MEMO

DATE: March 28, 2017
TO: House and Senate Committees on Transportation
FROM: Vermont Agency of Transportation
RE: Montpelier - Burlington - St. Albans Commuter Rail Study Final Report

---

The attached report is an update to the version originally submitted on January 14, 2017. Revisions to the report include corrections to arithmetic errors in fare revenue tables and the addition of an expanded discussion of the possible use of Diesel Multiple Units (DMU) for rolling stock.

The excerpted DMU content is as follows:

1.2.4.1 DMU Rolling Stock Equipment[1]

A diesel multiple unit (DMU) is a rail passenger vehicle that contains a propulsion motor within each car and is thus often referred to as "self-propelled" vehicles. There is recently developed DMU technology that meets federal requirements for operations in mixed freight-passenger rail conditions and Buy America requirements. There are very few DMUs currently utilized in commuter rail service in the United States. A DMU-based system in Sonoma and Marin Counties in California, known as the Sonoma-Marin Area Rail Transit (SMART) is expected to begin operating in 2017 using recently procured DMU equipment. Due to the small number of DMU systems in use, and varied costs for DMU trainsets, there are uncertainties as to their actual costs.

As noted above, a base assumption for the Study was that conventional trainsets would be used for any potential service. The passenger capacity is approximately 600 passengers. This was deemed the minimum train size that would be operated in a typical smaller scale commuter rail operation. If projected user demand is substantially less than the capacity of these trainsets then it is questionable if there is sufficient demand to support the service given the high fixed cost to make track and infrastructure improvements needed for any commuter rail service.

To provide a context for evaluation of a system based on a DMU equipment an analysis of comparable capacity for DMU and conventional equipment was used. Recent costs to purchase SMART DMU trainsets are $11 million for a three-car trainset. Each conventional trainset has a capacity for 600 passengers and includes a locomotive and five coach cars. Each three car DMU consist would have capacity for approximately 160 passengers. To obtain the equivalent capacity with DMUs, 21-24 consists would need to be purchased. Therefore, there would not likely be any capital cost savings associated with the DMU alternative. Capital costs associated with maintenance facilities and annual maintenance costs could be higher due to the requirement for specialized facilities to manage DMU technology as opposed to conventional locomotives and coach cars.

It was suggested in public comments that DMUs would require fewer crewmembers than is assumed in the operational assumptions for the conventional equipment contained in the Study. Specifically it was stated that a DMU trainset could be operated with only a single engineer and that ticketing would be based on the proof of purchase honor system with spot checks by railroad personnel. This could be also be done with conventional trainsets. However, this system is not universally accepted. Thus, the

---

[1] Montpelier – St. Albans Commuter Rail Feasibility Study, February 2017, Page 20.

operating costs used in this Study are based on a three-person crew, which should be considered the base case for either DMU or conventional trainset operation in order to avoid presenting an overly optimistic estimate of operating costs for the service.

An additional public comment was made noting that DMU are designed to use low-level platforms. The inference was that this would eliminate the need for high-level platforms and provide a substantive cost differential as compared to conventional equipment use. This is not the case. Conventional trainsets can also use low-level platforms as evidenced by the current low-level platforms used by the Amtrak intercity services. There are a number of federal and state initiatives that are moving more toward the adoption of high-level platforms at all passenger rail stations. For this reason the Study assumed that high level platforms would be likely be mandated at the time of implementation of a commuter rail system. As DMUs are not designed to work with both high and low level platforms, there is a concern that DMUs may not prove to be a viable long-term option for equipment in a typical commuter rail service.

For the reasons given above, the viability of the option for use of DMU trainsets for operation of a commuter rail service is deemed to be uncertain at this time. Thus, the assumption of the Study remains that conventional trainsets would be used in any commuter rail service within the corridors defined as part of the Study. Vermont may wish to re-evaluate the use of this technology in the future as the depth of US experience with DMUs increases, in particular through the SMART system in California.

Feasibility Study

Montpelier - St. Albans Commuter Rail Service

February 2017

Acknowledgements

Study Advisory Committee

David Armstrong – Green Mountain Transit
Charles Hunter – Genesee & Wyomong Railroad Services, Inc.
Seldon Houghton / Mary Anne Michaels (Alternate) – Vermont Rail Systems
Bethany Remmers – Northwest Regional Planning Commisssion
Charles Baker – Chittenden County Regional Planning Commission
Bonnie Waninger – Central Vermont Regional Planning Commission
Lisamarie Charlesworth – Franklin County Regional Chamber of Commerce
Cathy Davis – Lake Champlain Regional Chamber of Commerce
James Stewart – Central Vermont Economic Development Corporation
Bill Moore – Central Vermont Chamber of Commerce
Tim Smith – Franklin County Industrial Development Corportation
Curt Carter – Greater Burlington Industrial Corporation

Vermont Agency of Transportation Internal Working Group

Joe Segale
Costa Pappis
Barbara Donovan
Daniel Delabruere
Michele Boomhower

Study Management Team

Scott Bascom – Vermont Agency of Transportation
David Pelletier – Vermont Agency of Transportation
Ronald O'Blenis – HDR, Inc.
Matthew Moran – HDR, Inc.
Alexander Tang – HDR, Inc.
Katie Rougeot – HDR, Inc.

Thanks to the many Vermont citizens who participated in the public meetings that helped shape this study.

Executive Summary

The Montpelier to St. Albans Commuter Rail Service Feasibility Study (Study) examines the feasibility of implementing a commuter rail service between Montpelier and Burlington and St. Albans and Burlington (Corridor). The goal of the study was to evaluate the capital costs, operating costs, and necessary conditions for operating a conceptual commuter rail system in Northwest Vermont.

The study began as directive from the Vermont General Assembly, which stated that the Vermont Agency of Transportation (VTrans) shall "conduct a commuter rail feasibility study for the corridor between St. Albans, Essex Junction, and Montpelier, which shall also include a study of connecting service to Burlington." The legislature defined the purpose of the study as to "determine the feasibility of implementing a commuter rail system within the corridor, to estimate the time horizon to plan for and design the service, to estimate ridership potential, to estimate costs for operations and capital acquisition, and to identify any other general operational, capital, legal, and administrative requirements."

The study team (Team) worked with stakeholders, Vermont government agencies, and members of the public during the study process for technical guidance and gauge views toward study concepts. During the Study, the Team examined currently operating commuter rail programs in the United States, existing conditions on the Corridor, evaluated transportation demand in the corridor region, created conceptual schedules and operations conditions, determined conceptual capital costs, and finally created a path for implementing the service. The Team considered attributes that would be critical to the evaluation of a commuter rail transit network.

Existing Commuter Rail Systems

Existing commuter rail operations are profiled to provide a basis for understanding commuter rail services currently in operation in the United States. Commuter rail services tend to be focused in larger metropolitan areas with high levels of congestion and expensive downtown parking costs. Commuter rail services typically offer services that are faster than local urban transit (bus, light rail, subways) but slower than intercity rail. Additionally, commuter rail frequently operates on corridors that are shared with both intercity and freight rail services, meaning service schedules must be coordinated with other users and are frequently constrained by needs of other users.

Existing Corridor Conditions

The Team evaluated existing physical conditions, intercity passenger rail, and transit services operating on the Corridor to provide insight into the potential capital requirements and transportation systems that influence travel in the region. The Team evaluated three rail segments for the Study, including the New England Central Railroad (NECR) Mainline, NECR Winooski Branch (Winooski Branch), and Washington County Railway (WACR). Each segment of the Corridor has existing stations with varying facilities and usage, including Montpelier Junction, Waterbury, Essex Junction, St. Albans, and Burlington Union Station. Additionally, based on stakeholder input, four new station sites were considered, including Montpelier Downtown, Milton, Richmond, and Winooski.

Additionally, the Team considered the existing transit services in the Corridor. The LINK bus operates as a regional commuter express service between Corridor communities, with routes beginning at the Burlington Downtown Transit Center and connecting to points in Montpelier, Middlebury, and St. Albans. Operated by the Green Mountain Transit, the routes have been in service since 2003 and 2005 and are concentrated during peak commuting times. The LINK bus service serves a similar area to that which is proposed by the Corridor and served as a benchmark and reference for comparison in the assessment of the commuter rail service. In addition to the LINK bus, local and regional busses operate in the Corridor region. Intercity rail service is provided by the Amtrak Vermonter on the NECR Mainline between St. Albans and Montpelier and continuing south to Washington, D.C.

Transportation Demand Evaluation

The Team considered existing and future travel demand in the Corridor region to assess the potential demand for transit services. The evaluation of transit demand considered existing commuting populations in the region based on U.S. Census estimates and providing transit demand ranges.

U.S. Census estimates provide information on commuters between municipalities in Vermont. The Team utilized these numbers and applied low and high growth scenarios to determine future commuting patterns in 2030. The low growth population scenario was based on the "Vermont Population Projections – 2010-2030"[1] and high growth scenario based on the Chittenden County Regional Planning Commission's (CCRPC) "Environment Community Opportunity Sustainability Plan."[2] The CCRPC report projects higher population growth based primarily on stronger anticipated employment growth than the "Vermont Population Projections" report projections. Existing daily commuting demand in the corridor is approximately 7,814 with existing conditions, 8,664 with the low growth scenario, and 9,175 with the high growth scenario.

Finally, to determine daily commuting mode shares in the Corridor, the Team developed two primary transit share conditions to determine transit demand estimates. The low estimate uses the capture rate experienced when the Champlain Flyer service was in operation with a 12% transit share. The high estimate utilizes the LINK bus transit usage rate for projections due to its strong 24.5% share. Transit demand with the Champlain Flyer capture rate is 940 daily commuters with existing conditions and rises to 1,100 daily commuters with the high growth scenario. The LINK bus capture rate would result in 1,835 daily commuters for existing conditions and rises to 2,210

[1] Vermont Population Projections – 2010-2030." State of Vermont, August 2013. http://dail.vermont.gov/dail-publications/publications-general-reports/vt-population-projections-2010-2030

[2] "2013 Chittenden County ECOS Plan." Chittenden County Regional Planning Commission, June 2013. https://ccrpcvt-public.sharepoint.com/Studies%20and%20Reports/ECOS_Plan_FINALmerged_20130619.pdf

daily commuters for the high growth rate. The transit share demand provides an order of magnitude estimate for potential Corridor commuter rail users.

Conceptual Operations & Costs

Conceptual commuter rail operations include two schedules with varying frequencies levels. The schedule frequencies affect both annual operating costs and capital costs, with additional infrastructure and rolling stock required with more frequent service based on operational requirements.

Schedule 1 profiles a limited peak service with 12 daily trips (6 roundtrips from Burlington) on the Corridor. The schedule would include 2 roundtrips from St. Albans and 4 from Montpelier. The schedule would also enable reverse commuting from the Burlington area to the Montpelier area. The 12 daily trip service maximum would not require a Positive Train Control (PTC) system, which would add significantly to the capital costs for the system.

Schedule 2 profiles a peak service with 22 trips (11 roundtrips to Burlington) and would require the installation of a PTC system. The schedule would include 4 roundtrips from St. Albans and 7 from Montpelier and enable reverse commuting from the Burlington area to both the Montpelier and St. Albans areas. Additionally, Schedule 2 could accommodate off-peak commuter rail services. The frequencies in Schedule 2 would be comparable to the frequencies on the Montpelier LINK bus.

The Team determined Operating and Maintenance (O&M) costs for Schedules 1 and 2 based on comparable costs for commuter rail services in the New England region. Costs include train and equipment maintenance, crew, materials, fuel, and overhead costs. For Schedule 1, O&M costs are estimated to be nearly $5 million (2016 dollars) and Schedule 2 is estimated to cost nearly $9 million (2016 dollars).

Some of this O&M cost will be offset by the revenue brought in by riders. Potential operating revenue for the service would come from passenger fare and non-fare revenue sources. Fare revenue is estimated to be approximately $1,172,000 for Schedule 1 and $2,393,000 for Schedule 2. Like most transit systems in the United States, the Corridor is not expected to be self-supported on generated revenue and would most likely need operating support of around $3,782,000 for Schedule 1 and $6,507,000 for Schedule 2.

Corridor Capital Requirements & Costs

Capital requirements necessary to implement Corridor service include infrastructure and equipment costs. Improvements to infrastructure along each of the existing lines would include yard improvements, right-of-way upgrades, siding rehabilitation, station improvements, and new stations.

Required equipment upgrades would include 6 trainsets for Schedule 1 implementation or 7 trainsets for Schedule 2 implementation and assume push-pull locomotives and coach cars. Capital costs assume the state could either purchase new rolling stock from a supplier or second hand from another service provider when implementing the new service.

Conceptual cost estimates include infrastructure, new stations, rolling stock, and PTC implementation costs. Schedule 1 is estimated to cost approximately $301 million (2016 dollars) and Schedule 2 is estimated to cost $363 million (2016 dollars). Conceptual capital costs are profiled in Table E-1.

Table E-1: Conceptual Capital Costs

Unit	Unit Cost	Unit Quantity	Total Cost
Standard Cost Per Mile for Rehabilitation (Track, Signal, Bridge improvements)	$2.5 Million/Mile	9.4 Miles	$23.5 Million
Cost for New Track Infrastructure	$2.8 Million/Mile	4.1 Miles	$11.5 Million
Signal and Communications Equipment for NECR Mainline	$1 Million/Mile	56 Miles	$56 Million
New Station Development	$8 Million/Station	6 New Stations	$48 Million
Infrastructure Subtotal			$139 Million
New Trainsets	$27 Million/Trainset	6-7 Trainsets	$162-189 Million
PTC Implementation (Schedule 2 Only)			$35 Million
Corridor Total			**$301-363 Million**

DMU Rolling Stock Equipment

A diesel multiple unit (DMU) is a rail passenger vehicle that contains a propulsion motor within each car and is thus often referred to as a "self-propelled" vehicle. There is recently developed DMU technology that meets federal requirements for operations in mixed freight-passenger rail conditions and Buy America requirements. There are very few DMUs currently utilized in commuter rail service in the United States. A DMU-based system in Sonoma and Marin Counties in California, known as the Sonoma-Marin Area Rail Transit (SMART) is expected to begin operating in 2017 using recently procured DMU equipment. Due to the small number of DMU systems in use, and varied costs for DMU trainsets, there are uncertainties as to their actual costs. Thus, the assumption remains that conventional trainsets would be used in any commuter rail service within the corridors defined as part of the Study.

Implementation Issues & Framework

Before implementation of service, the State should consider several issues related to governance or rail operations. The State would need to develop a detailed Capital and Financing plan and operations plans that would consider the creation of a Corridor management plan, unified negotiations with Amtrak and host railroads, sharing information to help assess freight rail patterns, identifying capital funding requirements, final scheduling, and funding sources, and establishing contract requirements for a non-state service provider or for a state agency.

Potential funding sources for the project include federal, state, and local sources that could be targeted for support in implementation of the Commuter Rail project. Previously supported Commuter Rail projects have had federal funding programs including FTA Capital Investment Grant Program, FTA Formula Funds, FHWA Formula Funds, and USDOT Competitive Grants. The maximum level of federal funds that can be used on a project is 80% of the total capital costs with typical federal support contributing around 50% for commuter rail projects. Non-federal matching state funds include the gasoline tax, purchase and use tax, motor vehicle fees. Non-federal matching local funds include contributions from local jurisdictions, TIF Districts, benefit assessment districts, joint development, air rights, or developer contributions. Federal financing options are also available as well as public private partnerships.

In addition to costs and revenue, several implementation issues must also be considered before implementing Corridor service. These include labor requirements, Positive Train Control, and community and environmental considerations. Also, an increased number of trains running along the Corridor would affect the train noise and traffic at grade crossings in communities surrounding the track.

The study identified a framework for facilitating the implementation of the proposed commuter rail service. Scenarios dealing with incremental implementation, service implementation, O&M Support, environmental, and feasibility considerations are profiled in order to ease the implementation process should the service be adopted. Four options are outlined for varying combinations of Schedule 1 and Schedule 2 commuter rail service adoption are also profiled to provide additional options for implementing a phased approach to commuter rail services, which would reduce initial capital and operating costs.

VERMONT
AGENCY OF TRANSPORTATION

Contents

Introduction

The Montpelier to St. Albans Commuter Rail Service Feasibility Study (Study) examines the feasibility of implementing a commuter rail service between Montpelier and Burlington and St. Albans and Burlington (Corridor). The Vermont General Assembly passed language that included a provision for the Vermont Agency of Transportation (VTrans) to study the identified corridor to determine the "feasibility of implementing a commuter rail system within the corridor, to estimate the time horizon to plan for and design the service, to estimate ridership potential, to estimate costs for operations and capital acquisition, and to identify any other general operational, capital, legal, and administrative requirements."

Therefore, the Study examines the existing commuter rail networks in the United States to provide context for the regions that currently have commuter rail service. Additionally, the existing conditions for the Corridor are outlined in the study are examined to gain an overall understanding of service in the region. Currently, there are three railroad segments in the study area, which encompasses Montpelier, Burlington, and St. Albans. The existing segments are the New England Central Railroad (NECR) mainline, the NECR Winooski Branch (Winooski Branch), and the Washington County Railway (WACR). Each segment has existing stations varying in facilities and usage.

The study then details the Corridor travel demand, which includes an analysis of existing and future travel patterns and mode splits. Transit demand provides an order of magnitude understanding of potential ridership in the study area.

Conceptual commuter rail services and capital requirements are analyzed to provide an understanding of potential services, infrastructure improvements, and costs associated with starting a service and operating it on an annual basis.

Finally, implementation issues and framework is discussed to provide an understanding of the potential issues that starting a commuter rail service would need to resolve and have facilitated to have service operation. Public, agency, and stakeholder engagement is also summarized in the last chapter.

The Study does not offer a specific conclusion for implementing commuter rail service. The Study examines concepts for operating a commuter rail in northwest Vermont with capital and annual operating costs associated with comparable commuter rail systems in the region. The report also notes the exiting transit services and impacts of those services in the region as a direct comparison to the costs and attributes of operating a commuter rail network in Northwest Vermont.

1. What is Commuter Rail?

Commuter rail is a transit service that connects population centers in outlying areas to employment hubs located in central business districts. Commuter rail systems are common in large metropolitan areas around the world. In the United States (U.S.), commuter rail is a mode of transportation used in metropolitan areas and is generally associated with concentrated employment densities that experience high levels of road and transit congestion and have limited parking. Of the 20 largest metropolitan areas in the U.S., 15 have active commuter rail systems.

1.1 United States Overview

This section provides an overview in terms of history, ridership, system length, and number of stations for commuter rail systems in the U.S. Figure 1.1 shows a typical commuter rail station and train that are in use in the U.S.

Figure 1.1: The MBTA Commuter Rail Train and Station in Beverly, MA

Commuter Rail typically carries commuters on lines that are 10 to 60 miles in length and has schedules focused on peak commuting hours. Unlike other forms of public transit (such as subway and bus), commuter rail is designed to deliver riders to a central hub station in the central business district rather than providing localized service to specific destinations in a downtown. In general, commuter rail provides faster travel than other urban and suburban public transit modes. Additionally, unlike intercity rail (typically operated by Amtrak), commuter rail is designed to provide options for travelers within metropolitan areas whereas intercity rail transports travelers between metropolitan areas.

In New England, commuter rail systems are currently operating in Greater Boston and southern Connecticut with services to New York City and New Haven. The Massachusetts Bay Transportation Authority (MBTA) commuter rail network serves Greater Boston, including Eastern Massachusetts and Rhode Island. Connecticut is served by the Metro-North Railroad, connecting Southwestern Connecticut to New York City, and Shore Line East, connecting New London to New Haven with some peak services continuing to Stamford. Additionally, construction is currently underway for a commuter rail system serving the Greater Hartford Area (New Haven, Hartford, and Springfield), which is expected to be operational in 2018.[3]

Commuter rail systems operating in the U.S. are profiled Table 1.1 in terms of metropolitan area(s) served, distance, stations served, and ridership. Figure 1.2 shows the currently operating commuter rail systems in the U.S.

Figure 1.2: Currently Operational Commuter Rail Systems in the U.S.

[3] Connecticut Department of Transportation, http://www.nhhsrail.com/

Table 1.1: Commuter Rail Systems in the U.S.

Metro Area	System Name	Population Served (Millions)	System Length (Miles)	Number of Stations	Average Weekday Ridership
Chicago	Metra	9.7	487.7	241	290,500
New Jersey; New York City and Philadelphia	New Jersey Transit Rail Operations	8.9	398.2	164	295,173
Los Angeles–Southern California	Metrolink	18.6	388	55	41,200
New York City - Northern Suburbs and CT	Metro-North Railroad	12	385	122	298,900
Boston	MBTA Commuter Rail	8.1	368	127	130,600
New York City–Long Island	Long Island Rail Road	11.4	321	124	337,800
Philadelphia	SEPTA Regional Rail	7.1	280	153	134,600
Baltimore–Washington, DC	MARC Train	5.9	187	43	35,200
Sacramento–San Francisco Bay Area	Capitol Corridor	8.7	168	15	4,500
Albuquerque–Santa Fe	New Mexico Rail Runner	1.2	97	13	3,400
Washington, DC	Virginia Railway Express	3.4	90	18	17,900
Chicago–South Bend	South Shore Line	3.5	90	20	11,800
Salt Lake City	Utah Transit Authority	2.5	88	16	16,800
San Jose–Stockton	Altamont Corridor Express	8.7	86	10	4,600
Seattle–Tacoma	Sounder	4.6	80	9	13,700
San Francisco–San Jose	Caltrain	8.7	77	32	56,700
Miami–South Florida	Tri-Rail	6.6	70.9	18	14,400
New Haven	Shore Line East	2.1	59	13	2,200
San Diego–Oceanside	Coaster	3.1	41	8	4,900
Minneapolis–St. Paul	Northstar	3.9	40	6	2,500
Dallas–Fort Worth	Trinity Railway Express	7.5	34	10	8,200
Austin	Capital MetroRail	2	32	9	2,800
Nashville	Music City Star	1.8	32	6	1,200
Orlando	SunRail	2.1	31.7	12	3,200
Denver	A-Line	2.8	23.5	8	37,000*
Dallas–Fort Worth	A-Train	7.5	21	6	1,900
Portland	WES Commuter Rail	2.2	15	5	1,800

**The Denver A Line opened in April 2016 and ridership figures have not been released. Denver Transit Partners projects 2030 ridership for the East Rail Line are 37,000 daily passengers.*[4]

[4] "East Rail Line." Denver Transit Partners, http://denvertransitpartners.com/about/east-corridor/

1.1.1 Commuter Rail Historical Context

Commuter rail in the U.S. has been in existence since the advent of commercial passenger railroads in the 19th Century. The Long Island Rail Road was chartered in 1834, which today makes it the oldest continuously operating railroad in the country[5]. Commuter rail in the 19th Century and early 20th Century were owned and operated by private railroad companies, such as the Boston and Maine Railroad serving Boston, MA. Service connected riders from towns and villages in the countryside to the central city, and train travel became a significant form of travel in the 19th Century.

In the mid-20th Century, commuter rail travel began to decline as the popularity of the automobile rose. Freeways were constructed linking towns and suburban areas to city centers, providing competition with commuter rail systems. During this time period, the private railroad companies began to shut down commuter rail lines as they no longer provided the same benefits to the company since fewer people were using the systems. While many lines shut down completely, a handful of U.S. systems were purchased by local governments and began to be operated through local and state agencies. By the 1970s and 1980s, all remaining commuter rail in the U.S. had been converted private operations to public operations.

Since the 1980s, there has been a renewed interest in U.S. commuter rail services. Commuter preference has shifted to include a greater emphasis on public transit as road congestion becomes a larger problem in many metropolitan areas. Due to this resurgence in demand for public transit, many cities have seen the expansion of existing commuter rail systems as well as the creation of new commuter rail systems. Nine of the nation's 27 commuter rail systems have opened to riders since the year 2000.

In addition to existing commuter rail systems, there are several systems that are either under construction, in the planning stages, or considering major expansions. For example, Denver, CO, opened the first segment of a commuter rail line in April 2016 with an initial 8-station 23.5 mile system. When completed, Denver's commuter rail system will have 27 stations, over 90 miles of system mileage, and four different lines[6]. In Orlando, FL, the existing SunRail commuter rail system is in the midst of an expansion that is expected to increase the system mileage by approximately 50% by 2018[7].

Beyond the construction of new systems and the expansion of existing systems, other metropolitan areas that have commissioned feasibility studies to examine initiating commuter rail service. Metropolitan areas of all sizes across the country, such as Tulsa, OK, and Detroit/Ann Arbor, MI, have all investigated potentially implementing commuter rail systems.

1.1.2 System Mileage & Stations

In the U.S., the system mileage of all commuter rail systems combined is nearly 4000 miles. In general, the U.S. metropolitan areas with the largest populations have the most extensive commuter rail networks. The nation's three largest metropolitan areas, New York City, Los Angeles, and

[5] New York Metropolitan Transportation Authority, http://web.mta.info/lirr/Video/175thAnniversary/
[6] Regional Transportation District of Denver, http://www.rtd-fastracks.com/main_6
[7] Florida Department of Transportation, http://corporate.sunrail.com/expansion/phase-2-expansion/

Chicago, are home to the three commuter rail systems with the most system mileage. New York City alone is home to three different commuter rail systems (Long Island Rail Road, Metro-North, and New Jersey Transit) that collectively count for 27% of all commuter rail system mileage in the U.S.

Overall, six of the 27 commuter rail systems have over 300 miles of system mileage. By contrast, eight of the systems have fewer than 50 miles of system mileage. The largest commuter rail operator in the nation in terms of length is the Metra commuter rail system in Chicago. Metra has 487.7 miles of track that serves the nation's third largest metropolitan area. The shortest commuter rail system is the 15 mile WES commuter rail system serving the Portland, OR, metropolitan area.

The number of stations in a commuter rail system varies from system to system. In general stations are spaced 2-10 miles apart on a line and the total number of stations approximately relates to the total system mileage. In the U.S., six of the 27 systems serve 100 stations or more. By contrast, seven of the 27 systems serve fewer than 10 stations. Metra in Chicago has the highest total number of stations, with 241 stations across the system. Westside Express Service (WES) commuter rail system near Portland, OR, has the fewest number of stations, with a total of 5 stations on the line.

1.1.3 Ridership

On the average weekday in the U.S., there are approximately 1.7 million trips collectively on the nation's 27 different commuter rail systems. In general, the largest systems serving the metropolitan areas with the highest populations have the highest amount of riders. The three systems serving New York City are the three systems with the highest ridership nationally, carrying a total of 930,000 passengers on average per weekday, which accounts for approximately 53% of all commuter rail passengers in the U.S.

The system with the lowest daily ridership is the Music City Star serving Nashville, TN, with an average ridership of 1,200 passengers per weekday. Overall, six of the 27 systems serve more than 100,000 passengers on average per weekday. By contrast, twelve of the 27 systems serve fewer than 10,000 passengers on average per weekday.

1.2 Operating Requirements & Standards

Commuter rail systems have operating requirements and standards that are mandated by federal and state agencies, industry best practices, and other rail carriers who share the right-of-way. This section describes the standards required to operate typical commuter rail systems.

1.2.1 Regulatory Agencies & Industry Standards

Commuter rail services must comply with federal and state codes and safety regulations. There are several regulatory agencies that have oversight and set standards for commuter rail systems, including the Federal Transit Administration (FTA) and Federal Railroad Administration (FRA). In addition, individual state transit authorities and agencies may have additional standards that need to be followed. Commuter rail systems should adhere to standards set by industry groups to ensure interoperability between the commuter rail, intercity carriers, and freight networks.

Government regulations establish standards that dictate how commuter rail systems are allowed to operate and ensure that all commuter rail systems operate in a uniform manner. Some of the standards determine how fast commuter rail trains are allowed to operate based on the condition of the track, the minimum headway that is allowed between trains, and the level of pollutants that can be emitted by train locomotives.

For example, commuter rail systems must comply with federal Americans with Disabilities Act (ADA) standards, which ensure persons with disabilities are able to use public facilities. ADA standards mandate access to public accommodations for persons with special disabilities and compliance is monitored by FRA, FTA, and typically state transportation agencies. For new commuter rail, ADA is especially relevant for the design of station infrastructure and passenger coaches, such as level boarding. Figure 1.3 shows a high-level platform and ADA-required yellow platform edge strips at a Philadelphia, PA commuter rail station.

Figure 1.3: Commuter Rail Station with ADA Features

Industry standards are generally set by the American Railway Engineering and Maintenance-of-Way Association (AREMA) through the *Manual for Railway Engineering*. These standards ensure that all railroads in the U.S. are uniform and adhere to the same set of design standards. This standardization allows for the same equipment to operate on all standard tracks throughout the U.S.

1.2.2 Right-of-Way

The railroad right-of-way primarily includes the track a commuter railroad uses to operate. The right-of-way a commuter rail line operates in can be an exclusive use corridor, where only the commuter rail line has operations or shared with intercity services and freight trains. Key right-of-way considerations include physical characteristics, coordinating schedules between other users, dispatching, and corridor ownership.

Right-of-way characteristics vary greatly between systems and segments and are a major determinant for the frequency, capacity, and speed of the commuter rail service. Key right-of-way physical characteristics include:

- **Right-of-Way Track Capacity** – Typically, systems operating in the U.S. have two track right-of-ways. However, some system segments are wide-corridors with four or more tracks while other segments might have single tracks with passing sidings to allow trains to pass. The number of tracks determines the capacity and operational flexibility of the rail corridor.

- **Grade Crossings** – Railroad corridors frequently cross roads and, if not separated by a bridge or tunnel, are at-grade. At-grade crossings (or grade crossings) include a system of signage and warning devices to warn motorists and pedestrians of oncoming trains.

- **Track Speed** – Train speeds allowed on the right-of-way can also vary between systems and segments. The condition of the right-of-way determines the speed of each train. Each segment of track has a maximum authorized speed (MAS) that all trains (passenger and freight) must obey. The MAS is determined by the general condition of the track, vertical and horizontal geometry of the track, signal system, and any specific conditions on the right-of-way that require speed restrictions such as civil speed restrictions.

