ENVIRONMENTAL ASSESSMENT NEW YORK - VERMONT BI-STATE INTERCITY PASSENGER RAIL STUDY

Prepared Pursuant to the National Environmental Policy Act (42 USC 4332) and 64 FR 28545
by the
U.S. Department of Transportation
Federal Railroad Administration
and
Vermont Agency of Transportation

For FRA — Date of Approval: 12/17/2014

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Acronyms and Abbreviations

AADT	Average Annual Daily Trips
ABRB	Albany-Bennington-Rutland-Burlington
AM	Ante Meridiem
BCRC	Bennington County Regional Commission
CAAA	Clean Air Act Amendments
CDTA	Capital District Transportation Authority
CEQ	CEQ's *Considering Cumulative Effects under the National Environmental Policy Act*
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLP	Clarendon and Pittsford Railroad
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CP	Canadian Pacific Railway
CPF	Canadian Pacific Railway, Freight Subdivision
CTC	Centralized Traffic Control
CWR	Continuous-Welded Rail
D&H RR	Delaware and Hudson Railroad
dB	Decibels
dBA	A-weighted Decibels
DOT	US Department of Transportation
EA	Environmental Assessment
EJ	Environmental Justice
EPA	US Environmental Protection Agency
ESPA	Empire State Passenger's Association
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GGFT	Greater Glens Falls Transit
GMRR	Green Mountain Railroad
GMX	Green Mountain Community Network, Inc.
HSIPR	High-Speed Intercity Passenger Rail
Hz	Hertz
I	Interstate
Ldn	Day-Night Sound Level
Leq	Hourly Energy-Average Sound Level, or Hourly Equivalent Sound Level

LWCF	Land and Water Conservation Fund
MCD	Minor Civil Division
MOE	Measures of effectiveness
Mpg	Miles per gallon
MVRTD	Marble Valley Regional Transit District
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Oceanic and Atmospheric Administration – National Marine Fisheries Service
NNHP	Vermont Fish & Wildlife Department – Nongame and Natural Heritage Program
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetland Inventory
NY	New York
NYNHP	New York Natural Heritage Program
NYOPRHP	New York Office of Parks, Recreation, and Historic Preservation
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NY-VT	New York-Vermont
O&M	Operations and Maintenance
PAR	Pan Am Railways
PM	Particulate Matter
	Post Meridiem
PMT	Project Management Team
PRIIA	Passenger Rail Investment and Improvement Act
RINA	Rare and Irreplaceable Natural Areas
rms	Root Mean Square
RRPC	Rutland Regional Planning Commission
SHPO	State Historic Preservation Offices
SPDES	State Pollutant Discharge Elimination System
SUNY	State University of New York
"The Bus"	Marble Valley Regional Transit District
TOD	Transit-Oriented Development
TPC	Train Performance Calculator
USACE	US Army Corps of Engineers
USC	United States Code
USFWS	US Department of Interior – Fish & Wildlife Service
VCGI	Vermont Center for Geographic Information
VdB	Vibration Decibels
VMT	Vehicle Miles Traveled
VOCs	Volatile Organic Compounds

VRAN	Vermont Rail Action Network
VRS	Vermont Rail Systems
VSWI	Vermont State Wetland Inventory
VT	Vermont
VTDEC	Vermont Department of Environmental Conservation
VTDHP	Vermont Division for Historic Preservation
VTR	Vermont Railway
VTrans	Vermont Agency of Transportation

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Executive Summary

The New York-Vermont Bi-State Intercity Passenger Rail Study project is an initiative of the Vermont Agency of Transportation (VTrans) and the New York State Department of Transportation (NYSDOT) to identify and establish an efficient, intercity passenger rail-based transportation link that will benefit un-served and underserved communities in southwestern Vermont and eastern central New York. This Programmatic Environmental Assessment (EA) has been prepared to identify the preferred service alternative and evaluate the potential impacts that the project may have to the natural and human environment. The Proposed Action would retain the existing Ethan Allen service through east-central New York to Rutland, Vermont and add new service through southwest Vermont to Rutland. The existing Ethan Allen service operates between Rutland, Vermont and Albany/Rensselaer New York with stops in Castleton, Vermont and Whitehall, Fort Edward, Saratoga Springs, and Schenectady, New York. The new service would operate between Rutland, Vermont and Albany/Rensselaer, New York through southwest Vermont with stops in Mechanicville, New York and North Bennington and Manchester, Vermont.

Project funding would come from a federal grant from the Federal Railroad Administration (FRA) and state funding from Vermont and New York. In order to use federal funding, the project requires review under the National Environmental Policy Act (NEPA). A two-phase alternatives evaluation was undertaken to identify and screen service alternatives to address mobility and transportation needs in the study area. In Phase One, six alternatives were developed. All six of the alternatives would utilize existing, active rail lines. Two route alternatives emerged from the Phase One Screening to continue into the Phase Two Screening:

- Alternative 1: New Service to Rutland
- Alternative 2: Rerouted Ethan Allen Service

These two Build Alternatives were evaluated with respect to a set of performance criteria. Alternative 1, New Service to Rutland, VT, was determined to best meet the evaluation criteria and was advanced for an assessment of impacts in comparison to the No-Build Alternative. The analysis was completed as a Service Level review, based on anticipated infrastructure improvement requirements along the existing rail lines within the current railroad right-of-way. Three new stations (in Manchester and

North Bennington, VT, and Mechanicville, NY) would likely require property acquisition outside of the existing right-of-way. Environmental assessment of these station sites may be completed in future Project Level NEPA documents.

The Service Level review of the Proposed Action Alternative provided in this Environmental Assessment documents that the project would not have a significant direct, indirect, or cumulative adverse impact to any natural or human resource. The project is likely to result in a modest benefit to air quality and socioeconomic conditions. Automobile traffic would be reduced as riders chose transit for commuting or recreational purposes, with a concomitant reduction in exhaust emissions from cars. Businesses proximate to the stations are expected to benefit as new customers are delivered to business locations and property values may rise if commuters that use the transit service move to newly served communities.

Agency and railroad coordination has occurred throughout the study. The 2009 *Vision for the New England High-Speed and Intercity Rail Network* collectively developed by the Departments of Transportation in the six New England States provides a vision for rail in the region and a commitment to work together to coordinate efforts. The planning and project development activities have been a cooperative and collaborative effort by VTrans and NYSDOT, in cooperation with the FRA. VTrans serves as the overall project lead and is responsible for managing the Project Management Team, which consists of representatives from VTrans, NYSDOT, the Rutland Regional Planning Commission, and the Bennington County Regional Commission. Stakeholder Committee meetings have been held with representatives from VTrans, NYSDOT, FRA, potentially affected rail operators, regional planning agencies within the study area and various advocacy groups.

Public informational meetings have been held at various locations within the study area to provide the public an opportunity to learn about the scope of the proposed project. Public opinion and comments were documented and considered in the development of study recommendations. A project website, www.ny-vt-passengerrail.org, has been established which provides the public project updates, notices of meetings, links to other area organizations and studies, access to minutes of meetings and technical documents, and an opportunity to comment on the proposed project. Project newsletters have been prepared and distributed to the project mailing list at key milestones over the course of the study.

1

Introduction

1.1 Introduction

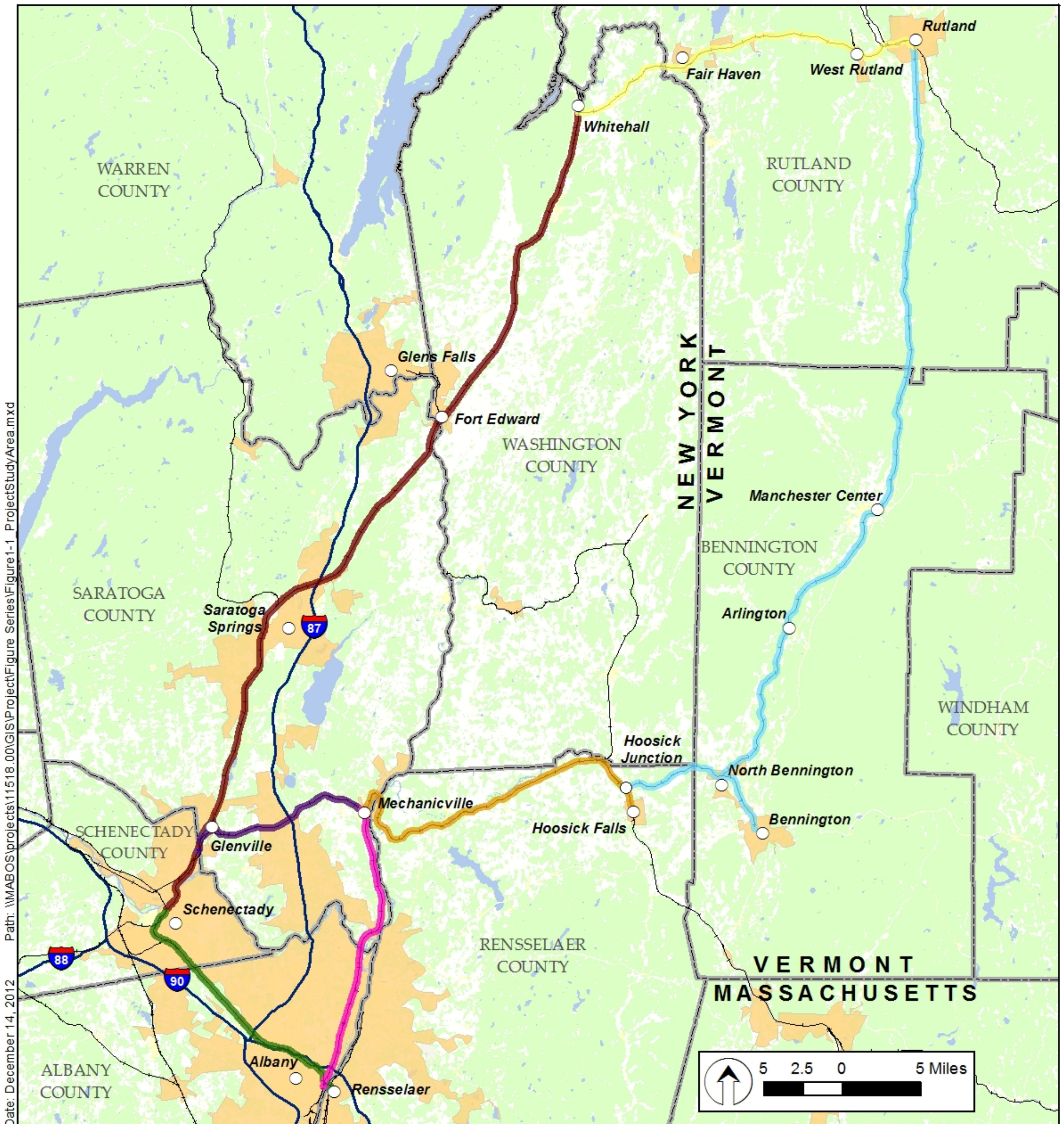
The New York-Vermont (NY-VT) Bi-State Intercity Passenger Rail Study project is an initiative of the Vermont Agency of Transportation (VTrans) and the New York State Department of Transportation (NYSDOT) to identify and establish an efficient, intercity passenger rail-based transportation link that will benefit un-served and underserved communities in southwestern Vermont (VT) and eastern central New York (NY).

Southwestern Vermont and eastern central New York (Figure 1-1) have limited transportation options. Communities have no direct access to the interstate highway system or a major airport, limited intercity passenger rail service, and limited intercity bus service. This condition has been, and continues to be, a hardship for residents and an impediment to economic development in the region.

Project funding would come from a federal grant from the Federal Railroad Administration (FRA) and state funding from Vermont and New York. In order to use federal funding, the project requires review under the National Environmental Policy Act (NEPA). This Programmatic Environmental Assessment (EA) has been prepared in compliance with:

- Council on Environmental Quality (CEQ) regulations for implementing NEPA, as amended (40 Code of Federal Regulations [CFR] Parts 1500 *et seq.*);
- US Department of Transportation (DOT) Order 5610.1C;
- FRA Procedures for Considering Environmental Impacts[1];
- 49 United States Code (USC) Section 303[2]; and
- Section 309 of the Clean Air Act, as amended.

1 Federal Railroad Administration, *Procedures For Considering Environmental Impacts*, Revised May 26, 1999.
2 Formerly known as Section 4(f) of the United States (U.S.) Department of Transportation (DOT) Act of 1966, and commonly referred to at Section 4(f).



Legend

Potential Host Railroads

- Canadian Pacific Rail Albany to Mechanicville (Colonie Subdivision)
- CSX Albany to Schenectady (Hudson Subdivision)
- Canadian Pacific Rail Mechanicville to Schenectady (Freight Subdivision)
- Canadian Pacific Rail Schenectady to Whitehall (Canadian Subdivision)
- Pan Am Southern line Hoosick Jct. to Mechanicville (Freight Main Line)
- Clarendon & Pittsford Whitehall to Rutland (CLP Main Line)
- Vermont Railway Rutland to Bennington/Hoosick Jct. (B&R Subdivision)

- Other Railroad
- County Boundary
- Urbanized Area
- City/Town
- Interstate Highway

NY - VT Bi-State Intercity Passenger Rail Study

Figure 1-1

Project Study Area

Source: New York State GIS Clearinghouse (NYGIS); Vermont Center for Geographic Information (VCGI); The United States Geological Survey National Map; and Environmental Systems Research Institute (ESRI) Data

VTrans NYSDOT VHB Vanasse Hangen Brustlin, Inc.

This EA describes the Proposed Action and its environmental impacts. Chapter 2 discusses the Purpose and Need for the project, Chapter 3 provides a summary of the alternatives evaluation, Chapter 4 describes the affected environment and environmental consequences of the Proposed Action, and Chapter 5 provides a summary of the agency and railroad coordination and public involvement to date for the project.

1.2 Project Description – Proposed Action

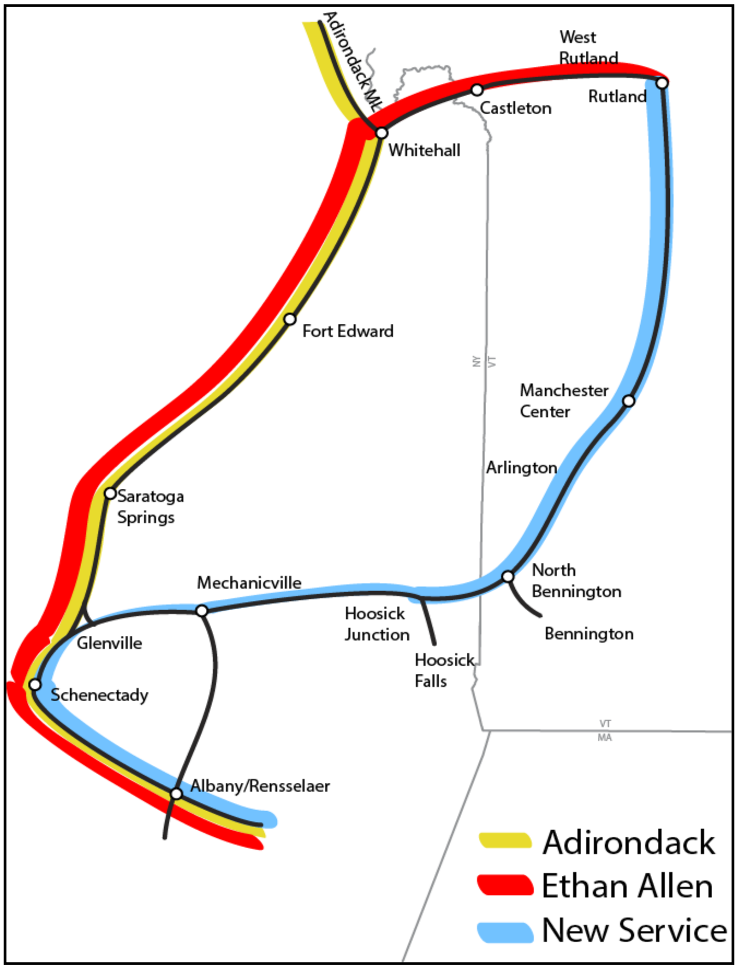


Figure 1-2: Proposed Action – New Service to Rutland, VT

The Proposed Action would retain the existing Ethan Allen service through eastern central New York and add new service through southwest Vermont. The existing Ethan Allen service operates between Rutland, Vermont and Albany/Rensselaer New York with stops in Castleton, Vermont and Whitehall, Fort Edward, Saratoga Springs, and Schenectady, New York. The new service would operate between Rutland, VT and Albany/Renselaer, NY through southwest Vermont with stops in Manchester and North Bennington, VT and Mechanicville, NY. Figure 1-2 is a schematic map of the proposed New Service to Rutland, VT.

The existing Ethan Allen and Adirondack services would continue to operate on the same route and at the same frequency (one round trip per day) as it does now. The new service would operate one round trip per day. With this alternative, service to Castleton, VT would be retained and service to Manchester and North Bennington, VT and Mechanicville, NY would be added.

1.3 Project Study Area

The project study area (Figure 1-1) includes Rutland and Bennington Counties in southwestern Vermont and adjacent areas in eastern central New York State, including Schenectady, Saratoga, Washington, Rensselaer, and Albany Counties. To minimize environmental impacts, the study focused on opportunities for providing intercity passenger rail service along existing, established rail corridors. Existing rail corridors within the project study area considered for potential intercity passenger rail service options include:

- Vermont Railway lines that extend between Rutland and Bennington, VT, and continue to Hoosick Junction, NY;
- Pan Am Railways’ southern main line between Hoosick Junction and Mechanicville, NY;
- Canadian Pacific Rail lines between Albany and Mechanicville, Mechanicville and Schenectady, and Schenectady and Whitehall, NY;
- CSX Rail lines between Albany and Schenectady, NY; and
- Clarendon and Pittsford lines between Whitehall, NY and Rutland, VT.

2

Purpose and Need

This chapter defines the Purpose and Need of the NY-VT Bi-State Intercity Passenger Rail project and identifies the project goals.

2.1 Project Purpose

The purpose of this project is to identify and establish an efficient, intercity passenger rail-based transportation link that will benefit un-served and underserved communities in southwestern Vermont and eastern central New York.

2.2 Need for Intercity Passenger Rail Improvements

Southwestern Vermont and eastern central New York have limited transportation options. Communities within the project study area have no direct access to the interstate highway system or a major airport, limited intercity passenger rail service, and limited intercity bus service. This condition has been, and continues to be, a hardship for residents and an impediment to economic development in the region.

The Capital District of New York is the gateway to the project study area from the south, both for highway as well as passenger rail access. Albany/Rensselaer Station provides connections to other services in the northeast and beyond. Schenectady is the secondary rail hub from which passenger rail service extends north with the Adirondack and Ethan Allen Express services and west via the Lake Shore Limited. Schenectady is also the highway hub with Interstate 88 (I-88) and I-90 providing access westward and I-890 linking Schenectady and Albany. Access from these regional centers to the eastern portion of the project study area (the Western Corridor of Vermont) is lacking.

I-87 provides north-south access to the communities in the New York State portion of the corridor, connecting Glen Falls, Fort Edward, and Saratoga Springs with Albany and Schenectady. The Western Corridor of Vermont – comprising the eastern half of the project study area – has no equivalent highway access to these regional centers. US Route 7 – a roadway that has limited 4-lane segments but is mostly a 2-lane unlimited access roadway – is the only major north-south connection for those living in the Western Corridor.

Passenger rail access to the project study area is provided by the Ethan Allen and Adirondack Amtrak services. The Ethan Allen service terminates in Rutland, VT, but the balance of the Western Corridor of Vermont has no passenger rail service, nor does Mechanicville, NY.

The lack of adequate access to the eastern half of the project study area not only hinders its residents from being able to travel within the Vermont portion of the project study area easily, it is also an impediment to attracting travelers. This is a significant need because tourism plays a major role in the regional economy.

Approximately four million residents in the New York City metropolitan area do not own a personal automobile and rely heavily on intercity passenger rail to travel the region. A rail connection to the Vermont portion of the project study area could provide an extremely attractive option, based on both cost and travel time, for these potential travelers. Connecting the entire study area to this type of buying power could stimulate significant economic development.

Intercity passenger rail improvements are needed within the project study area for the following reasons:

- Improved access to the eastern portion of the project study area from the south beyond the project study area is essential to support the tourism industry, a key economic engine for the project study area;
- Access from the eastern portion of the project study area to/from commercial centers, educational, medical and cultural facilities in the project study area is not an option by rail; and
- Highway access within the eastern portion of study area is limited to a single roadway that operates as a local road for substantial portions of its length.

2.3 Goals and Objectives

The states of Vermont and New York have identified a series of broad transportation goals to improve the quality and equity of transportation services within the region. The 2006 *Vermont State Rail and Policy Plan*[3] identified two priorities for intercity passenger rail: 1) continued service along routes currently served by Amtrak; and 2) new intercity passenger rail service along the Vermont Railway between Hoosick, NY and Burlington, VT. The 2009 *New York State Rail Plan*[4] identified numerous projects along the Empire Corridor, which runs between New York City and Niagara Falls, NY and is one of ten federally designated high speed rail corridors in the United States, including three priority projects within the Albany area, which would facilitate increased rail service to Saratoga Springs, NY and from southwestern Vermont through Mechanicville, NY.

The mapped system in the 2009 *Vision for the New England High Speed and Intercity Rail Network*[5] identifies existing service and potential services within the project study area, including the Western Corridor in Vermont and nearby New York communities. This region is considered an important geographical area and link to the overall rail system because it will provide direct intercity passenger rail connections to communities in southwestern Vermont, which will advance the goal of a continuous, integrated rail system in New England.

This project would aid both New York and Vermont in meeting their strategic rail transportation goals, and would improve intercity passenger rail access to those communities which are currently underserved or not served at all. Additionally, improved service, routing, infrastructure improvements, and travel times could result in significant increases in ridership between southwestern Vermont and Albany, NY. The goals, associated objectives, and potential evaluation measures for the project are described below.

2.3.1 Extend Intercity Passenger Rail Access and Improve Mobility

The lack of existing intercity passenger rail services within the eastern portion of the project study area results in insufficient links between centers of activity including residential and commercial areas, and educational, medical and cultural facilities. This lack of access adversely affects employment opportunities for residents within the project study area.

3 *State of Vermont, State Rail & Policy Plan*, December 2006. Available at http://railroads.vermont.gov/railpolicyplan.htm.
4 *New York State Rail Plan 2009 – Strategies for a New Age*, February 2009. Available at https://www.nysdot.gov/divisions/policy-and-strategy/planning-bureau/state-rail-plan.
5 *Vision for the New England High Speed and Intercity Rail Network,* July 2009. Available at http://www.mass.gov/Agov3/docs/PR071309.pdf.

As cited in the *NY-VT Bi-State Intercity Passenger Rail Grant Application*[6], existing bus service is currently offered by 17 local routes with direct connections to Rutland, VT. Additional bus routes in Manchester and Bennington, VT could 'feed' into intercity passenger rail service. The network of these bus 'feeder' routes could allow for seamless connections between the rail and bus modes; however, intercity passenger rail is necessary to provide the regional connections that are currently lacking.

Improvements in connectivity would make public transportation a more compelling travel choice. The provision of intercity passenger rail services would increase the transportation options for residents trying to access economic, educational, medical, and recreational opportunities within the project study area and the region. It would also improve mobility within the greater northeast region via connections to existing intercity passenger rail operations.

Mobility improvements in the project study area could result in regional improvements by increasing accessibility for all users, including residents, employees, students, and tourists. Residents of the project study area would benefit from improved employment access, as well as reduced travel times.

Increasing mode choice options would improve efficiency and effectiveness of the region's transportation system. Multimodal connections in the project study area between intercity passenger rail and bus services would also benefit commuters by improving mobility and flexibility in route choice.

Factors used in evaluating how effective each alternative is to achieve these goals include:

- Directness/travel time to key regional destinations;
- Availability of intermodal connections; and
- Frequency/ridership/population.

2.3.2 Support Economic Development and Sustainable Development

The project study area presents opportunities for economic development around transportation centers and throughout the region. Improved access to existing and/or new intercity passenger rail services would enhance connectivity to activity centers and commercial hubs for both residents and tourists. This proposed service, in coordination with local land use planning, would assist Vermont and New York in meeting their goals for economic growth and promoting sustainable, livable communities.

6 *NY-VT Bi-State Intercity Passenger Rail Grant Application*, August 2009. Available at http://railroads.vermont.gov/ARRA.htm.

Improved infrastructure for rail passenger service would also indirectly benefit rail freight service by allowing increased operating speeds and reducing in-transit time, making it more efficient and thus more competitive. Economic benefits would accrue to rail operators, industry, and business sectors in the region through investment in intercity passenger rail service.

Factors considered in evaluating how well proposed service options support this goal include:

- Accessibility and connections; and
- Opportunities for Smart Growth/economic development and support of Transit-Oriented Development (TOD).

2.3.3 Maximize Transportation Efficiencies

Given the need for increased passenger rail capacity in the project study area and limited funding resources, intercity passenger rail improvements should be cost effective and provide service that is reliable, safe, comfortable, and appealing. Financial resources are limited, and any investment in rail facilities and services must occur at the expense of other public and private investment. Therefore, total project costs should be minimized while meeting all project goals. The project would promote increased operating speeds for passenger and freight service, increased load capacity, and improved reliability of the rail network.

Factors used to evaluate how well proposed alternatives meet this goal include:

- Costs (capital, and operations and maintenance costs);
- Constructability;
- Sustainability/funding opportunities;
- Additional capacity;
- Reliability/flexibility; and
- Impact on multi-modal operations.

2.3.4 Protect Environmental Quality

In accordance with the *Vision for the New England High-Speed and Intercity Rail Network*[7], an integrated rail and transportation network would promote energy efficiency and improved environmental quality by diverting travelers from cars using highways while further enhancing movement of passengers and freight throughout the region. Proposed intercity passenger rail improvements must also support Vermont's and New York's goals for protecting environmental quality, as cited in their respective rail plans. Both the Vermont and New York State Rail Plans

▼

7 Ibid.

identify one of their missions as promoting environmental responsibility in the overall transportation system, thereby contributing to environmental sustainability and quality of life. Factors considered in comparing how well proposed service options meet environmental quality goals include anticipated impacts and benefits to natural, social and cultural resources.

2.4 Coordination with Other Initiatives

Transportation systems and economic development are closely tied together. There are a number of past and on-going initiatives and past planning studies whose findings are relevant to this study. A summary of the past planning studies is included below.

2.4.1 Albany-Bennington-Rutland-Burlington Project (2004)

The purpose of this study was to identify, evaluate and prioritize the various railroad infrastructure improvements necessary to upgrade the Albany-Bennington-Rutland-Burlington (ABRB) corridor to meet the present and future freight and passenger rail transportation needs for the State of Vermont. Findings and recommendations made from this study were:

- **ABRB 1 and 2 Programs (between Manchester and North Bennington, VT):** The preliminary work consisted of track, bridge and grade crossing rehabilitation and has been mostly completed.
- **ABRB S Program (between Hoosick Junction, NY and North Bennington, VT):** The work primarily consisted of track, bridge and grade crossing rehabilitation and was partially completed.
- **ABRB SC Program (between Hoosick Junction, NY and North Bennington, VT):** This program involved upgrading the ABRB corridor to FRA Class III operations from Hoosick Junction, NY to Burlington, VT in order to accommodate future freight and passenger rail service.

2.4.2 Albany-Bennington-Rutland-Burlington Rail Passenger Service Study (1998)

The purpose of this study was to consider the feasibility of establishing passenger rail service along a route between Albany, NY and Burlington, VT with intermediate stations in North Bennington, Manchester, Rutland, and Middlebury, VT. The overall goal was to provide a capital improvement plan outlining costs, tasks, and timetables for achieving passenger rail service. Recommendations made from this study were:

- Conduct a track inspection of the entire alignment in both Vermont and New York;

- Conduct strategy sessions with key stakeholders to clarify and agree upon next steps to advance ABRB;
- Initiate the environmental investigation process;
- Continue to engage the Rail Council and Agency of Transportation into working with the freight and passenger railroads on matters such as access agreements, infrastructure planning, operations planning and capital improvement programming; and
- Develop a business plan, following further advancement of the ABRB concept.

2.4.3 Western Corridor Transportation Management Plan (2000)

The purpose of this study was to examine transportation and area development conditions and proposed investment strategies for improving the transportation investments and efficiency of the Western Corridor of Vermont including Bennington, Rutland, Addison, Chittenden, and Franklin, VT. Recommendations made pertaining to the public transportation component of this EA were:

- Increase railroad ratings;
- Improve local circulation;
- Expand and improve public transportation service;
- Develop additional intermodal centers;
- Establish additional park-and-ride facilities;
- Expand travel demand management programs;
- Improve traveler information;
- Improve bicycle and pedestrian accommodations;
- Reduce border crossing delays for future passenger rail services; and
- Encourage compact, mixed-use development within towns.

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3

Alternatives Evaluation

This chapter describes the two-phase alternatives evaluation process and the selection of the Proposed Action Alternative.

3.1 Two-Phase Alternatives Evaluation

A two-phase alternatives evaluation was undertaken to identify and screen service alternatives to address the purpose of and need for the NY-VT Bi-State Intercity Passenger Rail.

3.1.1 Phase One Evaluation of Alternatives

Six alternatives were developed to address mobility and transportation needs in the project study area. These alternatives were established through a review of previous studies[8] and planning as well as a collaborative workshop. The initial alternatives were broadly defined to ensure that as many potentially feasible alternatives as possible were considered and evaluated. All six of the alternatives utilize existing, active rail lines within the project study area. These rail lines are primarily used for the movement of freight. Two route alternatives emerged from the Phase One Screening to continue into the Phase Two Screening and the next steps of project development.

8 Albany/Bennington/Rutland/Burlington Rail Passenger Service Study, VAT, 1998; Vermont Western Corridor Study – Report to Congress, 2000; Comparative Analysis of Transp. Needs in 4 Areas of VT (VT Transp. Board), 2004;Albany/Bennington/Rutland/Burlington Project, VTrans, 2004; VT State Rail & Policy Plan, 2006; NY State Rail Plan, 2009; Vision for the New England HSR and Intercity Rail Network, 2009; NY-VT HISPR Track 3 Application , 2009; Ethan Allen HSIPR Track 2 Application, 2009; Vermont Western Corridor Management Plan – Report to Congress, 2010; Projected Improvements to the Vermont Railway Western Corridor, 2010

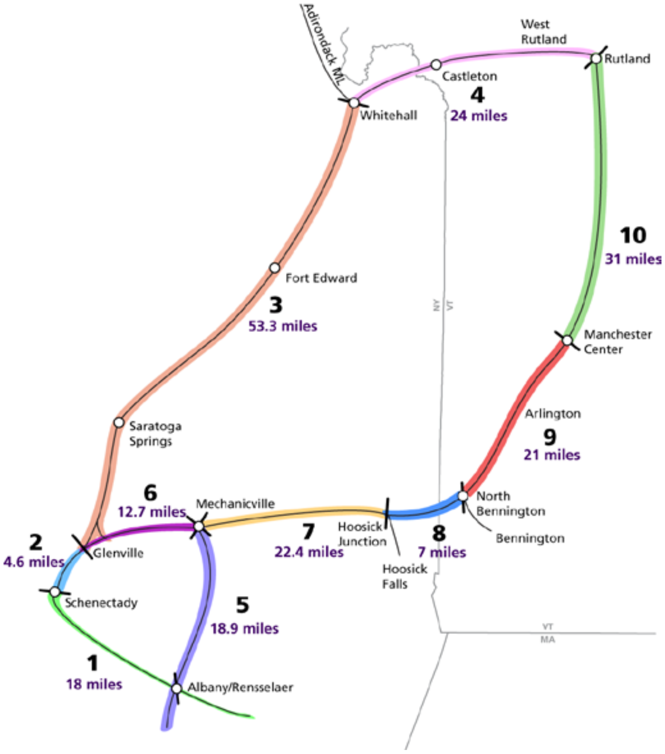


Figure 3-1: Study Segments

For the purposes of the Phase One Screening, the existing rail corridors in the project study area were divided into ten segments (Figure 3-1). Each segment was reviewed to determine the capital improvements necessary to accommodate one additional train per day to correspond with the assumptions of the alternatives. The proposed capital improvements are intended to bring all tracks in the project study area up to FRA Class 3 standards at a minimum – such that an operating speed of up to 59 mph is feasible, where geometry and operating rules allow.

In considering the routing of a new passenger rail service from southwestern Vermont to Albany/ Rensselaer, NY, two options are apparent to make the connection between Mechanicville and Albany/ Rensselaer, NY. The first option, Segment 5 in Figure 3-1, is via the Canadian Pacific Railway (CP) Colonie Line, which runs in a north-south orientation west of the Hudson River from Mechanicville to Albany/ Rensselaer, NY (CP Colonie Routing). The second option, Segments 6, 2, and 1 in Figure 3-1, is via the CP Freight Subdivision between Mechanicville and Schenectady, NY and the CSX Hudson Subdivision from Schenectady to Albany/Rensselaer, NY (Schenectady Routing). Both of these routing options have been evaluated at a conceptual level of definition.

3.1.1.1 Description of Phase One Alternatives

The six alternatives evaluated in Phase One included:

1. The No-Build Alternative;
2. Alternative 2, Loop Service;
3. Alternative 3, New Service to Manchester, VT;
4. Alternative 4, New Service to Rutland, VT;
5. Alternative 5, Re-routed Ethan Allen Service; and
6. Alternative 6, Split Shuttle Service.

Each of these alternatives is described below.

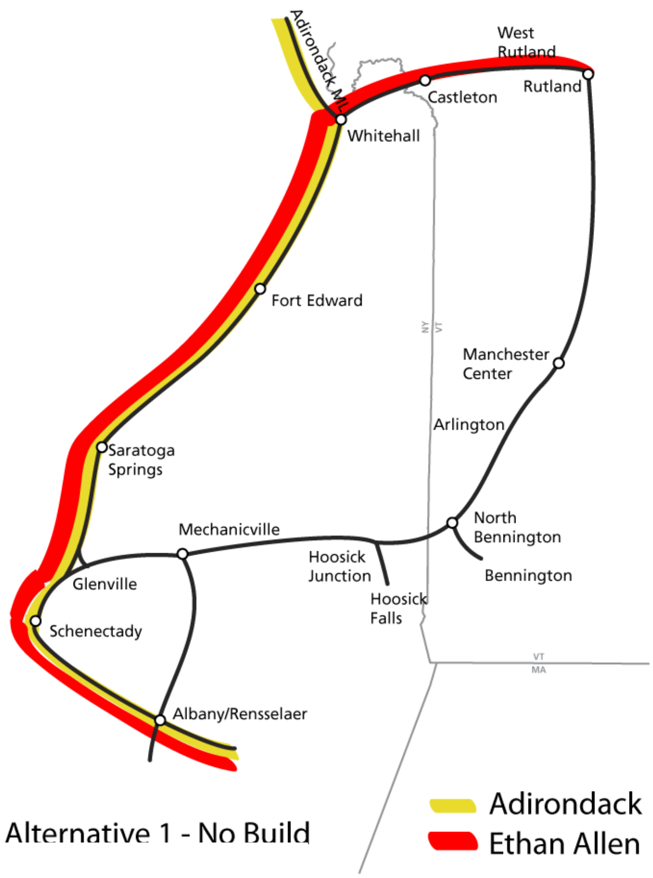


Figure 3-2: Alternative 1 – No-Build

Alternative 1: No-Build

The No-Build Alternative consists of the existing transportation systems plus the currently planned and programmed track and service improvements in the project study area through the long-range planning horizon (year 2030). NEPA requires that the No-Build Alternative is included in the evaluation of alternatives. It is evaluated to identify the operational and environmental effects on the project study area if no action is taken. Figure 3-2 provides a schematic drawing of the No-Build Alternative.

Existing passenger rail services in the project study area included in the No-Build Alternative include:

- The **Ethan Allen** service provides connections between Rutland, VT and New York City, NY. It makes one round trip daily. Station stops within the project study area include Rutland and Castleton, VT, and Fort Edward/ Glens Falls, Saratoga Springs, Schenectady, and Albany/Rensselaer, NY.
- The **Adirondack** service provides connections between Montreal, Canada and New York City, NY. It makes one round trip daily. Station stops within the project study area include Whitehall, Fort Edward/Glens Falls, Saratoga Springs, Schenectady, and Albany/Rensselaer, NY.

The No-Build Alternative includes programmed and funded improvements to the existing rail infrastructure in the project study area. These improvements are:

- Addition of a fourth track at the Albany/Rensselaer, NY station ($58.1M);
- Addition of a second main line track between Albany/Rensselaer and Schenectady, NY ($91.2M); and
- Two miles of new track at Ballston Spa, NY to provide a 5-mile segment of double track extending from Saratoga Springs to Ballston Spa, NY ($6.6M).

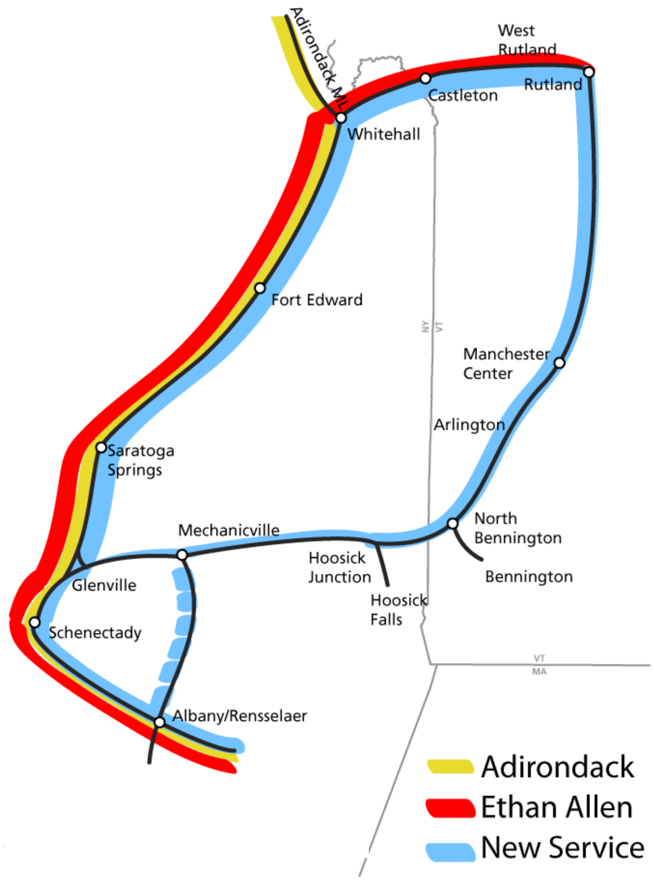


Figure 3-3: Alternative 2 – Loop Service

Alternative 2: Loop Service

Alternative 2 would provide "loop" service connecting stations in Albany/Rensselaer, Mechanicville, Schenectady, Saratoga Springs, and Fort Edward/Glens Falls, NY; and Castleton, Rutland, Manchester, and North Bennington, VT. Figure 3-3 is a schematic map of the Loop Service Alternative.

Alternative 2 would require one additional trainset to provide connecting service out of the Albany/ Rensselaer, NY station. The additional trainset would operate in one direction (clockwise or counterclockwise) providing one new round trip per day.

In Alternative 2 the existing Ethan Allen and Adirondack services would continue to operate on the same routes and frequencies (one round trip per day for both) as they do now.

This alternative would introduce service to Manchester and North Bennington, VT and to Mechanicville, NY.

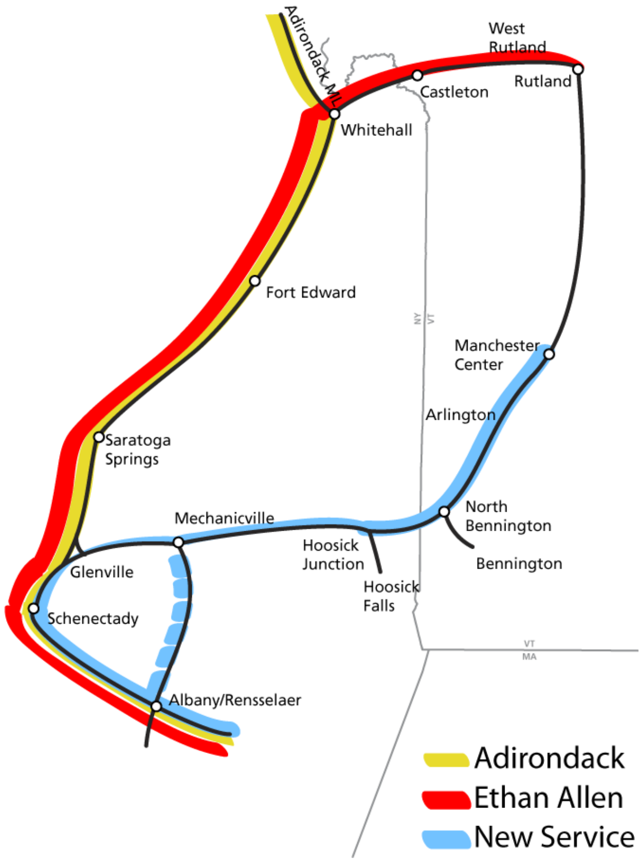


Figure 3-4: Alternative 3 – New Service to Manchester, VT

Alternative 3: New Service to Manchester, VT

Alternative 3 would provide new service to southwest Vermont with a terminus in Manchester. Figure 3-4 is a schematic map of the New Service to Manchester, VT Alternative.

This alternative would extend service from the Albany/Rensselaer, NY station to new stations in Mechanicville, NY and Manchester and North Bennington, VT. Alternative 3 would provide one round trip per day.

During the public review of the proposed service alternatives, it was suggested that a through service (no transfer at Albany/Rensselaer, NY, for continued service southbound along the Empire Corridor) would be preferred over a connecting service at Albany/ Rensselaer, NY (if trains terminate at this station, a transfer is required). For Alternative 3 to operate as a through service, an existing Empire Corridor train that currently terminates in Albany/Rensselaer, NY would be extended to Manchester, VT.

In Alternative 3 the existing Ethan Allen and Adirondack services would continue to operate on the same routes and frequencies (one round trip per day for both) as they do now. It would provide new service to Manchester and North Bennington Center, VT and Mechanicville, NY but would not connect between Manchester Center and Rutland, VT.

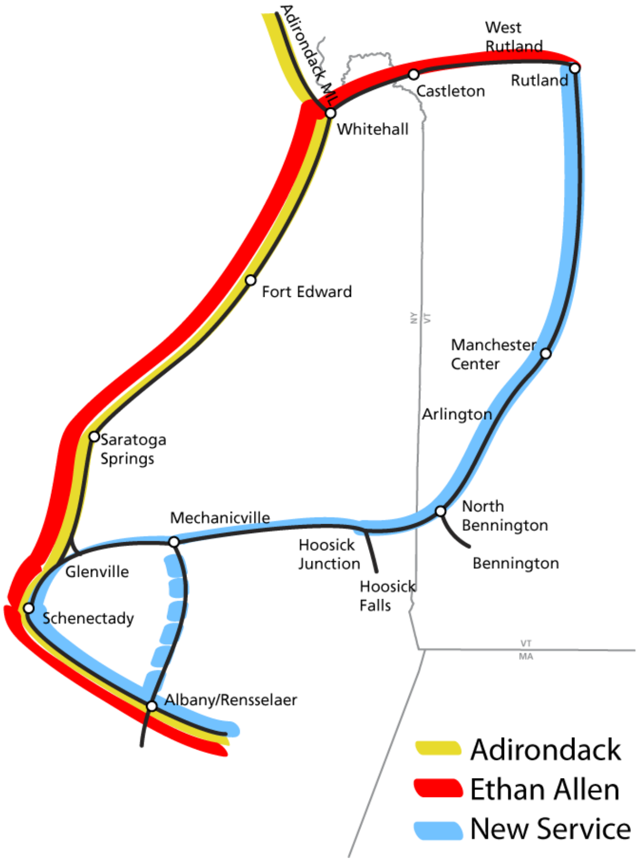


Figure 3-5: Alternative 4 – New Service to Rutland, VT

Alternative 4: New Service to Rutland, VT

Alternative 4 would extend service to southwest Vermont with a terminus in Rutland, VT. Figure 3-5 is a schematic map of the New Service to Rutland, VT Alternative.

This alternative would operate out of Albany/ Rensselaer, NY station connecting to new stations in Mechanicville, NY and North Bennington and Manchester, VT, en route to a terminus in Rutland, VT. Alternative 4 would operate one round trip per day.

Similar to Alternative 3, a preference for through service (no transfer needed for service beyond Albany/Rensselaer, NY, along the Empire Corridor) over a connecting service at Albany/Rensselaer, NY (trains terminate at this station, transfer required) was expressed by the public. To operate Alternative 4 as a through service, an existing Empire Corridor train that currently terminates at Albany/Rensselaer, NY would be extended to Rutland, VT.

In Alternative 4 the Ethan Allen and Adirondack services would continue to operate on the same routes and frequencies (one round trip per day for both) as they do now. Alternative 4 would provide new service to Manchester and North Bennington, VT and Mechanicville, NY.

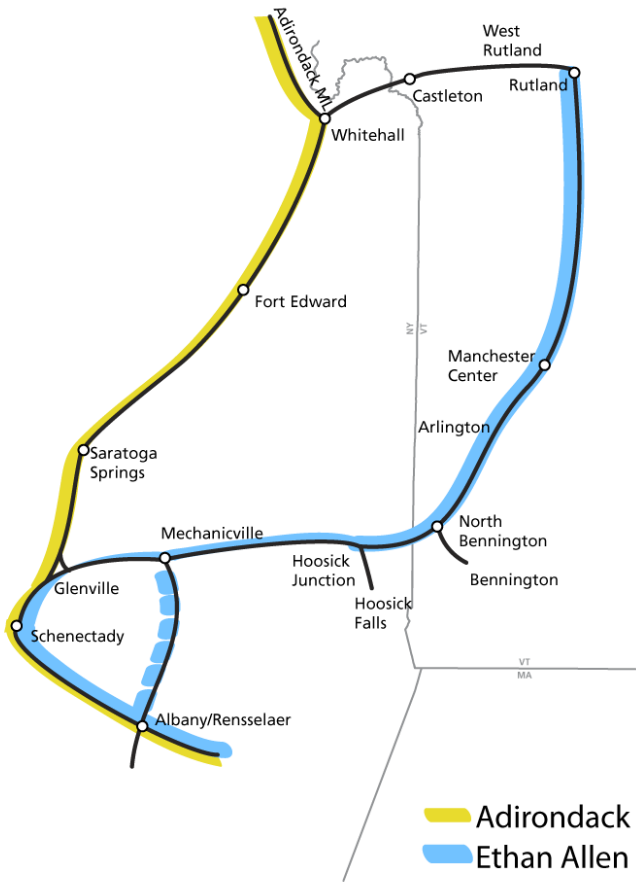


Figure 3-6: Alternative 5 – Reroute Ethan Allen

Alternative 5: Rerouted Ethan Allen Service

Alternative 5 would re-route the existing Ethan Allen service through southwest Vermont. The alternative would operate between Rutland, VT and Albany/Rensselaer, NY through southwest Vermont with stops in Mechanicville, NY and North Bennington and Manchester, VT. Figure 3-6 is a schematic map of the Rerouted Ethan Allen Service Alternative.

In Alternative 5 the existing Adirondack service would continue to operate on the same route and at the same frequency (one round trip per day) as it does now. The Ethan Allen service would operate one round trip per day.

With this alternative, service to Castleton would be eliminated while service to Manchester and North Bennington, VT and Mechanicville, NY would be added.

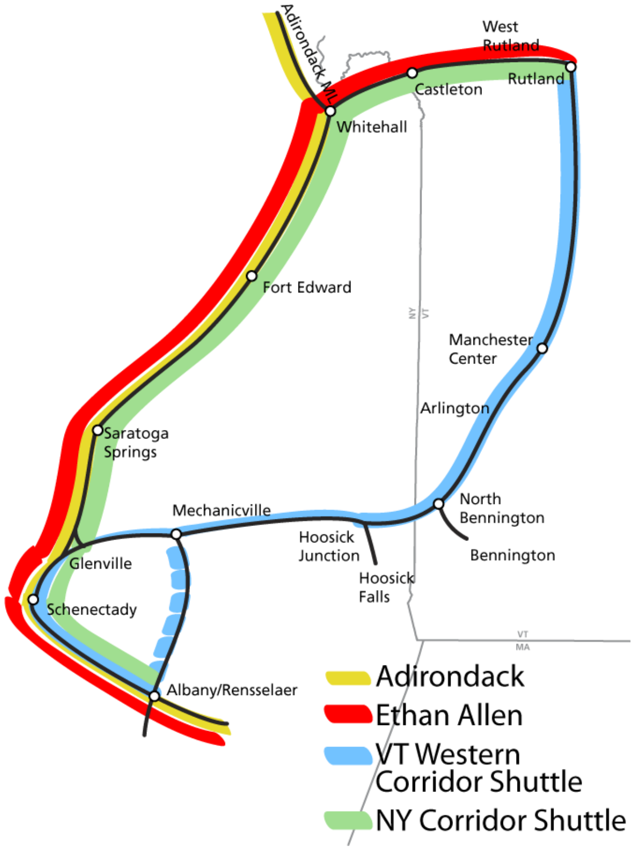


Figure 3-7: Alternative 6 – Split Shuttle Service

Alternative 6: Split Shuttle Service

Alternative 6 would be a "shuttle" service connecting Albany/Rensselaer, NY and Rutland, VT via two routes. The termini for both services would be Albany/ Rensselaer, NY on the south end and Rutland, VT on the north end. One service would stop in Mechanicville, NY and North Bennington and Manchester, VT. The other service would follow the same route as the existing Ethan Allen service, stopping at Castleton, VT and Fort Edward/Glens Falls, Saratoga Springs, and Schenectady, NY. Each service would operate on one side of the loop and provide round-trip service ("out and back") – for a total of two trains per day on each side of the loop. Figure 3-7 is a schematic map of the Split Service Shuttle Alternative.

In Alternative 6 the existing Ethan Allen and Adirondack services would continue to operate on the same frequencies (one round trip per day for each) as they do now. This alternative would provide new service to Manchester and North Bennington, VT and Mechanicville, NY.

3.1.1.2 Phase One Screening

The goal of the Phase One Screening is to objectively identify and evaluate the universe of alternatives and identify those that best satisfy the project Purpose and Need. During the Phase One Screening, the alternatives were evaluated in a conceptual manner. The Phase One Screening process included a determination of the basic realistic feasibility of each alternative, and considered the four categories of project goals:

- Rail access and mobility;
- Transportation efficiencies;
- Economic/sustainable development; and
- Environmental quality.

This section provides a brief summary of the major advantages and disadvantages for each of the Phase One alternatives, as well as recommendations regarding which alternatives should advance into the Phase Two Screening. Table 3-1 summarizes the construction cost and ridership for the six Phase One alternatives. Table 3-2 summarizes the rankings with respect to each category of project goals.

Table 3-1 Phase One Construction Cost and Ridership

	Cost ($2011)		Total Ridership (2030)[1]	
Alternative	Via CP Colonie	Via Schenectady	Via CP Colonie	Via Schenectady
Alternative 1 – No-Build	–	–	5,700	5,700
Alternative 2 – Loop Service	$210.4M	$154.7M	–	–
Alternative 3 – New Service to Manchester	$135.0M	$89.7M	108,900	114,200
Alternative 4 – New Service to Rutland	$160.1M	$114.8M	116,200	123,300
Alternative 4 – Rerouted Ethan Allen	$160.1M	$114.8M	107,000	112,700
Alternative 6 – Split Shuttle	$210.4M	$154.7M	109,000	114,100

1 One-way boardings

Table 3-2 Phase One Evaluation Rankings Summary

Criterion	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Rail Access and Mobility						
Improve regional mobility	❍	■	■	●	■	●
Travel time savings	❍	❍	■	●	■	●
Attractive frequency of service	❍	❍	■	●	■	●
Transportation Efficiency						
Viable intermodal connections	❍	■	■	●	●	●
Cost efficient?	●	❍	●	■	●	❍
Maximize use of existing infrastructure?	■	●	●	●	●	●
Minimize impacts on existing operations post-construction?	■	❍	●	●	●	❍
Minimize impacts on existing operations during construction?	■	■	■	■	■	■
Economic/Sustainable Development						
Support Smart Growth and Economic Development?	❍	❍	■	●	■	●
Environmental Quality						
Minimize potential impacts?	■	■	■	■	■	■
Result in positive impacts?	■	■	■	■	■	■

● = positive; ❍ = potential negative impact; ■ = no/neutral impact

Alternative 1: No-Build

The main advantage of the No-Build Alternative is that it has no implementation costs (capital or operating) associated with it. The major disadvantage of the No-Build Alternative is that those areas currently lacking intercity passenger rail service will continue to be un-served.

The No-Build Alternative was carried through the two-phase screening process to meet NEPA requirements.

Alternative 2: Loop Service

Although Alternative 2 would provide new service to currently un-served areas in southwest Vermont, it was determined early in the process that the loop routing would prove to be inefficient and, therefore, unattractive to potential choice riders. Alternative 2 would also be one of the most expensive alternatives to implement, since capital improvements would be required on most of the analysis segments throughout the project study area by this alternative.

