookfield to the Massachusetts state line in North Canaan. HRRC owns this line from Brookfield to New Milford, and the State of Connecticut owns it from New Milford to North Canaan. It is maintained at FRA Class 1 and Class 2 track standards. The HRRC provides through service for freight gathered in central and western Connecticut and provides local freight service to customers between Danbury and North Canaan. HRRC owns the line north of North Canaan to Pittsfield and interchanges traffic that moves over the Berkshire Line with CSX in Pittsfield.

There is no passenger service on this line at present, though the railroad company has expressed interest in establishing passenger service.

A.3 Branford Line

The Branford Line and industrial track, traverses 7.2 miles between Branford and North Branford. Tilcon Connecticut, Inc. owns this line and uses it to move trap rock from its quarry in North Branford to its barge loading dock on Long Island Sound in the Stony Creek section of Branford, or to a connection with Amtrak's Shore Line in Branford.

The Branford Steam Railroad provides freight service. It is maintained at FRA Class 2 track standards. There is no passenger service on this line.

A.4 Canal Line

The Canal Branch traverses 3.9 miles between Southington and Plainville. It connects with the Terryville Secondary at Plainville and runs south into the extreme north end of Southington. It crosses at grade and connects with the Waterbury Branch at Plainville Yard. PAS owns this line and maintains it to FRA Class 1 track standards.

There is no passenger or through freight service on this line and Springfield Terminal Railway provides local freight service.

A.5 Griffins Industrial Track

The Griffin's Industrial Track Line (Griffin Line) traverses 8.7 miles through urban and suburban areas, serving customers between Hartford and Windsor. The State of Connecticut owns this line, and it is maintained at FRA Class 1 track standards.

There is no passenger or through freight service on this line and local freight service to the Home Depot Regional Distribution Center is provided by the Central New England Railroad (CNZR).

A.6 Manchester Secondary Line

The Manchester Secondary Line traverses 9.6 miles through urban and suburban areas serving retail customers between Hartford and Manchester. CSO owns this line, and it is maintained at FRA Excepted Track. There is no passenger or through freight service on this line and local freight service is provided by the CSO.

A.7 Maybrook Line

The Maybrook Line traverses 33.5 miles between Derby and Danbury. In Danbury, it connects with New York's Beacon Line, the Danbury Branch, and the Berkshire Line. In Derby, it connects with the Waterbury Branch Line and PAS, located immediately south of Metro-North's Derby/Shelton passenger rail station. Housatonic Railroad Company (HRRC) owns this line, and it maintains it at FRA Class 1 track standards. HRRC provides local freight service and under a trackage rights agreement, P&W has rights to operate on this Line. There is no passenger service on this line.

A.8 Middletown Cluster

The Middletown Cluster system consists of four lines (E. Berlin, Portland, Middletown Secondary and Laurel Tracks) that traverse 1.1 miles north from Middletown toward East Berlin, 1 mile east across the Connecticut River to Portland, and 5.5 miles south along the river to the Laurel section of Middletown. This group includes 7.3 miles of the north end of the Middletown Secondary. Additionally, the Wethersfield Secondary Line begins at the crossing diamond in Middletown and goes to Hartford. The Laurel Track to the south connects with the Valley Line, which is out of service between Middletown and Haddam. The State of Connecticut owns these lines and they are maintained to FRA Class 1 or Class 2 track standards. There is no passenger or through freight service on these lines and local freight service is provided by the P&W.

A.9 Middletown Secondary Line

The Middletown Secondary Line traverses 15 miles between North Haven and Durham. It runs from the Springfield Line in North Haven and serves the Middletown Cluster. CSX owns this line in North Haven (4.8 miles), and Tilcon Connecticut, Inc. owns this line from North Haven to Durham (10.2 miles). Tilcon operates a major stone quarry in East Wallingford/Durham and ships crushed stone from this location to the New York City metropolitan area, to Danbury, and to Old Saybrook the State of Connecticut owns the line from Durham to Middletown (see the Middletown Cluster, above). It is maintained at FRA Class 2 track standards. There is no passenger or through freight service on this line and local freight service is provided by the P&W.

A.10 Palmer Line

The Palmer Line traverses 55.8 miles from the shore line in New London to the state line in Stafford. This line serves the State Pier in New London and connects to the Willimantic Secondary Line in Willimantic. This line is owned by New England Central Railroad (NECR) and is maintained at FRA Class 3 track standards. Through and local freight service is provided by the NECR. There is no passenger service on this line.

A.11 Plainfield Secondary Line

The Plainfield Secondary Line traverses 53.2 miles between Groton and Thompson. It runs from a connection with Amtrak's Shore Line in Groton to the Massachusetts state line in Thompson. It connects with the Willimantic Secondary Line in Plainfield. It is maintained at FRA Class 3 track standards (40 mph freight operations). P&W owns this line and provides through and local freight service. There is no passenger service on this line.

A.12 Suffield Branch Line/Bradley Spur

The Suffield Branch Line/Bradley Spur traverses 4.4 miles through suburban and rural areas serving customers between Windsor Locks and Suffield. The 2.4-mile Bradley Spur connects at Suffield and serves industries adjacent to Bradley Airport in Windsor Locks. Connecticut Southern Railroad (CSO) owns this line from a connection with Amtrak's New Haven-Hartford-Springfield Line in Windsor Locks, to Suffield. The line is maintained to FRA Excepted Track Standards. The State of Connecticut owns the line from Suffield to Bradley Airport, which crosses back into Windsor Locks. There is no passenger or through freight service on this line and local freight service is provided by CSO.

A.13 Terryville Secondary – Waterbury Branch

The Terryville Secondary is the common collective name for the freight-only Berlin Branch (2.6 miles), the New Britain Secondary (4.5 miles), and the Terryville Secondary Line (17.2 miles), which together traverse 24.3 miles between Berlin and Waterbury. The Terryville Secondary, running from Berlin westward through New Britain, Plainville, Bristol, Plymouth, and Waterbury is owned and operated by Pan Am Southern Railway (PAS). The Terryville Secondary connects with Amtrak's Springfield Line in Berlin, the Canal Branch in Plainville, and with MNR's Waterbury Branch and Naugatuck Railroad's Torrington Branch in Waterbury. The line is maintained to FRA Class 2 track standards. There is no passenger service on the line. The Springfield Terminal Railway provides PAS through freight service and local freight service for PAS.

MTA MNR operates passenger service over the Waterbury Branch and is responsible for maintenance of the track structure. PAS has the local freight operating rights on the northern portion of the Waterbury Branch, in the towns of Waterbury, Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby. The P&W, which holds the local freight operating rights on the southern end of the Waterbury Branch, also connects with PAS at Derby.

A.14 Torrington Branch

The Torrington Branch traverses 19.5 miles between Waterbury and Torrington. It runs from the Waterbury Branch Line in Waterbury to Torrington, where it terminates. The Naugatuck Railroad Company (NAUG) runs a seasonal tourist passenger service on this line. The State of Connecticut owns this line, and it is maintained at FRA Class 1 and 2 track standards. There is no through freight service on this line, and local freight service is provided by the NAUG.

A.15 Valley Line

The Valley Line traverses 22.5 miles from a connection with Amtrak's Shore Line at Old Saybrook to a connection with the Laurel Track in southern Middletown. The Valley Railroad Company has operated as a tourist passenger service attraction for the past 40 years between Old Saybrook and Haddam by means of the Valley Railroad, regularly carrying in excess of 130,000 passengers per year.

The line is out of service between Mile Post 13.25 in Haddam and Mile Post 22 in Middletown, although this portion is maintained clear for maintenance of way equipment, vegetation control, and property surveillance. The State of Connecticut owns this line, and it is administered by the Connecticut Department of Energy and Environmental Protection (DEEP). CTDOT strongly supports maintaining this section of the Valley Line as a rail corridor and not converting the line into a trail. DEEP strongly supports maintaining this section of the Valley Line for potential future scenic excursion service or other recreational or tourist uses. The Valley Line is a critical piece to a complex puzzle that should be preserved. It provides the only practical direct rail route between New London/Groton and the greater Hartford area.

The Line is maintained at FRA Class 1 and Class 2 track standards. There is no commuter or regional passenger or through freight service on this line. Valley Railroad is authorized to provide local freight service.

A.16 Wethersfield Secondary Line

The Wethersfield Secondary Line traverses 16.6 miles through urban and suburban areas between Hartford and Middletown. It connects to the Middletown Cluster in Middletown. CSO owns the northern 3 miles of this line, and the State of Connecticut owns the remainder. It is maintained at FRA Excepted Track standards. There is weekly through freight service on this line between Middletown and Hartford. Local freight service on the northern three (3) miles of the line is provided by the CSO. P&W provides local freight service south of Hartford. There is no passenger service on this line.

A.17 Willimantic Secondary Line

The Willimantic Secondary Line traverses 23.3 miles between Plainfield and Willimantic. It runs from the P&W's Plainfield Secondary Line in Plainfield to the New England Central's Palmer Line in Willimantic. This line is owned by P&W from Plainfield to Sprague, and by the State of Connecticut from Sprague to Willimantic. It is maintained at FRA Class 1 and 2 track standards and is being upgraded to FRA Class 3 standards. Through and local freight service is provided by the P&W. There is no passenger service on this line.

Appendix B. Description of Active Freight Railroad Operators

Connecticut's rail freight industry is operated by the private sector for profit and for public benefit under Federal common carrier regulations. There are ten private freight railroad companies operating in Connecticut and these operators own a combined 39 percent of the rail freight infrastructure and all related equipment operating within the state. These freight railroads originated 1.5 million tons and terminated 1.4 million tons of freight in 2019. The primary freight commodities handled by Connecticut's railroads include non-metallic minerals, food & consumer, waste & scrap, primary metals, lumber & wood, and petroleum products.

The following text describes all freight railroads operating in the state in alphabetical order.

B.1 Branford Steam Railroad

Operating over seven route miles between North Branford and Pine Orchard on Long Island Sound, the Branford Steam Railroad (BSRR) is a private industrial railroad. It serves the Tilcon Connecticut stone quarry in North Branford. Traffic consists of about 7,000 carloads of construction aggregate outbound from North Branford to an interchange with the Providence & Worcester Railroad on Amtrak's Northeast Corridor in Branford and at a barge transload facility in Pine Orchard. Operations on the railroad's route are limited 10 MPH. The carload weight limit on the line is 286,000 pounds. The railroad has a repair shop, a pit scale, and a motion scale in North Branford. Despite its name, the railroad operates with diesel-electric locomotives.

B.2 Central New England Railroad

The Central New England Railroad (CNZR) is a Class III railroad operating two sections of track: the 8.7-mile former Griffin Secondary from Hartford Union Station northwest to industrial areas in Bloomfield; and 4.4 miles of the Armory line from East Windsor Hill to the Massachusetts state line. The remaining 8.8 miles of the Armory line are out of service. Traffic consists of 2,400 carloads of fertilizer and other agricultural products, lumber and building products, and construction debris for recycling. The railroad interchanges traffic with Connecticut Southern Railroad in East Windsor Hill and with Pam Am Railways in Hartford. Operations on the railroad's routes are limited 10 MPH. The carload weight limit on the line is 263,000 pounds.

B.3 Connecticut Southern Railroad

Operating in Connecticut and Massachusetts, Connecticut Southern Railroad (CSO) is a Class III railroad and a subsidiary of the Genesee & Wyoming family of railroads. It operates on the Amtrak Hartford Line and hauls CSXT traffic between Springfield Terminal and the CSXT's Cedar Hill Yard in North Haven. It owns four short branch lines in central Connecticut: the Manchester Subdivision consisting of 3.6 route miles; the Suffield Subdivision, 2 miles; the East Windsor Subdivision, 6.8 miles; and the Wethersfield Subdivision, 3 miles. Traffic consists of about 18,500 annual carloads of cullet, lumber, lube oil, wood pulp, plastic, construction debris, residual waste, argon gas, carbon dioxide, military equipment, melamine, methyl methacrylate, formaldehyde solution, butanol, and isobutanol. It interchanges traffic with CNZR in East Windsor Hill. Its maintenance shop is in Hartford. The carload weight limit on the lines is 263,000 pounds.

B.4 CSX Transportation

CSX Transportation (CSXT) is a Class I railroad operating a 21,000-mile network in the eastern United States and the Canadian provinces of Ontario and Quebec. In Connecticut, CSXT operates on Amtrak's Hartford line, with trains running between Springfield Terminal in Springfield, Massachusetts in the north and New Haven and NEC in the south.