- **Signal Systems** – Passenger and freight rail corridors typically utilize signal systems to enable trains to operate efficiently and safely. Signals are typically found at regular intervals on the corridor and/or are installed in the cab of the train car. Some ROW segments have no signals and are referred to as dark territory where trains operate under the exclusive control of the train dispatcher and with additional safety procedures in place.

Typically, right-of-ways are not exclusive to commuter rail services. Competing uses on the right-of-way can impose limitations on commuter rail schedules, particularly on busy track segments where capacity constraints are a consideration. Outside the Northeast, most commuter rail corridors are owned and operated by freight companies. Freight operations can be coordinated as to avoid peak passenger rail times, such as during rush hours, because freight companies may have flexibility to schedule movements outside of commuting times. However, if freight demand is high and time sensitive, additional track capacity is required to meet the needs of both passenger and freight services. Additionally, in most major metropolitan areas, Amtrak operates intercity passenger rail services. Amtrak's use of the right-of-way requires close schedule coordination between commuter rail operators and Amtrak, particularly during peak operating times. Frequently, agencies and freight companies utilize a computer based system, such as Berkley Simulations Rail Traffic Controller, to evaluate system capacity and confirm scheduling assumptions.

Control of the movements of both passenger and freight trains on a rail right-of-way utilizes centralized dispatching control staff, which uses schedules and train status to direct train movements over an assigned territory. Dispatching is typically provided by the owner/operator of the right-of-way, such as the transit authority, freight railroad, or Amtrak.

Ownership of a rail right-of-way could include either public agencies, private freight railroad companies, or a combination. If the transit authority responsible for commuter rail operations does not own the right-of-way, an agreement must be reached with the owner of the right-of-way to provide access to the line. Access agreements detail the operating rights and other technical stipulations for commuter rail operation on non-agency owned rail corridors. Topics typically included in access agreements are costs, restrictions on the use of the rail line, labor provisions, insurance, liability, fulfilment of government regulatory protocols, term of agreement, termination provisions, and operations and dispatching.

1.2.3 Stations

Station location is the primary determinant of station infrastructure and amenities. Station locations are generally broken down into three categories, including downtown stations, suburban stations, and town center stations. Attributes for stations in key areas include:

- **Downtown Stations** - Most commuter rail systems are based around large central terminal stations located in the city's central business district. These stations serve as the beginning point or the end point for most passengers trips. Large commuter rail stations serve the center and edges of large urban areas, and are highly integrated with supporting public transportation systems. These stations are typically the heart of urban and regional multi-modal transportation networks, are frequently staffed to provide ticketing and support services, and often include passenger ticketing, restrooms, retail space, and transit oriented development surrounding the station. Hub stations include large stations serving hundreds of thousands of commuters daily, such as New York's Grand Central Terminal, while smaller hub stations include Nashville's Riverfront Station, which serves around 1,000 daily commuters.

- **Suburban Stations** – Suburban station facilities are usually limited to covered waiting areas, pick-up/drop-off areas, bus stops, and vehicular and bike parking. Vehicular access for cars and busses is critical to stations in suburban areas due to the prevalence of driving and low-density of development, which makes walking and bicycling less attractive. Therefore, integration of bus and pick-up/drop-off zones is important to facilitate commuters accessing stations in suburban areas. Additionally, large park-and-ride lots for vehicles and bikes are important for capturing commuters from a wide commuting area. Suburban stations are frequently located near Interstates and other regionally important roads to provide vehicular access to station facilities.

- **Town Center Stations** – Commuter rail stations in town centers or dense (non-central) urban neighborhoods typically feature covered waiting areas, pedestrian and vehicular access points, and limited to no parking. Pedestrian and vehicular access points are typically integrated into adjacent streets and the urban fabric of the surrounding communities. Riders accessing the station by walking, bicycling, or transferring from other transit services are the primary users at town center stations. Commuter rail stations in town centers will likely have limited or no vehicular parking facilities due to the high density of buildings in town centers and most urban neighborhoods. However, many stations will provide accommodations for passengers who access the station via bicycle. Intermodal bus facilities can also frequently be found adjacent to commuter rail stations in areas that have bus service.

Passenger access to commuter rail stations occurs through various methods, including private automobile, taxi, transit, bicycle, and walking. Commuter rail station access includes:

- **Transit** – Commuter rail stations, particularly in Downtown areas, frequently have connections to other transit modes. Transit services at urban stations include downtown circulators, rapid transit stations, local and intercity bus stops, and intercity rail.

- **Pedestrian** – Commuter rail stations located in downtowns and town centers include pedestrian access points to facilitate movements from nearby streets, sidewalks, and buildings. The level of pedestrian activity depends on station area land use, such as proximity to a high-density employment center or a nearby college campus. Pedestrian access to a station frequently includes designated walkways, lighting, and security systems.

- **Bike and Bike Sharing** – Commuter rail stations frequently include bicycle parking facilities designated for passenger usage. Stations in cities with bike share programs also frequently include bike sharing points.

- **Private Automobile and Taxi Pick-up Facilities** – Commuter rail stations frequently incorporate areas for private automobile, group ride, and taxi stands should be provided to facilitate easy passenger drop off and exit from stations.

- **Parking** – Commuter rail parking areas are located in lots or garages adjacent to the station and designated for passenger usage. Depending on the system, some commuter rail parking is paid (usually daily) while other parking facilities are free.

- **Car Sharing** – Some commuter rail stations feature car sharing facilities, such as Zipcar. While such facilities are not appropriate for all locations, stations should at least have information on area car rental and sharing agencies.

1.2.4 Equipment

All Commuter rail equipment and infrastructure must meet FRA and FTA standards. The common types of equipment for commuter rail vehicles are either diesel powered trains or electric powered trains that operate on tracks with electric overhead catenary wires or third rail. Commuter rail trains in the U.S. are generally made up of one locomotive and several passenger coach cars. A commuter rail train set generally has 3 to 8 coaches attached, depending on the ridership of the train. Coaches can be either single-level or bi-level. Single-level coaches have a seated capacity of approximately 115 passengers. Bi-level coaches have seats on two different levels and have a seated capacity of approximately 180 passengers.

The amount of equipment needed for operations is dependent on the frequency of service and the length of each route. The more service that is scheduled on the system, the more equipment sets that are needed. A minimum of two train sets are necessary for operation, one to operate the service and one to act as a backup set. Depending on the length of the route, it is possible that one train set could make multiple trips during each peak hour period.

1.2.4.1 DMU ROLLING STOCK EQUIPMENT

A diesel multiple unit (DMU) is a rail passenger vehicle that contains a propulsion motor within each car and is thus often referred to as "self-propelled" vehicles. There is recently developed DMU technology that meets federal requirements for operations in mixed freight-passenger rail conditions and Buy America requirements. There are very few DMUs currently utilized in commuter rail service in the United States. A DMU-based system in Sonoma and Marin Counties in California, known as the Sonoma-Marin Area Rail Transit (SMART) is expected to begin operating in 2017 using recently procured DMU equipment. Due to the small number of DMU systems in use, and varied costs for DMU trainsets, there are uncertainties as to their actual costs.

As noted above, a base assumption for the Study was that conventional trainsets would be used for any potential service. The passenger capacity is approximately 600 passengers. This was deemed the minimum train size that would be operated in a typical smaller scale commuter rail operation. If projected user demand is substantially less than the capacity of these trainsets then it is questionable if there is sufficient demand to support the service given the high fixed cost to make track and infrastructure improvements needed for any commuter rail service.

To provide a context for evaluation of a system based on a DMU equipment an analysis of comparable capacity for DMU and conventional equipment was used. Recent costs to purchase SMART DMU trainsets are $11 million for a three-car trainset. Each conventional trainset has a capacity for 600 passengers and includes a locomotive and five coach cars. Each three car DMU consist would have capacity for approximately 160 passengers. To obtain the equivalent capacity with DMUs, 21-24 consists would need to be purchased. Therefore, there would not likely be any capital cost savings associated with the DMU alternative. Capital costs associated with maintenance facilities and annual maintenance costs could be higher due to the requirement for specialized facilities to manage DMU technology as opposed to conventional locomotives and coach cars.

It was suggested in public comments that DMUs would require fewer crewmembers than is assumed in the operational assumptions for the conventional equipment contained in the Study. Specifically it was stated that a DMU trainset could be operated with only a single engineer and that ticketing would be based on the proof of purchase honor system with spot checks by railroad personnel. This could be also be done with conventional trainsets. However, this system is not universally accepted. Thus, the operating costs used in this Study are based on a three-person crew, which should be considered the base case for either DMU or conventional trainset operation in order to avoid presenting an overly optimistic estimate of operating costs for the service.

An additional public comment was made noting that DMU are designed to use low-level platforms. The inference was that this would eliminate the need for high-level platforms and provide a substantive cost differential as compared to conventional equipment use. This is not the case.

Conventional trainsets can also use low-level platforms as evidenced by the current low-level platforms used by the Amtrak intercity services. There are a number of federal and state initiatives that are moving more toward the adoption of high-level platforms at all passenger rail stations. For this reason the Study assumed that high level platforms would be likely be mandated at the time of implementation of a commuter rail system. As DMUs are not designed to work with both high and low level platforms, there is a concern that DMUs may not prove to be a viable long-term option for equipment in a typical commuter rail service.

For the reasons given above, the viability of the option for use of DMU trainsets for operation of a commuter rail service is deemed to be uncertain at this time. Thus, the assumption of the Study remains that conventional trainsets would be used in any commuter rail service within the corridors defined as part of the Study. Vermont may wish to re-evaluate the use of this technology in the future as the depth of US experience with DMUs increases, in particular through the SMART system in California.

1.2.5 Maintenance Facilities and Layover Yards

Maintenance facilities are necessary for the operation of commuter rail systems. Maintenance facilities provide a location for train coaches and engines to be regularly serviced, and to be repaired when trains break down for extended periods of time. Fueling stations and maintenance sheds are necessary aspects of maintenance facilities.

Layover yards are also critical to the operation of commuter rail systems. Layover yards provide a location for trains to layover when they are not in operation. Layover yards need to provide enough space for all of the equipment sets in the system to be stored. Some layover yards are used only overnight while others are used for train storage throughout the day.

The location of maintenance facilities and layover yards is a critical aspect of the overall commuter rail network. Layover yards are generally located near the terminus of a line so a train set can easily be moved to storage after finishing a trip. The industrial nature and operating hours of maintenance facilities and layover yards encourages the placement of these facilities away from residential neighborhoods.

1.2.6 System Operator

Commuter rail service operators in the U.S. include state supported public agencies, Amtrak, and private sector organizations under contract with state transportation agencies. Commuter rail operators provide necessary maintenance, staffing, and technical knowledge for vital daily and long-range systems that ensure a properly functioning commuter rail network.

Major commuter rail systems in the U.S. are operated by a variety of different organizations. For example, the public-sector MTA operates Metro North and Long Island Rail Road services in the New York City area. The MBTA Commuter Rail in the Boston area is operated by Keolis Commuter Services, a subsidiary of the French firm Keolis Group, which has a 5-year contract with the MBTA to operate the system. Meanwhile, the Chicago Metra system is operated by various freight railroads under contract with Metra.

1.2.7 System Operating Funding

Commuter rail service operations in the U.S. are not self-supporting and require funding from government agencies to sustain operations. For example, in 2015 the MBTA provided an average subsidy of $5.75 per commuter rail rider, which adds up to an annual operating deficit of $193 million for the MBTA Commuter Rail network and means 52% of MBTA Commuter Rail operations were covered by passenger revenue or the agency's other revenue sources.[8]

The federal government supports less than 10% of operating expenses for transit agencies, defined as "vehicle operation and maintenance, maintenance of stations and other facilities, general administration, and purchase of transportation from private operators.[9]" Therefore commuter rail operators rely on local, state, and occasionally private concerns to provide funding for operations. The remainder of funding comes from local and state support, which include government general funds, sales taxes, property taxes, special tax assessment districts, and commercial and non-profit support.

1.2.8 System Capital Support

Commuter rail systems in the U.S. rely on government support for capital improvements. Capital improvements are related to the purchase of equipment or construction of new infrastructure. The federal government provides a maximum matching grant of 80% for transit capital improvements and funds 40% of the overall transit capital improvements in the U.S.[10]

1.3 Passenger Experience

Riders of commuter rail systems can expect a passenger experience that will typically be consistent from day-to-day. Most commuter rail passengers take the train daily to and from work and expect service to be consistent each day. Due to this, most commuter rail systems have standard schedules, frequency, fare systems, station facilities, and on-board experiences. This creates a uniformity that is followed by most commuter rail systems throughout the U.S.

1.3.1 Frequency & Schedule

Most commuter rail schedules have service that is focused on peak arrival and departure times in the morning and evening rush hours, from 6:00AM to 10:00AM, and from 3:30PM to 7:00PM. Commuter rail service is expected to have reliable and consistent travel time due to the absence of road congestion and fewer weather related impediments.

---

[8] "Net Subsidy by Mode: Park II" http://www.mbta.com/uploadedfiles/About_the_T/Board_Meetings/NetSubsidybyModePartII11182015.pdf
[9] "Federal Transportation Program: In Brief." https://www.fas.org/sgp/crs/misc/R42706.pdf
[10] "Net Subsidy by Mode: Park II" http://www.mbta.com/uploadedfiles/About_the_T/Board_Meetings/NetSubsidybyModePartII11182015.pdf

Commuter rail also differs from heavy and light rail because schedules during peak-period operations are usually less frequent.[11] During the rush hour periods, trains generally operate every 15-60 minutes, depending on the service. During the off-peak hours and on weekends, service is generally more limited and may only operate every 1-2 hours. Some commuter rail systems only operate during the peak hours and have no service during the off-peak hours and/or on weekends. Heavy and light rail systems generally have more frequent service, with 5-minute headways typical during peak-periods on heavily used services.

1.3.2 Ticket Fares

Fares for commuter rail systems typically depend on distance traveled, with many longer commuter rail systems having a zone-based fare system. Fares for commuter rail systems range from $2 to $28 for one-way and most transit systems offer monthly passes for regular commuters. Tickets are generally collected onboard, with passengers purchasing tickets directly from conductors onboard the train or prior to boarding the train using a smartphone app or ticket vending machine. Some systems have proof-of-purchase fare collecting systems, where passengers are fined for either not having a ticket or not validating a ticket. Figure 1.4 shows a ticket vending and validation area at Crystal City Station in Arlington, VA.

Figure 1.4: Commuter Rail Station Ticket Vending and Validation Area

1.3.3 Station Facilities for Passengers

[11] Heavy rail is defined as urban mass transit rail systems that typically utilize third rail for power that are designed for large passenger capacities and frequent stops. Light rail is defined as rail systems that typically use overhead catenary for power and are designed for smaller passenger capacities than heavy rail and make frequent stops.

Stations serve as the rider's entry point for the commuter rail system and have distinct design features depending on location and population served. Station attributes vary between commuter rail systems from large downtown with various passenger amenities to small single platform stations with limited facilities. Key passenger facilities at stations include:

- **Primary Stations** – Primary stations are Downtown or major suburban stations that serve large numbers of passengers and are regionally important passenger rail destinations. Passengers beginning or ending a journey at primary stations will frequently have enclosed or covered waiting areas, ticket vending and validation machines, access to retail and food establishments, bathrooms facilities, and easy connections to area streets or connecting transit facilities. Passengers will also frequently have a station or ticket attendant to ask about fares.

- **Secondary Stations** – Secondary stations are typically suburban and town center stations that serve fewer passengers and are of less regional importance than primary stations. Passengers at secondary stations will frequently have amenities limited to covered waiting areas, ticket vending and validation machines, seating, and connection points to other modes.

1.3.4 Onboard the Train

Since commuter rail generally carries passengers on longer distances than inner-city modes of transit, more room is dedicated on commuter rail cars for seating. Passengers are encouraged to sit throughout the journey, with most cars having rows of seats that either faces the front or back of the trains. Standing passengers are encouraged to stand in the front or backs of the cars, away from the rows of sitting passengers. In addition, most commuter rail cars have capacity for passengers to travel with their bicycles. The passenger experience on commuter rail service differs from the passenger experience on inter-city train travel, such as those operated by Amtrak. Commuter rail service generally has fewer amenities than inter-city rail service, as the typical passenger trip is much shorter. For example, commuter rail service generally does not have a café car and has limited space dedicated to luggage, as the majority of space is dedicated to increasing the capacity for daily commuters.

2. Existing Conditions

This section is a description of the existing transportation system in Northwest and Central Vermont, including transit services, rail infrastructure, and roadway networks. The section identifies the configuration and use of existing infrastructure and services within the Montpelier to St. Albans Commuter Rail study area (Corridor). The existing conditions evaluation focused on elements in the Corridor that may affect the development and feasibility of study options. The data gathering and analysis was done to support subsequent operational analysis and order of magnitude cost estimates of improvements.

Development of the existing conditions summary was based on currently available existing data, including railroad track characteristic charts, GIS data, aerial photographs, and previous assessments of the Corridor. [12] The data was gathered from diverse sources, including publically available information, government reports, and partner railroads. The analysis includes information on the three railroad segment ROWs – New England Central Railroad (NECR) Mainline, NECR Winooski Branch (Winooski Branch), and Washington County Railway (WACR), stations and rail yards on the Corridor, roads and traffic patterns, and existing transit options.

2.1 Existing Conditions of Rail Infrastructure

The existing rail infrastructure within the study Corridor includes the NECR Mainline, WAR, and the Winooski Branch. Data analyzed included the track alignment, locations of communities along the tracks, ownership, and operating condition including existing intercity passenger and freight movements, and signal systems on the right-of-way. Additionally, the section includes information on existing stations and rail yard facilities on the Corridor.

2.1.1 Right-of-Way Conditions

2.1.1.1 NECR MAINLINE

The NECR Mainline segment under analysis is a 56-mile segment between St. Albans Station and Montpelier Junction. The segment is primarily single tracked but has regular sidings and passing tracks approximately every 8-10 miles. The NECR is a subsidiary of Genesee & Wyoming (GW). GW is a short-line railroad holding company based in Darien, CT and operates 121 railroads in North America, Europe, and Australia.[13]

The NECR Mainline operates between New London, Connecticut and St. Albans, Vermont and is capable of handling railcar weights of 286,000 pounds within Vermont. The upgrade to the de facto industry standard of 286,000 pounds from 263,000 pound loading was accomplished as part of a

[12] Previous Assessments Consulted as a part of this report include: "Burlington-Essex Corridor Alternatives Analysis: Phase IA Report" August 2001; "Burlington-Essex Rail Project: Burlington Rail Tunnel Assessment" August 2002; "Final Report: Commuter Rail Feasibility Study" February 1991.
[13] "About Us." Genesee & Wyoming Inc., https://www.gwrr.com/about_us, accessed June 2016

project funded with 2009 High Speed & Intercity Passenger Rail funds. Annual carloads handled by the NECR are in excess of 38,000, with a wide variety of products.[14] The NECR Mainline does not have signaling for the majority of the ROW but there are isolated segments of signaled track principally in locations of sidings and yards. The NECR Mainline is operated at FRA Track Class 3, meaning freight operations are limited to a maximum of 40 MPH and passenger operations are limited to 60 MPH.

The NECR mainline has a mix of freight and passenger rail services that operate on the ROW. NECR operates regular freight service along the Corridor and several other railroads have operating rights in the Corridor including Canadian National (CN) and Vermont Railway (VTR). Daily freight operations on the NECR Mainline include one through freight operating between St. Albans and Palmer, Massachusetts with up to 90 cars. Other freight trains that serve only local customers on the rail line operate most days. Most northbound NECR freight is interchanged with CN operated trains at St. Albans and also interchanges with VTR at the Burlington Yard. Additionally, Amtrak operates one daily roundtrip on the Vermonter service, which operates between Washington, D.C. and St. Albans.

The NECR Mainline is profiled in Figures 2.1 and 2.2, which is a track chart of the line with mileposts, grade crossings, bridges, sidings, and city/towns.

[14] Vermont State Rail and Policy Plan, Page 19

Figure 2.1 NECR Mainline Track Chart (MP 75-108)

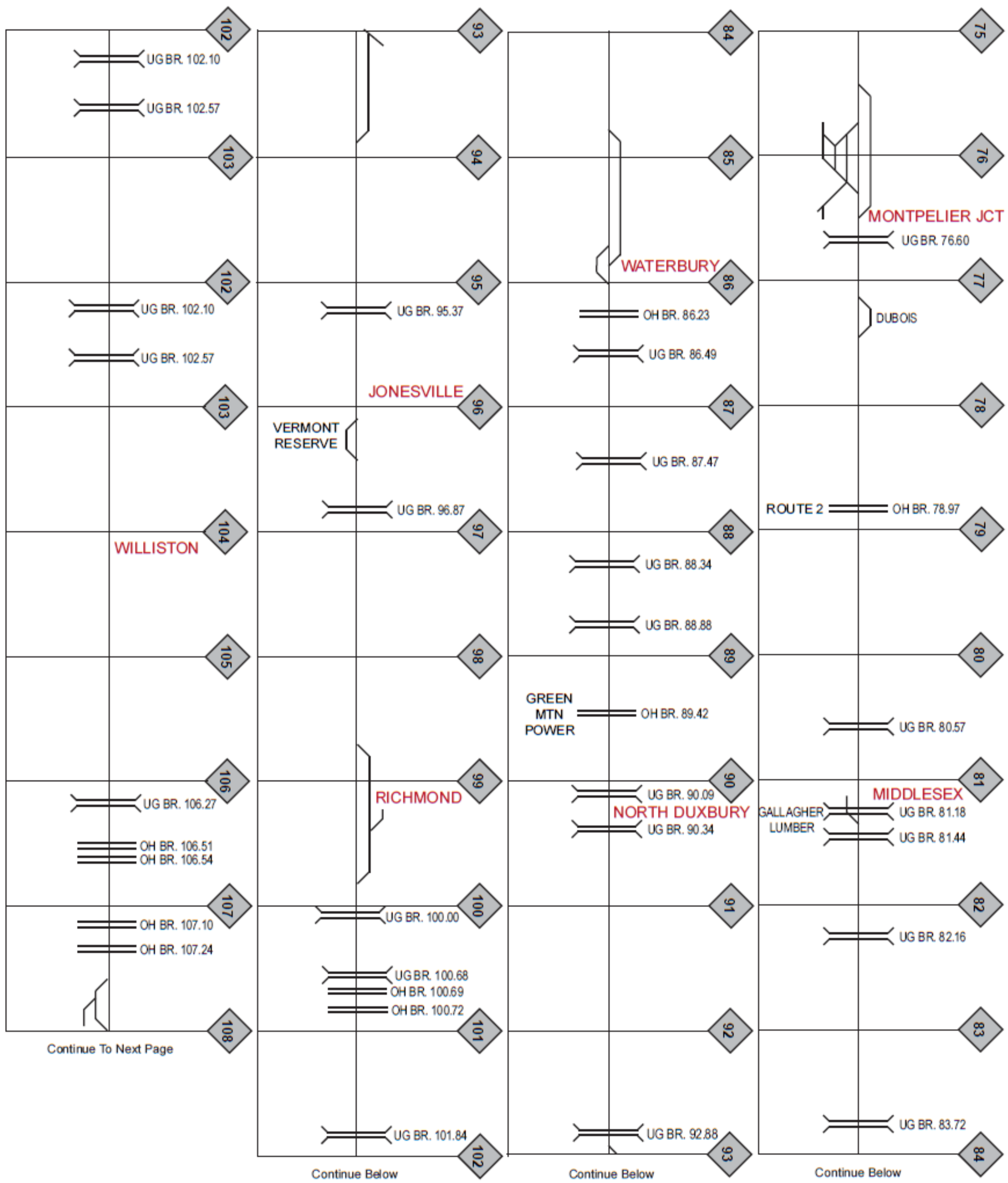
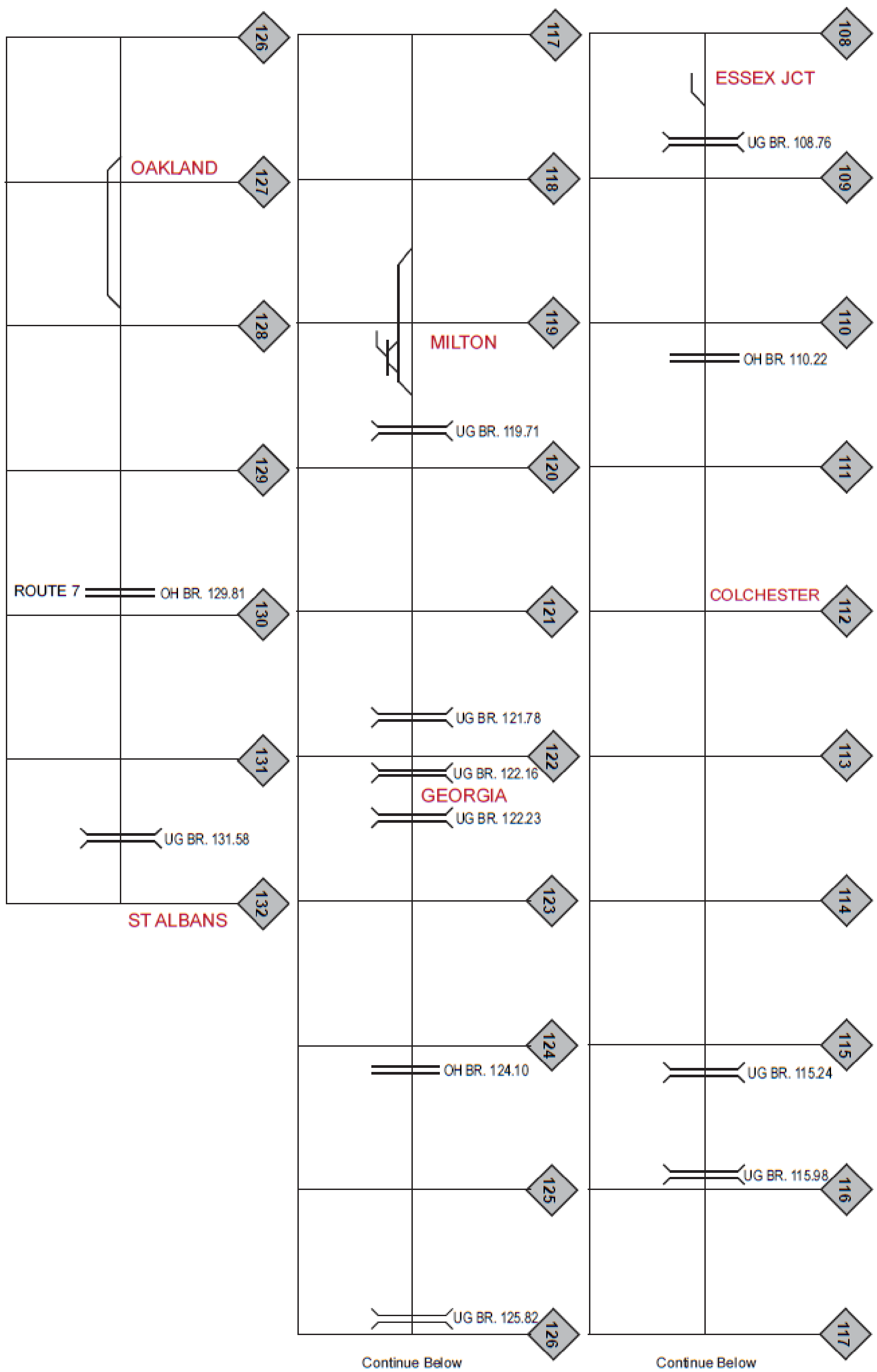


Figure 2.2 NECR Mainline Track Chart (MP 108-132)



2.1.1.2 NECR WINOOSKI BRANCH

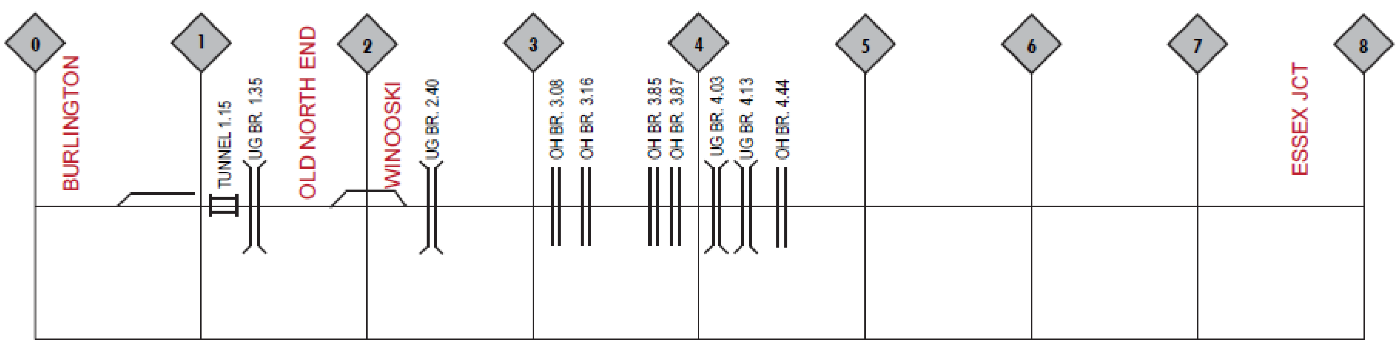
The Winooski Branch line is a 7.7 mile long railroad between Essex Junction and Burlington. The line traverses suburban areas north and east of Burlington and crosses into the densely developed area around Downtown Burlington and Winooski and east of Lake Champlain. The line branches from the NECR Mainline at Essex Junction and connects to the VTR in downtown Burlington. The line is a single track railroad between Essex Junction and downtown Burlington and has one tunnel at North Avenue in Burlington.

The line currently has no regularly scheduled passenger traffic and has limited freight operations. NECR uses the line to transport wood chips to a power generating station three times per week and occasionally to interchange freight cars with the VTR. The Winooski Branch is operated at FRA Class 1 Track standards, meaning freight operations are limited to a maximum of 10 MPH and passenger operations are limited to 15 MPH.