Alternative 2 was eliminated from further consideration prior to developing ridership projections. The alternative was eliminated because potential negative impacts are expected for five of the 11 Phase One criteria, while a positive impact is expected for only one criterion.

Alternative 3: New Service to Manchester, VT

Alternative 3 would provide new service to Bennington County (with stations in Manchester and North Bennington, VT); however the lack of connectivity between Manchester and Rutland, VT has been criticized by project stakeholders who note the substantial demand for travel between these two areas.

This alternative is anticipated to require the lowest capital cost expenditure (since the service area, and therefore amount of track that needs to be improved, is smaller than the other build alternatives); however, a maintenance facility would be required if Manchester, VT is used as a terminal stop. This maintenance facility would be abandoned if the service were eventually extended to Rutland, VT. The anticipated operating costs for Alternative 3 are moderate compared to the other build alternatives.

While no negative impacts are expected for any of the Phase One screening criteria, it was recommended that this alternative be removed from consideration and not move on to the Phase Two Screening. The lack of the rail connection between Manchester and Rutland, VT is a key stakeholder concern, and that connection is addressed by other alternatives without the need to construct a new maintenance facility that could ultimately be abandoned.

Alternative 4: New Service to Rutland, VT

Alternative 4 would provide new service to Rutland and Bennington Counties, VT and provide a key link along the Western Corridor which has been identified as a key rail corridor for the state. Alternative 4 supports the goals and objectives stated in the project Purpose and Need and the anticipated capital and operating costs are moderate compared to the other alternatives. This alternative is also forecast to produce the greatest increase in annual ridership.

Alternative 4 is expected to have no negative impacts on any of the Phase One screening criteria; positive impacts are expected for six criteria. It was recommended that Alternative 4 move forward into the Phase Two Screening for further evaluation.

Alternative 5: Rerouted Ethan Allen Service

Alternative 5 would provide new service to Rutland and Bennington Counties, VT and provide a key link along the Western Corridor which has been identified as a key rail corridor for the state. This alternative is estimated to have the lowest operating cost of all of the build alternatives. The operating cost is a key consideration for the State of Vermont, which already sponsors the Ethan Allen and the Vermonter services.

The major disadvantage of Alternative 5 is that it would reduce service from portions of the New York side of the project study area. This alternative is projected to produce the smallest increase in annual ridership – likely due to the reduction of service in a portion of the project study area.

Alternative 5 is not expected to have negative impacts for any of the Phase One screening criteria, and positive impacts are expected for four criteria. Given the importance of operating costs for the longevity of any service that is implemented, Alternative 5 was recommended to be carried forward to the Phase Two Screening for further evaluation.

Alternative 6: Split Shuttle Service

Alternative 6 would provide new service to Rutland and Bennington Counties, VT and increased service to the New York portion of the project study area. This alternative is projected to produce the second highest increase in annual ridership. Despite the additional service in New York for Alternative 6, which proposes connecting service in Albany/Rensselaer, NY, Alternative 4 has higher ridership projections because it proposes through service at Albany/Rensselaer, NY.

Due to the wide coverage Alternative 6 proposes, capital improvements would be required on most of the analysis segments by this alternative, making it one of the most expensive from a capital cost perspective. Alternative 6 would also have the highest operating cost of all the build alternatives.

Alternative 6 would have negative impacts for two of the Phase One screening criteria; positive impacts are expected for six criteria. It was recommended that Alternative 6 be removed from consideration and not move on to the Phase Two Screening.

3.1.1.3 Summary of Recommendations

From the initial set of alternatives, two Build Alternatives were recommended to advance to the Phase Two Screening process:

- Alternative 4: New Service to Rutland, VT; and
- Alternative 5: Rerouted Ethan Allen Service.

These two alternatives were recommended to move forward to the Phase Two analyses because, based on their performance in the Phase One Screening, they exhibit the greatest potential to satisfy the project Purpose and Need. For the connection from Rensselaer/Albany Station to Mechanicville, NY, the "Schenectady Routing" was selected.

3.1.2 Phase Two Evaluation of Alternatives

The purpose of the Phase Two screening process was to identify the Preferred Alternative for the project. During the Phase One screening the initial set of proposed alternatives was narrowed down to two Build Alternatives plus the No-Build Alternative based on criteria developed in accordance with the goals from the project Purpose and Need.

For the Phase Two evaluation, the Build Alternatives that were advanced from the Phase One screening were defined to a greater level of detail. The following analyses were developed for the No-Build Alternative and the two Build Alternatives that advanced past the Phase One screen:

- Capital costs;
- Operations and maintenance costs;
- Ridership estimates;
- Operational analysis/operating plans; and
- Review of environmental impacts.

Based on the compiled data and analyses, a detailed assessment of each alternative was performed as part of the Phase Two screening. The alternatives were evaluated against each of the criteria described below and are scored on a scale of +2 (alternative is expected to have a highly favorable impact), to -2 (alternative is expected to have a highly unfavorable impact) in each category. A brief description of why the alternatives scored as they did is included. The scores for each of the 25 criteria are then summarized to produce a composite score for each goal and a best fit alternative is identified for each goal. The alternatives advanced into Phase 2 were:

- The No-Build Alternative;
- Alternative 1: New Service to Rutland, VT (Alternative 4 in Phase One); and
- Alternative 2: Rerouted Ethan Allen Service (Alternative 5 in Phase One).

3.1.2.1 Phase Two Screening

This section includes a discussion of how the No-Build and two Build Alternatives perform with respect to each of the criteria identified in the evaluation methodology. The alternatives are compared with respect to each criterion, and a summary evaluation table is provided at the end of the section.

Goal 1: Extend Intercity Passenger Rail Access and Improve Mobility

Directness/Travel Time to Key Regional Destinations

This criterion focuses on the directness of the trip to key regional destinations within the project study area. The measures of effectiveness (MOE) used to evaluate this criterion are:

- The number of stations that would have train service;
- Transfers required; and
- Cumulative travel time.

Directness to Key Regional Destinations

A need identified in the project Purpose and Need is to provide better access to train service in the project study area – particularly in southwestern Vermont. Providing rail access to more towns within the project study area will open up better access to regional attractors near the stations. For existing stations within the project study area, regional destinations have, in many cases, developed around the stations. The proposed new stations would be placed in locations that are proximate to the highest numbers of regional attractions – in the respective town centers – are along viable (existing) track, and are currently un-served. Table 3-3 indicates the stations (both existing and proposed) that will be served under each alternative.

Table 3-3 Stations with Train Service

Station	No-Build	Alternative 1	Alternative 2
Rutland, VT	☐	☐	☐
Manchester, VT		☐	☐
North Bennington, VT		☐	☐
Mechanicville, NY		☐	☐
Albany/Rensselaer, NY	☐	☐	☐
Schenectady, NY	☐	☐	☐
Saratoga Springs, NY	☐	☐	☐
Ft. Edward/Glens Falls, NY	☐	☐	☐
Whitehall, NY	☐	☐	☐
Castleton, VT	☐	☐	
Rutland, VT	☐	☐	☐

Note: Assumes shuttle bus service is available from the Stations to the ski resorts and other attractions.

Alternative 1 provides the best access/coverage in the project study area since it retains the Ethan Allen service and also adds service along the Western Corridor of Vermont. Alternative 2 also maintains coverage through the New York portion of the project study area (via the Adirondack service), as well as provide access along the Western Corridor; however, Castleton, VT Station would not be served under this alternative. The No-Build Alternative maintains the existing service pattern, and the Western Corridor would continue to not be served (except for the existing station at Rutland, VT).

Transfers Required

The major difference between the three alternatives is related to how many transfers are required to access each of the station areas in the project study area:

- The No-Build Alternative would require travelers to make a transfer (bus or car) to access the Western Corridor and Mechanicville, NY.
- Alternative 1 provides access to all station areas, with no transfers needed.
- Alternative 2 would provide access to the majority of the stations within the project study area; however a transfer (bus or car) would be required (likely at Rutland Station, VT) to get to Castleton, VT.

Cumulative Travel Time

The travel time from Schenectady Station, NY to the other stations north and west is provided in Table 3-4. The times are based on travel from Schenectady, NY because the run times from Albany to Schenectady, NY are equal for all three alternatives.

Table 3-4 Cumulative Travel Time

Schenectady, NY to:	No-Build	Alternative 1	Alternative 2
Rutland, VT	2:24[1]	2:21[3]	2:21[3]
Manchester, VT	N/A	1:40[3]	1:40[3]
North Bennington, VT	N/A	1:14[3]	1:14[3]
Mechanicville, NY	N/A	0:37[3]	0:37[3]
Fort Edward, NY	0:46[1]	0:46[1]	0:50[2]
Saratoga Springs, NY	0:26[1]	0:26[1]	0:28[2]
Castleton, VT	2:00[1]	2:00[1]	N/A

1 Published travel times for the Ethan Allen Express (per www.amtrak.com reservation query for 10/2/12)
2 Published travel times for the Adirondack Service (per www.amtrak.com reservation query for 10/2/12)
3 Based on the Train Performance Calculator (TPC) from the Rail Traffic Controller model created for the project.

The end-to-end (Schenectady, NY to Rutland, VT) run time is similar for each alternative of the three alternatives. The summary evaluation scores for each of the MOEs for this criterion are provided in Table 3-5.

Table 3-5 Directness/Travel Time Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Stations Served	0	+2	+1
Transfers Required	0	+2	+1
Cumulative Travel Time	0	0	0
Overall Rating	0	+4	+2

<u>Availability of Intermodal Connections</u>

This criterion is a simple measure of whether there are intermodal connections (local/regional buses, other rail options) available to travelers at each station. It is assumed that given the non-urban nature of most stations in the project study area, most passengers would use taxis or private vehicles to transfer between modes. Table 3-6 summarizes the intermodal connections of the alternatives.

Table 3-6 Intermodal Connections Summary

	No-Build	Alternative 1	Alternative 2
Train Connections	4	5	2
Local Bus Connections	6	9	8
Regional Bus Connections	3	3	3
Overall Rating	0	+2	+1

<u>Frequency/Ridership/Population</u>

This criterion addresses whether the alternative will provide a frequency of service and/or routing that would make it an attractive transportation option by assessing the level of anticipated ridership. The forecast ridership of each alternative, and the population within 10 miles of each station – which may inform the local market for potential passengers, are used as measures of evaluation. Both of the Build Alternatives propose one round trip per day for the new service.

Table 3-7 provides the forecast annual ridership for each of the alternatives. A summary of the ridership estimates is included in Appendix A.

Table 3-7 Annual Ridership Forecasts[1]

	2010	2030		
Station	Baseline	No-Build	Alternative 1	Alternative 2
Montreal - Ft. Ticonderoga, NY	5,200	5,700	5,700	5,700
Rutland, VT	8,300	10,800	14,900	12,500
Castleton, VT	1,100	1,800	1,900	0
Whitehall, NY	900	1,000	1,000	1,000
Fort Edward/Glens Falls, NY	4,300	4,600	4,500	3,100
Saratoga Springs, NY	15,100	16,600	16,500	11,300
Schenectady, NY	8,100	8,400	10,300	9,200
Manchester, VT	--	--	4,400	4,400
N. Bennington, VT	--	--	6,400	6,400
Mechanicville, NY	--	--	4,600	4,600
Albany/Rensselaer, NY	3,200	3,400	3,700	3,300
Hudson – NY Penn, NY	32,400	35,900	52,100	42,600
Total	78,600	88,200	126,000	104,100
Overall Rating		0	+2	+1

1 One-way boardings.

Goal 2: Support Economic Development and Sustainable Development

Accessibility and Connections

These sub-criteria related to accessibility and connections evaluate how each alternative impacts access to employment, institutional services, regional attractions and tourist destinations within the project study area, with a focus on whether an alternative would allow travelers access without needing a car. Table 3-8 provides a summary of how well each alternative satisfies these criteria, as well as the evaluation scoring.

Table 3-8 Accessibility and Connections Evaluation Summary

Criteria	No-Build	Alternative 1	Alternative 2
Accessibility/Connections to Employment	Provides connections between Rutland and major employers in the Albany Capitol District	Provides connections between Rutland, Manchester and Bennington and major employers in the Albany Capitol District	Provides connections between Rutland, Manchester and Bennington and major employers in the Albany Capitol District
Accessibility/Connections to Institutional Services	Provides access between Rutland and institutional services in the Albany Capitol District and New York City	Provides access between Rutland, Manchester and Bennington and institutional services in the Albany Capitol District and New York City	Provides access between Rutland, Manchester and Bennington and institutional services in the Albany Capitol District and New York City
Accessibility/Connections to Regional Attractions and Tourist Destinations	Provides access to regional attractions and destinations in the vicinity of Rutland	Provides access to regional attractions and destinations in the vicinity of Rutland, Manchester and Bennington	Provides access to regional attractions and destinations in the vicinity of Rutland, Manchester and Bennington
Phase Two Rating	0	+2	+2

<u>Opportunities for Smart Growth/Economic Development and Support of Transit Oriented Development (TOD)</u>

This criterion is a qualitative measure of how well each alternative supports the opportunities for TOD development efforts, and takes into account factors that would support this type of development, such as level of service, mode and location of new stations. Table 3-9 provides a summary of how well each alternative satisfies these criteria, as well as the evaluation scoring.

Table 3-9 Smart Growth, Economic Development and TOD Support Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Opportunities for Smart Growth/ Economic Development and Support of Transit Oriented Development (TOD)	Opportunities present in the vicinity of existing stations	Opportunities present in the vicinity of existing stations and new stations, if new stations are located in downtown areas. Improved access to regional attractions along Western Corridor will also positively impact economic development in that corridor.	Opportunities present in the vicinity of existing stations and new stations, if new stations are located in downtown areas. Improved access to regional attractions along Western Corridor will also positively impact economic development in that corridor. Reduction in service to existing stations could have minor negative effect.
Phase Two Rating	0	+2[1]	+1[1]

[1]Assumes new stations are located in downtown areas.

Goal 3: Maximize Transportation Efficiencies

Alternative Costs

These criteria provide a measure of the financial resources that will be required to make capital improvements (capital costs), to operate and maintain each alternative annually (operations and maintenance [O&M] costs). Cost per rider is also assessed. Table 3-10 provides the projected cost and revenue information for each alternative. A summary of the capital cost estimates is included in Appendix B.

Table 3-10 Cost Evaluation Summary (2012)

	No-Build	Alternative 1	Alternative 2
Capital Cost[1]	$0	$112,244,000	$112,244,000
Annual O&M Cost	$6,297,000	$11,748,000	$6,889,000
Annual Revenue	$2,950,000	$4,431,000	$3,714,000
Net Operating Cost per Rider	$33.34	$69.61	$29.52
Overall Rating	0	-2	+2

1 Assumes cost for 425-foot, high level platform at the new stations.

O&M costs for each alternative were calculated based on the operating cost for the existing Ethan Allen service. The estimated cost for operating the Ethan Allen service during Fiscal Year 2012 was used to project the cost for the build alternatives.

The cost model is made up of two major categories: third party costs and route costs. Route costs consist of activities specific to running the route such as labor or route advertising. Third party costs are those costs paid to the host railroads so that the passenger service may operate over their right-of-way. Table 3-11 shows the estimated costs for Third Party Costs and Route Costs for FY 2012.

Table 3-11 O&M Cost Components

	No-Build	Alternative 1	Alternative 2
Third Party Costs	$868,000	$1,884,000	$1,016,000
Route Costs	$5,429,000	$9,864,000	$5,873,000

Annual revenue was calculated in the ridership model for the year 2030. The forecasted revenue was prepared using current fares for existing station-to-station trips (as accessed on the Amtrak website) and developing a similar fare structure for the proposed new stations based on distance between origin and destination. The total fare revenue for each alternative was calculated by multiplying the station-to-station ridership matrix with the attendant station-to-station fare matrix. The 2012 figures were based on the actual performance of the Ethan Allen service, factoring from the projected 2030 estimate for the No-Build Alternative.

Constructability

This criterion assesses whether the required infrastructure associated with each alternative can be built with minimum impact on the operation of existing freight and passenger rail services during construction. The No-Build would have no impact on freight and passenger rail services beyond what is already planned. There impacts associated with both of the Build Alternatives are expected to be minimal since the sidings and other proposed improvements can be constructed adjacent to the travel way without impacting operation. Some coordination for cut-ins of switches would be required. Table 3-12 gives the evaluation score for each alternative.

Table 3-12 Constructability Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Phase Two Rating	0	-1	-1

Sustainability/Funding Opportunities

This criterion evaluates whether an alternative has the potential to be financially sustainable. The financial stability of each alternative is related to the annual operating subsidy (annual O&M cost less the revenue generated). Since the state(s) have limited dollars, those alternatives that require fewer subsidies are preferable.

Funding and cost-sharing opportunities were also evaluated for each alternative, as shown in Table 3-13. VTrans and NYSDOT will cost-share on the new service, based on the cost-sharing agreement developed for the Ethan Allen Express.

Table 3-13 Sustainability Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Financial Sustainability: Subsidy Required	$3,347,000	$7,318,000	$3,175,000
Funding /Cost Sharing Opportunities	Yes	Yes	Yes
Phase Two Rating	0	-1	0

Additional Capacity

The Build Alternatives were analyzed to determine how much additional capacity would be added by implementing the proposed services. Table 3-14 summarizes the additional train miles, seat miles and revenue vehicle hours for each alternative, as well as the evaluation score.

Table 3-14 Additional Capacity Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Train Miles (Annual)	73,000	158,410	85,410
Seat Miles (Annual)	16,352,000	117% increase over No-Build	17% increase over No-Build
Revenue Vehicle Hours	2,250	4,249	1,996
Overall Rating	0	+2	+1

Reliability/Flexibility

Operational flexibility is dependent on how well service can be provided to passengers when there is an obstacle or outage in some part of the system. Alternative 1 provides operational flexibility to passengers because they have the option to take either the Ethan Allen or the new service, via the Western Corridor, to travel between Rutland, VT and Albany, NY. Neither the No-Build nor Alternative 2 provide such flexibility.

Reliability is a function of how well the system infrastructure accommodates conflicts while still helping trains maintain schedules. Among the proposed improvements for the Build Alternatives are a number of passing sidings included to accommodate high traffic areas. Table 3-15 indicates the amount of funding proposed for new passing sidings in the Build Alternatives and also gives the summary evaluation score for this criterion.

Table 3-15 Reliability/Flexibility Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Operational Flexibility	No	Yes	No
Costs of improvements to ensure reliability	$0	$10,973,000	$10,973,000
Phase Two Rating	0	+2	+1

Impact on Multi-Modal Operations

This criterion measures whether current bus routes and schedules would be affected by each alternative; how each alternative would impact the viability of routes and schedule of currently available passenger rail services; and how each alternative would impact existing freight operations; including consideration of such factors as operating schedules and potential improvements in infrastructure.

The two Build Alternatives are anticipated to have similar impacts on bus operations. For passenger rail operations, Alternative 2 removes a frequency of service from several of the current Ethan Allen stations; however, all but Castleton, VT are also served by the Adirondack service. Both Build Alternatives entail infrastructure improvements that would increase the maximum allowable speed for both freight and passenger rail operations in some areas.

Table 3-16 includes a summary of these criteria, as well as the evaluation scoring.

Table 3-16 Multi-Modal Operations Evaluation Summary

	No-Build	Alternative 1	Alternative 2
Impact on Bus Operations	No Impact	Minor re-routings to access train stations.	
Impact on Passenger Rail Operations	No Impact	Extends one Empire Corridor train set.	Removes direct train service to Castleton, VT, reduces frequency of service in Ft. Edward and Saratoga Springs, NY.
Impact on Freight Operations	No Impact	Improves track and sidings.	Improves track and sidings.
Overall Rating	0	+2	+1

Goal 4: Protect Environmental Quality

The environmental criteria are intended as a preliminary comparison of the alternatives to ensure that the alternative that is chosen as the preferred alternative will not have any significant adverse impacts on the environment. Table 3-17 provides a summary of how well each alternative satisfies these criteria, as well as the evaluation scoring.

Table 3-17 Environmental Impact Evaluation Summary

Criterion	No-Build	Alternative 1	Alternative 2
Current Land Use	No effect on existing land uses	No effect on existing land uses	No effect on existing land uses
Support for Planned Land Uses	Supports current land use, but not regional plans for economic development	Consistent with Rutland and Bennington County Regional Plans for economic development	Consistent with Rutland and Bennington County Regional Plans for economic development
Displacement and Relocation Requirements	No displacements or relocations	No displacements or relocations for sidings. Land acquisition and limited displacements may be required for new stations.	No displacements or relocations for sidings. Land acquisition and limited displacements may be required for new stations.
Environmental Justice	No effects on low income or minority populations	No effects on low income or minority populations	No effects on low income or minority populations
Impacts to Historic/ Archaeological Resources	No effects on historic or architectural resources	To be determined through future section 106 review and consultation during the Tier 2 level	To be determined through future section 106 review and consultation during the Tier 2 level
Impacts to 4(f) Properties	No effects to Section 4(f) properties	No adverse effects to Section 4(f) properties	No adverse effects to Section 4(f) properties
Traffic Impacts	No significant change anticipated.	Potential decrease in traffic due to mode switch from cars to rail for trips to/from newly served stations.	Potential decrease in traffic due to mode switch from cars to rail for trips to/from newly served stations.
Air Quality	No effects on air quality	Reduction in VOC, NOX, PM, and CO emissions	Reduction in VOC, NOX, PM, and CO emissions
Water Resources	No effects on water resources	No adverse effects to water resources	No adverse effects to water resources
Wetlands	No effects on wetlands	No adverse effects on wetlands	No adverse effects on wetlands
Floodplains	No effects on floodplains	To be determined during Tier 2 analysis	To be determined during Tier 2 analysis
Ecological Systems	No effects on ecological systems	No significant impacts on ecological systems	No significant impacts on ecological systems
Threatened & Endangered Species	No effects on threatened & endangered species	No adverse effects on threatened & endangered species	No adverse effects on threatened & endangered species
Public Health & Safety	No effects on public health	Maintain or improve public health & safety	Maintain or improve public health & safety
Energy	No effects on energy	No significant impacts to energy	No significant impacts to energy
Visual & Aesthetic Resources	No effects on visual & aesthetic resources	No significant impacts to visual & aesthetic resources	No significant impacts to visual & aesthetic resources
Noise and Vibration Impacts	Existing noise and vibration impacts from passenger and freight rail traffic would continue.	Potential minor increases in noise and vibration at sensitive receptors close to the right-of-way along the Western Corridor and along existing passenger rail alignment from Albany to Schenectady due to new/increased service.	Potential minor increases in noise and vibration at sensitive receptors close to the right-of-way along the Western Corridor and along segment from Albany to Schenectady due to new/increased service. Potential decrease in noise and vibration along segment from Schenectady to Rutland due to rerouted Ethan Allen.
Phase Two Rating	0	-1	-1

Other Factors

A number of other factors could affect the implementation of any of the alternatives being analyzed, and could make one more or less viable than the others. These factors include Public Support for the alternative and Project Schedule Risk.

Public Support

This criterion considers public support for or opposition to the alternative, based on input at public meetings or comments on the project website.

Project Schedule Risk

This criterion considers factors that could delay implementation of the project, including:

- Prerequisite projects; such projects may be necessary to satisfy operational requirements or to address/adhere to federal guidelines or requirements; and
- Obtaining approvals from key stakeholders, including the potential host railroad owners and the state Departments of Transportation

Table 3-18 provides a summary of how each alternative is affected by these factors, as well as the evaluation scoring.

Table 3-18 Summary of Other Impacts

Factor	No-Build	Alternative 1	Alternative2
Public Support	Minimal	Support has been split between Alternatives 1 and 2 at public meetings and in comments on the project website. Alternative 1 is praised for providing new service to the Western Corridor, while retaining all existing service in the corridor currently served Ethan Allen; however, it is acknowledged that Alternative 2 may be the more cost-feasible means of providing access to passenger rail service in the Western Corridor.	
Prerequisite projects	None	None	None
Approvals needed	None	FRA, VTrans, NY and VT, Pan Am, CP, Amtrak	FRA, VTrans, NY and VT, Pan Am, CP, Amtrak

3.1.2.2 Summary and Conclusions

Table 3-19 includes a summary of the evaluation scores for the Phase Two screening criteria, and shows that:

- Both Build Alternatives propose adding service in the Western Corridor of Vermont, but ***Alternative 1 best satisfies Goal 1*** because it adds service to new segments of the project study area without removing service from any existing station areas. Under Alternative 2, service would still be available along much of the existing Ethan Allen alignments via the Adirondack service; however, Castleton, VT will no longer be served by passenger rail.
- Alternatives 1 and 2 are anticipated to have a similar impact in terms of supporting economic development and sustainable development. The major driver for both of these objectives will be the placement of new stations, which will be the same for both alternatives. Alternative 1 ranks better for smart growth due to the addition of service through southwestern Vermont without reduction of service in eastern central New York
- ***Alternative 2 best satisfies Goal 3***, due in major part to the cost difference associated with running two services (Alternative 1) versus one service (Alternative 2). Alternative 2 outperforms both the No-Build and Alternative 1 in terms of the net cost per rider and the subsidy that would be required to support the service.
- All three alternatives are expected to have a similar (minimal) impact on the environment. Implementation of Alternative 2 could reduce noise impacts along the segment from Whitehall, NY to Rutland, VT if the Ethan Allen is rerouted.

As has been noted previously, the major difference between the two Build Alternatives is that Alternative 1 provides new service in the Western Corridor, while preserving both existing frequencies of service through the New York portion of the study area, while Alternative 2 would reroute the Ethan Allen from its existing alignment into the Western Corridor – leaving a single frequency of service (the Adirondack Service) through the New York portion of the project study area. This distinction has the greatest impacts on ridership and operations and maintenance costs; the major benefits and disadvantages for each of the Build Alternatives are summarized below.

Alternative 1

Benefits: Provides equivalent (to existing) or better access to passenger rail service *throughout* the study area; wider range of mode choices throughout the study area; operational and schedule flexibility in the New York portion of the study area, as compared to Alternative 2; higher anticipated ridership than Alternative 2.

Disadvantages: Higher operating cost than Alternative 2.

Alternative 2

Benefits: Lower operating costs than Alternative 1; provides service to the Western Corridor.

Disadvantages: Removes service along the existing Ethan Allen corridor, which negatively impacts anticipated ridership.

Recommendation

Based on this Phase Two evaluation, Alternative 1 is the Preferred Alternative recommended for further development. It provides the greatest transportation benefit by adding new service along the Western Corridor without eliminating or reducing service on other routes.

Table 3-19 Summary of Evaluation Scores

	No-Build	Alternative 1	Alternative2
Goal 1: Extend Intercity Passenger Rail Access and Improve Mobility			
Directness to Key Regional Destinations	0	+2	+1
Transfers Required	0	+2	+1
Cumulative Travel Time	0	0	0
Availability of Intermodal Connections	0	+2	+1
Frequency/Ridership /Population	0	+2	+1
Goal 1 Total:	*0*	*+8*	*+4*
Best Fit Alternative:		X	
Goal 2: Support Economic Development and Sustainable Development			
Accessibility/Connections	0	+2	+2
Smart Growth	0	+2	+1
Goal 2 Total:	*0*	*+4*	*+3*
Best Fit Alternative:		X	
Goal 3: Maximize Transportation Efficiencies			
Cost Evaluation	0	-2	+2
Construction Impacts on Operations	0	-1	-1
Sustainability/Funding Opportunities	0	-1	0
Additional Capacity	0	+2	+1
Reliability/Flexibility	0	+2	+1
Impacts to Rail and Bus Operations	0	+2	+1
Goal 3 Total:	*0*	*+2*	*+4*
Best Fit Alternative:			X
Goal 4: Protect Environmental Quality			
Environmental Impacts	0	-1	-1
Goal 4 Total:	*0*	*-1*	*-1*

Best Fit Alternative:		X	X
TOTAL:	0	+13	+10
Preferred Alternative:		X	

3.2 No-Build Alternative

The No-Build Alternative does not meet the project Purpose and Need. Communities in southwestern Vermont and eastern central New York would continue to be un-served or underserved by passenger rail service.

3.3 Preferred Service Alternative

The Preferred Service Alternative is Alternative 1, New Service to Rutland, VT. Based on the evaluation provided in this chapter, this alternative is identified as the Proposed Action Alternative. Chapter 4 of this Environmental Assessment compares the environmental impacts of the Proposed Action Alternative to the No-Build Alternative.

Alternative 1 retains the Ethan Allen service on its current alignment and adds a new service through southwest Vermont. The alternative assumes the routing from Albany to Mechanicville is via Schenectady.

To operate the proposed new service from Albany to Rutland via Schenectady and the Western Corridor, several infrastructure improvements are required to meet the targeted Maximum Allowable Speed (MAS) of 60MPH (at a minimum). Preliminary engineering has been completed to identify the necessary improvements, a summary of the track improvements by segment are included in Table 3-20.

3.4 Next Steps and Anticipated Tier 2 Projects with Separate NEPA Documents

The Proposed Action is a programmatic or service-level determination by the project proponents and FRA. Specific Tier 2 projects will be identified during project design, and the appropriate level of NEPA documentation will be prepared for each element. Specific actions likely to be included in Tier 2 and subject to separate NEPA reviews include:

- A new station at Manchester, VT;
- A new station at North Bennington, VT;
- A new train station at Mechanicville, NY;

- Additional or relocated track or sidings needed to accommodate these stations; and
- Reconstructed or widened bridges over rivers and roads.

Table 3-20 Track Improvements

Segment	Anticipated Infrastructure Improvements/Assumptions
Schenectady to CPF 480	• 700 ft of new mainline for new alignment through CPF 480; • All existing public grade crossings will require warning system modifications; • No track work required on existing mainline; • 50-foot wide crossings; • Signal system costs assumes electronic in-track signal system and interlocking tie-ins; • Aplauskill River Bridge needs upgrade to run double track; and • Two turnouts at Aplauskill River Bridge will be retired.
CPF 480 to Mechanicville	• 2.5 miles of new mainline/sidings for congestion relief; • All existing public grade crossings will require warning system modifications; • No track work required on existing mainline; • 50-foot wide crossings; • Signal system costs assumes electronic in-track signal system and interlocking tie-ins; • Two #20 crossovers, one #15 crossover, three #20 turnouts, and one #15 turnout needed. Two turnouts need to be retired; and • Culvert at 1528+00 needs to be extended past proposed siding.
Mechanicville to Hoosick	• Three new sidings totaling 4.75 miles – assume existing two sidings need no work; • Assumed 50-foot wide crossings • Updates to existing signal system; • All existing public grade crossings will require warning system modifications; and • Six new #20 turnouts needed for sidings.
Hoosick to North Bennington	• Existing mainline needs upgrading over entire length; • 50-foot wide crossings; • Every third tie is replaced, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds; • All existing public grade crossings will require warning system modifications; • One mile of new siding required for congestion relief; • Two new #20 turnouts for new siding; and • Culvert at 3143+00 needs to be extended past proposed siding.
North Bennington to Manchester	• Existing mainline needs upgrading over entire length; • 50-foot wide crossings; • All existing public grade crossings will require warning system modifications; • Every third tie is replaced, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds; • Bridge costs assumed for only bridges labeled in POOR condition; and • Assume VTR will allow increased passenger service without new signal system.
Manchester to Rutland	• Existing mainline needs upgrading over entire length; • 50-foot wide crossings; • All existing public grade crossings will require warning system modifications; • Every third tie is replaced, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds; • Bridge costs assumed for only bridges labeled in POOR condition; • Siding at MP 36.15 is out of service – assume addition of 3,000-foot siding; • Two turnouts needed for new siding; • Siding entrance moved back 500 feet to avoid intersection at Brooklyn Road; and • Assume VTR will allow increased passenger service without new signal system.

4

Affected Environment and Environmental Consequences

This chapter describes the existing physical, ecological system, and human resource conditions of the project study area and the potential environmental impacts that could result from implementation of the NY-VT Bi-State Intercity Passenger Rail Study Proposed Action Alternative. This chapter includes an overview of the project and a brief summary of resources that were not evaluated as part of this assessment; characterizes existing conditions and potential impacts to the physical environment, ecological systems, and human environment within the project study area; describes construction period impacts; and discusses indirect and cumulative impacts; and summarizes the findings. The list of resources evaluated is based on FRA NEPA procedures and CEQ regulations.

4.1 Overview of the Project

The NY-VT Bi-State Intercity Passenger Rail Study is a "Service Level" or "Phase 1" study undertaken to identify and evaluate service alternatives that have the potential to meet the project purpose.[9] Because such studies include numerous alternatives and extend over long corridors, project implementation may ultimately be through a series of smaller projects at a later date that are reviewed in more detail as "Project Level" or "Phase 2" projects. This Phase 1 study identifies the potential impacts of the preferred service alternative, based on conceptual identification of infrastructure improvements and railroad operations.

The analysis of the affected environment (existing conditions) and potential project impacts is based on an evaluation of each of the seven railroad corridor segments that comprise the Preferred Service Alternative described in Chapter 3, *Alternatives*. Detailed descriptions of the No-Build Alternative and the Proposed Action

▼

9 FRA. 2009. *High-Speed Intercity Passenger Rail (HSIPR) Program*. Docket No. FRA-2009-0045, and *Compliance with the National Environmental Policy Act in Implementing the High-Speed Intercity Passenger Rail Program*.

Alternative are provided in Sections 3.2 and 3.2, respectively. Table 4-1 summarizes the infrastructure improvements and operations within each segment. The potential effects of the Proposed Action Alternative are identified by adding the impacts along each included segment.

Table 4-1 Summary of Railroad Segments

Segments	New Daily Round Trips	Infrastructure Improvements
1	0	None
2	0	Construct 2 miles of new main line siding track
3	0	None
4	0	None
6	1	Construct 6 miles of new siding track
7	1	Add new second main line track on entire segment; construct new Mechanicville Station
8	1	Upgrade track; reconstruct all bridges rated “poor”; construct new North Bennington Station
9	1	Upgrade track; reconstruct all bridges rated “poor”; construct new Manchester Station
10	1	Upgrade track

The majority of the infrastructure improvements would be completed within the existing rail ROW, without additional disturbance of the natural or human environment. Infrastructure improvements that are likely to extend outside of the existing rail ROW are:

- New Manchester Station – Within Segment 9, a new station would be constructed in Manchester, VT;
- New North Bennington Station – Within Segment 8, a new station would be constructed in North Bennington, VT; and
- New Mechanicville Station – Within Segment 7, a new station would be constructed in Mechanicville, NY.

Since specific locations are not defined at this time, development of these stations would be evaluated in subsequent Project Level NEPA documents.

4.2 Resources Not Included

The following resources are not included in this evaluation because they are not present within the project study area, or because there would be no impact:

- Wild and Scenic Rivers (not present)
- Coastal Zone Management/Coastal Barriers (not present)
- Community Cohesion (not affected by use of existing rail alignment)

4.3 Transportation

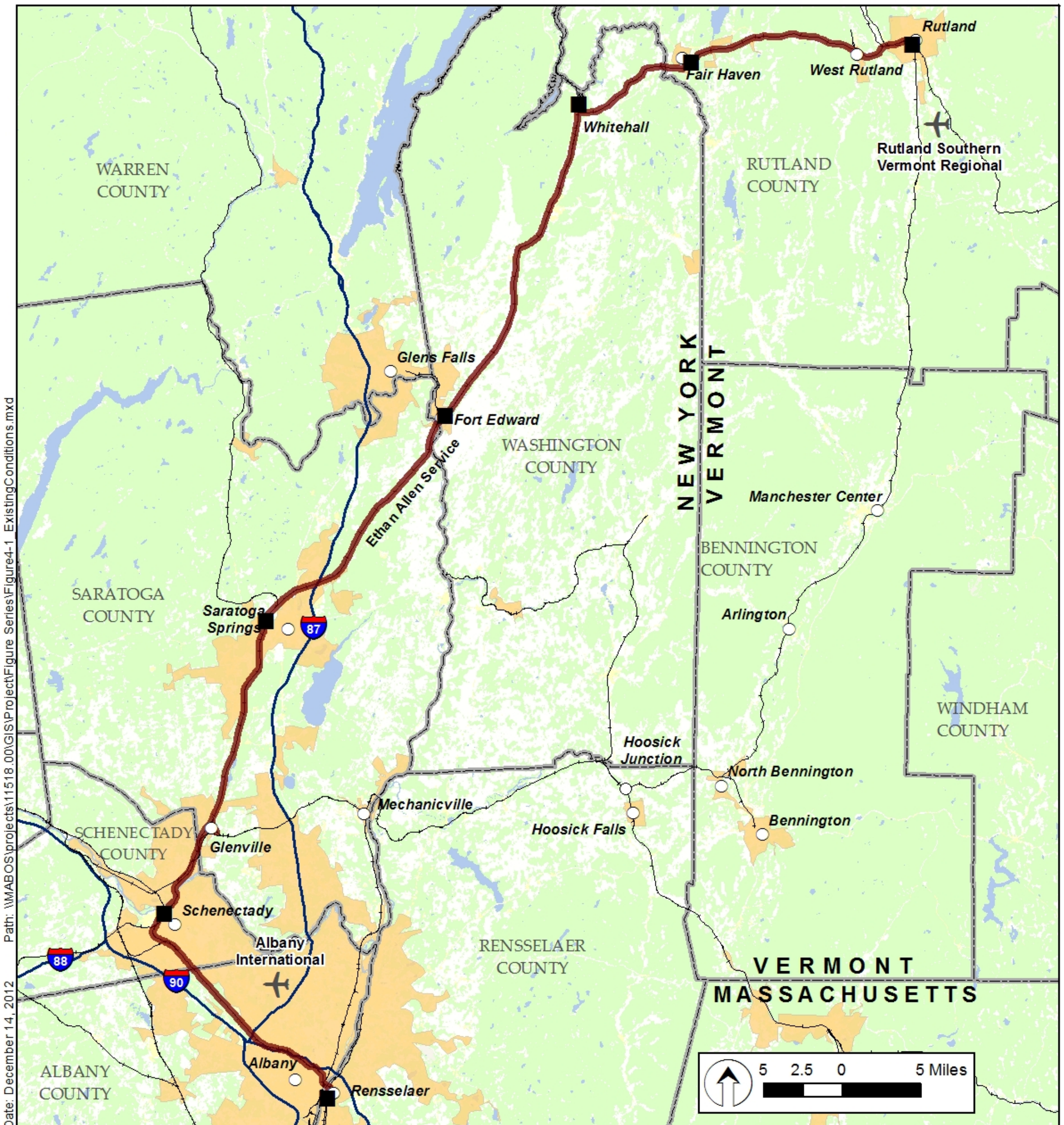
This section describes the existing conditions and potential impacts to transportation that may result from the No-Build Alternative and the Proposed Action Alternative.

4.3.1 Methodology

The anticipated impacts to mobility, traffic, transit and freight operations are discussed as applicable to each segment. The ridership forecasting model developed for this study reports ridership by station. Traffic impact analyses at specific intersections were not completed as part of this study; however, a qualitative evaluation of impacts due to increased ridership at proposed and existing stations is provided.

4.3.2 Existing Conditions

Transportation options within the project study area include car, intercity passenger rail, bus and air services. Figure 4-1 shows major roadways, railroads, rail stations, and airports in the project study area.



NY - VT Bi-State Intercity Passenger Rail Study

Legend

- Passenger Rail Station
- Airport
- Ethan Allen Service
- Other Railroad
- County Boundary
- Urbanized Area
- City/Town
- Interstate Highway

Figure 4-1

Transportation Systems, Existing Conditions

Source: New York State GIS Clearinghouse (NYGIS); Vermont Center for Geographic Information (VCGI); The United States Geological Survey National Map; and Environmental Systems Research Institute (ESRI) Data

VTrans NYSDOT VHB Vanasse Hangen Brustlin, Inc.

4.3.2.1 Roadways

A number of major roadways, including an Interstate highway and regional and secondary arterials, provide regional access for residents in the project study area and are summarized in this section.

Interstate Highways

I-87 (Adirondack Northway)

I-87 is an Interstate highway that extends from New York City, NY, north to the Canadian border via Albany, NY. It is the main north-south arterial for eastern NY State and is a heavily traveled commuter route. I-87 traverses both Albany and Saratoga counties within the project study area. This roadway generally has six lanes through the project study area, with three lanes running in each direction.

Regional Arterials

US 4

US 4 is a major connector through the project study area and runs north-south from Troy to Whitehall, NY and east-west from Whitehall, NY to Rutland, VT before continuing out of the project study area to Portsmouth, NH. US 4 is a two-lane highway through most of New York State. Upon entering Vermont just east of Whitehall, NY, it becomes a four-lane expressway for approximately 20 miles, returning to a two-lane highway near Rutland, VT.

US 7 (Ethan Allen Highway)

US 7 is the principal arterial highway in western VT running north-south through the Vermont portion of the project study area. It runs through both Bennington and Rutland Counties in Vermont. US 7 is a two-lane highway through Bennington, VT before becoming an expressway for three miles just north of town. The road then becomes a two-lane undivided freeway with frequent passing zones. North of Manchester, VT, the roadway varies between two and four lanes.

US 9 (Halfmoon Parkway)

US 9 is a principal north-south arterial that runs through Albany and Saratoga Counties in the New York portion of the project study area. When US 9 crosses the Mohawk River into Saratoga County, it is known as the Halfmoon Parkway. US 9 generally runs parallel to I-87within the project study area. US 9 north of Albany, NY is a two lane highway through the project study area.

Secondary Arterials

NY 40

NY 40 is a two lane north-south road that originates in Troy, NY and terminates at an intersection with NY 22 north of Granville, NY. It runs through Rensselaer and Washington Counties, NY roughly parallel to US 4 until its intersection with NY 22.

NY 32

NY 32 is a two-lane north-south roadway running between Albany and Hudson Falls, NY in the project study area. It runs through Albany and Washington Counties often overlapping with US 4 and intersecting with US 9 in Glens Falls before turning east to Hudson Falls.

NY 29

NY 29 is an east-west roadway, entering the project study area in the west via Saratoga Springs, and terminating in the east at an intersection with NY 22 just outside of Salem, NY. NY 29 is two lanes for most of its length in the project study area.

NY 22

NY 22 runs north-south from New York City, NY to the Canadian border and is mostly a rural two-lane roadway. Within the project study area, NY 22 runs through Rensselaer and Washington Counties, overlapping with US 4 south of Whitehall.

VT 30

VT 30 is a north-south roadway originating in Burlington, VT and traveling north to Middlebury, VT. Within the project study area, VT 30 travels from Manchester, VT to US 4 west of Rutland, VT, connecting Bennington and Rutland Counties. It intersects US 7 in Manchester, VT.

Traffic volumes (average annual daily trips) on each major roadway in the project study area are summarized in Table 4-2. All roadways are shown in Figure 4-1.

4.3.2.2 Intercity Passenger Rail Services

Intercity passenger rail service in the project study area is provided by Amtrak. There are currently three Amtrak regional routes providing intercity passenger service in the project study area:

- **Empire Service** – Providing daily service between New York City, NY and Buffalo, NY with continuing service to Niagara Falls, NY and Toronto, Canada with stops in Albany-Rensselaer and Schenectady, NY in the project study area.

Table 4-2 Traffic Volumes on Major Project Study Area Roadways

Route	From	To	AADT[1]
I-87	Albany	NY 146	109,814
	NY 146	Saratoga Springs	73,441
	Saratoga Springs	Glens Falls	45,765
US 9	Albany	NY 146	19,681
	NY 146	NY 108	12,055
	NY 108	NY 50	17,729
	NY 50	I-87	8,818
	I-87	Glens Falls	16,741
US 7	Bennington	Manchester	8,467
	Manchester	VT 103	4,933
	VT 103	Rutland	17,229
US 4	Rensselaer	NY 74	19,265
	NY 74	NY 142	12,460
	NY 142	NY 46	6,335
	NY 46	NY 41	13,157
	NY 41	VT 30	7,712
	VT 30	Rutland	11,875
NY 40	Troy	NY 126	12,527
	NY 126	NY 67	9,000
	NY 67	Argyle/NY 197	4,732
	Argyle/NY 197	US 4	2,674
NY 32	Albany	US 4	9,929
	US 4	Stillwater	7,550
	Stillwater	NY 50	2,709
	NY 50	Glens Falls	4,782
	Glens Falls	NY 42	13,124
NY 196	NY 42	NY 40	3,747
NY 29	Saratoga Springs	NY 67	11,997
	NY 67	NY 372	8,915
	NY 372	NY 22	1,970
NY 22	Hoosick Falls	NY 313	5,734
	NY 313	US 4	3,336
VT 30	Manchester	Pawlet	3,200
	Pawlet	VT 140	1,604
	VT 140	US 4	5,050

Source: NYSDOT Online Traffic Data Viewer, 2008, http://gis.dot.ny.gov/tdv/
VTrans 2008 (Route Log) AADTs State Highways, May 2009
State of Vermont 2008 Traffic Flow Map (AADT), VTrans, September 2010, http://www.aot.state.vt.us/Planning/Documents/TrafResearch/Publications/pub.htm

1 AADT = Average Annual Daily Trips

- **Adirondack Service** – Providing daily service between New York City, NY and Montreal, CA via Albany with stops in Schenectady, Saratoga Springs, Fort Edward-Glens Falls and Whitehall, NY in the project study area.
- **Ethan Allen Express** – Providing daily service between New York City, NY and Rutland, VT via Albany, NY with stops in Schenectady, Saratoga Springs, Fort Edward-Glens Falls, NY and Castleton, VT in the project study area.

Service on the Empire Corridor consists of 12 weekday roundtrips between Albany and New York City, NY. Four of these roundtrips extend to Buffalo, NY with one roundtrip extending to Toronto, Canada. Saturday service consists of eight roundtrips between Albany and New York City with three extending beyond to Buffalo and one to Toronto. Sunday service consists of nine roundtrips between Albany and New York City with three extending beyond to Buffalo and one to Toronto. Both the Adirondack service and the Ethan Allen service offer one passenger trip per day in each direction. Table 4-3 shows the annual ridership on these service lines.

Table 4-3 Amtrak Annual Passenger Trips

Service Line	FY2009	FY2010
Empire[1]	925,746	981,241
Ethan Allen	46,748	48,031
Adirondack	104,681	118,673

Source: Provided by Amtrak
1 Empire Service between New York City and Albany (not including the portion between Albany and Toronto)

4.3.2.3 Regional Bus Services

There are a few private companies that currently provide intercity bus services, connecting towns and counties in the project study area at a regional level. These services include:

- Greyhound provides several trips daily between New York City, NY and Montreal, Canada, with stops in Albany, Saratoga Springs, and Glens Falls, NY.
- Yankee Trails operates a regional bus line from Bennington, VT to Albany, NY, offering two trips per day.
- Adirondack Trailways provides regional connection from New York City, NY throughout New York State and into Canada, including Toronto and Montreal. Within the project study area, it has stops in Albany, Schenectady, Saratoga Springs and Glens Falls, NY. Adirondack Trailways has a stop at Albany International Airport, NY.

4.3.2.4 Local Bus Services

There are several local transportation agencies or companies that provide bus services for communities in the project study area. These buses provide connections within a town or among adjacent towns in the project study area, but their fixed-route services do not extend to connect one county to another. Some of these buses also serve as feeder buses that pick up and deliver passengers to existing rail stations in the project study area. Key local transportation organizations that serve the communities in the project study area include:

- **The Capital District Transportation Authority (CDTA)** – provides bus services in Albany, Schenectady, Troy and Saratoga Counties in NY, and serves the current rail stations at Albany/Rensselaer, Saratoga, and Schenectady, NY. CDTA also offers frequently scheduled ShuttleFly service to Albany International Airport.
- **Greater Glens Falls Transit (GGFT)** – provides bus services in Warren, Washington, and Saratoga Counties in New York State. GGFT also provides local feeder bus service to the existing Amtrak Station in Fort Edward-Glens Falls Monday through Saturday.
- **Marble Valley Regional Transit District (MVRTD, also known as "The Bus")** – provides bus services in Rutland County and surrounding areas in Vermont. MVRTD also operates a commuter bus service between Rutland and Manchester, VT, making connections with the Green Line Mountain Express for commuters traveling between Bennington and Rutland.
- **The Green Mountain Community Network, Inc. (GMX)** – provides bus services in Bennington County and surrounding areas in Vermont.

4.3.2.5 Air Services

Aviation also plays an important role in the region's transportation system and there are two commercial airports in the project study area. The busiest and largest airport in the project study area is Albany International Airport in Albany, NY. While it provides frequent flights to various destinations both domestically and internationally, it does not provide any direct connections within the project study area. CDTA and Adirondack Trailways serve the airport providing both local and regional bus connections to the airport. CDTA also provides a rail connection to the airport via its ShuttleFly service, which includes a stop at the Amtrak rail station in Albany/Rensselaer, NY. A taxi stand is also located just outside the baggage claim area.

Rutland-Southern Vermont Regional Airport (formerly known as "Rutland State Airport") is a state-owned public-use airport located near Rutland, VT. Three flights between Rutland, VT and Boston, MA are provided daily; however there are no flights proving connections within the project study area. There are no public transportation services available to and from this airport.

Other public aviation facilities found in the project study area do not host significant commercial passenger boardings. Table 4-4 shows the annual passenger boardings at these two airports.

Table 4-4 Commercial Airports Annual Passenger Boardings

Airport	2008	2009
Albany International Airport	1,365,854	1,302,814
Rutland-Southern Vermont Regional Airport	5,038	4,458

Source: Federal Aviation Administration (FAA)

4.3.2.6 Freight Rail Services

Freight rail service is currently operated over all of the project study area rail lines. Three different railroads (CSX, Canadian Pacific Railway, and Vermont Rail Systems) operate over lines they either own or lease (or have operating rights for).

CSX Hudson Subdivision

CSX operates freight service on the section of track between Rensselaer and Schenectady, NY, which is part of the Hudson Subdivision that they own. This section of track (Segment 1; see Figure 3-1) is approximately 18 miles long. This line is distinct from the CSX Selkirk Subdivision which runs south of Albany and Schenectady serving a major rail yard and automotive distribution center in Selkirk. It also serves a bulk transloading facility in Albany. Amtrak has operating rights over this section.

The line connects to the CSX Selkirk Subdivision at the west end at CP-169, providing access towards Buffalo. In Albany, it connects to Amtrak's Post Road Subdivision at CP-142, which provides access towards Massachusetts. The Hudson Subdivision connects with Canadian Pacific Railway's Colonie Subdivision (described below) in downtown Albany at CP-145; however, the only direct moves provided for are moves between the south and the west. Trains coming from the Albany-Rensselaer station are not able to make direct moves onto the CP Colonie Subdivision heading north. The Hudson Subdivision connects to the CP Freight Subdivision in downtown Schenectady at CP-160, with movements allowed between the south and the west, and between the north and the east.

The Hudson Subdivision is mostly single track, with short double track segments in Rensselaer, Albany, and Schenectady, NY. There are also several long freight sidings. The line is maintained for passenger speeds of up to 110 mph and freight speeds of 50 mph. Geometric restrictions in the urban areas result in several speed restrictions. In Rensselaer, around the Albany/Rensselaer station, the passenger train authorized speeds are reduced to 15 mph and freight train speeds down to 10 mph. Through Albany both the passenger and freight authorized speeds are 20 to 25 mph.

Approaching Schenectady Station, passenger train authorized speeds are reduced to 55 mph from the east and 50 mph from the west, before dropping to 30 mph in the station area. The freight train authorized speed is reduced to 30 mph throughout Schenectady. The track is generally maintained to FRA Class 5 standards.

The line is signaled with automatic block wayside signals with cab signals under centralized traffic control (CTC). In the section of track between Rensselaer and Schenectady, there are three highway-rail grade crossings equipped with automatic warning devices at Lincoln Avenue, Morris Road, and Cordell's Road.

The segment is primarily single track, with short double-track segments in Albany, Rensselaer, and Schenectady, and a 3.3-mile long passing siding. The line is currently maintained to FRA Class 5 standards and is signaled with automatic block wayside signals with cab signals under CTC.

Existing train operations on Segment 1 include more than six daily freight round trips, as well as eight daily round trip passenger trains associated with the Adirondack, Empire, Ethan Allen, Lake Shore Limited, and Maple Leaf services operated by Amtrak. Other transportation options include local bus service provided by the CDTA and regional connecting service provided by Adirondack Trailways; major roadway connections via I-90, I-87 and I-890; and access to domestic and international flights at Albany International Airport.

Canadian Pacific Railway

Canadian Pacific Railway (CP) operates freight services over three subdivisions they own in the project study area.

Colonie Subdivision

CP operates freight service on the Colonie Subdivision, the section of track between Albany and Mechanicville, NY along the west side of the Hudson River. This subdivision is approximately 19 miles long. The line serves a major yard at Kenwood, an intermodal facility at the Port of Albany, and a bulk transloading facility in Albany. Norfolk Southern has operating rights over this section.

The Colonie Subdivision would not be used by the Proposed Action Alternative; this route was dismissed from consideration as described in Chapter 3.

Freight Subdivision

CP operates freight service on the Freight Subdivision, the section of track between Mechanicville and Schenectady, NY (Segment 6; see Figure 3-1). This section of track is approximately 17 miles long. The line serves a yard at Schenectady. Pan Am Railways and Norfolk Southern have operating rights over this section.