The railroad owns the Cedar Hill classification yard in North Haven. It also operates a TRANSFLO terminal in North Haven that provides transloading (transfers of freight between railcars and trucks), materials management, and logistic services.

Its traffic consists of approximately 10,000 carloads of lumber, municipal and construction waste, plywood, limestone, and wood pulp. The Connecticut Southern Railroad moves traffic for CSXT between Springfield Terminal and North Haven.

B.4.1 Acquisition of Pan Am Railways and Pan Am Southern Railway

In 2022, CSX acquired Pan Am Railways (PAR), the Northeast's largest regional railroad along with Pan Am Southern Railway (PAS), a subsidiary. With operations in Maine, New Hampshire, Massachusetts, Vermont, Connecticut, New York, and Canada, PAR interchanges traffic with fifteen railroads throughout its network. The combined system, including haulage rights, totals to 1,700 route miles. Connecticut route mileage, apart from PAS, is 14 miles. Primary commodities handled include grain, coal, sand and gravel, food products, lumber, paper and pulp, chemicals and plastics, petroleum, processed minerals, metals, scrap metal, finished automobiles and intermodal trailers and containers.

Prior to 2022, PAS was a freight railroad jointly owned by Pan Am Railways (PAR) and Norfolk Southern Railway (NS). Under the PAS operating structure, the Springfield Terminal Railway provides all rail services for the joint venture. PAS operates in Connecticut on 59 route miles over the Amtrak Hartford Line between Springfield and the Waterbury Branch in Berlin; then on the 24-mile Waterbury Branch between Berlin, Plainville, and Waterbury; and on its three-mile Canal Branch (aka Canal Industrial Track) between Southington and Plainville. This Class II railroad's traffic consists of 2,500 carloads of steel, liquid propane gas, lumber, plywood, dispersant bas, construction and demolition debris, and scrap. The railroad interchanges traffic with the Naugatuck Railroad in Waterbury. Operations on the railroad's routes are limited to 10 MPH. The carload weight limit is 263,000 pounds. The railroad has a switching yard in Plainville.

B.5 Housatonic Railroad Company

A Class III railroad, the Housatonic Railroad (HRRC) operates over two lines: the 50-mile Berkshire Branch between Danbury and North Canaan; and the 32-mile Maybrook Branch between Derby and Danbury. Traffic consists of 7,500 carloads of lumber, plastic, wood pulp, and alcohol inbound; and limestone, and construction debris outbound. HRRC interchanges traffic with the Pan Am Southern Railroad in Derby and with the Providence & Worcester Railroad in Danbury via the latter railroad's overhead rights. Maximum operating speeds on the lines vary between 10 MPH and 25 MPH. The carload weight limit is 286,000 pounds. Trains are dispatched from the Dispatching and Operations Center in Canaan, and equipment is maintained at the Engine Repair and Maintenance Facility also in Canaan. The railroad has a Lumber Distribution Facility in Hawleyville.

B.6 New England Central Railroad

Operating in Connecticut, Massachusetts, New Hampshire, and Vermont, the New England Central Railroad (NECR) is a 384-mile Class II railroad and a subsidiary of the Genesee & Wyoming family of railroads. It owns and operates on 61 route miles running north-south in Connecticut between New London and the Massachusetts state line south of Monson. Its traffic consists of about 19,000 carloads of general freight, including lumber and stone products, metals, and chemicals. In Connecticut, it interchanges traffic with the Providence & Worcester Railroad in Willimantic and New London. The carload weight limit is 263,000 pounds.

B.7 Naugatuck Railroad Company

Naugatuck Railroad (NAUG), a Class III railroad, runs on 19.6 route miles from Waterbury to the end of track in Torrington. Operated by the Railroad Museum of New England, it provides regular seasonal passenger excursions between Thomaston, Waterville, and Thomaston Dam, with occasional trips to Torrington. It also operates freight service and interchanges freight traffic with the Pan Am Southern Railroad in Waterbury. It has a maintenance shop in Thomaston and can perform contract maintenance for other railroads and rail car fleets.

B.8 Providence and Worcester Railroad Company

A Class II railroad, the Providence & Worcester Railroad (P&W) provides freight service in Massachusetts, Rhode Island, New York, and in Connecticut, where it runs over 346 route miles consisting of lines it owns and lines over which it has trackage rights in the central and eastern parts of the state. It is a subsidiary of the Genesee & Wyoming family of railroads. It handles about 18,000 carloads of chemicals, transformers, plastics, steel, oil, minerals and stone, building materials, chemicals, salt, and malt, among other commodities. Minerals and stone shipments make up 66 percent of P&W's business in Connecticut, which is home to six out of the railroad's top 11 customers. In Connecticut, P&W interchanges traffic with the NECR in Willimantic and New London; with CSX Transportation in New Haven; with the Housatonic Railroad in Danbury via P&W overhead rights; and with the Branford Steam Railroad on Amtrak's Northeast Corridor in Branford. The carload weight limit is typically 286,000 pounds. It has classification yards in Plainfield and Willimantic.

B.9 Valley Railroad

Valley Railroad (VALE) is a heritage railroad operating on 14.3 route miles between Old Saybrook and Haddam. The route continues for another 7.6 route miles north to Maromas, but this segment is out of service. North of Deep River, the line runs for 6.4 miles along the west side of the Connecticut River. The total 22-mile route from Old Saybrook to Maromas is leased from the state. Valley Railroad operates the Essex Steam Train and the Essex Clipper Dinner Train. The company's mission is to keep alive the rich mechanical, industrial, and transportation heritage of the state through the continual operation of vintage steam and diesel locomotives and passenger coaches, as well as the operation and maintenance of the facilities and infrastructure that support train operations. It has an engine servicing facility in Essex and an interchange with the P&W Railroad in Old Saybrook. Maximum operating speed is 20 MPH. The carload weight limit is 265,000 pounds. There is no freight service on the line, though the lease from the state allows for freight service.

Appendix C. Sample State Funding Approaches

C.1 Rail in Relation to the State's Economic Development Goals

The 2018 Connecticut Economic Development Strategy outlines a policy framework that different state agencies, like CTDOT, can apply to their missions. One objective is to "Invest in Infrastructure and Support Systems that will Foster Business Growth." The goals under this resonate with the opportunities in rail development identified in previous sections, both highlighting the need for enhancing Connecticut's economic competitiveness and improving environmental sustainability.

C.2 Rail-Related Programs and Incentives

Connecticut has several approaches to investing in its transportation systems. For railroads, Connecticut offers the Railroad Tax Exemption Program (TEP). Using TEP, rail operators can reduce their gross earnings tax on a dollar-for-dollar basis by making capital investments that upgrade or maintain infrastructure in Connecticut. Moreover, CTDOT is annually authorized to use up to $7.5 million in General Obligation bonds to provide competitive matching grants for commercial freight rail lines operating in Connecticut. These grants can be used to improve, repair, and modernize existing rails, rail beds, and related facilities. Finally, the state also offers up to $2.5 million in Special Tax Obligation bonds to CTDOT for establishing a Fix It-First Program to repair, upgrade, or eliminate at-grade railroad crossings in Connecticut.

Many other states use different methods to financially support their rail systems. These include industrial access programs and low-interest or zero-interest loans

The following section presents examples of rail-related funding or incentive programs in selected states that could be considered as additional options for Connecticut to adopt.

C.2.1 California

The California State Transportation Agency (CalSTA) oversees the State Rail Assistance (SRA) Program. The program uses 0.5 percent of a new diesel sales tax revenue as the Program funding source. Funding is available for capital and operations and half of revenue is allocated in equal shares to commuter operators through 2019-20, and via guidelines thereafter (about $10.5 million to each total over 3 years). Additionally, half of revenue is allocated to intercity rail corridors such that each of the existing three corridors receives at least 25% of the intercity rail share (about $13.1 million to each over 3 years). In total, the SRA Program has awarded funds to 10 agencies with a total of $171.9 million awarded since 2018.

C.2.2 Massachusetts

The Massachusetts Department of Transportation (MassDOT) oversees the Industrial Rail Access Program (IRAP). IRAP is a public-private partnership that combines funding to help eligible applicants invest in industry-based freight rail infrastructure improvement projects. The goals of the program are to stimulate economic development, grow Massachusetts corporations, keep manufacturing jobs, and create new jobs through increased efficiency, production capacity, and improved distribution logistics. IRAP funds up to 60 percent of total project costs, and at minimum the remaining 40 percent of projects costs must be provided by the railroad operator and/or industry project sponsor. The maximum IRAP grant award is $500,000.

C.2.3 Michigan

Administered by the Michigan Department of Transportation (MDOT), the Freight Economic Development Program provides low-interest loans to businesses locating or expanding in Michigan and requiring rail service, or to entities interested in assisting these businesses. These loans, which can be used to fund up to 50 percent of a project's construction costs, are made at a minimum interest rate of 2 percent below the prime rate to be repaid over a five-year period, but they can be totally or partially forgiven if the facility is properly maintained and meet annual shipping commitments. If the shipping

C.2.4 Minnesota

The Minnesota Department of Transportation (MnDOT) offers the Minnesota Rail Service Improvement Program (MRSI), a program designed to rehabilitate deteriorating rail lines, improve rail-shipping opportunities, and preserve and maintain abandoned rail corridors for future transportation uses. Minnesota Department of Transportation (MnDOT) offers the program and it has three subcomponents:

- The Minnesota Rail Service Improvement Grant Program (MRSI Grant Program) provides grants for freight rail service improvement projects that support economic development. Eligible applicants include:
  - Railroads;
  - Rail shippers;
  - Political subdivisions of Minnesota; and
  - Federal agencies that seek to complete a major improvement or rehabilitation of railroad rights of way or other railroad facilities.
- The Minnesota Rail Service Improvement Loan Program (MRSI Loan Program) provides no-interest loans for capital improvements, rail line rehabilitation, and rail purchase assistance.
- The Rail User and Rail Carrier Loan Guarantee Program assists rail users in obtaining loans for rail rehabilitation and capital improvements by guaranteeing up to 90 percent of the loan. Rail users and rail carriers are eligible for assistance under the program. In addition to rail line rehabilitation, rolling stock acquisition and installation are eligible.

C.2.5 Nevada

Nevada Department of Transportation's Rail Service and Investment Program (RSIP) offers funding opportunities for both passenger and freight rail projects, with freight rail projects primarily funded by private-sector investments and passenger rail projects funded by both private investments and public (state and Federal) funding sources. The state engages its Class I rail providers, Union Pacific Railroad and BNSF Railway, to encourage partnerships and collaborations between stakeholders to facilitate rail development.

C.2.6 New Jersey

The New Jersey Department of Transportation (NJDOT) and its partner agencies lead the Transit Village Initiative, a partnership that creates incentives for municipalities to redevelop or revitalize the areas around transit stations using design standards of transit-oriented development (TOD).

C.2.7 New York

As part of the New York State's Rail Capital Improvement Programs, the New York State Department of Transportation (NYSDOT) offers the Passenger and Freight Rail Assistance Program (PFRAP) to provide enhanced assistance for rail and port capital investments to preserve and enhance the State's major trade and passenger corridors. In 2021, PFRAP made $85.5 million available for funding.

C.2.8 North Carolina

The North Carolina Department of Transportation (NCDOT) oversees the Rail Industrial Access Program, providing state funds to construct or refurbish railroad spur tracks required by a new or expanding company. Program funding is intended to modernize railroad tracks to ensure effective and efficient freight deliveries and is contingent upon a company receiving application approval prior to making a decision to locate or expand its facility in North Carolina. Local governments, community development agencies, railroad companies and industries are all eligible to apply, but the availability of matching funds from private and/or local sources needs to be confirmed before an award can be made. Recipients may receive a maximum 50% of total project costs up to $400,000.

C.2.9 North Dakota

Established by the North Dakota Department of Transportation (NDDOT), the Freight Rail Improvement Program (FRIP) is a low-interest, revolving loan program using interest repaid from the Local Rail Freight Assistance (LRFA) Program. It was established as a federal program in 1989. However, funds were transferred to the states in 2008. Both the LRFA and FRIP funds have been used primarily for infrastructure rehabilitation projects on short line railroads.