The Vermont State Rail Plan proposes spending $4 million on the Winooski Branch to upgrade the branch to 286,000 pound freight car standards by 2025 from 263,000 pound freight car operations. Near the southern terminus of the line is the Burlington Yard, which is used by VTR.

The Winooski Branch is profiled in Figure 2.3, which includes a track chart with mileposts, grade crossings, bridges, sidings, and cities/towns.

Figure 2.3 Winooski Branch



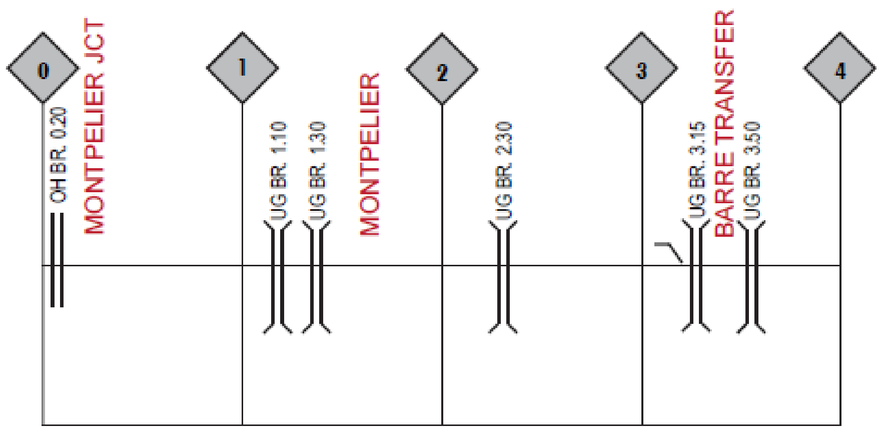
2.1.1.3 WASHINGTON COUNTY RAILROAD – MONTPELIER BRANCH

The WACR Montpelier Branch is a 13.1-mile railroad line between Montpelier Junction and Barre, owned by the State of Vermont and operated as a constituent part of Vermont Rail System (VRS). VRS is a privately held company that provides freight rail services on Vermont state-owned railways. The most recent freight volume constitutes the lowest freight density of any active rail line in Vermont. WACR has been maintained for FRA Class 1 track standards, meaning freight operations are limited to a maximum of 10 MPH and passenger operations are limited to 15 MPH. The railroad is operated with 263,000 pound railcar weight standards.

The WACR Montpelier Branch is not operating currently. In early 2015, the state placed an embargo on freight operations when several bridges on the ROW were identified as inadequate for freight operations.

The WACR – Montpelier Branch is profiled in Figure 2.4, which is a track chart of the line with mileposts, grade crossings, bridges, sidings, and city/towns.

Figure 2.4 WACR – Montpelier Branch



2.1.1 Existing Stations

Passenger stations of varying size, condition, capacity, and utilization exist along the Corridor. Certain stations are located in significant structures with indoor retail and waiting areas, such as Waterbury. However, other stations on the Corridor feature small concrete platforms with minimal passenger facilities and infrequent usage, such as Burlington Union Station.

2.1.1.4 MONTPELIER JUNCTION STATION, MONTPELIER, VERMONT

Montpelier Junction Station is an existing intercity passenger rail station located near the intersection of Junction and Short Roads in Berlin, Vermont. The station is located in a rural area west of central Montpelier. Some residences and commercial industrial facilities are located near the station. The station is served by Amtrak's Vermonter service and is owned and managed by NECR.

The station has a single low-level platform and historic headhouse with a waiting room. Parking is provided at an NECR owned lot and no connecting bus service is currently provided to the station. Facilities specifically for bicycles do not appear available; however a 2 mile long bike path provides a connection most of the way from downtown Montpelier to the station. The station is approximately one mile from the Interstate 89 interchange via local streets. The station parking lot consists of 10 short-term designated spaces but could potentially have 30 or more spaces if the paved area were adequately lined.

Montpelier Junction Station is currently the only passenger rail station in the Montpelier area; however, the City of Montpelier has identified a site for a potential Downtown Montpelier Station, which is outlined in Section 2.1.2. For the purposes of this study, it is assumed Montpelier Junction Station would serve as a secondary station for suburban commuters, who could primarily access the station by driving.

2.1.1.5 WATERBURY STATION, WATERBURY, VERMONT

Waterbury Station is an existing intercity passenger rail station located on US Highway 2 and Park Row in Waterbury, Vermont. The station is served by AMTRAK's Vermonter service and is owned and managed by Revitalizing Waterbury, Inc.

The station has a single low-level platform and historic headhouse with a waiting room, visitor center, cafe and restrooms; however the station does not provide ticketing or baggage services. Parking is provided at the station at a lot owned by Revitalizing Waterbury. Bus service is provided by GMT LINK and local bus services and is located in close proximity to the train station. The station is approximately one mile from the Interstate 89 interchange via local city streets. The station has short-term and long-term parking spaces available.

The station is located near the historic Waterbury town center, with local commercial, civic, and cultural amenities. The surrounding district is pedestrian friendly and the station is easily accessible to pedestrians. As a part of the study, it is assumed the station will serve as a secondary Town Center Station, with commuters accessing the station through a variety of means including vehicular, bicycle, walking, and connecting transit.

2.1.1.6 ESSEX JUNCTION-BURLINGTON, ESSEX, VERMONT

Essex Junction-Burlington Station is an existing intercity passenger rail station located on Railroad Avenue in Essex Junction, Vermont, 10 miles east of central Burlington. The station is served by AMTRAK's Vermonter service and the Green Mountain Railroad's seasonal tourist train. The station is owned and maintained by NECR.

The station has a single platform and headhouse with passenger waiting facilities, accessed from entrances on Railroad Avenue and Central Street. The station features bicycle parking and has a 10 space parking lot owned and managed NECR. Essex Junction-Burlington Station is proximate to Interstate 89 via local city streets. Local bus service also operates near the station by GMT (recently rebranded from CCTA).

Essex Junction-Burlington Station is located in a suburban town center, with a mix of commercial, institutional, and residential buildings. The surrounding district is pedestrian friendly and the station is easily accessible to pedestrians. As a part of the study, it is assumed the station will serve as a secondary Town Center Station, with commuters accessing the station through a variety of means including vehicular, bicycle, walking, and connecting transit.

2.1.1.7 ST. ALBANS STATION, ST. ALBANS, VERMONT

St Albans Station is an existing intercity passenger rail station located on Federal Street in St. Albans. St. Albans Station features an enclosed passenger waiting room and low level platform. The station is the northern terminus of Amtrak's Vermonter service and offers connections to local bus lines.

The station has 14 parking spaces for long and short term parking. The station is owned and maintained by NECR. The station is proximate to Interstate 89 via local roads.

The station is located in St. Albans town center, with local commercial, civic, and cultural amenities. The surrounding district is pedestrian friendly and the station is easily accessible to pedestrians. As a part of the study, it is assumed the station will serve as a secondary Town Center Station, with commuters accessing the station through a variety of means including vehicular, bicycle, walking, and connecting transit.

2.1.1.8 BURLINGTON UNION STATION

Burlington Union Station is a single platform station in Downtown Burlington. The station is located on the Vermont Railway Line (near the terminus of the Winooski Branch) and adjacent to the historic Union Station building, which was the primary train station in Burlington. The station currently has no regularly scheduled passenger traffic but is anticipated to be a stop on the Extended Ethan Allen Express if the service is extended from Rutland to Burlington.

The station is located near the heart of Downtown Burlington, a dense urban environment and the center of the largest employment cluster in Vermont. As a part of the study, it is assumed the station would serve as a primary Downtown Station as it is located in a dense district near Burlington's central business district. The station would likely serve as the beginning point or the end point for most passengers trips on the Vermont Commuter Rail network and would have connections to the regional bus transit network.

2.1.2 Proposed Station Sites

There are four sites proposed for stations that currently do not have any station facilities or infrastructure. Proposed station sites are located in Downtown Montpelier, Milton, Richmond, and Winooski.

2.1.1.9 MONTPELIER CENTRAL STATION SITE

Montpelier, Vermont is a city in Washington County with a population of 7,855 and is the capital of the state. Montpelier Downtown is a proposed site for a station on the VTR WACR right-of-way. For the purposes of this study, it is assumed a Montpelier station would serve as a primary Downtown Station as it would be located in Montpelier's central business district, which includes numerous government offices, cultural institutions, and commercial establishments. Therefore, facilities at the station will include a station platform, intermodal access, bicycle facilities, and vehicular drop off area.

The "Master Plan, Montpelier Vermont (2010)" notes that the city has a goal of securing "a location for an intercity, multi-modal transit station" and that this facility would "provide a destination to integrate local, regional and interstate transit, rail, bicycle path users, a Welcome Center for tourists and tour buses, and potential retail and commercial tenants."[15] Additionally, a study by the city on the potential Capital City Transit/Visitor Center establishes a site on the WACR near the

---

[15] "Master Plan, Montpelier Vermont." http://www.montpelier-vt.org/DocumentCenter/Home/View/1227

intersection of Taylor Street as the preferred location for a future train station.[16] In this study, no site will be identified as the final station location as this will be determined through a process that satisfies local, state, and federal planning and permitting guidelines. However, for the purposes of this study it is assumed a station will be located at the Taylor Street site identified in the "Capital City Transit/Visitor Center" plan.

2.1.1.10 MILTON STATION SITE

Milton, Vermont is a town in Chittenden County with a population of 10,352. Milton is a proposed site for a station between Essex Junction and St. Albans Stations on the NECR Mainline. For the purposes of this study, it is assumed a Milton station would serve as a secondary station for suburban commuters, who could primarily access the station by driving. Therefore, a new station would require a platform, parking lot, and auto/bus drop off area.

The Town of Milton 2013 Comprehensive Plan notes that historically a station was located on Main Street and that "if the possibility arises in the future to make use of this rail for passenger and/or commuter service, the Town may work to identify and develop station locations within easy walking distance of the highest concentrations of potential passengers.[17]" In this study, no site will be identified as the final station location as this will be determined through a process that satisfies local, state, and federal planning and permitting guidelines. However, for the purposes this study it is assumed a station will be located in the vicinity of Main Street near the intersection of Sunset Avenue.

2.1.1.11 RICHMOND STATION SITE

Richmond, Vermont is a town in Chittenden County with a population of 4,081. Richmond is a proposed site for a station between Essex Junction and Waterbury Stations on the NECR Mainline. For the purposes of this study, it is assumed a Richmond station would serve as a secondary station for suburban commuters, who would primarily access the station by driving. Therefore, a new station would require a platform, parking lot, and auto/bus drop off area.

The Town of Richmond 2012 Comprehensive Plan does not include a provision for a station site or study.[18] Additionally, in this study, no site will be identified as the final station location as this will be determined through a process that satisfies local, state, and federal planning and permitting guidelines. However, for the purposes this study it is assumed a station will be located in the vicinity of the historic station site in Richmond Village, in the vicinity of the intersection of Bridge Street and Railroad Street.

2.1.1.12 WINOOSKI STATION SITE

Winooski, Vermont is a city in Chittenden County with a population of 7,267. Winooski is a proposed site for a station between Essex Junction and Burlington Union Stations on the NECR

[16] "Capital City Transit/Visitor Center." http://www.montpelier-vt.org/DocumentCenter/Home/View/1406
[17] "Town of Milton 2013 Comprehensive Plan." http://www.miltonvt.org/images/pdffiles/government/docs/CompPlan.pdf
[18] "Town of Richmond 2012 Town Plan." http://www.richmondvt.gov/wp-content/uploads/2014/03/2012_Town-Plan_March.pdf

Winooski Branch. For the purposes of this study, it is assumed a Winooski station would serve as a secondary station and as a town center station, with commuters accessing the station through a variety of means including vehicular, bicycle, walking, and connecting transit. Therefore, a new station would require a platform, auto/bus drop off area, bicycle facilities, and potentially a parking lot if space is available.

The Winooski City Comprehensive Plan and previous studies have not identified a location for a potential Winooski Station. However, for the purposes this study it is assumed a station will be located on the Winooski Branch right-of-way in the town center in the area near Main Street/Route 2 and Barlow Street.

2.1.2 Rail Yard Facilities

Rail yards are facilities used by passenger and/or freight operators for equipment maintenance, storage, transloading, and switching freight between operators. Rail yard facilities also frequently have crew bases and other administrative facilities for the rail shippers and operators.

2.1.1.13 ST. ALBANS RAIL YARD

St. Albans Rail Yard is an intermodal facility located north of St. Albans Station in St. Albans. The yard is owned and operated by NECR and is the busiest rail yard in Vermont, handling approximately 44,000 cars annually. The yard is the primary interchange point for CN and NECR, allowing shipping inbound and outbound from Canada.

2.1.1.14 MONTPELIER JUNCTION RAIL YARD

The Montpelier Junction Rail Yard is an intermodal facility located west of Downtown Montpelier. The yard is owned and operated by NECR and is the primary interchange point between WACR and NECR. The yard is a four track facility.

2.1.1.15 BURLINGTON RAIL YARD

Burlington Rail Yard is located west of Downtown Burlington near Lake Champlain. The yard is the primary interchange point between the Vermont Railway Line and NECR. The yard is owned and operated by VTR and consists of freight and passenger maintenance facilities and transloading facilities. NECR has operating rights in the yard.

2.2 Existing Conditions of Roadways

The existing roadways on the Corridor include both local and regional arterial roadways and Interstate 89. The description includes the primary highway routes and connections and estimates of typical travel times between primary points.

2.2.1 Primary Highway Routes and Connections

The primary transportation Corridor for travelers between Montpelier, Waterbury, Essex Junction, Burlington, and St. Albans is Interstate 89. Interstate 89 begins in New Hampshire and cross into Vermont at White River Junction at the junction of Interstate 91. The route continues northwest, crossing the Green Mountains and passing to the east of Lake Champlain before ending at the

U.S./Canadian border. Interstate 89 parallels the NECR Mainline for most of the route between White River Junction and the U.S. Canadian border.

Interstate 89 is primarily a four lane limited access freeway with limited congestion except in select urban locations during peak periods. Additionally, Interstate 89 connects to most urban centers through local collector roads or arterials. Major urban connectors to Interstate 89 are profiled in Table 2.1.

Table 2.1 Major Arterials and Connectors to Interstate 89

Urban Area or Town	Interstate 89 Exit Number	Arterial or Collector Name/Route Number	Description
Montpelier	8	Memorial Drive	Memorial Drive connects the Montpelier region to Interstate 89.
Waterbury	10	Route 100 and Route 2	Route 100 is a major north-south state route in central Vermont. Route 100 connects downtown Waterbury to Interstate 89.
Richmond	11	Route 2	Route 2 connects Richmond and Essex Junction with Interstate 89.
Burlington	13	Interstate 189	Interstate 189 connects to Route 7 and serves southern Burlington and Shelburne from Interstate 89.
Burlington	14	Route 2/Main Street/Williston Road	Route 2/Main Street connects Downtown Burlington, University of Vermont, and University of Vermont Medical Center to Interstate 89. Route 2/Williston Road connects and Burlington International Airport to Interstate 89.
Burlington	15	Route 15/College Parkway/East Allen Street	Route 15 connects northern Burlington, Winooski, and Essex Junction to Interstate 89 South.
St. Albans	19	St. Albans State Highway	Connects St. Albans Town Center with Interstate 89 via Route 7.
St. Albans	20	Highland Road/Route 207 & 7	Connects St. Albans Town Center with Interstate 89 via Route 7.

Other major routes in the study Corridor are profiled in Table 2.2.

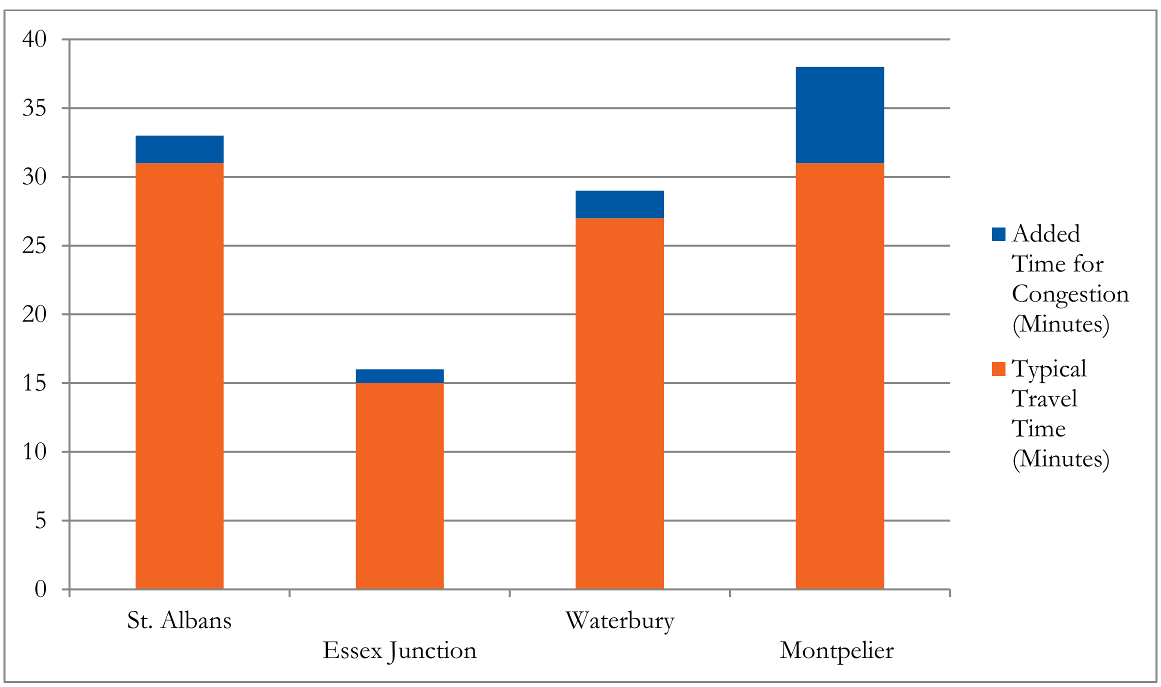
Table 2.2 Other Major Routes in the Study Corridor

Route Name or Number	Area Served	Description
Route 2	Montpelier, Waterbury, Richmond, Burlington	Route 2 parallels Interstate 89 from Montpelier to Burlington and serves as a connector from Interstate 89 to several major town centers.
Route 12	Montpelier	Route 12 traverses Downtown Montpelier and is a north-south route in central Vermont.
Route 100	Waterbury	Route 100 is a north-south Route in Vermont that intersects Interstate 89 at Waterbury.
Route 15	Essex Junction and Burlington	Route 15 is an east-west roadway that connects Burlington with Essex Junction and points east.
Route 7	Burlington and St. Albans	Route 7 parallels Interstate 89 north of Burlington.
Route 105	St. Albans	A route that connects St. Albans to points east and north.

2.2.2 Typical Travel Times for on Major Roadways

Typical travel times were calculated using Google Maps travel times at both peak and off-peak periods. Typically, the region experiences low levels of congestion, with peak period travel times adding at most seven minutes to an origin-destination pair, or approximately 12% to the travel time total. Table 2.3 profiles congestion in between key locations and Downtown Burlington and Figure 2.5 provide sample travel times between all locations in peak and off-peak.

Figure 2.5: Off-Peak Travel Time and Added Time for Delay from Key Origins to Burlington[19]



[19]Travel times used peak traffic data from www.maps.google.com

2.3 Existing Conditions of Transit and Passenger Rail

The existing transit on the Corridor primarily consists of intercity and regional bus services and the once per day roundtrip Amtrak Vermonter service. The description includes the routes, service plans and ridership of existing Corridor services and feeder services.

Green Mountain Transit (GMT) operates a regional system in the Montpelier, St. Albans and Burlington areas that offers both local and regional bus services. The GMT system is operated by Chittenden County Transportation Authority (CCTA) and includes Green Mountain Transit Agency. The two agencies are currently in the process of creating a single brand name under the GMT logo.

2.3.1 LINK Express Bus Service and Commuter Services

GMT operates regional express commuter busses known as the LINK. There are three LINK routes from the Downtown Transit Center in Burlington, including service to Montpelier, Middlebury, and St. Albans. The LINK routes began operation between 2003 and 2005 and services are concentrated during peak commuting times. Table 2.3 profiles LINK bus services.

Table 2.3: LINK Express Bus Service[20]

Route	Alternative Bus Number	Weekday Round-trips	Peak Travel Time (Minutes)*	One-way Length (Miles)
Montpelier LINK on Interstate 89 (via Richmond and Waterbury)	#86	10.5	Northbound: 78-83 Southbound: 82-90	42
Middlebury LINK on Route 7 (via Shelburne, Charlotte, Ferrisburgh, Vergennes, and New Haven)	#76	4	Northbound: 65 Southbound: 70-75	38
St. Albans LINK on Interstate 89 (via Winooski, Colchester (Chimney Corners Park and Ride), and Georgia)	#96	4	Northbound: 82-87 Southbound: 70	33

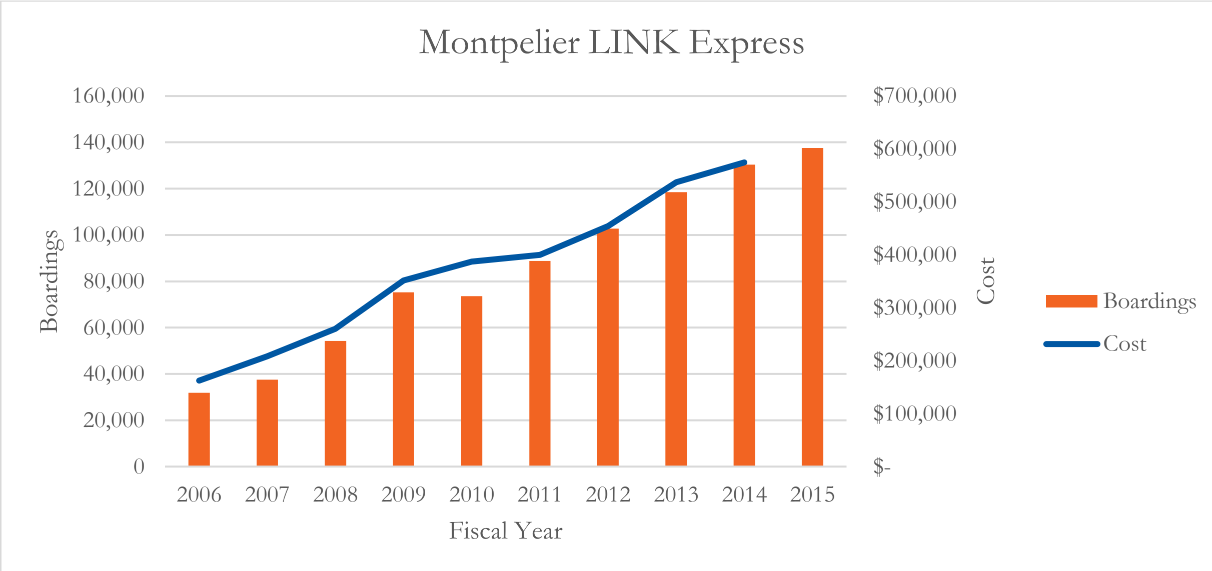
**Burlington times are measured as the scheduled time from the Downtown Transit Center.*

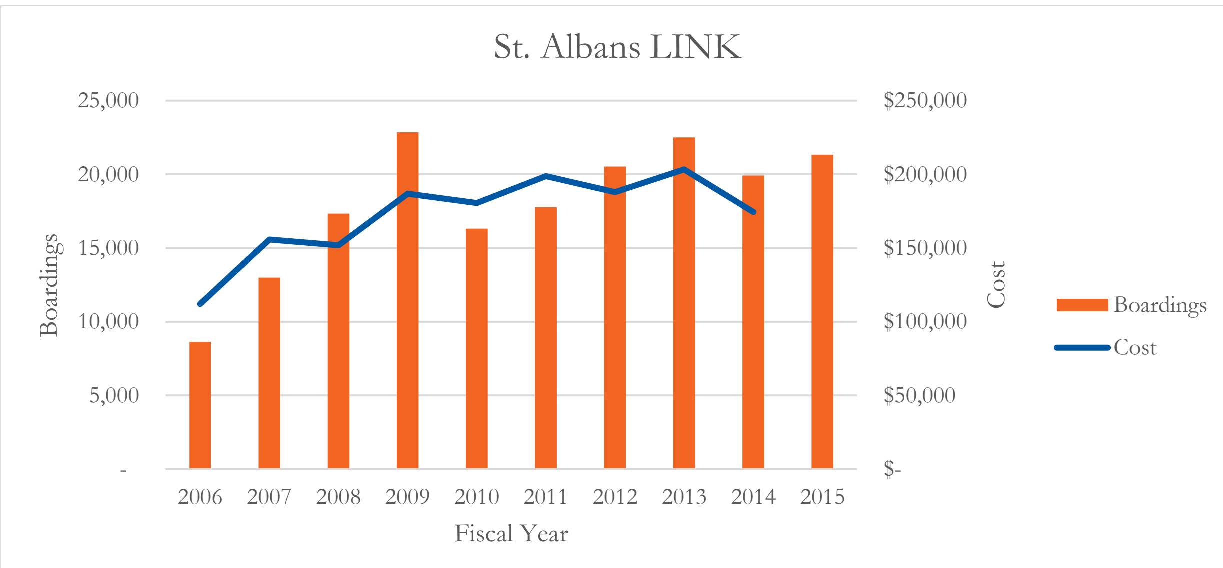
The Montpelier and St. Albans LINK bus routes closely parallel the Corridor and are utilized by commuters to Burlington and reverse commuters. The primary LINK route is from Downtown Montpelier to Downtown Burlington with service to Waterbury and Richmond. The bus primarily operates on Interstate 89 and also has a circulator loop through Downtown Montpelier and Burlington. Additionally, the St. Albans LINK bus closely parallels the St. Albans to Burlington portion of the Corridor, with stops in Colchester, Georgia, and Winooski. The bus travels on U.S. 7 and Interstate 89. A single ride on the LINK costs $4.00 and a monthly pass is $150.

Figure 2.6 profiles annual ridership and costs for the Montpelier and St. Albans LINK Express bus service.

[20] Green Mountain Transit

Figure 2.6: Montpelier and St. Albans LINK Express Annual Boardings and Operating Cost[21]





GMT also operates local Commuter Bus services from Downtown Transit Center in Burlington, Downtown Montpelier, and Waterbury. Fares on Commuter Bus services are $2.00 or $75.00 ($67.00 in the Montpelier area) for a monthly pass. Commuter bus services are profiled in Table 2.7.

[21] Vermont Agency of Transportation Statistics

Table 2.7 Weekday Commuter Routes

Service Number/Name	Terminal	Terminal	Notes
36/Jeffersonville Commuter	Burlington Downtown Transit Center	Jeffersonville	Regular Daily Service
46/Route 116 Commuter		Hinesburg or Middlebury	Rush Hour Service
56/Milton Commuter		Milton	Regular Daily Service
83/Waterbury Commuter	Downtown Montpelier	Waterbury	Regular Daily Service
84/U.S. 2 Commuter		St. Johnsbury	Regular Daily Service
89/City Commuter		Barre	Regular Daily Service
93/Northfield Commuter		Northfield	Regular Daily Service
100/Route 100 Commuter	Waterbury	Morrisville	Regular Daily Service
115/Alburgh/Georgia Commuter	Alburgh	Georgia	Regular Daily Service via St. Albans
116/Richford/St. Albans Commuter	Richford	St. Albans	Regular Daily Service

Additionally, the Route 126 SnowCap Commuter operates between Montpelier and several ski mountains. This is only in operation during peak ski season.

2.3.2 Local Bus Service

GMT operates Local bus service on the Corridor, serving Burlington, St. Albans, Montpelier, and other communities in northwest and central Vermont. Nearly 20,000 riders utilize local and commuter busses daily. Service is typically offered in 30-minute intervals with some busses having 15 minute intervals at peak times. Single rides cost $1.25 and monthly passes are $50.00.

The majority of local bus services are focused on Downtown Burlington's Downtown Transit Center (DTC), located on St. Paul Street. The DTC replaced an outdated terminal on Cherry Street in 2016 and features covered bus bays, climate controlled waiting areas, restrooms, and information/ticketing kiosks. Weekday services in the Burlington area are profiled in Table 2.8.

Table 2.8 Weekday Burlington Area Local Routes

Service Number/Name	Terminal	Terminal	Notes
1/Williston	Burlington Downtown Transit Center	Williston Walmart	Regular Daily Service
1V/Williston Village	Burlington Downtown Transit Center	Williston Village	Rush Hour Service
2	Burlington Downtown Transit Center	Essex Junction	Regular Daily Service
3/Lakeside Commuter	Burlington Downtown Transit Center	Burlington – Lakeside	Weekday Peak
5	Burlington Downtown Transit Center	Burlington – South End	Regular Daily Service
6	Burlington Downtown Transit Center	Shelburne Museum	Regular Daily Service
7	Burlington Downtown Transit Center	Burlington – Northgate Apartments	Regular Daily Service
8/City Loop	Burlington Downtown Transit Center	Loop	Regular Daily Service; Downtown Burlington Loop
9	Burlington Downtown Transit Center	Winooski	Regular Daily Service
4	Essex Junction	Essex Junction	Loop Service
10	Williston	Essex Junction	Regular Daily Service
11	Burlington (Waterfront/Boathouse)	UVM Medical Center	Regular Daily Service
12	South Burlington	Burlington International Airport	Regular Daily Service

Downtown Montpelier and St. Albans serve as secondary hubs for local services. Weekday local services for Montpelier are profiled in Table 2.9 and St. Albans in 2.10. Fares in the Montpelier area are $1.00 for a single ride and $33.00 for a monthly pass. Fares in St. Albans are $0.50 for a single ride and $16.00 for a monthly pass.