In Mechanicville, the Freight Subdivision connects at CPF-467 with the CP Colonie Subdivision (described above) to the south and Pan Am Railway's (PAR's) Freight Main Line to the east. From Mechanicville, the Freight Subdivision runs west to CPF-478 and CPF-480, where it connects to CP's Canadian Connector Subdivision and Canadian Subdivision (described below) to the north. Direct connections are provided for all moves, with the Canadian Connector Subdivision being a short track that is functionally one leg of the wye.[10] In addition, a separate spur track controlled by PAR, the Rotterdam Branch, continues west to the CSX Selkirk Subdivision at Rotterdam Junction. From Glenville, the branch continues southwest through Schenectady, where it connects to CSX's Hudson Subdivision (described above) at CPF-485. Connections exist to allow moves between the south and the west, and between the north and the east. The line continues all the way to Wilkes-Barre, Pennsylvania.

The Freight Subdivision is mostly single track, with one controlled siding in Crescent. The track is maintained for passenger and freight speeds of 40 to 50 mph. In Mechanicville and Schenectady, geometric restrictions limit the authorized speeds to 25 mph. The line is signaled with automatic block wayside signals under CTC.

Segment 2 runs 4.6 miles from Schenectady, NY to CPF-480 along the Freight Subdivision. The segment is single track and is currently maintained to FRA Class 3 standards. The line is signaled with automatic block wayside signals under CTC. There are three at-grade railroad crossings within this segment; all of them are public crossings.

Existing train operations on Segment 2 include more than nine daily freight round trips, as well as two daily round trip passenger trains associated with the Ethan Allen and Adirondack services. Other transportation options include local bus service provided by the CDTA and regional connecting service provided by Adirondack Trailways; major roadway connections via NY 50 and NY 146; and access to domestic and international flights at Albany International Airport.

Existing train operations in Segment 6 include three to four freight round trips per day. There is no existing passenger rail service. Transportation options include local bus service operated by the City of Mechanicville, local bus service provided by CDTA, and major roadway connections via NY 67, US 9 and I-87.

This segment is single track with one 1.8-mile long controlled siding west of Elnora, NY. The line is currently maintained to FRA Class 3 standards and is signaled with automatic block wayside signals under CTC. There are eight grade crossings within this segment, consisting of six public and two private or farm crossings.

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10 A triangular shaped arrangement of rail tracks with a switch or set of points at each corner. When used at a rail junction, it allows trains to pass from any line to any other line.

Canadian Subdivision

CP operates freight service on the Canadian Subdivision, the section of track between Glenville and Whitehall, NY (Segment 3; see Figure 3-1). This section is approximately 56 miles long. The Canadian Subdivision serves yards at Saratoga Springs, Fort Edward, and Whitehall. The yard in Whitehall is dispatched by Vermont Rail Systems although the only access is from the Canadian Subdivision. Amtrak has operating rights over this section.

Pan Am Railway Freight Main Line

Pan Am Railways (PAR) operates freight service on the PAR Freight Main Line, which they own and which runs from Mechanicville, NY to Mattawamkeag, Maine. The section covered by this study, between Mechanicville and Hoosick Junction, is 22 miles long (Segment 7; see Figure 3-1). There are no major yards or facilities in this section, though there are several freight sidings. CP and Norfolk Southern have operating rights over this section.

At the west end, the line connects to CP's Freight Subdivision (described above) at CPF-467 in Mechanicville, where a direct move is only provided between the PAR Freight Main Line and the Freight Subdivision line to the west. With the existing geometry, trains coming from Albany would not be able to make a direct move onto the PAR Freight Main Line towards Vermont and Massachusetts. The line connects with the Batten Kill Railroad (a freight short line) at CPF-448 in Eagle Bridge. It connects with Vermont Railway's B&R Subdivision (described below) at CPF-445 in Hoosick Junction, with connections provided for all movements.

The line is mostly single track, with small double track segments over the Hudson River and between Eagle Bridge and Hoosick Junction. The line is maintained for freight speeds of 30 to 40 mph. Geometric restrictions in the vicinity of Mechanicville result in speed restrictions of 10 mph. The line is signaled with automatic block wayside signals under CTC.

Segment 7 runs 22.4 miles from Mechanicville to Hoosick Junction, NY along PAR's Freight Main Line. This segment is principally single track, with 4.5 miles of double track over the Hudson River and between Eagle Bridge and Hoosick Junctions. The line is currently maintained to FRA Class 3 standards and is signaled with automatic block wayside signals under CTC. There are 17 grade crossings within this segment, consisting of ten public and seven private or farm crossings.

Existing train operations on Segment 7 include eight to ten freight round trips per day. There is no existing passenger rail service. Transportation options include local bus service operated by the City of Mechanicville, and major roadway connections via NY 67, US 4 and I-87.

Vermont Railway Bennington & Rutland (B&R) Subdivision

Vermont Railway (VTR), a subsidiary of Vermont Rail Systems (VRS), operates freight service on the B&R Subdivision, which runs from Hoosick Junction, NY to Rutland, VT (Segments 8, 9 and 10; see Figure 3-1). The line is owned by the State of Vermont. The line is approximately 59 miles long and currently serves yards in North Bennington and Rutland.

At the south end the line connects to PAR's Freight Main Line (described above) at CPF-445 in Hoosick Junction, with connections provided for all direct moves. In North Bennington, there is an inactive spur to Bennington. Direct connections to the spur are only available from the south, so trains moving between Rutland and Bennington do not have a direct move. It does appear that this connection existed in the past and could be restored. In Rutland, the line connects to another VRS subsidiary, the Green Mountain Railroad (GMRR), a freight short line that runs east towards the Connecticut River. Direct connections are provided only for moves between the north and the east. Just beyond the GMRR connection, the line connects with another VRS subsidiary, the Clarendon and Pittsford Railroad (described below).

The line is mostly single track, with freight sidings in Arlington, Manchester, Danby, and South Wallingford, VT in addition to the previously mentioned yards. The line is maintained for freight speeds of 10 to 30 mph. The line is not signaled and is operated as dark territory.

Segment 8 runs 7 miles from Hoosick Junction, NY to North Bennington, VT along the B&R Subdivision. This segment is single track with no passing sidings and is currently maintained to FRA Class 2 standards. The line is not signaled and currently operates as dark territory. There are 11 grade crossings, consisting of six public and five private or farm crossings.

Existing train operations on Segment 8 include two to three freight round trips per week operated by VRS. There is no existing passenger rail service. Transportation options include local bus service provided by the GMX Brown Line, serving North Bennington and Bennington, VT, and major roadway connections via US 7, VT 7A and NY/VT 67.

Segment 9 runs 21 miles from North Bennington to Manchester, VT along the B&R Subdivision. This segment is primarily single track, with 0.4 miles of freight sidings in North Bennington and Arlington. The line is currently maintained to FRA Class 2 standards: it is not signaled and it operates as dark territory. There are 37 grade crossings within this segment, consisting of 16 public and 21 private or farm crossings.

Existing train operations on Segment 9 include two to three freight round trips per week operated by VRS. There is no existing passenger rail service. Transportation options include local bus service provided by the GMX Regional Route serving Bennington and Manchester, VT, and a major roadway connection via VT 30.

Segment 10 runs 31 miles from Manchester to Rutland, VT along the B&R Subdivision. The segment is primarily single track, with 0.5 miles of freight sidings in Manchester, Danby, and South Wallingford. The line is currently maintained to FRA Class 2 standards: it is not signaled and is operated as dark territory. There are 78 grade railroad crossings, consisting of 21 public crossing and 57 private or farm crossings.

Existing train operations on Segment 10 include two to three freight round trips per week operated by VRS. There is no existing passenger rail service. Other transportation options include bus service provided by the MVRTD (which provides local circulators in Rutland and service from Rutland to Manchester, VT); major roadway connections via US 7 and VT 30; and limited flight services at the Rutland-Southern Vermont Regional Airport.

Clarendon and Pittsford Railroad Main Line

Clarendon and Pittsford Railroad (CLP), a subsidiary of VRS, operates freight service on its line between Whitehall, NY and Rutland, VT (Segment 4; see Figure 3-1). The line is approximately 24 miles long. The CLP line currently serves a yard in Whitehall, which is dispatched by VRS, despite the need to use CP's Canadian Subdivision Line to reach the yard. Amtrak has operating rights over this section.

4.3.3 Environmental Consequences

The proposed rail infrastructure improvements would accommodate the proposed additional round trip of passenger service and minimize freight delays throughout the project study area. These infrastructure improvements would not impact the existing transportation systems along any of the segments.

4.3.3.1 Impacts to Existing Railroad Infrastructure

No-Build Alternative

The No-Build Alternative would have no effects on transportation.

Proposed Action

The Proposed Action would require that the existing railroad infrastructure be improved, where needed, to accommodate one round trip per day of passenger service. Improvement requirements and impacts to the transportation system for each segment are described below.

Segment 1

The existing infrastructure in Segment 1 is in acceptable condition to accommodate the proposed passenger service. No infrastructure improvements are proposed on this segment. No modifications are proposed at Albany/Rensselaer Station to accommodate the proposed service, since it is anticipated that the current building and parking structure can accommodate the forecasted increase in ridership. Since there would be no infrastructure improvements there would not be any impact to the existing transportation systems along Segment 1.

Segment 2

Proposed improvements include adding 2 miles of siding (or double-track) for congestion relief; modifying the warning systems at all public grade crossings; and upgrading the signal system to an electronic in-track system with interlocking tie-in. Minimal modifications are proposed at Schenectady Station to bring the station up to Amtrak Class III standards. These infrastructure improvements would not impact the existing transportation systems along Segment 2.

Segment 3

The existing infrastructure in Segment 3 is in acceptable condition to accommodate the proposed passenger service. No infrastructure improvements are proposed on this segment. No modifications are proposed at Saratoga Springs, Fort Edward, or Whitehall Stations to accommodate the proposed service, since it is anticipated that the current buildings and parking structures can accommodate the forecasted increase in ridership. Since there would be no infrastructure improvements there would not be any impact to the existing transportation systems along Segment 3.

Segment 4

The existing infrastructure in Segment 4 is in acceptable condition to accommodate the proposed passenger service. No infrastructure improvements are proposed on this segment. No modifications are proposed at Castleton Station to accommodate the proposed service, since it is anticipated that the current building can accommodate the forecasted increase in ridership. Since there would be no infrastructure improvements there would not be any impact to the existing transportation systems along Segment 4.

Segment 6

Proposed improvements include adding a 3-mile long siding near Glenville, NY; upgrading 5 miles of main line track; and modifying the warning systems at all public grade crossings. These infrastructure improvements would not impact the existing transportation systems along Segment 6.

Segment 7

Proposed improvements include adding a 2-mile long passing siding near the middle of the segment and modifying the warning systems at all public grade crossings. A new station is proposed in Mechanicville, NY; the station would include a 425-foot long platform and 50 parking spaces, and meet Amtrak Class V standards. These infrastructure improvements would not impact the existing transportation systems along Segment 7.

Segment 8

Proposed improvements include replacing ties; upgrading the line to FRA Class 3 standards over the entire length by surfacing and curvature realignments; modifying the warning systems at all public grade crossings; upgrading the existing sidings; and replacing the bridges currently rated as being in "poor" condition. The proposed improvements do not include installation of a signal system due to the relatively low train frequency on this section. A new station is proposed in North Bennington, VT; the station would include a 425-foot long platform and 50 parking spaces, and meet Amtrak Class V standards. These infrastructure improvements would not impact the existing transportation systems along Segment 8.

Segment 9

Proposed improvements include replacing ties; upgrading the line to FRA Class 3 standards over the entire length by surfacing and curvature realignments; modifying the warning systems at all public grade crossings; upgrading the existing sidings; and replacing the bridges currently rated as being in "poor" condition. The proposed improvements do not include installation of a signal system due to the relatively low train frequency on this section. A new station is proposed in Manchester, VT; the station would include a 425-foot long platform and 50 parking spaces, and meet Amtrak Class V standards. These infrastructure improvements would not impact the existing transportation systems along Segment 9.

Segment 10

Proposed improvements include replacing tie; upgrading the line to FRA Class 3 standards over the entire length by surfacing and curvature realignments; modifying the warning systems at all public grade crossings; upgrading the existing sidings; and replacing the bridges currently rated as being in "poor" condition. The proposed improvements do not include installation of a signal system due to the relatively low train frequency on this section. Minimal modifications are proposed at Rutland Station so that the station meets Amtrak Class IV standards. These infrastructure improvements would not impact the existing transportation systems along Segment 10.

4.3.3.2 Impacts to Local Intersections

A ridership model was prepared to evaluate the service alternatives. Table 4-5 shows the preliminary ridership forecasts for re-routing the Ethan Allen service via Schenectady, NY. The ridership forecast estimated that there will be an annual increase of approximately 37,800 riders for the Proposed Action Alternative to stations within the project study area over the No-Build Alternative, or 104 riders per day.

Given the small forecasted increase in daily ridership throughout the project study area, it is anticipated that intersections adjacent to the stations within the project study area would experience relatively minor traffic impacts, if any. It is likely that any impacts that do arise could be largely mitigated by signal optimization and that capacity improvements would be unnecessary. The intersections adjacent to the stations within the project study area would experience relatively minor traffic impacts, which could be mitigated by signal optimization.

Implementing new passenger rail service would improve the transit options for choice riders and would improve regional mobility for transit-dependent riders by facilitating access to previously un-served areas in southwestern Vermont, and would connect these areas to the greater region via connections at Albany and Rensselaer, NY.

Table 4-5 Annual Ridership Forecasts[1]

	Forecasted Ridership			
			Proposed Action Alternative[3]	
Station	2010 Baseline	2030 No-Build[2]	2030	Change from No-Build
Montreal - Ft. Ticonderoga	5,200	5,700	5,700	0
Rutland	8,300	10,800	14,900	4,100
Castleton	1,100	1,800	1,900	100
Whitehall	900	1,000	1,000	0
Fort Edward/Glens Fall	4,300	4,600	4,500	-100
Saratoga Springs	15,100	16,600	16,500	-100
Schenectady	8,100	8,400	10,300	1,900
Manchester	–	–	4,400	4,400
N. Bennington	–	–	6,400	6,400
Mechanicville	–	–	4,600	4,600
Albany/Rensselaer	3,200	3,400	3,700	300
Hudson-NY Penn	32,400	35,900	52,100	16,200
Total	78,600	88,200	126,000	37,800

1 Preliminary unadjusted figures; one-way boardings.
2 Includes ongoing Ethan Allen service and Adirondack service
3 Includes relocated Ethan Allen service as well as ongoing Adirondack service

4.4 Air Quality

This section provides an overview of the existing conditions and potential impacts to air quality that may result from the No-Build Alternative and the Proposed Action Alternative.

4.4.1 Methodology

The Project falls under FRA regulations subject to US Environmental Protection Agency's (EPA's) General Conformity Rule. The General Conformity Rule ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality.

The General Conformity Rule, established under the Clean Air Act Amendment (CAAA), plays an important role in helping states improve air quality in those areas that do not meet the National Ambient Air Quality Standards (NAAQS). Federal agencies must work with State, Tribal, and local governments in nonattainment or maintenance areas to ensure that federal actions conform to the air quality plans established in the State Implementation Plan.

Transit projects are an important transportation measure for improving air quality because they reduce vehicle-miles-of-travel. The air quality evaluation includes a regional air quality analysis of air pollutants that calculated the reduction of automobile emission that would be eliminated and the increase in train engine emission due to the Project. This regional or mesoscale analysis evaluated the change in ozone precursors (volatile organic compounds [VOCs], oxides of nitrogen [NO_X]), carbon monoxide [CO], and particulate matter [PM]).

The purpose of the General Conformity Rule is to:

- Ensure that federal activities do not cause or contribute to new violations of the NAAQS;
- Ensure that actions do not cause additional or worsen existing violations of the NAAQS; and
- Ensure that attainment of the NAAQSs is not delayed.

The General Conformity Rule establishes standards for when a project must conduct more detailed analyses. These standards, called "De minimis" emissions levels, are thresholds that when a project has emissions below them demonstrate that the project satisfies the General Conformity Rule. The results of the mesoscale analysis were compared to the De Minimis criteria.

4.4.1.1 Air Quality Standards

The EPA has established the NAAQS for the primary air pollutants to protect the public health. The predominant sources of pollution anticipated from the proposed project include motor vehicle traffic and locomotives. The NAAQS are presented in Table 4-6.

Air pollution is of concern because of its demonstrated effects on human health. Of special concern are the respiratory effects of the pollutants and their potential toxic effects, as described below.

Carbon Monoxide

Carbon monoxide is a colorless and odorless gas that is a product of incomplete combustion. CO is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches and nausea and, at sustained high concentration levels, can lead to coma and death.

Proposed projects that are located in CO non-attainment or maintenance attainment areas are required to evaluate their impact on CO concentrations and the NAAQS. A mesoscale analysis was conducted to evaluate the regional pollution trends at a planning level. A hotspot or microscale analysis was not conducted.

Particulate Matter

Particulate matter is made up of small solid particles and liquid droplets. PM_{10} refers to particulate matter with a nominal aerodynamic diameter of 10 micrometers or less, and $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter of 2.5 micrometers or less. Particulates can enter the body through the respiratory system. Particulates over 10 micrometers in size are generally captured in the nose and throat and are readily expelled from the body. Particles smaller than 10 micrometers, and especially particles smaller than 2.5 micrometers, can reach the air ducts (bronchi) and the air sacs (alveoli) in the lungs. Particulates are associated with increased incidence of respiratory diseases, cardiopulmonary disease, and cancer. The counties and cities along the alternatives corridors are in attainment of PM standards. Similar to CO, a mesoscale analysis was conducted to evaluate the regional PM pollution trends at a planning level. A microscale analysis was not conducted.

Ozone

Ozone is a strong oxidizer and an irritant that affects the lung tissues and respiratory functions. Exposure to ozone can impair the ability to perform physical exercise, can result in symptoms such as tightness in the chest, coughing, and wheezing, and can ultimately result in asthma, bronchitis, and emphysema. On June 15, 2005, the EPA revoked the 1-hour ozone standard for most areas in the country.

Volatile Organic Compounds

VOCs are a general class of compounds containing hydrogen and carbon and are a precursor to the formation of the pollutant ozone. While concentrations of VOCs in the atmosphere are not generally measured, ground-level ozone is measured and used to assess potential health effects. Emissions of VOCs and nitrogen oxides (NO_X) react in the presence of heat and sunlight to form ozone in the atmosphere. Accordingly, ozone is regulated as a regional pollutant and is not assessed on a project-specific basis.

Nitrogen Oxides

When combustion temperatures are extremely high, as in automobile engines, atmospheric nitrogen gas may combine with oxygen gas to form various oxides of nitrogen. Of these, nitric oxide (NO) and nitrogen dioxide (NO_2) are the most significant air pollutants. This group of pollutants is generally referred to as nitrogen oxides or NO_X. Nitric oxide is relatively harmless to humans but quickly converts to NO_2. Nitrogen dioxide has been found to be a lung irritant and can lead to respiratory illnesses. Nitrogen oxides, along with VOCs, are also precursors to ozone formation.

Table 4-6 National Ambient Air Quality Standards

	Primary Standards		Secondary Standards	
Pollutant	Level	Averaging Time	Level	Averaging
Carbon Monoxide	9 ppm (10 mg/m[3])	8-hour[1]	None	
	35 ppm (40 mg/m[3])	1-hour[1]	None	
Lead	1.5 µg/m[3, 2]	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour[4]		
Particulate Matter (PM_{10})	150 µg/m[3]	24-hour[5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15 µg/m[3]	Annual (Arithmetic Mean)[6]	Same as Primary	
	35 µg/m[3]	24-hour[7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour[8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour[9]	Same as Primary	
	0.12 ppm	1-hour (applied to limited areas)[10]		
Sulfur Dioxide	0.03 ppm	Annual	0.5 ppm	3-hour[1]
	0.14 ppm	24-hour[1]	0.5 ppm	3-hour
	75 ppb[11]	1-hour	None	

1 Not to be exceeded more than once per year.
2 Final rule signed October 15, 2008.
3 The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
4 To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).
5 Not to be exceeded more than once per year on average over 3 years.
6 To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
7 To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
8 To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
9 (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—would remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).
10 (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <1.
11 (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb

4.4.1.2 Mesoscale Analysis

The air quality evaluation included a mesoscale analysis that estimates the area-wide emissions of CO, PM, NO_X, and VOC emissions. The mesoscale analysis evaluated the changes in emissions based upon changes in the average daily traffic volumes, roadway lengths, vehicle emission rates, and train engine emission rates. Using EPA-recommended air quality modeling techniques, total pollutant emissions were calculated for the difference between the No-Build and the Build Conditions in 2030. The mesoscale analysis calculated the 2030 mobile source emissions from the major roadways in the project study area; the analysis was conducted on the regional scale, not at the segment level.

Train Emissions

Diesel train emissions were modeled using the most recent approved EPA train emission factors and the train network and volumes as discussed below. The NY-VT Bi-State Rail Project train emissions are calculated by using the EPA passenger/ commuter train emission factors and the total distance the trains would travel for the Proposed Action Alternative. Estimates of rail emissions are based upon the factors contained in the EPA Emission Factor for Locomotives Guidance document.[11]

The number of train miles is estimated from a breakdown of track mileage by train line and community. Train mileage is a function of the train frequency data using present, and proposed commuter rail schedules. Multiplying the train miles per day by the vehicular emissions per train mile yields the estimated vehicular emissions per day.

Motor Vehicles

Ridership and Roadway Data. The air quality mesoscale analysis used ridership and roadway data (ridership reductions, roadway types, and speeds) developed for each analysis condition. The mesoscale analysis emissions used a breakdown of typical daily peak and off-peak traffic volumes.

Emission Rates. The vehicle emission factors used in the mesoscale and microscale analysis were based on the EPA's MOBILE 6.2[12] Vehicle Emission Modeling Software. MOBILE 6.2 calculates emission factors from motor vehicles in grams per vehicle mile for the future 2030 conditions. Specifically, the mobile emission factors were based on NYSDOT MOBILE 6 Emissions Factors[13]. The vehicle distributions of rural principal arterial and rural minor arterial roadways were utilized which best represent the project study area roadways where the vehicle miles traveled (VMT)

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11 *Emission Factors for Locomotives*, Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009.

13 *MOBILE6.2 (Mobile Source Emission Factor Model), The May 2004 release from USEPA, Office of Mobile Sources, Ann Arbor, MI.*

13 NYSDOT ESB April 2008 MOBILE Emission Factors for Regional, Mesoscale and CMAQ Project Emission Calculations for Albany, Rensselaer, Saratoga, and Schenectady Counties for Year 2030.

will be reduced. Although EPA is currently recommending use of a new model (MOVES), state data required for that model were not available at the time of the analysis.

Traffic Data. The air quality evaluation uses traffic data (volumes and speeds) developed for each alternative based upon ridership and VMT estimates. The mesoscale analysis uses typical daily peak and off peak traffic volumes for the ozone season (summer). Vehicle speeds are developed based upon traffic volumes and typical speeds for the project study area roadways. Based on the ridership and VMT estimates, the average percent of VMT reduction in Vermont versus New York is only 3 percent. Therefore, the New York factors were utilized.

4.4.2 Existing Conditions

The attainment status of each area traversed by the proposed project is provided in Table 4-7 and summarized below:

- All counties in Vermont and Washington County in New York are in attainment for ozone;
- All other counties in New York are nonattainment for ozone;
- All counties in New York and Vermont are in attainment for CO;
- All counties New York and Vermont are in attainment for $PM_{2.5}$; and
- All counties New York and Vermont are in attainment for PM_{10}.

Table 4-7 NAAQS Attainment Status of Counties in the Project Study Area[1]

			Attainment Status			
Segment[2]	County	State	Ozone	CO	$PM_{2.5}$	PM_{10}
1	Albany	NY	Nonattainment	Attainment	Attainment	Attainment
1, 2	Schenectady	NY	Nonattainment	Attainment	Attainment	Attainment
2, 6	Saratoga	NY	Nonattainment	Attainment	Attainment	Attainment
3, 4	Washington	NY	Attainment	Attainment	Attainment	Attainment
4, 10	Rutland	VT	Attainment	Attainment	Attainment	Attainment
8, 9, 10	Bennington	VT	Attainment	Attainment	Attainment	Attainment
7, 8	Rensselaer	NY	Nonattainment	Attainment	Attainment	Attainment

1 Sources: EPA, The Green Book Nonattainment Areas for Criteria Pollutants, http://www.epa.gov/oar/oaqps/greenbk/index.html
2 See Figure 3-1.

4.4.3 Environmental Consequences

The air quality evaluation included a mesoscale analysis that estimates the area wide emissions of VOCs, NO_X, PM, and CO emissions from vehicles and train engines. Using EPA recommended air quality modeling techniques, total pollutant emissions were calculated for the difference between No-Build and the Proposed Action Alternative.

4.4.3.1 No-Build Alternative

The No-Build Alternative VOC and NO_X emissions are typically lower than the Existing Conditions emissions due to the implementation of state and federal emission control programs, such as the Federal Motor Vehicle Emission Control Program.

4.4.3.2 Proposed Action Alternative

Table 4-8 presents the projected emission reduction related to the Project through the mesoscale analysis results for the Proposed Action Alternative, based on modeled concentrations of VOC, NO_X, PM, and CO emissions in 2030.

Table 4-8 Mesoscale Mobile Source Analysis Results: Emissions Reduction

	Pollutant				
Alternative	$PM_{2.5}$[2]	PM_{10}[2]	VOCs[3]	NO_X[3]	CO[2]
Proposed Action (Kg/day)	-29.7	-674.2	-449.2	-455.7	-28,469.5
Proposed Action (Tons/yr)	-11.9	-269.7	-180.6	-183.2	-11,444.7
De Minimis Criteria (Tons/yr)[1]	100	100	50	100	100

1- 40 CFR 93 § 153-- General Conformity Rule: De Minimis Criteria
2- De Minimis level shown for Maintenance Level (For Areas in Attainment)
3- De Minimis level Moderate Nonattainment –Albany, NY (inside an Ozone Transport Region)

The air quality evaluation demonstrated that the emission reductions from Project-related VMT outweighed the emission increases related to the additional train use. The Proposed Action Alternative therefore, results in a reduction in VOC, NOX, PM, and CO emissions, as compared to the No-Build condition. Because the Project results in a reduction of all pollutants, it meets the General Conformity De Minimis criteria.

4.4.3.3 Conformity

The air quality evaluation demonstrates that this FRA Project complies with the General Conformity Rule, which ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality. Although FRA is not subject to Transportation Conformity requirements, the NY-VT Bi-State Rail Project is a transit project, this section discusses the status on the NY-VT Bi-State Rail Project in their planning processes.

The New York Statewide Transportation Improvement Program (STIP) is a list of all projects, or project phases, in New York State proposed for Federal funding under Title 23 U.S.C. and 49 U.S.C. Chapter 53 that are scheduled to begin in the four federal fiscal years 2011 through 2014 (between October 1, 2010 and September 30, 2014). This time frame is mandated by regulations promulgated under federal law in Title 23 U.S.C. Section 135. The most recent STIP for New York State was formally approved on September 30, 2011. The NYSDOT has included the NY-VT Bi-State Intercity Passenger Rail Study in the 2010 to 2014 STIP (Agency PIN Number: S03754171).

The Capital District Transportation Committee (CDTC) is the designated MPO for the Capital District Transportation Management Area (TMA), which includes the metropolitan area of Albany, Rensselaer, Saratoga and Schenectady counties, with the exception of the Glens Falls urban area that extends into northern Saratoga County. As the MPO, CDTC, in cooperation with the NYSDOT and the Capital District Transportation Authority (CDTA), is responsible for carrying out the continuing, comprehensive, coordinated transportation planning process for the Capital District region. Part of the planning responsibility is the maintenance of a long-range Regional Transportation Plan (RTP). CDTC's most recent RTP is called New Visions. CDTC is also responsible for maintaining short-range TIPs for the metropolitan area's major highway and transit facilities. Federal regulations require that transit, highway and other transportation improvement projects within the Capital District metropolitan area be included in this TIP if these projects are to be eligible for federal capital or operating funding from Titles I, III and IV fund sources.

CDTC has included the NY-VT Bi-State Intercity Passenger Rail Study in the 2010 to 2015 TIP (Project Number RG121). As discussed above, the NYSDOT has also included the project in the 2010 to 2014 STIP. Consistent with the 1990 Clean Air Act Amendments, which requires that states with non-attainment areas evaluate the air quality impacts of transportation and transit projects during the planning process, this project has adhered to these requirements.

4.5 Noise

Introducing new or additional passenger rail service and/or infrastructure improvements has the potential to increase noise along the selected route. This section describes the existing noise environment and the potential impacts from adding passenger rail service to each segment.

4.5.1 Methodology

The noise impact assessment is based on the methodology defined in the FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (October 2005) and in the FTA guidance manual *Transit Noise and Vibration Impact Assessment* (Report FTA-VA-90-1003-06, May 2006).

Noise is typically defined as unwanted or undesirable sound, while sound is characterized by small air pressure fluctuations above and below the atmospheric pressure. The basic parameters of environmental noise that affect human subjective response are intensity or level, frequency content, and variation with time:

- Sound level is determined by how greatly the sound pressure fluctuates above and below the atmospheric pressure, and is expressed on a compressed scale in units of decibels. By using this scale, the range of normally encountered sound can be expressed by values between 0 and 120 decibels (dB).
- The frequency content of noise is related to the tone or pitch of the sound, and is expressed based on the rate of the air pressure fluctuation in terms of cycles per second (Hertz; Hz). The sensitivity of human hearing varies with frequency, the A-weighting system is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response. Sound levels measured using this weighting system are called "A-weighted" sound levels, and are expressed in decibel notation as "dBA."
- Human annoyance from noise depends on the cumulative noise exposure. Noise metrics used to assess potential impact include the day-night sound level (Ldn) and the hourly energy-average sound level (Leq). Both metrics are cumulative measures of noise exposure which take into account how loud noise events are, how long the events last, and how many occur. Leq takes into account how many events occur during a one-hour period. Ldn takes into account how many events occur over a 24-hour period during daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM) periods, with a 10-decibel penalty added for events that occur during the nighttime. Many surveys have shown that high Ldn is well correlated with human annoyance, and therefore this descriptor is widely used for environmental noise impact assessment.

Potential noise impact has been assessed by modeling existing and future conditions based on available data for current passenger and freight train operations, the proposed new passenger rail service, and improvements to the infrastructure which may affect future noise levels. Since noise impact is assessed based on a cumulative noise metric that takes into account the number of train events, increasing the number of trains even by one may increase future noise conditions. Infrastructure improvements that may affect noise levels include:

- Improving the track to allow higher train speeds;
- Relocating new track closer to sensitive receptors;
- Replacing jointed track with continuous-welded rail (CWR);
- Introducing new special track work (i.e., crossovers or turnouts) such as at track sidings; and
- Introducing new stations.

Higher train speeds generally cause higher noise levels. For passenger coaches and rail cars this is primarily due to the increase in wheel/rail rolling noise at higher train speeds. For some locomotive operating conditions (i.e., high throttle settings for diesel-powered trains), higher train speeds can result in lower cumulative noise levels. Under these conditions locomotives generate the same maximum noise level regardless of speed since the dominant noise source is the diesel prime mover engine. At higher speeds the locomotive will actually pass by sensitive receptors faster and the amount of time sensitive receptors are exposed to the noise will decrease.

Relocating tracks within an existing railroad ROW by a typical track separation (15 feet) would typically increase future noise levels substantially only if sensitive receptors are already relatively close (within 50 feet) to the existing tracks. For receptors that are farther away from the existing tracks, relocating the tracks has a less significant effect. If tracks are moved significantly closer, future noise conditions may substantially increase for some receptors and there is a potential for impact.

Noise levels from the trains depend on the track conditions. Trains generate more noise when operating on jointed track or over special track work because there are gaps in the rail running surface which the wheels encounter. The noise assessment methodology assumes that replacing any existing jointed track with CWR would help to reduce future noise conditions.

Introducing new track sidings may increase future noise conditions due to three factors:

- Tracks would potentially be relocated closer to receptors,
- Special track work would be introduced at one or both ends of the sidings, and
- There is the potential for locomotives to idle on the sidings while waiting for other trains to pass on the main line tracks.

In this analysis, only the potential increase in noise from the introduction of special track work for new track sidings has been considered. As more detailed information becomes available about the location of new track sidings and the number and duration of locomotives idling, a more detailed analysis should be conducted.

Introducing new stations would change future noise conditions and may cause potential noise impact. While passenger train speeds are reduced compared to main line speeds as the train approaches and departs the stations, the locomotives will typically idle at the station for approximately 3.5 minutes while passengers get on and off the train. Stations may also introduce new noise sources such as public announcement notifications and increased automobile traffic for parking facilities. These new noise sources are typically less significant than changes to the train operations.

Near existing at-grade crossings, noise levels are typically substantially higher than main line sections due to the train sounding its horn. This analysis does not consider closing any of the existing at-grade crossings. Since the project would increase the total number of train operations, future cumulative noise levels would increase near the at-grade crossings. As described in the next section, when existing noise levels are higher the FRA allows less increase in future noise. Therefore, there is a greater potential for noise impact near at-grade crossings than there is for main line sections. FRA regulates the use of locomotive horns so that they are not sounded before the train is 1/4-mile from an at-grade crossing and that they are sounded for 15 to 20 seconds. At low speeds (i.e., 20 mph), the train would not typically begin sounding its horn until it is approximately 1/8-mile from the crossing. Therefore, if train speeds are increased through at-grade crossings, the train may begin sounding its horn closer to the 1/4-mile location and future noise conditions in these areas could substantially increase.

Per FTA and FRA guidance, the future noise levels evaluated in this EA do not take into account potential changes in future freight train volumes, as such would not be due to the increased passenger rail service of the project.

Distances to potential noise impact (measured from the near track centerline) have been computed. These distances assume that existing and future noise conditions are dominated by train activity. At locations where other noise sources significantly contribute to existing levels, such as near major roads and urban areas, the potential for impact would be less. Based on the description of different operating conditions above and their effect on future noise conditions, the following conditions have been analyzed:

- Main lines where existing and future tracks are CWR;
- Main lines where existing track is jointed and would be upgraded to CWR;
- Receptors within 1/4-mile from at-grade crossings;
- Receptors within 1/8-mile from at-grade crossings;
- New passenger train station locations where existing track is jointed;
- New passenger train station locations where existing track is CWR;
- New special track work locations where existing track is jointed; and
- New special track work locations where existing track is CWR.

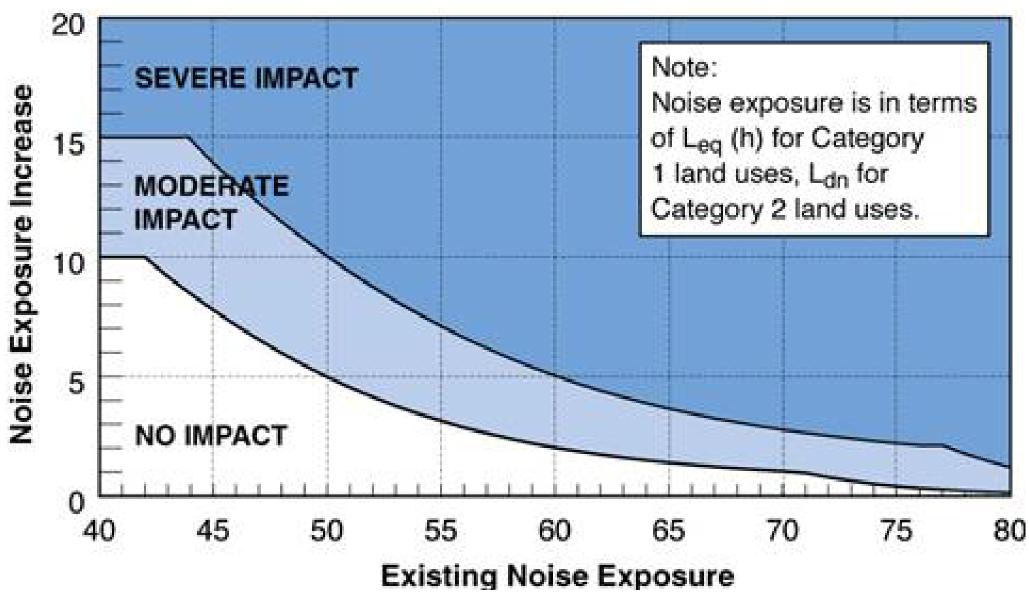
The FRA and FTA noise impact criteria are founded on well-documented research on community reaction to noise and are based on a comparison of existing and future noise levels. According to the FRA and FTA, noise-sensitive land uses are categorized as follows:

- **Category 1:** Tracts of land where quiet is an essential element of their intended purpose.
- **Category 2:** Places where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
- **Category 3:** Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches and parks with passive use.

Noise impact is assessed at receptors with nighttime sensitivity (Category 2) according to the Ldn. For other noise sensitive land uses, such as outdoor amphitheaters and institutional buildings (Categories 1 and 3), the hourly equivalent sound level (Leq) during the peak transit service while the facility is in operation is used to assess impact. There are two levels of noise impact included in the criteria:

- Severe Impact: project-generated noise in the severe impact range can be expected to cause a significant percentage of people to be highly annoyed by the new noise. Severe impacts represent the most compelling need for mitigation. Noise mitigation will normally be specified for severe impact areas unless there are truly extenuating circumstances that prevent it.
- Moderate Impact: In this range of noise impact, the change in the cumulative noise level is noticeable to most people but may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These factors include the existing noise level, the predicted level of increase over existing noise levels, the types and numbers of noise-sensitive land uses affected, the noise sensitivity of the properties, the effectiveness of the mitigation measures, community views and the cost of mitigating noise to more acceptable levels.

Figure 4-2 expresses the criteria in terms of the increase in total or cumulative noise that can occur in the overall noise environment before impact occurs. With higher existing noise levels, smaller increases in total future noise exposure are allowed.



Source: Federal Railroad Administration, October, 2006.

Figure 4-2 FRA Noise Impact Criteria

4.5.2 Existing Conditions

This section describes noise-sensitive land use and existing noise conditions for each of the segments.

Segment 1

There are residential and institutional land uses along Segment 1 in urban and suburban areas. The closest residential receptors are typically 80 to 500 feet from the tracks. Residential land use is scattered among commercial and industrial areas as the railroad enters Rotterdam, NY and becomes denser within the city. The railroad is adjacent to the New York State Thruway (I-90) as it nears Colonie, NY, where residential land use is generally more than 900 feet away. After crossing I-87 and entering Albany, NY, the corridor includes a mix of commercial and residential areas with the closest homes approximately 80 feet from the tracks. Outside areas of dense commercial and residential land use, the corridor extends through largely wooded and agricultural land use where the closest sensitive receptors are typically 1,000 feet or farther from the alignment.

Institutional receptors along Segment 1 include schools, theaters, and churches, such as the State University of New York – Schenectady campus, the State Bowtie Movie Cinemas, the Schenectady Light Opera Theater, the Proctor's Theater of Schenectady, KIPP Tech Valley School, and Livingston Jr. High School.

Existing noise levels along Segment 1 are dominated by existing freight and passenger rail service. This is one of the busier freight routes in the project study area with approximately six roundtrip freight operations per day. There are three at-grade crossings within this segment. Existing noise levels 100 feet from the railroad typically range from 75 Ldn/69 Leq where there is existing CWR to 80 Ldn/74 Leq near at-grade crossings.

Segment 2

Segment 2 passes through open space and commercial areas, and East Glenville, NY. The closest sensitive residential receptors are typically 120 to 300 feet from the tracks. Institutional receptors include schools and churches, such as the Success Recording Studios and Production and the Ellis Medicine School of Nursing.

Existing noise levels are dominated by freight and passenger rail service. This is one of the busier freight routes in the project study area, with approximately nine roundtrip freight operations per day. There are three at-grade crossings within this segment. Existing noise levels 100 feet from the alignment typically range from 74 Ldn/68 Leq where there is existing CWR to 79 Ldn/73 Leq near at-grade crossings.

Segment 3

Segment 3 passes through several cities and towns such as Ballston Lake, Ballston Spa, Saratoga Springs, Gansevoort, Fort Edward, and Fort Ann. The closest residential receptors are typically 20 to 200 feet from the tracks. Outside the more populated areas, the segment extends through largely wooded and agricultural land use where scattered homes are approximately 100 feet or farther away from the tracks. The segment includes institutional receptors such as schools, libraries and churches. Examples of these institutional land uses include the Maple Avenue Middle School and Saratoga Abundant Life Church.

Existing noise levels are dominated by freight and passenger rail service along this segment. This segment is one of the busier freight routes in the project study area with approximately six roundtrip freight operations per day. There are also approximately 50 at-grade crossings along this segment. Existing noise levels 100 feet from the alignment typically range from 71 Ldn/65 Leq where there is existing CWR to 77 Ldn/71 Leq near at-grade crossings.

Segment 4

Segment 4 passes through cities and towns such as Castleton, Hydeville, and Fair Haven. The closest sensitive residential receptors in this segment are typically 40 to 200 feet from the tracks. Outside areas of denser sensitive land use, the segment passes through wooded and agricultural areas where residences are scattered and as close as 75 feet from the tracks. Category 2 land use in this segment includes single family residences, multi-family residences and hotels. Category 3 land use includes institutional receptors such as schools, libraries, and churches. Examples of these institutional receptors include the Green Mountain Baptist Church in Rutland, VT, the Federated Church of Castleton and Whitehall Junior-Senior High School.

Existing noise levels are dominated by freight and passenger rail service along this segment, although freight operations are typically only two to three trains per week along this segment. There are approximately 40 at-grade crossings along this segment. Existing noise levels 100 feet from the alignment typically range from 61 Ldn/55 Leq where there is existing CWR to 69 Ldn/63 Leq near at-grade crossings.

Segment 6

Segment 6 passes through the towns of Ushers and Elnora, NY. The corridor is almost entirely wooded and farmland. The closest sensitive residential receptors in this corridor are a few properties in Elnora approximately 80 feet from the tracks and a few properties in Mechanicville approximately 100 feet away. Outside of these areas, the closest sensitive land use is typically 150 to 200 feet away in suburban areas and 400 to 650 feet away in wooded areas. Institutional land use in this corridor includes Corpus Christi Church in Ushers.

Existing noise levels are dominated by freight service. There is no existing passenger rail service. There are eight at-grade crossings along this segment. Existing noise levels 100 feet from the alignment typically range from 68 Ldn/62 Leq where there is existing CWR to 73 Ldn/67 Leq near the at-grade crossings.

Segment 7

Segment 7 passes through Johnsonville, Schaghticoke, and Valley Falls, NY where there are single family residences, multi-family residences, and hotels such as the Eagle Bridge Inn. The closest sensitive residential receptors in this area are typically 60 to 300 feet from the tracks, except in Mechanicville where some residences north of town are only 30 feet from the tracks. The corridor includes institutional receptors such as schools, libraries, daycares, and churches including Brenda Lynn's Daycare, Mechanicville Art School, and several churches.

Existing noise levels in this segment are dominated by freight service. This is one of the busier freight routes in the project study area with nine roundtrip freight operations per day. There is no existing passenger rail service. There are 17 at-grade crossings. Existing noise levels 100 feet from the railroad typically range from 73 Ldn/67 Leq where there is existing CWR to 78 Ldn/72 Leq near the at-grade crossings.

Segment 8

Segment 8 passes through Walloomsac and North Hoosick, NY, continuing on to North Bennington, VT. The corridor includes single family and multi-family residences with the closest sensitive receptors typically 50 to 250 feet from the tracks. As the railroad continues to North Hoosick, the surrounding land is wooded and largely agricultural with few residential neighborhoods. Residential and institutional land uses within this corridor include School Number 16 in Walloomsac, Hathaway's Drive-In Movie Theater in North Hoosick, and Southshire Community School in North Bennington.

Existing noise levels at receptors in close proximity to the railroad are dominated by freight service, although freight operations are typically only two to three per week along this segment. There is no existing passenger rail service. There are 11 at-grade crossings. Existing noise levels 100 feet from the tracks typically range from 56 Ldn/49 Leq near existing CWR to 63 Ldn/57 Leq near the at-grade crossings.

Segment 9

Segment 9 passes through Arlington and Shaftsbury, VT. The corridor includes single family residences, multi-family residences, and hotels. The closest sensitive residential receptors are approximately 50 feet from the tracks near the cities and 100 feet from the tracks where land use is less dense. Institutional land uses include several churches and schools such as the Martha Canfield Library and Happy Day's Preschool in Arlington, and the Shaftsbury United Methodist Church.

Existing noise levels at receptors in close proximity to the railroad are dominated by freight service, although freight operations in this segment are typically only two to three per week. There is no existing passenger rail service. There are 37 at-grade crossings. Existing noise levels 100 feet from the railroad typically range from 56 Ldn/49 Leq where there is existing CWR to 63 Ldn/57 Leq near the at-grade crossings.

Segment 10

Segment 10 passes though Wallingford, East Dorset, and Barnumville, VT. The closest sensitive residential receptors in this area are typically 50 to 200 feet from the tracks. Land use in Rutland Center is densely commercial and residential with the closest home approximately 50 feet away and scattered schools and churches 600 to 1,300 feet from the tracks. This corridor includes institutional receptors such as schools, libraries, and churches including Mill River Union High School in Rutland; Emerald Lake State Park near East Dorset, and the East Dorset Congregational Church.

Existing noise levels at receptors in close proximity to the railroad are dominated by freight service, although freight operations in this segment are typically only two to three per week. There is no existing passenger rail service. There are 78 at-grade crossings along this segment. Existing noise levels 100 feet from the railroad typically range from 56 Ldn/49 Leq where there is existing CWR to 63 Ldn/57 Leq near the at-grade crossings.

4.5.3 Environmental Consequences

This section describes potential noise impacts from the No-Build and Proposed Action Alternatives. General information on potential noise mitigation is provided, but specific mitigation has not been recommended. Distances to potential moderate and severe noise impact for each segment, each operating condition, and both Category 2 and Category 3 land uses are presented in Table 4-9.

4.5.3.1 No-Build Alternative

The No-Build Alternative would not increase noise at any location.

4.5.3.2 Proposed Action Alternative

Segment 1

Train speeds are not expected to increase in this segment. Depending on operating conditions, future noise levels would increase up to 3 dBA and may cause noise impacts (Table 4-9). For Category 2 land uses along main line sections, there would be no new noise impacts whether the existing tracks were jointed or CWR. Potential moderate noise impacts would occur near at-grade crossings at distances up to 139 feet from the near track due primarily to the increase in the number of trains. The greatest noise impacts would be associated with new special track work. There would potentially be moderate noise impacts up to 200 and 300 feet and severe noise impacts up to 46 and 200 feet from the near track where the existing tracks are jointed or CWR, respectively.

Segment 2

Freight and passenger train speeds are expected to increase from 50 mph to 55 mph. Depending on operating conditions, future noise levels would increase up to 3 dBA and may cause noise impacts (Table 4-9). For Category 2 land uses along main line sections, there would be no noise impacts if the existing tracks are jointed. Where existing tracks are CWR, there would be potential moderate noise impacts up to 108 feet and severe noise impacts up to 23 feet from the near track. Near at-grade crossings there would be potential moderate noise impacts at distances up to 191 feet and severe noise impacts up to 41 feet. Where new special track work would be introduced, there would be potential moderate noise impacts up to 200 and 300 feet and severe noise impacts up to 55 and 200 feet from the alignment where the existing tracks are jointed or CWR, respectively.

Segment 3

Passenger train service and train speeds are not expected to increase in this segment. There would be no noise impact to sensitive receptors.

Segment 4

Passenger train service and train speeds are not expected to increase in this segment. There would be no noise impact to sensitive receptors.

Segment 6

One new roundtrip daily passenger train service would be introduced in Segment 6. Train speeds are expected to be 40 mph for passenger service and remain at 40 mph for freight service. Since there would be no increase in freight train speeds, noise levels would not increase as much as other segments and the potential for noise impact is less. The noise levels are expected to increase up to 2 dBA and may cause noise impacts (Table 4-9). For Category 2 land uses along main line sections, there would be no noise impacts whether the existing tracks were jointed or CWR. Near at-grade crossings there would be potential moderate noise impacts at distances up to 139 feet and severe noise impacts up to 30 feet from the near track. Where new special track work would be introduced, there would be a potential for moderate noise impacts up to 59 feet if existing tracks are jointed. If existing tracks are CWR, there would potentially be moderate noise impacts up to 200 feet and severe noise impact up to 35 feet from the near track.

Table 4-9 Noise Impact Analysis Results

Operating Condition	Distance from Near Track to Potential Noise Impact (feet)																															
	Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3		Cat. 2		Cat. 3	
	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.	Mod.	Sev.
	Segment 1				Segment 2				Segment 3				Segment 4				Segment 5				Segment 6				Segment 7				Segment 8-10			
Mainline - Existing Jointed Track	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	188	23	--	--	--	--	--	--	--	--	--	--	100	--	--	--
Mainline - Existing CWR	--	--	--	--	108	23	--	--	--	--	--	--	--	--	--	--	549	58	26	--	--	--	--	--	--	--	--	--	147	26	--	--
Within 1/8-mile of at-grade crossing [1]	139	--	24	--	191	41	33	--	138	29	24	--	443	37	23	--	278	49	39	--	139	30	24	--	139	29	24	--	905	207	94	--
Between 1/4 and 1/8-mile of at-grade crossing [1]	112	--	--	--	171	36	29	--	112	24	--	--	24	23	--	--	313	44	35	--	111	23	--	--	112	--	--	--	740	164	76	--
New Station - Existing Jointed Track	--	--	--	--	--	--	--	--	--	--	--	--	26	--	--	--	194	24	20	--	--	--	--	--	--	--	--	--	209	49	27	--
New Station - Existing CWR	113	31	26	--	111	27	22	--	40	--	--	--	56	--	--	--	549	61	27	--	29	--	--	--	29	--	--	--	257	64	34	--
New Special Trackwork - Existing Jointed Track	200	46	37	--	200	55	44	--	88	--	--	--	39	--	--	--	300	177	76	--	59	--	--	--	110	23	--	--	200	49	22	--
New Special Trackwork - Existing CWR	300	200	134	--	300	200	104	--	200	50	34	--	148	--	--	--	549	200	137	--	200	35	21	--	200	61	43	--	200	66	30	--

[1] Distance to grade-crossing (e.g. 1/8 or 1/4-mile) is measured along tracks.

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Segment 7

One new roundtrip daily passenger train service would be introduced in Segment 7. Train speeds are expected to be 40 mph for passenger service and remain at 40 mph for freight service. The noise levels are expected to increase from 0 to 2 dBA, which may cause noise impacts (Table 4-9). For Category 2 land uses along main line sections, there would be no noise impacts whether the existing tracks were jointed or CWR. Near at-grade crossings there would be potential moderate noise impacts at distances up to 139 feet and severe noise impacts up to 29 feet from the near track. For the new Mechanicville Station, there would potentially be moderate noise impacts up to 29 feet if the existing tracks are CWR. Where new special track work would be introduced, there would be potential moderate noise impacts at distances up to 110 feet and 200 feet and severe noise impacts up to 23 feet and 61 feet, if existing tracks are jointed or CWR, respectively.

Segment 8

One new roundtrip daily passenger train service would be introduced in Segment 8. Train speeds are expected to be 60 mph for passenger service and increase from 25 mph to 40 mph for freight trains. Due to the low existing volume of trains, introducing one new train has a more of an effect than other segments. Future noise levels would increase up to 6 dBA, which may cause noise impacts (Table 4-9). For Category 2 land uses along main line sections with existing jointed track, the potential for moderate noise impacts would extend up to 100 feet from the near track. For main line sections with existing CWR, potential moderate and severe noise impacts would extend up to 147 and 26 feet, respectively. Near the at-grade crossings there would be potential moderate noise impacts at distances up to 905 feet and severe noise impacts up to 207 feet from the near track.

For the new North Bennington Station, there would potentially be moderate noise impacts up to 209 feet and 257 feet and severe impacts up to 49 feet and 64 feet where existing tracks are jointed or CWR, respectively. Where new special track work would be introduced, there would potentially be moderate noise impacts at distances up to 200 feet whether existing tracks were jointed or CWR. There would potentially be severe noise impacts up to 49 feet and 64 feet, if existing tracks are jointed or CWR, respectively. There is also the potential for moderate noise impact at Category 3 land uses for most operating conditions.

Segment 9

Existing and future freight and passenger train operations in Segment 9 are identical to Segment 8, as listed in Table 4-9. For the new Manchester Station, there would potentially be moderate noise impacts up to 209 feet and 257 feet and severe impacts up to 49 feet and 64 feet where existing tracks are jointed or CWR, respectively. Where new special track work would be introduced, there would potentially be moderate noise impacts at distances up to 200 feet whether existing tracks were jointed or CWR. There would potentially be severe noise impacts up to 49 feet and

64 feet, if existing tracks are jointed or CWR, respectively. There is also the potential for moderate noise impact at Category 3 land uses for most operating conditions.