C.2.10 Pennsylvania

The Pennsylvania Department of Transportation (PennDOT) oversees the Pennsylvania Intermodal Cargo Growth Incentive Program (PICGIP). PICGIP is offered to eligible ocean carriers starting a new service to a Commonwealth port. New carriers enrolled in the PICGIP receive $25 per new container unit loaded or discharged from vessels moving through Commonwealth's ports. The program has resulted in $4.1 million in incentive funds awarded to 10 grantees and helped secure full-time employment by economic activity through indirect and induced jobs.

C.2.11 Virginia

Offered through the Virginia Department of Rail and Public Transportation (VDRPT), the Rail Industrial Access Program provides a total of $5.5 million in annual appropriations to construct rail spurs for businesses connecting new or expanding businesses to the freight railroad network. Funds may not be used for right-of-way acquisition or adjustment of utilities. Each grant recipient may receive up to $450,000, with a minimum 30 percent match required from the applicant. The program supports localities, businesses, or industries seeking access to a common carrier railroad.

Appendix D. Notable Upgrades Since the 2012 Plan

D.1 Hartford Line

Opened for service in June 2018, the Hartford Line (HL) was developed through a partnership between the CTDOT, CTrail and Amtrak. The Hartford Line is a regional passenger rail service that expands service between New Haven, Hartford and Springfield. CTDOT provides this service which consists of Amtrak and CTrail trains operated by a service provider—a joint venture of TransitAmerica Services, Inc. and Alternate Concepts, Inc. (TASI/ACI).

The HL normally carries 17 trains a day between New Haven and Hartford, with 12 of those trains continuing to Springfield, Massachusetts. In addition, Valley Flyer service to Greenfield, Massachusetts was instituted in 2018 in conjunction with Massachusetts Department of Transportation (MASSDOT). The HL quickly and easily connects passengers to New Haven Line service to New York City, Amtrak Northeast Corridor rail services, and Shore Line East service, as well as CTfastrak bus rapid transit service in the Hartford/New Britain area. To ensure efficiency of this new line, double track was installed on a four-mile stretch between Hartford and Windsor.

To support growth of the HL, high-level platforms were constructed at Hartford Union Station and Windsor while three replacement stations have been built in Berlin, Meriden, and Wallingford. Parking has been added to these areas with modern amenities such as bike racks, updated lighting, electric vehicle charging stations, and heated platforms to reduce snow and ice buildup. Tickets for the HL can be purchased through Ticket Vending Machines (TVMs), located at each station on the route or through eTix, a mobile phone app.

D.2 Shore Line East

To support service and growth on SLE, a CTrail station replacement project is currently underway in Clinton, which includes the construction of a new main track crossover. In addition, a project has commenced at the joint Amtrak/SLE station at New London to facilitate improved ADA access at this location. There is a future SLE connectivity project in process that will bring real-time train information, camera connectivity and TVMs to the SLE.

SLE recent improvements include an Amtrak undercutting project in 2019 that improved track conditions and addressed temporary speed restrictions between New Haven and Old Saybrook. In addition, the completed GP-40 and active P40DC locomotive overhaul programs also benefit reliability and on-time performance on SLE. CTDOT also began running electric M8 locomotives on the SLE.

D.3 New Haven Line

The New Haven Yard has undergone major improvements over the past several years including the addition of the $215 million Component Change-Out (CCO) building, an immense structure which can accommodate 13 cars on three tracks for replacing major components. An adjunct to the CCO facility is a new materials and parts warehouse that boasts a state-of-the art Automated Storage and Retrieval System (ASRS). The ASRS opened in 2017. The rail yard has also received new power substations which will help prevent prolonged power outages while increasing power efficiency. Additional tracks and catenary to connect the east end of the CCO facility to the east end of New Haven Yard are under construction, facilitating improved workflow and reduced congestion.

D.4 New Technology/Equipment/Rolling Stock

- Purchase and staged rollout of 405 new Electric Multiple Unit (EMU) Kawasaki M-8 rail cars to replace retired M-2 and M-5 rail cars and expand the EMU fleet. In 2021, 80 M-8s were added to the fleet. This additional volume of M8s means the full roster now includes 275 CTDPT-owned cars.
- Six newly overhauled GP-40 diesel locomotives for HL and SLE service were placed into service.
- Contracted with Amtrak for the overhaul of CTDOT's 12 P40DC diesel locomotives. The first of these units was released in early 2021 from Amtrak's Beech Grove, Indiana Shop. The P40DC fleet is utilized on both HL and SLE.
- Procurement negotiations are underway for the construction of 60 new coaches and cab cars to augment and replace the existing diesel-hauled coaches on HL, SLE, and the NHL's Waterbury and Danbury Lines.
- Positive Train Control (PTC) is a technology-based communication system to increase train safety. PTC was installed successfully on: CTDOT's Metro-North New Haven Line and feeder lines, CT*rail* Shore Line East, and the Hartford Line. PTC on all CTDOT commuter lines has been installed, tested, and operational ahead of the FRA PTC nationwide 2020 deadline. CTDOT worked closely with all stakeholders to implement this new federal mandate on such a short timeframe. This project represents a significant capital expenditure, including ongoing updates and maintenance.
- CT*rail* eTix is Connecticut's electronic ticketing app for Hartford Line and Shore Line East rail services. This new mobile app was developed and became fully operational in 2020. The app allows customers to purchase rail fares for HL and SLE. Through- ticketing is available on New Haven Line trains, in conjunction with Metro-North Railroad. The app also facilitates electronic purchases for connecting CTtransit bus passes and in-app parking payment at select Hartford Line stations.
- Catenary structure and line replacement on Metro North Railroad's New Haven Line.
- Achievements to date towards improving the train maintenance and repair capabilities include:
  - Renovations to existing Electrical Multiple Unit (EMU) and the Critical System Replacement (CSR) Shops are complete. These renovations were needed to meet the current State building code, improve the working environment in the shops and offices, enhance safety, and extend the life of buildings.
  - The Independent Wheel Truing Facility (IWT) construction was completed in 2013 (see **Appendix B**). The IWT will be used to reprofile the steel wheels on the new and existing New Haven Line and Shoreline East rolling stock and will provide a needed increase in maintenance capacity to support the expanding rail fleet.
  - Multiple grade crossing improvements have been completed throughout the rail corridors

Appendix E. Passenger Rail Projects List

Table E-1. Passenger Rail Line Abbreviations

Abbreviation	Name of Railroad
NHL	New Haven Line
WBL	Waterbury Branch
DBL	Danbury Branch
HFL	Hartford Line
SLE	Shore Line East
MNR	Metro-North Rail

Table E-2. Program Effect Index

A	Travel Time Savings
B	Improved Reliability
C	Increased Service
D	Increased Capacity
E	Customer Experience
F	Accessibility
G	Improved Connectivity
H	Safety
I	Environmental Benefits

Table E-3. Passenger Rail Project List

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
NHL					
TIME 1-5	**NHL**	**$1,682,000,000**	**A, B, C, D, G, H**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Arch St Bridge Deck Repair					
Bridge Replacement Program - Fort Point Street Bridge (1st half only)					
Compo Rd Bridge Replacement					
East Ave Roadway, Bridge Replacement					
East Main St fixed bridge					
East Norwalk Station Replacement					
Greenwich Sta Repairs (Cat., Ped. Bridge)					
Haul Routes Paving					
King St/Main St Culvert/Tanner's Brook Rehab					
Local Bridge Utilities					
Longbrook Avenue Overhead Bridge					
New CP227-CP228 Track Improvements					
New CP-259 Universal Interlocking, Modify CP-261					
Osborne Ave Bridge Rehabilitation					
Overhead Catenary System Work					
Rebuild Westport Station Platform					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Retaining Wall 427 Replacement					
Saugatuck Ave Bridge Track & Catenary					
Saugatuck Bridge Replacement with Fixed Bridge					
Steamboat Rd Bridge Replacement					
Strawberry Hill Rd Bridge Replacement					
Temp. Signalization of 2 Intersections					
Track Work					
West Broad St, King St, Main St, Bruce Ave, and Bishop Ave Fixed Bridges					
Walk Bridge Replacement	**NHL**	**$1,000,000,000**	**B, D, H**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Walk Bridge (Accelerated Construction)					
Walk Bridge Utility Relocations					
Walk Bridge Supporting Program	**NHL**	**$0**	**B, H**	**CTDOT, Federal grants**	**TBD**
WALK - Advanced Utility Project (AUP)					
Devon Bridge	**NHL**	**$2,100,000,000**	**B, H**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Devon Bridge Interim Repairs					
Devon Bridge Replacement					
Saugatuck Bridge Interim Repairs	**NHL**		**B, H**	**CTDOT, Federal grants**	**Long-Range**
Saugatuck Bridge Interim Repairs		$26,500,000			