Table 2.9 Weekday Montpelier Area Local Routes

Service Number/Name	Terminal	Terminal	Notes
80/City Route Mid-Day	Downtown Montpelier	Downtown Loop	Non-Commuter Mid-Day Loop in Downtown Montpelier
82	Downtown Montpelier	Montpelier Hospital Hill	Regular Daily Service
92/Montpelier Circulator	Downtown Montpelier	Downtown Loop	Regular Daily Service

Table 2.10 Weekday St. Albans Area Local Routes

Service Number/Name	Terminal	Terminal	Notes
110/St. Albans Downtown Shuttle	St. Albans Downtown	St. Albans Downtown	Circulator in St. Albans with Regular Weekday service

Additionally, seasonal local operations include the Route 88 Capital Shuttle, which provides a loop between state government locations in Montpelier. The Capital Shuttle only operates when the state legislature is in session.

2.3.3 Existing Passenger Rail Services

Amtrak operates the Vermonter service in the study Corridor area. The Vermonter operates one daily roundtrip between St. Albans and Washington, D.C. with Corridor stops at St. Albans, Essex Junction/Burlington, Waterbury, and Montpelier. The service departs at 9:25 AM from St. Albans for southbound operations and arrives at St. Albans at 8:40 PM for northbound service. The service utilizes the NECR Mainline and is a state-supported service with operating support from the State of Vermont. Amtrak schedule time from St. Albans to Montpelier is 67 minutes for southbound trains and 73 minutes for northbound services.

2.3.4 Existing Travel Time on Study Rail Lines

Train travel times on the existing tracks, without major changes, were determined using existing Amtrak schedules, track charts, and previous studies on service times.

Trains traveling northbound from a Downtown Montpelier Station to Burlington Union Station (skipping Essex Junction Station) would have a total travel time of approximately 72 minutes. The total travel time from Burlington Union Station to St. Albans (stopping at Essex Junction) would be approximately 44 minutes. Table 2.11 profiles sample travel times between station locations.

Table 2.11: Existing Travel Time: Northbound Services

Origin Station	Destination Station	Travel Time (Minutes)
Downtown Montpelier to Burlington		
Downtown Montpelier	Montpelier Jct. Station	15*
Montpelier Jct. Station	Waterbury	12
Waterbury	Richmond	15
Richmond	Winooski	20
Winooski	Burlington	10
Burlington to St. Albans		
Burlington	Winooski	10
Winooski	Essex Junction	6
Essex Junction	Milton	13
Milton	St. Albans	15

**This travel time assumes the existing track configuration in which trains would operate 1.3 miles between Taylor Street and Montpelier Junction. At Montpelier Junction, trains would enter the NECR Mainline and operate south at which point it would be required make a backup move and crew would have to switch ends. After switching ends, the train would continue north to Montpelier Junction Station and continue on the NECR Mainline.*

Trains from traveling southbound from Burlington Union Station (skipping Essex Junction Station) to Downtown Montpelier Station would have a total travel time of approximately 72 minutes. The total travel time from St. Albans (stopping at Essex Junction) to Burlington Union Station would be approximately 44 minutes. Table 2.12 profiles sample travel times between station locations.

Table 2.12: Existing Travel Time: Southbound Services

Origin Station	Destination Station	Travel Time (Minutes)
St. Albans to Burlington		
St. Albans	Milton	16
Milton	Essex Junction	13
Essex Junction	Winooski	6
Winooski	Burlington	10
Burlington to Downtown Montpelier		
Burlington	Winooski	10
Winooski	Richmond	20
Richmond	Waterbury	14
Waterbury	Montpelier Jct. Station	13
Montpelier Jct. Station	Downtown Montpelier	15*

**This travel time assumes the existing track configuration where trains would operate on the NECR Mainline south of Montpelier Junction Station. At that point, the train engineer would reverse ends and operate the train through Montpelier Junction to the WACR to Downtown Montpelier Station.*

3 Corridor Travel Demand

The purpose of this chapter is to provide an overview of travel volumes in the Corridor being considered for commuter rail service. This will include an identification of existing travel in the Corridor, projected changes to travel volumes, and a range of typical transit mode shares. Specific commuter rail or transit ridership projections will not be developed as part of this study, as there are too many variables that need to be more thoroughly defined before any meaningful commuter rail ridership could be developed. Instead, the information provided in this chapter will provide a range of possible travel volumes and will highlight the attributes of the Corridor or the service that would influence ridership.

As noted in the previous chapters, commuter rail primarily serves as a mode for long distance[22] trips between home and work and typically operates on a service plan that facilitates those types of trips. Although it can be used for other trip purposes, work related trips are the most prevalent; therefore the focus of this travel demand analysis is on long-distance work trips between communities with potential stations and the Burlington area. Although the Burlington area is the focus of work trips in the region, an analysis of potential "reverse commute" trips is also included. These would include trips where Burlington area residents commute out of the area to work locations in St. Albans or Montpelier.

The first section provides an overview of existing transportation demand in the Corridor and is followed by a section related to future Corridor growth. Existing Corridor travel demand was projected using American Community Survey (ACS) data[23] that profiles home/work locations for employees. This travel data was used along with two different future population growth scenarios to project regional future travel demand. In addition, various profiles of typical transit usage are provided in the last section of the chapter. This information provides a reasonable range of possible corridor transit demand in 2030.

3.1 Corridor Existing Travel Demand

Existing travel demand was determined using ACS 2009-2013 employment data. The ACS is a U.S. Census Bureau survey, which provides information on national, state, and local demographics, including topics, such as employment, housing, population change, and educational attainment. Travel demand accounts for all commuting trips in the Corridor region and is not exclusive to a single mode (driving alone, carpooling, walk, bike, or transit).

The ACS data used in this study was dataset related to location of residence and employment in the Corridor. ACS provides profiles of employed residents for each city and town in Vermont and estimates the number of people working in their home municipality and those commuting to other locations (city/town). For example, ACS estimates that there are 3,936 residents of the City of

[22] Average trip for commuter rail trip is 24.7 miles; 2015 APTA Public Transportation Fact Book
[23] 2009-2013 5-Year American Community Survey Commuting Flows, US Census

Montpelier that are employed and, of those employed residents, 164 people work in the City of Burlington.

For the purposes of this analysis, the Corridor was divided into four trip segments. Segments are divided geographically and by direction of commute. The following trip segments and employee origin/destination pairs were considered:

- **Montpelier to Burlington** (Northbound): This segment includes employee origins in Barre (City), Barre (Town), Berlin, Duxbury, East Montpelier, Middlesex, Montpelier, Moretown, Plainfield, Waterbury, Bolton, and Richmond and commuting to jobs in Essex, Winooski, and Burlington. Additionally, employees commuting from Montpelier to Waterbury were considered in this segment.

- **Burlington to Montpelier** (Southbound): This segment includes employee origins in Burlington, Winooski, Essex Junction, Bolton, Richmond, and Waterbury and commuting to jobs in Waterbury and Montpelier.

- **St. Albans to Burlington** (Southbound): This segment includes employee origins in Fairfax, Fairfield, Georgia, Milton, St. Albans (City), St. Albans (Town), and Swanton and commuting to jobs in Essex Junction, Winooski, and Burlington Union Station.

- **Burlington to St. Albans** (Northbound): This segment includes employee origin at Burlington Union Station, Winooski, Essex Junction, and Milton and commuting to jobs in Milton and St. Albans.

The origin municipality for each segment includes employee resident cities/towns within approximately five miles of a potential station location. Work destinations were limited to only the cities/towns with potential stations since employees typically have less ability to travel significant distances from a station to a work destination. The existing transportation demand in the Corridor is summarized by segment in Table 3.1.

Table 3.1: Existing Corridor Travel Demand (All Modes)

Segment	Direction of Commute	Total Daily Commuters
Montpelier to Burlington	Northbound	1,737
Burlington to Montpelier	Southbound	1,096
	Segment Total	**2,833**
St. Albans to Burlington	Southbound	4,433
Burlington to St. Albans	Northbound	548
	Segment Total	**4,981**
	Regional Total	**7,814**

3.2 Corridor Future Travel Demand

Travel demand in the Corridor is projected to increase since the population in the Corridor is growing. For this study future travel demand is assumed to grow at the same rate as population growth. Although transportation demand, expressed in per capita vehicle miles traveled (VMT) has been outpacing population growth in past decades, VMT has declined in recent years at both the Vermont and the national level.

Two population growth scenarios for the period from 2010 and 2030 have been modeled to provide a range of potential Corridor future travel demands. One growth scenario is based on the State of Vermont's "Vermont Population Projections – 2010-2030". This provides population estimates for all communities in Vermont. This scenario projects less growth by 2030 so we labeled it the "Low Growth Scenario". The other growth scenario was developed based on data from the Chittenden County Regional Planning Commission's (CCRPC) Environment Community Opportunity Sustainability (ECOS) Plan, where it was identified that there is a market for an additional 50,000 people, 24,000 households, and 49,000 jobs in Chittenden County by 2035. The CCRPC ECOS Plan population growth scenario included an estimate on how that level of growth may be distributed among area municipalities. This growth scenario projects more growth by 2035 so it is labeled in this study as the "High Growth Scenario". The "Low" and "High" designations are included for comparison of the only available population projections available in the Corridor and not as an evaluation of the validity of the data. Both growth scenarios assume that employment in the Corridor region will increase at the same rate as population.

3.2.1 Corridor Low Growth Scenario Methodology

The Low Growth Scenario relies on the State of Vermont's population estimates to understand changes to commuting patterns in 2030. The State of Vermont estimated population change for municipalities across the state. The Low Growth Scenario projected future travel demand on the Corridor based on the population growth rate for each municipality. Table 3.2 profiles the State of Vermont population growth rates for each city and town in the study Corridor area.

Table 3.2: State of Vermont Population Projection Change 2010 to 2030[24]

Chittenden County	Population Change
Bolton	17.5%
Burlington	4.6%
Essex	7.9%
Milton	11.4%
Richmond	2.1%
Winooski	7%
Chittenden County Total Growth	9.7%
Franklin County	
Fairfax	41.3%
Fairfield	10.5%
Georgia	12.8%
St. Albans (Town)	58.5%
St. Albans (City)	-24.4%
Franklin County Total Growth	16.5%
Washington County	
Barre (Town)	4.1%
Barre (City)	-3.4%
Berlin	4.9%
Duxbury	15.9%
East Montpelier	5.5%
Middlesex	5.3%
Montpelier	-3.4%
Moretown	6.5%
Plainfield	-3.8%
Waterbury	4.9%
Washington County Total Growth	4.8%

The State of Vermont model uses a cohort-survival methodology for estimating population growth.[25] The cohort survival model uses birth, death, and migration rates of 5-year age groups of the population to estimate the population of these individuals in future years.

For example, in 2000 Vermont had 34,182 people in the 25-29 in the age cohort and in 2010 (now aged 35-39), the group had a population of 36,358. The population change took into account a 6.51% net migration rate and .15% mortality rate among this population cohort.[26] Therefore, when projecting the future population these rates are applied to the 25-29 age cohort groups to

[24] "Vermont Population Projections – 2010-2030." State of Vermont, http://dail.vermont.gov/dail-publications/publications-general-reports/vt-population-projections-2010-2030
[25] Ibid.
[26] Ibid.

understand their population in future years. Rates for different cohort groups are then applied for a total population projection.

3.2.2 Corridor High Growth Scenario Methodology

The High Growth Scenario uses both the CCRPC and State of Vermont population change rates to estimate a high rate of growth for Corridor commuting patterns.

CCRPC growth estimates are used in this methodology to establish the estimated population growth in Chittenden County communities. CCRPC's growth rates are typically higher than the State of Vermont's and thus represent an opportunity to understand the impact of higher growth on the Corridor. For example, CCRPC estimated an overall Chittenden County growth rate of 11.9% between 2010 and 2030 whereas the State of Vermont estimated a 9.7% rate of growth in the county. Table 3.3 profiles CCRPC's growth rates by town.

Table 3.3: CCRPC Population Projection Change from 2010 to 2030[27]

Chittenden County	Population Change
Bolton	16.5%
Burlington	11.1%
Essex	15.3%
Milton	14.0%
Richmond	27.0%
Winooski	11.4%
Chittenden County Total Growth	11.9%

CCRPC's method for generating population projections is based on an economic projection that estimates future total employment and deduces population growth from employment growth. The model estimates the population change based on net migration rate projected from changes to employment in the county. By estimating the total number of new employees, the model then estimates the number of new households and household average size for a projection of countywide economic growth. The CCRPC estimated total employment and population growth for the entire county and this forecast is applied to municipalities. The municipal forecast was adjusted based on the CCRPC population growth projections and also on the Travel Demand Model/Land Use Allocation Module for the final projection results.

High growth population changes in Washington and Franklin Counties are estimated based on a modified version of the State of Vermont's growth model because supplemental forecasts are not available. The population growth projection assumes a minimum growth rate for each municipality as the projected county growth rate (16.5% in Franklin County and 4.8% in Washington County) and the high growth rate if the municipality's rate is above the county average. This accounts for variability in population growth and provides a higher rate of growth to understand the potential

[27] Ibid.

impacts of additional growth for transportation demand. Table 3.4 profiles the adjusted growth projections for Franklin and Washington Counties.

Table 3.4: High Growth Projections for Franklin and Washington Counties

Franklin County	Population Change
Fairfax	41.3%
Fairfield	16.5%
Georgia	16.5%
St. Albans (Town)	58.5%
St. Albans (City)	16.5%
Washington County	
Barre (Town)	4.8%
Barre (City)	4.8%
Berlin	4.9%
Duxbury	15.9%
East Montpelier	5.5%
Middlesex	5.3%
Montpelier	4.8%
Moretown	6.5%
Plainfield	4.8%
Waterbury	4.9%
Washington County Total Growth	4.8%

3.2.3 Corridor Travel Demand Results

The two growth scenarios show that potential demand on the Corridor will increase from 7,814 in existing demand to 8,664 in the low growth scenario or 9,175 in the high growth scenario. Table 3.5 profiles existing transportation demand and low and high growth scenarios by segment in 2030.

Table 3.5: Existing and 2030 Low and High Growth Scenarios

Segment	Direction of Commute	Daily Commuters		
		Typical Conditions	Ambitious Transit Focused Policies/ Conditions	Aggressive Transit Focused Policies/ Conditions
Montpelier to Burlington	Northbound	1,737	1,819	1,958
Burlington to Montpelier	Southbound	1,096	1,177	1,204
Segment Total		**2,833**	**2,996**	**3,162**
St. Albans to Burlington	Southbound	4,433	5,084	5,394
Burlington to St. Albans	Northbound	548	583	619
Segment Total		**4,981**	**5,667**	**6,013**
System Total		**7,814**	**8,664**	**9,175**

3.3 Transit Demand

Transit demand is the total number of people in a transportation corridor using a form of public or private transit service for the majority of their commute. The transit demand is a share of the total commuters traveling between two identified geographic points. Transit demand does not specify a mode of travel. Rather, transit demand defines the total number of travelers who could potentially take transit if high-quality public transportation services were available to weekday commuters.

Frequently, transit demand is a small percent of the overall travel market, typically less than 5% in suburban and rural areas. However, for certain travel market pairs, transit demand can be higher. The most significant contributors to transit usage are costs and inconveniences associated with driving, such as parking costs and traffic congestion. However, the quality and convince of transit services also contribute to transit market share, such as travel time, frequency, and cost.

For the purposes of overall potential travel demand in the Corridor, home locations for employees are considered in municipalities within 5-miles of a potential commuter rail station stop. Additionally, employment destinations in municipalities less than one mile from a potential commuter rail stop were considered to understand market share. The 5 mile employee origin station market area was defined based on analysis of ridership on the Boston, MA area's MBTA commuter rail system. On that system it was identified that commuter rail stations could draw riders from as far as five miles away at stations with good freeway access and parking availability. Therefore, station market areas identified for this analysis cover the towns located within 5-miles of the home station.

An analysis of the same MBTA commuter rail system data identified that commuter rail riders typically travel no more than 10 to 15 minutes on the employment end of the trip. This typically is no more than a 1 mile walk or short bus trip. Therefore, for this study employment destinations are exclusively for jobs located in the terminal municipality.

3.3.1 Corridor Transit Demand Methodology

Corridor transit demand is divided into three potential transit shares. The transit shares are reflective of a low transit usage share and two higher shares to understand the variability in potential transit operations within a given corridor. Transit demand represents the total number of commuters who might take transit given specific transportation conditions. The profiled shares include:

- **Typical Conditions**: A low transit share is based on the current transit share of commuters to employment destinations in the county of origin. Transit share by county is the total number of county residents using transit to access employment and are reported in ACS 2009-2013 surveys. For the three counties included in this report, the transit share for each is: Chittenden County transit share is 2.5%; Washington County transit share is 1.2%; and Franklin County transit share is 0.06%. County transit share is expected to stay constant between existing operations and in 2030 growth scenarios.

- **Ambitious Transit Focused Policies/Conditions:** This potential transit demand shares utilizes the Montpelier LINK Bus service as an example. The Montpelier LINK Bus is a Green Mountain commuter service from Montpelier and Waterbury to Burlington. The Montpelier LINK bus operates as an express service with no stops between Waterbury and Burlington. The total share of commuters commuting between Montpelier/Waterbury to Burlington (and making the reverse commute) is 24.5%, a high transit usage rate for transit market share purposes. This service achieves high transit usage by providing a high quality service that includes travel times and fare structures that are competitive with car usage. Stop locations that are convenient and the span of service and frequency of service match well with the travel demand.

- **Aggressive Transit Focused Policies/Conditions**: This potential transit demand shares utilizes the MBTA Commuter Rail service area as an example. The MBTA Commuter Rail operates 13 lines connecting Boston suburbs to the city center. The transit share for commuters living near MBTA commuter rail stations 35-40 miles from Boston (approximately the same distance as Montpelier to Burlington) is 38% to 55% of total commuters to employment hubs in Boston/Cambridge. The MBTA Commuter Rail transit share provides a good comparison because it is a rush-hour focused passenger rail system that primarily connects low density suburbs to high-density job central employment districts. The MBTA transit share used for this study is 38% to provide a conservative estimate for the transit demand forecast.

Additionally, certain origin-destination pairs were excluded from the transit demand calculation. These trips are unlikely to be taken by transit due to the significantly longer travel times than comparable trips by auto. For example, travelers between Fairfax and Essex Junction are unlikely to use transit because of substantially longer transit times and distances than comparable trips by auto.

3.3.2 Corridor Transit Demand Results

Existing transit demand results in a system-wide transit demand profile of 135 transit users on the low end to 2,850 users in the highest percentage scenario. Transit demand does not equate to ridership on a particular transit service but indicates a portion of total Corridor commuter who could be expected to use transit service given specific commuting parameters. Corridor transit demand is profiled in Table 3.6.

Table 3.6: Existing Daily Transit Demand

Segment	Direction of Commute	Daily Commuters		
		Typical Conditions	Ambitious Transit Focused Policies/ Conditions	Aggressive Transit Focused Policies/ Conditions
Montpelier to Burlington	Northbound	30	425	660
Burlington to Montpelier	Southbound	30	270	420
Segment Total		**60**	**695**	**1,080**
St. Albans to Burlington	Southbound	60	1,005	1,560
Burlington to St. Albans	Northbound	15	135	210
Segment Total		**75**	**1,140**	**1,770**
System Total		**135**	**1,835**	**2,850**

Conditions related to transit mode share and their applicability to the Corridor have several assumptions:

- The **County Average** mode share assumes the mode share currently being achieved in Corridor communities as an average of the entire county. The assumption is that conditions would not change significantly.

- The **Ambitious Transit Focused Policies/Conditions** mode share assumes a mode share currently being achieved by the LINK service between Montpelier, Waterbury, and Burlington. This service achieves high transit usage by providing a high quality service that includes travel times and fare structures that are competitive with car usage. Stop locations that are convenient and the span of service/frequency of service matches well with the travel demand. Additionally, the State of Vermont subsidizes state employees who take LINK services to Montpelier due to parking shortages in Downtown Montpelier. These conditions lead to a higher transit mode share and therefore higher ridership.

- The **Aggressive Transit Focused Policies/Conditions**: mode share assumes conditions comparable to commutes on the MBTA Commuter Rail system to Downtown Boston. Boston experiences severe peak period congestion. Using trips from the Town of Ayer as an example of commuting share into Boston. Ayer is located on an MBTA commuter rail line and is about 35 miles northwest of Boston. An auto trip from Ayer to Downtown Boston typically takes 50 minutes without traffic. However, the trip typically takes 80-90 minutes with peak period traffic, while the commuter rail trip only takes 51 minutes on an MBTA Commuter Rail Fitchburg Line express train. Additionally, parking in Downtown Boston is among the highest in the nation. Parking in Downtown Boston is intentionally limited by a parking cap - which freezes commercial spaces at 35,556 - a limitation that was created in 1976 to address regional air quality concerns. The Downtown Boston Parking Freeze leads to constrained parking and high rates; Downtown Boston parking in 2016 is $38 for daily rates and $475 for guaranteed reserved monthly rates. Downtown Boston parking rates are third highest in the nation for a central business district, behind only New York City (Downtown and Midtown Manhattan). These conditions contribute to a high transit share into Downtown Boston from outlying communities.

3.4 Future Transit Demand

Future transit demand requires a determination of total transportation demand, future growth expectations, and transit share. The total transportation demand on the Corridor is derived from Section 3.1, which outlines the transit market segments utilized for analysis of the Corridor. The methodology for future growth is outlined in Section 3.2, which profiles both low and high growth scenarios for 2030. Transit market share is profiled in Section 3.3, which includes a description of the three potential market shares for high-quality transit services in the Corridor.

The result of the analysis shows a low demand for transit services in the Corridor at 135 people assuming that demand for service in the corridor is no higher than current transit use across all trips in the Corridor. However, that demand could skyrocket if conditions in the Corridor changed dramatically in coming years. With heavy levels of roadway congestion, high parking prices and high levels of growth, there could be demand for commuter rail services as high as 3,300 people daily. However, it is more likely that demand for commuter rail services in the Corridor would more closely match the transit mode shares currently being achieved on the existing LINK bus services. When this level of demand is applied to projected trips being made in the Corridor in the future, it is estimated that demand for Corridor services would be in the range of 2,000 to 2,200 people daily.

It is important to note that these are demand estimates and do not equate to projected commuter rail service ridership. They should be considered the upper end of ridership given the stated population and service utilization conditions. Instead of projecting ridership, these demand estimates project the number of people who may consider utilizing the commuter rail or other transit services. There are many attributes to a service that may dissuade riders from actually using the service. The major attributes that influence actual ridership include:

- Travel time
- Parking/Fare costs
- Station location
- Frequency of service
- Time of service
- Quality of service

Once a service plan is developed, each of these attributes will be more defined and an estimate can be developed regarding how commuter rail riders are predicted to choose from their travel options.

Table 3.7 includes the estimated demand for transit in the Corridor in 2030 with both low and high population growth scenarios. It also provides the range of transit demand given the conditions of other travel options.

Table 3.7: 2030 Daily Transit Demand Low/High Growth Scenarios by Commuters

Segment	Direction of Commute	Daily Commuters		
		Typical Conditions	Ambitious Transit Focused Policies/ Conditions	Aggressive Transit Focused Policies/ Conditions
Montpelier to Burlington	Northbound	30 / 35	445 / 480	690 / 745
Burlington to Montpelier	Southbound	30 / 30	290 / 295	450 / 460
	Segment Total	**60 / 65**	**735 / 775**	**1,140 / 1,205**
St. Albans to Burlington	Southbound	60 / 70	1,210 / 1,285	1,765 / 1,880
Burlington to St. Albans	Northbound	15 / 15	145 / 150	220 / 235
	Segment Total	**75 / 85**	**1,355 / 1,435**	**1,985 / 2,115**
	System Total	**135 / 150**	**2,090 / 2,210**	**3,125 / 3,320**

3.5 Past Vermont Experience with Commuter Rail

Vermont's recent experience with commuter rail was the Champlain Flyer, a 12.9-mile commuter train that operated between Burlington and Charlotte. This section will provide an overview of the Champlain Flyer service and the ridership attained by the service.

3.5.1 Service Overview

The Champlain Flyer began service in 2000 to address anticipated congestion on Shelburne Road/Route 7 due to a major reconstruction project. Shelburne Road is a major commuter route from southern Chittenden County and Addison County to the Burlington area. While it operated, the service provided inbound morning rush hour trips and evening outbound rush hour trips as well as mid-day service. At the peak of its operation, the service provided a total of 9.5 round trips daily from Monday to Friday and 8 round trips on Saturdays and Sundays. The service operated with station stops at Charlotte, Shelburne, South Burlington, and Burlington Union Station.

The service operated on weekdays (excluding holidays) and charged $1.00 for one-way fares. Later in the later stages of operation, Friday and Saturday evening service was added in lieu of Sunday service. The Champlain Flyer was intended to serve as a demonstration service to assess the feasibility of commuter rail in the greater Burlington area.

The reconstruction of Shelburne Road/Route 7 did not begin as anticipated and ridership was never as high as originally forecasted. Due to low ridership and high costs associated with service operating subsidies, the Champlain Flyer service was ended in 2003..

3.5.2 Ridership

The Champlain Flyer did not attain the ridership anticipated before service began. Original projections anticipated annual ridership of over 214,000 in the first year of operation. However, in the first year of operations the service had only 85,403 riders and in the second year 82,811 riders. The average number of daily riders for the first year of operations was therefore approximately 325, assuming 250 working days per year.

3.5.3 Transit Demand

In 2000, 1,449 workers commuted from residences in Charlotte and Shelburne to jobs in Burlington according to U.S. Census estimates. Therefore, with over 214,000 projected riders, anticipated transit share was approximately 20% of employees commuting from residences in Charlotte and Shelburne to jobs in Burlington. With only 85,403 commuters using the train in the first year of operation, the transit share for commuters from Charlotte and Shelburne to Burlington was 12%.

If the 12% transit share were applied to the existing total travel demand on the entire Corridor (Table 3.5), the *transit demand* would be approximately 940 people. If indexed to 2030, transit demand on the entire Corridor would be 1,040 in the low growth scenario and up to 1,100 in the high growth scenario.

3.6 Transit Demand Analysis

The Montpelier LINK Bus transit service and the Champlain Flyer commuter rail service provide a basis for evaluating potential high quality transit demand in the Corridor.

The Montpelier LINK Bus provides four inbound trips from Montpelier to Burlington during the AM rush hour and five outbound trips during the PM peak. Additionally, the service provides one mid-day roundtrip between Montpelier and Burlington. This high level of peak services provides commuters with flexibility on job start/end times and reliability in the event they miss a bus. Fares are lower than the combined cost of gas/parking and this furthers the service's attractiveness for riders. Additionally, the LINK bus acts as a distribution service to key commercial, institutional, and transit transfer centers in Downtown Burlington, allowing passengers the opportunity to have near door-to-door service with the LINK bus. The relatively high Montpelier LINK bus transit share, at 25%, therefore is a high-end for transit demand share on the Corridor.

The Champlain Flyer operated varying levels of service over its lifespan, though it consistently provided service during key weekday work start/end times. Services were priced lower than the combined cost of gas/parking, making the service financially attractive. The service only served destinations in the Burlington Union Station area, requiring commuters to walk or take transit to destinations further into Burlington. Therefore, the transit mode share at 12%, while high for a transit service in a small urban area, was not as high as the LINK bus service transit mode share.

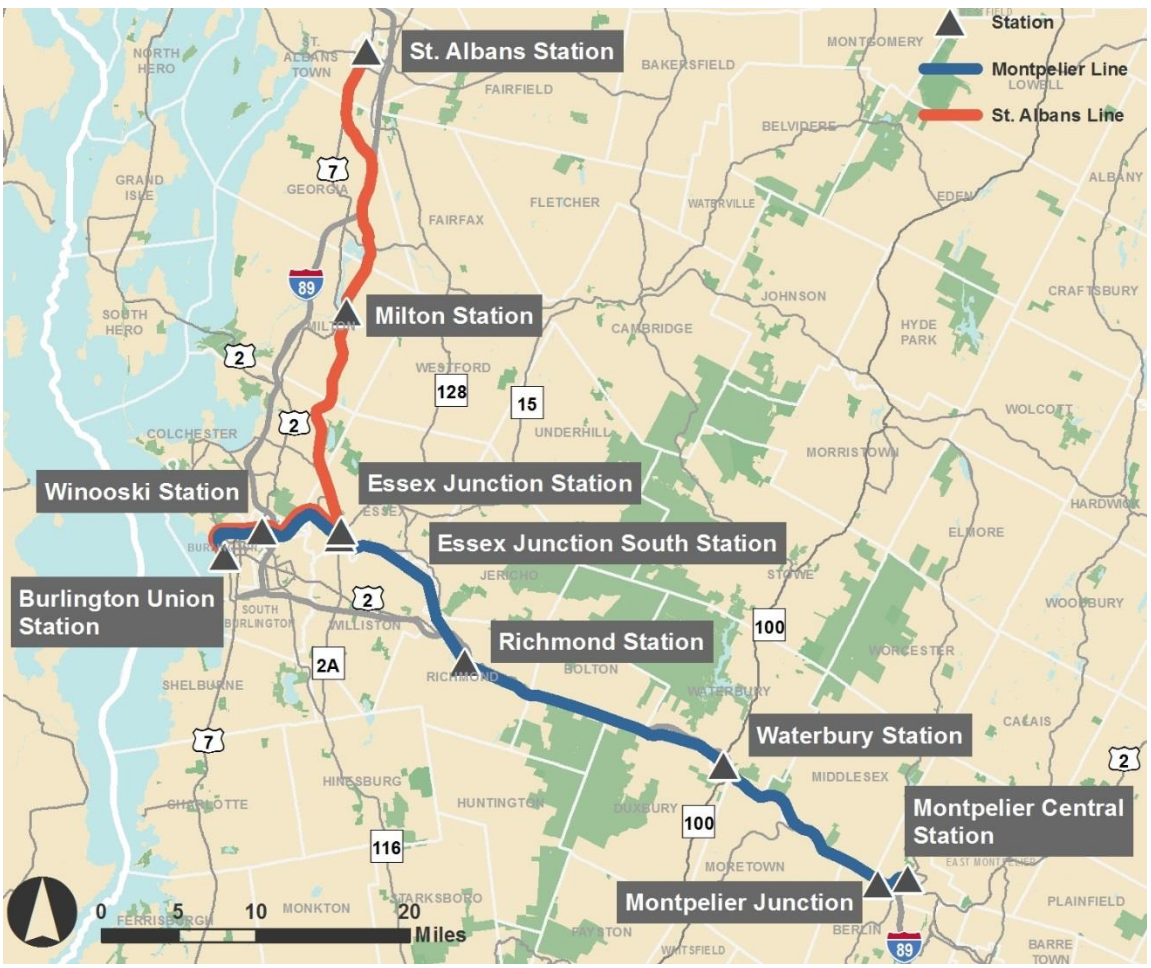
The two transit mode shares represent a low and high share for transit riders in the Corridor if additional transit service is considered. A high frequency transit service with low fares and comprehensive coverage of Downtown Burlington could attain a transit mode share similar to the Montpelier LINK bus. A low frequency transit service with limited coverage of Downtown Burlington and low fares could attain a similar mode share as the Champlain Flyer. The two services provide a range of potential transit demand that could be feasible in the Burlington area. These range from a Corridor-wide 940-1,835 with existing transit demand and by 2030 grow to 1,040-2,090 in the low growth scenario to 1,100-2,210 in the high growth scenario.