Segment 10

Existing and future freight and passenger train operations in Segment 10 are identical to Segment 8, as listed in Table 4-9. No new stations are proposed for Segment 10.

4.5.3.3 Summary

Table 4-9 summarizes the noise assessment results. Potential moderate noise impacts typically extend out 100 to 200 feet from the near track. Potential severe noise impacts typically extend out less than 50 feet from the near track.

There is a potential for noise impact in Segments 6, 7, 8, 9, and 10. The potential for noise impacts is the greatest in Segments 8, 9, and 10; there would be a reduction of noise in Segment 6. Several segments would not have the potential for moderate or severe noise impacts along main line sections because there are no grade crossings, new special track work, or new stations.

Noise impacts would be mitigated in accordance with FTA guidance. Detailed analyses during a subsequent Phase 2 Study would identify specific locations for and types of noise mitigation measures. Noise mitigation would be considered depending on the need, feasibility, reasonableness, and effectiveness of potential options. In considering potential noise impact, severe impacts should be mitigated if at all practical. At the moderate impact level, more discretion should be used, and other project-specific factors should be included in considering mitigation. These factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-to-indoor sound insulation, and the cost-effectiveness of mitigating the noise.

To mitigate noise impact from train operations, noise control can be considered at the source, along the sound path, and at the receiver. Detailed recommendations for specific segments of the selected alternative would require additional evaluation. Typical noise mitigation measures are:

- Noise Barriers: Noise barrier construction is the most common path noise control treatment and can be very effective at reducing noise levels in the community. Noise barriers are effective generally when they are tall enough to break the line-of-sight from the sound source to the receiver.
- Relocation or Use of Engineered Special Track work: Wheels traveling over rail gaps at track crossovers or turn-outs increase noise and can be a significant factor causing potential noise impact when they are near sensitive receptors. Relocating special track work away from sensitive receptors can help to mitigation potential impact. Another approach is to use engineered special track work such as spring-

rail or moveable point frogs in place of standard rigid frogs at turnouts. These devices close the gaps in the rail running surface and minimize potential increases in noise.

- Building Sound Insulation: Sound insulation to improve the outdoor-to-indoor noise reduction has been widely applied around airports. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable, and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to the windows, by sealing any holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air-conditioning so that windows do not need to be opened.
- Wayside Horn/Quiet Zones: Implementing quiet zones or installing wayside horns can significantly reduce noise due to horn blowing in areas where there is a shared freight corridor.
- Property Acquisitions or Easements: Additional options for avoiding noise impacts are for the agency to purchase residences likely to be impacted by train operations or to acquire easements for such residences by paying the homeowners to accept the future train noise conditions. These approaches are usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly.

4.6 Vibration

Introducing new or additional passenger rail service and/or infrastructure improvements has the potential to increase vibration along the selected route. This section describes the existing vibration environment and the potential impacts from the project along each segment.

4.6.1 Methodology

The vibration impact assessment is based on the methodology defined in the FRA's *High-Speed Ground Transportation Noise and Vibration Impact Assessment* (October 2005) and in the FTA guidance manual *Transit Noise and Vibration Impact Assessment* (May 2006).

Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position that can be described in terms of displacement, velocity, or acceleration. Because sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range of most concern for environmental vibration (roughly 4 to 80 Hz), velocity is the preferred measure for evaluating ground-borne vibration from rail projects. Ground-borne vibration from rail systems is usually characterized in terms of the root mean square (rms) vibration velocity level, in vibration decibels (VdB), with a reference quantity of one micro-inch per second. VdB is used in place of dB to avoid confusing vibration decibels with sound decibels.

Ground-borne noise is produced when ground-borne vibration propagates into a room and radiates noise from the motion of the surfaces. Ground-borne noise is perceived as a low frequency rumble and is generally considered only when airborne paths are not present (e.g., train inside a tunnel or a large masonry building with no windows or other openings to the outdoors). As described below, there are separate criteria for potential impact from airborne noise versus ground-borne noise.

Potential vibration impact has been assessed by modeling existing and future conditions based on available data for passenger and freight train operations including improvements to the infrastructure which may affect future vibration levels. Vibration levels have been modeled based on the general assessment method used in the FRA and FTA guidance manuals. Future vibration levels can be affected by several factors:

- Trains generate higher vibration levels with higher speeds. Infrastructure improvements to the track that increase the maximum allowable speed would result in higher vibration levels.
- Trains generate more vibration when operating on jointed track or over special track work because there are gaps in the rail running surface which the wheels encounter. The project would replace any existing jointed track with CWR which would help to reduce future noise conditions.
- Constructing new track sidings may increase future vibration conditions because tracks could potentially be relocated closer to receptors and special track work would be introduced at one or both ends of the sidings.
- Constructing new stations would typically reduce future vibration conditions since passenger train speeds would be reduced compared to main line speeds as the train approaches and departs the stations.

Since the specific locations of existing jointed track, new track sidings, and new station locations have not been determined, distances of potential vibration impacts to sensitive receptor locations (measured from the near track centerline) have been computed. The following conditions have been analyzed:

- Main line sections;
- New passenger train station locations; and
- New special track work locations.

According to the FRA and FTA, vibration-sensitive land uses are:

- **Category 1:** Buildings where vibration would interfere with operations within the building, including levels that may be well below those associated with human annoyance. These may include vibration-sensitive equipment.
- **Category 2:** Places where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.

- **Category 3:** Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches and parks with passive use.
- **Special-use Buildings:** Concert halls, theatres and other special-use buildings have separate ground-borne vibration and ground-borne noise criteria. Due to the sensitivity of these buildings, they usually warrant special attention during the environmental assessment.

The FTA and FRA vibration and ground-borne noise impact criteria are based on land use and train frequency. Tables 4-10 and 4-11 present the ground-borne noise and vibration impact criteria for the three land use categories and special buildings, respectively.

Table 4-10 FTA Ground-borne Noise and Vibration Impact Criteria

	Ground-borne Vibration Impact Levels (VdB re 1 micro-inch/second)			Ground-borne Noise Impact Levels (dBA re 20 micro-pascals)		
Land Use Category	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1	65 VdB[4]	65 VdB[4]	65 VdB[4]	n/a[5]	n/a[5]	n/a[5]
Category 2	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Source: FTA, 2006.
1 "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2 "Occasional Events" is defined as between 30 and 70 vibration events of the same kind per day. Most commuter rail trunk lines have this many operations.
3 "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
5 Vibration-sensitive equipment is generally not sensitive to ground-borne noise.

Table 4-11 FTA Ground-borne Noise and Vibration Impact Criteria for Special Buildings

	Ground-borne Vibration Impact Levels (VdB re 1 micro-inch/second)		Ground-borne Noise Impact Levels (dBA re 20 micro-pascals)	
Type of Building or Room[3]	Frequent Events[1]	Occasional or Infrequent Events[2]	Frequent Events[1]	Occasional or Infrequent Events[2]
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theatres	72 VdB	80 VdB	35 dBA	43 dBA

Source: FTA, 2006.
1 "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2 "Occasional or Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail lines.
3 If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

For projects in existing railroad ROWs, where receptors may already be exposed to vibration, the applicable vibration criteria also depend on the existing number of trains per day:

- For infrequently used rail corridors (less than five trains per day), potential impact is assessed by comparing vibration levels from the project to the FRA criteria regardless of existing vibration levels. Segments 4, 6, 8, 9, and 10 are infrequently used segments.
- For moderately used rail corridors (five to 12 trains per day), there would be no impact if the project vibration levels are lower than the existing levels by 5 VdB or more. Otherwise, potential impact is assessed by comparing vibration levels from the project to the FRA criteria. None of the segments for the project are moderately used.
- For heavily used rail corridors (more than 12 trains per day), the project will cause additional impact if the project significantly increases the number of vibration events (e.g., doubles the number of trains). If there is not a significant increase in vibration events, there will be additional impact only if the project vibration will be 3 VdB or higher than existing vibration. Segments 1, 2, 3, and 7 are heavily used segments.

For this project, where the number of vibration events are less than 30 per day (infrequent events), the vibration criterion is 80 VdB for Category 2 land uses and 83 VdB for Category 3 land uses for Segments 4, 6, 8, 9, and 10. For Segments 1, 2, 3, and 7, future vibration levels would occur if vibration levels are above 80 VdB for Category 2 and 83 VdB for Category 3 land uses and also if vibration levels would increase 3 VdB of more.

4.6.2 Existing Conditions

This section describes existing vibration conditions for each of the segments. Although there could be land uses that are sensitive to vibration that are not sensitive to noise (i.e., research institutes with vibration-sensitive equipment), no such land uses were identified in the project study area. Similarly, there are outdoor noise-sensitive land uses (i.e., parks or cemeteries) which are not sensitive to vibration. Therefore, existing vibration-sensitive land uses in each segment are as described in the Section 4.3.3.2, *Noise*.

Segments 1, 2, 3, and 7 are considered heavily used rail corridors because there are currently more than 12 passenger and/or freight trains operating daily. Segments 4, 6, 8, 9, and 10 are considered infrequently used rail corridors because there are currently fewer than five passenger and/or freight trains operating daily.

4.6.3 Environmental Consequences

This section describes potential vibration impacts for each of the segments. Distances to potential vibration impact for each segment, each operating condition, and both Category 2 and Category 3 land uses, are presented in Table 4-12.

Table 4-12 Distance to Potential Vibration Impact (ft)

	Segments													
	1		2		3		4		6		7		8-10	
	Land Use Category													
Project Element	2	3	2	3	2	3	2	3	2	3	2	3	2	3
Main line							94	66	86	60			86	60
New Station											29	20	29	20
New Special Track work	200	183	157	110	172	120	200	183	172	120	157	110	172	120

Note: Blank = No vibration impact.

4.6.3.1 No-Build Alternative

The No-Build Alternative would not increase vibration.

4.6.3.2 Proposed Action Alternative

Segment 1

Train speeds are not expected to increase in Segment 1. No increases in future vibration levels would occur on main line sections and there would be no impact. At locations where new special track work is introduced, future vibration levels would increase more than 3 VdB (Table 4-12). There is a potential for potential vibration impacts up to 200 feet from the near track (where vibration levels would exceed 80 VdB) for Category 2 land uses and up to 183 feet from the near track (where vibration levels would exceed 83 VdB) for Category 3 land uses.

Segment 2

Although train speeds would increase from 50 mph to 55 mph in Segment 2, increases in vibration levels would be less than 3 VdB and there would be no impacts along main line sections (Table 4-12). At locations where new special track work is introduced, future vibration levels would increase more than 3 VdB and there would potential be vibration impacts up to 157 feet from the near track for Category 2 land uses and up to 110 feet from the near track for Category 3 land uses.

Segment 3

There are currently more than 12 passenger and freight trains operating along this segment, so it is considered a heavily used corridor. Maximum allowable train speeds are not expected to increase in this segment, remaining at 40 mph for freight service and 60 mph for passenger service. No increases in future vibration levels would occur on mainline segments and there would be no impact. At locations where new special trackwork is introduced, future vibration levels would increase more than 3 VdB and there would potential vibration impact up to 172 feet from the near track for Category 2 land uses and up to 120 feet from the near track for Category 3 land uses.

Segment 4

There are currently less than five passenger and freight trains operating along this segment, so it is considered to be an infrequently used rail corridor. Introducing additional vibration events may cause impact if they exceed the vibration criteria. Maximum train speeds are not expected to increase in this segment, remaining at 40 mph for freight service and 60 mph for passenger service. For mainline sections, there would be potential vibration impact up to 94 feet from the near track for Category 2 land uses and up to 66 feet for Category 3 land uses. At locations where new special trackwork is introduced, future vibration levels would increase and there would potential vibration impact up to 200 feet from the near track for Category 2 land uses and up to 183 feet from the near track for Category 3 land uses.

Segment 6

Train speeds are expected to be 40 mph for passenger service and remain 40 mph for freight service in Segment 6. For main line sections, there would potentially be vibration impacts up to 86 feet from the near track for Category 2 land uses and up to 60 feet for Category 3 land uses (Table 4-12). At locations where new special track work is introduced, future vibration levels would increase and there would potentially be vibration impacts up to 172 feet from the near track for Category 2 land uses and up to 120 feet from the near track for Category 3 land uses.

Segment 7

Train speeds are expected to be 40 mph for passenger service and remain 40 mph for freight service in Segment 7. No increases in future vibration levels would occur on main line sections or at new station locations and there would be no impact (Table 4-12). At locations where new special track work is introduced, future vibration levels would increase more than 3 VdB and there would potentially be vibration impacts up to 157 feet from the near track for Category 2 land uses and up to 110 feet from the near track for Category 3 land uses.

Segment 8

Train speeds are expected to be 60 mph for passenger service and increase from 25 mph to 40 mph for freight trains in Segment 8. For main line sections, there would potentially be vibration impacts up to 86 feet from the near track for Category 2 land uses and up to 60 feet for Category 3 land uses (Table 4-12). At new station locations where train speeds are lower than main line sections, there would potentially be vibration impacts up to 29 feet from the near track for Category 2 land uses and up to 20 feet for Category 3 land uses. At locations where new special track work is introduced, future vibration levels would increase and there would potentially be vibration impacts up to 172 feet from the near track for Category 2 land uses and up to 120 feet from the near track for Category 3 land uses.

Segment 9

Future freight and passenger train operations and vibration impacts in Segment 9 are identical to Segment 8 (Table 4-12).

Segment 10

Future freight and passenger train operations and vibration impacts in Segment 10 are identical to Segment 8 (Table 4-12).

4.6.3.3 Summary

Table 4-12 summarizes the vibration assessment results. The analysis indicates there is a potential for vibration impacts in all segments. For mainline sections, there would be potential vibration impact up to 94 feet from the near track for Category 2 land uses and up to 66 feet for Category 3 land uses. At new station locations there may be vibration impacts up to 20 feet from the near track for Category 2 land uses and up to 29 feet from the near track for Category 3 land uses. At locations where new special track work is introduced, vibration impacts may extend up to 200 feet from the near track for Category 2 land uses and up to 183 feet for Category 3 land uses.

Vibration impacts would be mitigated in accordance with FTA guidance. Detailed analyses during a subsequent Project Level analysis would identify specific locations for and types of vibration mitigation measures. The purpose of vibration mitigation is to minimize adverse effects from the project at sensitive locations. The effectiveness of specific vibration mitigation measures is dependent on several factors such as the component design, installation techniques, axle loads of the trains, and frequencies of concern. Detailed recommendations for specific segments of the corridor would require additional evaluation. Typical noise mitigation measures are:

- Resilient rail fasteners that are specially designed fasteners between the rails and the ties.

- Ballast mats that are rubber or other elastomer pads placed in the trackform between the ballast and the sub-grade or ground.
- Resiliently supported ties that have a rubber or other resilient material placed between the ties and the ballast.
- Tire-derived aggregate, also known as shredded tires, that can be layered under the sub-ballast to reduced vibration levels.
- Floating slab trackforms that consist of a concrete slab supported on resilient elements such as rubber or elastomer pads.
- Special hardware (e.g., spring-rail or moveable-point frogs in place of standard rigid frogs) for special track work such as turnouts and crossovers.
- Relocating special track work away from sensitive areas and using CWR rather than jointed rail.

Maintenance programs can also be essential for controlling vibration. Maintaining a proper wheel/rail profile, minimizing the number and extent of wheel flats and minimizing potential rail corrugation are important factors. Rail grinding, truing wheels and monitoring wheel/rail profiles can be effective means of reducing potential vibration impact.

4.7 Water Resources

Many water resources within the project study area are crossed by the existing rail line. Because this is a Service Level study, current designs do not include detailed plans on modifications to existing stream and river crossings to upgrade the existing main line track or construct new sidings. Bridges rated as “poor” in Segments 8 and 9 would be reconstructed.

This section describes the surface water and groundwater resources in proximity to the rail segments. Once the design has advanced to identify upgraded or new crossing locations, surface water resources would be delineated prior to or concurrently with the design phase, in order to design the crossing to avoid and/or minimize impacts to regulated surface water bodies. If it is determined that impacts to waters are unavoidable, authorization for unavoidable impacts would be sought from the appropriate federal and state agencies, including the US Army Corps of Engineers (USACE) (under Section 404 of the Clean Water Act) and the New York State Department of Environmental Conservation (NYSDEC) or the Vermont Department of Environmental Conservation (VTDEC) through the joint permit application process.

In New York, stormwater runoff from construction sites would require compliance with the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity. A Stormwater Pollution Prevention Plan consistent with the New York Standards and Specifications for Erosion and Sediment Control would be developed once the project design identifies specific rail improvements. In Vermont, stormwater runoff from construction sites would require compliance with the VTDEC General Permit for Stormwater Discharges

Associated with Construction Activities. Other impacts to surface waters in Vermont are regulated by the VTDEC Water Quality Division River Management Section.

4.7.1 Methodology

Information regarding the streams, lakes, pond, and well head protection areas (groundwater supply sources) was provided by state agencies. Surface water and groundwater resources were reviewed using digital mapping information of hydrography provided by the Vermont Center for Geographic Information (VCGI) and the New York State GIS Data Clearinghouse. Surface water resources within 250 feet of the rail ROW were identified. The total number of features within the project study area is provided, as well as stream names when available. Existing stream or river crossings were identified for each segment. Groundwater resource mapping was only available for Segments 9 and 10, and the Vermont portion of Segment 8.

4.7.2 Existing Conditions

The project study area contains several dozen named streams and rivers and over 100 other mapped stream crossings.

Segment 1

The majority of Segment 1 is located in heavily developed downtown areas. Water resources crossed by Segment 1 are the Hudson River, Sand Creek, Lisha Kill, and an unnamed stream (crossed twice). Adjacent water resources (within 250 feet) include Patroons Creek and Rensselaer Lake. None of the surface water resources near Segment 1 are designated Wild, Scenic, or Recreational rivers. Two surface water bodies near Segment 1 are identified as impaired waters under Section 303d of the Clean Water Act, the Lower Hudson River and Patroon Creek.

Segment 2

Water resources crossed by Segment 2 are the Mohawk River and two unnamed tributaries, and Alplaus Kill and one unnamed tributary. Two other unnamed tributaries to Alplaus Kill are adjacent to this segment. None of the surface water resources near Segment 2 are designated Wild, Scenic, or Recreational rivers, and none are identified as impaired waters.

Segment 3

Water resources crossed by Segment 3 are three unnamed tributaries to Ballston Lake, Mourning Kill and four unnamed tributaries, Kayaderosseras Creek, Geyser Brook, Putnam Brook, an unnamed tributary to Loughberry Lake, Delegan Brook, Rice Brook, Snook Kill, North Branch, the Hudson River, the Old Champlain Canal and six tributaries, and Halfway Creek. None of the surface water resources near

Segment 3 are designated Wild, Scenic, or Recreational rivers, and none are identified as impaired waters.

Segment 4

Four community water supply wells are in close proximity to Segment 4 and their source protection zones extend into the rail ROW. Water resources crossed by Segment 4 are the Old Champlain Canal, the Mettawee River, Mud Brook and four tributaries, the Poultney River, the Castleton River and an unnamed tributary, Pond Hill Brook, the Clarendon River, Otter Creek, and East Creek. One water resource is within 250 feet of Segment 4: North Breton Brook flows adjacent to the rail line. None of the surface water resources near Segment 4 are designated Wild, Scenic, or Recreational. One surface water body near Segment 4 is an impaired water: Otter Creek.

Segment 6

Water resources crossed by Segment 6 are two unnamed tributaries to the Alplaus Kill, Cooley Kill and an unnamed tributary, Long Kill, and Dwaas Kill and two unnamed tributaries. Anthony Kill is adjacent to this segment. None of the surface water resources near Segment 6 are designated Wild, Scenic, or Recreational rivers. Four surface water bodies near Segment 6 are identified as impaired: Dwaas Kill and tributaries, Lower Hoosic River Main Stem Portion 1, Middle Hoosic River Main Stem Portion 2; and Middle Hoosic River Main Stem Portion 3.

Segment 7

Water resources crossed by Segment 7 are Anthony Kill, the Hudson River and four unnamed tributaries, Tomhannock Creek and two unnamed tributaries, Hoosic River and six unnamed tributaries, Electric Lake, Nipmoose Brook, and Case Brook. Two surface water resources are adjacent to Segment 7, Pine Lake and Golden Pond. None of the surface water resources near Segment 7 are designated Wild, Scenic, or Recreational rivers, and none are identified as impaired.

Segment 8

Water resources crossed by Segment 8 are the Walloomsac River and an unnamed tributary, and Cold Spring Brook. None of the surface water resources near Segment 8 are designated Wild, Scenic, or Recreational rivers, and none are identified as impaired.

Segment 9

Two community water supply wells and one non-transient non-community water supply well are proximate to Segment 9 and the source protection areas extend into the rail ROW. Water resources crossed by Segment 9 are Cold Spring Brook, Paran Creek, Warm Brook, Mill Brook, Batten Kill, Lye Brook, and Bourn Brook. Two surface water bodies are adjacent to Segment 9, Lake Shaftsbury and Dry Brook.

None of the surface water resources near Segment 9 are designated Wild, Scenic, or Recreational rivers, and none are identified as impaired.

Segment 10

There are two groundwater wells near Segment 10, and their well head protection areas extend into the rail ROW. Surface water resources crossed by Segment 10 are the Batten Kill River, Dufresne Pond, Otter Creek, Gulf Brook, Mill Brook, Homer-Stone Brook, Roaring Brook, Mill River, Cold River, Mussey Brook, and Moon Brook. Emerald Lake is adjacent to this segment. None of the surface water resources near Segment 10 are designated Wild, Scenic, or Recreational rivers. One surface water body near Segment 10, Moon Brook, is identified as impaired. The Roaring Brook watershed is a public water supply where it crosses the Segment 10 rail ROW.

4.7.3 Environmental Consequences

Impacts to surface water and groundwater resources were only considered for those areas where project actions could have a direct impact through alteration of drainage patterns or could cause discharges to water resources. The project is not expected to increase the impervious area footprint or alter the terrain in a significant manner; no indirect impacts to water quality are expected.

Rail improvements may require that certain segments of track and their associated culvert and bridge crossing(s) be modified. Crossings with potential upgrades will need to be evaluated on case-by-case basis and, at a minimum, the work will need to comply with all state and/or federal permit requirements and recommendations regarding hydraulic capacity, aquatic organism passage, and water quality.

Potential impacts to water resources within each segment are summarized below.

4.7.3.1 No-Build Alternative

The No-Build Alternative would have no new impacts to water quality.

4.7.3.2 Proposed Action Alternative

Overall, no significant impacts to water resources are anticipated because work would be limited to upgrading or reconstructing existing stream crossings. No new stormwater discharges to surface water bodies or groundwater are anticipated because the existing rail lines would be used.

Segment 1

The potential for impacts to surface water or groundwater resources along Segment 1 is negligible. No infrastructure improvements are planned for Segment 1.

Segment 2

The potential for impacts to groundwater resources along Segment 2 is negligible. Infrastructure improvements in this segment would consist of constructing 2 miles of new siding track within the existing ROW; upgrading the crossings to accommodate the new siding would not permanently impact surface water resources.

Segment 3

The potential for impacts to surface water or groundwater resources along Segment 3 is negligible. No infrastructure improvements are planned for Segment 3.

Segment 4

The potential for impacts to surface water or groundwater resources along Segment 4 is negligible. No infrastructure improvements are planned for Segment 4.

Segment 6

The potential for impacts to groundwater resources along Segment 6 is negligible. Infrastructure improvements in this segment would consist of constructing 6 miles of new siding within the existing ROW; upgrading the crossings to accommodate the new siding would not permanently impact surface water resources. No new crossings are planned.

Segment 7

The potential for impacts to groundwater resources along Segment 7 is negligible. Infrastructure improvements in this segment would consist of constructing a second main line track and a new station in Mechanicville; upgrading the crossings to accommodate the track would not permanently impact surface water resources.

Segment 8

The potential for impacts to groundwater resources along Segment 8 is negligible. Infrastructure improvements in this segment would consist of upgrading the main line track, reconstructing all bridges rated "poor," and constructing a new station in North Bennington, all within the existing ROW. Upgrading the crossings to accommodate the infrastructure improvements and reconstructing bridges would not permanently impact surface water resources.

Segment 9

The potential for impacts to groundwater resources along Segment 9 is negligible. Infrastructure improvements in this segment would consist of main line track upgrades, reconstruction of all bridges rated "poor," and constructing a new station in Manchester, all within the existing ROW. Upgrading the crossings to accommodate the new infrastructure and reconstructing bridges would not permanently impact surface water resources.

Segment 10

The potential for impacts to groundwater resources along Segment 10 is negligible. Infrastructure improvements in this segment would consist of upgrading the main line track; upgrading the crossings to accommodate the new track would not permanently impact surface water resources.

4.7.3.3 Summary

Numerous surface water bodies are crossed by or adjacent to the rail ROW in each segment. Table 4-13 summarizes the number of surface water and groundwater resources along each segment. There is a negligible potential for impacts to surface water or groundwater resources in any of the segments: either no infrastructure improvements are planned or the planned infrastructure improvements would be within the existing ROW and would not permanently impact the resources.

Table 4-13 Summary of Surface Water and Groundwater Resources

Segment	Surface Water Bodies			
Number	Crossed by Rail	Adjacent to ROW	Impaired	Groundwater Wells[1]
1	4	2	2	0
2	5	2	0	0
3	25	0	0	0
4	14	1	1	4
6	8	1	4	0
7	19	2	0	0
8	3	0	0	0
9	7	2	0	2
10	11	1	1	2

1 Including wellhead protection areas.

4.8 Wetlands

Wetlands are critical environmental resources that perform functions such as wildlife habitat, flood attenuation, groundwater recharge and discharge, and others. Wetlands are regulated by the USACE (New England District in Vermont and New York District in the eastern portion of New York) through the Clean Water Act Section 404 permit process. In New York, the NYSDEC Freshwater Wetlands Program regulates wetlands. In Vermont, the VTDEC Wetlands Section regulates impacts to significant wetlands and their buffer zones.

Executive Order 11990, *Protection of Wetlands* (May 24, 1977, 42 FR 26961), establishes a federal policy to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

4.8.1 Methodology

Wetland features along each segment within 250 feet of the rail centerline were identified by using Vermont State Wetland Inventory (VSWI, 2010) from VTANR and NYSDEC wetlands map (2010) data, as well as National Wetlands Inventory (NWI) data.

4.8.2 Existing Conditions

The wetland analyses identified several hundred wetland features that are in proximity to the study corridor. Wetland resources for each segment are provided summarized below.

Segment 1

There are 64 potential wetland features identified on the NWI or by the NYSDEC, adjacent to or extending into approximately 4 miles of Segment 1. These wetlands are generally small with the exception of a large wetland complex associated with the Lisha Kill, adjacent to the rail ROW in Colonie, Rotterdam, and Schenectady, NY.

Segment 2

There are 50 potential wetland features identified on the NWI or by the NYEC, adjacent to or extending into approximately 5 miles of Segment 2. These potential wetlands are associated with the Alplaus Kill in Glenville and Clifton Park, NY and the Mohawk River on the Schenectady-Glenville town line. Portions of the Mohawk River are listed as a lake wetland due to impoundments.

Segment 3

There are 213 potential wetland features identified on the NWI or by the NYS DEC, adjacent to or extending into approximately 40 miles of Segment 3. Wetlands in this section are associated with Ballston Lake in Ballston, Kayaderosseras Creek north of the Village of Ballston Spa in Milton, Geyser Creek in Saratoga Springs, Putnam Brook in Saratoga Springs and Greenfield, a tributary to Loughberry Lake in Milton, Delegan Brook in Milton, Rice Brook in Northumberland, Snook Kill in Northumberland, the North Branch in Moreau, the Hudson River on the Moreau-Fort Edward town line, and the Old Champlain Canal in the towns of Fort Edward, Kingsbury, Fort Ann, and Whitehall.

Segment 4

There are 85 potential wetland features identified on the NWI or VSWI, adjacent to or extending into approximately 16 miles of Segment 4. Key wetlands are associated with the Mettawee River, Mud Brook and the Old Champlain Canal in Whitehall, NY. A large complex of wetlands associated with the Castleton River is in close proximity to the railroad through the towns of Fair Haven, Castleton, Ira, and West Rutland, VT.

Segment 6

There are 69 potential wetland features identified on the NWI or by the NYSDEC, adjacent to or extending into approximately 9.5 miles of Segment 6. A large wetland complex is adjacent to the ROW for about 2.5 miles from Ashdown Road to Tanner Road in Clifton Park, NY. The Anthony Kill wetland complex also is adjacent to the ROW for approximately 2.5 miles in Halfmoon, Stillwater, and Mechanicville, NY.

Segment 7

There are 99 potential wetland features identified on the NWI or by the NYSDEC, adjacent to or extending into approximately 20 miles of Segment 7. The Anthony Kill wetland is crossed in Mechanicville, NY at the location of the proposed new wye associated with Segment 5. In Stillwater, approximately 1 mile of the ROW is adjacent to or within wetlands that are associated with the Hudson River and its floodplain. There are some isolated wetland features along the ROW just west of Schaghticoke, including a wetland associated with Tomhannock Creek that is crossed by the rail line. A wetland system that incorporates Electric Lake and the Hoosic River follows the ROW from Schaghticoke east for 3.5 miles. In Pittstown, there is small wetland on Pine Lake and a larger complex along 1.2 miles of the ROW just west of East Buskirk. Two smaller wetland systems associated with Golden Pond and Case Brook in Hoosick are within 0.35 and 0.4 miles, respectively, of the ROW. The Hoosic River wetland complex also parallels about 1.3 miles of the ROW in Hoosick.

Segment 8

There are 19 wetland features identified on the NWI, by the NYSDEC or the VSWI, adjacent to or extending into approximately 4.5 miles of Segment 8. The Walloomsac River wetland complex is crossed by the rail line three times in Hoosick, NY. One isolated wetland and two wetlands associated with a tributary to the Walloomsac River are located in Shaftsbury, VT.

Segment 9

There are 40 Class II wetlands adjacent to or extending into approximately 14 miles of Segment 9. There are 17 Class II wetlands in Shaftsbury, nine in Arlington, two in Sunderland, and 12 in Manchester, VT. In Shaftsbury and south of Arlington, the wetlands are primarily associated with small drainages and valley bottom features. Starting in North Arlington, through Sunderland and Manchester many of the wetland features are riverine and associated with Batten Kill.

Segment 10

There are 96 Class II wetlands adjacent to or extending into approximately 18 miles of Segment 10. There are six Class II wetlands in Manchester, 13 in Dorset, six in Danby, nine in Mount Tabor, 24 in Wallingford, 25 in Clarendon, eight in the Town of Rutland, and five in Rutland City, VT. In Manchester and south Dorset, the wetlands are primarily associated with the Batten Kill. From north Dorset to Rutland City, the wetlands are primarily associated with Otter Creek.

4.8.3 Environmental Consequences

Potential impacts to wetlands from the No-Build and the Proposed Action Alternatives are described below.

4.8.3.1 No-Build Alternative

The No-Build Alternative would have no effect on wetlands.

4.8.3.2 Proposed Action Alternative

Wetlands extending into or adjacent to Segments 1, 3, and 4 are unlikely to be impacted by the project as no infrastructure improvements are planned. Wetlands extending into or adjacent to Segments 2, 6, 7, 8, 9, and 10 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

4.8.3.3 Summary

Numerous potential wetland features have been mapped which are crossed by the rail line or adjacent to the ROW in each segment. Table 4-14 summarizes the number and adjoining length of wetlands present along each segment.

Table 4-14 Summary of Wetlands, by Segment

Segment Number	Adjacent Wetlands	
	Number	Adjoining Length (miles)
1	64	4
2	50	5
3	213	40
4	85	16
6	69	9.5
7	99	20
8	19	4.5
9	40	14
10	96	18

At the current level of design, no permanent impacts to wetlands would be required for the Proposed Action Alternative. Potential impacts to wetland resources will be evaluated once the design identifies specific rail improvements. If it is determined that impacts from constructing new or modifying existing wetland crossings are unavoidable, authorization for unavoidable impacts would be sought from the appropriate Federal and state agencies, including the USACE (under Section 404 of the Clean Water Act), the NYSDEC (under the Freshwater Wetlands Program), or the VTDEC Water Quality Division Wetland Section under the Vermont State Wetland Permit Program (pursuant to 10 V.S.A. § 6025(d)(5)).

At the current level of design, the project would be in compliance with EO 11990, *Protection of Wetlands*. Detailed evaluations would be required to specifically identify impacts and compliance with this EO during final design.

4.9 Floodplains

Floodplain areas are zones adjacent to streams, rivers, lakes, or other surface waters that are periodically inundated, usually as a result of large precipitation events. Development within floodplains may be at risk due to possible inundation and also endangers downstream areas by reducing flood storage capacity.

Executive Order 11988, *Floodplain Management* (May 24, 1977; 42 FR 26951), requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

The Federal Emergency Management Agency (FEMA) currently maintains floodplain mapping and possible changes to mapping in Letters of Map Amendment or Letters of Map Change. New York and Vermont both have cooperative agreements with FEMA to review floodplain impacts and request additional information such as elevation survey and hydraulic calculations.

4.9.1 Methodology

The floodplain assessment utilized FEMA GIS data provided by VCGI (2010) and NYS GDC (2010) was overlain on base mapping containing the railroad segments. Digital flood map data were not available for all portions of all segments and the analysis extent is indicated where coverage was incomplete.

4.9.2 Existing Conditions

The segments are within or adjacent to several mapped 100-year and 500-year floodplains. In some cases the railroad bed is a topographic divide between two areas mapped as floodplains. Floodplains within or adjacent to the rail ROW are summarized below for each segment.

Segment 1

Flood data were available for Rensselaer, Albany, Colonie, and Guilderland, NY but were not available for Rotterdam or Schenectady, NY. Segment 1 is within or adjacent to 100- or 500-year floodplains associated with the Hudson River in Albany and Rensselaer, Tivoli Lake and Patroons Creek in Albany, Sand Creek in Colonie, Rensselaer Lake in Guilderland, and Lisha Kill in Colonie.

Segment 2

Flood data were available for Clifton Park but were not available for Glenville or Schenectady, NY. Segment 2 is within or adjacent to the Alplaus Kill 100-year floodplain in Clifton Park.

Segment 3

Flood data were available for Ballston, Milton, Saratoga Springs, Northumberland, and Moreau, but were not available for Greenfield, Wilton, Fort Edward, Kingsbury, Fort Ann, or Whitehall. Segment 3is within or is adjacent to the Ballston Lake 100-year floodplain and the 500-year floodplain in Ballston, the Mourning Kill 100-year floodplain in Ballston,the Kayaderosseras Creek 100-year floodplain in Milton, the Slade Creek and Geyser Brook 100-year floodplain in Saratoga Springs, the Putnam Brook 100-year floodplain in Saratoga Springs, the Snook Kill 100-year floodplain in Northumberland, the 500-year floodplain of an unnamed tributary to the North Branch of the Snook Kill in Moreau, the 100-year floodplain of the North Branch of the Snook Kill in Moreau; and the 100-year floodplain of the Hudson River in Moreau.

Segment 4

Flood data were available for Fair Haven, Castleton, Ira, Rutland, and Rutland City, VT but were not available for Whitehall or Hampton, NY or for West Rutland, VT. Segment 4 is within or adjacent to the 100-year floodplain of the Poultney River in Fair Haven; the 100-year floodplain of the Castleton River in Fair Haven; the 100-year floodplain of Lake Bomoseen in Castleton; the 100-year floodplain of the Castleton River in Castleton, Ira, and West Rutland; the 100-year floodplain of the Clarendon River in West Rutland; the 100-year floodplain of the Otter Creek in West Rutland; and the 100-year floodplain of East Creek in Rutland City.

Segment 6

Flood data were available for Clifton Park, Halfmoon, and Mechanicville, NY. Segment 6 is within or adjacent to the 100- or 500-year floodplains associated with Cooley Kill and Long Kill in Clifton Park; Dwaas Kill and Anthony Kill in Halfmoon; and Anthony Kill in Mechanicville.

Segment 7

Flood data were available for Mechanicville, Stillwater, Schaghticoke, Pittstown, and Hoosick, NY. Segment 7 is within or adjacent to the 100- or 500-year floodplains associated with Anthony Kill in Mechanicville; the Hudson River between Stillwater and Schaghticoke; Tomhannock Creek in Schaghticoke; the Hoosick River and Electric Lake in Schaghticoke; the Hoosick River in Pittstown; and the Hoosick River in Hoosick.

Segment 8

Flood data were available for Hoosick, NY, and were not available for the towns of Shaftsbury or Bennington, VT. Segment 8 is within or adjacent to the Hoosick River 100-year floodplain in Hoosick.

Segment 9

There was no digital flood data available for Bennington, Shaftsbury, Arlington, Sunderland, or Manchester, VT. Additional review of non-digital FEMA maps for this area would be conducted to determine the presence of floodplain resources within Segment 9.

Segment 10

Flood data were available for Danby, Mount Tabor (partial), Wallingford, Clarendon, Rutland, and Rutland City but were not available for Manchester or Dorset, VT. Segment 10 is within or adjacent to the 100- or 500-year floodplains associated with Mill Brook in Danby; Otter Creek between Danby and Mount Tabor; Otter Creek and an unnamed tributary, Homer Stone Brook, and Roaring Brook in Wallingford; Otter Creek and an unnamed tributary, Mill River, and the Cold River in Clarendon; and Mussey Brook and Moon Brook in Rutland City.

4.9.3 Environmental Consequences

Potential impacts to floodplains from the No-Build and the Proposed Action Alternatives are described below.

4.9.3.1 No-Build Alternative

The No-Build Alternative would have no effect on floodplains.

4.9.3.2 Proposed Action Alternative

The current level of design does not indicate that modifying existing crossings or reconstructing the existing railbed would impact floodplains. New rail construction or existing rail modification would be within the existing rail ROW and unlikely to impact adjacent floodplains.

Segment 1

Floodplains crossed by or adjacent to the railroad in Segment 1 are unlikely to be impacted by the project because no infrastructure improvements are proposed.

Segment 2

Floodplains crossed by or adjacent to the railroad in Segment 2 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

Segment 3

Floodplains crossed by or adjacent to the railroad in Segment 3 are unlikely to be impacted by the project because no infrastructure improvements are proposed.

Segment 4

Floodplains crossed by or adjacent to the railroad in Segment 4 are unlikely to be impacted by the project because no infrastructure improvements are proposed.

Segment 6

Floodplains crossed by or adjacent to Segment 6 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

Segment 7

Floodplains crossed by or adjacent to Segment 7 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

Segment 8

Floodplains crossed by or adjacent to Segment 8 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

Segment 9

Floodplains crossed by or adjacent to Segment 9 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such as way as to change the hydraulic opening.

Segment 10

Floodplains crossed by or adjacent to Segment 10 are unlikely to be impacted by the project unless infrastructure improvements extend outside of the existing rail ROW or surface water crossings are modified in such a way as to change the hydraulic opening.

4.9.3.3 Summary

Each segment is within or adjacent to numerous mapped 100-year and 500-year floodplains in many towns and cities within the project study area. Electronic floodplain data is not available for several towns; it would be necessary to review hard copies of FEMA floodplain mapping for these towns to determine the extents of any floodplains located within the segments comprising the selected alternative. Table 4-15 summarizes the number of mapped floodplains crossed by or adjacent to each segment.

Potential impacts to floodplains will be re-evaluated once the project design identifies specific rail improvements. No significant impacts to floodplains are expected, and any impacts would be mitigated in compliance with the criteria within the National Flood Insurance Program for development within flood prone areas.

At the current level of design, the project would be in compliance with EO 11998, *Floodplain Management*. Detailed evaluations would be required to specifically identify impacts and compliance with this EO during final design.

Table 4-15 Summary of Floodplains, by Segment

	Number of Floodplains	
Segment Number	Crossed by Rail	Adjacent to ROW (but not crossed)
1	3	2
2	0	1
3	4	5
4	4	4
6	3	1
7	6	0
8	1	0
9	0	0
10	9	0

4.10 Ecological Systems

Ecological systems are comprised of upland and wetland communities. Wetland communities are discussed in Section 4.8; this section focuses on the protected upland communities identified in the project study area. Important wildlife habitat and movement corridors (specifically, deer wintering areas or bear habitat in Vermont) are present in the project study area. This section describes the potential presence of important wildlife habitat and corridors along each segment; the potential impacts of the alternatives; and recommendations for minimizing any potential impacts.

4.10.1 Methodology

The assessment of wildlife habitat and corridors included:

- Reviewing US Department of Interior – Fish & Wildlife Service (USFWS) online Federally protected species information;

- Reviewing Vermont Fish and Wildlife Department, Nongame and Natural Heritage Program (NNHP) Rare, Threatened, or Endangered Species & Significant Communities GIS data (2010) , identifying Vermont state protected species and their habitat, Rare and Irreplaceable Natural Areas (RINAs), and bear habitat and deer wintering areas for wildlife corridors:
- Reviewing New York Natural Heritage Program's (NYNHP) Biodiversity Database GIS data (2011), identifying New York state protected species and their habitat;
- Reviewing records of wildlife corridors within 250 feet of the rail corridor; and
- Evaluating potential impacts to the wildlife habitat and corridors found within the project study area that would result from project implementation.

4.10.2 Existing Conditions

Wildlife habitat and corridors are present within the project study area at selected locations, as summarized below for each segment.

Segment 1

Three New York state-listed habitat types have been recorded within 250 feet of Segment 1: Pine Barren Vernal Ponds, Tidal River (Lower Hudson River), and Pitch Pine-Oak Forest. No wildlife corridors were identified within 250 feet of Segment 1.

Segments 2, 3, 6, 7, and 8

No protected wildlife habitat or corridors were identified within 250 feet of Segment 2, 3, 6, 7, or 8.

Segment 4

One New York state-listed habitat type has been recorded within 250 feet of Segment 4: Floodplain Forest. Two Vermont state-listed natural communities have been recorded within 250 feet of Segment 4, both of which are palustrine.[14]

Segment 9

Two Vermont state-listed natural communities have been recorded within 250 feet of Segment 9, both of which are palustrine. Segment 9 is within mapped bear habitat for 1.63 miles in the Town of Arlington from just south of Old Depot Road to north of Putnam Road. No other wildlife corridors were identified within 250 feet of Segment 9.

Segment 10

Four state-listed natural communities have been recorded within 250 feet of Segment 10, all of which are palustrine. Segment 10 is within several deer wintering

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14 Palustrine means of, pertaining to, or living in a marsh or swamp.

areas and several bear habitat areas. Segment 10 is also within 400 feet of Emerald Lake, a designated Vermont RINA in Dorset.

4.10.3 Environmental Consequences

Potential impacts to wildlife habitat and corridors from the No-Build and the Proposed Action Alternatives are described below.

4.10.3.1 No-Build Alternative

The No-Build Alternative would not affect protected wildlife habitat.

4.10.3.2 Proposed Action Alternative

Specific instances of wildlife habitat or corridors within the project study area do not necessarily indicate that there would be potential impacts to those resources. Locations where additional investigation would be required include road and water crossings that would be modified, and new siding construction. Once infrastructure improvement locations are specified, additional evaluations, which may include a field investigation and agency coordination, would be conducted during the final design to determine potential effects on wildlife habitat. Reconstructing existing rail infrastructure and adding passenger service (one roundtrip per day) would not adversely affect wildlife habitat or wildlife corridors. The project would increase train traffic on Segments 7, 8, 9 and 10 by two trains per day (one round trip). This would result in a minimal increase in the potential for wildlife mortality.

Segment 1

The potential to impact wildlife habitat or corridors in Segment 1 is negligible because no infrastructure improvements are planned for this segment.

Segment 2

The potential to impact wildlife in Segment 2 is negligible because the known habitat is not in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of 2 miles of new siding track within the existing ROW. No improvements outside the ROW are planned.

Segment 3

The potential to impact wildlife habitat or corridors in Segment 3 is negligible because no infrastructure improvements are planned for this segment.

Segment 4

The potential to impact wildlife habitat or corridors in Segment 4 is negligible because no infrastructure improvements are planned for this segment.

Segment 6

The potential to impact wildlife in Segment 6 is negligible because the known habitat is not in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of 6 miles of new siding construction within the existing ROW. No improvements outside the ROW are planned.

Segment 7

The potential to impact wildlife in Segment 7 is negligible because the known habitat is not in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of constructing a second main line track and a new station in Mechanicville, all within the existing rail ROW.

Segment 8

The potential to impact wildlife in Segment 8 is negligible because the known habitat is not in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of main line track upgrades and reconstruction of all bridges rated "poor," all within the existing ROW, and constructing a new station in North Bennington near the existing ROW.

Segment 9

Wildlife habitat in Segment 9 may be impacted because the known habitat is in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of main line track upgrades, reconstruction of all bridges rated "poor," and constructing a new station in Manchester, all within the existing rail ROW. Increased train traffic or track improvements could impact bear movement and result in habitat fragmentation; the impacts are expected to be minimal because this segment is an active rail corridor. Mitigating these impacts is not necessary.

Segment 10

Wildlife habitat in Segment 10 may be impacted because the known habitat is in close proximity to the rail ROW. Infrastructure upgrades in this segment would consist of main line track upgrades within the existing ROW. No improvements outside the ROW are planned. Increased train traffic or track improvements could impact deer and bear movement and result in habitat fragmentation; the impacts are expected to be minimal because this segment is an active rail corridor. Mitigating these impacts is not necessary. Increased rail traffic would not impact Emerald Lake because of Segment 10's distance from this Vermont RINA and current use as an active rail corridor.

4.10.3.3 Summary

Wildlife habitat is known to occur within 250 feet of Segments 1, 9, and 10 within the project study area, and wildlife corridors were identified along Segments 3, 4, 9, and 10. One Vermont RINA, Emerald Lake, was identified near Segment 10. The wildlife habitat and corridors, and the Vermont RINA, may be impacted if work is required outside the existing rail footprint to modify existing or construct new tracks or stream or road crossings. These areas are unlikely to be impacted by any work within the existing ROW. A field investigation is recommended where work would occur outside the ROW and habitat or corridors are proximate to the ROW, to identify any potential impacts and, if necessary, design appropriate impact avoidance or minimization measures.

4.11 Threatened and Endangered Species

Threatened or endangered species fall under the jurisdiction of state and federal agencies and are known or likely to be present in proximity to the segments comprising the project study area. At the federal level, the USFWS and the National Marine Fisheries Service (NMFS) are responsible for protecting terrestrial plants and animals, and marine animals, respectively, under the authority of the Endangered Species Act. These agencies may list species as "threatened" or "endangered" and, if warranted, designate critical habitat for listed species. Listed species and designated critical habitat are legally protected from harm by activities undertaken, authorized, or funded by federal agencies. Species protected by state law are managed by the New York NHP and the Vermont NNHP.

Recorded federal- or state- listed species and their habitat near segments comprising the Proposed Action Alternative would need to be confirmed with the USFWS or NMFS and the NYNHP or NNHP (as appropriate) during final design to determine if listed species or designated critical habitat are actually present within the rail corridor and would be affected by the project. If present, coordination with the agencies will be required to identify potential impacts and appropriate avoidance measures.

This section describes the potential presence of protected species and their habitat along each segment; the potential impacts of the alternatives; and recommendations for minimizing any potential impacts.

4.11.1 Methodology

The assessment of protected species and habitat included:

- Reviewing USFWS and NMFS online protected species information;

- Reviewing NNHP Rare, Threatened, or Endangered Species & Significant Communities GIS data (2010) , identifying Vermont state-protected species;
- Reviewing NYNHP's Biodiversity Database GIS data (2011), identifying New York state-protected species;
- Reviewing records of federal- and state-listed species and their habitat within 250 feet of the rail corridor; and
- Evaluating potential impacts to the listed species and their habitat found within the project study area that would result from project implementation.

4.11.2 Existing Conditions

A number of listed species and their habitat are present within the project study area. The federally listed species that have been recorded within the project study area are:

- Indiana bat (*Myotis sodalis*) is listed by the USFWS as an endangered species. Although the Indiana bat has been recorded in Northeastern states, its primary range is in the Midwest.[15]
- Karner blue butterfly (*Lycaeides melissa samuelis*) is listed by the USFWS as an endangered species. This small butterfly is widespread in Wisconsin and can be found in other states including New York.[16]
- Bog turtle (*Clemmys (Glyptemys) muhlenbergii*) is listed by the USFWS as threatened. One of the smallest turtles in the world, this species is known to occur in Northeastern states including New York.[17]
- Shortnose sturgeon (*Acipenser brevirostrum*) is listed by NMFS as endangered. This anadromous fish occurs in most major river systems along the eastern seaboard, including New York.[18]
- Small whorled pogonia (*Isotria medeoloides*) is listed by the USFWS as threatened. This rare orchid is widely distributed but rare in eastern states and Canada, and has been extirpated from New York and Vermont.[19]

State records of protected species do not provide species-specific information at this level of inquiry; a distinction is only made between records of plant and animal species. Further investigation would be required at a later stage of the project.

<u>Segment 1</u>

Four Federally protected wildlife species (bog turtle, Indiana bat, Karner blue butterfly, and shortnose sturgeon) have been recorded within 250 feet of Segment 1.

15 USFWS. Indiana Bat (*Myotis sodalis*) Fact Sheet. http://www.fws.gov/northeast/pdf/indianabat.fs.pdf
16 USFWS. Karner Blue Butterfly Fact Sheet. http://www.fws.gov/midwest/endangered/insects/kbb/kbb_fact.html
17 USFWS. Species Profile: Bog Turtle (*Clemmys (Glyptemys) muhlenbergii*). http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C048
18 NMFS. Shortnose Sturgeon (*Acipenser brevirostrum*) http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm
19 USFWS. Small Whorled Pogonia (*Isotria medeoloides*) Fact Sheet. http://www.fws.gov/midwest/Endangered/plants/smallwhorledpogoniafs.html

Segment 2

Two federally protected species (Indiana bat and Karner blue butterfly) have been recorded within 250 feet of Segment 2.

Segment 3

Three federally protected species (Indiana bat, Karner blue butterfly, and small whorled pogonia) have been recorded within 250 feet of Segment 3.

Segment 4

Two federally protected species (Indiana bat and small whorled pogonia) have been recorded within 250 feet of Segment 4.

Segment 6

Two federally listed species (Indiana bat and Karner blue butterfly) have been recorded within 250 feet of Segment 6.

Segment 7

Three federally listed species (Indiana bat, Karner blue butterfly, and shortnose sturgeon) have been recorded within 250 feet of Segment 7.

Segment 8

Two federally listed species (Indiana bat and shortnose sturgeon) have been recorded within 250 feet of Segment 8.

Segment 9

One federally listed species (Indiana bat) and eleven state-listed species (six unspecified plants and five unspecified animals) have been recorded within 250 feet of Segment 9.

Segment 10

One federally listed species (Indiana bat) and thirteen state-listed species (ten unspecified plants and three unspecified animals) have been recorded within 250 feet of Segment 10.

4.11.3 Environmental Consequences

Potential impacts to threatened or endangered species from the No-Build and the Proposed Action Alternatives are described below.

4.11.3.1 No-Build Alternative

The No-Build Alternative would not affect protected species or their habitat.

4.11.3.2 Proposed Action Alternative

Specific instances of the listed species and their habitat found within the project study area do not necessarily indicate that there would be potential impacts to those resources. However, proximity to the rail segments where work would occur outside the ROW does indicate that further coordination with the state and federal agencies will be needed to evaluate and minimize any potential impacts from the Proposed Action Alternative.

Segment 1

The potential to impact threatened or endangered species in Segment 1 is negligible because no infrastructure improvements are planned for this segment.

Segment 2

The potential to impact threatened or endangered species in Segment 2 is negligible because the species are not known to be within the rail ROW. Infrastructure improvements in this segment would consist of 2 miles of new siding track within the existing ROW. No improvements outside the ROW are planned.

Segment 3

The potential to impact threatened or endangered species in Segment 3 is negligible because no infrastructure improvements are planned for this segment.

Segment 4

The potential to impact threatened or endangered species in Segment 4 is negligible because no infrastructure improvements are planned for this segment.

Segment 6

The potential to impact threatened or endangered species in Segment 6 is negligible because the species are not known to be within the rail ROW. Infrastructure improvements in this segment would consist of 6 miles of new siding construction within the existing ROW. No improvements outside the ROW are planned.

Segment 7

The potential to impact threatened or endangered species in Segment 7 is negligible because the species are not known to be within the rail ROW. Infrastructure improvements in this segment would consist of constructing a second main line track within the existing rail ROW. A new station in Mechanicville may include elements (e.g., parking lot) outside of the ROW but distant from known protected species locations or habitat.

Segment 8

The potential to impact threatened or endangered species in Segment 8 is negligible because the species are not known to be within the rail ROW. Infrastructure improvements in this segment would consist of main line track upgrades and reconstruction of all bridges rated "poor," all within the existing ROW. A new station in North Bennington may include elements (e.g., parking lot) outside of the ROW but distant from known protected species locations or habitat.

Segment 9

Threatened or endangered species in Segment 9 may be impacted because the species are known to be in close proximity to the rail ROW. Infrastructure improvements in this segment would consist of main line track upgrades, reconstruction of all bridges rated "poor," all within the existing rail ROW. A new station in Manchester may include elements (e.g., parking lot) outside of the ROW but distant from known protected species locations or habitat.