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Cos Cob Bridge	**NHL**	**$1,213,800,000**	**B, H**	**CTDOT, Federal grants**	**Long-Range**
Cos Cob Bridge Interim Repairs					
Cos Cob Bridge Replacement					
NHL Bridge Program	**NHL**	**$177,125,000**	**A, B**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Bridge Timber Program					
F-Program – Freight Line Bridge Repairs					
Indian River Bridge Replacement (Bridge #8086R, M.P. 64.59)					
Middletown Swing Bridge Rehabilitation					
Off-System Railroad Bridge Inspection Program					
Railroad Bridge Inspection Programs					
Scour Rehabilitation Project-(Cos Cob M.P. 29.9), (Five Mile River M.P. 39.02), (Norwalk River DB M.P. 9.42), (Canal WB M.P. 12.57)					
S-Program – MNR Bridge Repairs Program					
NHL Signals & Comms	**NHL**	**$325,500,000**	**A, E**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Signal System Replacement Sections 1-4					
Update to Network Infrastructure Phases 2-4					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
NHL Stations	**NHL**	**$410,000,000**	**E, F, H**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Bridgeport Transportation MTAPD relocation					
Customer Service Initiatives (CSI) - audio and visual communication system upgrades					
Darien Station Improvements					
New Haven Union Station Improvements (Parking Lot)					
Signage Replacement Program					
State Street Station new platform & pedestrian bridge					
Station State of Good Repair Program					
South Norwalk Station Platform Rehabilitation and Repair					
New Haven Union Station Platform Replacement					
NHL Stations - Stamford	**NHL**	**$105,300,000**	**E, F, H**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
1985 Stamford Station parking garage inspection					
Stamford parking garage					
Stamford parking garage demolition					
Stamford Station Elevator & Escalator Improvements					
Station Improvement Program - Stamford (Phase 2)					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
NHL Track & Speed	**NHL**	**$172,400,000**	**A, B, D**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Bridgeport Area New Turnback Track					
C-Program (Capital Track Program)					
Harrison-Greenwich Local Tracks Passing Sidings					
Milford Culvert & Rt-1 Drainage Improvements					
New Canaan Branch Sidings					
Stamford Railroad Underpasses and Roadway Improvements					
Switch Towers Rehabilitation					
CP 261 (Devon) to CP 266 (Woodmont) 4th Track Project & Milford Station Relocation					
NHL Traction Power	**NHL**	**$152,000,000**	**B**	**CTDOT, Federal grants**	**Short-Range**
Catenary System - State of Good Repair					
Cos Cob Utility Supply Substation					
Devon Transformer					
Eversource Overall Engineering and Project Scoping					
Motor Generator Set Replacement - Cos Cob (309) and Fair Street (1091) Substations					
NHL Catenary & Power Design (Including Replacement of Aging Overhead Catenary System) – Round 2					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Power Substation Program (Phases 1-4)					
Sasco Creek Traction Power Supply Station Transformer					
Stamford Catenary Improvement (With Prj 135-301 Atlantic St. Bridge)					
Station Grounding & Bonding					
Powell Circuit Breaker Replacement and Refurbishment					
New Haven Cut Fence Repair - Howard Ave Substation					
NHL Shops & Yards	**NHL**	**$168,750,000**	**C, D**	**CTDOT, Federal grants**	**Short-Range**
CMV Shed at Stamford and Bridgeport					
Danbury Fueling Facility					
Replacement of Catenary for Stamford Yard Leads & Car Wash Facility					
Stamford MOE Facility Improvements					
Stamford MOW Yard (Passenger Yard)					
New Haven Yard Master Program	**NHL**	**$1,130,000,000**	**C, D**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Car Wash					
CSR/Diesel Shop Roof					
Final Track Completion					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Mainline Signal System Mods					
Modification of New Haven Yard to include 50's and 80's yards					
NHY - Design and Program Management					
NHY-Master Complex					
Parking Garage					
Pedestrian Bridge					
Running Repair Shop Upgrades					
Service and Inspection Shop					
Transportation & Engineering Building Expansion					
West End Yard, East End Yard, East End Connector					
Wheel Mill Facility Rehabilitation					
WBL					
WBL Improvements	**WBL**	**$120,282,000**	**B, C, D, E, F, G, H**	**CTDOT, Federal grants**	**Short-Range**
Derby/Shelton Platform & Bus Transit Facility Improvements					
Rehabilitation of Four Bridges on the Pan Am Line					
Relocation of Naugatuck Railroad Station					
Waterbury Branch High Level Platforms					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Waterbury Station Passenger Waiting Area Improvements					
DBL					
DBL Improvements	**DBL**	**$12,500,000**	**A, B, E, F, H**	**CTDOT, Federal grants**	**Short-Range**
Danbury Branch Slope and Track Stabilization (3 sites) (In Design)					
Merritt 7 Station (In Construction)					
HFL					
HFL Improvements	**HFL**	**$920,800,000**	**C, F, G**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Enfield Station					
Hartford Line BMW Station Network Connectivity					
Hartford Line Double Track (Phase 3B)					
Hartford Station Relocation (Associated with I-84 Viaduct Relocation)					
Hartford Line Sealed Corridor Program					
Hartford Union Station Canopy (Platform Room Project)					
Hartford Yard: Additional Storage and MOE Capacity					
Newington Station					
North Haven Station					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
West Hartford Station					
Windsor Locks Station					
Windsor Station					
SLE					
SLE Improvements	**SLE**	**$142,200,000**	**B, E, F, G**	**CTDOT, Federal grants**	**Short-Range, Long-Range**
Clinton Station					
Madison RR Station Ped. Bridge & North Platform					
New London PIDS & ADA Improvements					
New London Track 6 Electrification					
Shore Line East Power Supply Upgrade					
Statewide					
Statewide	**Statewide**	**$212,379,719**	**B, E**	**CTDOT, Federal grants**	**Short-Range**
5G Program					
Asset Management Program					
Positive Train Control (PTC)					
Rail Maintenance Facilities SOGR					
Transportation Enterprise Database (TED)					
Wi-Fi on Trains					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
Code Compliance Upgrades of Rail Maintenance Facilities					
Amtrak					
Related Projects (Amtrak)		**$1,263,400,000**	**A, B, D, H**	**Amtrak, Federal grants**	**Long-Range**
Brook Interlocking Improvement (Old Saybrook)					
Connecticut River Bridge Replacement					
Fitter Interlocking (Amtrak)					
Guilford Interlocking Renewal					
Mystic, CT Interlocking Improvements					
New England Grade Crossing Elimination Program: Elihue Island Rd.					
New England Grade Crossing Elimination Program: Latimer Point Rd.					
New England Grade Crossing Elimination Program: Miner Lane					
New England Grade Crossing Elimination Program: Wamphassuc Rd.					
New Haven – New Rochelle NEC Capacity & Trip Time Planning Study					
New Haven – Providence Capacity Planning Study					
New London Station Safety Improvements					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
NHL Passing Sidings: One new passing siding between CP-241 (S. Norwalk) and CP-255 (Bridgeport)					
SPG: Connecticut River Bridge Replacement & Station					
Springfield High-Level Platform: Completion of second high platform at Springfield					
Springfield Yard: New storage for Amtrak Regionals					
Off-System					
Vision 2050	**Statewide**	**TBD**	**A, C, D, G, I**	**TBD**	**TBD**
DLB Upgrade to 70 mph					
East-West Rail: Connections via Springfield to Albany, NY and Boston, MA					
Electrification of Branch Lines (Hartford Line, Waterbury Line, Danbury Line)					
Expand Fleet, Shops & Yards to Support High-Speed, Electric & Express Services					
HLF Upgrade Speeds to 150 mph between New Haven and Hartford					
New 220 mph HSR in Central CT					
New Canaan Line Double Track and Increase Speeds					
NHL Upgrade Mainline Speeds between Greenwich and New Haven					

Project	Rail Line	Funding	Benefit Type	Funding Source	Project Timeline
SLE Service Extension to Rhode Island					
WBL Connection to HFL					
Planning Studies	**Statewide**	**TBD**	**C, D**	**TBD**	**TBD**
Eastern CT Rail Plan					
Eastern CT Yard					
Electrification Study for CT Rail System					
NHL High Speed Study - Fairfield to Stratford					
Waterbury Yard					
Yard and Facility Expansion Program					
CTrail Fleet		**$940,000,000**	**B, C, D, E**	**CTDOT, Federal grants**	**Short-Range**
CTrail: 60 Coaches					
CTrail: 72 Coaches					
Rail Fleet (New Locomotives)					
MNR Fleet	**MNR**	**$340,000,000**	**B, C, E**	**MNR, CTDOT, Federal grants**	**Long-Range**
MNR - 6 Dual Mode Locomotives					
MNR - Replace 50 Bombardier Coaches					
Bruce Brook Culvert, Dam Removal					

Appendix F. Freight Rail Projects List

Table F-1. Freight Railroad Abbreviations

Abbreviation	Name of Railroad
BSRR	Branford Steam
CNZR	Central New England Railroad
CSOR	Connecticut Southern Railroad
HRRC	Housatonic Railroad Company
NAUG	Naugatuck Railroad Company
NECR	New England Central Railroad
PAS	Pan Am Southern Railroad
P&W	Providence and Worcester
VRR	Valley Railroad

Table F-2. Freight Rail Project List

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
BSRR	Rolling Stock	North Branford	TBD	Facilities and Equipment	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 2.9 to 3.1	$168,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 3.6 to 3.9	$252,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 4.3 to 4.6	$252,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 4.9 to 5	$84,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 5.5 to 5.7	$168,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 7.4 to 7.87	$152,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP .63 to .83	$300,326	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP .63 to .83	$152,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 5.3 to 5.7	$600,652	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 5.3 to 5.7	$152,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 5.1 to 5.15	$70,000	Track and Bridges	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
CNZR	Rail Track Program	MP 5.1	$84,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 11.9 to 13.07	$1,756,909	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 13.08 to 13.91	$1,333,886	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 13.91 to 15.7	$2,441,012	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 15.7 to 16.62	$555,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 2.5 to 4	$2,461,424	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 4.1 to 4.6	$825,055	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 4.9 to 7.4	$628,427	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 7.4 to 8.2	$548,756	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	Griffin Line	$315,400	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 4.3	$82,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 11.67 to 11.9	$164,000	Track and Bridges	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
CNZR	Rail Track Program	MP 11.67 to 11.9	$175,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 18.1	$82,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 16.8 to 16.9	$82,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 19.8 to 20.1	$164,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 19.8 to 20.1	$448,350	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 6.77 to 11.9	$6,802,820	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	MP 16.78 to 20.3	$4,655,263	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	system wide	$1,000,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Rail Track Program	system wide	$750,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Bridges	MP 16.8	$45,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Bridges	system wide	$1,509,400	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Crossings	system wide	$5,200,390	Control Systems	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
CNZR	Crossings	Rte. 140 and Rte. 191	$1,100,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Crossings	Rte. 190 and Rte. 220	$1,170,000	Control Systems	Railroad operating revenues, Federal grant
CNZR	Crossings	MP 6.77	$235,750	Control Systems	Railroad operating revenues, Federal grant
CNZR	Communications and Signals	Griffin Line	$191,540	Control Systems	Railroad operating revenues, Federal grant
CNZR	Facilities/ Yards	East Windsor	$4,350,000	Facilities and Equipment	Railroad operating revenues, Federal grant
CNZR	Rolling Stock	n/a	$1,950,300	Facilities and Equipment	Railroad operating revenues, Federal grant
CNZR	Studies	system wide	$400,000	Studies	Railroad operating revenues, Federal grant
CNZR	Security	system wide	$550,000	Safety	Railroad operating revenues, Federal grant
CNZR	Other	Windsor and Windsor Locks	$8,000,000	Track and Bridges	Railroad operating revenues, Federal grant
CNZR	Other	system wide	$500,000	Studies	Railroad operating revenues, Federal grant
HRRC	Priority 1Rail Track Program	Berkshire Line-Canaan to Berkshire Junction	$10,000,000	Safety	Railroad operating revenues, Federal grant
HRRC	Priority 1 Rail Track Program	Berkshire Line - Canaan	$2,080,000	Track and Bridges	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
HRRC	Priority 1 Rail Track Program	Berkshire Line - Canaan	$400,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 1 Rail Track Program	Berkshire Line - Canaan	$370,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 1 Rail Track Program	Berkshire Line - Canaan	$2,888,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 1 Rail Track Program	Berkshire Junction Maybrook Line Danbury Station to Hawleyville - 6.5 miles, 10 track miles	$5,000,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 2 Rail Track Program	Berkshire Line Canaan to New Milford	$28,000,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 2	Berkshire Line New Milford to Berkshire Jct.	$11,000,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 1 Passenger Service	Danbury to New Milford	$60,000,000	Track and Bridges	Railroad operating revenues, Federal grant
HRRC	Priority 2 Facilities/ Yards	Canaan	$300,000	Facilities and Equipment	Railroad operating revenues, Federal grant
Naugatuck	Bridge	Jericho Bridge over Naugatuck River, Watertown/Thomaston .	$775,000	Track and Bridges	Railroad operating revenues, Federal grant
Naugatuck	Bridge	Chase Bridge over Naugatuck River, Waterbury/Watertown	$735,000	Track and Bridges	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
Naugatuck	Track Program		$4,375,000	Track and Bridges	Railroad operating revenues, Federal grant
Naugatuck	Rail Replacement	MP 1.5 to 2.4, 0 to 1.5, and 9 to 15.6	$2,337,216	Track and Bridges	Railroad operating revenues, Federal grant
CSOR	Priority 3 Rail Track Program	All CSO subdivisions-Suffield, Wethersfield, Manchester, Windsor, & Bradley	$2,625,000	Track and Bridges	Railroad operating revenues, Federal grant
CSOR	Priority 4 Switch Tie Program	All CSO subdivisions-Suffield, Wethersfield, Manchester, Windsor, & Bradley	$500,000	Control Systems	Railroad operating revenues, Federal grant
CSOR	Priority 6 Yard	Hartford Yard, rebuild switches	$450,000	Facilities and Equipment	Railroad operating revenues, Federal grant
CSOR	Priority 9 Crossings	Bradley, Manchester, and Wethersfield Subdivisions.	$450,000	Safety	Railroad operating revenues, Federal grant
NECR	Priority 3 Rail Track Program	MA State Line, MP 55, near Palmer, MA to New London, CT	$5,150,000	Track and Bridges	Railroad operating revenues, Federal grant
NECR	Priority 3 Rail Track Program	MA State Line, MP 55, near Palmer, MA to New London, CT	$3,200,000	Track and Bridges	Railroad operating revenues, Federal grant
NECR	Priority 6 Rail Bridges	MA State Line, MP 55, near Palmer, MA to New London, CT	$3,993,500	Track and Bridges	Railroad operating revenues, Federal grant

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Potential Funding Source(s)
NECR	Priority 8 Culverts/Drainage	MA State Line, MP 55, near Palmer, MA to New London, CT	$700,000	Track and Bridges	Railroad operating revenues, Federal grant
P&W	Priority 3 Track Program	Norwich Branch MP 1 to MP 14	$1,302,000	Track and Bridges	Railroad operating revenues, Federal grant
P&W	Priority 8 Track Program/ Maximizing Middletown	Middletown Branch MP 28.75 to MP 35.88	$7,800,000	Track and Bridges	Railroad operating revenues, Federal grant