4. Conceptual Commuter Rail Operations

This chapter examines conceptual commuter rail operations on the Corridor and the required infrastructure to facilitate service. All services operate inbound or outbound from Burlington Union Station and diverge at Essex Junction with northbound services continuing to St. Albans as the St. Albans Line and southbound services to Montpelier as the Montpelier Line.

The St. Albans Line would operate from Burlington Union Station via the Winooski Branch and NECR Mainline to St. Albans. The Montpelier Line would operate from Burlington Union Station via the Winooski Branch, NECR Mainline, and WACR to Montpelier. Figure 4.1 shows the lines and station stops for both the St. Albans Line and Montpelier Line.

Figure 4.1: Montpelier Line and St. Albans Line with Stations



Two conceptual schedules are included to profile different levels of peak service. Peak commuting periods are rush hour periods defined as arrivals in Burlington between 7:00 AM and 9:00 AM and departures between 4:00 PM and 6:00 PM. Peak commuting hours are typically the times of job start/quit times and also the times of heaviest roadway congestion. Therefore, peak commuting times are the times used as the basis for determining conceptual commuter rail schedules.

The service levels are based on the FRA maximum for passenger trains operating on a corridor without PTC. PTC is a technology designed to enhance safety of rail services through a GPS-based system that creates separation between trains and collision avoidance. However, PTC has a substantial capital cost and implementation would also impact freight services on the Corridor.

The scheduled train run times are based on existing passenger train travel times, travel times calculated with previous studies, and estimates based on forecast track conditions. Existing Amtrak travel times are used for the NECR Mainline for travel between Montpelier and Essex Junction and St. Albans and Essex Junction. Travel times on the Winooski Branch were calculated in the 1991 *Commuter Rail Feasibility Study* and updated based on new infrastructure added to the Corridor. WACR travel times were calculated assuming trains travel slowly (40 MPH) along the WACR branch due to the curvature of the right-of-way and dense urban environment and have recovery time built into the schedule.

Schedule 1 profiles a limited peak service with 12 daily trips on the Corridor, the maximum allowed without a Positive Train Control (PTC) system. Schedule 1 allows six roundtrips to Burlington, including two St. Albans and three from Montpelier enabling peak service to Burlington reverse commuting options to Montpelier. Schedule 2 profiles a comprehensive peak service with 11 roundtrips, including three from St. Albans and seven from Montpelier and would require the installation of a PTC system.

Section 4.3 profiles the capital requirements for the Corridor with the addition of commuter rail services and the equipment requirements for the corridor. Finally, Section 4.4 discusses the operations requirements for a commuter rail service, including potential governance models, requirements of a rail service operator, and potential organizations that could fulfill the role of Corridor service operator.

4.1 Schedule 1: Limited Peak Service

Schedule 1 profiles a limited peak schedule with service from outlying areas into Downtown Burlington and reverse commute service to Montpelier. Without PTC, the FRA maximum allowable number of passenger trains on a corridor is 12, meaning at most six passenger roundtrips on the Winooski Branch between Essex Junction and Burlington Union Station.

Service on the St. Albans Line would be limited to two inbound trips in the morning peak and two outbound trips in the evening peak. The Montpelier Line would feature two morning peak inbound trips from Montpelier to Burlington and two outbound morning peaks trains from Burlington to Montpelier. Tables 4.1 and 4.2 profile conceptual limited peak St. Albans Line and Montpelier Line schedules.

Table 4.1: Conceptual St. Albans Line Limited Peak Service Schedule

St. Albans Line		Schedule 1
Inbound	**001**	**003**
St. Albans	6:30 AM	7:55 AM
Milton	6:45 AM	8:10 AM
Essex Junction North	6:59 AM	8:24 AM
Winooski	7:06 AM	8:31 AM
Burlington Union Station	7:14 AM	8:39 AM
Outbound	**002**	**004**
Burlington Union Station	4:30 PM	5:45 PM
Winooski	4:37 PM	5:52 PM
Essex Junction North	4:44 PM	5:59 PM
Milton	4:58 PM	6:13 PM
St. Albans	5:13 PM	6:28 PM

Table 4.2: Conceptual Montpelier Line Limited Peak Service Schedule

Montpelier Line				Schedule 1
Inbound	**020**	**022**	**024**	**026**
Montpelier Central	6:25 AM	7:25 AM	4:19 PM	5:50 PM
Montpelier Junction	6:34 AM	7:34 AM	4:28 PM	5:59 PM
Waterbury	6:44 AM	7:44 AM	4:38 PM	6:09 PM
Richmond	7:01 AM	8:01 AM	4:55 PM	6:26 PM
Essex Junction South	7:11 AM	8:11 AM	5:05 PM	6:36 PM
Winooski	7:18 AM	8:18 AM	5:12 PM	6:43 PM
Burlington Union Station	7:26 AM	8:26 AM	5:20 PM	6:51 PM
Outbound	**021**	**023**	**025**	**027**
Burlington Union Station	6:15 AM	7:36 AM	4:40 PM	5:30 PM
Winooski	6:22 AM	7:43 AM	4:47 PM	5:37 PM
Essex Junction South	6:29 AM	7:50 AM	4:54 PM	5:44 PM
Richmond	6:38 AM	7:59 AM	5:03 PM	5:53 PM
Waterbury	6:55 AM	8:16 AM	5:20 PM	6:10 PM
Montpelier Junction	7:06 AM	8:27 AM	5:31 PM	6:21 PM
Montpelier Central	7:15 AM	8:36 AM	5:40 PM	6:30 PM

4.2 Schedule 2: Comprehensive Peak Service

Schedule 2 profiles Corridor commuter rail service with comprehensive peak service for both the St. Albans and Montpelier Lines. Schedule 2 assumes full implementation of PTC on the Corridor with service. Schedule 2 service levels are comparable to the existing LINK bus services with similar arrival and departure times and frequency of service.

On the St. Albans Line, Schedule 2 would provide three inbound morning peak trips and one morning outbound trip to accommodate reverse commuters. Evening peak services would feature three outbound trains and one inbound reverse peak train. Similar to the morning service, the reverse peak train would accommodate reverse commuters and move equipment.

Services on the Montpelier Line would operate four inbound morning peak trains and three outbound trains from Burlington to Montpelier. Evening services would include four outbound trains from Burlington to Montpelier and three inbound trains from Montpelier to Burlington.

While Schedule 1 would preclude mid-day or additional late-evening services due to the PTC passenger service maximum, Schedule 2 could accommodate additional off-peak services if stakeholders determined additional services preferable. The conceptual St. Albans Line and Montpelier Line comprehensive peak service schedules are profiled in Tables 4.3 and 4.4.

Table 4.3: Conceptual St. Albans Line Comprehensive Peak Service Schedule

St. Albans Line				Schedule 2
Inbound	**001**	**003**	**005**	**007**
St. Albans	6:25 AM	7:30 AM	8:10 AM	5:08 PM
Milton	6:40 AM	7:45 AM	8:25 AM	-
Essex Junction North	6:54 AM	7:59 AM	8:39 AM	5:35 PM
Winooski	7:01 AM	8:06 AM	8:46 AM	-
Burlington Union Station	7:09 AM	8:14 AM	8:54 AM	5:48 PM
Outbound	**002**	**004**	**006**	**008**
Burlington Union Station	7:19 AM	4:15 PM	5:00 PM	6:00 PM
Winooski	-	4:22 PM	5:07 PM	6:07 PM
Essex Junction North	7:32 AM	4:29 PM	5:14 PM	6:14 PM
Milton	-	4:43 PM	5:28 PM	6:28 PM
St. Albans	7:59 AM	4:58 PM	5:43 PM	6:43 PM

Table 4.4: Conceptual Montpelier Line Comprehensive Peak Service Schedule

Montpelier Line							Schedule 2
Inbound	**020**	**022**	**024**	**026**	**028**	**030**	**032**
Montpelier Central	5:40 AM	6:35 AM	7:35 AM	8:05 AM	4:19 PM	5:19 PM	6:00 PM
Montpelier Junction	5:49 AM	6:44 AM	7:44 AM	8:14 AM	4:28 PM	5:28 PM	6:09 PM
Waterbury	5:59 AM	6:54 AM	7:54 AM	8:24 AM	4:38 PM	5:38 PM	6:19 PM
Richmond	6:16 AM	7:11 AM	8:11 AM	8:41 AM	4:55 PM	5:55 PM	6:36 PM
Essex Junction South	6:26 AM	7:21 AM	8:21 AM	8:51 AM	5:05 PM	6:05 PM	6:46 PM
Winooski	6:33 AM	7:28 AM	8:28 AM	8:58 AM	5:12 PM	6:12 PM	6:52 PM
Burlington Union Station	6:41 AM	7:36 AM	8:36 AM	9:06 AM	5:20 PM	6:20 PM	7:00 PM
Outbound	**021**	**023**	**025**	**027**	**029**	**031**	**033**
Burlington Union Station	6:20 AM	6:51 AM	7:46 AM	4:00 PM	4:45 PM	5:30 PM	6:30 PM
Winooski	6:27 AM	6:58 AM	7:53 AM	4:07 PM	4:52 PM	5:37 PM	6:37 PM
Essex Junction South	6:34 AM	7:05 AM	8:00 AM	4:14 PM	4:59 PM	5:44 PM	6:44 PM
Richmond	6:43 AM	7:14 AM	8:09 AM	4:23 PM	5:08 PM	5:53 PM	6:53 PM
Waterbury	7:00 AM	7:31 AM	8:26 AM	4:40 PM	5:25 PM	6:10 PM	7:10 PM
Montpelier Junction	7:11 AM	7:42 AM	8:37 AM	4:51 PM	5:36 PM	6:21 PM	7:21 PM
Montpelier Central	7:20 AM	7:51 AM	8:46 AM	5:00 PM	5:45 PM	6:30 PM	7:30 PM

4.3 Connecting Transit

GMT operates bus services near potential transit stations. Bus services include LINK express busses, local bus routes, and circulator services. A full description of existing bus routes in the Corridor region is in Chapter 2 (Existing Conditions). Additionally, intercity busses, such as Vermont Translines, Greyhound Lines, and Megabus, as well as paratransit, and private taxi companies serve areas near existing stations.

Table 4.5 profiles existing transit services at each station and conceptual modifications to services to accommodate commuter rail service at identified station sites. Some stations in suburban areas will not have connecting transit service because the stations will primarily be park-and-ride locations where the majority of passengers will arrive at the station by vehicle, then park or be dropped off.

Table 4.5: Conceptual Transit Connections

Station	Conceptual Transit Connections	Changes to Existing Transit
Montpelier Central	Montpelier Central Station will be located near the heart of Downtown Montpelier. The conceptual location for the station is directly adjacent to the future site of the Capital City Transit Center, which will include bus and vehicular drop off points. Through the Capital City Transit Center program, it is anticipated that existing transit services in the Montpelier region will be reorganized to serve this location. Additionally, given the station's location in Downtown Montpelier, a significant number of passengers will be able to access final destinations by foot or utilize existing busses on Taylor or State Streets.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules. No changes to routes will be necessary as it is anticipated that routes will be optimized to serve the Capital City Transit Center.
Montpelier Junction	A conceptual plan for Montpelier Junction would include a parking lot for commuters and areas for bus/auto drop off. As a suburban station with a parking lot, it is anticipated that most passengers will connect to the station by automobile. Therefore, no connecting transit service is anticipated to be active at this station apart from taxi and paratransit operations.	None
Waterbury	Waterbury Station is an existing station stop with parking and passenger drop off points. The 83 and 100 busses currently serve Downtown Waterbury in the vicinity of Waterbury Station.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules. No changes to routes will be necessary as existing transit already serves the station area.
Richmond	A conceptual plan for Richmond Station would include a parking lot for commuters and areas for bus/auto drop off. As a suburban station with a parking lot, it is anticipated that most passengers will connect to the station by automobile. Therefore, no connecting transit service is anticipated to be active at this station apart from taxi and paratransit operations.	None
Milton	A conceptual plan for Milton Station would include a parking lot for commuters and areas for bus/auto drop off. As a suburban station with a parking lot, it is anticipated that most passengers will connect to the station by automobile. Therefore, no connecting transit service is anticipated to be active at this station apart from taxi and paratransit operations.	None

St. Albans	St. Albans Station is an existing station stop with parking and passenger drop off points. The 96 (St. Albans LINK), 109, 110, 115, and 116 busses currently serve Downtown Waterbury in the vicinity of Waterbury Station.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules. No changes to routes will be necessary as existing transit already serves the station area.
Essex Junction (Existing)	Essex Junction Station is an existing station stop with parking and passenger drop off points. The 1E, 2, and 4 busses directly serve the station.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules. No changes to routes will be necessary as existing transit already serves the station.
Essex Junction South	A conceptual plan for Essex Junction South Station would include a parking lot for commuters and areas for bus/auto drop off. The 1E and 2 busses directly serve Park Street, which passes directly by the conceptual station site. Additionally, the 4 bus passes within 900’ of the conceptual Essex Junction South Station site.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules for the 1E and 2 busses. Minor alterations to the 4 bus route could be made to serve the conceptual station site.
Winooski	A conceptual plan for Winooski Station would include a parking lot for commuters and areas for bus/auto drop off. The 2, 9, 56, and 96 busses operate less than 600’ of the station site on Main Street.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules for the 1E and 2 busses. Minor alterations to the area bus routes could be made to serve the conceptual station site.
Burlington Union Station	Essex Junction Station is an existing station stop with parking and passenger drop off points. The 8 (City Circulator) and 11 operate less than 400’ from the station. The 8/Circulator provides access to major points around Downtown Burlington with frequent peak service. The 11 bus operates on College Street and connects Downtown Burlington to the University of Vermont campus and Medical Center. Both busses would be critical for providing distribution around the Burlington urban core.	Schedule changes could be necessary to existing transit connections to accommodate future commuter rail schedules. Minor modifications to bus routes would enable a more direct connection from the station to busses.

It is anticipated that route and timing alternations would be made to existing bus transit services to accommodate new stations and commuter rail services. A full evaluation of transit services will be required if service is implemented and a final schedule is completed. Additionally, it is anticipated that some reduction in LINK bus service would be made due to new commuter rail services.

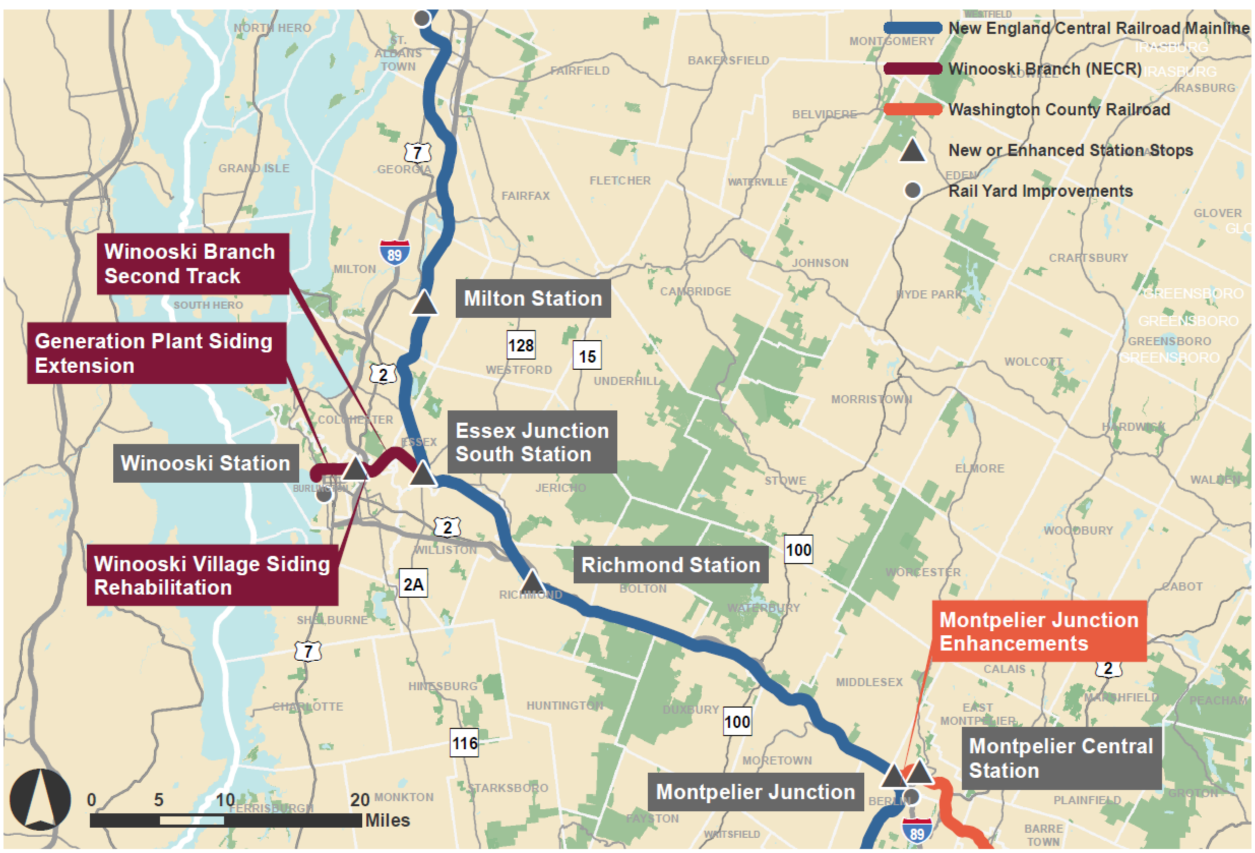
4.4 Capital Requirements

Capital requirements for Corridor commuter rail service include both infrastructure and trainset equipment. Infrastructure includes both right-of-way upgrades and additional station infrastructure. Equipment requirements are primarily based on acquiring trainsets to operate the service and installation of PTC equipment on passenger and freight trains in Schedule 2. Capital requirement costs are discussed in Chapter 5.

4.4.1 Infrastructure Capital Requirements

Corridor infrastructure upgrades are necessary to provide reliable and resilient commuter rail operations. The identified upgrades are the same for both Schedules 1 and 2 as increased service levels would not require additional infrastructure. This section profiles infrastructure improvements by line segment and reasons for the improvement. Upgrades for the entire Corridor are profiled in Figure 4.2.

Figure 4.2: Corridor-wide Infrastructure Upgrades



Identified Corridor infrastructure improvements are based conditions identified in the Existing Conditions chapter. The Existing Conditions chapter profiles the Corridor based on previous studies, Google aerial and Street view images, and other information gained through research into the Corridor conditions. A final determination of Corridor conditions will be required if the State takes further actions taken to implement Corridor commuter rail services.

4.4.1.1 WINOOSKI BRANCH

Implementation of commuter rail service on the Winooski Branch would require upgrades to existing track, the addition of passing sidings, and the addition of station infrastructure. The upgrades to track would facilitate faster and more reliable commuter rail service on the existing corridor and efficient freight and passenger rail operations. The addition of passing sidings would enable bi-directional passenger service on the Winooski Branch and provide resiliency in the event of a schedule disruption. Stations would enable the Corridor trains to better serve communities along the Corridor. The upgrades include:

- **Right-of-Way Upgrades**: The Winooski Branch would require upgrading to improve the service from FRA Class 1 (limited to 15 MPH for passenger rail services) operations to at least FRA Class 4 operations. Class 4 operations would allow for a maximum of 79 MPH operations in the area and provide efficient and reliable track for trains to operate. Additionally, the Vermont State Rail Plan identified a statewide goal of upgrading all rail lines to Class 4. A wayside signal system will also be necessary to provide efficient operations for the commuter rail service with both schedule versions. Additionally, the wayside signal system in Schedule 2 will require supplemental equipment to facilitate PTC implementation.

- **Essex Junction to Lime Kiln Road/Colchester Second Track**: Commuter rail service on the Winooski Branch would require the installation of a 3.1 mile second track from Essex Junction to Lime Kiln Road in Colchester to enable inbound and outbound trains to pass each other without significant speed restrictions or schedule disruptions.

- **Winooski Siding Rehabilitation**: The addition of commuter rail services on the Winooski Branch would require the rehabilitation of the siding in Winooski to facilitate resilient passenger rail operations and allow for continued freight operations. The rehabilitation of the 1000’ rail siding in Winooski would improve passenger services by allowing trains to pass each other on a single-track segment of the Winooski branch. Additionally, the siding would allow freight trains to bypass a potential Winooski Station stop.

- **Generation Plant Siding Extension**: The addition of commuter rail services on the Winooski branch would require the extension of the existing siding at the Joseph C. McNeil Generating Station to facilitate continuation of freight services to the plant. The 3,200’siding extension at the plant would enable freight trains to deliver supplies to the generating station and minimize commuter rail disruptions.

- **Winooski Station**: The addition of commuter rail service on the Winooski Branch would provide the opportunity for a new station in Winooski. A new station near the center of Winooski would include a 300' high-level platform. This station would serve the City of Winooski, northern Burlington, and surrounding communities and primarily facilitate commuting to the Burlington area and reverse commuting options. While this study will not determine a final location Winooski Station, a 300' high-level station platform could be added in the vicinity of Main Street/Route 2 and Barlow Street. A location on the right-of-way near Main Street/Route 2 and Barlow Street would enable the station to be built either on the mainline or siding and therefore allow freight trains to operate through the area. Freight trains are not able to pass by stations that have full-length high-level platforms due to clearance requirements.

- **Essex Junction South Station**: The addition of commuter rail service to the Corridor would require new station in Essex Junction to accommodate services on the Montpelier Line. A new station is necessary because services on the Montpelier Line would be encumbered using the existing Essex Junction Station. Given the existing configuration, trains on the Montpelier Line would have to reverse direction after arriving at the existing Essex Junction Station. This maneuver could take up to 15 minutes, which would severely affect travel time on the Montpelier Line. Therefore, a new 300' high-level station could be built to provide service on the Montpelier Line while not causing a significant travel time penalty. A potential station location could be in the vicinity of Park Street and a second track in the area restored to provide for passing freight trains.

Figure 4.3 shows infrastructure upgrades on the Winooski Branch and Figure 4.4 shows infrastructure upgrades and services in the Essex Junction area.

VERMONT
AGENCY OF TRANSPORTATION

Figure 4.3: Winooski Branch Infrastructure Upgrades

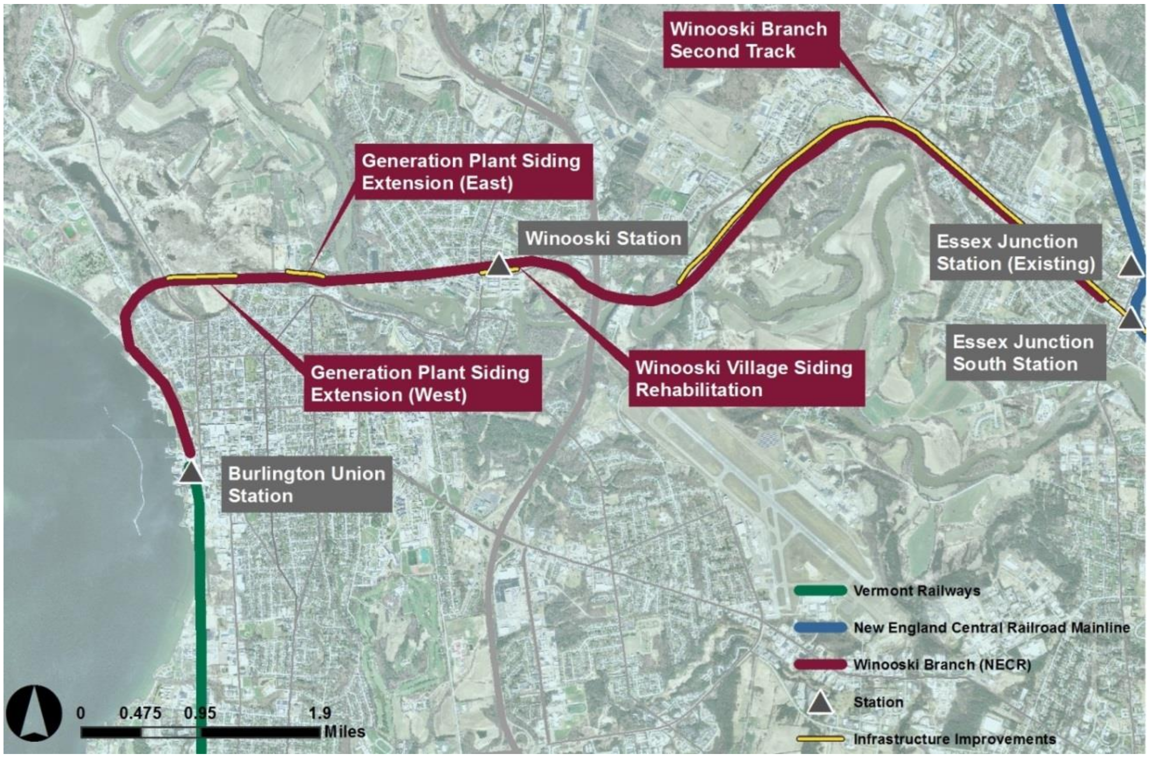


Figure 4.4: Essex Junction Infrastructure Upgrades and Service Patterns

4.4.1.2 WASHINGTON COUNTY RAILROAD

The WACR serves as the conduit for Corridor commuter rail between Montpelier Junction and Downtown Montpelier on the Montpelier Line. The WACR area would require upgrades to existing rail infrastructure, improvements to the track and station configuration at Montpelier Junction, and the addition of a station in Montpelier's Downtown. The improvements include:

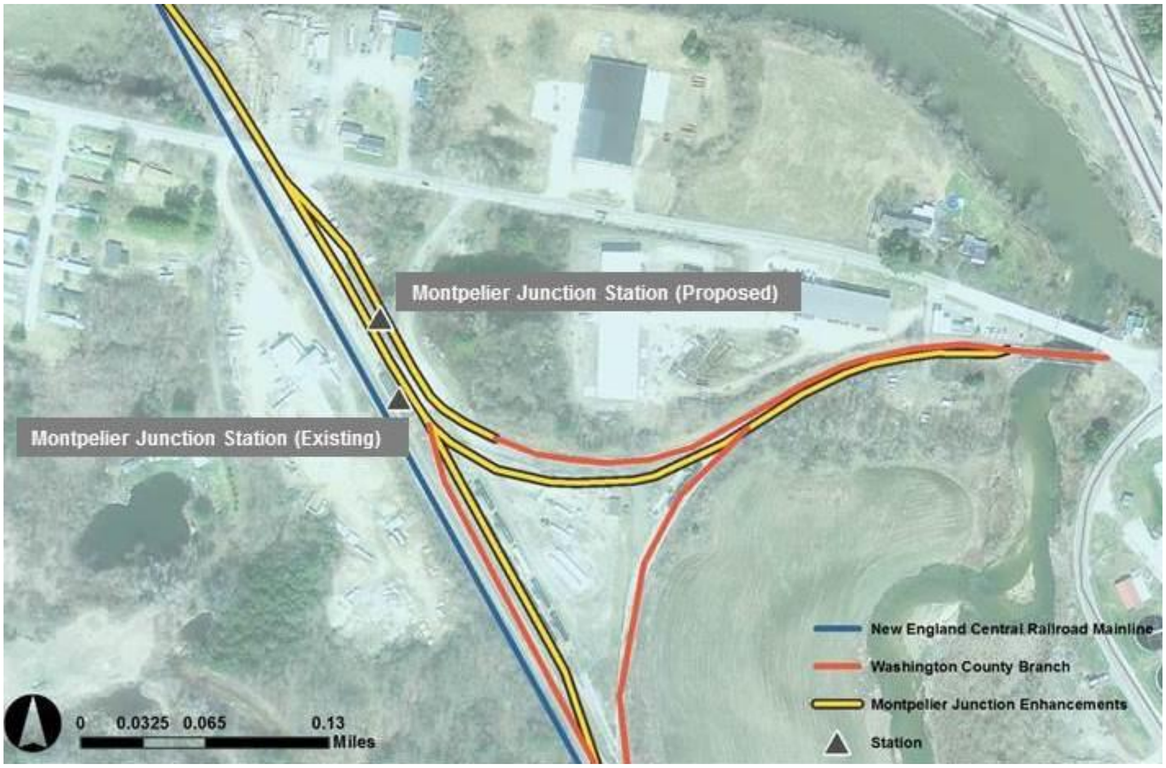
- **Right-of-Way Upgrades**: The WACR corridor would require upgrading to improve the service from FRA Class 1 operations to at least FRA Class 4 operations. Class 4 operations would allow for a maximum of 79 MPH operations in the area and provide efficient and reliable track for trains to operate. A wayside signal system will also be necessary to provide efficient operations for the commuter rail service with both schedule versions. Additionally, the wayside signal system in Schedule 2 will require supplemental equipment to facilitate PTC implementation.