Segment 10

Threatened or endangered species in Segment 10 may be impacted because the species are in close proximity to the rail ROW. Infrastructure upgrades in this segment would consist of main line track upgrades within the existing ROW. No improvements outside the ROW are planned.

4.11.3.3 Summary

Federal- or state-protected species and habitat have been recorded within 250 feet of each segment within the project study area. Threatened or endangered species, or their habitat, are unlikely to be impacted by any work within the existing ROW for all segments. Work outside of the ROW would not occur in habitats likely to contain listed species.

One federally listed species (Indiana bat) and thirteen state-listed species (ten unspecified plants and three unspecified animals) have been recorded near the rail bed in Segment 10. Coordination with the Vermont NNHP to confirm the protected species type and habitat requirements is required. A field investigation may be conducted during preliminary or final design to identify any potential impacts and, if necessary, design appropriate impact avoidance or minimization measures.

During the next phase of the project, records of federal- or state- listed species and their habitat along each segment of the Proposed Action Alternative would be confirmed with the USFWS or NMFS and the NYNHP or VTNHP to determine if listed species or designated critical habitat are actually present within the rail corridor. If present, coordination with the agencies will be required to identify potential impacts and appropriate avoidance measures.

4.12 Land Use

Land uses and levels of development are considered with regard to proximity to project rail infrastructure and potential sensitivity to related construction and operations activities. Land use conditions may be affected directly (e.g., locally) or indirectly (e.g., regionally) by the project. Typically, the potential for direct effects on land uses within and near a project area comprised of existing rail is limited to instances where planned capital improvements (e.g., rail yards and service facilities, new rail stations or expansions) may extend beyond the limits of the existing rail ROW and also result in a change in land use. Indirect effects of the project are separately discussed in Section 4.21, *Indirect Effects and Cumulative Impacts*.

A general review of local and regional land use and development conditions is provided in this section. Local conditions are reviewed in areas where activities are anticipated to occur outside the existing rail ROW. Regional conditions are described as a means of providing context to the project and to inform the assessment of potential indirect and cumulative effects.

4.12.1 Methodology

Land use types are defined broadly throughout the project study area to ensure relative consistency and according to available land use data. Relative locations and sizes of urbanized areas are summarized for the region as a whole, and major unique land uses or facilities (such as regional airports) are identified as landmarks of regional context and to inform the general characterization of the project study area overall.

Local consideration of land use information is also provided for the areas of North Bennington and Bennington, VT and Mechanicville, NY. Additional characterization is provided of land uses in the vicinity of Segment 8, which links Hoosick Junction to the North Bennington (VT) Station and Segment 7, which links Mechanicville to Hoosick Junction, NY.

Data utilized were the National Land Cover Data Set originated by the Multi-Resolution Land Characteristics Consortium, a partnership of nine federal agencies, led by the US Geological Survey.[20] The data product is a 2006 GeoTIFF image; the land cover data sets are single band raster images. The assessment does not include calculation of land use types. Land coverage for "developed" areas is characterized primarily according to development intensity:

- High Intensity: Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
- Medium Intensity: Includes areas with a mixture of structures and vegetation. These areas most commonly include single-family housing units. Impervious surfaces account for 50 to 79 percent of the total cover.
- Low Intensity: Includes areas with a mixture of structures and vegetation. These areas most commonly include single-family housing units. Impervious surfaces account for 20 to 49 percent of total cover.
- Open Space: Includes areas with a mixture of some structures, but mostly vegetation in the form of landscaped areas such as lawns. These areas most commonly include large-lot single-family housing units, parts, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20 percent of total cover.

Supplemental information is available from the US Census (2010 and 2000), such as land area and persons per square mile, was also reviewed.

This analysis assumes that the No-Build Alternative projects (currently programmed and funded improvements to the existing infrastructure, which include the addition of a fourth track at Albany/Rensselaer Station and new double-track near Saratoga Springs, NY) are intended to improve operations to meet existing and projected demand. Thus, the future conditions without the project would largely resemble existing conditions, with no substantial changes in development patterns or trends in community planning and public policy. Local planning projects that may be considered by municipalities throughout the bi-state region would not substantially alter the character of the human environment throughout the project study area, and so future conditions without the project are anticipated generally to resemble existing conditions.

4.12.2 Existing Conditions

The existing land uses near each station location and within the region are discussed in the following sections. The potential to affect land uses directly by physical alteration of the human environment is limited to the areas outside the existing rail

20 MRLC Consortium, U.S. Geological Survey. *National Land Cover Data Set.* 2006.

ROW where parking lots would be constructed to serve the three new stations: Manchester and North Bennington, VT and Mechanicville, NY.

4.12.2.1 Mechanicville, NY

Cities in New York potentially served by a new station in Mechanicville range in population density from under 3,000 to over 6,000 persons per square mile. The 2010 Census reports that Mechanicville has a total land area of 0.8 square miles, and a population density of approximately 6,178 persons per square mile. Nearby Capital District cities have greater land area and lower population densities, listed in order of largest to smallest total land area, are:

- Albany (21.4 square miles and about 4,575 persons per square mile);
- Schenectady (10.8 square miles and about 6,136 persons per square mile);
- Troy (10.4 square miles and about 4,840 persons per square mile); and
- Rensselaer (3.2 square miles and about 2,961 persons per square mile).

4.12.2.2 Bennington, VT

Bennington, VT covers 4.8 square miles and has about 1,890 persons per square mile, while North Bennington covers 1.90 square miles and has about 763 persons per square mile. Development in these areas is generally low intensity, with some medium intensity in geographic centers, along with a few small spots of high intensity. Development patterns in these areas generally reflect the presence of Bennington and Southern Vermont colleges.

4.12.2.3 Manchester, VT

Manchester Center covers 4.5 square miles and has about 456 persons per square mile. Development in this area is generally low intensity, with some medium intensity in the geographic centers, along with a few small spots of high intensity.

4.12.2.4 Region

Urbanized areas throughout the project study area include:

- New York State Capital District (comprising the cities of Albany, Rensselaer, Troy, and Schenectady);
- Saratoga Springs and Glens Falls, NY, with a small urbanized area at Fort Edward (roughly equivalent in physical size);
- Small urbanized areas of Whitehall, NY and Castleton, VT;
- Rutland, VT, with a small urbanized area near West Rutland;
- Bennington, VT, with a small urbanized area near North Bennington Village;

- Fair Haven, VT; and
- Hoosick Falls, NY.

Existing passenger service stations serve the Capital District, Saratoga Springs, and Glens Falls, NY and Rutland, VT.

The New York portion of the project study area is part of a generally developed (mostly low intensity) area that extends north and south along the eastern New York border, generally following the Adirondack and Ethan Allen service lines along the Hudson River. A similar low-intensity development pattern extends west from the Capital District along the southern edge of the Adirondacks, generally following the route of the Erie Canal and I-90. The high-intensity development is located within the urbanized areas, generally surrounded by a succession of medium and lower intensity development.

4.12.3 Environmental Consequences

Potential impacts to land use are described below.

4.12.3.1 No-Build Alternative

The No-Build Alternative would have no effects on land use.

4.12.3.2 Proposed Action Alternative

There would be no change to land use along the alignment of the Proposed Action Alternative, as all infrastructure improvements would be made within the rail ROW. Land use in the vicinity of the new stations could change if property acquired for new parking lots is outside of the rail ROW and the acquired property is currently used for some purpose other than parking. The planned parking lots are small, comprised of 50 spaces each, and each may require approximately 20,000 square feet (less than ½ acre) of land acquisition. Detailed consideration of land use and development potential in the vicinity of the proposed new stations may be prepared as part of future Project Level analyses of the stations.

4.12.3.3 Summary

Neither the No-Build Alternative nor the Proposed Action Alternative would directly affect land use, except for potential land use changes at the proposed new stations. Small parking lots are planned for the three new stations; it is likely that the parking lots would be located outside of the existing rail ROW, requiring property acquisition. Detailed consideration of land use in the vicinity of the proposed new stations may be prepared as part of future Project Level analyses

4.13 Socio-Economic Environment

This socioeconomics assessment is aimed at identifying social and economic components of the communities and region, and identifies potential sensitivities to the types of effects associated with rail service and improvement projects. Potential direct effects may occur at a relatively discrete local level (e.g., the area that may be altered physically by a project). Potential indirect effects may be experienced locally near stations where existing direct service would be changed or where new direct service would be accessed, or across a region.

4.13.1 Methodology

The most current socioeconomic data sets available at levels comparable among counties, cities, places and states are summarized in US Census “Quickfacts,” which are data summary reports prepared by the US Census Bureau to include population, demographics, housing, income, employment and business activity data.[21] Quickfacts data were collected in November 2011 and reviewed for the counties that would be directly served by the project and also for the cities of Albany, Rensselaer, Schenectady, Troy, and Mechanicville, NY, as well as Bennington, VT. The most current and comparable data for Manchester and North Bennington, VT are 2000 Census population and demographic data. These data are summarized below and used to characterize the socioeconomic conditions of the seven-county regional area as well as station areas that would be serviced by the project.

4.13.2 Existing Conditions

The socioeconomic conditions near one rail segment, new station locations, and the region each discussed in turn in the following sections. The potential to affect socioeconomic conditions directly by physical alteration of the human environment (e.g., land use patterns) is limited to the areas where parking lots would be constructed to serve the three new stations: Manchester and North Bennington, VT and Mechanicville, NY.

4.13.2.1 Population and Employment

21 U.S. Bureau of the Census. *Census Quickfacts.* Last updated October 18, 2011. http://quickfacts.census.gov Date accessed November 1, 2011.

Table 4-16 shows summary information for the counties in the project study area including: population, land area, and population density. Median housing values, household income and total employment are also provided.

Table 4-16 Population and Employment by Project Study Area County

County	Total Population	Persons under 18 yrs and over 65 yrs	Land Area (square miles)	Population Density (population/ square mile)	Median Housing Values	Employment[1]	Median Household Income
New York State							
Schenectady	152,169	38.4%	206	711	$94,500	52,667	$53,404
Saratoga	220,069	35.1%	812	247	$120,400	62,863	$63,883
Washington	62,753	36.0%	835	73	$77,400	9,967	$46,702
Rensselaer	155,541	35.0%	654	233	$102,900	42,058	$54,437
Albany	298,284	33.8%	523	563	$116,300	173,998	$59,245
Vermont State							
Rutland	63,014	35.9%	933	68	$96,000	26,620	$47,147
Bennington	36,411	39.2%	676	55	$115,700	15,887	$45,029
Project Study Area Total	988,241	36.2% (Avg.)	4,639	279 (Avg.)	$103,314 (Avg.)	384,060	$52,835 (Avg.)

Sources: Data from US Census Bureau (http://quickfacts.census.gov/qfd/news.html) viewed on March, 2011.
Data base years: Total Population (2009), Land Area (2000), Population Density (2000), Median Housing Values (2000), Median Household Income (2000), Employment (2008).

1 Private Non-Farm Employment

4.13.2.2 Travel Behavior

According to the data from the US Census Minor Civil Division (MCD) Journey to Work Tables,[22] a majority of Vermont residents in the project study area (i.e., the Counties of Bennington and Rutland) are employed within their resident county (approximately 85 percent). Residents of Albany, NY also showed a high employment rate within their own county (83 percent). In the remaining New York counties, roughly 50 percent of residents in the project study area are employed outside their resident county, showing strong needs for regional transportation services. Among those people that are employed outside their counties of residency, the most popular employment center is Albany, NY.

4.13.2.3 Stations

Preliminary locations for the new stations have been identified for the purposes of this evaluation and specific layouts will be determined in future phases of the project; it is not possible to accurately characterize existing conditions or potential impacts. Proposed station parking areas may be located outside the ROW and

22 U.S. Census 2000 Minor Civil Division (MCD) County-To-County Worker Flow Files. Available at: http://www.census.gov/population/www/cen2000/commuting/mcdworkerflow.html.

require land acquisition. A direct effect to socioeconomic conditions could result if these changes in land use resulted in property acquisition and relocation, related to businesses, or community disruption. It is anticipated that the introduction of the relatively small (approximately 50 spaces) parking areas could be accommodated without relocation of unique businesses or substantial community disruption, and therefore would have no significant direct effect on local socioeconomic conditions in Manchester and North Bennington, VT and Mechanicville, NY. Based on US Census 2010 and 2000 data, the socioeconomic conditions of the region and potential impacts from the project are summarized below.

Population

A total of 99,425 people lived in the two Vermont counties in 2010, while 888,816 people lived in the five New York counties. The total 2010 population for the seven-county study area was 988,241, approximately 90 percent living in New York counties. The populations in each of the New York counties and cities reviewed grew between 2000 and 2010, while the Vermont counties and cities generally lost population. In the Vermont portion of the project study area, only Bennington County grew (by less than 1 percent), while Rutland County, Bennington, and Rutland City declined substantially.

Demographics

As of 2010, the populations were predominantly white in all five New York counties reviewed, with county and city populations less diverse than for the state overall. The proportions of total population that were black or of Hispanic or Latino origin were lower in all counties than the state, and lower in Mechanicville. Albany, Schenectady, and Troy, NY had larger percentages of black population than their respective counties or the state overall. Saratoga and Washington counties were the least diverse of the five New York counties that would be served by the project. Vermont counties, however, were the least diverse of the seven counties in the project study area, with populations about 97 percent white, with less than 2 percent each of black, Asian, Hispanic, or Latino origin.

Housing and Income

Rates of home ownership were higher in all five New York counties than in the state overall. Vermont's Bennington and Rutland Counties home ownership rates were than New York's Albany, Rensselaer and Schenectady Counties, though slightly lower than Saratoga and Washington Counties. Median home values of homes in the five New York counties were lower than in the state. Similarly, median home values in the two Vermont counties were lower than the respective statewide median.

Per capita incomes were lower in the New York cities reviewed than in the counties and New York state overall. In Vermont, per capita incomes were also lower in the cities than the counties and, except for Bennington County, lower than the state median per capita money income. Median household income was higher in all New York counties than the state, except for Washington County, but lower in all New York cities than the respective counties. In contrast, median household income was lower in both Vermont counties than in the state (and also lower than median incomes in New York).

Generally, the five New York counties had lower percentages of total population living in poverty than the state overall. Rates of poverty were higher in the Vermont counties and cities than in the state overall. Though higher than New York counties, the poverty rates in Vermont were notably lower than the cities of Albany, Rensselaer, and Schenectady, NY.

County-Level Employment

Non-farm employment increased in New York's Albany, Schenectady, and Saratoga Counties, but declined in Rensselaer County and Washington County. The rate of job loss (nonfarm employment declines) in Vermont's Rutland and Bennington Counties, however, outpaced declines in Rensselaer and Washington Counties.

Education

Several colleges and universities are located within or near these urban areas. Within the Capital District are the State University of New York (SUNY) at Albany, Rensselaer Polytechnic Institute, Siena College and Union College. SUNY Empire State College and Skidmore College are located within Saratoga Springs, and Adirondack Community College is located in Glens Falls. All these schools are located in urban areas served by the Adirondack and Ethan Allen service lines. In Vermont, Southern Vermont College and Bennington College are both located in Bennington and served by the Vermont Railway, with service north to Rutland.

Business Activity

Albany County had the most firms in 2007, compared to the other six counties that would be directly served by the project. Firms in the five New York counties were not concentrated in the major cities. Albany and Saratoga Counties achieved higher sales numbers than the other New York counties in the project study area. In Vermont, Bennington County had fewer firms than all other counties, and Rutland County had fewer firms than all other counties except Bennington and Washington. The Vermont counties generally had lower total sales numbers than the New York counties, but per capita retail sales were relatively higher in Vermont.

4.13.3 Environmental Consequences

The potential impacts to socioeconomic resources from the No-Build and the Proposed Action Alternatives are described below.

4.13.3.1 No-Build Alternative

The No-Build Alternative would have no adverse or beneficial effects on social or economic resources.

4.13.3.2 Proposed Action Alternative

The Proposed Action Alternative is consistent with Bennington and Rutland Counties' regional planning policies aimed at achieving economic growth. Specifically, Rutland County's *Rutland Regional Plan* cites "infrastructure gaps" as unmet needs to be addressed. A main issue associated with economic activity is to upgrade and expand railway services, in addition to airport services, as a means of supporting ongoing economic growth.[23] This policy is a continuation of the policy promoting rail network improvements outlined in the *Rutland Region Economic Development Strategy*.[24]

Though the Bennington County *Regional Plan* does not cite the importance of improving rail service as a means of achieving economic development, it does state the importance of the region's ability to provide the critical infrastructure and amenities that will support businesses.[25] The 2008 *Bennington County Regional Transportation Plan Update*, however, closely relates to the project and includes reference to a 1998 Position Statement that "…it is both feasible and appropriate to undertake the improvements necessary to restore effective passenger and freight rail service to the region" and reference to 2006 *Vermont State Rail and Policy Plan* Goals, including "Foster economic development and benefit local industry."[26] The *Bennington County Regional Transportation Plan Update* also specifically indicates that stops Manchester and North Bennington are considered "ideal" in the provision of passenger service to the Bennington region. The project is anticipated to support these regional policies concerning socioeconomic conditions.

The project is intended, in part, to promote socioeconomic development within the project study area. This support, however, would not result in direct impacts to the socioeconomic environment. The indirect effects to the socioeconomic environment are described in Section 4.21, *Indirect Effects and Cumulative Impacts*.

Some temporary direct impacts would result from constructing the project, specifically related to infrastructure improvements along the rail lines and three new stations. These impacts would be realized in the form of jobs for local or imported workers, and resultant economic activity in local communities. This would be a temporary effect for the construction period only and is not likely to substantively affect the local or regional economy.

▼

23 Rutland Regional Planning Commission. *Rutland Regional Plan (Adopted April 15, 2008).*
24 *Rutland Region Economic Development Strategy (Draft, July 2006).* Effort funded in part by the Municipal Planning Grant Program and the Vermont Community Development Program administered by the Vermont Department of Housing and Community Affairs, Agency of Commerce & Community Development.
25 Bennington County Regional Commission. *The Regional Plan, Bennington, Vermont (Adopted May 17, 2007).*
26 Bennington County Regional Commission. *Bennington County Regional Transportation Plan Update (Fall 2008).*

4.13.3.3 Summary

No significant and adverse impacts to socioeconomic conditions are expected to result from the project. It is anticipated that the scale or types of properties acquired or businesses potentially relocated would not amount to a significant impact to socioeconomic conditions. On a regional level, the project would be expected to support regional planning initiatives, particularly the clearly defined goals outlined by the Rutland Regional Planning Commission with regard to enhancement of rail service throughout the region as a means of supporting economic development.

4.14 Environmental Justice

The Environmental Justice (EJ) assessment identifies the locations of EJ communities along each segment and within the region, and support efforts to conform to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994; 59 FR 32) and US Department of Transportation policy to ensure nondiscrimination under Title VI of the Civil Rights Act of 1964. Title VI states that "no person in the United States shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." This effort at nondiscrimination is known as Environmental Justice.

EJ communities are those areas where minority or low-income populations exist in concentrations that are substantially greater than the associated planning region. EJ communities may be affected directly (locally) or indirectly (regionally) by rail service and improvement projects. Minority and low-income populations are defined by the US Census Bureau, and Census Tracts occupied by certain threshold percentages of these populations are used to identify EJ communities.

Potential direct impacts to EJ communities comprise significant adverse impacts determined in other analyses, which for rail projects are typically related to noise, land acquisition, and community cohesion. These analyses, if appropriate, would be conducted as part of future Project Level evaluations. These analyses may reveal potential significant adverse impacts, and would evaluate whether such impacts constitute a disproportionate and adverse impact to EJ communities.

The extent to which EJ communities would be expected to share in project benefits is also a concern of this assessment. Conducted primarily at a regional level, it is closely tied to the evaluation of socioeconomic conditions (Section 4.13, *Socio-Economic Environment*). Regional effects to EJ communities would be indirect (for example, benefits would be the result of access to service).

4.14.1 Methodology

For the purposes of this EA, potentially impacted EJ communities are identified at the Census Tract level, using the most currently available US Census data (2010 for minority data and 2000 for poverty data). Census Tracts are the smallest level at which both poverty and minority data are typically available for comparison among multiple scales of geographic regions (e.g., state, county, town, village, non-incorporated "places" that "resemble incorporated places," etc.). Poverty data and race and ethnicity data (e.g., minority races and ethnicities) are the subject of the analysis.

These data are collected for all Census Tracts intersecting or adjacent to the ROW for each of the ten segments, extending to within 1,000 feet of the existing stations, and within the towns in which the new stations are proposed. In this way, EJ communities potentially affected directly by significant adverse impacts to the physical environment (such as noise) are identified for the entire project corridor.

In addition, EJ communities identified independently by the New York State Department of Environmental Conservation (NYSDEC), Office of Environmental Justice (using 2000 Census data) are reviewed for the five New York counties in the project study area and EJ communities identified by the EPA (also using 2000 Census data) are reviewed for the two Vermont counties in the project study area. These supplemental data sources identify communities within the project study area and verify that no identifiable EJ community is overlooked.

4.14.2 Existing Conditions

The EJ communities near each rail segment and new station location, and within the region, each discussed in turn in the following sections.

4.14.2.1 Rail Segments

Nine Census Tracts have been identified as EJ communities within 1,000 feet of two segments (Table 4-17). Five of these tracts qualify as EJ communities both for having concentrations of minority population and persons living in poverty; three qualify for poverty status (not minority) and one qualifies for minority (not poverty) status. The EJ Census Tracts within 1,000 feet of the rail ROW are located in the Capital District region and are present only along Segments 1 and 2 in Albany and Schenectady Counties in New York. There are no EJ populations adjacent to or within the rail ROW in communities served in Vermont.

Table 4-17 Environmental Justice Communities

Segment	County, State	Census Tract	Poverty	Minority
1	Albany, NY	2	X	X
1	Albany, NY	3	X	X
1	Albany, NY	7	X	X
1	Albany, NY	11	X	X
1	Schenectady, NY	211.02	X	
1	Schenectady, NY	214	X	X
1	Schenectady, NY	215		X
2	Schenectady, NY	202	X	
2	Schenectady, NY	203	X	

Source: U.S. Census, 2000 for poverty status; 2010 for minority status

A concentration of EJ communities is present in the New York State Capital District. EJ communities in Albany County, NY are primarily located within the City of Albany limits, extending from much of the Hudson River waterfront westward to include a large portion of the city. These EJ communities are served by the existing Albany/Rensselaer Station.

Similarly, the greatest concentration in Schenectady County, NY is located in Schenectady, primarily comprising the physical heart of the city. An additional EJ community area is located directly northwest in Glenville, NY. These EJ communities are served by the existing Schenectady Station.

In Rensselaer County, NY, the NYSDEP data reveal EJ communities (in addition to those in Cohoes) south along the Hudson River waterfront and also to the east. Several EJ communities are located within Troy and one is in Rensselaer. Rensselaer is served by an existing station, which is currently the station nearest Troy; bus service connects Troy to the existing Albany/Rensselaer Amtrak Station.

Saratoga County, NY contains no EJ communities, according to NYSDEC data, and the only EJ community in Washington County is within Fort Ann, just south of the existing Whitehall Station, though not contiguous to it.

The EPA data indicates that several potential EJ communities may be located along the northern border of Vermont, generally 30 miles or more east of the existing Vermont Railway service line. Nearer the project study area, a potential EJ community is indicated along the northern border of Rutland County. Additional potential EJ communities are indicated in Woodford; and just to north in Glastenbury; and much farther east (10 miles) in Searsburg. These areas could be served by the proposed North Bennington Station.

Segment 1

Census tracts qualifying as EJ communities are present in Albany and Schenectady, NY near the southern and northwestern ends, respectively, of Segment 1. Of the seven tracts qualifying as EJ populations, five qualify for both minority and poverty status, one for poverty status alone, and one for minority status alone.

Segment 2

Census tracts qualifying as EJ communities are present in Schenectady, NY near the southern end of Segment 2. Of the two tracts qualifying as EJ populations in Segment 2, both qualify for poverty status alone.

4.14.3 Environmental Consequences

Disproportionate adverse impacts to EJ communities in the region are not expected from the project, as the additional passenger service on active freight and passenger rail lines would not directly affect these communities. The EJ communities in each county are expected to benefit from the project as a result of increased access to goods, services, and jobs; these indirect impacts are described below.

The types of benefits that EJ communities may experience would be improved public transportation access to employment, goods, or services within the region (e.g., within the Capital District or possibly Saratoga County, NY), or outside the region, potentially the New York City metropolitan region. An alternative commuting mode within the Capital District (Segment 6 through Mechanicville, NY) could be a potential benefit. Most EJ communities identified in this preliminary analysis are concentrated around existing stations, and so providing a new station in Mechanicville would be of no significant benefit.

The new station proposed in Manchester, VT is least likely of the three proposed stations to provide a benefit to EJ communities, as no EJ communities are located nearby. However, the proposed North Bennington Station may be of benefit to EJ communities identified in the nearby towns of Woodford, Glastenbury, and Searsburg, VT. The potential value to nearby EJ communities of a North Bennington Station may be new rail access to the Capital District.

4.14.3.1 No-Build Alternative

The No-Build Alternative would have no adverse or beneficial effects on EJ communities.

4.14.3.2 Proposed Action Alternative

EJ communities near Segments 1 and 2 may be impacted by changes in noise levels, as described in Section 4.5, although impacts are expected to be minimal, neither adverse nor disproportionate. No properties would be acquired in this segment, so EJ communities would not be displaced nor would community cohesion be affected.

4.14.3.3 Summary

EJ communities were identified adjacent to the rail ROW in Segments 1 and 2. No EJ communities are located near the proposed new stations. Additional EJ communities are present in the counties comprising the project study area, but not proximate to the rail corridors.

Based on the current level of project design, no direct adverse effects to EJ communities are anticipated. Future Project Level evaluations would be conducted for all segments, particularly with regard to potential effects on the physical environment (such as noise), and potential effects associated with acquisition and relocation, and community cohesion, and potential temporary or construction-related effects. In addition, 2010 poverty data may be available at the Census Tract level when Project Level evaluations of the new stations are performed, allowing this inventory of identified EJ communities to be updated. The Project Level efforts should include an appropriate public outreach component. Should impacts be identified, particularly impacts associated with changes to the physical environment (e.g., air quality and noise), it is anticipated that they would be avoided or otherwise mitigated where practicable, thus eliminating the potential for disproportionate direct impacts to EJ communities.

4.15 Public Health and Safety

This section describes public health and safety issues associated with the proposed change in passenger rail service. Passenger and freight rail service has the highest potential to impact public health and safety where the track crosses roads at grade (rather than grade-separated crossings; e.g., bridges). At-grade crossing control is provided by gates, lights, and bells to prevent crossing the tracks or warn the public of an arriving train. These features reduce the risk of car/train crashes.

4.15.1 Methodology

Potential impacts to public health and safety were evaluated by reviewing existing rail line at-grade crossings, train speeds, and track classifications as compared to the proposed conditions.

4.15.2 Existing Conditions

The existing rail lines cross numerous roadways with various forms of at-grade crossing control such as automatic warning devices, as described in Section 4.3, *Transportation*. The number of at-grade crossings and current train speed limits are summarized in Table 4-18.

4.15.3 Environmental Consequences

Potential impacts to public health and safety that may result from the No-Build Alternative and the Proposed Action Alternative are described below.

No-Build Alternative

There would be no change in passenger or freight train service under the No-Build Alternative, and public health and safety would not be affected.

Proposed Action Alternative

Under the Proposed Action Alternative, the tracks in Segments 2, 6, 7, 8, 9, and 10 would be upgraded to FRA Class 3 at a minimum, such that an operating speed of up to 59 mph is feasible where geometry and operating rules allow, as shown in Table 4-18. There would be no changes to tracks in Segments 1, 3, or 4, as these meet project criteria. There would be no new at-grade crossings. No closures of at-grade crossings are planned; the crossings would be upgraded where necessary to meet applicable FRA standards. Although train speeds may be increased by the upgraded tracks, the grade crossing improvements are expected to maintain or improve public health and safety along these rail lines by reducing the potential for car/train crashes.

The three proposed new stations (Manchester and North Bennington, VT and Mechanicville, NY) would be designed to ADA standards and include safety features to protect the public from automobile traffic and unauthorized access to the tracks.

On a national level, comparing miles traveled via commercial aircraft, trains, and automobiles on highways, auto travel on highways has the highest rate of passenger fatalities per mile traveled. In 2011, more than 34 percent of all transportation fatalities involved occupants of passenger cars, while there were no fatalities related to passenger rail[27]. These statistics indicate that a passenger rail system would provide a safer travel option for travelers than passenger cars traveling on area highways.

[27] USDOT 2012 Bureau of Transportation Statistics, Transportation Statistics Annual Report. http://www.rita.dot.gov/bts/rita.dot.gov.bts/files/tsar_2012.pdf

Table 4-18 Summary of At-grade Crossings and Speed Limits

Segment	FRA Class	At-grade Crossings	Existing Train Speed Limits	Proposed Train Speed Limits
1	5	3	*General:* ➤Passenger: 110 mph ➤Freight: 50 mph *At Albany/Rensselaer Station:* ➤Passenger: 15 mph ➤Freight: 10 mph *Through Albany:* ➤Passenger & Freight: 10-25 mph *Approaching Schenectady Station:* ➤From east: 55 mph ➤From west: 50 mph ➤At station: 30 mph *Through Schenectady:* ➤Freight: 30 mph	*General:* ➤Passenger: 110 mph ➤Freight: 50 mph *At Albany/Rensselaer Station:* ➤Passenger: 15 mph ➤Freight: 10 mph *Through Albany:* ➤Passenger & Freight: 10-25 mph *Approaching Schenectady Station:* ➤From east: 55 mph ➤From west: 50 mph ➤At station: 30 mph *Through Schenectady:* ➤Freight: 30 mph
2	3	3	*General:* ➤Passenger & Freight: 25 mph *Through Kenwood:* ➤Passenger & Freight: 10 mph	*General:* ➤Passenger & Freight: 59 mph *Through Kenwood:* ➤Passenger & Freight: 10 mph
3	3	50	*General:* ➤Passenger: 60 mph ➤Freight: 40 mph *Between Hudson River and Fort Edward Station* ➤Passenger: 45 mph	*General:* ➤Passenger: 60 mph ➤Freight: 40 mph *Between Hudson River and Fort Edward Station* ➤Passenger: 45 mph
4	3	40	*General:* ➤Passenger: 30-60 mph ➤Freight: 20-40 mph *Crossing Wood Creek in Whitehall* ➤Passenger: 15 mph ➤Freight: 10 mph	*General:* ➤Passenger: 30-60 mph ➤Freight: 20-40 mph *Crossing Wood Creek in Whitehall* ➤Passenger: 15 mph ➤Freight: 10 mph
6	3	8	*General:* ➤Passenger & Freight: 40-50 mph *Through Schenectady & Mechanicville:* ➤25 mph	*General:* ➤Passenger & Freight: 40/50 mph *Through Schenectady & Mechanicville:* ➤25 mph
7	3	17	*General:* ➤Freight: 30-40 mph *Near Mechanicville:* ➤Geometric restrictions: 10 mph	*General:* ➤Passenger & Freight: 40 mph *Near Mechanicville:* ➤Geometric restrictions: 10 mph
8	2	11	*General:* ➤Freight: 10-30 mph	*General:* ➤Passenger & Freight: 59 mph
9	2	37	NA (dark territory)	*General:* ➤Passenger & Freight: 59 mph
10	2	78	NA (dark territory)	*General:* ➤Passenger & Freight: 59 mph

Note: "Dark Territory" refers to an unsignalized section of track that is controlled by a train dispatcher.

4.16 Cultural Resources

Cultural resources are an important part of the character of a community, and may include historic features such as buildings, structures, sites, objects and districts, as well as archaeological resources, which are physical remains, usually buried, of past activities on a site. Cultural resources in the form of historic properties (which include both above-ground and archaeological resources) are the focus of Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 USC 470) and Section 4(f) of the Department of Transportation Act (DOT Act) of 1966 (49 USC 303). Section 106 of the NHPA states that any project with federal involvement (defined as an undertaking) must "take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register [of Historic Places; the NRHP]."

Section 4(f) of the DOT Act prohibits the use of land from any public park, recreation area, wildlife or waterfowl refuge, or historic property listed in or eligible for the NRHP , unless there is no feasible and prudent alternative to the use of such land. Historic properties protected by Section 4(f) are discussed in this section, while the recreational properties protected by Section 4(f) are discussed in the next section.

Methodology

Above-ground resources and archaeological sensitivity were identified and examined in order to assess potential impacts to historic properties. For above-ground resources, research was undertaken to identify NRHP-listed individual properties and districts located within100 feet (50 feet from centerline) of the rail corridors. Locations of previously inventoried archaeological sites, and cultural features and landscape features from ca. 1900 USGS topographic quadrangle maps, were used to provide an overview of potential archaeological sensitivity along the rail corridors. As research was conducted through the New York and Vermont State Historic Preservation Offices (SHPOs), methods for compiling necessary data differed in each state, depending on the electronic availability of data.

New York Office of Parks, Recreation and Historic Preservation

The New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) has some information on NRHP properties available electronically. Properties and districts listed in the NRHP have been geocoded by the NYOPRHP. This information is available through a public GIS interface on the NYOPRHP website, which also has entire copies of the NRHP nomination forms available for download. Archaeological sensitivity is also available through the GIS interface, shown through generalized geographic areas. The potential for archaeological sensitivity has been compiled using a combination of known sites and cultural and landscape features commonly associated with prehistoric and historic period human activity. Using generalized areas to present archaeological sensitivity provides a certain degree of guidance, without compromising the confidentiality and security of the location of archaeological sites.

Due to the extensive project area, the NYSOPRHP staff prepared GIS data results directly related to the project study area. Staff provided an ESRI shapefile on November 7, 2011, showing locations of NRHP-listed or nominated properties and archaeological sensitivity within 100 feet of all rail corridors. These results are summarized by segment in Section 4.16.2, *Existing Conditions*.

Vermont Division for Historic Preservation

The Vermont Division for Historic Preservation (VT DHP) keeps all of their records in hard copy format, which is accessible in their office in Montpelier, VT. A site file search at the VT DHP office was conducted on November 1, 2011 to identify properties and districts listed in the NRHP and assess archaeological sensitivity. NRHP nomination forms are filed by municipality, and the maps in each form were used to determine the relationship of each property to the location of the project study area. In order to assess potential archaeological sensitivity for segment locations in Vermont, archaeological maps available at the VT DHP office were consulted for locations of known sites along the rail corridors. These data were combined with analysis of known geographical and cultural features in order to provide an overview of potential archaeological sensitivity, summarized in the discussions for each segment.

The files at the VT DHP office also contain information on NRHP and State Register eligibility determinations for a number of properties. When locations of these properties could be confirmed as being within or adjacent to the project study area, a summary of the determination was included in the discussion for the appropriate segment.

Existing Conditions

This section presents an overview of the history of the railroad segments within the project study area, and the cultural resources in each segment. Listed districts and individual properties which are located within 100 feet of the rail corridors are summarized by segment. As described in Chapter 3, Alternatives, all anticipated project railroad construction would be performed within the existing ROW except for the three new stations.

Overview of Railroad History in the Project Study Area

The large railroad companies in New York and Vermont during the 19th and 20th centuries were very active in the project study area segments, which were attractive acquisitions or worthwhile construction investments for these large enterprises.

The Delaware and Hudson Railroad (D&H RR) operated a number of the segments in New York during the 19th and 20th centuries, including those currently owned by CP Rail. The company began as a canal operator in the early 19th century, but changed focus in the mid-19th century to pursue the growing railroad business.[28] While constructing new railroads, the D&H RR also consolidated a number of existing railroads during the 1860s and 1870s by acquisition, mergers, and leases. Segment 2 and Segment 3 between Whitehall and Schenectady, NY were acquired at this time, as were Segment 5 and Segment 6 between Albany and Schenectady, NY through Mechanicville, NY.[29] The D&H RR declared bankruptcy in 1988 and was acquired by CP Rail in 1991.[30]

The Vermont Railway Company was prominent in the history of the project railroad corridors in Vermont. Segment 9 and Segment 10 between Rutland and Bennington, VT were constructed in 1852 as the Western Vermont Railroad, which was later renamed the Bennington and Rutland Railroad.[31] In 1901, the Rutland Railroad took over the lease for the corridor, which was subsequently purchased by the state and became part of the Vermont Railway in 1963.[32]

Segment 4 between Whitehall, NY and Rutland, VT shares a history with both of these large railroad operators. The railroad was constructed as the Saratoga and Rensselaer Railroad in 1843, and in 1871, the D&H RR signed a perpetual lease for the railroad as part of its consolidation campaign.[33] In 1965, the Vermont Railway acquired the corridor from the D&H RR, which is operated under its Clarendon and Pittsford subsidiary.[34]

Regional railroads have also operated some of the segments, including Segments 1, 7, and 8. The Segment 1 corridor between Albany and Schenectady, NY, constructed in 1831, was one of the state's first railroads and was originally called the Mohawk and Hudson Railroad. In 1853, the corridor was merged with the extensive New York

28 Dufresne, Marilyn E. Delaware and Hudson Railway. (Charleston, SC: Arcadia, 2010), 7-8. http://books.google.com, accessed November 2011.
29 Bridge Line Historical Society, "History of the Delaware and Hudson Railroad." http:// http://bridge-line.org/blhs/history.html, accessed October 2011.
30 Ibid.
31 Vermont Historical Society, "Vermont Railroad Timeline." http://www.vermonthistory.org, accessed November 2011.
32 Railfan and Railroad Magazine, "Rutland Revival – the Vermont Railway." http://www.railfan.com, accessed November 2011.
33 Bridge Line Historical Society, "History of the Delaware and Hudson Railroad."
34 Rutland Historical Society, "The Clarendon and Pittsford Railroad," *Rutland Historical Society Quarterly*, Vol. XI, No. 3, Summer 1891. http://rutlandhistory.com, accessed October 2011.

Central Railroad network.[35] The New York Central Railroad operated for more than a century, followed by the CSX Railway, which began operating the Segment 1 corridor during the late 20th century.[36]

Segment 7 and Segment 8 between Mechanicville, NY and North Bennington, VT were originally constructed during the 1850s as part of the Troy and Boston Railroad, and became part of the Fitchburg Railroad after the Hoosac Tunnel was opened in 1876. The Boston and Maine Railroad leased the corridor beginning in 1900.[37] In the mid-20th century, Segment 8 between Hoosick Junction, NY and Bennington, VT became part of the Vermont Railway.[38] Guilford Transportation acquired Segment 7 between Hoosick Junction and Mechanicville, NY in 1983, and the corridor now operates as part of the Pan Am Transportation system.[39]

Existing Conditions along the Project Corridor

The known existing cultural resources within each segment are described below.

Segment 1

There are two NRHP-listed properties or districts along Segment 1:

- Broadway-Livingston Avenue Historic District, Albany, NY; and
- Mica Insulator Company, Schenectady, NY.

There is a likelihood of intact historic deposits in undisturbed areas of Albany and Schenectady, but prehistoric archaeological sensitivity is considered generally low.

Segment 2

There is one NRHP-listed district along Segment 2: the Union Street Historic District in Schenectady, NY. There is some archaeological sensitivity near the Erie Canal and Mohawk River due to historic settlement and industrial development along this segment. Prehistoric archaeological sensitivity is low.

Segment 3

There are two NRHP-listed properties or districts along Segment 3:

- Fort Edward Delaware & Hudson Train Station, Fort Edward, NY; and
- Champlain Canal, Saratoga and Washington Counties, NY.

▼

35 "Mohawk and Hudson Railroad." http://oldrailhistory.com, accessed November 2011.
36 New York Central System Historical Society, Inc., "NYC Railroad History." http://nycshs.blogspot.com, accessed November 2011.
37 "Fitchburg Railroad: 1845-1900." http://www.cyberbee.com, accessed November 2011.
38 Vermont Historical Society, "Vermont Railroad Timeline."
39 North Adams Public Library, "Hoosac Tunnel Collection – Historical Notes." http://www.naplibrary.com, accessed November 2011.

There is a low degree of archaeological sensitivity along Segment 3 between Saratoga Springs and Fort Edward, NY. There is a higher potential for buried historic or prehistoric resources near the Champlain Canal, between Fort Edward and Whitehall, and south of Saratoga Springs.

Segment 4

There are three NRHP-listed districts but no individual properties along Segment 4:

- Castleton Village Historic District, Castleton, VT;
- Marble Street Historic District, West Rutland, VT; and
- Rutland Downtown Historic District, Rutland, VT.

There is a moderate degree of archaeological sensitivity along much of Segment 4, with a potential for buried historic or prehistoric resources along the Castleton River and in the developed areas of Rutland and West Rutland, VT. There is a low degree of archaeological sensitivity along the corridor between Whitehall, NY and Fair Haven, VT.

Segment 6

There are no NRHP-listed properties or districts along Segment 6. There is a low potential for archaeological sensitivity along most of this segment. There is a higher potential for buried historic or prehistoric resources near Anthony Kill.

Segment 7

There are two NRHP-listed properties or districts along Segment 7:

- Downtown Cohoes Historic District, Cohoes, NY; and
- Delaware & Hudson Railroad Freight House, Cohoes, NY.

There is a relatively high degree of archaeological sensitivity along the Hoosic River in this segment.

Segment 8

There are two NRHP-listed properties along Segment 8:

- Delany Hotel, Hoosick, NY; and
- Bennington Battlefield, Hoosick and White Creek, NY.

Archaeological sensitivity is considered high along this segment.

Segment 9

There are four NRHP-listed properties or districts along Segment 9:

- Amos Lawrence House, Manchester, VT;
- Arlington Village Historic District, Arlington, VT;
- North Bennington Historic District, Bennington, VT; and

- North Bennington Depot, Bennington, VT.

There is a moderate level of archaeological sensitivity for buried historic or prehistoric deposits along this segment.

Segment 10

There are three NRHP-listed districts along Segment 10:

- Rutland Downtown Historic District, Rutland, VT;
- Wallingford Main Street Historic District; Wallingford, VT; and
- Rural Otter Creek Valley Historic District, Wallingford, VT.

There is a high degree of archaeological sensitivity for buried historic or prehistoric deposits along this segment.

Environmental Consequences

The potential impacts to cultural resources from the No-Build and the Proposed Action Alternatives are described below.

No-Build Alternative

The No-Build Alternative would have no effects on cultural resources.

Proposed Action Alternative

Eighteen individual properties or districts listed in the NRHP are located within or adjacent to the project study area (Table 4-19). Ten are Historic Districts, concentrated primarily in municipal centers which developed as major depots along the railroad lines during the 19th century. Individually listed properties vary considerably, and include residential properties, cultural landscapes, municipal buildings, canals, and industrial structures. All of the cultural resources known along Segments 1, 2, 3, 4, 6, 7, 8, 9, and 10 are outside the ROW, and are therefore unlikely to be impacted by the project.

There is a relatively low potential for intact archaeological resources within the disturbed railroad ROW. The potential presence of such resources is greater for any aspect of the project study area outside of the ROW, including locations where stations would be expanded or new passenger platforms and connections constructed, and at construction staging areas. Segments located along major waterways and historic canals are expected to have a high level of archaeological sensitivity associated with prehistoric and historic period activities (Table 4-20).

The return of or increase in rail traffic along the corridor, and any associated rehabilitation of former railroad depots and stations, is expected to have a net positive effect on cultural resources.

The location of the project within existing rail corridors limits the potential to disturb underground archaeological resources. As the rail line passes through previously disturbed areas that over the years have been periodically reconstructed in some locations, potential direct impacts to cultural and archaeological resources will be substantially reduced because physical intersection with resources will be largely avoided. However, cultural deposits from previous activities associated with these resources may be present along rivers and former canal beds that the railroads follow. A more extensive assessment of potential impacts to archaeological resources will be required once project plans are more fully developed, including components such as station improvements, passenger platform construction, and staging areas that fall outside of the railroad ROW.

In addition to the NRHP-listed resources identified in Section 4.16.2.2, the background research conducted for this service-level analysis indicated there may be other NRHP-eligible resources present in the study area, including those previously identified by VT DHP or NYSOPRHP. However, no further identification of historic properties or evaluations of impacts to historic properties took place at this stage. Such activities, as well as any necessary mitigation, would take place in the future when detailed design plans have been developed, and would include consultation with VT DHP and NYSOPRHP for specific undertakings that could affect historic properties. VT DHP and NYSOPRHP were notified of this service-level study by letter dated December 2, 2014 (Appendix D).

Table 4-19 Summary of Potential Effects to Above-ground Resources

Segment	Location	National Register Property/ District Adjacent to Rail Segment	Anticipated Adverse Effects of Project
1	Albany, NY	Broadway-Livingston Avenue Historic District	None
	Schenectady, NY	Mica Insulator Company	
2	Schenectady, NY	Union Street Historic District	None
3	Fort Edward, NY	Fort Edward Delaware & Hudson Train Station	None
	Saratoga and Washington Counties, NY	Champlain Canal	None
4	Castleton, VT	Castleton Village Historic District	None
	West Rutland, VT	Marble Street Historic District	None
	Rutland, VT	Rutland Downtown Historic District	None
6	N/A	N/A	None
7	Cohoes, NY	Downtown Cohoes Historic District	None
	Cohoes, NY	Delaware & Hudson Railroad Freight House	
8	Hoosick, NY	Delaney Hotel	None
	Hoosick and White Creek, NY	Bennington Battlefield	
9	Manchester, VT	Amos Lawrence House	None
	Arlington, VT	Arlington Village Historic District	
	Bennington, VT	North Bennington Historic District	
	Bennington, VT	North Bennington Depot	
10	Wallingford, VT	Wallingford Main Street Historic District	None
	Wallingford, VT	Rural Otter Creek Valley Historic District	

Table 4-20 Summary of Archaeological Sensitivity by Segment

Segment	Areas of Potential Sensitivity
1	Possible industrial sites associated with Albany
2	Portion of corridor near Mohawk River and Erie Canal
3	Portions of the corridor near the Champlain Canal and the barge canal between Fort Edward and Whitehall, and south of Saratoga Springs
4	Portions of the corridor along the Castleton River and in developed areas in Rutland and West Rutland
6	Potential sites near Anthony Kill, otherwise generally low sensitivity
7	Portions of corridor located close to Hoosic River
8	High sensitivity along most of corridor due to close proximity of Walloomsac River and Bennington Battlefield
9	Portions of corridor along Batten Kill; potential industrial sites associated with development of Arlington and South Shaftsbury
10	High sensitivity along Otter Creek, with several known sites; possible industrial sites associated with development of Manchester

4.17 Section 4(f) and Section 6(f) Resources

Section 4(f) resources, as defined in the DOT Act, are any public park, recreation area, wildlife or waterfowl refuge, or NRHP-listed or eligible property. Section 6(f) properties, as defined by the Land and Water Conservation Act, are those properties which have been purchased, maintained, or enhanced with Land and Water Conservation Fund (LWCF) monies. This section focuses on recreational or wildlife refuge (e.g., non-historic) Section 4(f) properties and Section 6(f) properties. (Section 4(f)-protected historic resources are those identified in Section 4.5.5, *Cultural Resources*.) Direct impacts or constructive use (i.e., indirect impacts that diminish the protected property's function) to these resources are prohibited unless no reasonable alternative is feasible. Impacts to properties protected by Section 4(f) are regulated by the US Department of Transportation and impacts to Section 6(f) lands are regulated by the US Department of Interior, National Park Service.

Section 4(f) resources also include any NRHP-listed or eligible property. These properties, and the potential effects of the project, are described above in Section 4.16, Cultural Resources. The analysis in Section 4.16 was conducted in accordance with the requirements of Section 106.

4.17.1 Methodology

Section 4(f) and Section 6(f) lands within 250 feet of the rail centerline were identified using publically available data from NYSGDC and VCGI. New York Section 4(f) DEC

Lands, State Lands, and Municipal lands data (2005) were used New York and in Vermont Section 4(f) Conserved and Recreational Lands data (2009) were used.

4.17.2 Existing Conditions

The Section 4(f) and Section 6(f) protected properties along each segment within the project study area are described below.

Segment 1

One wildlife refuge Section 4(f) property owned by the NYSDEC, and two each wildlife refuges and recreational Section 4(f) municipal properties were identified adjacent to Segment 1:

- Corning City Preserve, south of the rail ROW on the shoreline of the Hudson River in Albany, NY;
- Riverfront Preserve, north of the rail ROW on the shoreline of the Hudson River in Albany, NY;
- Tivoli Park, in Albany, NY adjacent to the rail ROW;
- Cook Park, west of the New York State Thruway and north of the rail ROW in Colonie, NY; and
- NYSDEC-owned Albany Pine Bush Preserve, which contains a portion of the pitch pine-oak forest EO described above, south of the rail ROW in Colonie, NY.

No Section 6(f) properties were identified adjacent to Segment 1.

Segments 2, 6, 7, and 8

No Section 4(f) or Section 6(f) properties were identified adjacent to Segments 2, 6, 7, or 8.

Segment 3

One wildlife refuge Section 4(f) property owned by the NYDEC and one recreational Section 4(f) municipal property were identified adjacent to the rail line in Segment 3:

- Gavin Park, a municipal property in Wilton; and
- NYDEC Wilton Wildlife Preserve, on several parcels in Wilton.

No Section 6(f) properties were identified adjacent to Segment 3.

Segment 4

There were no recreational Section 4(f) properties identified adjacent to the New York portion of Segment 4. In Vermont, two recreational and one wildlife refuge Section 4(f) properties were identified:

- Dewey Field, a municipal recreation area in Castleton north of the rail ROW;

- Blueberry Hill Wildlife Management Area, in Ira north of the rail ROW; and
- Depot Park, a municipal recreational facility adjacent to the rail ROW in Rutland.

No Section 6(f) properties were identified adjacent to Segment 4.

Segment 9

Four Section 4(f)-protected properties were identified adjacent to the rail line in Segment 9:

- Shaftsbury Elementary School playground, in South Shaftsbury;
- Howard Park, a municipal property east of the rail in Shaftsbury;
- Lake Shaftsbury State Park, west of the rail ROW and just south of the Arlington town line in Shaftsbury; and
- Arlington Recreation Park, between the Batten Kill and the rail ROW just north of Arlington.

No Section 6(f) properties were identified adjacent to Segment 9.

Segment 10

Three recreational and one wildlife refuge Section 4(f) properties were identified adjacent to Segment 10:

- The Dufresne Dam Pond Site, bisected by the rail ROW in Manchester, VT just south of Barnumville;
- Bullhead Pond, west of and adjacent to the rail ROW on the Manchester-Dorset, VT town line;
- Shaw Pond and Emerald Lake State Park, bisected by the rail ROW in Dorset, VT; and
- Otter Creek Wildlife Management properties in Mount Tabor, VT bisected by the rail ROW.

Five properties within the Green Mountain National Forest, and two Nelson Stream Bank properties in Mount Tabor, VT may also be Section 4(f)-protected properties. Additional research on these properties will be conducted during the Project Level analyses to determine their status.

No Section 6(f) properties were identified adjacent to Segment 10.

4.17.3 Environmental Consequences

The potential impacts to Section 4(f) or Section 6(f) resources from the No-Build and Proposed Action Alternatives are described below. "Impact" in the context of Section 4(f) and Section 6(f) is defined as property acquisition or constructive use (i.e., impacts that change the property's function).

4.17.3.1 No-Build Alternative

The No-Build Alternative would not require any use of Section 4(f) or Section 6(f) resources.

4.17.3.2 Proposed Action Alternative

Thirteen Section 4(f)-protected properties are present near the rail ROW, along Segments 1, 9, and 10. No Section 6(f) properties were identified adjacent to any of the segments. Table 4-21 summarizes the number of Section 4(f) properties along each segment.

Table 4-21 Summary of Section 4(f) Properties, by Segment

Segment Number	Section 4(f) Properties		
	Total Number	Type: Recreational	Type: Wildlife Refuge
1	5	2	3
2	0	0	0
3	2	1	1
4	3	2	1
6	0	0	0
7	0	0	0
8	0	0	0
9	4	4	0
10	4	3	1

Of the 18 Section 4(f)-protected properties within the project study area, 12 are designated recreational uses and six are wildlife refuges (designated as preserves, wildlife management areas, or similar).

The current freight use of the rail lines would not be substantively changed by the addition of passenger service; recreational activities or wildlife functions at nearby Section 4(f) properties would not be affected by the project and changes in noise levels that may result from the project are not anticipated to conflict with active recreational use. There would be no direct or constructive use of recreational Section 4(f) or Section 6(f) resources associated with improvements to the existing track infrastructure.

As discussed in Section 4.16, Cultural Resources, the project would not acquire property from any resource listed on or eligible for the NRHP that is not currently in transportation use. The project would rehabilitate the infrastructure of two existing railroads that are eligible as linear historic districts, but would not have an adverse effect on those resources. There would, therefore, be no use of historic properties under Section 4(f).

4.18 Energy

This section evaluates the impacts to energy that may result from the No-Build and the Proposed Action Alternatives.