Table F-3. Freight Rail Long-Range and Vision Project List

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
PAS	Priority 1 Waterbury Branch Crosstie Replacement Program	Waterbury to Berlin	$15,000,000	Track and Bridges	Vision
PAS	Priority 1 (a) Waterbury Branch Track Surfacing In support of tie installation	Waterbury to Berlin	$2,400,000	Track and Bridges	Vision
PAS	Select CWR installation –Priority 1 Line Segment is complicated with the advent of the proposed Busway	New Britain	$1,500,000	Track and Bridges	Long-Range
PAS	Crossings –essential system safety priority projects - 1	Waterbury to Berlin	$7,500,000	Safety	Vision
PAS	Waterbury Branch Rail Program Priority 2	Waterbury to Berlin	$16,000,000	Track and Bridges	Vision
PAS	Select CWR installation –Priority 2	Bristol	$1,600,000	Track and Bridges	Long-Range
PAS	Select CWR installation –Priority 3	Plymouth	$1,000,000	Track and Bridges	Long-Range
PAS	Advance Freight Rail Support Facilities/ Yards	Plainville	$3,000,000	Facilities and Equipment	Long-Range
PAS	Alleviate rail initiated interference in Plainville at Route 372 (E. Main) and Route 10 (East St.)	Plainville	$500,000	Control Systems	Long-Range
PAS	Advance Freight Rail Support Facilities/ Yards	Waterbury	$5,000,000	Facilities and Equipment	Long-Range
PAS	Clearance Restrictions	Waterbury to Berlin	$3,000,000	Control Systems	Vision
PAS	Bridge Strengthening or Replacement	Waterbury to Berlin	$20,000,000	Track and Bridges	Vision

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
BSRR	Track Maintenance	North Branford	$2,510,000	Track and Bridges	Vision
BSRR	Track Expansion	North Branford	$300,000	Facilities and Equipment	Long-Range
CNZR	Rail Track Program	Armory line	TBD	Track and Bridges	Vision
CNZR	Rail Track Program	East Windsor	TBD	Track and Bridges	Vision
CNZR	Rail Track Program	Hartford Union Station To Griffin Line	TBD	Track and Bridges	Vision
CNZR	Rolling Stock	n/a	TBD	Facilities and Equipment	Vision
CNZR	Rolling Stock	n/a	TBD	Facilities and Equipment	Vision
CNZR	Rolling Stock	n/a	TBD	Facilities and Equipment	Vision
HRRC	Priority 2 Crossings	Main lines from Canaan to Danbury and Danbury to Derby	$20,000,000	Control Systems	Long-Range
HRRC	Priority 2 Rail and Track	Maybrook Line Hawleyville to Derby Jct.	$15,000,000	Track and Bridges	Long-Range
HRRC	Priority 2 Culverts/ Drainage	Main lines from Canaan to Danbury and Danbury to Derby	$12,000,000	Track and Bridges	Long-Range
HRRC	Priority 2 Rail and Track	Maybrook Line Danbury Station to NY state line	$6,000,000	Track and Bridges	Long-Range

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
HRRC	Priority 2 Passenger Service	Berkshire Line MA State Line to New Milford and beyond	$90,000,000	Track and Bridges	Long-Range
VRR	Rail Track Program Priority 1	Old Saybrook-Haddam running track MP 0-MP 13.25	$880,000	Track and Bridges	Long-Range
VRR	Rail Track Program Priority 1	Old Saybrook-Haddam running track MP 0-MP 13.25	$300,667	Track and Bridges	Long-Range
VRR	Rail Track Program Priority 1	All trackage from Essex north yard limit to Deep River yard, north limit	TBD	Track and Bridges	Vision
VRR	Rail Track Program Priority 1	All trackage from Deep River north yard limit to north Chester	TBD	Track and Bridges	Vision
VRR	Rail Track Program Priority 1	All trackage from north Chester to end of currently operable track in Haddam	TBD	Track and Bridges	Vision
VRR	Rail Track Program Priority 2	Southern active trackage	TBD	Track and Bridges	Vision
VRR	Rail Track Program Priority 2	Essex yard trackage	TBD	Track and Bridges	Vision
VRR	Rail Track Program Priority 2	Various locations of worn and/or small rail sections	$366,667	Track and Bridges	Long-Range
VRR	Rail Track Program Priority 2	Various locations of worn and/or small rail sections	$366,667	Track and Bridges	Long-Range
VRR	State of Good Repair Priority 1	State of Good Repair (15 year) program	TBD	Track and Bridges	Vision

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
VRR	Vegetation Control Priority 1	Old Saybrook-Haddam running track MP 0-MP13.25, spray MP 13.25-22.0	$35,200	Track and Bridges	Long-Range
VRR	Other Priority 1	All operable track, Old Saybrook to Haddam	TBD	Track and Bridges	Vision
VRR	Bridges Priority 1	7 bridges between Essex and Haddam	$233,000	Track and Bridges	Long-Range
VRR	Crossings Priority 1	Various locations on running track, public and/or private crossings	$440,000	Track and Bridges	Long-Range
VRR	Crossings Priority 2	Essex Transfer Station Road, Essex	$110,000	Facilities and Equipment	Long-Range
VRR	Crossings Priority 3	Kirtland Street, Deep River and Parker's Point Road, Chester	$110,000	Control Systems	Long-Range
VRR	Communications and Signals Priority 3	Various locations at the 12 automated crossings, 1 set every two years	$22,000	Control Systems	Long-Range
CSOR	Priority 2 Upgrade Rail	Windsor Subdivision	$360,000	Track and Bridges	Long-Range
CSOR	Priority 3 Locomotives	NA	$600,000	Facilities and Equipment	Vision
CSOR	Priority 3 Rail Track Program	All CSO subdivisions-Suffield, Wethersfield, Manchester, Windsor, & Bradley	$7,094,190	Track and Bridges	Long-Range
CSOR	Priority 5 Bradley Spur	Bradley Spur	$100,000	Track and Bridges	Vision

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
CSOR	Priority 5 Bradley Spur	Bradley Spur	$220,000	Track and Bridges	Vision
CSOR	Priority 7 Ditching	Windsor and Manchester Subdivisions.	$400,000	Track and Bridges	Vision
CSOR	Priority 7 Bridges	Amtrak Main Line between MA state line and New Haven- Conn R Bridge & Hartford Viaduct	$65,000,000	Track and Bridges	Vision
CSOR	Priority 8 Bridges	Manchester and Suffield Subdivision bridges	$253,000	Track and Bridges	Vision
CSOR	Priority 10	Hartford Diamond Crossing	$195,000	Safety	Vision
CSOR	Other	CRRA in Hartford	$1,500,000	Track and Bridges	Vision
CSOR	Other Studies	Windsor to Bradley Field	$850,000	Studies	Vision
CSOR	Priority 11	Manchester Sub	$1,393,920	Track and Bridges	Long-Range
NECR	Priority 2 Upgrade Rail	MA State Line, MP 55, near Palmer, MA to New London, CT	$10,000,000	Track and Bridges	Long-Range
NECR	Priority 4 Rail Track Program	MA State Line, MP 55, near Palmer, MA to New London, CT	$6,900,000	Track and Bridges	Vision
NECR	Priority 9 Other	M.P. 55 and M.P. 43	$150,000	Control Systems	Vision
NECR	Other Study	MA State Line, MP 55, near Palmer, MA to New London, CT	$850,000	Studies	Vision

Railroad	Project	Project Location	Total Cost (2021$)	Project Type	Project Timeline
NECR	Other Study	System wide	$750,000	Studies	Vision
NECR	Other Study	Willimantic to Manchester, CT	$900,000	Studies	Vision
NECR	Other Study	MA State Line, MP 55, near Palmer, MA to New London, CT	$550,000	Studies	Vision
P&W	Priority 1 Bridge	Norwich, CT Bridge 12.14 over the Shetucket River	$6,500,000	Track and Bridges	Vision
P&W	Priority 2 Track Program	Plainfield, CT	$2,700,000	Track and Bridges	Vision
P&W	Priority 4 Other	Putnam to Willimantic	$2,000,000	Track and Bridges	Vision
P&W	Priority 9 Track Program	Middletown Branch MP 15.00 to MP 21	$2,500,000	Track and Bridges	Long-Range
P&W	Priority 12 Facilities/ Yards	Putnam , CT	$1,000,000	Facilities and Equipment	Vision
P&W	Priority 13 Track Program	Middletown Branch MP 28.75 to MP 35.88	$2,900,000	Track and Bridges	Long-Range

Appendix G. Other Notable Studies

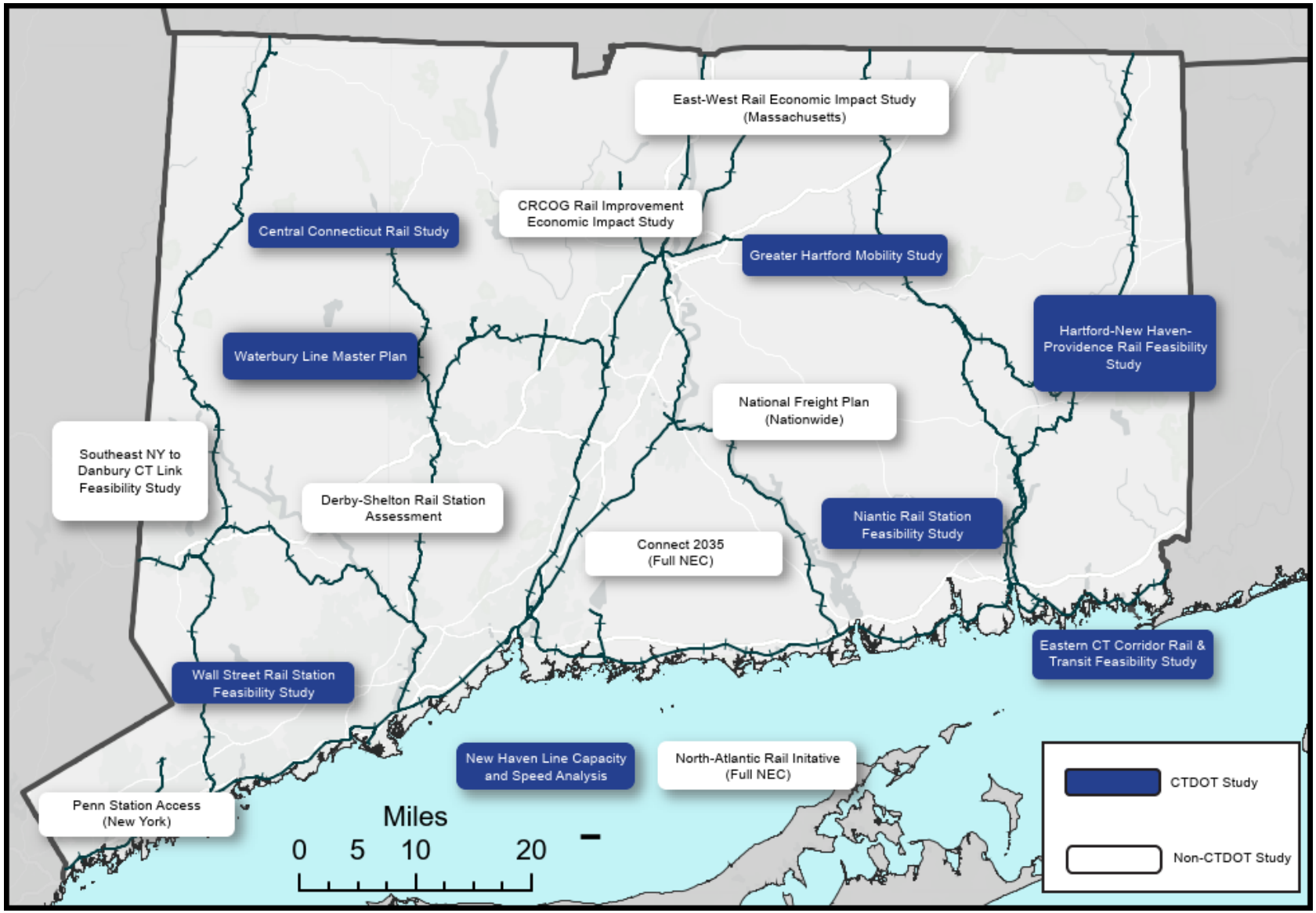
G.1 CTDOT Studies

- Greater Hartford Mobility Study
- Hartford-New Haven-Providence Rail Feasibility Study
- Niantic Rail Station Feasibility Study
- Wall Street Rail Station Feasibility Study
- Conceptual Electrification Study
- Battery-Powered Locomotive Feasibility Study

G.2 Non-CTDOT Studies

- East-West Rail Economic Impact Study (Massachusetts)
- CRCOG Rail Improvement Economic Impact Study
- National Freight Plan (nationwide)
- Southeast, NY to Danbury, CT Link Feasibility Study
- Derby-Shelton Rail Station Assessment
- Connect 2035 (Full NEC)
- North-Atlantic Rail Initiative (Full NEC)
- Penn Station Access (New York)