- **Montpelier Junction and Station Configuration**: Currently, there is no track connection between the WACR and the northbound NECR Mainline. The addition of commuter rail service would necessitate a direct connection between the WACR and northbound NECR Mainline to facilitate reliable and timely commuter rail services. Therefore, the reconfiguration of Montpelier Junction and Montpelier Junction Station would be necessary with the addition of commuter rail services. A new 300' high-level two-track island platform station would be built adjacent to the existing Montpelier Junction Station with a connection to the NECR Mainline to allow for Amtrak trains to utilize the new platform. A new parking lot and bus loop would also be constructed to provide commuters and intercity rail passengers convenient parking and transfer points. Additionally, to provide scheduling flexibility, a second track between the Dog River Railroad Bridge and Junction Road would be added to the NECR Mainline and WACR.

- **Montpelier Central Station**: Commuter rail services on the WACR would provide the opportunity for a new station in Downtown Montpelier. The station would include a 300' high-level station platform built on a single track. The station would be located in the vicinity of Taylor Street on a site identified by the City of Montpelier for a future railway stop and transit center.

The upgrades to infrastructure in the Montpelier area are profiled in Figure 4.5. The Richmond and Milton Station sites are profiled in Figure 4.1.

Figure 4.4: Montpelier Junction Infrastructure Upgrades



4.4.1.3 NECR MAINLINE

The NECR Mainline will serve the Montpelier Line between Montpelier Junction and Essex Junction and the St. Albans Line between St. Albans and Essex Junction. Commuter rail services on the NECR Mainline would require upgrading the line with a full signal system and the addition of stations in Richmond and Milton. The improvements include:

- **Right-of-Way Upgrades**: The addition of commuter rail services to the NECR Mainline would require a wayside signal system to provide efficient operations for the commuter rail service and, in Schedule 2, additional equipment to facilitate PTC implementation. Currently, the NECR Mainline only has limited island signal systems between Hartford, VT and St. Albans.

- **Richmond Station**: Commuter rail services on the Corridor will provide the opportunity for a new station in Richmond. The station would feature a commuter parking lot, passenger drop off point, and a 300' high-level platform. The study assumes the station would be located near the town center but a final determination will not be made in this study regarding the station's location.

- **Milton Station**: Commuter rail services on the Corridor will provide the opportunity for a new station in Milton. The station would feature a commuter parking lot, passenger drop off point, and a 300' high-level platform. The study assumes the station would be located near the town center but a final determination will not be made in this study regarding the station's location.

4.4.1.4 YARD IMPROVEMENTS

The implementation of commuter rail services on the Corridor would require improvements to Corridor train yards to ensure trains are properly serviced and stored. The extent of the improvements to the existing yards would depend on the operator chosen and availability of space in existing freight yards. Yard upgrades would likely include Burlington Yard, St. Albans Yard, and Montpelier Junction Yard. The Burlington Yard would require space for mid-day layover trains and light maintenance. Montpelier and St. Albans Yards would require space for overnight layover and locations for light-maintenance. A heavy-maintenance facility would be required and could be housed at any of the three identified yards on the Corridor depending space and resources available. Yard locations are profiled in Figure 4.2.

4.1.2 Equipment Requirements

The equipment requirements for Corridor service would vary based on the number of trains operated daily. Additionally, the number of trips is the principle function for determining PTC requirements for equipment operating on the Corridor. If the PTC threshold is crossed, all equipment operating on the Corridor, including freight trains, would be required to have PTC installed. PTC systems are designed to be interoperable regardless of vendor or technology type used.

Schedule 1 would require 6 trainset to provide service, which would provide two regular service trains plus one spare train for each line. A spare train for each line is necessary to provide service in the event a trainset has a mechanical issue or is taken out of service for long-term maintenance.

Schedule 2 would require 7 trains to provide the enhanced service, with one additional trainset added to the Montpelier Line. Schedule 2 allows for more efficient use of rolling stock as trains could make multiple trips in the peaks without having to consider the FRA PTC 12-trip cap.

If commuter rail service were implemented in Vermont, the State could purchase new rolling stock equipment from a supplier or potentially second hand from another service provider if available. If new equipment is purchased, it will have to meet U.S. Department of Transportation (USDOT) Buy America provisions, which stipulates minimums for total vehicle parts made in the U.S. and final assembly location requirements.

Table 4.6 shows the projected equipment demand for trainsets and daily set utilization for the schedules.

Table 4.6: Equipment Requirements and Daily Set Utilization

Line	Set Letter	Schedule 1 Utilization (Trips)	Schedule 2 Utilization (Trips)
St. Albans	A	2	6
St. Albans	B	2	2
St. Albans	C	Spare	Spare
Montpelier	D	4	5
Montpelier	E	4	5
Montpelier	F	Spare	Spare
Montpelier	G	-	4
Total Daily Set Usage (Trips)		**12**	**22**

The type of trainset used on the Corridor is not defined in this report. However, most North American commuter rail systems use push-pull diesel locomotives with attached coach cars and a control car. A push-pull locomotive configuration is assumed as the trainset for schedule development due to the proclivity of this technology in North American passenger rail.

Schedule 2 would require the use of PTC on the Corridor. PTC would be installed in the cab of locomotives operating on the Corridor to enhance the safety and reliability of the train network. Additionally, as freight trains will also be operating on the Corridor, PTC will have to be added to all freight locomotives that utilize parts of the Corridor. This would include trains owned/operated by NECR and any VTR trains that operate north of Burlington Union Station. Costs will also be associated with signaling and other wayside infrastructure necessary for PTC operations.

Other options for trainset configuration include electrified rail systems and diesel-multiple units (DMU). Commuter rail systems in the New York, Philadelphia, Chicago, and Denver regions electric-multiple units are used for operations, which require either overhead catenary or third rail for power supply. Overhead catenary and third rail systems cost between $1.2 and $6 million per mile depending on site conditions and technology. DMUs are generally not used on commuter rail corridors in the U.S. that are shared with freight rail due to FRA safety standards. However, a transit system in Marin and Sonoma Counties in California will begin operating in 2017 that will use DMUs in mixed-freight/passenger operations.

4.5 Operations Requirements

Corridor commuter rail service raises important issues that would require a program to manage the service, which would influence the requirements for an operator and a potential operator profile. This section profiles potential governance models, requirements for the commuter operator, and potential operator profiles.

4.5.1 Commuter Rail Governance

Before implementing Corridor service or selecting a service provider, the State of Vermont must consider the several issues related to governance of rail operations, including:

- An ongoing Corridor management plan would be created to provide a coherent and consistent approach to implementation, including budgeting,
- Unified negotiations to determine Corridor access with Amtrak and host railroads would build on the transparency intended by the Passenger Rail Investment and Improvement Act of 2008 (PRIIA).
- Shared information that may help the state assess freight rail patterns and anticipate freight rail growth that could require special accommodations and benefit from passenger-related improvements.
- Identify capital funding requirements and sources for capital funds.
- Identify final scheduling and fare structures.
- Identify funding sources for operating costs.
- Establish contract requirements for a non-state service provider or identify requirements for a state agency to operate the service.

A state chartered rail authority (SCRA) would be necessary to oversee and manage issues identified. SCRAs are a vehicle for providing governance and funding for passenger commuter rail services. Nationally, SCRAs have different governing and financing structures, but benefit from the ability to use federal funds to support capital and sometimes operating funds. SCRAs directly operate commuter rail services or provide the vehicle for administering contracts for third-party operators. The Vermont Transportation Authority (VTA) is an existing but inactive SCRA in Vermont that was originally used to govern the Champlain Flyer service. The VTA could potentially be resuscitated to serve as the governing organization for future Corridor commuter rail services.

SCRAs include agencies across the U.S. Examples of SCRAs include:

- Long Island Rail Road (LIRR): The LIRR operates commuter rail lines between New York City and suburban locations in Nassau and Suffolk Counties in New York. The railroad is directly operated and managed by the LIRR. LIRR is constituent part of the Metropolitan Transit Authority (MTA), a New York-state-chartered authority that operates rail, subway, and bus services in metropolitan New York City.

- MBTA Commuter Rail: The MBTA Commuter Rail division is a constituent part of the MTBA, a state-chartered authority that operates and manages rail, subway, bus, ferry services in Greater Boston. The MBTA Commuter Rail Division oversees the contract for the MBTA Commuter Rail system. The MBTA Commuter Rail system is operated by a private company, which provides daily operations, maintenance, and management services. The MBTA evaluates service provided by the contractor to ensure performance standards are maintained and contract compliance adhered to. Additionally, the MBTA manages policy decisions regarding major service changes, expansions, and other high-level operations.

- Northern New England Passenger Rail Authority (NEPRA): NEPRA is the organization that manages the Amtrak Downeaster service. NEPRA is a Maine state-chartered rail authority that oversees the Downeaster service. The Downeaster is a hybrid intercity-commuter rail service between Portland, ME and Boston, MA, which provides 5 roundtrips daily. The Downeaster is operated by Amtrak under a contract with the State of Maine. Amtrak operates the Downeaster service, leases equipment for the service, and provides non-track maintenance for the service. NEPRA manages the contract components and policy-level decisions for operations of the Downeaster.

4.5.2 Operator Requirements

An operator for the commuter rail would be required to provide service, maintain equipment, and collaborate with host freight railroads on Corridor dispatching and other service elements. Specific elements an operator would be required to perform include:

- **Daily Operation of Service**: The operation of services includes hiring staff as engineers, conductors, and supervisors to operate daily service, collect revenue, and provide oversight of operations. Daily service operations would also include dispatching either directly by the operator or coordinated through host railroads. Tickets could be collected either by conductors or as a random proof-of-purchase random inspection.

- **Maintenance**: The operator would be required to maintain the commuter rail fleet with daily cleaning and fueling and periodic heavy maintenance. The operator would also be responsible for the maintenance of certain station sites and potentially right-of-way segments built specifically for commuter rail services. The operator would be responsible for hiring staff and managers to ensure a regular maintenance schedule is followed.

- **Service Management**: The operator would be required to have a management and administrative staff to oversee service operations. This includes internal administrative functions and responding to rider and stakeholder concerns.

- **Liability and Insurance Protection**: The operator must have liability and insurance protection to ensure a basic level of protection for the system.

4.5.3 Potential Operators

In the U.S., there are several examples for potential commuter rail operators. Operators include state agencies, Amtrak, freight railroads, and private sector companies. With the exception of state agencies, all other operators must create an operating agreement with the state that sets standards for commuter rail operation. Specific operator types include:

- **State Agency**: A state agency in the form of a regional transit authority could operate a commuter rail system and provide all basic functions for regular maintenance and service management. Most American commuter rail systems are operated by state agencies, including MTA Metro North and Long Island Rail Road, New Jersey Transit, and SEPTA.

- **Amtrak**: Amtrak operates commuter rail services for state agencies under contract with the state or regional transit authority. With commuter rail agreements, Amtrak would assume the operations and maintenance (O&M) of the system and provide technical support for administrative functions. Amtrak currently operates commuter rail or similar services in California with the Capitol Corridor and between Boston, MA and Portland, ME with the Downeaster.

- **Freight Railroads**: Freight railroads could operate rail service under contract with the state or regional transit authority. The freight company would assume the operation and maintenance of the system and administration of the system. The freight company could also provide optimal dispatching because it would control the right-of-way and therefore have the final authority on dispatching and coordination with freight services. Examples of freight companies operating commuter rail systems include the Chicago Metra's contract with BNSF Railway (BNSF) to operate a commuter train on BNSF-owned tracks between Downtown Chicago and Aurora, IL. In addition, the GW-owned Portland & Western Railroad operates the Westside Express Service (WES) commuter rail line near Portland, OR under a contract with the Portland area transit operator Tri-County Metropolitan Transportation District of Oregon (TriMet).

- **Private Company**: A private company (non-freight rail related) could also operate commuter rail services through a contract with the state or regional transit authority. The private company would control the O&M of the system and administration could be through the company or state agency. Examples of private operators include the MBTA and Virginia Railway Express (VRE), both of which are operated by Keolis Commuter Services.

5 Conceptual Cost Estimates & Potential Funding Sources

Information in this chapter describes the conceptual capital costs and operating costs and potential funding opportunities for the Corridor. Conceptual capital costs are based on comparative rail improvement projects and studies that have recently been completed in the New England region. The primary components of cost estimates are definition of the service route, inventory of the existing conditions and needed infrastructure, including right-of-way and station stops. Conceptual operating and maintenance costs are based on comparative existing commuter rail operating costs. Potential funding sources are derived from potential state, local, federal, and private sources for capital and operating costs that have been utilized by other recent programs.

5.1 Conceptual Capital Costs

Capital costs reflect the initial improvements in infrastructure and equipment, including PTC technology that would be necessary for operations of Schedule 2 Corridor commuter rail services. Infrastructure on the Corridor was assessed in the Existing Conditions chapter and improvements outlined in Chapter 4 based on different scenarios for level of service.

5.1.1 Infrastructure Costs

Infrastructure capital costs for the Corridor were estimated based on similar costs developed for similar rail improvement efforts in New England, including estimates for the rehabilitation of the Knowledge Corridor-Restore the Vermonter (Knowledge Corridor) and Northern New England Intercity Rail Initiative (NNEIRI) Study.

5.1.1.1 TRACK REHABILITATION COSTS

Full track rehabilitation is required for the Winooski Branch and WACR to bring track to FRA Class 4 (79 MPH maximum) standards with a full signal system. While the Winooski Branch and WAR are active freight lines, significant rehabilitation of the right-of-way is necessary to improve speed and reliability for passenger rail service, which are currently Class 1 and un-signaled dark territory. Conversely, the NECR Mainline has already received significant upgrades through state, federal, and private funding sources and is therefore assumed to not require major right-of-way upgrades apart from signals (discussed in Section 5.1.13).

The rehabilitation of track on the Corridor is anticipated to be equivalent to the rehabilitation of the Massachusetts Department of Transportation (MassDOT) Knowledge Corridor project. The Knowledge Corridor project rerouted the Amtrak Vermonter Service to a more direct route north of Springfield, MA saving approximately 25 minutes on the train journey, improving reliability, and increasing ridership. While the Knowledge Corridor program is currently only used by intercity rail service, the level of improvements are sufficient to host higher levels of traffic, including commuter rail service.

The Knowledge Corridor project included crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and re-decking for certain bridges.[28] The all-inclusive average cost for the Knowledge Corridor was approximately $2.5 million per mile.

The improvements to the Knowledge Corridor were designed to facilitate reliable passenger and freight rail at speeds that are competitive with road travel. The improvements to the Knowledge Corridor are more comprehensive than comparable rehabilitation programs in Vermont, such as the Rutland to Leicester segment of the Western Corridor, which did not install a full signal and communications system.

Therefore, the total length of the rehabilitation on both the Winooski Branch and WAC would include 9.4 miles of track and cost approximately $23.5 million (2016 dollars). The rehabilitation would upgrade the track to FRA Class 4 standards and include full crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and re-decking for certain bridges.

5.1.1.2 SIGNALS AND COMMUNICATIONS FOR THE NECR MAINLINE

Currently, the NECR Mainline does not have a signal and communications system from Montpelier Junction to St. Albans except for isolated areas near major interlockings. In order to accommodate safe and efficient Corridor commuter rail services, a signal and communications system would be required on the NECR Mainline. Signals and communications equipment includes wayside signal equipment, signal power access and distribution, traffic control and dispatching systems, communications equipment, and grade crossing protection. The cost per mile for signal work is approximately $1 million per mile. The cost estimate is based on conceptual engineering estimates developed for the NNEIRI Study for the NECR Mainline in Vermont. Therefore, full signalization of 56 miles of the NECR Mainline between Montpelier Junction and St. Albans would cost $56 million (2016 dollars).

5.1.1.3 NEW TRACK EXTENSION COSTS

The cost for construction of new track within the existing right-of-way would include subgrade work, installation of crossties, installation of rail, installation of grade crossings, installation of switches, installation of signal and communications systems, surfacing and alignment of track. No new bridges are included as part of the 4.1 miles of new track in the Corridor capital estimate. Additionally, the estimate does not assume property acquisition or substantial subsurface work as the new track is within the existing right-of-way. The estimated cost per mile of new track is $2.8 million per mile based on similar estimates developed for the NNEIRI Study in Vermont.

---

[28] "Knowledge Corridor - Restore Vermonter Project: About this Project." Massachusetts Department of Transportation, http://www.massdot.state.ma.us/knowledgecorridor/, accessed November 20, 2014.

Therefore, the 4.1 miles of new track on the Corridor are expected to cost approximately $11.5 million (2016 dollars).

5.1.2 New Stations

The study includes six new or rebuilt stations for Corridor operations. Existing stations infrastructure would be utilized at Burlington Union Station, Essex Junction (St. Albans Line services), and St. Albans. However, for operational purposes, new stations would be required at Essex Junction (Montpelier Line) and Montpelier Junction. New station stops would also be built at Milton, Richmond, Winooski, and Downtown Montpelier.

New stations would be designed and constructed with full-length and high-level platforms with platform canopies and interior waiting areas based on standards used in comparable rail stations in New England and typical FRA related requirements for ADA access. Station tracks would be required at each station to provide for freight trains to pass the high-level station platforms. Additionally, stations would include vehicular and bicycle parking, passenger drop off areas, and meet ADA requirements.

According to construction costs for stations on the recently built Knowledge Corridor, each station would cost approximately $8 million. Therefore, the conceptual capital cost for six stations would be approximately $48 million (2016 dollars).

5.1.3 Rolling Stock Costs

Rolling stock costs are for the trainsets required to operate Corridor services. According to figures developed for the NNEIRI study, new trainsets would cost approximately $27 million to purchase, including six passenger cars and a locomotive. However, retired or spare MBTA, Metro-North, or Shore Line East trainsets could also be used for Corridor operations, if at the time of opening service they are available. The caution that needs to be added relative to the use of used equipment is that annual operating costs need to include allowance for near term rehabilitation work that will be needed for long term operation. For this report it is assumed that new rolling stock would be more effective in support of a long term operation and is therefore the basis of the capital cost.

Schedule 1 would require 6 trainsets for Corridor services for a total of approximately $163 million (2016 dollars). Schedule 2 assumes three trainsets for Montpelier Line services and three trainsets for the St. Albans Line. Schedule 2 would require 7 trainsets for Corridor services for a total of approximately $189 million (2016 dollars). Schedule 2 assumes four trainsets for the Montpelier Line and three for the St. Albans Line.

5.1.4 PTC Implementation

PTC safety technology is a FRA requirement for passenger rail corridors that have more than 12 passenger train movements. PTC would be required for all passenger and freight locomotives and would also require alteration to the Corridor's signal system.

This report assumes that any new passenger trainsets purchased for Corridor services will be equipped for PTC operations. Therefore, PTC system costs are by default already incorporated into rolling stock costs. Additionally, any Amtrak equipment operating on the Corridor will be equipped with PTC due to Amtrak operations on the Northeast Corridor.

However, PTC systems would be required for any existing freight locomotives operating on the Corridor. Industry standards for freight operations assume $100,000 per locomotive for upgrades. The exact number of freight locomotives operating on the Corridor is not known but is assumed to be in the 15-20 range. Therefore, the capital cost estimate assumes $2 million (2016 dollars) to upgrade 20 locomotives in the capital cost. The costs to upgrade locomotive operations would primarily impact NECR operations.

Additionally, Corridor signal systems would have to be upgraded to accommodate PTC technology. The average cost per mile for PTC signal systems is $500,000 based on an industry standard for PTC implementation. The Corridor's total length is 65.4 miles and would therefore cost $32.7 million (2016 dollars) for new PTC systems.

5.1.5 Conceptual Capital Cost Summary

Corridor capital costs vary depending on the level of service with Schedule 1 (6 daily roundtrips) costing approximately $301 million (2016 dollars) and Schedule 2 (11 roundtrips) costing approximately $363 million (2016 dollars). Table 5.1 describes the total capital costs for infrastructure, trainsets, and PTC implementation with a range provided to show the variation between Schedules 1 and 2.

Table 5.1: Corridor Capital Cost Summary (2016 dollars)*

Unit	Unit Cost	Unit Quantity	Total Cost
Standard Cost Per Mile for Rehabilitation (Track, Signal, Bridge improvements)	$2.5 Million/Mile	9.4 Miles	$23.5 Million
Cost for New Track Infrastructure	$2.8 Million/Mile	4.1 Miles	$11.5 Million
Signal and Communications Equipment for NECR Mainline	$1 Million/Mile	56 Miles	$56 Million
New Station Development	$8 Million/Station	6 New Stations	$48 Million
Infrastructure Subtotal			$139 Million
New Trainsets	$27 Million/Trainset	6-7 Trainsets	$162-189 Million
PTC Implementation (Schedule 2 Only)			$35 Million
Corridor Total			**$301-363 Million**

**Locations for new infrastructure are defined in Chapter 4 and in sections below.*

Cost could be less under certain circumstances. For example, less elaborate or fewer train stations could be constructed on the Corridor. Additionally, the cost estimate for trainsets assumes new equipment and it is possible that used or leased equipment could be utilized for Corridor services and thus reducing capital costs. However, it is unadvisable to reduce the level of right-of-way improvement because of the significant penalties to speed and reliability that would result from fewer renovations.

5.2 Potential Capital Funding Sources

This section provides an overview of the potential federal, State and local funding sources that could be targeted in the near future to support implementation of the Commuter Rail Project. The section begins with a review of the financial strategies used for recently implemented commuter rail projects around the country. A key conclusion from this review is that federal programs can provide a significant source of funding for Commuter Rail projects. As described in sections that follow, to date the primary federal funding programs that have supported Commuter Rail projects have included:

- FTA Capital Investment Grant (CIG) Program (New Starts / Small Starts);
- FTA Formula Funds;
- Federal Highway Administration (FHWA) Formula Funds; and
- United States Department of Transportation (USDOT) Competitive Grants.

Additionally, the recently implemented FAST Act established new funding programs that support passenger rail. These programs are also summarized in the sections below.

Finally, while there is no limitation on the number of federal funding programs that can be included in a financial strategy, the maximum level of federal funds that can be used on a project is 80 percent of the total capital costs. Non-federal matching funds from potential State and local governments as well as potential opportunities for private sector participation are summarized beginning in Section 5.2.6.

5.2.1 Commuter Rail Financial Strategy Examples

Table 5.2 and Figure 5.1 **Error! Reference source not found.**summarize the level of federal f unding included in the financial implementation strategies for thirteen (13) commuter rail projects implemented over the last 10 years with total capital costs ranging from $41 million to $2 billion. As shown in the table, 9 of the 13 projects obtained federal funding as part of their overall financial strategy. In general, the four agencies that did not obtain federal funding determined that their respective commuter rail project would not perform well relative to the FTA discretionary grant program evaluation criteria and requirements and more importantly, had State and/or local resources available to fund the projects without federal assistance. These local resources included dedicated transit tax revenues, state capital funds, and – for the two commuter rail projects in Texas – regional toll revenues.

It should be noted that the two Salt Lake City projects were part of the Utah Transit Authority's (UTA) FrontLines 2015 Program of Projects, which was a precursor to FTA's Program of

Interrelated Projects. Specifically, UTA and FTA came to an agreement for the program of LRT extensions and commuter rail projects that UTA would fund certain corridors without federal funding and other corridors would receive federal funds.

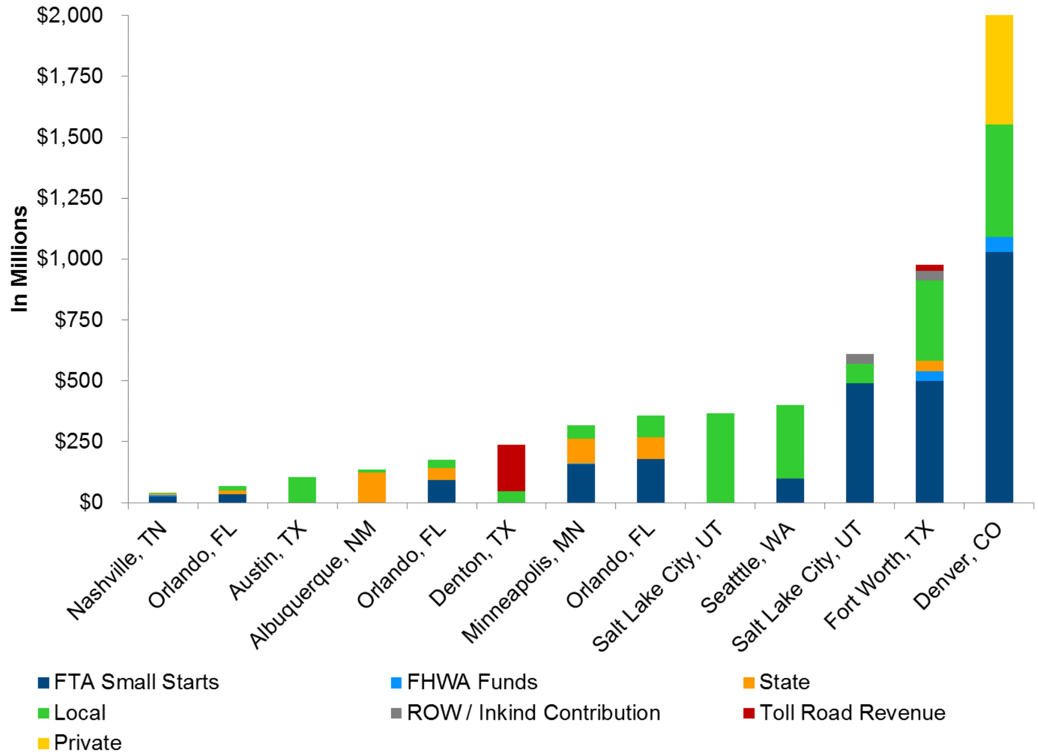
For the nine commuter rail projects that did obtain federal funding, federal participation ranged from 25 percent to 80 percent, with an average federal participation of 55 percent.

Table 5.2 Federal Funding Participation for Recent Commuter Rail Projects (In Millions)

Location	Total Capital Cost	FTA CIG	% Share	FHWA	% Share	% Total Federal
Nashville, TN	$41	$24	59%	$8	20%	78%
Orlando, FL	$68	$34	50%			50%
Austin, TX	$105					0%
Albuquerque, NM	$135					0%
Orlando, FL	$176	$93	53%			53%
Denton, TX	$238					0%
Minneapolis, MN	$318	$157	49%	$5	2%	51%
Orlando, FL	$357	$179	50%			50%
Salt Lake City, UT (South CR Line)	$368					0%
Seattle, WA	$401	$100	25%			25%
Salt Lake City, UT (North CR Line)	$611	$489	80%			80%
Fort Worth, TX	$976	$498	51%	$40	4%	55%
Denver, CO	$2,042	$1,030	50%	$62	3%	53%

Source: HDR, 2016.

Figure 5.1: Federal Funding Participation for Recent Commuter Rail Projects (In Millions)*



Source: HDR, 2016.
**All blue shading is federal funding.*

5.2.2 FTA Funding Programs

The FTA has several funding programs that are available for transit-related capital costs. FTA funding programs include:

- **FTA CIG Program:** The FTA CIG Program awards grants on a discretionary basis for major capital investments in new and expanded rail projects that are locally planned, implemented, and operated. The CIG Program includes two categories for new high capacity transit projects:
    - **The New Starts Category** funds projects with capital costs in excess of $300 million and project sponsors requesting more than $100 million in CIG funds. New Starts projects are evaluated and rated based on a set of defined justification criteria (mobility improvements (ridership forecasts), environmental benefits, cost effectiveness, economic development effects, and public transportation supportive land use policies) as well as local financial commitment criteria. Projects pursuing New Starts funds typically request no more than 50 percent of total funding from the CIG Program.
    - **The Small Starts Category** funds projects with capital costs less than $300 million and project sponsors requesting less than $100 million in CIG funds. These projects are

evaluated and rated on fewer project justification criteria and local financial commitment measures. Smaller scale high capacity transit projects (capital costs less than $100 million) the meet or exceed the project justification criteria have obtained between 75 percent and 80 percent of total funding through Small Starts Grant Agreements in recent years.

- **FTA Formula Funds:** FTA provides annual formula funds to transit agencies through the FTA Section 5307 Urbanized Area Formula Program. Eligible activities for Section 5307 funds include planning, engineering design and evaluation of transit projects and other technical transportation-related studies; crime prevention and security equipment; construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. Specifically related to the commuter rail project, and depending on current short-term capital improvement and state of good repair needs, Section 5307 could support planning and engineering activities as well as the construction of project elements such as stations, park and ride lots, or communication systems.

  One potential approach for using FTA formula funds to support implementation of a commuter rail project would be for acquiring new vehicles. This could be accomplished without impacting the agency's existing vehicle replacement plan and state of good repair program. Based on experiences across the country, implementation of high capacity transit service in a corridor typically results in the reduction or elimination of existing local bus service within the corridor. As an illustrative example, assume implementation of the commuter rail project will result in the reduction of 10 buses from the existing local service. The FTA formula funds that would have been used to purchase 10 replacement buses for this local service could be transferred to acquire a portion of the costs for the commuter rail vehicles.

5.2.3 FHWA Funding Programs

The FHWA has funding programs that are available for transit-related capital costs. FHWA funding programs include:

- **Flexible FHWA Funds:** The following funding programs are eligible to be "flexed" or transferred to the FTA to support implementation of transit projects. These funds would require adoption in the Long Range Transportation Plan (LRTP) and Transportation Improvement Plan (TIP) in order to support a portion of the commuter rail project's capital costs:

  - **Congestion Mitigation and Air Quality (CMAQ) Improvement Program:** Jointly administered by FHWA and FTA, this program provides a flexible funding source for transportation projects and programs that help improve air quality and reduce congestion. Funds are distributed by the formula for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas). The distribution formula is based on an area's population by county and the severity of its ozone and carbon monoxide problems within the nonattainment area. Eligible uses are projects that reduce emissions or improve air quality, including capital costs of transit and highway projects; intermodal freight facilities and operations; and three years of operating and maintenance costs for new service, such as transit service or traffic management operations centers. CMAQ funding may be used for freight and passenger rail projects that accomplish CMAQ goals. CMAQ funds have been used by Maine to fund operations of the Downeaster rail service. CMAQ funds have also been transferred to FRA by State DOTs to fund intercity passenger rail projects that accomplish CMAQ goals. Vermont is in attainment for ambient air quality but the use of CMAQ funding must still be consistent with either CMAQ eligible projects.