4.18.1 Methodology

Potential impacts to energy were estimated by comparing the existing rail service to the anticipated changes that would result from the Proposed Action Alternative. Greenhouse gas (GHG) emissions were derived from the energy use and based on emission factors from The Climate Registry's *General Reporting Protocol* (GRP 2008). The GHG emissions analysis assumed all construction energy would be provided by diesel and used the diesel carbon dioxide (CO_2) emission factors provided by *General Reporting Protocol*. Nitrous oxide (N_2O) and methane (CH_4) emissions were assumed to be a similar proportion as for a highway project and estimated to be 5 percent of the total CO_2 emissions; they were converted and reported as CO_2 equivalents (CO_2e). Using CO_2e allows various GHG emissions to be reported as a single unit. Given the conceptual level of the project design at this stage, is not currently possible to estimate impacts to energy that could result from construction activities with any degree of accuracy.

4.18.2 Existing Conditions

The existing Ethan Allen service from Rensselaer to Whitehall, NY, operates diesel-powered trains over the 200-mile round-trip distance on a once per day basis. A passenger train consumes about 55,000 British thermal units (BTUs) of energy per vehicle mile. The energy for a passenger train is in the form of diesel fuel, and the average fuel economy of a passenger train is approximately 0.7 miles per gallon (mpg). Information regarding current trip distance on the No-Build Alternative, fuel and energy use, and GHG emissions are shown in Table 4-22.

Table 4-22 Existing Daily Train Energy Use

Current Ethan Allen Train Travel	Existing Conditions
Number of round trips per day	1
Distance through the project area	100 miles
Total train miles	200 miles
Fuel use	286 gallons
Energy use (Mbtu[1])	11
GHG emissions (MT CO_{2e})	6.5

1- Mbtu = one million British Thermal Units

4.18.3 Environmental Consequences

This section describes the potential impacts to energy and natural resources that may result from the No-Build and the Proposed Action Alternatives.

No-Build Alternative

The No-Build Alternative would not cause a change in current energy consumption patterns or natural resource use. The No-Build Alternative retains existing rail service.

Proposed Action Alternative

Energy consumption patterns would be minimally changed by the Proposed Action Alternative. The existing Ethan Allen service runs 73,000 miles annually. Annual train miles would be an additional 85,410 miles for the new service between Albany and Rutland. Table 4-23 compares the energy impacts of the No-Build and Proposed Action Alternatives.

Table 4-23 Future Daily Energy Use and Resulting GHG Emissions

	Train-Related Operations			Vehicle-Related Operations	Total
Travel Conditions	No-Build Alternative	Proposed Action Alternative	Difference	Proposed Action Alternative	
Number of round trips per day	1	2	1	-	
Distance through the project area (miles)	100	217	117	-	
Total miles	200	434	234	-2,497,900	
Fuel use (gallons)	286	620	334	-115,644[2]	
Energy use (Mbtu[1])	11.0	23.8	12.8	-	
GHG emissions (MT CO_{2e})	6.5	14.1	7.6	-1,018[3]	-1,003

1- Mbtu = one million British Thermal Units
2- Average Light Duty Vehicle MPG= 21.6 mpg ("Highway Statistics 2012" *Chapter 5, Section 3.1;* FHWA, 2012
3- 8.8 kg CO_2/ gal gasoline ("Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks" US EPA, October 2008) [Converted from 19.4 lbs/gal].

The Proposed Action Alternative is projected to result in a total reduction in 1,003 tons per year of CO_2 from the No-Build Alternative.

4.19 Visual and Aesthetic Resources

This section identifies and evaluates potential impacts the visual and aesthetic resources along the project corridor.

4.19.1 Methodology

The existing visual and aesthetic conditions along the project corridor were identified by reviewing aerial photographs to determine the nature of the visual environment along the existing rail lines. Potential impacts to the visual and aesthetic resources were evaluated by reviewing areas where new construction would occur and assessing how the visual environment may change.

4.19.2 Existing Conditions

The existing rail lines pass through developed and undeveloped land. The existing visual environment along each of the segments is summarized below.

Segment 1

Segment 1 runs from Rensselaer through Albany to Schenectady, NY. Beginning in Rensselaer, the rail line crosses the Hudson River and enters Albany, passing through the northern extent of the city while paralleling I-90 in a northwesterly direction. Surrounding land in this area is developed with transportation, commercial, and industrial use. A portion of the segment between Albany and Schenectady, NY, passes through undeveloped land, although low-density commercial, industrial, and residential development is nearby. Entering Schenectady, the rail line passes through increasingly dense development, ultimately entering the downtown area.

The visual environment along Segment 1 is dominated by development in for the majority of its length. The visual environment is undisturbed in short intervals between the major cities.

Segment 2

Segment 2 runs from Schenectady to Glenville, NY. From the highly urbanized downtown Schenectady, the rail line crosses the Mohawk River and passes through low-density development of Glenville. Surrounding land use is principally residential, although undeveloped land (open space) is present as well.

The visual environment along Segment 2 varies from the urban views of Schenectady to the semi-rural character of the low-density development and open space in Glenville.

Segment 3

Segment 3 runs from Glenville to Whitehall, NY. From the north side of Glenville, outside the urban core, the rail line passes through low-density rural development, farmland, and forested areas until reaching the outskirts of Saratoga Springs. The line passes along the western suburban edge of Saratoga Springs and then continues through low density rural development, farmland and forested areas to Fort Edward. The railroad crosses the Hudson River to enter Fort Edward, passes through the urban core of this small town, and then resumes its passage through mixed use rural areas to the small residential town of Whitehall.

The visual environment along Segment 3 varies from the suburban views of Saratoga Springs to several small towns and the semi-rural character of the low-density development and open space in intervening areas.

Segment 4

Segment 4 runs from Whitehall, NY to Rutland, VT. The rail line passes near a residential area of Whitehall before exiting the town near an industrial site. The corridor passes through farmland and forested areas until reaching the New York/Vermont state line at Fair Haven. Residential, industrial, and commercial development adjoins the corridor in Fair Haven. The segment passes along the edges of the small towns of Hydeville and Castleton, near similarly developed areas interspersed with farmland and forest. The rail line parallels US Highway 4 between Castleton and West Rutland, generally passing through farmland and forested areas before entering the development of West Rutland and Rutland.

The visual environment along Segment 4 varies from the residential, commercial and industrial views of Whitehall, Fair Haven, Hydeville, Castleton, West Rutland, and Rutland to the semi-rural character of farmland and open space in intervening areas.

Segment 6

Segment 6 runs from Glenville to Mechanicville, NY. Exiting Glenville, the rail line passes through increasingly rural areas, with little adjacent development until near Elnora, NY. Some commercial and residential development is proximate to the rail line in this reach, especially near the I-87 crossing. Open space and agricultural lands are present along the rail line from near I-87 until Mechanicville. The rail line enters this city from the northwest, passing a rail yard before skirting the densely developed downtown area. Some commercial and residential land use abuts the rail line in this final reach.

The visual environment along Segment 6 varies between views of agricultural land, low-density development, and open space between Glenville and Mechanicville. Some intervals of dense development are visible adjoining the rail line in Mechanicville.

Segment 7

Segment 7 runs from Mechanicville to Hoosick Junction, NY. Exiting the densely developed northern extent of Mechanicville, the rail line crosses the Hudson River and passes through agricultural land of the Hudson River Valley. It passes through several small towns along the Hoosick River before reaching Hoosick Junction.

The visual environment along Segment 7 is dominated by views of agricultural land and small communities, with some urban views while exiting Mechanicville.

Segment 8

Segment 8 runs from Hoosick Junction, NY to North Bennington, VT. Similar to Segment 7, the rail line passes through agricultural land and small communities in the Hudson River Valley, with some open space in irregular intervals. Adjoining residential development increases as the rail line approaches North Bennington.

The visual environment along Segment 8 is dominated by views of agricultural land and small communities, with increasing views of small city development in North Bennington.

Segment 9

Segment 9 runs from North Bennington to Manchester, VT. Exiting North Bennington, this segment passes through open space and agricultural land, near small towns and cities such as Shaftsbury, Arlington, and Sunderland, VT before entering Manchester. Rural residential land is the most common development type; there is little commercial or industrial development along this segment. Development density increases in Manchester.

The visual environment along Segment 9 is dominated by views of open space, agricultural land, and small communities, with increasing views of small city development in Manchester.

Segment 10

Segment 10 runs from Manchester to Rutland, VT. Exiting Manchester, the rail line passes through low density rural residential and agricultural land as well as small communities such as East Dorset and Clarendon, VT. Some intervals of open space are present along this segment. Entering Rutland, the rail line passes near commercial, industrial, and residential development of increasing density.

The visual environment along Segment 10 is dominated by views of open space, agricultural land, and small communities, with increasing views of small city development in Rutland.

4.19.3 Environmental Consequences

The potential impacts to visual and aesthetic resources from the No-Build and Proposed Action Alternatives are described below.

No-Build Alternative

The No-Build Alternative would not impact visual and aesthetic resources.

Proposed Action Alternative

The Proposed Action Alternative would use existing active rail lines for its entire length. New infrastructure in certain segments (as listed in Table 4-1) would be limited to sidings to allow trains to pass, and new stations in Manchester and North Bennington, VT and Mechanicville, NY. Some track relocation within the existing railbed and bridge modifications may be necessary. No work is planned outside the ROW and no changes to the visual character or setting are anticipated. Construction activities that have the potential to change the visual and aesthetic environment are described for each segment below.

Segment 1

No infrastructure improvements are planned for Segment 1. The visual and aesthetic environment would be unchanged.

Segment 2

Two miles of new main line siding track would be constructed in Segment 2, within the existing rail ROW. The new siding track would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 2.

Segment 3

No infrastructure improvements are planned for Segment 3. The visual and aesthetic environment would be unchanged.

Segment 4

No infrastructure improvements are planned for Segment 4. The visual and aesthetic environment would be unchanged.

Segment 6

Six miles of new main line siding track would be constructed in Segment 6, within the existing rail ROW. The new siding track would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 6.

Segment 7

A second main line track would be constructed in Segment 7, within the existing rail ROW. The new track would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 7. A new station would be constructed in Mechanicville. The station would consist of a platform, shelter, walkways, and parking lot. These features would have little impact to the visual environment of the rail ROW in Mechanicville; however, this would be evaluated in a subsequent Project Level NEPA document once a location is selected.

Segment 8

The existing main line track would be upgraded and all bridges rated "poor" would be reconstructed in Segment 8, within the existing rail ROW. This new infrastructure would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 8. Additionally, a new station would be constructed in North Bennington. The station would consist of a platform, shelter, walkways, and parking lot. These features would have little impact to the visual environment of the rail ROW in North Bennington; however, this would be evaluated in a subsequent Project Level NEPA document once a location is selected.

Segment 9

The existing main line track would be upgraded and all bridges rated "poor" would be reconstructed in Segment 9, within the existing rail ROW. This new infrastructure would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 9. Additionally, a new station would be constructed in Manchester. The station would consist of a platform, shelter, walkways, and parking lot. These features would have little impact to the visual environment of the rail ROW in Manchester; however, this would be evaluated in a subsequent Project Level NEPA document once a location is selected.

Segment 10

The existing main line track would be upgraded in Segment 10, within the existing rail ROW. This new infrastructure would be similar to the existing track, and not materially change the visual and aesthetic environment along Segment 10.

Summary

The NY-VT Bi-State Intercity Passenger Rail service would utilize existing active rail lines for its entire length. New construction in certain segments would be limited to sidings to allow trains to pass, new double track, upgraded track, and replaced bridges, all within the existing rail ROW. New stations would be constructed in Manchester and North Bennington, VT and Mechanicville, NY. None of these activities are expected to substantively change the visual and aesthetic environment. The existing viewshed of the rail corridor from the surrounding land uses would be maintained under the Proposed Action Alternative.

4.20 Construction Period Impacts

Construction period impacts cannot be accurately evaluated at this stage of the project because detailed engineering design has not been completed. This section generally characterizes construction impacts that may be expected for the project. Construction period activities may result in localized, short-term impacts to certain resources, as described below.

4.20.1.1 Transportation

Traffic delays may result from construction activities during infrastructure reconstruction, in particular where grade crossings (public at-grade or bridge crossings) are upgraded or replaced. Detours would be used to direct traffic around construction zones.

4.20.1.2 Air Quality

Air quality may be impacted by exhaust emissions from construction equipment and dust generated by earthmoving equipment or wind. Construction contractors would be required to comply with state and local emission control regulations or ordinances for construction equipment, and implement dust control measures (e.g., watering) during construction activities.

4.20.1.3 Noise

Noise would be generated by construction equipment engines, pile drivers or jackhammers, and drilling rigs. Construction contractors would be required to comply with state and local noise management regulations or ordinances for construction activities.

4.20.1.4 Vibration

Vibration would be generated by construction pile drivers, jackhammers, and drilling rigs. Construction contractors would be required to implement vibration management measures during construction activities.

4.20.1.5 Water Resources

Water resources may be affected by stormwater runoff from construction sites. Construction contractors would be required to comply with National Pollutant Discharge Elimination System (NPDES) requirements for stormwater management, including implementation of Best Management Practices to prevent or minimize impacts to water resources.

4.20.1.6 Summary

The project would not result in any significant short-term impacts to environmental resources from construction when regulations and ordinances are complied with and mitigation measures are used.

4.21 Indirect Effects and Cumulative Impacts

This section provides an assessment of the indirect effects and cumulative impacts of the project in combination with the past, present, and reasonably foreseeable future actions in the project study area and the surrounding region.

The CEQ regulations at 40 CFR 1500 *et seq* require an assessment of indirect effects and cumulative impacts for federally assisted projects. Indirect effects are defined by CEQ as “effects which are caused by the [proposed] action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects include growth-inducing effects and other effects related to changes in the pattern of land use, population density, or growth rate…”.

Cumulative impacts are defined by CEQ as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” Cumulative impacts include the direct and indirect impacts of a project together with the past, present, and reasonably foreseeable future actions of others.

4.21.1 Methodology

The project has the potential to result in indirect effects and, when combined with past, present and other reasonably foreseeable future actions, could result in cumulative impacts. The potential for indirect effects was assessed for each resource in the project study, using methods similar to those for assessing direct impacts.

Federal guidance was used in evaluating the project’s cumulative effects, specifically CEQ’s *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997). The analysis was completed by adding the project’s direct and indirect impacts on the natural and human environment to the impacts from past, present, and reasonably foreseeable future actions. Reasonably foreseeable future actions are defined as specific projects that are, for example, in a public planning or permitting phase; conceptual studies and speculative projects are not considered reasonably foreseeable.

As described in Section 2.4, *Coordination with Other Initiatives*, recent and ongoing transportation projects within the project study area include:

- **ABRB 1 and 2 Programs (between Manchester and North Bennington, VT):** The preliminary work consisted of track, bridge and grade crossing rehabilitation and has been mostly completed.
- **ABRB S Program (between Hoosick Junction, NY and North Bennington, VT):** The work primarily consisted of track, bridge and grade crossing rehabilitation and was partially completed.
- **ABRB SC Program (between Hoosick Junction, NY and Manchester, VT):** This program involved upgrading the ABRB corridor to FRA Class III operations from Hoosick Junction, NY to Burlington, VT in order to accommodate future freight and passenger rail service.

These projects were considered in the cumulative effects evaluation.

4.21.2 Indirect Effects

The Proposed Action Alternative is unlikely to generate local or regional growth in jobs or population. However, the Proposed Action Alternative could affect where the growth occurs, the form of the growth, and the pace of redevelopment, indirectly affecting land use and socioeconomics. Changes in land use that indirectly result from the project could affect other resources as well, as described below.

Development in the vicinity of the new stations, whether "transit-oriented development" or not, may result if businesses chose to locate near stations to take advantage of the train riders. However, as described in Section 4.3, *Transportation*, the increases in ridership are anticipated be low, on the order of 30 to 40 per day. It is unlikely that a business would specifically chose to locate near a station because of this number of potential customers, although existing nearby businesses could benefit. Indirect effects on local land use or socioeconomics would be minimal.

There is limited potential for new development pressure on a regional basis. If new development were to occur it would likely be associated with the Capital District (such as bedroom community development for persons employed in Albany). That pressure may be directed toward the vicinity of the proposed new Mechanicville Station and, perhaps, North Bennington. These areas are currently not considered "urbanized" and may be seen as new development opportunities for low-density exurban residential development. As described in Section 4.12, *Land Use*, development density in the area is considered low; there is low pressure to develop additional land outside of the urban areas. It is unlikely that new development pressure in Mechanicville or North Bennington would be substantive. Commercial or industrial development is not expected to indirectly result from the project. The Proposed Action Alternative would indirectly result in minimal changes to land use.

Changes in land use could affect natural resources and the human environment depending upon where they occur. Residential development of undeveloped land, for example, could impact water resources, wetlands, floodplains, ecological systems (wildlife habitat), or threatened or endangered species if these resources are present in the development area. Residential development can also affect traffic, air quality, noise and vibration, environmental justice neighborhoods, public safety, cultural resources, energy, or the visual environment if commuters drive cars to stations or build homes that change the visual setting. Impacts to these resources are governed by environmental regulations at the federal, state, or local levels and are therefore expected to be minimal. With the low level of land use changes expected to indirectly result from the Proposed Action Alternative, these further impacts would be *de minimus*.

Indirect socioeconomic effects at the local level could be associated with the creation of new access opportunities to goods, services, employment, and labor. Given the projected ridership assumed for the project, however, it is unlikely that indirect local socioeconomic effects would be significant. As mentioned above, it is possible that new station parking may provide an opportunity for municipalities to harness commuter spending power, and thus lead to possible positive indirect socioeconomic effects. Given the size of the stations, however, with parking for a maximum of 50 cars at one time, it is reasonable to conclude that such localized effects to surrounding businesses would not be significant.

The types of indirect benefits that communities may experience are better assessed at a regional level, and would consist of improved public transportation access to employment, goods, and services. Considering the socioeconomic conditions for the counties and cities in the project study area, as described in Section 4.16, *Socio-Economic Environment*, the following low magnitude changes in regional socioeconomic conditions may result indirectly from the project.

While Washington County, NY would not likely experience any benefit from the project, persons seeking employment in Vermont may be able to access employment opportunities in the New York Capital District, where employment has generally increased. There is also the potential for Vermont and New York residents northeast of Albany and Rensselaer to seek employment in Saratoga County, where employment has also increased. However, it is expected that the numbers of persons in Vermont that would be employed in New York cities would be small and not likely affect the larger pattern of job loss in the Vermont counties.

The number of firms is smallest in the Vermont counties and Washington County, NY. The new access to potential employees (labor) living in Vermont and in the Capital District could provide a stimulus to establish or locate businesses in Washington, Saratoga, and Rensselaer Counties of New York, particularly around Mechanicville, NY. Likewise the new access to potential employees (labor) living in the Capital District could provide stimulus to establish or locate businesses in Vermont. Business location and establishment depends on many factors, however, including taxation, and so it is difficult to estimate the potential for such indirect effects without detailed analysis. Based on the available information regarding ridership, as well as the small populations in Vermont and the competitiveness of Albany, NY, it is anticipated that there is limited potential for the project to cause substantial business development outside the cities comprising the Capital District.

Given the limited potential to increase employment, it is unlikely that substantial increases to median per capita income or median household income in Vermont or parts of New York, like Schenectady, could be indirectly attributable to the project. Likewise, overall poverty rates are not likely to be affected by the project.

As mentioned above, there is a potential for shifts in population associated with new commuting access. For example, there is the possibility that persons already employed in the Capital District may seek housing in areas north and east that would be served by the proposed Mechanicville Station or in Vermont. The median values of homes in Vermont were substantially lower than in New York. Depending on multiple other factors, including development restrictions, perceived quality of life, including schools and other community facilities and services, and travel time, it is possible that the project could result in the indirect development of "bedroom" communities in the vicinity of Mechanicville and areas east along the rail line. Further study of potential pressure to shift population may be conducted as part of Project Level analyses for the stations.

To the extent that population shifts may occur there may be some changes in population counts for each county or city. Though the area is not generally diverse in demographic composition, there already exists the concentration of minorities within the cores of the urbanized areas; and there is already the similar urban concentration of persons living in poverty. Given that this condition already exists, it is possible that shifts in population may further exacerbate demographic polarities. This is particularly the case given the limited potential for overall improvements to socioeconomic conditions in the future (either with or without the project), which if possible could create new incentives for relocation, particularly for the currently economically disadvantaged as their own situations improve. Further study of potential pressure to shift population may be conducted as part of Project Level analyses of the stations.

To the extent that New York areas such as Glens Falls, Saratoga Springs, and Glenville may have grown due to their rail linkage to Albany and Rensselaer and extra-regional points north and south, it is reasonable to anticipate that new development pressures in Vermont, south of Rutland, may result from the project. Thus, there is the possibility that the project may indirectly affect socioeconomic conditions, as it would provide new access to potential market opportunities for development (housing, commercial activity, employment centers, etc.). However, as described in the land uses discussion above, new development pressure is expected to be minimal, and the socioeconomic effects would also likely be minimal.

Because new access to Vermont will be provided from the Capital District, which links into areas south (including New York City), there is the potential for increases in tourism in Vermont, particularly seasonal tourism associated with "leaf peeping" in the fall and skiing in the winter. As described in Section 4.16, sales attributable to accommodation and food services were lower in Vermont than in New York; this may be due to limited access and also may be due to limited industry (existing hotel accommodations and similar tourist infrastructure) in the area. A detailed analysis of the Vermont tourism industry during Project Level analyses of the stations would be necessary to determine whether significant indirect effects would result from the project. Given the ridership numbers assumed, however, anticipated demand would not represent notable increases in tourism.

None of these indirect effects to the socioeconomic environment, insofar as they can be determined via this Service Level analyses, are likely to be significant. Further study may be required at the Project Level analyses of the stations to determine potential indirect effects associated with a population shift. Depending on where the new development may occur, tax bases may be positively affected and some municipalities may experience positive potential fiscal improvements as an indirect result of the project. At this stage of analysis, it is anticipated that any such effects would be minimal and not significant. Likewise, demographic changes may also occur, together with population shift, but neither the population shift nor the demographic change would be expected to be significant.

4.21.3 Cumulative Impacts

The project study area has been subject to development of increasing intensity over the last 400 years, but is effectively stable at this time. Impacts to the natural and human environment from past activities have largely stabilized, and no large-scale new projects are planned. The recent and reasonably foreseeable future actions listed above will improve the existing rail infrastructure but do not consist of new rail lines that would have a substantive direct effect on the environment. Adding new passenger service to the existing rail lines would also not have a direct substantive effect to any resource. Work that extends outside the ROW may affect certain resources.

As described in previous sections of this chapter, there is a potential for the Proposed Action Alternative to have a minor direct adverse impact to noise and vibration levels, ecological systems, and energy, and minor indirect effects to land use and socioeconomics. The cumulative impacts analysis below focuses on these resources. Potential adverse impacts to threatened or endangered species, land use, and visual and aesthetic resources would be identified in future Project Level NEPA documents. There is no potential for the Proposed Action to have a permanent adverse impact to transportation, air quality, water resources, wetlands, floodplains, socioeconomics, environmental justice neighborhoods, public safety, cultural resources, or Section 4(f) or Section 6(f) resources; there is no potential for cumulative effects to these resources as a result of the Proposed Action Alternative.

The rail improvement projects that are programmed and underway would occur under the No-Build Alternative and would facilitate the Proposed Action Alternative. These projects have been taken into consideration in the current design of the Proposed Action Alternative (e.g., in regard to the extent of infrastructure improvements required). These other projects do not add to the minimal indirect land use and socioeconomic impacts expected from the Proposed Action Alternative.

4.21.3.1 Noise

Other past, present, and reasonably foreseeable future actions have created a noise environment that varies considerably through the project study area, from quiet landscapes of undeveloped areas to noisy landscapes of the various cities. The existing rail lines passing through these areas are used at varying levels of intensity, including heavily used corridors. The frequency of the noise generated by trains is episodic, occurring only when the trains pass. The addition of one roundtrip (two passes) of passenger trains for the Proposed Action Alternative would not substantively add to the episodes of increased noise levels. There would be minimal cumulative impacts to noise levels from the Proposed Action Alternative.

4.21.3.2 Vibration

Similar to the noise environment described above, other past, present, and reasonably foreseeable future actions have created a vibration environment that varies considerably through the project study area, from calm landscapes of undeveloped areas to active landscapes of the various cities. The existing rail lines passing through these areas are used at varying levels of intensity, including heavily used corridors. The frequency of the vibration generated by trains is episodic, occurring only when the trains pass. The addition of one roundtrip (two passes) of passenger trains for the Proposed Action Alternative would not substantively add to the episodes of increased vibration levels. There would be minimal cumulative impacts to vibration levels from the Proposed Action Alternative.

4.21.3.3 Ecological Systems

Other past, present, and reasonably foreseeable future actions have altered ecological systems to varying degrees through the project study area, from natural landscapes of undeveloped areas to highly developed landscapes of the various cities. Some of the ecological systems have been substantively disturbed by historical activities, but there are no current or known reasonably foreseeable future actions that would further affect ecological systems. Wildlife habitat or corridors within Segments 1, 9, and 10 may be impacted if work for the Proposed Action Alternative is required outside the existing rail footprint to modify existing or construct new tracks or stream or road crossings. Additional investigation of ecological systems would be conducted as part of Project Level NEPA review during preliminary and final design to identify any potential impacts and, if necessary, design appropriate impact avoidance or minimization measures. Cumulative impacts to ecological systems may result if impacts cannot be avoided.

4.21.3.4 Energy

Other past, present, and reasonably foreseeable future actions use energy in the project study area, including transportation activities. None of the reasonably foreseeable future actions are expected to increase energy use; they are railroad improvement projects that improve the railroad infrastructure but are not expected to increase its use. The Proposed Action Alternative would use slightly more than double the energy than the No-Build Alternative due to an additional daily trip from the new service. The Proposed Action Alternative, in combination with other past, present, and reasonably foreseeable future actions, would not result in a substantive change in cumulative energy use.

4.21.3.5 Land Use

Other past, present, and reasonably foreseeable future actions have altered land use to varying degrees through the project study area, from natural landscapes of undeveloped areas to highly developed landscapes of the various cities. Land use in the project study area includes residential, commercial, industrial, transportation, and agricultural properties, as well as undeveloped land. There are no current or known reasonably foreseeable future actions that would further change land use. The reasonably foreseeable future actions considered in this assessment are railroad infrastructure improvement projects that will not affect land use. The Proposed Action Alternative may directly or indirectly impact land use outside of the ROW depending upon the selected locations for the proposed new stations in Manchester and North Bennington, VT and Mechanicville, NY. Property may need to be acquired to accommodate small parking lots at the new station sites. Additional investigation of changes to land use would be conducted as part of Project Level NEPA review during preliminary and final design. The impacts may be beneficial if abandoned or blighted properties are obtained for the project. The Proposed Action Alternative, in combination with other past, present, and reasonably foreseeable future actions, may result in beneficial cumulative impacts to land use.

4.21.3.6 Socioeconomics

Other past, present, and reasonably foreseeable future actions have altered the socioeconomic environment to varying degrees through the project study area, rural economies in less developed areas to urban economies in the larger cities. There are no current or known reasonably foreseeable future actions that would further alter the socioeconomic environment. The reasonably foreseeable future actions considered in this assessment are railroad infrastructure improvement projects that will not affect socioeconomics. The Proposed Action Alternative is expected to indirectly benefit the economy by providing new rail service to southwestern Vermont and east central New York. The Proposed Action Alternative, in combination with other past, present, and reasonably foreseeable future actions, may result in beneficial cumulative impacts to the socioeconomic environment.

4.22 Summary of Findings

This Service Level analysis identified the existing conditions along each segment comprising the Proposed Action Alternative and the potential impacts of the No-Build Alternative and the Proposed Action Alternative for the following resources:

- Transportation
- Air quality
- Noise
- Vibration
- Water resources
- Wetlands
- Floodplains
- Ecological Systems
- Threatened and endangered species
- Land use
- Socio-economic environment
- Environmental justice
- Public health and safety
- Cultural resources
- Section 4(f) and Section 6(f) resources
- Energy and natural resources
- Visual and aesthetic resources

Potential construction period impacts to air quality, noise, vibration, and water resources were also evaluated.

Because the project, at this stage of development, would extend outside the existing rail ROW in only at the proposed station locations, this evaluation concluded that there is a negligible to low potential for the project to result in adverse impacts to natural resources. The human resources present within the project study area would not be adversely affected by the project, as the new service would follow existing rail lines, not disrupting communities in any substantive way. The Proposed Action Alternative would not result in substantive direct, indirect, or cumulative adverse impacts to natural resources or the human environment.

The construction period impact analysis concluded that the project would not result in any significant short-term impacts to environmental resources when regulations and ordinances are complied with and mitigation measures are used.

5

Agency and Railroad Coordination and Public Involvement

5.1 Agency and Railroad Coordination

This section discusses agency and railroad coordination that has occurred throughout this study.

5.1.1 Inter-state Agency Coordination

The *Vision for the New England High-Speed and Intercity Rail Network* collectively developed by the Departments of Transportation in the six New England States provides a vision for rail in the region and a commitment to work together to coordinate efforts. The development of the rail system envisioned by this document will "… provide a foundation for economic competitiveness and promote livable communities through a network of High-Speed and Intercity Passenger Rail routes connecting every major city in New England with smaller cities and rural areas and internationally to Montreal." This document serves as a guideline to ensure that actions taken to advance intercity high speed rail are coordinated among the New England States.

5.1.2 Scoping Process

The planning and project development activities have been a cooperative and collaborative effort by VTrans and NYSDOT in cooperation with the Federal Railroad Administration (FRA). VTrans serves as the overall project lead and is responsible for managing the Project Management Team (PMT), which consists of representatives from VTrans, NYSDOT, the Rutland Regional Planning Commission (RRPC) and the Bennington County Regional Commission (BCRC).

Stakeholder Committee meetings were held with representatives from VTrans, NYSDOT, FRA, potentially affected rail operators, regional planning agencies within the project study area and various advocacy groups:

- March 22, 2011
- June 7, 2011
- December 13, 2011
- October 18, 2012
- December 11, 2012

Railroad owners and operators which have participated in these discussions include: Pan Am Railways (PAR), Vermont Rail Systems (VRS), Canadian Pacific Rail (CP), CSX, and Amtrak. Rail interest groups that have also participated throughout this process include: the Vermont Rail Action Network (VRAN), the Empire State Passenger's Association (ESPA), Rutland Railway Association, Friends of Rutland Rail, and the Southwestern Vermont Rail Corridor Steering Committee. Other interested parties invited to participate in the study included the US Army Corps of Engineers, US Environmental Protection Agency, US Fish & Wildlife Service, Vermont Department of Environmental Conservation, Vermont Division for Historic Preservation, New York State Department of Environmental Conservation, New York State Historic Preservation Office, State Representatives, local elected officials and municipalities, and other interest groups and individuals.

Through the preparation of this document, these representatives have been in constant communication, both formally and informally. Through information sharing and thoughtful negotiation, a Service Development Plan has been prepared, which provides for both enhanced passenger and freight rail service. All parties have been provided with an opportunity to participate in project related discussions in an effort to identify and resolve issues early on in the process.

5.1.3 Applicable Regulations and Permits

The Proposed Action would require permits and approvals from several Federal, state and local agencies. Table 5-1 lists the permits and approvals that are anticipated for the Proposed Action.

Table 5-1 Possible Permits or Approvals

Agency	Permit or Approval
US Army Corps of Engineers	Clean Water Act Section 404 Nationwide Permit for extended culverts and upgraded bridges
US Environmental Protection Agency, Regions 1 & 2	Compliance with National Pollutant Discharge Elimination System (NPDES) Construction General Permit to stormwater discharges during construction
Vermont Department of Environmental Conservation	Wetlands Conditional Use Permit for new track sidings where these are located within 50 feet of wetlands
New York Department of Environmental Conservation	Wetland Permit for extended culverts and upgraded bridges
Local Municipalities	Approval for temporary closings/detours associated with construction Building permits as needed Approval for intersection and signal modifications, as appropriate Stormwater permits, as needed Street opening permits, as needed

5.2 Public Involvement

This section describes how the public was involved during the study.

5.2.1 Public Informational Meetings

Public informational meetings were held at various locations within the project study area to provide the public an opportunity to learn about the scope of the proposed project:

- March 22, 2011 (Bennington, VT) – Project Introduction, Purpose and Need, Screening Criteria
- June 7, 2011 (Mechanicville, NY) – Project Recap, Alternatives, Evaluation Methodology
- June 8, 2011 (Rutland, VT) – Project Recap, Alternatives, Evaluation Methodology
- December 13, 2011 (Bennington, VT)
- December 14, 2011 (Mechanicville, NY)
- December 11, 2012 (Mechanicville, NY)
- December 12, 2012 (Rutland, VT)

Public opinion and comments were documented and considered in the development of study recommendations. Meeting minutes from each of the public meetings are provided in the project web site, described below.

5.2.2 Project Web Site

A project website, www.ny-vt-passengerrail.org, has been established which provides the public project updates, notices of meetings, links to other area organizations and studies, access to minutes of meetings and technical documents, and an opportunity to comment on the proposed project.

5.2.3 Project Newsletters

Four project newsletters were prepared and distributed to the project mailing list at key milestones over the course of the study:

- Newsletter #1 (March 2011) – Project Introduction, Purpose and Need, Schedule, Stakeholder Committee
- Newsletter #2 (June 2011) – Summary of Public Involvement Activities, Refined Purpose and Need, Notice of June 2011 Public Meetings
- Newsletter #3 (December 2011) – Phase One Screening
- Newsletter #4 (December 2012) – Phase Two Screening

These newsletters covered significant topics that were critical to the study's completion. Newsletters were distributed to coincide with upcoming public meetings.

6

References

ACRPC, BCRC, CCMPO, CCRPC, NRPC, RRPC, and VTrans. 2010. *Vermont Western Corridor Transportation Management Plan*. February 2010. Vermont Agency of Transportation; Bennington County Regional Commission; Chittenden County Metropolitan Planning Organization; and Addison County, Chittenden County, Northwest, and Rutland Regional Planning Commissions; prepared by Parsons Brinckerhoff.

AMTK. 2000. *Vermont Western Corridor Study*, Report to Congress. January 28, 2000. National Railroad Passenger Corporation (Amtrack).

BCRC. 2007. *The Regional Plan, Bennington, Vermont*. May 17, 2007. Bennington County Regional Commission. Available at http://www.bcrcvt.com/documents/regionalplan.pdf.

BCRC. 2008. *Bennington County Regional Transportation Plan*. Fall 2008. Bennington County Regional Commission, prepared by Bannon Engineering and von Grossmann & Company.

BLHS. 2006. *History of the Delaware and Hudson Railroad*. December 31, 2006. Bridge Line Historical Society. Available at http://bridge-line.org/blhs/history.html. Accessed October 2011.

CDRPC. 2009. *Comprehensive Economic Development Strategy for the Capital District*. September 2009. Capital District Regional Planning Commission. Available at http://www.cdrpc.org/2009-09_CDRPC_CEDS.pdf.

CEQ. 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. January 1997. Council on Environmental Quality. Available at: http://ceq.hss.doe.gov/publications/cumulative_effects.html.

ConnDOT, MaineDOT, MassDOT, New Hampshire DOT, RIDOT, and VTrans. 2009. *Vision for the New England High-Speed and Intercity Rail Network*. July 2009. Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island Departments of Transportation and Vermont Agency of Transportation. Available at http://www.mass.gov/Agov3/docs/PR071309.pdf.

The Climate Registry. 2008. *General Reporting Protocol*. May 2008. Available at http://www.theclimateregistry.org/downloads/GRP.pdf.

Curry, Bruce P. 1975. "Rutland Revival – the Vermont Railway." *Railfan and Railroad Magazine*, Summer 1975. Available at http://www.railfan.com. Accessed November 2011.

DuFresne, Marilyn E. 2010. *Delaware and Hudson Railway*. Charleston, SC: Arcadia, 2010. 7-8. Available at http://books.google.com. Accessed November 2011.

Executive Order 11988. 1977. *Floodplain Management*. May 24, 1977. Available at http://water.epa.gov/lawsregs/guidance/wetlands/eo11988.cfm.

Executive Order 11990. 1977. *Protection of Wetlands*. May 24, 1977. Available at http://water.epa.gov/lawsregs/guidance/wetlands/eo11990.cfm.

Executive Order 12898. 1994. *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. February 11, 1994. Available at http://www.archives.gov/federal-register/executive-orders/pdf/12898.pdf

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, *PE&RS*, Vol. 77(9):858-864. Available at http://www.mrlc.gov/nlcd2006.php.

Joseph, Linda C. and Resch, Linda D. 2000. *Fitchburg Railroad: 1845-1900*. Available at http://www.cyberbee.com/henryhikes/fitchburgrr.html. Accessed November 2011.

Mohawk and Hudson Railroad. Available at http://oldrailhistory.com. Accessed November 2011.

NAPL. 2003. *Historical Notes, Hoosac Tunnel Collection*. May 2003. North Adams Public Library, compiled by Gary Smith. Available at http://www.naplibrary.com/HTHistoricNotes.html. Accessed November 2011.

NOAA-NMFS. 2012. *Shortnose Sturgeon (Acipenser brevirostrum)*. December 5, 2012. National Oceanographic and Atmospheric Administration – National Marine Fisheries Service, Office of Protected Resources. Available at http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm

NYCSHS. 2008. *NYC Railroad History*. May 2008. New York Central System Historical Society, Inc. Available at http://nycshs.blogspot.com/2008/05/nyc-railroad-history.html. Accessed November 2011.

NYSDOT. 2008. *Highway Data Services Bureau Online Traffic Data Viewer*. New York State Department of Transportation. Available at http://gis.dot.ny.gov/tdv/. NYSDOT. 2009. *NY State Rail Plan*, Strategies for a New Age. New York State Department of Transportation. Available at https://www.dot.ny.gov/divisions/policy-and-strategy/planning-bureau/state-rail-plan/repository/State%20Rail%20Plan%202009-02-10.pdf.

NYSDOT ESB. 2008. *MOBILE6 Emission Factors for Regional, Mesoscale, and CMAQ Project Emission Calculations for Albany, Rensselaer, Saratoga, and Schenectady*

Counties (for year 2030). April 2008. New York State Department of Transportation – Environmental Science Bureau. Available at https://www.dot.ny.gov/divisions/engineering/environmental-analysis/repository/albany.pdf.

RRPC. 2006. *Rutland Region Economic Development Strategy* (Draft). July 2006. Rutland Regional Planning Commission. Available at http://rutlandrpc.org/_download.php?mode=pub&id=5&name=CEDS_updated_6_29_06.pdf.

RRPC. 2008. *Rutland Regional Plan*. April 15, 2008. Rutland Regional Planning Commission. Available at http://www.rutlandrpc.org/Plan08/Regional_Plan_2008.pdf.

USBOC. 2000. *MCD/County-To-MCD/ County-To-County Worker Flow Files*. U.S. Bureau of the Census. Available at http://www.census.gov/population/www/cen2000/commuting/mcdworkerflow.html.

USBOC. 2011. *Census Quickfacts.* October 18, 2011. U.S. Bureau of the Census. Available at http://quickfacts.census.gov. Data accessed November 1, 2011.

USDOI-FWS. 2004. *Indiana Bat (Myotis sodalis) Fact Sheet*. July 2004. US Department of Interior -- Fish & Wildlife Service. Available at http://www.fws.gov/northeast/pdf/indianabat.fs.pdf.

USDOI-FWS. 2008. *Karner Blue Butterfly* (*Lycaeides melissa samuelis*) *Fact Sheet*. January 2008. US Department of Interior – Fish & Wildlife Service. Available at http://www.fws.gov/midwest/endangered/insects/kbb/kbb_fact.html.

USDOI-FWS. 2012. *Bog Turtle (Clemmys (Glyptemys) muhlenbergii) Species Profile.* December 12, 2012. US Department of Interior – Fish & Wildlife Service. Available at http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C048.

USDOT-FRA. 1999. *Procedures for Considering Environmental Impacts*. May 26, 1999. US Department of Transportation – Federal Railroad Administration. Available at http://www.fra.dot.gov/Elib/Document/1348.

USDOT-FRA. 2005. *High-Speed Ground Transportation Noise and Vibration Impact Assessment.* October 2005. US Department of Transportation Federal Railroad Administration – Office of Railroad Policy and Development. Available at http://www.fra.dot.gov/Elib/Document/1218.

USDOT-FTA. 2006. *Transit Noise and Vibration Impact Assessment,* Report FTA-VA-90-1003-06. May 2006. US Department of Transportation – Federal Transit Administration, Office of Planning and Environment. Available at http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf.

USEPA-OMS. 2004. *Mobile6.2 Vehicle Emissions Modeling Software*. May 2004. US Environmental Protection Agency – Office of Mobile Sources. Available at http://www.epa.gov/oms/m6.htm.

USEPA-OTAQ. 2009. *Emission Factors for Locomotives*, EPA-420-F-09-025. April 2009. US Environmental Protection Agency – Office of Transportation and Air Quality. Available at www.epa.gov/otaq/regs/nonroad/locomotv/420f09025.pdf.

USEPA. 2012. *The Green Book Nonattainment Areas for Criteria Pollutants*. July 10, 2012. US Environmental Protection Agency. Available at http://www.epa.gov/oar/oaqps/greenbk/index.html

VHS. 2011. Vermont Historical Society. *Vermont Railroad Timeline*. Available at http://www.vermonthistory.org. Accessed November 2011.

VTrans. 1998. *Albany/Bennington/Rutland/Burlington Rail Passenger Service Study*. November 1998. Vermont Agency of Transportation, prepared by LS Transit Systems.

VTrans. 2004. *Albany/Bennington/Rutland/Burlington Project*. October 2004. Vermont Agency of Transportation, prepared by Clough, Harbour & Associates LLP.

VTrans. 2004. *Comparative Analysis of Transportation Needs in Four Areas of Vermont*, Final Report. January 15, 2004. Vermont Agency of Transportation Board. Prepared by Resource Systems Group, Inc. Available at http://www.rpc.bennington.vt.us/documents/2004transportationboard.pdf.

VTrans. 2006. *State Rail & Policy Plan*, State of Vermont. December 2006. Vermont Agency of Transportation, prepared by Parsons Brinckerhoff. Available at http://railroads.vermont.gov/railpolicyplan.htm.

VTrans 2008 (Route Log) AADTs State Highways, May 2009. Vermont Agency of Transportation.

VTrans. 2009. *Ethan Allen Express Improv. & Extension*, High Speed Intercity Passenger Rail (HSIPR) Program: Track 2 Application Form. October 02, 2009. Vermont Agency of Transportation. Available at http://railroads.vermont.gov/documents/ARRAstimulus/AOT-OPS-Rail_ARRA_preaward_attachment2.pdf.

VTrans. 2009. *NY-VT Bi-State Intercity Passenger Rail Project*, High Speed Intercity Passenger Rail (HSIPR) Program: Track 3 Application Form. August 24, 2009. Vermont Agency of Transportation. Available at http://railroads.vermont.gov/documents/ARRAstimulus/AOT-OPS-Rail_ARRA_preaward_attachment3.pdf.

VTrans. 2010. *Projected Improvements to the Vermont Railway Western Corridor*. January 2010. Vermont Agency of Transportation.

VTrans. 2010. *VTrans (2008) Traffic Flow Map*. September 2010. Vermont Agency of Transportation. Available at http://www.aot.state.vt.us/Planning/Documents/TrafResearch/Publications/pub.htm.

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Appendices

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Appendix A: Ridership Study

VHB Planning | Transportation | Land Development | Environmental

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Memorandum

To: Costa Pappis, VTRANS

Date: May 3, 2013 (Revised January 8,2014)

Project No.: 11518.00

From: Lara Webster, VHB

Re: NY-VT Ridership and Revenue Forecasts Revision and Update

---

The purpose of this memorandum is to present the results of the revised ridership forecast for the NY-VT Intercity Passenger Rail Study Area. Three alternatives were analyzed:

1) No Build Alternative
2) Alternative 1 – New Service to SW Vermont
3) Alternative 2 – Rerouted Ethan Allen Service

For both Build alternatives, service would be provided to Rutland via the "Western Corridor"; however Alternative 1 retains the Ethan Allen service – which provides service to Rutland through New York – and Alternative 2 reroutes the Ethan Allen through southwest Vermont. Both alternatives assume the routing from Albany to Mechanicville is via Schenectady. **Figures 1** and **2** below, illustrate the two Build alternatives.

Figure 1: Alternative 1 – New Service to SW Vermont

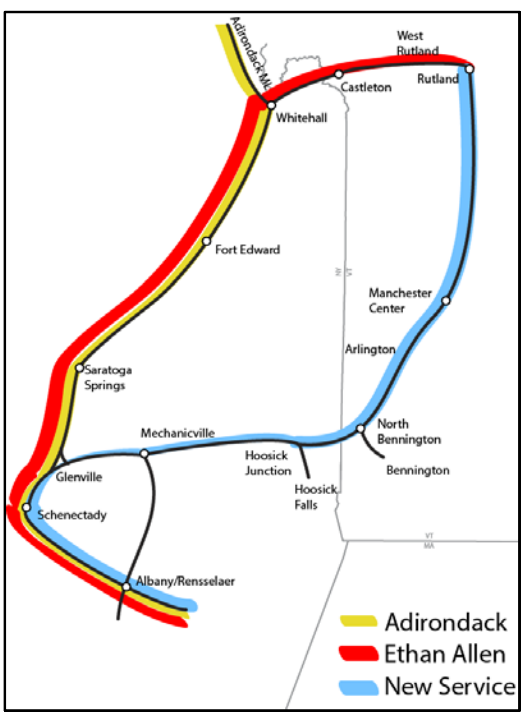
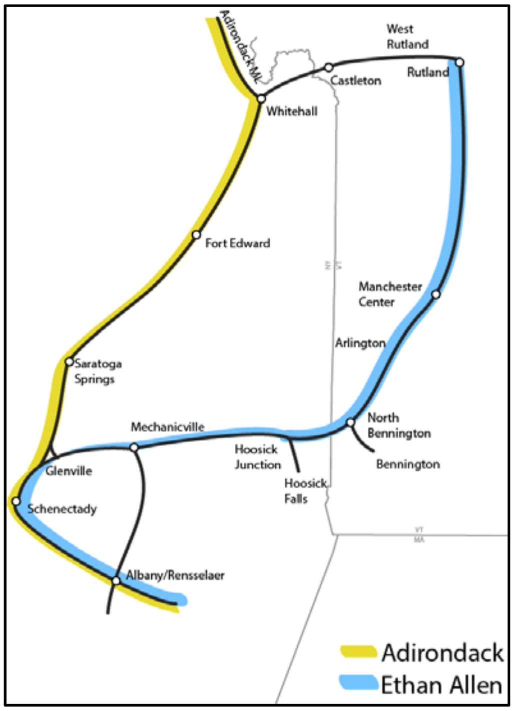


Figure 2: Alternative 2 – Rerouted Ethan Allen Service



The original ridership forecasts were developed using an analytical procedure considering the following information:

- Existing demographic and economic conditions in Study Area;
- Forecasted demographic and economic conditions in the Study Area;
- Rail ridership of existing services in the region, specifically the ridership of the Adirondack and Ethan Allen services operated by Amtrak;
- Ridership for station pairs served by the Adirondack and Ethan Allen services;
- Service level and fare of existing and proposed rail service in the region; and
- Travel time, operating costs and toll costs of automobile drivers or passengers in the region

The ridership forecasting procedure is district-to-district based. The Study Area has been divided into traffic districts, each representing the catchment area of an existing or new rail station. For the purposes of the ridership analysis, the catchment areas were defined as the 10-mile buffer around each station. If a portion of a town fell within 10 miles of a station it was assigned to a station (Figure 3). Towns that fell within 10 miles of two stations were assigned to the closest station.

Figure 3: Catchment Areas of Stations

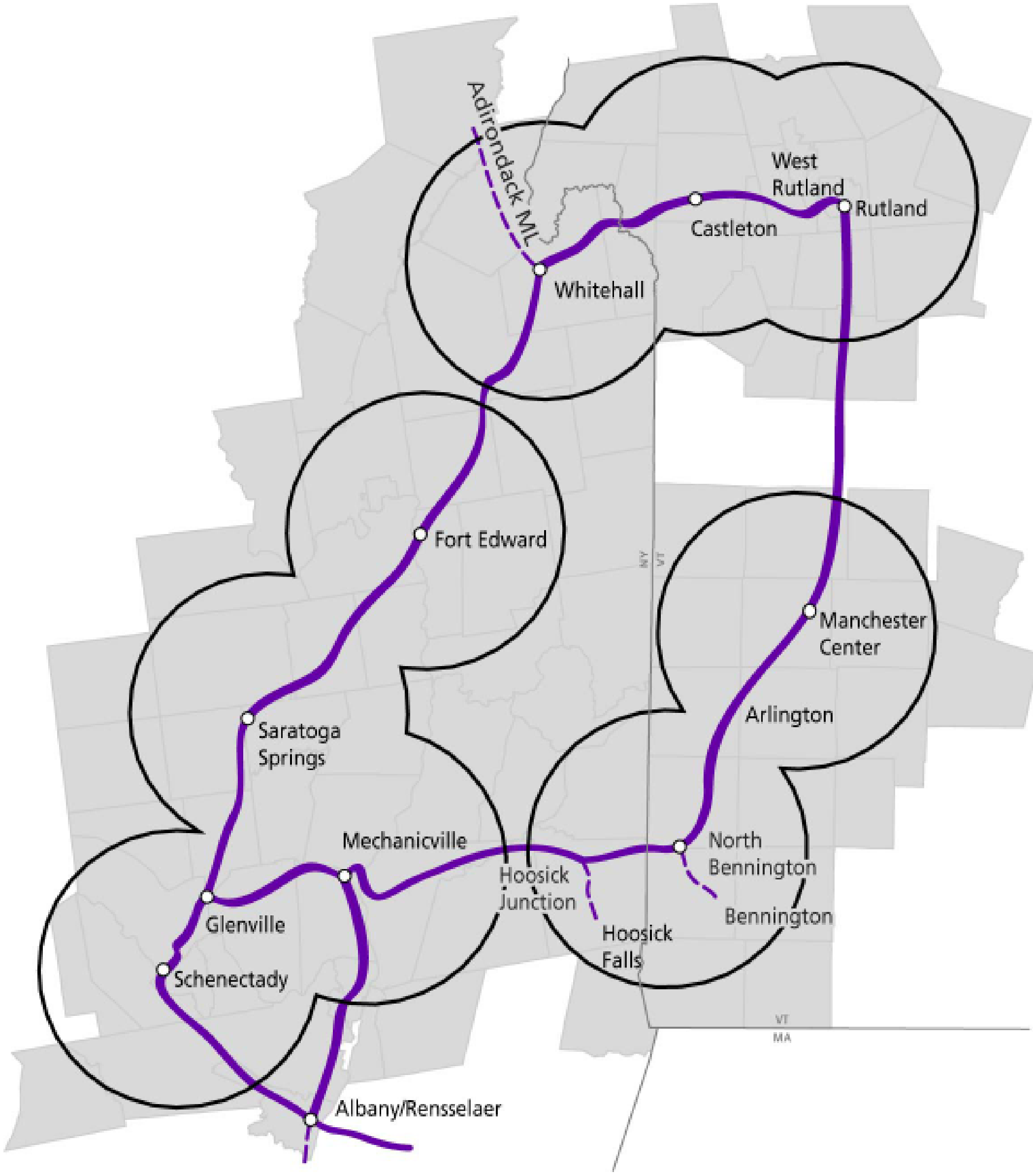
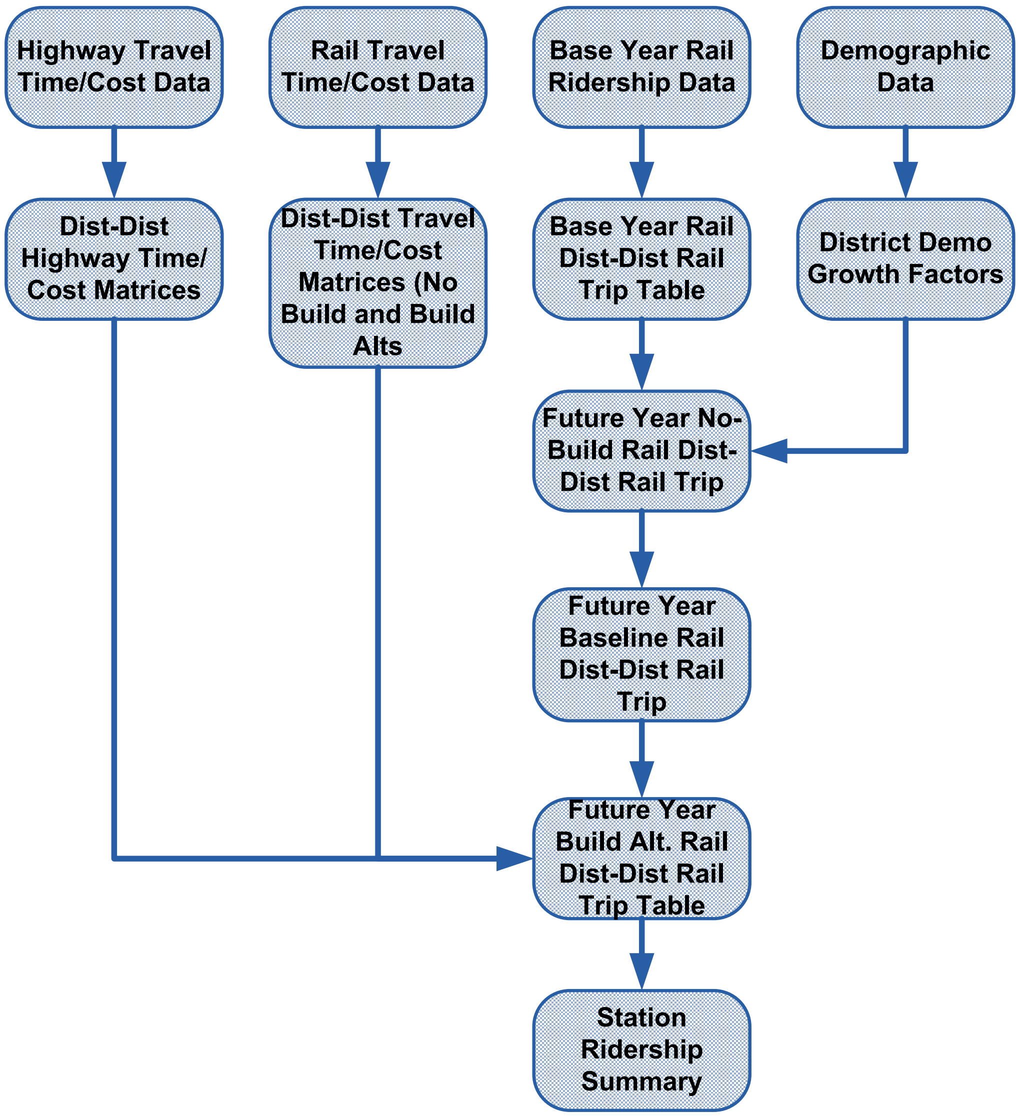


Figure 4 provides a flow chart of the ridership forecasting methodology.