Figure G-1. Ongoing Studies



Appendix H. Existing Conditions Details

H.1 Rail Mileage by Branch

Table H-1. Rail Line Mileage by Branch

Rail Line Branch	Length Miles (in CT)	Public Owner Miles	Private Owner Miles
New Haven Line	46.8	46.8	0
New Canaan Line	7.9	7.9	0
Danbury Line	24.2	24.2	0
Waterbury Line	27.1	27.1	0
Shore Line	68.2	68.2	0
Derby Branch (Maybrook)	33.5	0	33.5
Berkshire Line	50	50	0
North Canaan Industrial Track	0.5	0	0
Torrington Branch	19.5	19.5	0
Terryville Secondary (Waterbury Branch)	24.3	24.3	0
Waterbury Industrial Track (Tilcon) and Watertown Branch	1	1	0
Canal Line	3.9	3.9	0
Hartford Line	54.3	54.3	0
Middletown Secondary - 1	4.8	0	4.8
Bradley Spur	2.4	2.4	0
Middleton Secondary - 2	10.2	0	10.2
Middletown Secondary - 3	7.3	7.3	0
Wethersfield Secondary (HFD) - 1	13.6	13.6	0
East Berlin Track	1.1	1.1	0
Portland Track	1	1	0
Laurel Track	5.5	5.5	0
Branford Steam	7.2	0	7.2
Valley Line	22.5	22.5	0
Palmer Line	55.8	0	55.8
Plainfield Secondary (Norwich)	53.2	0	53.2

Rail Line Branch	Length Miles (in CT)	Public Owner Miles	Private Owner Miles
Groton Old Main	3.1	0	3.1
Belle Dock/Waterfront Street	2.2	1.4	0.8
Willimantic Secondary - 1	10.8	0	10.8
Griffins Industrial Track	8.7	8.7	0
Armory Branch (East Windsor Secondary)	20.3	20.3	0
Manchester Secondary	9.6	0	9.6
Suffield Branch	4.4	0	4.4
Wethersfield Secondary (HFD) - 2	3	0	3
Regional Market (HFD)	1.5	1.5	0
Willimantic Secondary - 2	12.5	12.5	0
Plainfield Spur	1	1	0
Windham to Columbia	0.4	0.4	0
Stratford Industrial Track	2.7	0	2.7
Bristol - Terryville Loop Track	1	0	1
Bristol Spur (City of Bristol) - Terryville Loop Track	2	2	0
Total	**629**	**428.4**	**200.1**

Source: Source CTDOT Rail Ownership Map, 2013

H.1.1 NEC Amtrak Locomotive Details

All NEC Amtrak trains running on the Boston-Washington main line are electric powered from an overhead catenary system. Amtrak intercity service on the Hartford Line uses diesel-powered locomotives. Amtrak Northeast Regional and Vermonter service features newly-refurbished Amfleet coach and business class cars plus café service on most trains.[54] The Valley Flyer and Hartford Line services use these cars, without the business class and café car. The high-speed premium Acela service features first class, business class, and café service on all trains.[55]

Amtrak uses Siemens ACS-64 electric locomotives and General Electric P-42DC diesel locomotives on their services in Connecticut (**Figure H-1**). The Amtrak P-42DC fleet is scheduled to be replaced with new Siemens ALC-42 diesel locomotives beginning in 2022. Acela trainsets use dedicated power units at each end of the train consist and thus do not require separate locomotives. Amtrak Maintenance-of-Equipment forces at New Haven perform locomotive servicing, light repairs, and inspections on Amtrak trains and locomotives.

[54] Amtrak recently announced a major fleet replacement program, with an order for single-level Venture coaches from Siemens that will facilitate eventual replacement of the Budd-built Amfleet coaches.
[55] New Acela trainsets are on order, and Amtrak is expecting to place them into service in early 2022.

Figure H-1. Amtrak Locomotive

Source: CTDOT

Hartford Line service is operated with a fleet of 16 Messerschmitt-Bolkow-Blohm (MBB) single-level push-pull coaches leased from the MBTA, supplemented as needed by a fleet of Mafersa-built single-level push-pull coaches owned by CTDOT. These cars are pushed/pulled using one of six Electro-Motive built locomotives (GP-40-3H) or twelve General Electric built Genesis locomotives (P-40DC) (**Figure H-2**).[56] These locomotives are currently being overhauled.

Amtrak facilities in Connecticut include Maintenance of Equipment shops located in New Haven Yard. These facilities and their staff handle servicing, inspection, and light repair of locomotives and railcars. Adding to Amtrak's support abilities is the Hamden Maintenance of Way Base at Cedar Hill Yard, serving Maintenance of Way operations plus Communication and Signal infrastructure on both the NEC and the Hartford Line.

[56] These locomotives are shared with the Shore Line East commuter line.

Figure H-2. General Electric P-40DC Locomotive

Source: CTDOT

H.1.2 Commuter Line Locomotive Details

Both commuter services, including the SLE and New Haven line use similar equipment. Collectively, CTDOT owns 357 rail vehicles (rolling stock units), the majority of which are EMUs for the New Haven. Shore Line East, and New Canaan Lines (274 Kawasaki M8s).[57] Additionally, the commuter system inventory includes 28 locomotives and 83 passenger coaches. Of the 83 passenger coaches, 50 are Bombardier-built used primarily on the Danbury and Waterbury Lines and the remaining 33 are Mafersa-built coaches operating on the HL and on SLE as necessary.[58]

The M8 fleet of cars are critical to the commuter rail service since they increase reliability, address service and ridership demand, and meet the requirements of the ADA. The rail cars can presently store two bicycles per M8 rail car. The open space areas adjacent to the vestibules are equipped with anchored eyelets, enabling passengers to securely fasten bikes inside the rail car. This open area is also the same space that passengers utilizing wheelchairs position themselves while onboard. (Wheelchair needs are given priority).

The Danbury and Waterbury Lines are not electrified, and they rely on diesel or dual-mode locomotives for propulsion. The Genesis Dual-Mode Locomotive (P-32DM) is the primary locomotive used on the Danbury Branch. It is a dual mode diesel-electric/electric locomotive using diesel-power in CT and electric power once near New York City. While electric compatible, the locomotive does so using a third

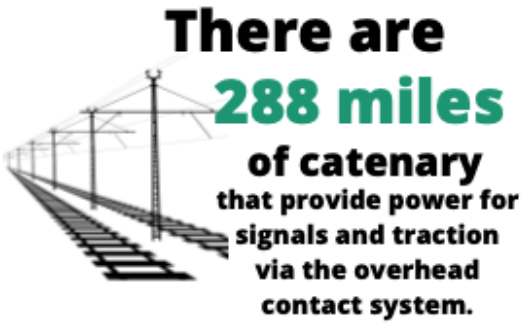
[57] Kawasaki us under contract to produce up to 380 M8s.
[58] CTDOT is in the process of phasing out diesel operations on the SLE and at the time of this plan's creation, M8s had just begun operation on the SLE.

rail, not overhead power. This means it does not have the capability to operate on the overhead catenary on the NHL in Connecticut. The Waterbury line uses one of six Connecticut-owned, new reduced-emissions locomotives manufactured by Brookville Locomotive Company (BL-20) (**Figure H-3**). The BL-20s are used on the branch lines or as switcher locomotives. The locomotives are diesel-powered only.

Figure H-3. BL-20 at New Haven Station

Source: CTDOT

Figure H-4. Overhead Catenary System Information



The entire Main Line and New Canaan Line have an overhead catenary system that provides the primary source of electric power for over 90 percent of the trains operated in daily service. In Connecticut, it is 100 percent overhead catenary (A.C.) power collection and there are a collective, 288 miles of catenary equipment (**Figure H-4**).

The system is a nominal 13.2 kV (kilovolts) at 60 Hz (hertz). The electric utility company supplies power to three commercial power supply points at Cos Cob (Greenwich), Sasco Creek (Westport), and Devon (Milford). The Cos Cob West Supply Substation Upgrade Project was completed in 2013. This project included Phase 1 and Phase 2 of the necessary upgrades to the Cos Cob West Supply Substation. Phase 1 included the design of the signal power feeders, additional feeders, preliminary design, and procurement for two transformers and the design of modifications to the MNR/CTDOT signal power yard. Phase 2 included construction of the Signal Power feeders, final

design activities associated with the outage coordination/staging and construction of additional feeders to the signal power yard and to substation 309, as well as the construction of the necessary modifications to the signal power yard. The 13 wayside substations are spaced approximately five miles apart over 72 miles of the NHL. These facilities also allow the entire traction power system to be sectionalized.

While the entire Connection portion of the system has overhead catenary wires, the power system switches to electrified third rail in New York State. To accommodate this change M8 cars are fitted with collection "shoes" that conduct power from the wayside substations to the rail car for auxiliary and propulsion power. The M-8's are equipped to take power from both overhead catenary and third rail.

H.1.3 Amtrak Service Summary Table

Table H-2. Summary of Amtrak's Connecticut Services

Route	Distance	CT Stations	Trains/ Week Day	FRA Track Class	Shared with Freight?
Acela Express (Washington DC - Boston)	457	3	34	8, 7	Local Only
Northeast Regional (Washington DC - Boston)	682	13	56	8, 7	Local Only
Hartford Line (Hartford - Springfield)	62	8	14	6,4	Yes
Valley Flyer (New Haven - Greenfield)	102	8	2	6, 4, 3	Yes
Vermonter (Washington DC - St. Albans)	606	4	1	4, 4	Yes

H.2 Summary of Freight Facilities

H.2.1 Transload Facilities in Connecticut

Table H-3. Transload Facilities in Connecticut

Location	Transload Type	Serving Carrier	Terminal Operator
Hartford	Warehouse	CSO	Russo Brothers
Hawleyville	Bulk, Lumber	HRRC	Housatonic Railroad
Litchfield	Bulk	NAUG	Naugatuck Railroad
Manchester	Construction Materials	CSO	Tri-State Brick
New Haven	Metals	PW	Gateway Terminals
New Haven	Bulk	PW	Palumbo Trucking
New Haven	Marine Terminal	PW	Gateway Terminals
New London	Marine Terminal	NECR	Gateway Terminals

Location	Transload Type	Serving Carrier	Terminal Operator
North Haven	Bulk	CSX	TRANSFLO
Plainville	Bulk	PAS/CSX	Meyer Enterprises
South Windham	Lumber	NECR	CC Lounsbury
Torrington	Bulk	NAUG	Naugatuck Railroad
Yantic-Fitchville	Lumber	NECR	Can Am Trading

H.2.2 Deep-Water Ports in Connecticut

New London Harbor

New London Harbor includes waterfront facilities owned by several different entities. The State of Connecticut owns the Admiral Harold E. Shear State Pier (State Pier), the only maritime facility in New London Harbor capable of handling ships carrying dry cargo, as well as large passenger vessels. Gateway Terminal operates it under a lease agreement. The pier includes an intermodal facility, and it has a 1,000 PSF deck load capacity. This allows for the transfer of products, as well as other types of cargo between low bed/flatbed truck, rail car and ships or barges moored at the State Pier (**Figure H-5**).

Additionally, the harbor includes several city-owned properties including the New London City Pier, Customhouse Pier, and Waterfront Park. Additionally, the Cross Sound Ferry and Fisher Island Ferry District own and operate terminals in close proximity to the New London Railroad Station.

Figure H-5. Admiral Harold E. Shear State Pier

Connecticut is in the process of enhancing the harbor and on February 11, 2020, the Connecticut Port Authority (CPA), the state's quasi-public agency responsible for promoting and coordinating the

development of the state's ports and maritime industry, terminal operator Gateway Terminal, and joint venture partners Ørsted and Eversource finalized a harbor development agreement to redevelop State Pier in New London into a state-of-the-art heavy-lift capable port facility and bring hundreds of well-paying jobs to the area. This agreement includes enhanced rail service that will develop additional container feeder and short sea shipping cargo business.

New Haven Harbor

The Port of New Haven is the largest deep-water port in Connecticut. The port is located approximately one-quarter mile south of the reconfigured I-95 / I-91 Interchange (**Figure H-6**).