- **Surface Transportation Block Grant Program:** The FAST Act converts the long-standing Surface Transportation Program into the Surface Transportation *Block Grant* Program (STBG) acknowledging that this program has the most flexible eligibilities among all Federal-aid highway programs and aligning the program's name with how FHWA has historically administered it. The STBG promotes flexibility in State and local transportation decisions and provides flexible funding to best address State and local transportation needs. Potential commuter rail project elements that could be eligible for STBP funds include:
    - Construction, reconstruction, rehabilitation, resurfacing, restoration, preservation, or operational improvements for highways;
    - Capital costs for transit projects;
    - Corridor parking facilities;
    - Improvements at intersections with high accident rates or levels of congestion;
    - Transportation alternatives projects; and
    - Infrastructure-based ITS capital improvements.

- **Railway-Highway (Section 130) Crossing Program:** This program provides annual funding to support the elimination of hazards at railway-highway crossings to reduce the number of fatalities, injuries, and crashes. The FAST Act provides approximately $1.3 billion through FY 2020 for this program. Funding is distributed to the states based on a formula, which accounts for the number of public railway-highway crossings in the state. Fifty percent of a State's apportionment is dedicated for the installation of protective devices at crossings. The remainder of the funds apportionment can be used for any hazard elimination project, including protective devices. A state's apportionment of Section 130 funds may be a used to improve safety at grade crossings along the corridors.

5.2.4 FRA Funding Programs

With the passage of the FAST Act in December 2015, Congress implemented new programs within the FRA that could provide funding support for a commuter rail project. FRA programs include:

- **Intercity Passenger Rail Section–** the FAST Act authorizes $2.2 billion over five years for three new competitive rail development grant programs that build off of the Administration's previous $10 billion investment through the High-Speed Intercity Passenger Rail. As of October, the FRA has not issues the first round of grant requests nor defined the evaluation criteria for these programs.
    - **Consolidated Rail Infrastructure and Safety Improvements (Sec. 11301):** The purpose of this program is to improve the safety, efficiency, and reliability of passenger and freight rail systems. Eligible activities include a wide range of capital, regional and corridor planning, environmental analyses, research, workforce development, and training projects.
    - **Federal-State Partnership for State of Good Repair (Sec. 11302):** The intent of this program is to reduce the state of good repair backlog on publically-owned or Amtrak-owned infrastructure, equipment, and facilities. Eligible activities include capital projects to (1) replace existing assets in-kind or with assets that increase capacity or service levels, (2) ensure that service can be maintained while existing assets are brought into a state of good repair, (3) bring existing assets into a state of good repair.
    - **Restoration and Enhancement Grants (Sec. 11303):** This program will provide operating assistance to initiate, restore, or enhance intercity passenger rail transportation. Grants are limited to three years of operating assistance per route and may not be renewed.
- **National Highway Freight Program (NHFP**): This new program provides funding to support the following freight rail improvements, which may support elements of the commuter rail project. Specifically, a State may use not more than 10 percent of its total NHFP apportionment each year for freight intermodal or freight rail projects. Eligible uses include:
    - Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities.
    - Construction, reconstruction, rehabilitation, acquisition of real property (including land relating to the project and improvements to land), construction contingencies, acquisition of equipment, and operational improvements directly relating to improving system performance.
    - Efforts to reduce the environmental impacts of freight movement.
    - Environmental and community mitigation for freight movement.
    - Railway-highway grade separation.

5.2.5 Competitive Grant Programs

As a project moves through the implementation process, there may be opportunities to leverage additional federal funding for specific elements of the project through competitive grant opportunities. The sources described below provide a brief overview of competitive grant programs used by other transit agencies to support the planning, engineering, and construction of high capacity transit projects.

- **USDOT TIGER Grants:** The TIGER Program, one of USDOT's largest multimodal discretionary grant programs, supports innovative, projects that would be otherwise difficult to fund through traditional federal programs. USDOT seeks projects that will catalyze long-lasting, positive changes in economic development, safety, quality of life, environmental sustainability, or state of good repair. Prior rounds of TIGER have prioritized projects seeking to improve access to reliable, safe, and affordable transportation for disconnected communities in urban, suburban, and rural areas.

  The TIGER Program is extremely competitive with a total of 7,300 applications submitted to USDOT requesting $143 billion in TIGER funds over the program's eight rounds. USDOT has awarded $5.1 billion to 421 projects, which is less than six percent of all applicants. Table 5.3 illustrates overall supply and demand for the program since it was first authorized under the American Recovery and Reinvestment Act of 2009 (ARRA). Table 5.3 shows the total number of projects by fiscal year that were funded, total applicants, and program size.

Table 5.3: TIGER Program Size, Applicants, and Projects Funded (FY2009 – 2016)

Fiscal Year (FY)	Program Size ($M)	Applicants	Projects Funded
2009	1,500	~1,400	51
2010	600	~1,700	75
2011	510	848	46
2012	500	703	47
2013	474	585	52
2014	600	797	72
2015	500	627	39
2016	500	585	40

Source: USDOT

Despite the program's $100 million statutory maximum grant amount, the typical TIGER grant awarded to projects in urban areas is $10 to $15 million with an average of $12 million awarded to transit projects. USDOT rarely awards up to $25 million in TIGER funding to any one project. Since 2012, only 20 out of 250 TIGER projects have received $20 million or more in funding. Notably, nearly two-thirds of the 40 grant recipients in FY 2016 were repeat applicants.

Assuming continuation of the TIGER Program, if the project partners were to pursue a future TIGER grant to support implementation of a commuter rail project, the application would need to demonstrate specific elements that would meet requirements for independent utility. For example, the Detroit QLINE streetcar project and Reno BRT project received TIGER awards for multimodal roadway improvements that would benefit the respective communities with or without the streetcar or BRT project.

- **Transit Oriented Development Discretionary Pilot:** the transit oriented development (TOD) discretionary pilot program provides funding to advance planning efforts that support TOD associated with new high capacity transit projects pursuing cig program funds. The fast act reauthorized this program through 2020 and USDOT recently announced FY 2016 awards totaling $14.7 million to 16 metropolitan areas around the country. Awards ranged between the minimum of $250,000 to the maximum of $2 million, with an average award of $920,000.

Potential applications should involve comprehensive planning projects covering an entire transit capital project corridor, rather than proposals for individual station areas or small sections of the corridor. Selected projects must:

- Enhance economic development and ridership;
- Facilitate multimodal connectivity;
- Increase access to transit hubs for bikes and pedestrians;
- Enable mixed-use development;
- Identify infrastructure needs; and
- Include private sector participation.

FTA is prioritizing applications in corridors with significant challenges related to TOD planning, low levels of existing development, lack of connectivity to essential services, or where the cost of the planning work to overcome the challenges exceeds what might be readily available locally. FTA is also prioritizing projects that include strategies to address the gentrification and displacement that can sometimes occur when transit capital projects are implemented. To ensure that planning work reflects the needs and aspirations of the local community and results in concrete, specific deliverables and outcomes, FTA is requiring that transit project sponsors partner with entities with land use planning authority in the transit project corridor.

- **Rail Safety Infrastructure Improvements Grants:** In June 2016, FRA accepted applications to providing funding to projects that improve safety of railroad infrastructure, including the acquisition, improvement, or rehabilitation of intermodal or rail equipment or facilities, including track, bridges, tunnels, rail yards, buildings, passenger stations, and maintenance and repair shops. Projects that make improvements to highway-rail at-grade crossings, including grade separations and grade crossing closures, and improvements necessary to establish a quiet zone are also eligible. Additionally, pre-construction planning activities were eligible to apply, but these applications had to be part of a construction application and could only support planning and permitting that directly supports the construction of a project eligible for funding under this grant. Total funding available was $25 million. At this time it is not clear if this program will continue in the future.

5.2.6 Potential State and Local Matching Funds

The majority of recently implemented commuter rail systems required 50 percent or more of the total project funding from non-federal sources. The following provides an overview of potential State and local funding sources that could be pursued to support implementation of the commuter rail project.

- **Existing State Resources–** In Vermont, funds are appropriated to capital improvement projects from the State Transportation Fund (STF), which includes the Transportation Fund and the Transportation Infrastructure Bond Fund (TIB Fund). The TIB Fund revenue can only be expended on certain long life transportation assets (either directly or via payment of debt service on bonds issued for such purposes). Vermont STF had $230 million in available funds in 2015 and TIB fund had about $20 million in funds.[29] The Transportation Fund (excluding the TIB Fund) has six sources of revenue:[30]

- **Gasoline tax:** a fixed cent-per-gallon gasoline tax and a fixed cent-per-gallon diesel fuel tax, a gasoline percentage-of-price assessment with a minimum and maximum cent-per-gallon equivalent. This tax contribution to Transportation Fund made up about 30.2 percent in 2014.

- **Purchase and Use tax:** a motor vehicle purchase and use tax (6% split 4% to the Transportation Fund and 2% to the Education Fund). This tax contribution to Transportation Fund made up about 24.2 percent in 2014.

- **Motor vehicle fees:** This revenue contribution to Transportation Fund made up about 31.2 percent in 2014**.**

- **Other revenue (other small transportation related taxes and fees):** This revenue contribution to Transportation Fund made up about 7.7 percent in 2014.

The TIB fund is funded by revenue from a gasoline percentage of price assessment, and a fixed-cent-per-gallon diesel fuel assessment. The Vermont State Rail Plan currently includes three passenger rail projects as high priorities:[31]

- Extending the Ethan Allen Express to Burlington;
- Extending the Vermonter to Montreal; and
- Adding new service between Albany, New York and Burlington, Vermont.

The State Rail Plan identifies $114.4 million in short-term and $370.3 million in long-term passenger rail needs. Additionally, the plan identifies $295.3 million in freight rail needs. The plan proposes that these investments be phased over 20 years. According to plan, the annual State funding available to cover capital needs is approximately $4 million. Since 2002, Vermont has been able to secure on average slightly over $15 million in federal capital discretionary grant funding per year.

- **Potential Local Sources** These funding sources could include a combination of local government funding, value capture revenue at stations and potential private sector participation. Included as potential local sources are:

  - **Contributions from Local Jurisdictions:** An approach used by other multi-jurisdiction passenger rail systems across the country is to develop an equitable capital cost allocation methodology that distributes costs among the jurisdictions served by the commuter rail line. Based on the results of the potential cost allocation methodology, each jurisdiction

[29] http://vtrans.vermont.gov/sites/aot/files/documents/aboutus/capprog/16/FY2016BudgetHighlights.pdf
[30] http://www.leg.state.vt.us/jfo/publications/2015%20Fiscal%20Facts.pdf
[31] 2015 Vermont State Rail Plan, October 2015: http://vtrans.vermont.gov/sites/aot/files/rail/VT%20State%20Rail%20Plan_Final.pdf

would be responsible for funding their share of capital costs from their respective general funds or other locally controlled funding sources. As a starting point, potential cost allocation approaches could reflect the following options or a combination of these options. If the decision is made to pursue this approach, regional negotiations would be required to analyze the potential technical/fiscal impacts as well as political implications of a capital cost allocation methodology.

- Option 1: Allocate all capital costs equally among the jurisdictions: Based on the experiences of regions that have implemented multi-jurisdictional rail programs, while this approach provides a simple, easy to understand methodology, it may be perceived as not being equitable to all jurisdictions. Examples would be jurisdictions with more capital assets (stations, track, signals, maintenance-of-way equipment, etc.) within their geographic boundary would pay the same as those with fewer assets. However, this approach has been successful in allocating capital costs that benefit the entire system, such as the costs of the maintenance/ storage facility and rolling stock.

- Option 2: Develop a capital cost allocation methodology that distributes costs equitably among the jurisdictions based on specified variables. The methodology would reflect a percentage of costs for specific items based on the level of capital infrastructure within a specific jurisdiction. These variables could include, but not be limited to, the following: track miles, stations, ticket vending machines, at-grade crossing / grade crossings; and/or other localized improvements.

- **Tax Increment Financing (TIF) Districts:** This value capture mechanism involves the creation of a special taxing district that captures incremental changes in property tax revenues. The tax base is frozen at predevelopment levels, and all or a portion of property tax revenues derived from increases in assessed values (the tax increment) is are applied to a special fund created to retire the tax-exempt bonds originally issued for development of the district. TIF revenues are small initially, but grow over time as the redevelopment project increases in value, which often results in additional economic growth and increased property values in the district. TIF districts are generally created for a set period of time, often for 20 to 30 years.

- **Benefit Assessment Districts:** Throughout the country, jurisdictions along rail corridors have established special assessment districts covering some or all of the properties in close proximity to station locations. Depending on local regulations, establishing these assessment districts requires a vote of the property owners within the boundaries of the area to be specially assessed and, because of this, residential properties are often deliberately excluded. In other cases, jurisdictions are able to impose assessments without requiring a vote of the affected property owners, but even in these cases a vote is frequently taken or at least an extensive series of public hearings held to determine local political support for the proposed action. In addition to supporting costs related to a station, assessment district funds can also support project elements, such as street and landscape improvements, way-finding, and pedestrian/cycling amenities.

- **Joint Development**: This is an example of a partnership between a public entity and a private developer created to develop certain assets. According to FTA guidance, the development and the property must have a physical and a functional relationship. Joint development can occur when an agency owns land that can be leased to the developer for a long period of time. This enables the developer to build on the land with a low risk of losing the capital investment. In exchange, rents are paid to the agency, creating a revenue stream that can be bonded against to support the development of a transit improvement. Revenue potential can vary depending on market conditions. Joint development can also take the form of the sale of development rights for upfront capital funding.

- **Air Rights:** Air rights refer to the right to develop, occupy, and control the vertical space above a property. Air rights can either be bought, leased, or transferred. This is most often seen in transit projects where the space above a transit station is developed by a private developer to build transit-oriented developments.

- **Developer Contributions:** Developers often provide in-kind or monetary contributions to facilitate construction of infrastructure that would result in a positive impact on property values. Often these contributions are negotiated to reflect the benefit the developer derives from the project. If funding is negotiated, project sponsors often request the contribution upfront to reduce overall financing needs and/or during the early portion of the debt service period. This enables the project sponsor to better leverage other funding options. In some instances, developers have received density allowance increase in return for their contributions. Contributions may be used to fill in funding gaps for both capital and operating costs.

5.2.7 Potential Federal Financing Options

The following provides an overview of potential federal financing programs that have increased in popularity in recent years due to the competition for the limited federal funding levels. A critical component to successfully applying for these financing programs is documentation of a stable, long terms revenue source to provide the annual debt service payments.

- **FRA Railroad Rehabilitation and Improvement Financing (RRIF) Loans**: RRIF was created in 1998 to help railroad operators finance improvements to infrastructure and equipment. Eligible borrowers include railroad operators, state and local governments, government-sponsored authorities and joint ventures that include at least one railroad. With $35 billion in authorized funding (33 loans executed for $1.7 billion as of June 2014)[32] the program provides direct loans for up to 100% of project costs for up to 35-year loan term from the of loan execution, priced at U.S. Treasury rates with principal deferral for up to 6 years from loan execution. The program was designed to operate at no cost to the government and therefore it charges the Credit Risk Premium (CRP) to the borrower based on the borrower's financial health. The CRP is equal the net present value of expected losses

[32] https://www.oig.dot.gov/sites/default/files/RRIF%20final.pdf

due to default and generally ranges between 0 and 5% of the loan amount. The borrower pays CRP upfront and is not allowed to fund CRP through loan proceeds. FRA returns the CRP to the borrower after the loan is repaid. The borrower may choose to reduce the credit risk with collateral pledge. Average RRIF loans assistance was $80 million.

RRIF loan example projects: In 2012 the Kansas City Southern Railway Company (KCSR) obtained a $54.6 million, 25-year loan to reimburse its purchase 30 new locomotives. The loan was priced at 2.96 percent per annum. The obligations under the financial agreement were secured by a first priority security interest in the locomotives and certain related rights.[33] In 2011 Amtrak secured a 25-year $562.9 million RRIF loan to finance the purchase of 70 new electric locomotives, related spare parts, and improvements to existing maintenance facilities to serve the new locomotives. Amtrak repays the loan out of farebox receipts. The loan has an interest rate of 4.04 percent per annum. In addition, Amtrak pays a 4.424 percent CRP on the loan advances. [34]

- **FHWA Transportation Infrastructure Finance and Innovation Act (TIFIA) program:** Created in 1998, TIFIA provides loans and loan guarantees for highway, transit, railroad, intermodal freight, and port access projects. According to 2009 TIFIA program guide rail projects "involving the design and construction of intercity passenger rail facilities or the procurement of intercity passenger rail vehicles" are eligible for TIFIA assistance. However, no TIFIA loans have been approved for pure rail projects.[35] TIFIA did finance intermodal projects and stations improvement projects, which benefited rail systems (Miami Intermodal Center and Denver Union Station). TIFIA had authorized funding of $1.75 billion for FY2013-2014 to cover the cost of program administration and Credit Risk Premium (CRP). Since DOT assumes a CRP of 10 percent, the $1.6 billion available after administrative costs provided TIFIA with the capacity to extend $16 billion in loans in FY2013-2014 or about $8 billion annually. The program provides direct loans and loan guarantees for up to 33-49 percent of project costs (33 percent has been practice so far), 35-yr loan term from substantial project completion. The loans are priced at U.S. Treasury rates plus one basis point (the credit spread). The program average loan has been about $379 million.[36]

  TIFIA loan example: Denver Union Station $145M TIFIA loan, repayment pledge included 30-year Tax Incremental Financing (TIF) District revenue, property taxes after TIF expiration, lodger's tax generated within project area, Denver area Regional Transportation District Authority (RTD) sale tax revenue bond.[37]

---

[33] Kansas City Southern 2013 Form 10-K filed with the SEC: http://www.sec.gov/Archives/edgar/data/54480/000005448014000014/kcs1231201310k.htm

[3434] Amtrak 2013 Annual Report, Note 7: http://www.amtrak.com/ccurl/1000/237/Amtrak-Annual-Report-2013.pdf

[35] TIFIA database of projects: http://www.transportation.gov/tifia/projects-financed

[36] The Railroad Rehabilitation and Improvement Financing (RRIF) Program, David Randall Peterman, Congressional Research Service, May 2015: http://pennyhill.com/jmsfileseller/docs/R44028.pdf

[37] Financing of the Denver Union Station, Ballard Spahr LLP: http://www.law.du.edu/documents/rmlui/conference/powerpoints/2013/KhokhryakovaADUSCaseStudyFinancing-of-The-Denver-Union-Station-DMWEST-9630502-1.pdf

5.2.8 Public Private Partnerships

Public private partnerships (PPP) are an infrastructure procurement, development, and operations method that involve government and private-sector parties working together on a project. PPPs programs include project financing, delivery, and operations. PPPs usually involve government agencies granting a concession to a private-sector company for a service and usually have specific performance metrics. Other PPPs involve government and a private-sector entity collaborating to produce a project that is mutually beneficial.

For example, CSX Transportation (CSX) and MassDOT collaborated to improve MBTA Commuter Rail service between Boston and Worcester while also increasing freight capacity in Massachusetts. The project, included investments by both CSX and MassDOT, resulted in providing full double-stack access to Massachusetts by improving the clearance on 30 bridges along the CSX line. In addition, CSX made a significant investment in intermodal facilities in Worcester, West Springfield, and Westborough, which in turn was a supportive action in allowing the MBTA to increase its service between Boston and Worcester. The full double stack project provides efficiencies and cost savings in the movement of goods to and from Massachusetts that will be shared with businesses and consumers.[38]

5.3 Conceptual Operating Costs

Conceptual annual operating and maintenance (O&M) costs for service (utilizing Amtrak equipment) would be nearly $5 million (2016 dollars) for Schedule 1 and $9 million (2016 dollars) for Schedule 2.

The O&M costs are based on actual costs of operating similar commuter rail services in the New England region (Connecticut and Massachusetts). The estimated O&M costs are inclusive of costs associated with:

- Train and Equipment Maintenance – Costs associated with spare parts, labor and materials, and periodic overhauls;
- Crew, Materials, and Fuel – Costs associated with operating the service such as crew salaries and fringe benefits, ticketing, crew-used support materials, and fuel costs;
- Access Rights to Rail Corridors – Defines a charge levied by the owner of the rail infrastructure to use the rail for public transit-related passenger purposes; and
- Service Overhead/Management Costs – Defines the costs for system administrative services, customer service, and general management activities.

Conceptual annual operating costs are calculated using the per-mile costs associated with the above items and multiplying by annual operating miles and hours. The cost estimate does not include liability insurance, the necessity of which will depend on the agreement between the operator, State, and host railroads.

[38] P 37: http://www.nh.gov/dot/org/aerorailtransit/railandtransit/documents/2015ne_pass_rail_summit.pdf

With six weekday roundtrips, Schedule 1 would cost approximately $4.9 million to operate annually. With 11 weekday roundtrips, Schedule 2 would cost approximately $8.9 million to operate. Table 5.4 profiles approximate costs for Schedules 1 and 2.

Table 5.4: Approximate Corridor Operating & Maintenance Costs (2016 Dollars)

	Schedule 1	Schedule 2
Transportation (Train and Engine)	$720,000	$1,320,000
Crew/Material/Fuel	$3,600,000	$6,530,000
Corridor Access Rights	$250,000	$450,000
Service Overhead/Management Costs	$330,000	$600,000
Total Annual Operating Costs	**$4,900,000**	**$8,900,000**

5.4 Potential Operating Revenues

At this early stage of the project development process, operating funding sources and strategies are typically less defined compared to capital revenue sources. However, it is critical to start discussions among the potential public and private partners that would benefit from the proposed service to identify which sources have the most political support to carry forward for further evaluation.

To initiate discussions with potential operating funding partners, the following provides a long list of potential sources, which can be narrowed down as one or more of the service options moves through the project implementation process.

5.4.1 Passenger Fare Revenue

Passenger fares will be one of the key sources of operating revenue for the commuter rail project. The following summarizes an initial evaluation of potential fare revenue. As the project moves through the implementation process, a detailed ridership forecast would need to be developed and refined fare revenue estimates would be developed.

Conceptual fare revenue is the estimate of the amount of revenue that may be generated with the Corridor through implementation of Schedule 1 or 2. Fare revenue was calculated using a rate of $0.114 per mile and multiplied by the approximate distance that would need to be travelled. Fares are assumed to be based on commuter rail-type distance based zone structure used by commuter railroads in the Northeast, including the MBTA, CT Shore Line East, and MTA Metro North. Typical fares per mile on New England commuter rail trains are under $0.20 per mile, such as Shore Line East, which is $0.19.[39]

However, to provide a direct comparison to existing transit fares in Vermont, $0.114 per mile is used to calculate fares. This is the approximate value per mile based on current Montpelier LINK

[39] The fare structure on the Shore Line East is currently priced at a rate of $9.50 per 50 miles, or approximately $0.19 per mile. "Tickets and Fares" Shore Line East, http://www.shorelineeast.com/fares_passes/fares.php.

bus service fares. Fares are broken down into cost for a one-way ticket and monthly fare, which is the total amount for what a passenger would need to pay to commute on the Corridor for a month. Sample fares are profiled in Tables 5.5 and 5.6.

Table 5.5: Conceptual Montpelier Line Ticket Costs

Origin Station	Destination	Approximate Distance (Miles)	Total One-way Cost ($0.114/mile)	Monthly Fare[40]
Montpelier Central	Essex Junction	33	$3.76	$163.65
	Winooski	38	$4.33	$188.44
	Burlington	41	$4.67	$203.32
Montpelier Junction	Essex Junction	32	$3.65	$158.69
	Winooski	36	$4.10	$178.52
	Burlington	39	$4.45	$193.40
Waterbury	Essex Junction	22	$2.51	$109.10
	Winooski	27	$3.08	$133.89
	Burlington	30	$3.42	$148.77
Richmond	Essex Junction	9	$1.03	$44.63
	Winooski	14	$1.60	$69.43
	Burlington	17	$1.94	$84.30

Table 5.6: Conceptual St. Albans Line Ticket Costs

Origin Station	Destination	Approximate Distance (Miles)	Total One-way Cost ($0.114/mile)	Monthly Fare
St. Albans	Essex Junction	24	$2.74	$119.02
	Winooski	29	$3.31	$143.81
	Burlington	32	$3.65	$158.69
Milton	Essex Junction	11	$1.25	$54.55
	Winooski	16	$1.82	$79.34
	Burlington	19	$2.17	$94.22

Based on these assumptions, conceptual fare revenue estimates include:

- Schedule 1 would include $519,000 on the Montpelier Line and $653,000 on the St. Albans Line, totaling $1,172,000 in annual operating revenue; and
- Schedule 2 would include $1,059,000 on the Montpelier Line and $1,334,000 on the St. Albans Line, totaling $2,393,000 in annual operating revenue.

[40] Typical "Monthly Fare" assumes 261 business days per year and a daily roundtrip fare purchased. This does not assume any discounts for regular riders/monthly passes or added premiums for onboard sales or less frequent trips.

Conceptual yearly fare revenues are based on yearly roundtrip revenue estimates for both directions of travel on each line.

5.4.2 Potential Non-Fare Revenue Funding Sources

Based the results of the conceptual fare analysis, the Corridor commuter rail system would not be self-supporting based on passenger fare revenue alone. Table 5.7 summarizes the additional non-fare revenue levels that would be required for the two schedules.

Table 5.7: Conceptual Annual Operating Support

Schedule	Line	Conceptual Annual Fare Revenue[41]	Conceptual Annual Operating Support Needed	Operating Support Per Passenger (Daily)[42]	Farebox Recovery Ratio (Overall)[43]
Schedule 1	Montpelier Line	$519,000	$2,993,000	$16.90	15%
	St. Albans Line	$653,000	$724,000	$2.50	47%
	Corridor Total	**$1,172,000**	**$3,717,000**	**$19.40**	**24%**
Schedule 2	Montpelier Line	$1,059,000	$5,087,000	$14.10	17%
	St. Albans Line	$1,334,000	$1,421,000	$2.40	48%
	Corridor Total	**$2,393,000**	**$6,508,000**	**$16.20**	**27%**

Potential sources and funding partners that could be targeted to assist in addressing the conceptual annual funding needs are summarized below.

- **Contributions from State and Local Jurisdictions General Funds:** Similar to capital costs, operating costs could be funded through the development of an equitable operating cost allocation methodology that distributes costs (after accounting for fare revenue) among the State and the jurisdictions served by the Commuter Rail based one or more variables related to service levels, passenger, and or demographics (population or employment).

- **Increase State Gas Tax and/or Purchase and Use Tax Rates:** As mentioned in Section 5.2.6, two key sources of transportation funding with the State of Vermont are gas tax and purchase and use tax revenues. The State could consider increasing one or both of the existing rates for these taxes for the Commuter Rail Project or as part of a statewide infrastructure improvement program. For the purposes of this analysis, a one-cent increase in the State Gas Tax would generate an additional $3.4 million annually. Similarly, a 0.125% increase in the State Purchase and Use Tax would generate an additional $20 million in

[41] Conceptual annual fare revenue numbers are based on the sum of fare revenues for all roundtrips on each line
[42] Operating support per passenger is based on annual operating support divided by annual passenger estimates.
[43] Farebox recovery ratio is based on estimated fare revenue divided by the operating cost for each schedule.

revenue per year. Increasing either tax would require detailed financial analysis and discussions with local and State political leaders.

- **Reallocation of Existing Fixed Route Bus Service Costs within the Corridor:** A key planning component of the project implementation process is the development of an integrated service plan that reflects the incorporation of the proposed alternatives into the existing bus route network. As the project moves forward an Operations Plan will be developed to integrate the commuter rail's service plan with existing bus service, which could result in the elimination or reduction of duplicate fixed route bus service. The operating savings from the reduced fixed route service could be reallocated to pay for a portion of the Commuter Rail O&M costs. However, for context it should be noted that current operating and maintenance expenses for the existing Montpelier LINK and St Albans LINK services total less than $1m.

- **Other Operating Revenues:** The State could consider taking advantage of the positive image created by the Commuter Rail project to encourage sale of static and electronic advertising on stations, vehicle exteriors, vehicle interiors, website, and promotional materials.

- **CMAQ Program:** In addition to supporting implementation of capital projects, CMAQ funding is also eligible to support the first five years of operation of a new transit service. Negotiation of potential realistic annual levels of CMAQ funding would be required to provide assistance during the first five years of commuter rail service.

- **Contributions from Private Partners:** For major employers and/or other activity centers served directly by the commuter rail, a revenue structure could be established where the employer / activity center purchases a set number of tickets per year or pays an agreed upon share of operating costs relative to the benefits the transit service provides.

- **Assessment Districts / Tax Increment Financing Districts:** In addition to providing a source of revenue for capital costs (Section 5.2), these Districts could also provide assistance in paying for a share of on-going maintenances costs.

- **Parking Fees**: A parking fee is a tax or surcharge levied on paid parking. The fee could be applied within the City limits for the use of off-street commercial or employer provided parking spaces. If applied within the corridor, there would be some degree of relationship between traffic and parking within the corridor relative to parking requirements and parking tax. If applied City-wide for each jurisdiction served by the Commuter Rail, the relationship between the parking fee and operating costs within the corridors would be less direct. More likely, a City-wide parking fee would be used to fund a variety of improvements, and would not be used solely to fund operating costs for the commuter rail.

6 Implementation Issues

This chapter outlines the issues that would need to be considered and resolved before implementing Corridor commuter rail services. Issues include implementation requirements like labor and PTC requirements, potential impacts to existing traffic, service to IBM/Global Foundries, and noise concerns. Additional issues to consider include feasibility criteria including capital costs, subsidy requirements, and ridership demand with Federal and State funding also needing to be taken in to consideration.

Development of the Implementation Issues section was based on currently available data and previous assessments of the Corridor. The data was gathered from diverse sources including publically available information, government reports, and partner railroads.

6.1 Labor Requirements

Operating a commuter rail system and also implementing capital programs will have certain labor requirements. These requirements will need to be met in order to implement the proposed Commuter Rail service including both capital programs and operating services.