Figure 4: Ridership Forecasting Process



District Demographic Data

The demographic data (households, population and employment) were assembled for each traffic district. The data were derived from the demographic data of the area travel demand models received from the State of Vermont, the Capital District Transportation Committee (CDTC) and the Adirondack/Glen Falls Transportation Council (AGFTC). Table 1 summarizes the existing and projected demographic data by traffic district.

Table 1: Households and Employment by Traffic District

Station	2010 Households	2010 Employment	2030 Households	2030 Employment
Rutland	16,400	22,100	20,300	32,700
Castleton	4,900	3,900	6,500	5,900
Whitehall	9,900	8,500	10,900	9,200
Fort Edwards	28,200	34,600	31,000	36,800
Saratoga Springs	32,300	36,500	37,700	38,300
Schenectady	92,200	97,800	99,100	101,700
Manchester	5,400	6,300	7,000	12,600
North Bennington	14,000	16,100	15,300	21,100
Mechanicsville	34,500	28,100	40,200	34,400

District-to-District Travel Time/Cost Matrices

The district-to-district travel time and travel cost matrices for the rail mode and automobile mode were assembled based on data from:

- AMTRAK schedule and fare information
- Proposed service plans of the build alternatives
- A GIS roadway network covering the study area. Travel times were based on distances and assumed travel speeds. The travel speeds were based on regional travel demand model assumptions and posted speed limits.
- For the rail mode, the following district-to-district matrices were generated:
- In-vehicle times (time spent on rail train)
- Average wait time derived from the service frequency
- Rail fare
- Auto access and egress time

For the auto mode, the average travel time and operation cost matrices were generated based on the highway network developed for this study.

Base Year Rail Trip Table

The base year station to station rail trip table was constructed based on collected ridership data provided by Amtrak. Amtrak provided the station ridership on the Adirondack and Ethan Allen services, as well as ridership of major station-to-station pairs on these lines. Based on these two sets of data, an estimation procedure was applied to derive the complete station-to-station rail trip table of the two rail lines.

The following table summarizes the Year 2010 annual ridership of existing rail stations in the study region.

Table 2: Year 2010 Baseline Station Ridership

Station	Baseline Ridership [1]	Households within 10 miles of station	Rail Ridership/HH
Rutland	16,600	16,400	1.00
Castleton	2,200	4,900	0.45
Whitehall	1,800	9,900	0.18
Fort Edward	8,600	28,200	0.30
Saratoga Springs	30,200	32,300	0.94
Schenectady	16,200	92,200	0.18

[1] Values refer to annual boardings and alightings combined.

Table 3 shows the results of the revised ridership forecasts.

Table 3 – Revised Annual Boardings Forecasts

Year	No Build	Alternative 1	Alternative 2
2010	78,600	--	--
2030	88,200	126,000	104,100

The ridership results reflect refinements to the model to reflect the following:

- **Updated (train) travel times**. The travel times used in the refined model are based on the Rail Traffic Controller (RTC) model. The infrastructure used in the model was prepared to run the model's Train Performance Calculator (TPC) which calculated travel times between station based on the operating speeds of the train, the tractive effort and braking, station stops and cumulative travel times. The times used for the original ridership analysis were calculated based on distance between stations, assumed Maximum Allowable Speed (MAS), and a (conservative) impedance factor that was applied across the board. The travel times generated as part of the TPC run are faster than the originally calculated times.
- **Updated fares**. For the original iteration of the ridership analysis, fares were matched to existing, published fares for Amtrak trips (Ethan Allen or Adirondack) of similar trip length for the trip pairs in the study area. The refined ridership model reflects current fares for the Ethan Allen service and incremental fares based on average cost per mile for non-Ethan Allen trip pairs.

Refined forecasts were completed for the No Build and the two Build alternatives still being analyzed. **Table 4** shows the updated annual boardings forecast for the years 2013 through 2017. To develop estimates for 2013 through 2017, the rate of growth from the 2010 to 2030 No-Build boardings was determined, and a straight line percentage difference in ridership was assumed for the interim years for each alternative.

Table 4 – 2013 - 2017 Annual Boardings

Year	No Build	Alternative 1	Alternative 2
2013	79,980	114,100	98,350
2014	80,440	114,770	98,920
2015	80,910	115,440	99,500
2016	81,380	116,120	100,080
2017	81,860	116,800	100,670

Table 5 provides the revised annual boardings by station for the 2010 base year and projected to 2030.

Table 5 – Revised 2030 Annual Boardings Forecasts

Station	2010	2030		
	No Build	No Build	Alternative 1	Alternative 2
Montreal - Ft. Ticonderoga	5,200	5,700	5,700	5,700
Rutland	8,300	10,800	14,900	12,500
Castleton	1,100	1,800	1,900	0
Whitehall	900	1,000	1,000	1,000
Fort Edward	4,300	4,600	4,500	3,100
Saratoga Springs	15,100	16,600	16,500	11,300
Schenectady	8,100	8,400	10,300	9,200
Manchester	--	--	4,400	4,400
North Bennington	--	--	6,400	6,400
Mechanicville	--	--	4,600	4,600
Albany/Rensselaer	3,200	3,400	3,700	3,300
Hudson - NY Penn	32,400	35,900	52,100	42,600
Total	**78,600**	**88,200**	**126,000**	**104,100**

Note: Ridership numbers reflect one-way boardings.

Table 6 presents the projected boardings by station and service. Stations that would be served by more than one service have had their annual boardings divided approximately equally between the services.

Table 6 – Annual Boardings by Service

	2,010 No Build		2030 No Build		2030 Alternative 1			2030 Alternative 2	
Station	**Adirondack**	**Ethan Allen**	**Adirondack**	**Ethan Allen**	**Adirondack**	**Ethan Allen**	**New Service**	**Adirondack**	**Ethan Allen**
Montreal - Ft. Ticonderoga	2,600	2,600	5,700		5,700			5,700	
Rutland		8,300		10,800		7,450	7,450		12,500
Castleton		1,100		1,800		1,900			
Whitehall	450	450	500	500	1,000			1,000	
Fort Edward	2,150	2,150	2,300	2,300	1,500	1,500	1,500	3,100	
Saratoga Springs	7,550	7,550	8,300	8,300	5,500	5,500	5,500	11,300	
Schenectady	4,050	4,050	4,200	4200	3,500	3,400	3,400	4,600	4,600
Manchester							4,400		4,400
North Bennington							6,400		6,400
Mechanicville							4,600		4,600
Albany/Rensselaer	1,600	1,600	1,700	1,700	1,300	1,200	1,200	1,700	1,600
Hudson - NY Penn	16,200	16,200	17,950	17,950	17,400	17,350	17,350	22,400	20,200
Total	34,600	44,000	40,650	47,550	35,900	38,300	51,800	49,800	54,300
Adirondack + Ethan Allen + New Service	**78,600**		**88,200**		**126,000**			**104,100**	

The ridership within the study area was forecasted based on the methodology described above. Some post-processing was completed to reassign boardings for unlikely trip pairs – for instance while a trip from North Bennington to Castleton would be possible via rail, it would require a transfer and would be neither time nor cost effective. These types of trips were reassigned using professional judgment to nearby major transfer points (i.e. Rutland, Schenectady or Albany).

The ridership results indicate the following:

- A significant portion of the increase in boardings for the Build alternatives (41% for Alternative 1, and 76% for Alternative 2) is generated at the new stations at Manchester, North Bennington, and Mechanicville.
- Another significant portion of the increase in boardings for the Build alternatives is generated by trips to the New York City metro area; this result is expected since the New Service (or rerouted Ethan Allen) would improve access between Vermont's Western Corridor and New York City.
- There is also a significant increase in boardings at Rutland station. This large increase is expected because Rutland is the terminal station and will provide access to a larger catchment area than the other stations in the Study Area. Providing the

option for travel through the Western Corridor is also expected to be attractive for passengers in both directions as it will provide a slightly shorter travel time.

- Differences in boardings between the two Build alternatives are primarily seen in those stations that will lose a frequency of service (Ft. Edward, Saratoga Springs), the model indicates that there is a mode shift for many of these “lost” trips.
- At both Schenectady and Rutland Stations a moderate number of additional boardings are anticipated for Alternative 1 vs. Alternative 2. The difference in boardings is greater at Schenectady Station because it is anticipated that many of the riders that currently use Castleton Station would instead access the system at Rutland Station under Alternative 2 – this behavior causes a “bump” in boardings at Rutland Station for Alternative 2.

Projected Fare Revenue

Annual revenue was calculated in the ridership model for the year 2030. The ridership forecast procedure included use of a station-to-station trip matrix, with forecast ridership calculated for each pairing. Total fare revenues were calculated by multiplying the station-to-station trip matrix with the attendant station-to-station fare matrix. The forecasted revenue was prepared using current fares for existing station-to-station trips (as accessed on the Amtrak website) and developing a similar fare structure for the proposed new stations based on distance between origin and destination. **Table 7** shows the projected 2030 annual revenues as well as adjusted 2013 ticket revenue projections based on the Pro Forma revenues shown in the PRIIA 209 Cost Methodology that has been prepared for the Ethan Allen Service. The adjusted revenue estimates were calculated by factoring the 2030 projections to the actual ticket revenues from FY’2010-11 (as reported in the 209 Cost Methodology).

Table 7 – Fare Revenue Forecasts

Revenue Forecasts	No Build	Alternative 1	Alternative 2
2030 Revenue	$4,371,000	$6,566,000	$5,504,000
2013 Revenue	$2,839,000	$4,264,000	$3,574,000

Table 8 provides the annual revenue forecast for each alternative for the years 2013 through 2017. Similar to the interim year ridership forecasts, the interim year revenue forecasts are based on a straight line extrapolation of the difference between the calculated 2010 and 2030 revenues.

Table 8 – 2013 – 2017 Annual Fare Revenue Forecasts

Year	No Build	Alternative 1	Alternative 2
2013	$ 2,839,000	$ 6,565,600	$ 3,574,464
2014	$ 2,929,129	$ 6,700,976	$ 3,687,942
2015	$ 3,019,259	$ 6,836,351	$ 3,801,420
2016	$ 3,109,388	$ 6,971,727	$ 3,914,898
2017	$ 3,199,518	$ 7,107,102	$ 4,028,376

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Appendix B: Capital Cost Estimate

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Memorandum

To: Costa Pappis, VTRANS

Date: March 29,2012

Project No.: 11518.00

From: VHB

Re: NY-VT Final Capital Cost Estimate

The purpose of this memorandum is to present the revised capital cost estimates for the NY-VT Intercity Passenger Rail Study Area. There are two components to the capital cost estimates – costs for track improvements, and station costs. This document provides the following:

- A summary of the alternatives estimated and the segments used in this estimate.
- A description of the work defined for each alternative for each segment.
- A description of the unit costs and their development for use in this estimate.
- A summary capital cost estimate for each alternative.

ALTERNATIVES ANALYZED & ANALYSIS SEGMENTS

Three alternatives were analyzed:

1) No Build Alternative
2) Alternative 1 – New Service to SW Vermont
3) Alternative 2 – Rerouted Ethan Allen Service

For both Build alternatives, service would be provided to Rutland via the "Western Corridor"; Alternative 1 retains the Ethan Allen service on its current alignment and adds a new service through southwest Vermont, while Alternative 2 reroutes the Ethan Allen through southwest Vermont. Both alternatives assume the routing from Albany to Mechanicville is via Schenectady. **Figures 1** and **2** below, illustrate the two Build alternatives.

Figure 1: Alternative 1

Figure 2: Alternative 2

To run the proposed new/rerouted service from Albany to Rutland via Schenectady and the Western Corridor (shown in blue in **Figures 1** and **2**), various infrastructure improvements are required to meet the targeted Maximum Allowable Speed (MAS) of 60MPH and provide sufficient capacity in the system to eliminate conflicts with the freight operations. Preliminary engineering has been completed to identify the necessary improvements for each alternative.

For the purposes of the preparing the capital cost estimate, the existing rail corridors in the project study area were divided into 10 segments, shown in **Figure 3**. Improvements are required for segments 2, 6, 8, 9 and 10 to accommodate the new or rerouted service through the Western Corridor of Vermont that are proposed in the Build Alternatives. The same capital improvements are required for Alternatives 1 and 2. **Table 1** provides a summary of the track improvements by segment. Segment 1 was not included in this table because it assumed no improvements on this segment are needed on both the signal and rail systems. Segment 5 was not included in the table because it has been eliminated from the study.

Figure 3: Segments Used in Cost Estimating

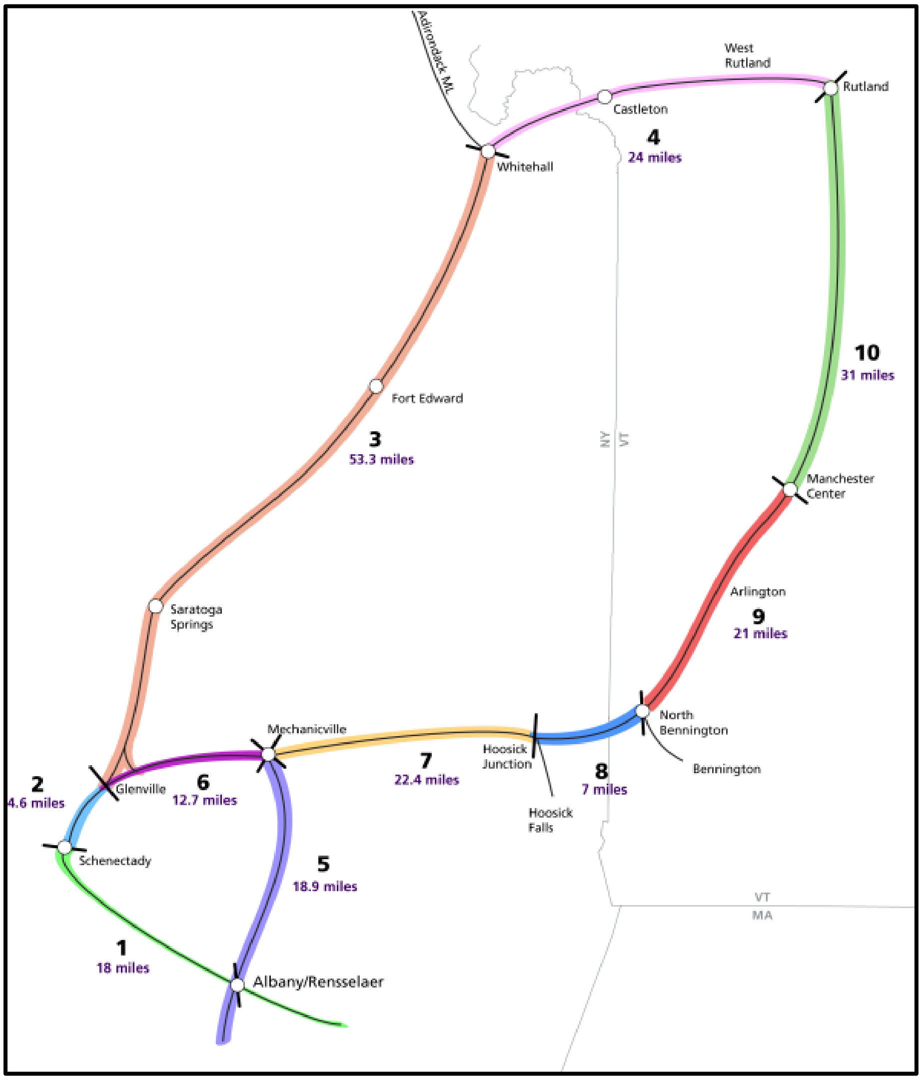

Table 1: Track Improvements

#	Segment	Proposed Infrastructure Improvements
2	Schenectady to CPF 480 (Glenville)	• 700' of new mainline for new alignment through CPF 480, all existing Public Grade crossings will require warning system modifications • No track work required on existing mainline, 50' wide crossings assumed • Signal system costs include electronic in-track signal system and interlocking tie-ins • Aplaus Kill River Bridge needs upgrade to run double track; two turnouts at Aplaus Kill River Bridge will be retired
6	CPF 480 (Glenville) to Mechanicville	• 2.5 miles of new sidings for congestion relief, all existing Public Grade crossings will require warning system modifications • Signal system costs include electronic in-track signal system and interlocking tie-ins • Two #20 crossovers, one #15 crossover, three #20 turnouts, and one #15 turnout needed; two turnouts to be retired • Culvert at 1528+00 to be extended past proposed siding
7	Mechanicville to Hoosick	• 3 new sidings totaling 5.4 miles, existing 2 sidings need no work, 50' wide crossings assumed • $4M for updates to existing signal system, all existing Public Grade crossings will require warning system modifications • 8 new #20 turnouts needed for sidings • 800' of track needs to be realigned in order to fit #20 for station • Grade crossing at Vial Ave will be made into double track to accommodate station siding at Mechanicville • Bridge at Anthony's Kill (Bridge 186.93) requires a bridge extension/modification to facilitate second track • A high platform passenger station in Mechanicville
8	Hoosick to North Bennington	• Existing mainline is currently 100% welded rail (no rail upgrade needed), 50' wide crossings assumed • Every 12th tie replaced, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds • All existing Public Grade crossings will require warning system modifications • 1 mile of new siding required for congestion relief • Two new #20 turnouts for new siding, existing bridge will require some work • Culvert at 3143+00 needs to be extended past proposed siding • 3100' of new siding for station at North Bennington • 1350' of realigned track needed to allow space for siding inside the ROW • Bridge costs included to rehabilitate or replace one (1) bridge identified as being in Poor condition based on inspections • Two #20 turnouts needed for station siding • Additional grade crossing for siding at Bank Street in North Bennington • A high platform station in North Bennington including the historic station building and expanded parking

Table 1: Track Improvements (Continued)

#	Segment	Proposed Infrastructure Improvements
9	North Bennington to Manchester	• Existing mainline is currently welded rail MP 2.0 - MP 13.4 • Existing mainline is currently Jointed 105# Rail MP13.4-MP16.0 & MP 19.7- MP23.0 that requires upgrades and new welded rail • Rail between MP16.0 to MP 19.7 is 115# 80' lengths that requires welding • All existing Public Grade crossings will require warning system modifications, 50' wide crossings assumed • Every 12th tie is replaced MP 2.0 -MP 13.4, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds • Every 3rd tie is replaced MP13.4-MP 23.0, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds • Bridge costs included to rehabilitate or replace three (3) bridges identified as being in Poor condition based on inspections • VTR will allow increased passenger service without new signal system • $1M for new siding to accommodate high level platform station at Manchester • 1350' of realigned track needed to accommodate a 425' high level platform • Relocation of private grade crossing Miles Lumber (MP 23.27) to accommodate siding
10	Manchester to Rutland	• Existing mainline needs upgrading over entire length (30.4 miles of welded rail at 750k/mile) • Shift track within railroad right-of-way in Manchester over length of 5,739' • 50' wide crossings assumed, all existing Public Grade crossings will require warning system modifications • Every 3rd tie is replaced, 50% of segment requires additional surfacing and aligning of curvature to meet increased speeds • Bridge costs included to rehabilitate or replace three (3) bridges identified as being in Poor condition based on inspections • VTR will allow increased passenger service without new signal system • Replace siding at MP 36.15 (601'), addition of siding for station 767' and addition of 3,000' siding • 2 turnouts needed for new siding, 1 turnout for replaced siding and 2 for station • Siding entrance moved back 500' to avoid intersection at Brooklyn Road • A high level platform station in Manchester

UNIT COSTS

The basic tool for pricing alternatives is the typical or "unit" cost by system element. The first task in developing unit costs is to prepare a list of work items or "library" of cost items included it the scope of work of this project. Each unit cost includes: labor, burden, construction equipment usage, materials, permanent equipment and contractor's overhead and profit. The unit costs are then developed for each of the typical cross-sections anticipated for this project. The following elements were used to develop this estimate:

- New Mainline/
- Siding Track
- Upgrade Mainline Track
- Shift Mainline Track
- Stations
- Signal System Cost
- Grade Crossing - Public
- Grade Crossing - Private
- Grade Crossing - Warning System
- Grade Crossing Signage -All
- Undergrade Bridges
- Turnouts
- Turnouts to be Retired
- Clearing and Filling
- Culvert Extension

Table 2 provides a brief description of each system elements and unit costs.

Table 2: Unit Costs

System Element	Description	Unit Cost
New Mainline/Siding Track	New wood tie track construction, 115# CWR with new plates and resilient fasteners.	$200/TF
Upgrade Mainline Track	Spot tie replacements as required per track condition, 115# CWR with new plates and resilient fasteners.	Varies
Shift Mainline Track	Mainline track that requires realignment and shifting to meet the increased speeds and proposed alignment configurations.	$150/TF
Stations	The cost estimate for each station was developed individually to reflect the varying conditions of each station location. Stations include a high level (48”) platform of 425’ by 15’ with stairs and an access ramp to meet ADA requirements.	Varies – See **Tables 3-5**
Signal System Cost	Cost of providing a basic signal system to support the desired passenger train speeds.	Lump Sum
Grade Crossing – Public	Installation/replacement of the track panel through the crossing and the associated typical roadway paving work.	$3,000/ TF
Grade Crossing – Private	Installation/replacement of a timber plank crossing for private use.	$5,000 EA
Grade Crossing - Warning System	Installation and upgrade of the signal system to accommodate the increased passenger train speeds.	$300,000 EA
Grade Crossing Signage - All	Installation of all required crossing warning signage.	$5,000 EA
Undergrade Bridges	Structural repairs to bridges listed as in “poor” condition required for passenger trains. All bridges not listed as “poor” we assumed to need no work.	$500,000 EA
Turnouts	Addition of new turnouts required to support operational needs.	Varies by type.
Turnouts to be retired	Removal of turnouts.	$70,000 EA
Clearing and Filling	Clearing and grubbing, required fill slopes for track alignment, potential ditching.	Lump Sum
Culvert Extension	Extension of culverts to support the additional siding tracks or relocated track alignment.	Lump Sum

Table 3 shows the total costs by major system elements and **Table 4 shows** the cost breakdown by analysis segment.

Table 3: Total Costs, by Major System Element

System Element							Total[1]
Mainline Improvements	Crossings	Stations	Bridges	Signal System	Special Trackwork	Clearing and Drainage	
$ 55,730,050	$ 23,110,000	$5,290,000	$ 4,500,000	$ 16,000,000	$6,035,000	$ 1,579,060	$ $112,244,110

1. Costs include: labor, burden, construction equipment usage, materials, station site acquisition, permanent equipment and contractor's overhead and profit. Does not include contingency allowances.

Table 4: Total, Costs, by Analysis Segment

	New Siding Track		Upgrade Mainline Track		Shift Mainline Track		Signal System	Grade Crossing - Public		Grade Crossing - Private		Grade Crossing - Warning System		Grade Crossing Signage -All		Undergrade Bridges		Turnouts/Turnout Removal		Clearing & Filling	Culvert Extension	Stations	Total[1]
	$200	TF	Varies	TF	$150	TF	LS	$3,000	TF	$5,000	EA	$150,000	EA	$5,000	LS	$500,000	EA						
	Quant	Cost	Quant.	Cost	Quant	Cost		Quant	Cost	Quant	Cost	Quant.	Cost	Quant	Cost	Quant.	Cost	Quant	Cost	Cost	Cost	Cost	
Segment 1 - CSX (Schenectady-Albany)	0	$0	0	$0	0	$0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	$0	$0	$0	**$0**
Segment 2 - CPR (CPF 480-Schenectady)	700	$140,000	0	$0	1,000	$150,000	$4,000,000	200	$600,000	0	$0	4	$600,000	4	$20,000	1	$500,000	0/2	$140,000	$0	$0	$0	**$6,150,000**
Segment 6 - CPR (Mechanicville-CPF 480)	13,200	$2,640,000	0	$0	7,000	$1,050,000	$8,000,000	400	$1,200,000	5	$25,000	8	$1,200,000	13	$65,000	0	$0	10/2	$2,370,000	$431,500	$25,000	$1,550,000	**$18,556,500**
Segment 7 - PAR (Hoosick-Mechanicville)	28,500	$5,700,000	0	$0	800	$120,000	$4,000,000	600	$1,800,000	4	$20,000	12	$1,800,000	16	$80,000	1	$500,000	8/0	$1,880,000	$877,800	$0	$0	**$16,777,800**
Segment 8 - VTR (No. Bennington-Hoosick)	8,100	$1,620,000	9,240	$554,400[1]	1,350	$202,500	$0	200	$600,000	2	$10,000	4	$600,000	6	$30,000	1	$500,000	4/0	$940,000	$219,760	$25,000	$2,290,000	**$7,591,660**
Segment 9 - VTR (Manchester-N. Bennington)	0	$0	110,880	$8,995,400[2]	1,350	$202,500	$0	1,000	$3,000,000	26	$280,000	20	$3,000,000	46	$230,000	3	$1,500,000	0	$0	$0	$0	$0	**$17,207,900**
Segment 10 - VTR (Rutland-Manchester)	4,368	$873,600	163,680	$32,620,800[3]	5,739	$860,850	$0	1,200	$3,600,000	63	$315,000	24	$3,600,000	87	$435,000	3	$1,500,000	3/0	$705,000	$0	$0	$1,450,000	**$45,960,250**

1 – Unit price = $15/TF (track foot)
2 – Unit price = $30/TF. Includes $244,000 for new welds, and $4,425,000 for 5.9 miles of welded rail.
3 – Unit price= $60/TF. Includes $22,800,000 for 30.4 miles of new welded rail.

Station Costs

New stations are proposed to be constructed in Mechanicville, North Bennington, and Manchester for both Build alternatives. All stations will be full length (425’) high level platform stations to comply with ADA requirements.

The general development plan for each station calls for a Class V station that includes:

- Platform for ingress/egress access to trains;
- Parking lot with 50 spaces;
- Auto pick-up/drop-off area; and
- Sheltered Waiting Area.

Tables 5 through **7** provide a breakdown of the station cost estimates for each station location – the total station costs are included in **Tables 3** and **4**.

Table 5: Mechanicville Station Cost Estimate

Area Calculations				
Hot Mix Asphalt (driveway/parking)	25210	SF		
Cement Concrete Sidewalk	6650	SF		
Loam & Seed / Landscaping	4130	SF		
Platform (425-ft) / stairs / ramps	6375	SF		
TOTAL AREA	42030	SF		
Cost Estimate				
	Unit Costs	**Unit**	**Quantity**	**Cost**
Property Acquisition (60,000SF)	$100,000	LS	1	$100,000
Excavation (assume 1-ft cut)	$30	CY	1557	$46,710
Grading & Compacting	$5	SY	4670	$23,350
Gravel Borrow (pavement & sidewalks)	$35	CY	787	$27,545
Crushed Stone	$60	CY	311	$18,660
Hot Mix Asphalt Pavement (3.5" thick)	$120	TON	549	$65,880
Cement Concrete	$60	SY	739	$44,340
Loam Borrow (4" thick)	$50	CY	51	$2,550
Seeding	$5	SY	459	$2,295
Landscaping (12 trees & shrubs)	$8,000	LS	1	$8,000
Curbing	$40	FT	1560	$62,400
Drainage	$50,000	LS	1	$50,000
Parking Area Lighting	$50,000	LS	1	$50,000
Station Signage	$40,000	LS	1	$40,000
Highway Signage	$5,000	LS	1	$5,000
Platform				
High Level Platform	$140	SF	6375	$892,500
Platform Lighting	$75,000	LS	1	$75,000
Shelter Structure	$30,000	LS	1	$30,000
TOTAL COST				$1,544,230
TOTAL COST (rounded)				**$1,550,000**

Table 6: North Bennington Station Cost Estimate

Area Calculations				
Hot Mix Asphalt (driveway/parking)	27210	SF		
Cement Concrete Sidewalk	8430	SF		
Loam & Seed / Landscaping	6490	SF		
Platform (425-ft) / stairs / ramps	6375	SF		
TOTAL AREA	48170	SF		

Cost Estimate				
	Unit Costs	**Unit**	**Quantity**	**Cost**
Property Acquisition (100,000SF)	$500,000	LS	1	$500,000
Excavation (assume 1-ft cut)	$30	CY	1784	$53,520
Grading & Compacting	$5	SY	5352	$26,760
Gravel Borrow (pavement & sidewalks)	$35	CY	880	$30,800
Crushed Stone	$60	CY	336	$20,160
Hot Mix Asphalt Pavement (3.5" thick)	$120	TON	593	$71,160
Cement Concrete	$60	SY	937	$56,200
Loam Borrow (4" thick)	$50	CY	80	$4,000
Seeding	$5	SY	721	$3,605
Landscaping (12 trees & shrubs)	$8,000	LS	1	$8,000
Curbing	$40	FT	1750	$70,000
Drainage	$50,000	LS	1	$50,000
Parking Area Lighting	$50,000	LS	1	$50,000
Station Signage	$40,000	LS	1	$40,000
Highway Signage	$5,000	LS	1	$5,000
Platform				
High Level Platform	$140	SF	6375	$892,500
Platform Lighting	$75,000	LS	1	$75,000
Shelter Structure	$30,000	LS	1	$30,000
Allowance for Historic N. Bennington Station				$300,000
TOTAL COST				$2,286,725
TOTAL COST (rounded)				**$2,290,000**

Table 7: Manchester Station Cost Estimate

Area Calculations				
Hot Mix Asphalt (driveway/parking)	26760	SF		
Cement Concrete Sidewalk	5450	SF		
Loam & Seed / Landscaping	3800	SF		
Platform (425-ft) / stairs / ramps	6375	SF		
TOTAL AREA	42050	SF		
Cost Estimate				
	Unit Costs	**Unit**	**Quantity**	**Cost**
Excavation (assume 1-ft cut)	$30	CY	1557	$46,710
Grading & Compacting	$5	SY	4672	$23,360
Gravel Borrow (pavement & sidewalks)	$35	CY	795	$27,825
Crushed Stone	$60	CY	330	$19,800
Hot Mix Asphalt Pavement (3.5" thick)	$120	TON	583	$69,960
Cement Concrete	$60	SY	606	$36,360
Loam Borrow (4" thick)	$50	CY	47	$2,350
Seeding	$5	SY	422	$2,110
Landscaping (12 trees & shrubs)	$8,000	LS	1	$8,000
Curbing	$40	FT	1650	$66,000
Drainage	$50,000	LS	1	$50,000
Parking Area Lighting	$50,000	LS	1	$50,000
Station Signage	$40,000	LS	1	$40,000
Highway Signage	$5,000	LS	1	$5,000
Platform				
High Level Platform	$140	SF	6375	$892,500
Platform Lighting	$75,000	LS	1	$75,000
Shelter Structure	$30,000	LS	1	$30,000
TOTAL COST				$1,444,975
TOTAL COST (rounded)				**$1,450,000**

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Appendix C: Mesoscale Analysis

Air Quality Technical Data

- **MOBILE 6.2 Files**
    - Sample Input Files
    - Output Files
- **Train Emissions**
- **Mesoscale Results**

MOBILE 6.2 Files

MOBILE 6.2 Sample Input Files

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

MOBILE6.2 EMISSION FACTORS

FOR REGIONAL, MESOSCALE, and CMAQ PROJECT EMISSION CALCULATIONS

PART A

ENVIRONMENTAL SCIENCE BUREAU

April 2008

Vehicle Distribution by NYSDOT Region
NYSDOT Region 1

Veh. Type	01	02/06	07/08/09	11/12	14/16	17/19
	Functional Class					
LDGV	40.16%	41.78%	43.23%	42.17%	45.33%	46.98%
LDGT1	6.65%	6.93%	7.17%	6.98%	7.51%	7.79%
LDGT2	22.25%	23.17%	23.97%	23.38%	25.12%	26.05%
LDGT3	10.16%	12.06%	11.65%	12.81%	10.16%	9.27%
LDGT4	4.61%	5.48%	5.29%	5.82%	4.61%	4.21%
HDGV2B	3.08%	1.85%	1.44%	1.47%	1.17%	0.85%
HDGV3	1.16%	0.70%	0.55%	0.55%	0.44%	0.32%
HDGV4	0.33%	0.19%	0.16%	0.15%	0.13%	0.09%
HDGV5	0.44%	0.27%	0.21%	0.21%	0.17%	0.12%
HDGV6	0.35%	0.21%	0.17%	0.16%	0.13%	0.09%
HDGV7	0.34%	0.21%	0.16%	0.16%	0.13%	0.10%
HDGV8A	0.55%	0.33%	0.26%	0.26%	0.21%	0.15%
LDDV	0.06%	0.06%	0.07%	0.06%	0.07%	0.07%
LDDT12	0.11%	0.11%	0.12%	0.11%	0.12%	0.13%
LDDT34	1.03%	1.21%	1.17%	1.28%	1.03%	0.94%
HDDV2B	0.55%	0.33%	0.26%	0.26%	0.21%	0.15%
HDDV3	0.37%	0.22%	0.17%	0.18%	0.14%	0.10%
HDDV4	0.24%	0.15%	0.11%	0.12%	0.09%	0.07%
HDDV5	0.32%	0.19%	0.15%	0.15%	0.12%	0.09%
HDDV6	0.60%	0.36%	0.28%	0.29%	0.23%	0.17%
HDDV7	0.80%	0.48%	0.38%	0.38%	0.30%	0.22%
HDDV8A	2.50%	1.50%	1.17%	1.19%	0.95%	0.69%
HDDV8B	1.53%	0.92%	0.72%	0.73%	0.58%	0.42%
HDGB	0.19%	0.11%	0.09%	0.09%	0.07%	0.05%
HDDBT	0.57%	0.34%	0.27%	0.27%	0.22%	0.16%
HDDBS	0.57%	0.34%	0.27%	0.27%	0.22%	0.16%
MC	0.48%	0.50%	0.51%	0.50%	0.54%	0.56%
Sum	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Note: 01 - Rural Interstate
02 - Rural Principal Arterial
06 - Rural Minor Arterial
07 - Rural Major Collectors
08 - Rural Minor Collectors
09 - Rural Local
11 - Urban Interstate
12 - Urban Freeways and Expressways
14 - Urban Principal Arterial
16 - Urban Minor Arterial
17 - Urban Collectors
19 - Urban Local

Sample Input File – Albany County, Summer 2010

```
MOBILE6 INPUT FILE :
*CMAQ Table Input File - Albany           For Year 2010, Summer

POLLUTANTS          : HC NOX CO
PARTICULATES        :
AIR TOXICS          :
REPORT FILE         : cmaq2008\output\summer\alb10sum.out
DATABASE OUTPUT     :
EMISSION TABLE      : cmaq2008\output\summer\alb10sum.tbl
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
DATABASE EMISSIONS : 2222 2221 22
DATABASE VEHICLES   : 22222 22222222 2 222 22222222 222

RUN DATA
EXPRESS HC AS VOC   :
EXPAND BUS EFS      :
EXPAND LDT EFS      :
EXPAND HDDV EFS     :
EXPAND HDGV EFS     :
EXPAND EXHAUST      :
EXPAND EVAPORATIVE :

ANTI-TAMP PROG      :
84 85 08 22222  22211111 1 11 098 22212222
I/M DESC FILE       : cmaq2008\nysparam\im_mile\NYVIPup.d
START DIST          : cmaq2008\nysparam\start\001sdist.d
REG DIST            : cmaq2008\nysparam\reg\07_UPreg.d

DIESEL FRACTIONS    :
0.0000 0.0007 0.0007 0.0007 0.0029 0.0029 0.0014 0.0012 0.0016 0.0019
0.0006 0.0009 0.0004 0.0002 0.0004 0.0011 0.0036 0.0018 0.0017 0.0001
0.0094 0.0108 0.0304 0.0413 0.0105
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0385 0.0366 0.0154
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0384 0.0365 0.0154
0.0519 0.0861 0.0642 0.0658 0.0821 0.0849 0.0984 0.0971 0.1244 0.0696
0.1397 0.1525 0.1225 0.1258 0.1560 0.1425 0.1369 0.1415 0.0949 0.0797
0.1085 0.1341 0.1171 0.0926 0.0197
0.0519 0.0861 0.0642 0.0659 0.0821 0.0850 0.0985 0.0971 0.1244 0.0697
0.1398 0.1527 0.1222 0.1262 0.1562 0.1420 0.1373 0.1423 0.0951 0.0791
0.1090 0.1328 0.1159 0.0928 0.0197
0.3506 0.3127 0.2520 0.2307 0.2380 0.2138 0.1930 0.1880 0.2387 0.1668
0.2491 0.2248 0.2415 0.2296 0.2663 0.2279 0.2079 0.2194 0.1588 0.1014
0.1248 0.1726 0.1403 0.0970 0.0430
0.6377 0.5670 0.4208 0.3692 0.4220 0.3649 0.3637 0.3657 0.3837 0.2900
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0.2156 0.2765 0.3313 0.3694 0.1747
0.7772 0.7649 0.6951 0.6601 0.6088 0.6430 0.7085 0.6616 0.6922 0.6582
0.6645 0.7319 0.7178 0.6529 0.6562 0.5987 0.6685 0.5668 0.5403 0.4159
0.3716 0.4394 0.3872 0.3380 0.1570
0.9623 0.8878 0.8541 0.8277 0.8470 0.9243 0.8776 0.8977 0.8925 0.8565
0.8630 0.8534 0.8079 0.8387 0.7630 0.8012 0.7293 0.8268 0.7666 0.7107
0.6456 0.7093 0.6274 0.6960 0.3030
0.9922 0.9756 0.9691 0.9575 0.9616 0.8961 0.9701 0.9346 0.9380 0.9099
```

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0.9959 0.9923 0.9859 0.9847 0.9887 0.9746 0.9857 0.9780 0.9510 0.9672
0.9505 0.9577 0.9453 0.9310 0.9423 0.9573 0.9476 0.9348 0.9319 0.9235
0.9228 0.8940 0.9125 0.9202 0.6233
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
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0.9005 0.8441 0.9133 0.9263 0.9223 0.9015 0.8970 0.8741 0.8621 0.8349
0.7868 0.6030 0.4725 0.4368 0.0359

VMT BY HOUR        : cmaq2008\nysparam\hvmt\001_hvmt.def
SEASON             : 1

HOURLY TEMPERATURES: 68.5 71.6 74.7 77.7 81.2 83.6 86.5 87.8 89.6 89.7 88.7 88.2
                     86.6 82.6 80.0 77.5 75.7 74.5 70.7 69.5 68.4 67.7 66.7 66.5

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T2 EVAP PHASE-IN   : cmaq2008\nysparam\lev2\L2EVAP.d
T2 CERT            : cmaq2008\nysparam\lev2\L2CERT.d
94+ LDG IMP        : cmaq2008\nysparam\lev2\LEV2.d
REBUILD EFFECTS    : 0.05

SCENARIO RECORD    : Scenario No.:   1;  Summer 2010;  FREEWAY ;  Speed: 2.5 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   :  7
RELATIVE HUMIDITY  : 86.6 79.4 71.9 67.2 61.8 57.8 53.0 51.1 47.7 48.3 50.0 51.2
                     54.6 61.8 67.7 73.1 75.6 78.9 76.0 80.5 84.0 86.0 88.6 87.5
BAROMETRIC PRES    : 29.92
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
PARTICLE SIZE      : 2.5
DIESEL SULFUR      :  15
FUEL PROGRAM       :    4
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
FUEL RVP           :  8.6
GAS AROMATIC%      : 28.0
GAS OLEFIN%        : 12.0
GAS BENZENE%       : 1.00
E200               : 48
E300               : 82
OXYGENATE          : MTBE    0.00    0.00
                   : ETBE    0.00    0.00
                   : ETOH    5.00    1.00
                   : TAME    0.00    0.00
AVERAGE SPEED      :  2.5 FREEWAY  100.0 0.0 0.0 0.0

END OF RUN
```

Sample Input File – Suffolk County, Summer 2010

```
MOBILE6 INPUT FILE :
*CMAQ Table Input File - Suffolk          For Year 2010, Summer

POLLUTANTS          : HC NOX CO
PARTICULATES        :
AIR TOXICS          :
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DATABASE OUTPUT     :
EMISSION TABLE      : cmaq2008\output\summer\suf10sum.tbl
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
DATABASE EMISSIONS : 2222 2221 22
DATABASE VEHICLES   : 22222 22222222 2 222 22222222 222

RUN DATA
EXPRESS HC AS VOC   :
EXPAND BUS EFS      :
EXPAND LDT EFS      :
EXPAND HDDV EFS     :
EXPAND HDGV EFS     :
EXPAND EXHAUST      :
EXPAND EVAPORATIVE :

STAGE II REFUELING :
89 1 77 77

ANTI-TAMP PROG      :
84 85 08 22222  22222222 2 11 098 22212222
I/M DESC FILE       : cmaq2008\nysparam\im_mile\NYim10.d
START DIST          : cmaq2008\nysparam\start\103sdist.d
REG DIST            : cmaq2008\nysparam\reg\07_NYreg.d

DIESEL FRACTIONS    :
0.0000 0.0004 0.0006 0.0003 0.0010 0.0016 0.0006 0.0007 0.0017 0.0014
0.0008 0.0011 0.0013 0.0003 0.0011 0.0016 0.0035 0.0013 0.0009 0.0005
0.0183 0.0114 0.0554 0.0778 0.0223
0.0016 0.0061 0.0041 0.0036 0.0048 0.0068 0.0049 0.0083 0.0103 0.0083
0.0086 0.0070 0.0094 0.0113 0.0139 0.0127 0.0125 0.0170 0.0146 0.0153
0.0241 0.0268 0.0527 0.0544 0.0177
0.0016 0.0061 0.0041 0.0036 0.0048 0.0068 0.0049 0.0083 0.0103 0.0083
0.0086 0.0070 0.0094 0.0113 0.0139 0.0127 0.0125 0.0170 0.0146 0.0153
0.0241 0.0268 0.0528 0.0542 0.0177
0.0225 0.0614 0.0555 0.0528 0.0682 0.0842 0.0912 0.1079 0.0978 0.0804
0.1241 0.1087 0.1183 0.1381 0.1494 0.1351 0.1562 0.1830 0.1536 0.1329
0.1541 0.1406 0.1242 0.1524 0.0249
0.0225 0.0614 0.0555 0.0528 0.0682 0.0842 0.0912 0.1079 0.0978 0.0804
0.1239 0.1084 0.1184 0.1378 0.1495 0.1354 0.1542 0.1834 0.1531 0.1327
0.1554 0.1403 0.1242 0.1507 0.0249
0.1936 0.2375 0.1950 0.1705 0.1804 0.1894 0.1605 0.1690 0.2212 0.1775
0.2338 0.2079 0.2658 0.2557 0.2708 0.3103 0.2829 0.2189 0.2192 0.1986
0.1657 0.1773 0.0928 0.0851 0.0451
0.5558 0.5084 0.3952 0.3629 0.3698 0.4342 0.4533 0.4914 0.5084 0.5171
0.4996 0.5358 0.4894 0.5156 0.5323 0.5455 0.5701 0.5193 0.4252 0.3763
0.4018 0.3299 0.2308 0.3441 0.1379
0.8890 0.8294 0.7917 0.8012 0.7991 0.7831 0.8067 0.7966 0.7907 0.8175
0.8036 0.8673 0.8173 0.7571 0.7708 0.7545 0.5779 0.5126 0.5122 0.2912
0.3692 0.3288 0.1712 0.3333 0.0989
0.9184 0.9028 0.8759 0.8788 0.8908 0.9130 0.9284 0.9077 0.9362 0.9290
0.9044 0.9305 0.9259 0.8707 0.8722 0.9071 0.8529 0.6102 0.6408 0.4312
0.3815 0.2955 0.4438 0.3692 0.1678
0.9745 0.9107 0.9425 0.9339 0.9558 0.9518 0.9642 0.9521 0.9731 0.9361
```

```
0.9142 0.9387 0.8735 0.9404 0.9100 0.8715 0.8892 0.8361 0.7668 0.7714
0.7968 0.6946 0.7019 0.7152 0.2342
0.9917 0.9878 0.9832 0.9899 0.9899 0.9800 0.9828 0.9802 0.9789 0.9783
0.9224 0.9688 0.9599 0.9562 0.9604 0.9228 0.9150 0.9169 0.8644 0.8691
0.8079 0.8299 0.8145 0.7500 0.2874
0.9938 0.9909 0.9863 0.9853 0.9695 0.9840 0.9821 0.9780 0.9785 0.9849
0.9723 0.9658 0.9757 0.9482 0.9480 0.9440 0.9038 0.9616 0.9606 0.9488
0.8914 0.9351 0.9413 0.9289 0.4993
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
0.8625 0.7539 0.8330 0.8571 0.8768 0.8756 0.9144 0.8807 0.8245 0.8436
0.8278 0.8618 0.8249 0.8014 0.9072 0.8638 0.8383 0.8020 0.6097 0.5820
0.5553 0.4167 0.2581 0.2554 0.0271

VMT BY HOUR        : cmaq2008\nysparam\hvmt\103_hvmt.def
SEASON             : 1

HOURLY TEMPERATURES: 71.3 75.7 79.7 82.7 86.1 86.9 88.3 88.4 87.2 86.2 84.4 81.9
                     80.1 78.1 76.2 76.1 75.1 74.7 72.6 72.2 71.5 70.8 69.6 69.3

T2 EXH PHASE-IN    : cmaq2008\nysparam\lev2\L2EXH.d
T2 EVAP PHASE-IN   : cmaq2008\nysparam\lev2\L2EVAP.d
T2 CERT            : cmaq2008\nysparam\lev2\L2CERT.d
94+ LDG IMP        : cmaq2008\nysparam\lev2\LEV2.d
REBUILD EFFECTS    : 0.05

SCENARIO RECORD    : Scenario No.:   1;  Summer 2010;  FREEWAY ;  Speed: 2.5 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   :  7
RELATIVE HUMIDITY  : 88.7 81.2 70.6 63.9 55.3 54.4 52.4 54.6 55.4 57.6 62.0 67.9
                     69.6 75.4 78.1 79.6 82.7 84.6 87.1 87.2 87.9 88.6 91.9 92.6
BAROMETRIC PRES    : 29.92
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
PARTICLE SIZE      : 2.5
DIESEL SULFUR      :  15
FUEL PROGRAM       :    4
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
FUEL RVP           :  6.8
GAS AROMATIC%      : 22.0
GAS OLEFIN%        : 13.0
GAS BENZENE%       : 0.60
E200               : 47
E300               : 84
OXYGENATE          : MTBE    0.00    0.00
                   : ETBE    0.00    0.00
                   : ETOH   10.00    1.00
                   : TAME    0.00    0.00
AVERAGE SPEED      :  2.5 FREEWAY  100.0 0.0 0.0 0.0

END OF RUN
```

Sample Input File – Dutchess County, Summer 2010

```
MOBILE6 INPUT FILE :
*CMAQ Table Input File - Dutchess         For Year 2010, Summer

POLLUTANTS         : HC NOX CO
PARTICULATES       :
AIR TOXICS         :
REPORT FILE        : cmaq2008\output\summer\dut10sum.out
DATABASE OUTPUT    :
EMISSION TABLE     : cmaq2008\output\summer\dut10sum.tbl
WITH FIELDNAMES    :
AGGREGATED OUTPUT  :
DATABASE EMISSIONS : 2222 2221 22
DATABASE VEHICLES  : 22222 22222222 2 222 22222222 222

RUN DATA
EXPRESS HC AS VOC  :
EXPAND BUS EFS     :
EXPAND LDT EFS     :
EXPAND HDDV EFS    :
EXPAND HDGV EFS    :
EXPAND EXHAUST     :
EXPAND EVAPORATIVE :

ANTI-TAMP PROG     :
84 85 08 22222  22211111 1 11 098 22212222
I/M DESC FILE      : cmaq2008\nysparam\im_mile\NYVIPup.d
START DIST         : cmaq2008\nysparam\start\027sdist.d
REG DIST           : cmaq2008\nysparam\reg\07_UPreg.d

DIESEL FRACTIONS   :
0.0000 0.0007 0.0007 0.0007 0.0029 0.0029 0.0014 0.0012 0.0016 0.0019
0.0006 0.0009 0.0004 0.0002 0.0004 0.0011 0.0036 0.0018 0.0017 0.0001
0.0094 0.0108 0.0304 0.0413 0.0105
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0385 0.0366 0.0154
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0384 0.0365 0.0154
0.0519 0.0861 0.0642 0.0658 0.0821 0.0849 0.0984 0.0971 0.1244 0.0696
0.1397 0.1525 0.1225 0.1258 0.1560 0.1425 0.1369 0.1415 0.0949 0.0797
0.1085 0.1341 0.1171 0.0926 0.0197
0.0519 0.0861 0.0642 0.0659 0.0821 0.0850 0.0985 0.0971 0.1244 0.0697
0.1398 0.1527 0.1222 0.1262 0.1562 0.1420 0.1373 0.1423 0.0951 0.0791
0.1090 0.1328 0.1159 0.0928 0.0197
0.3506 0.3127 0.2520 0.2307 0.2380 0.2138 0.1930 0.1880 0.2387 0.1668
0.2491 0.2248 0.2415 0.2296 0.2663 0.2279 0.2079 0.2194 0.1588 0.1014
0.1248 0.1726 0.1403 0.0970 0.0430
0.6377 0.5670 0.4208 0.3692 0.4220 0.3649 0.3637 0.3657 0.3837 0.2900
0.3238 0.2825 0.2722 0.2855 0.3306 0.2814 0.3266 0.3211 0.2410 0.1998
0.1800 0.1892 0.1582 0.1505 0.1167
0.8180 0.7137 0.6920 0.6380 0.5113 0.5782 0.5520 0.5558 0.5611 0.4339
0.5057 0.6199 0.4993 0.4703 0.5187 0.5099 0.5144 0.4363 0.4785 0.2970
0.2156 0.2765 0.3313 0.3694 0.1747
0.7772 0.7649 0.6951 0.6601 0.6088 0.6430 0.7085 0.6616 0.6922 0.6582
0.6645 0.7319 0.7178 0.6529 0.6562 0.5987 0.6685 0.5668 0.5403 0.4159
0.3716 0.4394 0.3872 0.3380 0.1570
0.9623 0.8878 0.8541 0.8277 0.8470 0.9243 0.8776 0.8977 0.8925 0.8565
0.8630 0.8534 0.8079 0.8387 0.7630 0.8012 0.7293 0.8268 0.7666 0.7107
0.6456 0.7093 0.6274 0.6960 0.3030
```

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

MOBILE6.2 PM10/PM2.5 EMISSION FACTORS

FOR REGIONAL, MESOSCALE, CMAQ, AND MICROSCALE AIR QUALITY ANALYSES

ENVIRONMENTAL SCIENCE BUREAU

June 2008

Sample Input File – Albany County (EF Tables A1-A4), Winter 2010

```
MOBILE6 INPUT FILE :
*CMAQ Table Input File - Albany           For Year 2010, winter

POLLUTANTS         :
PARTICULATES       :
AIR TOXICS         :
REPORT FILE        : pm2008\output\winter\alb10win.out
DATABASE OUTPUT    :
EMISSION TABLE     : pm2008\output\winter\alb10win.tbl
WITH FIELDNAMES    :
AGGREGATED OUTPUT  :
DATABASE EMISSIONS : 2222 2221 22
DATABASE VEHICLES  : 22222 22222222 2 222 22222222 222