Figure H-6. Port of New Haven

Active, proximal rail exists at Gateway Terminal's Chapel Street Facility and on-dock rail is active at Gateway's Waterfront Street terminal, including the bio-diesel manufacturing facility operated by American Green Fuels. Genesee and Wyoming, via Providence and Worcester, provides rail service with connections to the Canadian National Railway, Canadian Pacific Railway, and Norfolk Southern Railway. Fifty-six acres of land are available for open storage. P&W currently accesses the port via a main track into the port area down Waterfront Street and has connections to the entire Port of New Haven facilities. The city of New Haven took a significant step toward enhancing use of the port with its establishment of the New Haven Port Authority (NHPA) in 2003. The NHPA governs the port district located on the east side of New Haven Harbor. The NHPA works closely with the privately-owned/operated terminals and the City of New Haven.

A new rail commodity is feedstock for biofuels, shipped in tank cars. Commodities traveling through the ports include metals, such as coil steel and steel billets. Biofuels are an additional commodity that is quickly increasing in volume, with the Port of New Haven serving one of the nation's largest producers.

Connecticut sees over 15 percent of all inbound rail shipments (by weight) to biofuels producers. The largest of these producers is located at the Port of New Haven.

Bridgeport Harbor

The Port of Bridgeport is the largest of Connecticut's ports, occupying 23 acres with 1,350 linear feet of waterfront. It has a 160-foot pier that accommodates vessels up to 300 feet in length, 60-foot beam, and 18-foot draft. Additionally, the port owns additional land that could be developed, should the need present itself. The Port of Bridgeport primarily handles domestic commodity traffic, or goods moving between Connecticut and other states. Additionally, it brings in small amounts of foreign goods, though this volume continues to shrink over time. In addition to providing freight support, the port also hosts the Bridgeport & Port Jefferson Steamboat Company, a ferry that moves passengers and cars between Bridgeport and Long Island.

H.3 Major Hubs

H.3.1 Bridgeport Station

Bridgeport is an ADA-compliant station served by commuter rail (NHL and SLE), Amtrak intercity passenger rail, 16 Greater Bridgeport Transit bus routes, intercity bus routes, and taxi services. The station is near the Port of Bridgeport. The Water Street dock and terminal (next to the train station), located in the Bridgeport Harbor, offers year-round ferry service for pedestrians and vehicles between Connecticut and Port Jefferson, Long Island, New York.

Figure H-7. Bridgeport Station

Source: CTDOT

Hartford Union Station is an ADA-compliant station serving Amtrak intercity passenger rail, six CT*transit* Bus routes, the CT*transit*-operated Star Shuttle downtown circulator, a Greyhound Bus terminal that offers bus service to Boston, New York City, and other points, and taxis. Passengers are also able to access the New Britain-Hartford Busway (Busway), a dedicated Bus Rapid Transit (BRT) facility along a 9.4-mile corridor between downtown New Britain and downtown Hartford.

The City of Hartford has also partnered with a Boston-based micromobility company, Link, to offer a scooter share program for those looking for alternative means of transportation. Scooters are docked in the downtown area and will soon be available around the city. They can be located and unlocked for a small fee using a mobile app. Fees are paid for each mile travelled on a scooter. Link scooters now provide Hartford Line riders another mode to get to and from the Station in an efficient manner.

Figure H-8. Multimodal Connections at Hartford Union Station

Source: CTDOT

H.3.2 New Haven Union Station

New Haven Union Station is an ADA-compliant station served by commuter (NHL and SLE) and intercity (HL and Amtrak) passenger rail. The station has numerous multi-modal connections including:

- Three CT*transit* bus routes that connect with the larger local and regional bus system at New Haven Green;
- Intercity bus operators
- Taxi and rental car services including rideshare companies; and
- Private shuttle bus systems for Yale, Mohegan Sun, and Foxwoods Casino.

New Haven has a growing bike culture and to support cyclists, the New Haven Parking Authority commissioned the design of a dedicated bicycle parking facility that includes new decorative lighting, fencing, racks and shelters.

Figure H-9. Commuter Rail (Left) and Intercity Rail (Right) Trains at New Haven Union Station

Source: CTDOT

H.3.3 New London Station

New London Station is an ADA-compliant station served by commuter rail service (SLE), Amtrak intercity passenger rail, eight (8) Southeast Area Transit District bus routes, intercity bus lines, traditional taxis and rideshare companies. The station is adjacent to Port of New London, the Cross Sound and Fisher's Island ferry terminals offering year-round ferry service to Orient Pt. Long Island, Fisher's Island, New York, and Block Island, RI (seasonal). The Mohegan Sun and Foxwoods casino bus services also serve the Cross Sound terminal.

Figure H-10. New London Station

Source: CTDOT

H.3.4 South Norwalk Station

South Norwalk Station is an ADA-compliant station served by commuter rail (NHL), three (3) bus routes, and eight (8) shuttle routes. The station also has two (2) electric vehicle chargers, taxi service, private vans, Connecticut Limo pick up and drop off, indoor and outdoor bike racks, and a café for both east and westbound commuters.

Figure H-11. Multimodal Connections at South Norwalk Station

H.3.5 Stamford Station

Stamford Station is an ADA-compliant station served by commuter rail (NHL and SLE), Amtrak intercity passenger rail, 16 CT*transit* bus routes, three CT*transit* Commuter Connection bus routes, intercity bus routes, taxis, and privately operated corporate shuttle bus services. There are four areas at the station with bicycle racks.

Figure H-12. Intercity Rail at Stamford Station

Source: CTDOT

H.4 Additional Amtrak Statistics

H.4.1 Amtrak Service Projections

Table H-4. Station-level Ridership Growth, 2019-2035, Existing Service Level Conditions

Station	2019			2035			2019-2035 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Windsor Locks	25,800	35,400	-	27,400	36,900	-	6.2%	4.2%	-
Windsor	16,900	58,600	-	18,100	60,900	-	7.1%	3.9%	-
Hartford	171,800	453,100	-	182,400	472,100	-	6.2%	4.2%	-
Berlin	19,900	50,800	-	21,000	52,500	-	5.5%	3.3%	-
Meriden	18,200	53,400	-	19,200	55,300	-	5.5%	3.6%	-
Wallingford	9,700	29,900	-	10,400	31,100	-	7.2%	4.0%	-
New Haven State Street	2,900	3,000	121,600	3,100	3,100	127,700	6.9%	3.3%	5.0%
New Haven Union Station	772,500	509,600	287,300	822,500	537,400	301,900	6.5%	5.5%	5.1%
Mystic	28,700	-	-	30,800	-	-	7.3%	-	-
New London	164,800	-	34,000	176,800	-	35,700	7.3%	-	5.0%
Old Saybrook	71,400	-	94,100	74,900	-	98,400	4.9%	-	4.6%
Westbrook	-	-	44,900	-	-	46,800	-	-	4.2%
Clinton	-	-	37,000	-	-	38,600	-	-	4.3%
Madison	-	-	74,100	-	-	77,800	-	-	5.0%
Guilford	-	-	79,000	-	-	83,400	-	-	5.6%
Branford	-	-	82,700	-	-	86,800	-	-	5.0%

Station	2019			2035			2019-2035 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Bridgeport	95,700	-	-	103,700	-	-	8.4%	-	-
Stamford	438,100	-	-	473,100	-	-	8.0%	-	-

Table H-5. Station-level Ridership Growth, 2019-2050, Existing Service Level Conditions

Station	2019			2050			2019-2050 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Windsor Locks	25,800	35,400	-	28,800	38,200	-	11.6%	7.9%	-
Windsor	16,900	58,600	-	19,000	63,000	-	12.4%	7.5%	-
Hartford	171,800	453,100	-	190,900	487,700	-	11.1%	7.6%	-
Berlin	19,900	50,800	-	21,900	54,000	-	10.1%	6.3%	-
Meriden	18,200	53,400	-	19,900	57,000	-	9.3%	6.7%	-
Wallingford	9,700	29,900	-	11,000	32,100	-	13.4%	7.4%	-
New Haven State Street	2,900	3,000	121,600	3,200	3,200	132,800	10.3%	6.7%	9.2%
New Haven Union Station	772,500	509,600	287,300	864,000	560,400	313,900	11.8%	10.0%	9.3%
Mystic	28,700	-	-	32,700	-	-	13.9%	-	-
New London	164,800	-	34,000	186,400	-	37,300	13.1%	-	9.7%
Old Saybrook	71,400	-	94,100	78,000	-	102,000	9.2%	-	8.4%
Westbrook	-	-	44,900	-	-	48,400	-	-	7.8%
Clinton	-	-	37,000	-	-	40,000	-	-	8.1%
Madison	-	-	74,100	-	-	80,900	-	-	9.2%
Guilford	-	-	79,000	-	-	86,900	-	-	10.0%
Branford	-	-	82,700	-	-	90,300	-	-	9.2%
Bridgeport	95,700	-	-	108,900	-	-	13.8%	-	-
Stamford	438,100	-	-	497,700	-	-	13.6%	-	-

H.4.2 Mean Distance Between Failures

Table H-6. Mean Distance Between Failures

Time Period	P-32 Locomotive		Coaches		EMU· MS		BL-20 Locomotive	
	Result	Target	Result	Target	Result	Target	Result	Target
2016-CY-Ql	25,482	30,000	284,137	295,000			29,521	13,000
2016-CY-Q2	23,927	30,000	153,308	295,000			59,316	13,000
2016-CY-Q3	21,612	30,000	423,540	295,000			24,576	13,000
2016-CY-Q4	28,736	30,000	432,431	295,000			27,369	13,000
2017-CY-Ql	36,756	27,000	383,973	260,000	309,163	350,000	41,081	13,000
2017-CY-Q2	22,559	27,000	291,696	260,000	367,408	350,000	19,212	13,000
2017-CY-Q3	22,848	27,000	550,305	260,000	371,141	350,000	34,180	13,000
2017-CY-Q4	22,709	27,000	243,948	260,000	223,312	350,000	22,939	13,000
2018-CY-Ql	19,791	27,000	353,184	260,000	352,432	350,000	21,538	13,000
2018-CY-Q2	18,431	27,000	161,587	260,000	256,966	350,000	13,666	13,000
2018-CY-Q3	13,402	27,000	94,238	260,000	138,682	350,000	15,841	13,000
2018-CY-Q4	22,939	27,000	198,013	260,000	209,153	350,000	13,563	13,000
2019-CY-Ql	42,641	21,000	305,355	200,000	222,168	280,000	35,262	13,000
2019-CY-Q2	55,206	21,000	535,728	200,000	713,168	280,000	128,012	13,000
2019-CY-Q3	25,970	21,000	207,664	200,000	314,594	280,000	25,364	13,000
2019-CY-Q4	40,749	21,000	238,636	200,000	529,464	280,000	21,501	13,000
2020-CY-Ql	37,104	21,000	265,107	205,000	364,116	285,000	18,454	13,000
2020-CY-Q2	37,104	21,000	437,586	205,000	530,833	285,000	14,839	13,000

Time Period	P-32 Locomotive		Coaches		EMU· MS		BL-20 Locomotive	
	Result	Target	Result	Target	Result	Target	Result	Target
2020-CY-Q3	24,838	21,000	495,212	205,000	1,138,637	285,000	10,736	13,000
2020-CY-Q4	37,792	21,000	359,811	205,000	791,014	285,000	15,938	13,000
2021-CY-Ql	36,741	21,000	356,966	210,000	98,050	290,000	21,812	13,000
2021-CY-Q2	29,095	21,000	360,192	210,000	118,073	290,000	21,968	13,000
2021-CY-Q3	27,732	21,000	333,820	210,000	273,137	290,000	8,867	13,000
2021-CY-Q4	34,040	21,000	263,280	210,000	522,786	290,000	24,282	13,000

H.4.3 Amtrak Boardings and Alightings

Table H-7. Amtrak Boardings and Alightings at Connecticut Stations

Station	Total Boardings & Alightings
New Haven Union Station	778,534
Stamford	429,103
Hartford Union Station	172,178
New London	164,454
Bridgeport	94,551
Old Saybrook	70,366
Mystic	28,662
Windsor Locks	25,408
Berlin	19,904
Meriden	17,676
Windsor	16,717
Wallingford	9,305
New Haven - State Street Station	2,912

Source: Amtrak Government Affairs; May 2019

H.4.4 Certified Schedule

Table H-8. Certified Schedule

Host Railroad	Certified	Uncertified	Disputed	Total
Amtrak	333	0	0	333
BNSF Railway	75	0	6	81
Buckingham Branch Railroad	2	0	0	2
Canadian National	20	0	8	28
Canadian Pacific	25	0	0	25
Central Florida Rail Corridor (Florida Rail)	6	0	0	6
CSX Transportation	44	0	10	54
Massachusetts Bay Transportation Authority	22	0	0	22
Massachusetts Department of Transportation	12	0	0	12
Metra	19	0	0	19

Host Railroad	Certified	Uncertified	Disputed	Total
Metro-North Railroad	89	40	0	129
Michigan Department of Transportation	8	0	0	8
New England Central Railroad	4	0	0	4
New Mexico Department of Transportation	2	0	0	2
Norfolk Southern	22	0	21	43
North County Transit District (San Diego Northern)	37	0	0	37
Pan Am Railways	20	0	0	20
South Florida Regional Transportation Authority (Florida Department of Transportation)	4	0	0	4
Southern California Regional Rail Authority	44	0	0	44
Trinity Railway Express	2	0	0	2
Union Pacific Railroad	98	0	6	104
Vermont Railway	6	0	0	6
Total	**894**	**40**	**51**	**985**
Percentage (%)	**91**	**4**	**5**	**100**

Source: FRA Quarterly Report FY21Q4

H.4.5 Station Performance

The station performance metric measures the average number of late customers relative to all customers alighting from a train (**Table H-9**). Data from Amtrak's FY21 Q4 Station Performance Metrics report indicates that New Haven, Hartford, and Stamford are the stations that have the latest passengers exiting a train. This makes sense given that they are major hubs for other connections. Additionally, stations where passengers typically are running the most late are Mystic, New London and Windsor.