6.1.1.1 STATE REQUIREMENTS FOR CAPITAL PROGRAMS

The State has labor requirements for contractors working on state projects. Specifically, prevailing wages dictate what hourly rates workers must at least be paid when working on public projects. The prevailing wage is defined as "no less than the mean (average) prevailing wage determined by the Vermont Department of Labor plus 42.5% Fringe Benefit component."[44] The Vermont "Capital Construction Act" provides that any projects funded or authorized by the State of Vermont, which cost more than $100,000 will utilize prevailing wage for occupation covered. Occupations covered by prevailing wage include construction related occupations.[45] If employees are laid off due to new commuter rail services, the State will be responsible for three years of employee salaries.

6.1.1.2 FEDERAL EMPLOYEE PROTECTIVE ARRANGEMENTS FOR TRANSIT EMPLOYEES

Employee protective arrangements are required when federal funds are used to acquire, improve, or operate a public transportation system. These arrangements provide for the preservation of rights and benefits bestowed through collective bargaining agreements. These arrangements will also protect employees against a worsening of their positions related to their employment.[46]

---

44 "2016 Vermont State Construction Prevailing Wage." Vermont Department of Labor, http://www.vtlmi.info/stateconstrprevailwage.pdf
45 Ibid.
46 "Mass Transit Employee Protections 49 U.S.C. § 5333(b)" United States Department of Labor, https://www.dol.gov/Olms/regs/compliance/compltransit.htm.

6.1.1.3 SERVICE OPERATION LABOR REQUIREMENTS

Corridor commuter rail would utilize require train engineers, conductors, and administrative staff. The labor situation for employees would depend on the operator of the service and labor requirements of that organization.

Generally, there are various national-level labor unions that represent employees of commuter rail services. The labor unions include:

- The American Railway and Airway Supervisor's Association
  - Maintenance of Equipment Division
  - Maintenance of Way Division
- The Brotherhood of Maintenance of Way Employees
- The Brotherhood of Railroad Signalmen
- The International Association of Machinists
- The International Brotherhood of Boilermakers
- The National Conference of Firemen and Oilers
- The Joint Council of Carmen & Coach Cleaners
- The International Brotherhood of Electrical Workers – Mechanical Dept.
- The Transportation Communications International Union
- The American Train Dispatchers Association
- The Brotherhood of Locomotive Engineers and Trainmen
- United Transportation Union (UTU) Sheet Metal Air Rail Transportation (SMART) Union – Transportation Division
- The Sheet Metal Air and Rail Transportation Workers

It is anticipated that the State, SCRA, or contracted operator of the service would engage in labor negotiations and establish necessary labor provisions to support service.

6.2 Positive Train Control

As outlined in Chapters 4 and 5, without PTC implementation, only a limited number of trains are allowed to run on the Corridor daily. Schedule 1, which provides a limited peak service, is designed to provide service below the FRA PTC requirement. Meanwhile, Schedule 2, which provides comprehensive peak period services, has would require the installation of a PTC system. The requirement to install PTC systems is relevant for the Corridor commuter rail system because PTC requires a substantial capital investment. The State would have to determine the level of service desired and use this as the basis for determine if PTC will be installed on the Corridor.

6.3 Community & Environmental Considerations

Corridor commuter rail service will have some impacts on communities served. The issues include additional trains at grade crossings, noise impacts, and changes to connecting transit services.

6.3.1 Grade Crossings

The addition of more trains running through the Corridor will result in impacts to traffic near certain grade crossings. Additional grade crossing protection equipment could be necessary with additional services. Costs associated with improved grade crossings are factored into capital costs identified in corridor rehabilitation in Section 5.1. The Corridor has grade crossings in the following communities:[47]

- WACR
  - Montpelier
    - Taylor Street
    - Bailey Avenue
    - Green Mountain Drive
    - Junction Road
  - Berlin
    - Industrial Grade Crossing
- NECR Mainline
  - Berlin
    - Junction Road
  - Montpelier
    - Graves Street
  - Middlesex
    - Cross Road
  - Waterbury
    - Demeritt Place
    - Park Row
    - Waterbury Wastewater Treatment Access Road
  - Richmond
    - Cochran Road
    - Bridge Street
  - Williston
    - Williston Road
  - Essex
    - Robinson Parkway
    - Maple Street
    - Main Street
    - Central Street
    - North Street
    - Pinecrest Drive
  - Colchester
    - Colchester Pond Road
    - East Road (south)

[47] The list excludes minor crossings such as farm and private crossings.

        - East Road (north)
        - Farnsworth Road
    - Milton
        - McMullen Road
        - Kingsbury Crossing
        - Railroad Street
        - Cherry Street
        - Main Street
        - North Road
    - Fairfax
        - Skunk Hill Road
    - St. Albans (City)
        - Oakland Station Road
        - Conger Road
        - Industrial Park Road
        - Nason Street
        - Lower Weldon Street
        - Lake Street
- Winooski Branch
    - Essex
        - Park Street (North and South of the Essex Junction Wye)
        - South Summit Street
        - West Street Extension
        - Woodside Drive
    - South Burlington
        - Berard Drive
    - Winooski
        - East Allen Street
        - Barlow Street
        - Malletts Bay Avenue
    - Burlington
        - Intervale Road
        - Penny Lane
        - College Street

6.3.1.1 ESSEX JUNCTION GRADE CROSSINGS

Due to the location of the Essex Junction Wye, where the NECR Mainline and Winooski Branch meet, Corridor commuter rail service would have particular effect on grade crossings in the Essex Junction neighborhood. Trains on the St. Albans Line would cross Central Street, Main Street, Maple Street, and Park Street and services on the Montpelier Line would cross Park Street. Corridor commuter rail services would pass through during peak period commuting hours, closing streets during rush hour periods. Additionally, Corridor commuter rail service has the potential to add additional traffic in the Essex Junction area if additional public busses or private shuttles operate service to pick up commuters disembarking from trains.

6.3.2 Potential for Noise Impacts and Quiet Zones

The addition of 12-22 daily trips along the Corridor will increase the amount of times trains are heard travelling past any property adjacent to the rail lines. Any property currently next to the rails would already hear train noise throughout the day from existing trains that travel along the corridor and the additional proposed trains should not increase current levels drastically.

Quiet zones are areas nationwide of at least a half mile where railroads have been instructed to cease sounding their horns when approaching a grade crossing to maintain the peace of quiet of the location. Grade crossings within quiet zones should have increased warnings to compensate for trains being discouraged from sounding their horns with the normal 2 long, 1 short, and 1 long horn when nearing such a crossing. These public grade crossings must be equipped with standard or conventional automatic warning devices.[48] The maximum volume level for the train horn is 110 decibels with a minimum of 96 decibels.

Burlington, VT currently has a quiet zone in place with the Vermont Railway line south of the Burlington station.

6.3.3 Connecting Transit Schedule Coordination

Corridor commuter rail service will result in changes to existing transit service in central and northwest Vermont. Existing local transit services could be modified in locations such as Burlington, Essex Junction, Winooski, Montpelier, and St. Albans to serve as distribution networks for Corridor commuter rail services. This could primarily be done with schedule and slight route variations. However, larger institutions, such as the University of Vermont, might choose to run dedicated shuttle busses for employees commuting by trains. This section identifies potential impacts to the IBM/Global Foundries and LINK bus system.

6.3.3.1 POTENTIAL FOR SERVICE TO IBM/GLOBAL FOUNDRIES

Currently, there are no plans to open a station at the IBM/Global Foundries. Stakeholder review of the Corridor commuter rail station listing in June 2016 recommended stations that would be evaluated with the Corridor commuter rail study.

However, bus service from Essex Junction Station or the new proposed Essex Junction South Station may be modified to deliver workers to these locations thereby establishing a link from the train station to IBM/Global Foundries. This would reduce the number of cars travelling to the facilities and increase usage of public transportation if implemented correctly.

[48] "FRA Locomotive Horn Sounding and Quiet Zone Establishment." Federal Railroad Administration. https://www.fra.dot.gov/eLib/details/L04309

6.3.3.2 LINK BUS PROGRAM

The LINK bus system would likely have changes to accommodate services on the Corridor commuter rail service. Potential options are identified in Table 6.1.

Table 6.1: LINK Bus Services

	Description	Impact
Schedule 1: Continue LINK Bus with Reduced Peak Service Schedules	LINK bus operations during shoulder peak periods and mid-day periods.	This would reduce LINK bus services but still have operations to accommodate mid-day and shoulder peak services that do not have Corridor commuter rail operations.
Schedule 2: Operate Mid-day LINK Bus	Operation of mid-day LINK bus services.	Schedule 2 does not provide for mid-day Corridor commuter rail services and these services would provide existing mid-day links.

6.4 Implications for Statewide Transit Programs

Commuter rail operations on the Corridor will impact existing transit system operating and capital funding. Impacts will include the new annual operating costs associated with commuter rail services and capital costs required for infrastructure enhancements and equipment.

The annual O&M costs for Corridor commuter rail services is between $4.9-8.9 million, depending on service levels. The farebox recovery ratio, as described in Chapter 5, would require an operating subsidy of nearly $3 to over $5 million per year. The FY 2017 budget for transit (not including intercity rail) in Vermont is $34.8 million, which includes over $3.5 million from Green Mountain Transit (a.k.a. CCTA) and other local funds. As described in Chapter 5, operating funding for Corridor commuter rail services could come from reallocating existing transit spending through reduction of other transit services, other VTrans funding sources, local contributions, additional funding identified by the State government, or a combination of sources.

Capital funding for Corridor commuter rail services would likely come from the State and federal government programs. The State provides capital funding for infrastructure projects through VTrans and other state agencies. Additional funding could come from the federal government through agencies such as the FTA or FRA. Federal formula funds could also be used for capital projects on the Corridor but this would take away from existing programmed transportation sources. Conceptual capital funding sources are identified in Chapters 5 and 7.

7 Implementation Framework

This chapter describes the framework and possible next steps for beginning commuter rail service on the Corridor through the implementation process. The chapter is divided into six primary areas:

- Incremental Implementation Scenarios
- Service Implementation Considerations
- OM Support Scenarios
- Capital Program Funding Scenarios
- Environmental Considerations
- Feasibility Criteria

The chapter concludes with a summary of the implementation considerations and next steps that would need to be taken in advance of service.

7.1 Incremental Implementation Scenarios

Due to the large investment required to support the complete implementation of service on the Corridor, an analysis was done to evaluate the potential for partial investments and service development. This analysis is important to understand the benefits that minimal investments could provide. The investment options were developed based on an understanding of maximizing ridership, providing rational service levels, and minimizing infrastructure investments. Table 7.1 details conceptual Corridor Phasing elements, including capital cost, operating cost, annual operating support, and daily transit demand.

Table 7.1: Potential Corridor Implementation Phasing Scenarios

Option	Capital Cost	Operating Cost	Annual Operating Support	Daily Transit Demand[49]
Option 1 – Corridor-wide Service with Schedule 1	$301 Million	$4.9 Million	$3.7 Million	940
Option 2 – Corridor-wide Service with Schedule 2	$363 Million	$8.9 Million	$6.5 Million	1,835
Option 3 – St. Albans Line - only Service with Schedule 2	$164 Million	$2.8 Million	$1.4 Million	1,140
Option 4 – Montpelier Line Service-only with Schedule 2	$249 Million	$6.1 Million	$5.1 Million	695

[49] Transit demand assumes the Champlain Flyer demand profile for Option 1 and LINK bus demand profile for Options 2-3 with existing population and employment counts.

The figures in Table 7.1 are derived from data used to develop other figures in Chapters 3-6, including:

- **Capital Cost:** Describes the infrastructure required to operate commuter rail services. Options 1 and 2 figures were developed in Chapter 4 and costs in Chapter 5. Options 2 and 4 assume infrastructure and associated costs that are unique to the individual service options and are discussed in 7.1.3 and 7.1.4.
- **Operating Cost**: Describes the annual costs that will be required to operate the service. Option 1 and 2 figures were developed in Chapter 5 and use Schedules 1 and 2. Options 3 and 4 figures were developed using Schedule 2 levels of service and divide costs into individual lines based on the distance and level of service formula described in Chapter 5.
- **Annual Operating Support**: Describes the total subsidy that will be required to operate services above ticket revenue. As described in Chapter 5, ticket revenue was calculated based on $0.114 per mile traveled, approximately the same per mile cost for a one-way ticket on the LINK bus. Ticket revenue is then deducted from annual O&M costs to determine the operating support figures. The operating support for all four options was developed in Section 5.2.3.
- **Daily Transit Demand**: Describes the conceptual demand for transit service for commuters in the Study Corridor. The transit demand for each segment was developed in Chapter 3.

All costs and figures assume 2016 dollar values.

7.1.1 Option 1: Corridor-wide Service with Schedule 1

Option 1 details the implementation of Schedule 1 with service on both the St. Albans Line and Montpelier Line. The lines would operate as a regional system with limited peak period services. The capital cost for Option 1 is $301 million, including $139 million for infrastructure and $162 million for equipment.

The capital program and operating assumptions for Option 1 are outlined in Chapter 4 and capital costs and O&M costs are in Chapter 5.

7.1.2 Option 2: Corridor-wide Service with Schedule 2

Option 2 details the implementation of Schedule 2 with service on both the St. Albans Line and Montpelier Line. The lines would operate as a regional system with comprehensive peak period services. The capital cost for Option 2 is $362 million, including $139 million for infrastructure, $35 million for PTC implementation, and $189 million for equipment.

The capital program and operating assumptions for Option 2 are outlined in Chapter 4 and capital costs and O&M costs are in Chapter 5.

7.1.3 Option 3: St. Albans Line Service-Only with Schedule 2

Operating Schedule 2 service for only the St. Albans Line would result in a service with five station stops between St. Albans and Burlington Union Station, with intermediate stops at Milton, Essex Junction, and Winooski.

Schedule 2 transit demand is estimated to be 1,139 people in the St. Albans to Burlington corridor. Annual revenue generated from riders is estimated to be $1,330,000 with an operating cost of $2,755,000 and operating support of approximately $1,425,000. When split by passenger, this is a daily operating support of $2.40 per passenger with a farebox recovery ratio of 48%. .

The capital cost for Option 3 is $164 million, including $83 million for infrastructure and $81 million for three sets of equipment. Infrastructure assumes full rehabilitation of the Winooski Branch, new stations at Milton and Winooski, and signalization of the NECR Mainline from Essex Junction to St. Albans. PTC would not be required with Option 3 because the total number of trains operating on the Corridor would not pass the 12 maximum for a system without PTC.

7.1.4 Option 4: Montpelier Line Service-Only with Schedule 2

Operating only service on the Montpelier Line would result in a service with seven station stops between Montpelier Central Station and Burlington Union Station with intermediate service at Montpelier Junction, Waterbury, Richmond, Essex Junction South Station, and Winooski.

Transit demand for the Montpelier Line service is estimated to be 695 people in the Montpelier to Burlington Corridor. Annual Revenue generated from riders is estimated to be $1,055,000 with an operating cost of $6,145,000 and approximately $5,090,000 in operating support. When split by passenger, this is a daily operating support of $14.00 per passenger with a farebox recovery ratio of 17%.

The capital cost for Option 4 is $249 million, including $106 million for infrastructure and $108 million for four sets of equipment. Infrastructure costs include full rehabilitation of the Winooski Branch and WACR, new stations at Richmond and Montpelier Central, a station serving the Montpelier Line in Essex Junction, and new Montpelier Junction Station and reconfigured Montpelier Junction wye. PTC would be required with Option 4 because the total number of trains operating on the Corridor would be 14, two more than the 12 maximum for a system without PTC.

7.2 Service Implementation Plan

The implementation requirements for future Corridor commuter rail include:

- Creation of a governing and funding program for operating and capital programs;
- Adopting an agreement with NECR to utilize NECR-owned tracks and stations for Corridor commuter rail services;
- Creation of final schedules based on service levels and service option preferred;
- Identifying an operator for the commuter rail service;

- Finalizing capital engineering requirements and rolling stock procurements; and
- Close coordination between local, state, and federal partners to ensure cohesion between public agencies during implementation and operation.

Each implementation issue is discussed in detail in the sections below.

7.2.1 Service Option Choice

The Service Options outlined in Section 7.1 are conceptual in nature. Lead agencies should consider developing final service options in order to coordinate construction timelines, service implementation timeframes, and other logistics. The final service levels chosen by the State and other stakeholders will have a significant impact on the funding requirements, host railroad agreements, scheduling, capital program, and operating program used for the Corridor commuter rail system.

7.2.2 Governance and Funding

A governance and funding agreement must be finalized prior to implementation of Corridor commuter rail service, as outlined in Chapter 5. State agencies should establish a governance agreement that identifies a service operator and grants operating authority for Corridor commuter rail service. Funding and financing agreements for the project should identify state and federal funding sources to assist in initial capital requirements and operation of the service.

Importantly, an initial funding source must be in place to fund anticipated O&M costs and the predicted capital costs for the Corridor commuter rail service. Sections 7.3 and 7.4 explore O&M Support scenarios and Capital funding scenarios.

7.2.3 Host Railroad and Service Operator Agreements

Agreements with the freight railroad operations and track owners must be in place before any permitting, construction, or implementing service can begin on the Corridor. For implementation of the Corridor commuter rail service, an agreement must be made with NECR, the host railroad for the NECR Mainline and Winooski Branch, and VTR, the operator of the WACR and with trackage rights in vicinity of Burlington Union Station. A host railroad agreement with NECR must be in place before additional passenger service can occur on the right-of-way. These agreements should consider how the proposed services would affect freight service and how the lead agencies plan to mitigate any disruptions that may occur for the host railroad. Previous agreements between host railroads and service operators could be used as a guideline for Corridor commuter rail service.

7.2.4 Final Schedules

As passenger service and freight schedules continue to change, a final service schedule will need to be developed prior to the implementation of service to ensure optimal timing. The final schedule will also have a significant impact on the availability of PTC in the region. When the final schedule is adopted, an operations model would need to be developed and modeled in a computer simulation to ensure proper operations for both passenger and freight railroads.

7.2.5 Operator

The state agencies must also enter into an agreement with a passenger service operator prior to implementation of Corridor commuter rail service. The selected service operator should have sufficient knowledge of commuter rail operations and should be able to meet terms agreed upon between the states and host freight railroads. Once an operator is procured, the O&M costs in Chapter 5 would require updating to account for the service operator's standards and any changes to standard commuter passenger rail operations in the northeastern United States.

7.2.6 Conceptual Engineering and Rolling Stock

To ensure that the Corridor has sufficient capacity to implement the proposed service, the recommended infrastructure improvements outlined in Chapters 4 and 5 would need to be permitted, designed, and completed. Detailed plans, project designs, and permits would be required before final funding and construction can commence. Additionally, sponsoring agencies would need to procure design and construction firms to facilitate the work. Infrastructure improvement construction may be staggered depending on the availability of funding. Additionally, train sets would need to be procured to accommodate Corridor commuter rail service.

7.2.7 Coordination

Full implementation of the Corridor commuter rail service would require close coordination between local, state, and federal agencies. Multiple entities will need to work together to define the future service under mutually agreeable terms. The State and local governments along the Corridor would need to concur on the key aspects of governance, funding, and management of the proposed system and services. Additionally, federal agencies will be key for environmental permitting, funding, and general oversight of Corridor commuter rail services.

7.2.8 Conceptual Schedule for Implementation

Table 7.2 profiles a conceptual schedule for implementation. The schedule is based on timelines for comparable commuter rail projects in the U.S. and assumes the State will pursue federal funding. This example assumes that the State would begin the process in early 2017 and no major impediments are identified during the process, such as unforeseen engineering, permitting, public or political opposition, or funding challenges, which could extend the 7-year duration estimated in table 7.2.

Table 7.2: Potential Operating Subsidy Funding Streams

Step	Timeframe	Year
Comprehensive implementation plan to determine final Capital and Operating Costs, Ridership, Project Feasibility, and Public Opinion	12 Months	Early 2018
State and Stakeholders Determine to Proceed with Corridor Commuter Rail Service, Create Finance Plan, and conclude agreement with Host Railroads	6-8 Months	Mid-2018
Federal Approvals and Permitting Process, including Alternatives Analysis, NEPA, Preliminary Engineering, and other Processes.	24 Months	Mid-2020
Construction	24 Months	Late 2022
Line Tests and Start of Service	2-3 Months	Late 2022/ Early 2023

7.3 Capital Funding Scenarios

This section outlines the conceptual funding scenarios for constructing necessary capital improvements to implement Corridor commuter rail service. The conceptual financial strategies reflect scenarios where multiple federal funding programs would be targeted to cover varying shares of the total costs. The purpose of these scenarios is to assist the Project Team in determining if the conceptual level of federal and non-federal funding is considered realistic or would be considered a red flag in terms of moving forward with the implementation process. The scenarios assume:

- Scenario 1: Maximum Federal Funding: The State is successful in obtaining a total of 80 percent federal funding from a variety of programs with the remaining funds provided by a combination of State and Local sources;
- Scenario 2: Moderate Federal Funding: The State is successful in obtaining a total of 50 percent federal funding from a variety of programs with the remaining funds provided by a combination of State and Local sources;
- Scenario 3: Minimal Federal Funding: The State is successful in obtaining a total of 10 percent federal funding from a variety of programs with the remaining funds provided by a combination of State and Local sources.

Each scenario is constructed to assume different levels of federal support and the necessary State/regional support that would then be required to meet the capital needs for the program. The federal programs outlined are discretionary and competitive grant programs that are awarded based on an FTA evaluation and multi-year planning process.

Tables 7.3, 7.4, and 7.5 provide conceptual financial strategies to initiate the discussion on potential approaches to fund construction of commuter rail project.

Table 7.3: Maximum Federal Participation (2016 Dollars)

Option	Capital Cost	80% Federal Share	20% State / Local Share
Option 1 – Corridor-wide Service with Schedule 1	$301 Million	$240.8 Million	$60.2 Million
Option 2 – Corridor-wide Service with Schedule 2	$363 Million	$290.4 Million	$72.6 Million
Option 3 – St. Albans Line - only Service with Schedule 2	$164 Million	$131.2 Million	$32.8 Million
Option 4 – Montpelier Line Service-only with Schedule 2	$249 Million	$199.2 Million	$49.8 Million

Table 7.4: Moderate Federal Participation (2016 Dollars)

Option	Capital Cost	50% Federal Share	50% State / Local Share
Option 1 – Corridor-wide Service **with Schedule 1**	$301 Million	$150.5 Million	$150.5
Option 2 – Corridor-wide Service with Schedule 2	$363 Million	$181.5 Million	$181.5
Option 3 – St. Albans Line - only Service with Schedule 2	$164 Million	$82.0 Million	$82.0
Option 4 – Montpelier Line Service-only with Schedule 2	$249 Million	$124.5 Million	$124.5

Table 7.5: Minimal Federal Participation (2016 Dollars)

Option	Capital Cost	10% Federal Share	90 % Local Share
Option 1 – Corridor-wide Service with Schedule 1	$301 Million	$30.1 Million	$270.9 Million
Option 2 – Corridor-wide Service with Schedule 2	$363 Million	$36.3 Million	$326.7 Million
Option 3 – St. Albans Line - only Service with Schedule 2	$164 Million	$16.4 Million	$147.6 Million
Option 4 – Montpelier Line Service-only with Schedule 2	$249 Million	$24.9 Million	$224.1 Million

7.3.1 Local Match Sources

The federal government requires that a local match be provided for projects obtaining federal discretionary grants. The local match funds cannot be federal formula funds or related to other federal sources; however, federal formula and other federal sources can constitute up to 80% of total project capital sources. Therefore, the State, local governments, and other stakeholders must allocate funds from other sources to satisfy the federal local match requirement. The match sources are outlined in Chapter 5.

7.4 Environmental Considerations

A *Tier 1 Service Level Environmental Analysis* (EA) would likely be necessary for Corridor commuter rail service to comply with the National Environmental Policy Act (NEPA) process. While the impact of Corridor commuter rail service will likely be minimal because the proposed service is within existing right-of-way, an EA is necessary to satisfy federal legal requirements. The EA will identify the potential for significant adverse impacts due to operating commuter rail service on the Corridor and the capital projects required for Corridor service to commence.

Impacts that will be identified during the NEPA process include:

- **Air Quality –** The analysis would include consideration of increased congestion close to stations, change in regional vehicle-miles-traveled, and the impact of railroad sidings near sensitive receptors. The data collected and analyzed would determine the impacts on the quality of the air in the region and identify if mitigation is required and what those measures would be.
- **Water Quality** – As part of an EA, coordination with resource agencies regarding permits and design details that could result in potential impacts would occur.
- **Noise and Vibration** – A noise and vibration assessment, a general assessment, and preliminary screening would include a review of the FTA Category 1 receptors and the number of potential noise and vibration impacts that would require the consideration of mitigation measures.
- **Ecological Systems** –Identification of potential endangered species habitats. Project-related construction in these areas would have to be reviewed under the applicable state endangered species and habitat laws in future phases of work.
- **Wetlands** – The potential impacts to wetlands would determine the locations and impacts to wetlands in the Corridor study area.
- **Endangered Species and Wildlife** – The creation of an inventory of endangered species found in the Corridor region and proper steps to mitigate harm to species.
- **Flood Hazards** – Impacts to floodplains and flood hazard areas and possible avoidance or minimization measures.
- **Aesthetics/Visual Impacts** - Potential visual impacts to the areas where construction will take place and mitigation measures to prevent long-term harm.
- **Environmental Justice** – An analysis to determine the impacts to environmental justice populations.
- **Use of Section 6(f) Lands** – An analysis, in coordination with the U.S. Fish and Wildlife Service, to ensure impacts are minimized and potential mitigation measures are implemented as necessary.
- **Cultural Resources and Historic Properties** –Identification and review of historic properties near the Corridor to determine potential effects on historic and cultural resources.

The lead federal agency would consult with the applicable State Historic Preservation Offices (SHPO) to identify any impacts to historic resources and identify mitigation measures, if needed.

- **Use of Section 4(f) Protected Properties** – A complete Section 4(f) analysis would occur to determine impacts to publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites.
- **Socioeconomic** – An assessment to evaluate potential socioeconomic impacts.
- **Construction Period** – The sequence and extent of construction would be identified and staging plans developed during the final design phases.

The lead agency responsible for sponsoring specific projects would be required to conduct further Tier 2 environmental analysis as a part of the NEPA process.

7.5 Feasibility Criteria

When analyzing at feasibility of implementing this Commuter Rail service, capital costs, subsidy requirements, and ridership demand must be considered. Table 7.6 outlines the feasibility criteria that could be used to evaluate if the State should advance consideration for Corridor commuter rail programs. The table provides decision points where the potential impacts of Corridor commuter rail service will be evaluated and weighed by the State, regional stakeholders, and members of the public.

Table 7.6: Corridor Feasibility Criteria

Issue	Details
Cost Comparison	Determine if the order of magnitude costs (OM and Capital) warrants further consideration by the State and regional stakeholders.
Confirm Demand for Service through Ridership Analysis	Conduct a standard ridership analysis to determine demand for a commuter rail service. Confirm that demand is sufficient for regional stakeholders to proceed with further.
Determine Service Profile	Determine the level of service or service Option that meets the needs of the region. This could be a combination of commuter rail service, a combination of commuter rail and LINK express bus, or maintenance of the existing bus system for peak level demand.
Determine if Public Support Exists for Service Plan	Determining if public support exists for service should be conducted through public meetings and other public outreach efforts as well as Legislative reviews.
Obtain Support from Regional Railroads	Regional railroads, such as NECR, who will host passenger service, should be consulted to ensure support for commuter rail programs.
FTA Capital Grant Process and Federal Environmental Processes	If the State chooses to pursue federal funding, it will have to partake in the FTA and NEPA process. This will determine if the federal government will fund the capital program for the commuter rail system.
Funding and Financing	The State will need to create a funding and financing program for O&M and capital programs. This will also be necessary to secure a federal discretionary grant for capital funding. The State must

	determine what funding streams will be utilized to create the funding and financing program.

As the State further refines timelines for specific projects and service implementation, updates to specific sections of this report would be required to account for changes to the existing conditions and rail operations on the corridor.

8 Stakeholder, Agency & Public Engagement

Outreach was a critical component throughout the study development process since it began in the spring of 2016 from stakeholders, agencies, and members of the public. Input was provided through direct comments and feedback at designated meetings and through letters received. This section describes the outreach and feedback process.

8.1 Study Advisory Committee

Stakeholders, including public and private organizations, were invited to participate as members of a Study Advisory Committee (SAC). SAC meetings were held in June and October of 2016 and discussions were held during each meeting to further understanding of the specific requirements of stakeholder groups that needed to be met. The following is a general list of the stakeholders that were engaged during the Study:

- Railroads
- Economic Development Agencies/Chambers of Commerce
- Municipalities
- Transit Authorities
- Regional Planning Organizations
- Vermont Legislative Members

SAC comments provided the project management team with valuable insight into federal, state, and corporate technical requirements for passenger rail operations along the Corridor.

The SAC also provided key insight into the, policy, and institutional realities of establishing and operating a commuter rail service.

8.2 Public Engagement

Public meetings were held in order to include the Public in discussions defining the Corridor. Public meetings were held in Burlington and Montpelier in April of 2016 to discuss the project scope, existing conditions, and attributes that would contribute to the study. Additionally, public meetings on the project findings were held in December 2016 in Montpelier, Burlington, and St. Albans. Discussions during each meeting aimed to further the public's understanding of the Study and the efforts behind it. Additional public information was available through VTrans public notices and on the Study pages on the VTrans website.

Comments and feedback were recorded from the meetings and taken into consideration. Additionally, members of the press were present at public meetings, including newspaper and television, allowing a broader audience to understand the project attributes and findings. Specifically, at public meetings in December 2016 three local television stations covered meetings.

8.3 State Advisory Council Coordination

Vermont State Advisory Councils were included in discussions defining the Corridor, which included both Vermont government entities and the Rail Council and Public Transit Advisory Council meetings. Specifically, Rail Council meetings were held in May and November of 2016 and discussions were held during each meeting to further understanding. Further, the draft of chapters 1-7 were distributed to agencies for review in November of 2016. Comments received from State Advisory Councils were incorporated into the Study.