Table H-9. Amtrak Station Performance Metrics

Arrival Station Name	Total Detraining Customers	Late Detraining Customers	Average Minutes Late
Berlin, Connecticut	1,963	369	38
Bridgeport, Connecticut	9,692	1,685	38
Hartford, Connecticut	15,930	3,149	34
Meriden, Connecticut	1,867	326	32
Mystic, Connecticut	3,009	535	40
New Haven (State Street Station), Connecticut	1,774	205	37

Arrival Station Name	Total Detraining Customers	Late Detraining Customers	Average Minutes Late
New Haven (Union Station), Connecticut	61,046	7,633	35
New London, Connecticut	16,154	2,938	39
Stamford, Connecticut	25,536	4,490	36
Wallingford, Connecticut	728	74	35
Windsor Locks, Connecticut	2,190	521	35
Windsor, Connecticut	1,359	241	39

Source: Amtrak FY21 Q4 Station Performance Metrics

H.5 At-Grade Highway-Rail Crossings in Connecticut

Table H-10. Total At-Grade Highway-Rail Crossings in Connecticut

County	Total		Private Vehicle		Public Vehicle	
	Count	Percent	Count	Percent	Count	Percent
Fairfield	75	12.2	28	4.5	47	7.6
Hartford	142	23.1	36	5.8	106	17.2
Litchfield	85	13.8	42	6.8	43	7
Middlesex	69	11.2	30	4.9	39	6.3
New Haven	74	12	32	5.2	42	6.8
New London	86	14	52	8.4	34	5.5
Tolland	29	4.7	12	2.1	16	2.6
Windham	56	9.1	25	4.1	31	5
Total	**616**	**100**	**257**	**41.8**	**358**	**58.1**

H.6 Connecticut and U.S. Employment Comparison by Industry

Table H-11. 2019 Connecticut and U.S. Employment Comparison by Industry

NAICS Code	Industry Title	Percentage of State Employment	Percentage of Total U.S.	Location Quotient
62	Health Care & Social Assistance	17.50%	15.00%	1.2
44-45	Retail Trade	10.60%	10.60%	1
61	Educational Services	10.40%	8.60%	1.2
31-33	Manufacturing	9.80%	8.70%	1.1

NAICS Code	Industry Title	Percentage of State Employment	Percentage of Total U.S.	Location Quotient
72	Accommodation and Food Services	7.80%	9.60%	0.8
52	Finance and Insurance	6.20%	4.10%	1.5
54	Professional and Technical Services	5.80%	6.50%	0.9
56	Administrative and Waste Services	5.50%	6.30%	0.9
81	Other Services, Except Public Administration	4.00%	3.10%	1.3
23	Construction	3.80%	5.20%	0.7
48-49	Transportation and Warehousing	3.60%	4.40%	0.8
42	Wholesale trade	3.60%	4.00%	0.9
92	Public Administration	3.40%	5.00%	0.7
51	Information	2.10%	2.00%	1
55	Management of Companies and Enterprises	2.00%	1.60%	1.2
71	Arts. Entertainment, and Recreation	1.80%	1.90%	0.9
53	Real Estate and Rental leasing	1.30%	1.60%	0.8
22	Utilities	0.40%	0.50%	0.8
11	Agriculture, Forestry, fishing and Hunting	0.30%	0.90%	0.3
21	Mining, Quarrying, and Oil and Gas Extraction	0.03%	0.50%	0.1
99	Unclassified	0.02%	0.10%	0.2

Source: AECOM 2020; U.S. Bureau of Labor Statistics

H.7 Rail Freight Tonnage

Table H-12 and **Table H-13** show the amount of rail freight tonnage and freight value, respectively, by direction and Standard Transportation Commodity Code (STCC) industry group.

Table H-12. Connecticut Rail Freight Tonnage by STCC Industry Group and Direction

STCC Code	STCC Industry Group	Tonnage by Direction				
		Inbound	Outbound	Intrastate	Through	Total
1	Farm Products	134,152	-	-	3,520	137,672
14	Nonmetallic Minerals; except Fuels	43,048	864,268	280,164	16,016	1,203,496
20	Food or Kindred Products	134,648	-	-	47,532	182,180
24	Lumber or Wood Products; except Furniture	111,400	1,160	-	144,720	257,280
26	Pulp, Paper or Allied Products	44,400	2,520	-	171,440	218,360
28	Chemicals or Allied Products	29,560	50,800	-	55,456	135,816
29	Petroleum or Coal Products	15,240	-	-	-	15,240
30	Rubber or Miscellaneous Plastics Products	-	-	-	280	280
32	Clay, Concrete, Glass or Stone Products	121,440	237,080	-	73,560	432,080
33	Primary Metal Products, including Galvanized; except Coating or other Allied Processing	415,640	6,452	-	7,320	429,412
37	Transportation Equipment	2,000	8,576	-	2,480	13,056
40	Waste or Scrap Materials Not Identified by Producing Industry	-	980,852	-	28,144	1,008,996
46	Miscellaneous Mixed Shipments	-	-	-	1,400	1,400
38	Hazardous Wastes	-	2,480	-	7,600	10,080
49	Hazardous Materials	61,400	23,520	-	13,680	98,600
	Total	**1,112,928**	**2,177,708**	**280,164**	**573,148**	**4,143,948**

Source: 2019 Waybill Sample data

Table H-13. Rail Freight Value ($US) by STCC Industry Group and Direction

STCC Code	STCC Industry Group	Value ($US) by Direction					
		Inbound	Outbound	Intrastate	Through	Total	Average 2019 $/Ton
1	Farm Products	5,298,324	-	-	103,360	5,401,684	39.2
14	Nonmetallic Minerals; except Fuels	1,464,436	9,889,192	1,823,692	470,196	13,647,516	11.3
20	Food or Kindred Products	5,930,808	-	-	707,108	6,637,916	36.4
24	Lumber or Wood Products; except Furniture	9,020,240	47,040	-	10,330,360	19,397,640	75.4
26	Pulp, Paper or Allied Products	3,725,320	176,400	-	9,993,080	13,894,800	63.6
28	Chemicals or Allied Products	2,502,040	5,891,360	-	3,143,884	11,537,284	84.9
29	Petroleum or Coal Products	598,560	-	-	-	598,560	39.3
30	Rubber or Miscellaneous Plastics Products	-	-	-	145,200	145,200	518.6
32	Clay, Concrete, Glass or Stone Products	4,560,640	7,169,240	-	4,347,840	16,077,720	37.2
33	Primary Metal Products, including Galvanized; except Coating or other Allied Processing	22,349,480	578,740	-	293,760	23,221,980	54.1
37	Transportation Equipment	215,920	603,472	-	582,800	1,402,192	107.4
40	Waste or Scrap Materials Not Identified by Producing Industry	-	30,739,636	-	1,098,652	31,838,288	31.6
42	Containers, Carriers or Devices, Shipping, Returned Empty	-	-	-	525,080	525,080	-
46	Miscellaneous Mixed Shipments	-	-	-	81,960	81,960	58.5
48	Hazardous Wastes	-	223,200	-	515,080	738,280	73.2

STCC Code	STCC Industry Group	Value ($US) by Direction					
		Inbound	Outbound	Intrastate	Through	Total	Average 2019 $/Ton
49	Hazardous Materials	5,744,680	1,928,080	-	699,160	8,371,920	84.9
	Total	**61,410,448**	**57,246,360**	**1,823,692**	**33,037,520**	**153,518,020**	

Source: 2019 Waybill Sample data

H.8 Station-Level Ridership Growth Projects (2019-2035 and 2019-2050)

Table H-14. Station-level Ridership Growth, 2019-2035, Service Improvements

Station	2019			2035			2019-2035 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Windsor Locks	25,800	35,400	-	89,300	41,200	-	246%	16%	-
Windsor	16,900	58,600	-	58,700	66,600	-	247%	14%	-
Hartford	171,800	453,100	-	470,600	522,700	-	174%	15%	-
Berlin	19,900	50,800	-	66,900	58,900	-	236%	16%	-
Meriden	18,200	53,400	-	48,700	64,600	-	168%	21%	-
Wallingford	9,700	29,900	-	31,100	38,100	-	221%	27%	-
New Haven State Street	2,900	3,000	121,600	3,800	3,700	138,300	31%	23%	14%
New Haven Union Station	772,500	509,600	287,300	1,026,500	642,400	326,800	33%	26%	14%
Mystic	28,700	-	-	36,900	-	-	29%	-	-
New London	164,800	-	34,000	178,600	-	45,800	8%	-	35%
Old Saybrook	71,400	-	94,100	96,000	-	103,700	34%	-	10%
Westbrook	-	-	44,900	-	-	49,000	-	-	9%
Clinton	-	-	37,000	-	-	40,400	-	-	9%
Madison	-	-	74,100	-	-	83,200	-	-	12%
Guilford	-	-	79,000	-	-	90,200	-	-	14%
Branford	-	-	82,700	-	-	92,800	-	-	12%
Bridgeport	95,700	-	-	132,300	-	-	38%	-	-

Station	2019			2035			2019-2035 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Stamford	438,100	-	-	571,900	-	-	31%	-	-

Table H-15. Station-level Ridership Growth, 2019-2050, Service Improvements

Station	2019			2050			2019-2050 Percentage Increase		
	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East	Amtrak	Hartford Line	Shore Line East
Windsor Locks	25,800	35,400	-	93,700	42,700	-	263%	21%	-
Windsor	16,900	58,600	-	61,600	68,900	-	264%	18%	-
Hartford	171,800	453,100	-	491,900	540,300	-	186%	19%	-
Berlin	19,900	50,800	-	69,500	60,600	-	249%	19%	-
Meriden	18,200	53,400	-	50,300	66,700	-	176%	25%	-
Wallingford	9,700	29,900	-	32,800	39,500	-	238%	32%	-
New Haven State Street	2,900	3,000	121,600	4,000	3,900	144,000	38%	30%	18%
New Haven Union Station	772,500	509,600	287,300	1,077,200	670,200	340,200	39%	32%	18%
Mystic	28,700	-	-	39,100	-	-	36%	-	-
New London	164,800	-	34,000	188,400	-	48,000	14%	-	41%
Old Saybrook	71,400	-	94,100	99,800	-	107,500	40%	-	14%
Westbrook	-	-	44,900	-	-	50,700	-	-	13%
Clinton	-	-	37,000	-	-	41,900	-	-	13%
Madison	-	-	74,100	-	-	86,600	-	-	17%
Guilford	-	-	79,000	-	-	94,100	-	-	19%
Branford	-	-	82,700	-	-	96,600	-	-	17%
Bridgeport	95,700	-	-	139,000	-	-	45%	-	-
Stamford	438,100	-	-	601,300	-	-	37%	-	-