RUN DATA
EXPRESS HC AS VOC  :
EXPAND BUS EFS     :
EXPAND LDT EFS     :
EXPAND HDDV EFS    :
EXPAND HDGV EFS    :
EXPAND EXHAUST     :
EXPAND EVAPORATIVE :
IDLE PM EMISSIONS  :

ANTI-TAMP PROG     :
84 85 08 22222  22211111 1 11 098 22212222
I/M DESC FILE      : cmaq2008\nysparam\im_mile\NYVIPup.d
START DIST         : cmaq2008\nysparam\start\001sdist.d
REG DIST           : cmaq2008\nysparam\reg\07_UPreg.d

DIESEL FRACTIONS   :
0.0000 0.0007 0.0007 0.0007 0.0029 0.0029 0.0014 0.0012 0.0016 0.0019
0.0006 0.0009 0.0004 0.0002 0.0004 0.0011 0.0036 0.0018 0.0017 0.0001
0.0094 0.0108 0.0304 0.0413 0.0105
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0385 0.0366 0.0154
0.0003 0.0012 0.0009 0.0009 0.0025 0.0016 0.0017 0.0018 0.0036 0.0023
0.0041 0.0037 0.0048 0.0058 0.0064 0.0071 0.0098 0.0112 0.0131 0.0120
0.0184 0.0309 0.0384 0.0365 0.0154
0.0519 0.0861 0.0642 0.0658 0.0821 0.0849 0.0984 0.0971 0.1244 0.0696
0.1397 0.1525 0.1225 0.1258 0.1560 0.1425 0.1369 0.1415 0.0949 0.0797
0.1085 0.1341 0.1171 0.0926 0.0197
0.0519 0.0861 0.0642 0.0659 0.0821 0.0850 0.0985 0.0971 0.1244 0.0697
0.1398 0.1527 0.1222 0.1262 0.1562 0.1420 0.1373 0.1423 0.0951 0.0791
0.1090 0.1328 0.1159 0.0928 0.0197
0.3506 0.3127 0.2520 0.2307 0.2380 0.2138 0.1930 0.1880 0.2387 0.1668
0.2491 0.2248 0.2415 0.2296 0.2663 0.2279 0.2079 0.2194 0.1588 0.1014
0.1248 0.1726 0.1403 0.0970 0.0430
0.6377 0.5670 0.4208 0.3692 0.4220 0.3649 0.3637 0.3657 0.3837 0.2900
0.3238 0.2825 0.2722 0.2855 0.3306 0.2814 0.3266 0.3211 0.2410 0.1998
0.1800 0.1892 0.1582 0.1505 0.1167
0.8180 0.7137 0.6920 0.6380 0.5113 0.5782 0.5520 0.5558 0.5611 0.4339
0.5057 0.6199 0.4993 0.4703 0.5187 0.5099 0.5144 0.4363 0.4785 0.2970
0.2156 0.2765 0.3313 0.3694 0.1747
0.7772 0.7649 0.6951 0.6601 0.6088 0.6430 0.7085 0.6616 0.6922 0.6582
0.6645 0.7319 0.7178 0.6529 0.6562 0.5987 0.6685 0.5668 0.5403 0.4159
0.3716 0.4394 0.3872 0.3380 0.1570
0.9623 0.8878 0.8541 0.8277 0.8470 0.9243 0.8776 0.8977 0.8925 0.8565
0.8630 0.8534 0.8079 0.8387 0.7630 0.8012 0.7293 0.8268 0.7666 0.7107
```

```
0.6456 0.7093 0.6274 0.6960 0.3030
0.9922 0.9756 0.9691 0.9575 0.9616 0.8961 0.9701 0.9346 0.9380 0.9099
0.8859 0.8935 0.8737 0.8965 0.8780 0.8879 0.8443 0.8003 0.7127 0.6970
0.6766 0.6430 0.6929 0.6678 0.2963
0.9959 0.9923 0.9859 0.9847 0.9887 0.9746 0.9857 0.9780 0.9510 0.9672
0.9505 0.9577 0.9453 0.9310 0.9423 0.9573 0.9476 0.9348 0.9319 0.9235
0.9228 0.8940 0.9125 0.9202 0.6233
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
1.0000 1.0000 1.0000 1.0000 1.0000
0.9022 0.8733 0.9032 0.9028 0.8941 0.9110 0.9024 0.9049 0.9100 0.8941
0.9005 0.8441 0.9133 0.9263 0.9223 0.9015 0.8970 0.8741 0.8621 0.8349
0.7868 0.6030 0.4725 0.4368 0.0359

VMT BY HOUR        : cmaq2008\nysparam\hvmt\001_hvmt.def
SEASON             : 2

HOURLY TEMPERATURES: 17.6 17.5 18.3 21.1 23.9 25.5 27.5 29.4 30.6 31.3 30.9 29.2
                     27.4 26.2 25.0 24.6 24.3 23.4 20.7 20.0 19.7 18.6 18.3 18.1

T2 EXH PHASE-IN    : cmaq2008\nysparam\lev2\L2EXH.d
T2 EVAP PHASE-IN   : cmaq2008\nysparam\lev2\L2EVAP.d
T2 CERT            : cmaq2008\nysparam\lev2\L2CERT.d
94+ LDG IMP        : cmaq2008\nysparam\lev2\LEV2.d
REBUILD EFFECTS    : 0.05

SCENARIO RECORD    : Scenario No.:   1;  Winter 2010;  FREEWAY ;  Speed: 2.5 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   :  1
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
PARTICLE SIZE      :  2.5
DIESEL SULFUR      :  15
FUEL PROGRAM       :    4
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
FUEL RVP           : 12.5
GAS AROMATIC%      : 25.0
GAS OLEFIN%        : 12.0
GAS BENZENE%       : 1.00
E200               : 53
E300               : 84
OXYGENATE          : MTBE    0.00    0.00
                   : ETBE    0.00    0.00
                   : ETOH    5.00    1.00
                   : TAME    0.00    0.00
AVERAGE SPEED      :  2.5 FREEWAY  100.0 0.0 0.0 0.0

SCENARIO RECORD    : Scenario No.:   2;  Winter 2010;  FREEWAY ;  Speed: 2.5 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   :  1
PARTICULATE EF     : PMGZML.CSV PMGDR1.CSV PMGDR2.CSV PMDZML.CSV PMDDR1.CSV PMDDR2.CSV
PARTICLE SIZE      : 10.0
DIESEL SULFUR      :  15
FUEL PROGRAM       :    4
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     30.00     30.00     30.00     30.00     30.00     30.00     30.00     30.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
     80.00     80.00     80.00     80.00     80.00     80.00     80.00     80.00
FUEL RVP           : 12.5
GAS AROMATIC%      : 25.0
GAS OLEFIN%        : 12.0
```

```
GAS BENZENE%       : 1.00
E200               : 53
E300               : 84
OXYGENATE          : MTBE    0.00    0.00
                   : ETBE    0.00    0.00
                   : ETOH    5.00    1.00
                   : TAME    0.00    0.00
AVERAGE SPEED      :  2.5 FREEWAY  100.0 0.0 0.0 0.0

END OF RUN
```

MOBILE 6.2 Output Files

MOBILE6 Emission Factors
For Albany, Rensselaer, Saratoga, and Schenectady Counties

Year: 2030

VOC Rate (gram/mile)

Road Type	2.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0
	Average Vehicle Speed (mph)														
01	2.19	0.85	0.59	0.46	0.35	0.28	0.25	0.23	0.22	0.21	0.20	0.19	0.19	0.18	0.18
02/06	2.13	0.82	0.57	0.45	0.34	0.27	0.24	0.22	0.21	0.20	0.19	0.18	0.18	0.18	0.18
07/08/09	2.12	0.81	0.57	0.45	0.34	0.26	0.24	0.22	0.20	0.19	0.19	0.18	0.18	0.18	0.18
11/12	2.11	0.81	0.56	0.43	0.32	0.25	0.23	0.22	0.20	0.19	0.19	0.18	0.18	0.18	0.18
14/16	2.12	0.81	0.56	0.44	0.33	0.26	0.24	0.22	0.20	0.19	0.19	0.18	0.18	0.18	0.18
17/19	2.11	0.80	0.56	0.44	0.33	0.26	0.23	0.22	0.20	0.19	0.19	0.18	0.18	0.18	0.18

NOx Rate (gram/mile)

Road Type	2.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0
	Average Vehicle Speed (mph)														
01	0.36	0.31	0.25	0.22	0.18	0.18	0.17	0.17	0.17	0.17	0.18	0.19	0.20	0.22	0.24
02/06	0.34	0.29	0.25	0.23	0.19	0.17	0.16	0.16	0.15	0.16	0.16	0.17	0.18	0.19	0.20
07/08/09	0.33	0.28	0.24	0.22	0.19	0.17	0.16	0.15	0.15	0.15	0.15	0.16	0.17	0.18	0.19
11/12	0.33	0.28	0.22	0.19	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.17	0.18	0.19
14/16	0.32	0.28	0.24	0.22	0.18	0.16	0.15	0.14	0.14	0.14	0.15	0.15	0.16	0.17	0.18
17/19	0.32	0.27	0.23	0.21	0.18	0.16	0.15	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.17

CO Rate (gram/mile)

Road Type	2.5	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0
	Average Vehicle Speed (mph)														
01	21.52	15.69	13.21	11.97	10.63	10.19	9.91	9.74	9.71	9.92	10.16	10.43	10.74	11.11	11.54
02/06	21.34	15.44	13.33	12.28	11.16	10.57	10.22	10.08	10.08	10.32	10.59	10.87	11.17	11.53	11.93
07/08/09	21.33	15.40	13.33	12.29	11.23	10.67	10.35	10.22	10.23	10.48	10.76	11.04	11.35	11.70	12.08
11/12	21.26	15.35	13.02	11.86	10.73	10.46	10.29	10.18	10.18	10.44	10.71	11.00	11.31	11.66	12.04
14/16	21.38	15.42	13.37	12.34	11.32	10.78	10.47	10.36	10.37	10.63	10.91	11.20	11.50	11.86	12.23
17/19	21.39	15.40	13.38	12.38	11.39	10.88	10.59	10.48	10.51	10.78	11.06	11.36	11.66	12.01	12.37

Note: 01 - Rural Interstate; 02 - Rural Principal Arterial; 06 - Rural Minor Arterial;
07 - Rural Major Collectors; 08 - Rural Minor Collectors; 09 - Rural Local;
11 - Urban Interstate; 12 - Urban Freeways and Expressways; 14 - Urban Principal Arterial;
16 - Urban Minor Arterial; 17 - Urban Collectors; 19 - Urban Local;

Table A1 MOBILE6 PM10 Non-Idle Emission Factors (g/mi)
For All Counties in Regions 1 - 7 and 9 and Ulster and Columbia Counties in Region 8

	Analysis Year																
Veh. Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
LDGV	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
LDGT1	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
LDGT2	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
LDGT3	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
LDGT4	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
HDGV2B	0.034	0.034	0.033	0.033	0.033	0.032	0.032	0.032	0.032	0.031	0.031	0.031	0.030	0.030	0.030	0.030	0.030
HDGV3	0.043	0.042	0.041	0.041	0.040	0.040	0.039	0.038	0.038	0.037	0.037	0.036	0.035	0.035	0.035	0.035	0.035
HDGV4	0.041	0.040	0.039	0.039	0.039	0.038	0.038	0.037	0.037	0.036	0.036	0.036	0.035	0.035	0.035	0.035	0.035
HDGV5	0.046	0.046	0.046	0.045	0.045	0.045	0.044	0.043	0.043	0.042	0.042	0.042	0.036	0.036	0.036	0.036	0.036
HDGV6	0.054	0.053	0.053	0.052	0.051	0.051	0.051	0.050	0.049	0.049	0.048	0.048	0.036	0.036	0.036	0.036	0.036
HDGV7	0.060	0.060	0.060	0.059	0.058	0.057	0.056	0.055	0.053	0.052	0.052	0.051	0.037	0.037	0.037	0.037	0.037
HDGV8A	0.091	0.090	0.090	0.089	0.089	0.089	0.088	0.087	0.086	0.085	0.085	0.085	0.062	0.062	0.062	0.062	0.062
LDDV	0.054	0.049	0.048	0.048	0.047	0.046	0.045	0.043	0.040	0.033	0.031	0.030	0.030	0.030	0.030	0.030	0.030
LDDT12	0.043	0.041	0.039	0.038	0.036	0.035	0.034	0.033	0.032	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
LDDT34	0.033	0.032	0.032	0.031	0.031	0.031	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
HDDV2B	0.030	0.030	0.029	0.028	0.028	0.028	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
HDDV3	0.035	0.034	0.033	0.033	0.032	0.032	0.032	0.032	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
HDDV4	0.039	0.037	0.036	0.035	0.034	0.033	0.033	0.032	0.032	0.032	0.032	0.032	0.031	0.031	0.031	0.031	0.031
HDDV5	0.040	0.039	0.038	0.037	0.036	0.035	0.035	0.034	0.033	0.033	0.032	0.032	0.031	0.031	0.031	0.031	0.031
HDDV6	0.058	0.055	0.053	0.048	0.047	0.045	0.043	0.042	0.041	0.040	0.040	0.039	0.036	0.036	0.036	0.036	0.036
HDDV7	0.057	0.054	0.052	0.048	0.046	0.044	0.042	0.041	0.040	0.039	0.039	0.038	0.036	0.036	0.036	0.036	0.036
HDDV8A	0.109	0.104	0.100	0.097	0.093	0.089	0.085	0.082	0.079	0.076	0.074	0.073	0.064	0.064	0.064	0.064	0.064
HDDV8B	0.094	0.089	0.086	0.084	0.082	0.080	0.076	0.074	0.072	0.071	0.069	0.068	0.064	0.064	0.064	0.064	0.064
HDGB	0.062	0.062	0.062	0.061	0.061	0.061	0.061	0.060	0.059	0.058	0.057	0.055	0.041	0.041	0.041	0.041	0.041
HDDBT	0.079	0.073	0.070	0.068	0.066	0.063	0.062	0.060	0.058	0.056	0.055	0.054	0.049	0.049	0.049	0.049	0.049
HDDBS	0.079	0.076	0.071	0.069	0.065	0.061	0.059	0.057	0.053	0.051	0.050	0.049	0.048	0.048	0.048	0.048	0.048
MC	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037

Table A2 MOBILE6 PM2.5 Non-Idle Emission Factors (g/mi)
For All Counties in Regions 1 - 7 and 9 and Ulster and Columbia Counties in Region 8

	Analysis Year																
Veh. Type	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
LDGV	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LDGT1	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LDGT2	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LDGT3	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
LDGT4	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
HDGV2B	0.020	0.019	0.019	0.019	0.019	0.018	0.018	0.018	0.017	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.016
HDGV3	0.025	0.024	0.024	0.023	0.023	0.022	0.022	0.021	0.020	0.020	0.020	0.019	0.018	0.018	0.018	0.018	0.018
HDGV4	0.023	0.022	0.022	0.021	0.021	0.021	0.020	0.020	0.019	0.019	0.019	0.019	0.018	0.018	0.018	0.018	0.018
HDGV5	0.027	0.027	0.027	0.026	0.026	0.026	0.026	0.025	0.025	0.024	0.024	0.024	0.019	0.019	0.019	0.019	0.019
HDGV6	0.033	0.033	0.032	0.032	0.031	0.032	0.032	0.031	0.030	0.030	0.030	0.030	0.019	0.019	0.019	0.019	0.019
HDGV7	0.038	0.038	0.038	0.038	0.037	0.037	0.036	0.035	0.034	0.033	0.033	0.033	0.020	0.020	0.020	0.020	0.020
HDGV8A	0.049	0.049	0.049	0.049	0.048	0.050	0.049	0.048	0.048	0.047	0.048	0.047	0.027	0.027	0.027	0.027	0.027
LDDV	0.038	0.034	0.033	0.032	0.032	0.031	0.030	0.028	0.026	0.019	0.017	0.016	0.016	0.016	0.016	0.016	0.016
LDDT12	0.028	0.026	0.025	0.023	0.022	0.021	0.019	0.018	0.018	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
LDDT34	0.019	0.018	0.017	0.017	0.017	0.017	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
HDDV2B	0.016	0.016	0.015	0.015	0.014	0.014	0.014	0.014	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
HDDV3	0.018	0.017	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014	0.014	0.014
HDDV4	0.022	0.020	0.019	0.018	0.017	0.017	0.016	0.015	0.015	0.015	0.015	0.015	0.014	0.014	0.014	0.014	0.014
HDDV5	0.023	0.022	0.021	0.020	0.019	0.018	0.018	0.017	0.017	0.016	0.016	0.015	0.014	0.014	0.014	0.014	0.014
HDDV6	0.039	0.036	0.034	0.030	0.029	0.027	0.026	0.025	0.024	0.023	0.023	0.022	0.019	0.019	0.019	0.019	0.019
HDDV7	0.039	0.036	0.034	0.030	0.028	0.026	0.025	0.024	0.023	0.022	0.022	0.021	0.019	0.019	0.019	0.019	0.019
HDDV8A	0.071	0.066	0.062	0.059	0.055	0.052	0.048	0.045	0.042	0.040	0.038	0.037	0.029	0.029	0.029	0.029	0.029
HDDV8B	0.056	0.052	0.048	0.047	0.045	0.043	0.040	0.038	0.036	0.035	0.033	0.033	0.029	0.029	0.029	0.029	0.029
HDGB	0.040	0.040	0.040	0.040	0.040	0.041	0.040	0.040	0.039	0.038	0.037	0.036	0.023	0.023	0.023	0.023	0.023
HDDBT	0.059	0.053	0.050	0.048	0.046	0.044	0.043	0.041	0.039	0.038	0.037	0.036	0.031	0.031	0.031	0.031	0.031
HDDBS	0.059	0.056	0.052	0.049	0.046	0.042	0.040	0.038	0.034	0.033	0.032	0.031	0.030	0.030	0.030	0.030	0.030
MC	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021

Train Emissions

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Emission Factors for Locomotives

The Environmental Protection Agency (EPA) has established emission standards for oxides of nitrogen (NOx), hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM) and smoke for newly manufactured and remanufactured locomotives. These standards, which are codified at 40 CFR part 1033, include several sets of emission standards with applicability dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) applies to most locomotives originally manufactured before 2001. The most stringent set of standards (Tier 4) applies to locomotives originally manufactured in 2015 and later. This fact sheet describes EPA's estimates of the typical in-use emission rates for locomotives subject to these standards, as well as the previous standards.

It is important to emphasize that this fact sheet relies on many simplifying assumptions. Thus emission rates calculated as described in this fact sheet should be considered as approximations.

Estimated Locomotive Emission Rates by Tier

EPA has estimated average emission rates, given in grams per brake horsepower-hour (g/bhp-hr), for uncontrolled locomotives and those required to meet the various emission standards. Emissions were estimated for two different types of operation: a low power cycle representing operation in a switch yard, and a higher power cycle representative of general line-haul operation. These estimates are shown in Tables 1 and 2. Note that plus signs in the table indicate that a given tier of standards was revised in a 2008 rulemaking (73 FR 37096, June 30, 2008). For example, locomotives originally manufactured in years 2002-2004 were initially subject to the original Tier 1 standards, but will be required to meet revised Tier 1 standards (also known as Tier 1+ standards) when remanufactured. See the regulatory text for a more precise explanation of which standards apply to which locomotives.

United States Environmental Protection Agency

Office of Transportation and Air Quality
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It is important to note that there can be significant variability in in-use emission rates, especially for uncontrolled locomotives. Also, a single locomotive's emission rate can vary throughout its life as the engine ages and as ambient conditions change. Thus the values presented here are intended to reflect the average emission rates. It is also worth noting that these emission estimates were developed in the context of adopting new emission standards. This is especially important for the CO emission factors. Because EPA's CO emission standards were intended to cap CO emissions at pre-control levels (which were relatively low), we have not projected any reductions in CO emission factors. However, recent testing indicates that emission controls designed to reduce PM and HC emissions are also reducing CO emissions. Thus the CO emission rates presented here may be too high and should be used with some caution. A similar effect may also apply for HC emissions from Tier 0 and Tier 1 locomotives (but not the Tier 0+ and Tier 1+ locomotives).

Table 1 - Line-Haul Emission Factors (g/bhp-hr)

	PM_{10}	HC	NO_X	CO
UNCONTROLLED	0.32	0.48	13.00	1.28
TIER 0	0.32	0.48	8.60	1.28
TIER 0+	0.20	0.30	7.20	1.28
TIER 1	0.32	0.47	6.70	1.28
TIER 1+	0.20	0.29	6.70	1.28
TIER2	0.18	0.26	4.95	1.28
TIER 2+ & TIER 3	0.08	0.13	4.95	1.28
TIER 4	0.015	0.04	1.00	1.28
+ INDICATES THAT THESE ARE THE REVISED STANDARDS IN 40 CFR PART 1033				

Table 2 - Switch Emission Factors (g/bhp-hr)

	PM_{10}	HC	NO_X	CO
UNCONTROLLED	0.44	1.01	17.40	1.83
TIER 0	0.44	1.01	12.60	1.83
TIER 0+	0.23	0.57	10.60	1.83
TIER 1	0.43	1.01	9.90	1.83
TIER 1+	0.23	0.57	9.90	1.83
TIER2	0.19	0.51	7.30	1.83
TIER 2+	0.11	0.26	7.30	1.83
TIER 3	0.08	0.26	4.50	1.83
TIER 4	0.015	0.08	1.00	1.83
+ INDICATES THAT THESE ARE THE REVISED STANDARDS IN 40 CFR PART 1033				

Conversion to Gram per Gallon Emission Factors

It is often useful to express emission rates as grams of pollutant emitted per gallon of fuel consumed (g/gal). This can be done by multiplying the emission rates in Table 1 or 2 by a conversion factor relating the fuel consumption (gal/hr) and the usable power (bhp) of the engine. EPA has estimated different conversion factors for different types of locomotive service as shown in Table 3. The two primary reasons for the differences are variations in locomotive age and duty cycle. Fuel efficiency tends to be worse for older locomotive designs and for locomotives used in low power applications such as switching. Note that the g/gal emission factors presented at the end of this fact sheet can be converted back to g/bhp-hr by dividing them by the conversion factors shown here.

Table 3
Conversion Factors (bhp-hr/gal)

Locomotive Application	Conversion Factor (bhp-hr/gal)
Large Line-Haul and Passenger	20.8
Small Line-Haul	18.2
Switching	15.2

Conversion to Gram per Ton-Mile Emission Factors

In some cases, it can be helpful to express emission factors as grams emitted per ton-mile of freight hauled. However, this can also be very problematic because the amount of engine work required for each ton-mile varies significantly with a variety of factors. For example, it takes more work to haul freight through mountainous terrain than across flat areas. Since EPA does not have detailed information about these variations, we cannot provide accurate g/ton-mile emission rates. However, very approximate national average values can be calculated based on data collected by the Association of American Railroads for revenue ton-miles and fuel consumption, which show that about one gallon of fuel is consumed by the railroads to haul 400 tons-miles of freight. Thus dividing g/gal emission rates by 400 ton-miles/gal gives approximate g/ton-mile emission rates.

Emission Inventory Estimation

Total emissions can be calculated by multiplying the emission factors (in g/gal) by the fuel consumption rates (in million-gal/yr) to give annual emission rates (in metric tons per year). Multiplying this metric estimate by 1.102 gives standard U.S. tons (or short tons) per year.

EPA has estimated that locomotives consume approximately 4 billion gallons of diesel fuel each year. This includes national/regional freight service, switching, local freight service, and passenger service. The relative amounts of fuel used in the United States for these four different types of operation are shown in Table 4. The great majority of fuel consumed by locomotives each year is used in line-haul freight service by the largest railroads. Smaller amounts are also used in switching and passenger service, and by very small railroads. For the purpose of this fact sheet, we are aggregating the largest railroads with smaller railroads that are fully subject to EPA's emission requirements. This includes regional railroads as well as other railroads such as those that are owned by large businesses. The local freight category includes only those railroads that meet our regulatory definition of "small railroad" (40 CFR 1033.901) to qualify for small business allowances under our regulations. These railroads are included in this fact sheet as local whether or not they are truly local in nature. The passenger category includes local commuter railroads and AMTRAK.

Table 4 - Locomotive Fuel Consumption by Service Category	
National and Regional Freight Line-haul	88%
National Freight Switching	7%
Local Freight	<2%
Passenger	3%

Other Pollutants

The preceding emission factors include those pollutants for which EPA has set emission standards. However, other pollutants may also be of interest.

The broad category of volatile organic compounds (VOC) is a slightly different way of aggregating the organic pollutants controlled by our HC emission standards. In our rulemaking analysis (http://www.epa.gov/otaq/regs/nonroad/420r08001a.pdf), we estimated that VOC emissions can be assumed to be equal to 1.053 times the HC emissions. Similarly, PM emissions can be expressed as PM_{10} (which includes all particles up to 10 microns in diameter) or $PM_{2.5}$ (which includes only those particles up to 2.5 microns in diameter). $PM_{2.5}$ emissions can be estimated as 0.97 times the PM_{10} emissions, meaning that nearly all of the PM is less than 2.5 microns in diameter.

Gram per gallon emissions of sulfur dioxide (SO_2) and carbon dioxide (CO_2) are largely independent of engine parameters and are primarily dependent on fuel properties. Locomotive-specific emission rates are not presented here. Instead, SO_2 and CO_2 emission rates should be calculated based on the properties of the specific fuel being used by the locomotives. These emission rates can also be assumed to be the same as for other diesel engines operating on similar fuel. Note that special caution should be used when estimating SO_2 emission rates since the sulfur content of diesel fuel varies much more than the carbon content. Also, while the vast majority of sulfur in the fuel is typically converted to SO_2, up to 5 percent of the sulfur is oxidized further to sulfate (and forms particulate matter), so that the fraction of fuel sulfur emitted as SO_2 may be as low as 95 percent. Examples of these calculations are shown below based on inputs described in the NONROAD technical document NR-009c (http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/420p04009.pdf).

SO_2 (g/gal) = (fuel density) × (conversion factor) × (64 g SO_2/32 g S) × (S content of fuel)

Consider the example where the density of diesel fuel is 3200 g/gal, the fraction of fuel sulfur converted to SO_2 is 97.8 percent, and the sulfur content of the fuel is 300 ppm.

SO_2 (g/gal) = (3200) × (0.978) × (2.00) × (300×10^{-6}) = 1.88 g/gal

CO_2 (g/gal) = (fuel density) × (44 g CO_2/12 g C) × (C content of fuel)

Consider the example where the density of diesel fuel is 3200 g/gal and the carbon content of the fuel is 87 percent by mass.

CO_2 (g/gal) = (3200) × (3.67) × (0.87) = 10,217 g/gal

Other trace pollutants such as N_2O, methane, and many air toxics are more dependent on engine parameters. At this time, however, EPA does not have detailed emission rates for these pollutants from locomotives. Where estimates are needed for N_2O or methane, you may assume that emissions of these pollutants from locomotives are similar to those of other diesel engines with similar technology. For N_2O, you may assume the emissions are proportional to total NOx. For methane, you may assume the emissions are proportional to total hydrocarbons. Note however, that the presence of catalyzed components in the exhaust can significantly affect these ratios. So it is best to compare emissions from uncatalyzed locomotives to emissions from other uncatalyzed diesel engines. While this same approach could be used for air toxics (assuming that air toxic emissions are proportional to total hydrocarbons), EPA has estimated air toxic emissions from locomotives. These estimates are described in the National Emission Inventory documentation (see ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002nei_mobile_nonroad_methods.pdf - appendix C).

Projected Future Emission Factors

Tables 5-7 give the expected fleet average NOx, PM_{10}, and HC emission factors by calendar year for the four categories of locomotives (the same four categories as are shown in Table 4). The steady decline in these emission factors reflects the penetration of the various tiers of locomotives into the fleet over time. More detail regarding the assumptions on which these projections were based can be found in the Regulatory Impact Analysis for the 2008 rulemaking (http://www.epa.gov/otaq/regs/nonroad/420r08001a.pdf)

For More Information

You can access the rule and related documents on EPA's Office of Transportation and Air Quality (OTAQ) Web site at: www.epa.gov/otaq/locomotives.htm.

For more information on this rule, please contact the Assessment and Standards Division information line at:

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E-mail: asdinfo@epa.gov

Table 5 – NOx Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	180	250	242	244	188
2007	175	249	242	229	183
2008	169	243	242	214	177
2009	165	241	242	200	172
2010	157	236	242	183	165
2011	149	235	242	167	157
2012	144	227	242	157	152
2013	139	225	242	147	147
2014	135	217	242	138	143
2015	129	215	240	131	137
2016	121	208	239	119	129
2017	114	206	237	112	122
2018	108	202	236	105	117
2019	103	200	233	98	112
2020	99	187	231	93	107
2021	94	185	228	88	102
2022	89	177	225	83	97
2023	84	172	223	78	92
2024	79	162	220	73	87
2025	74	150	217	68	81
2026	69	144	215	64	77
2027	65	138	212	60	72
2028	61	132	209	56	68
2029	57	126	206	52	64
2030	53	119	203	49	60
2031	49	112	200	46	56
2032	46	105	197	42	52
2033	43	98	193	39	49
2034	40	91	190	36	46
2035	37	84	187	33	43
2036	35	77	184	30	40
2037	33	71	180	28	38
2038	31	67	177	26	36
2039	29	63	174	24	34
2040	28	60	171	23	32

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Table 6 – PM_{10} Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	6.4	6.5	6.5	6.5	6.4
2007	6.3	6.5	6.5	6.4	6.3
2008	5.1	5.5	5.7	5.1	5.1
2009	4.9	5.5	5.7	5.0	4.9
2010	4.7	5.4	5.7	4.8	4.7
2011	4.4	5.3	5.7	4.5	4.5
2012	4.1	5.1	5.7	4.2	4.2
2013	3.8	5.0	5.6	3.9	3.9
2014	3.6	4.8	5.6	3.6	3.7
2015	3.4	4.8	5.5	3.4	3.5
2016	3.1	4.6	5.5	3.1	3.3
2017	2.9	4.5	5.4	2.8	3.0
2018	2.7	4.4	5.4	2.6	2.8
2019	2.5	4.4	5.4	2.3	2.6
2020	2.3	4.1	5.3	2.1	2.5
2021	2.2	4.0	5.3	2.0	2.4
2022	2.0	3.9	5.3	1.8	2.2
2023	1.9	3.7	5.2	1.7	2.1
2024	1.7	3.5	5.2	1.5	1.9
2025	1.6	3.2	5.1	1.4	1.8
2026	1.5	3.1	5.1	1.2	1.6
2027	1.4	3.0	5.1	1.1	1.5
2028	1.3	2.8	5.0	1.0	1.4
2029	1.1	2.7	5.0	0.9	1.3
2030	1.0	2.5	4.9	0.8	1.2
2031	1.0	2.4	4.8	0.7	1.1
2032	0.9	2.2	4.8	0.7	1.0
2033	0.8	2.1	4.7	0.6	0.9
2034	0.7	1.9	4.6	0.6	0.9
2035	0.7	1.7	4.6	0.5	0.8
2036	0.6	1.6	4.5	0.5	0.7
2037	0.6	1.5	4.4	0.4	0.7
2038	0.5	1.4	4.4	0.4	0.6
2039	0.5	1.3	4.3	0.4	0.6
2040	0.4	1.2	4.2	0.3	0.5

Table 7 - HC Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	9.5	15.0	11.7	9.7	10.0
2007	9.3	15.0	11.7	9.5	9.8
2008	9.0	14.5	11.7	9.3	9.5
2009	8.7	14.5	11.7	9.1	9.1
2010	8.3	14.1	11.7	8.6	8.8
2011	7.7	14.0	11.7	8.1	8.2
2012	7.1	13.3	11.7	7.5	7.6
2013	6.5	13.3	11.7	6.9	7.1
2014	6.1	12.7	11.7	6.3	6.7
2015	5.7	12.6	11.7	5.8	6.3
2016	5.1	12.0	11.7	5.2	5.7
2017	4.6	11.8	11.7	4.6	5.2
2018	4.2	11.5	11.7	4.1	4.8
2019	3.9	11.4	11.7	3.5	4.5
2020	3.6	10.5	11.7	3.1	4.2
2021	3.4	10.4	11.7	2.9	4.0
2022	3.2	9.8	11.7	2.7	3.8
2023	3.0	9.5	11.7	2.4	3.6
2024	2.8	8.9	11.7	2.2	3.4
2025	2.6	8.0	11.7	2.0	3.1
2026	2.5	7.6	11.7	1.8	2.9
2027	2.3	7.3	11.7	1.6	2.8
2028	2.1	6.9	11.7	1.5	2.6
2029	2.0	6.5	11.7	1.3	2.4
2030	1.9	6.2	11.7	1.2	2.3
2031	1.7	5.8	11.7	1.1	2.2
2032	1.6	5.5	11.7	1.0	2.0
2033	1.5	5.1	11.7	0.9	1.9
2034	1.4	4.7	11.7	0.8	1.8
2035	1.3	4.4	11.7	0.7	1.7
2036	1.2	4.0	11.7	0.7	1.6
2037	1.2	3.7	11.7	0.6	1.5
2038	1.1	3.6	11.7	0.6	1.4
2039	1.1	3.4	11.7	0.5	1.4
2040	1.0	3.2	11.7	0.5	1.3

Mesoscale Results

Table A : Train Emissions Factors[1]

Alternative	Unit	$PM_{2.5}$[4]	PM_{10}	VOC	NOX	CO	CO_2[6]
Tier 1+ [1,2]	g/bhp-hr	0.194	0.200	0.290	6.700	1.200	
	g/mile[5,6]	1.345	1.387	2.011	46.453	8.320	3,405.667

Convert to	
# of miles/gal :	3
Line-Haul Emission Factor (g/bhp-hr) t(	20.8

1 Emission Factors are based on the *Emission Factors for Locomitves,* United States Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009.Emission Factors assume locomotives similar to the GE P32AC-DM which can operate on both diesel powere or use the 3rd rail system near Penn Station and represent a tier 0/Teir1 locomotive.

2 The values presented here are intended to reflect the average emission rates. It is also worth noting that these emission estimates were developed in the context of adopting new emission standards. This is especially important for the CO emission factors. Because EPA's CO emission standards were intended to cap CO emissions at pre-control levels (which were relatively low), we have not projected any reductions in CO emission factors. However, recent testing indicates that emission controls designed to reduce PM and HC emissions are also reducing CO emissions. Thus the CO emission rates presented here may be too high and should be used with some caution. A similar effect may also apply for HC emissions from Tier 0 and Tier 1 locomotives.

3 Conversion of g/gallon to g/mile assumes 3 gallons per mile for passenger locomotives

4 Pm2.5 is 0.97 times of PM10 (EPA Train Emission Guidelines)

5 All values are from Table 1 of Line-Haul Emission Factor (g/bhp-hr) * 20.8 (bhp-hr/gal) which is the conversion factor from Table 3 for Passenger.

6 CO_2 assumed density of diesel fuel of 3,200 g/gal and carbon content of fuel is 87 percent by mass (Based on page 4, Other Pollutants in*Emission Factors for Locomotives* . CO2 (g/gal) =3,200*3.67*0.87=10,217 g/gal

Table B: Estimated Rail Emissions for NY-VT Rail Alternatives

Alternatives	Description of Alternative	Total Increase in Train Mileage per day per Alternative (miles)[1]	# Trains	$PM_{2.5}$ (kg/day)	PM_{10} (kg/day)	HC (kg/day)	NOX (kg/day)	CO (kg/day)
			Passenger Train Emission Factors (calculated in Table A):	1.35	1.39	2.01	46.45	8.32
Alternative 3A	New Service to SW VT - Terminus Manchester (via Schenectady)	129	1	0.17	0.18	0.26	5.99	1.07
Alternative 3B	New Service to SW VT -Terminus Manchester (via CP Colonie)	170	1	0.23	0.24	0.34	7.90	1.41
Alternative 4A	New Service to SW VT - Terminus Rutland (via Schenectady)	191	1	0.26	0.26	0.38	8.87	1.59
Alternative 4B	New Service to SW VT - Terminus Rutland (via CP Colonie)	234	1	0.31	0.32	0.47	10.87	1.95
Alternative 5A	Re-Route Ethan Allen (via Schenectady)	-9	1	(0.01)	(0.01)	(0.02)	(0.42)	(0.07)
Alternative 5B	Re-Route Ethan Allen (via CP Colonie)	34	1	0.05	0.05	0.07	1.58	0.28
Alternative 6A	Split Shuttle (via Schenectady)	391	1	0.53	0.54	0.79	18.16	3.25
Alternative 6B	Split Shuttle (via CP Colonie)	434	1	0.58	0.60	0.87	20.16	3.61

1 Based on information provided by the VHB Team. 11/30/11

Table C : Estimated Emissions Reduction due to VMT Reduction

Average Speed Assumptions for Project Roadways [1]:

0.3%	49.25
0.5%	51.25
1.6%	53.75
1.2%	56.25
30.1%	58.75
22.9%	61.25
43.4%	63.75
Average:	61.3165
Peak =	55
Off-Peak	65

MOBILE6 Emission Factors [2]

	$PM_{2.5}$ [3]	PM_{10} [3]	VOC	NOX	CO
	g/mile	g/mile	g/mile	g/mile	g/mile
Of-Peak	0.01	0.27	0.18	0.18	11.17
Peak	0.01	0.27	0.18	0.20	11.93

Roadway Type : Rural Principal Arterial/Rural minor Arterial

Alternatives	Description of Alternative	Reduction in Annual Total Vehicles Miles Traveled (VMT) : (miles/year)	$PM_{2.5}$ kg/day	PM_{10} kg/day	VOC/HC kg/day	NOX kg/day	CO kg/day
Alternative 3A	New Service to SW VT - Terminus Manchester (via Schenectady)	1,495,800	17.95	403.87	269.24	278.22	17,049.13
Alternative 3B	New Service to SW VT -Terminus Manchester (via CP Colonie)	2,441,400	29.30	659.18	439.45	454.10	27,827.08
Alternative 4A	New Service to SW VT - Terminus Rutland (via Schenectady)	2,497,900	29.97	674.43	449.62	464.61	28,471.06
Alternative 4B	New Service to SW VT - Terminus Rutland (via CP Colonie)	3,890,500	46.69	1,050.44	700.29	723.63	44,343.92
Alternative 5A	Re-Route Ethan Allen (via Schenectady)	2,144,900	25.74	579.12	386.08	398.95	24,447.57
Alternative 5B	Re-Route Ethan Allen (via CP Colonie)	2,743,600	32.92	740.77	493.85	510.31	31,271.55
Alternative 6A	Split Shuttle (via Schenectady)	2,369,800	28.44	639.85	426.56	440.78	27,010.98
Alternative 6B	Split Shuttle (via CP Colonie)	2,797,800	33.57	755.41	503.60	520.39	31,889.32

1 Average Speeds provided by VHB Team 11/30/11

2 MOBILE 6 Emissions Factors are based on the the NYSDOT ESB April 2008 MOBILE Emission Factors for Regional, Meossocale and CMAQ Project Emission Calcluations for Albany, Rensselaer, Saratoga, and Schenectady Counties for Year 2030. (Based on the ridership/VMT estimates, the average percent of VMT reduction in Vermont versus NY is only 3% therefore the NY factors were utilized.)

3 See the PM Emissions Calculation Table based on the NYSDOT MOBILE Emission Factor Tables with Vehicle Distributions

3 Peak Period Volume Factor is assumed to be 70% (0.7) which means that 70% of the daily volume is considered to be "peak traffic" .

Off-Peak Period Factor= 0.7

Table D : Estimated Mobile Source Emissions Reduction of Each Alternative
(Emissions from VMT Reduction - Estimated Train Emission)

		TOTAL PROJECT-RELATED REDUCTION IN EMISSIONS (kg/day)				
Alternatives	Description of Alternative	$PM_{2.5}$ kg/day	PM_{10} kg/day	VOC/HC kg/day	NOX kg/day	CO kg/day
Alternative 3A	New Service to SW VT - Terminus Manchester (via Schenectady)	17.78	403.69	268.98	272.23	17,048.06
Alternative 3B	New Service to SW VT -Terminus Manchester (via CP Colonie)	29.07	658.94	439.11	446.20	27,825.66
Alternative 4A	New Service to SW VT - Terminus Rutland (via Schenectady)	29.72	674.17	449.24	455.74	28,469.48
Alternative 4B	New Service to SW VT - Terminus Rutland (via CP Colonie)	46.37	1,050.11	699.82	712.76	44,341.97
Alternative 5A	Re-Route Ethan Allen (via Schenectady)	25.75	579.14	386.10	399.37	24,447.65
Alternative 5B	Re-Route Ethan Allen (via CP Colonie)	32.88	740.72	493.78	508.73	31,271.27
Alternative 6A	Split Shuttle (via Schenectady)	27.91	639.30	425.78	422.62	27,007.73
Alternative 6B	Split Shuttle (via CP Colonie)	32.99	754.80	502.73	500.23	31,885.71

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Appendix D: Section 106 Consultation

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

DEC 02 2014

Ms. Laura Trieschmann
State Historic Preservation Officer
Vermont Division for Historic Preservation
1 National Life Drive
Davis Building, 6th Floor
Montpelier, VT 05620-0501

RE: Initiation of Section 106 Consultation for the New York-Vermont Bi-State Intercity Passenger Rail Study

Dear Ms. Trieschmann:

The Federal Railroad Administration (FRA), in conjunction with the Vermont Agency of Transportation (VTrans), has undertaken the New York-Vermont Bi-State Intercity Passenger Rail Study (Study) to identify an efficient intercity passenger rail-based transportation link that would benefit un-served and underserved communities in southwestern Vermont and eastern central New York. If implemented, the project would allow for a new intercity passenger rail service between Rutland, VT and Albany, NY via Mechanicville, NY, North Bennington, VT, and Manchester, VT, and would utilize Vermont Railway, Pam Am Railway, and CSX active rail lines. A map of the study area is shown in Figure 1.

By way of this letter, FRA is initiating the Section 106 process per 36 CFR 800.3 to comply with the National Historic Preservation Act, which includes incorporating a preliminary cultural resources analysis into a Tier I Environmental Assessment (EA) being prepared for the Study in accordance with the National Environmental Policy Act (NEPA). NEPA and NHPA are triggered because FRA is providing funds to VTrans under its High-Speed Intercity Passenger Rail (HSIPR) Program to undertake the Study.

Environmental Assessment

A Tier 1 Environmental Assessment (EA) has been prepared to identify and evaluate potential environmental impacts at the corridor level. The EA establishes a Tier I Area of Potential Effects (APE) and outlines the likelihood of cultural resources (built environment and archaeological resources) within that APE.

Tier 2 environmental documents would be prepared at a future date for specific projects, if/when future funding becomes available and detailed design plans have been developed. The Tier 2 documents would identify, evaluate, and assess effects on specific resources within the specific project areas for any proposed undertaking. Consultation with the appropriate State Historic Preservation Officer (SHPO) for these Tier 2 documents would take place individually for each project per 36 CFR 800, and project-specific APEs would be refined, if necessary.

Tier 1 Section 106 Process

NHPA Section 106 compliance for the Tier 1 EA involved establishing a Tier 1 APE and conducting background research to identify above-ground resources and locations of archaeological sensitivity. For above-ground resources, research was undertaken to identify NRHP-listed individual properties and districts located within the APE, which was defined as the property within 100 feet (50 feet from centerline) of the rail corridors. Locations of previously inventoried archaeological sites and cultural features and landscape features from ca. 1900 USGS topographic quadrangle maps were used to provide an overview of potential archaeological sensitivity along the rail corridors.

Consultants for VTrans conducted a site file search at your office on November 1, 2011 to identify individual properties and districts listed in the NRHP and to assess archaeological sensitivity in the study area. NRHP nomination forms are filed by municipality, and the maps in each form were used to determine the relationship of each historic resource to the location of the study area. In order to assess potential archaeological sensitivity for study segment locations in Vermont, archaeological maps available at your office were reviewed to identify locations of known sites along the rail corridors. This information was combined with analyses of known geographical and cultural features in order to determine potential archaeological sensitivity.

The results of the background research, which included reviewing information maintained by your office and information provided by the New York State Division for Historic Preservation, is summarized below by the nine rail segments that comprise the study area (see Figure 2):

Segment 1

There are two NRHP-listed properties or districts along Segment 1:

- Broad way-Livingston Avenue Historic District, Albany, NY; and
- Mica Insulator Comp any, Schenectady, NY.

The background research conducted thus far indicates there is there is a likelihood of intact historic deposits in undisturbed areas of Albany and Schenectady, but prehistoric archaeological sensitivity is generally low.

Segment 2

There is one NRHP-listed district along Segment 2:

- Union Street Historic District, Schenectady, NY.

The background research conducted thus far indicates there is some archaeological sensitivity near the Erie Canal and Mohawk River due to historic settlement and industrial development along this segment, but prehistoric archaeological sensitivity is low.

Segment 3

There are two NRHP-listed properties or districts along Segment 3:

- Fort Edward Delaware & Hudson Train Station, Fort Ed ward, NY; and
- Champlain Canal, Saratoga and Washington Counties, NY.

The background research conducted thus far indicates there is a low degree of archaeological sensitivity along Segment 3 between Saratoga Springs and Fort Ed ward, NY; there is a higher potential for buried historic or prehistoric resources near the Champlain Canal, between Fort Ed ward and Whitehall, and south of Saratoga Springs.

Segment 4
There are three NRHP-listed districts but no individual properties along Segment 4:

- Castleton Village Historic District, Castleton, VT;
- Marble Street Historic District, West Rutland, VT; and
- Rutland Downtown Historic District, Rutland, VT.

The background research conducted thus far indicates there is a moderate degree of archaeological sensitivity along much of Segment 4, with a potential for buried historic or prehistoric resources along the Castleton River and in the developed areas of Rutland and West Rutland, VT; there is a low degree of archaeological sensitivity along the corridor between Whitehall, NY and Fair Haven, VT.

Segment 6
There are no NRHP-listed properties or districts along Segment 6. The background research conducted thus far indicates there is a low potential for archaeological sensitivity along most of this segment, and there is a higher potential for buried historic or prehistoric resources near Anthony Kill.

Segment 7
There are two NRHP-listed properties or districts along Segment 7:

- Downtown Cohoes Historic District, Cohoes, NY; and
- Delaware & Hudson Railroad Freight House, Cohoes, NY.

The background research conducted thus far indicates there is a relatively high degree of archaeological sensitivity along the Hoosic River in this segment.

Segment 8
There are two NRHP-listed properties along Segment 8:

- Delany Hotel, Hoosick, N Y; and
- Bennington Battlefield, Hoosick and White Creek, NY.

The background research conducted thus far indicates archaeological sensitivity is high along this segment.

Segment 9
There are four NRHP-listed properties or districts along Segment 9:

- Amos Lawrence House, Manchester, VT;
- Arlington Village Historic District, Arlington, VT;
- North Bennington Historic District, Bennington, VT; and
- North Bennington Depot, Bennington, VT.

The background research conducted thus far indicates there is a moderate level of archaeological sensitivity for buried historic or prehistoric deposits along this segment.

Segment 10
There are three NRHP-listed districts along Segment 10:

- Rutland Downtown Historic District, Rutland , VT;
- Wallingford Main Street Historic District; Wallingford , VT; and
- Rural Otter Creek Valley Historic District, Wallingford, VT.

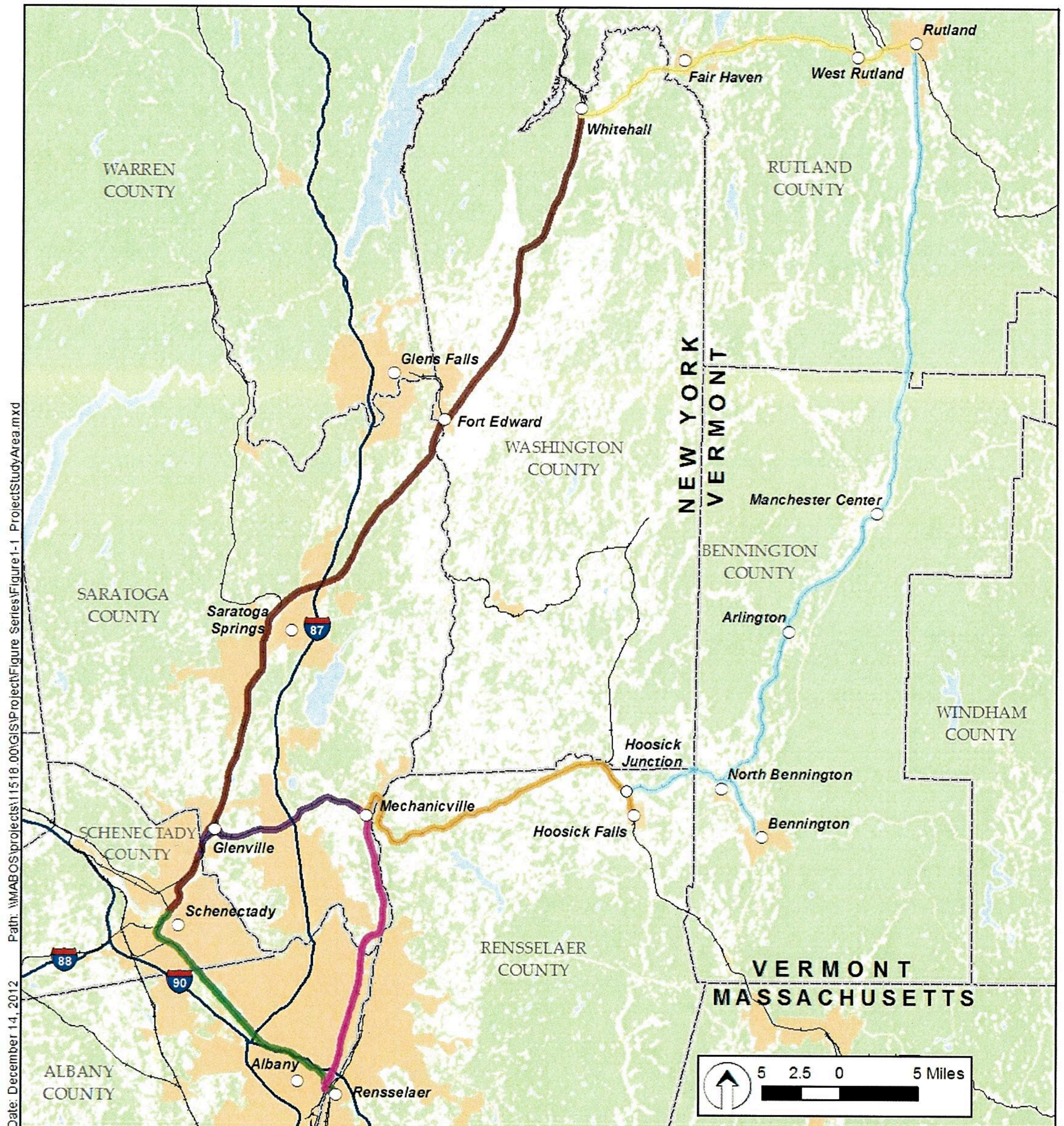
Summary and Next Steps
FRA is initiating the Section 106 process per 36 CFR 800.3 for purposes of the Tier I EA. Potential future Section 106 undertakings could consist of various track, crossing, and bridge improvements, as well as construction of new stations, but specific locations have not been identified at this stage. In addition to the known NRHP-listed districts and individual properties included in this letter, the background research conducted thus far indicates there may be additional NR-eligible resources present in the study area. However, no further identification of historic properties or evaluations of impacts to historic properties takes place as part of this Tier I study; such activities would take place at a later date, and would include consultation with your office for specific undertakings.

At this Tier 1 level, FRA wants to ensure you are informed of the planning process and understand you will see specific undertakings if/when our efforts advance to the Tier 2 stage in the future, where we would be asking for your concurrence on any effects to historic properties. If you have any questions regarding the New York-Vermont Bi-State Intercity Passenger Rail Study, please contact Laura Shick of my staff at laura.shick@dot.gov or 202-366-0340.

Sincerely,

David Valenstein
Division Chief, Environmental & Corridor Planning

cc: Costa Pappis, VTrans
Tim Conway, NYSDOT



Legend

Potential Host Railroads

- Canadian Pacific Rail Albany to Mechanicville (Colonie Subdivision)
- CSX Albany to Schenectady (Hudson Subdivision)
- Canadian Pacific Rail Mechanicville to Schenectady (Freight Subdivision)
- Canadian Pacific Rail Schenectady to Whitehall (Canadian Subdivision)
- Pan Am Southern line Hoosick Jct. to Mechanicville (Freight Main Line)
- Clarendon & Pittsford Whitehall to Rutland (CLP Main Line)
- Vermont Railway Rutland to Bennington/Hoosick Jct. (B&R Subdivision)

- Other Railroad
- County Boundary
- Urbanized Area
- City/Town
- Interstate Highway

NY - VT Bi-State Intercity Passenger Rail Study

Figure 1-1

Project Study Area

Source: New York State GIS Clearinghouse (NYGIS); Vermont Center for Geographic Information (VCGI); The United States Geological Survey National Map; and Environmental Systems Research Institute (ESRI) Data

VTrans NYSDOT VHB *Vanasse Hangen Brustlin, Inc.*

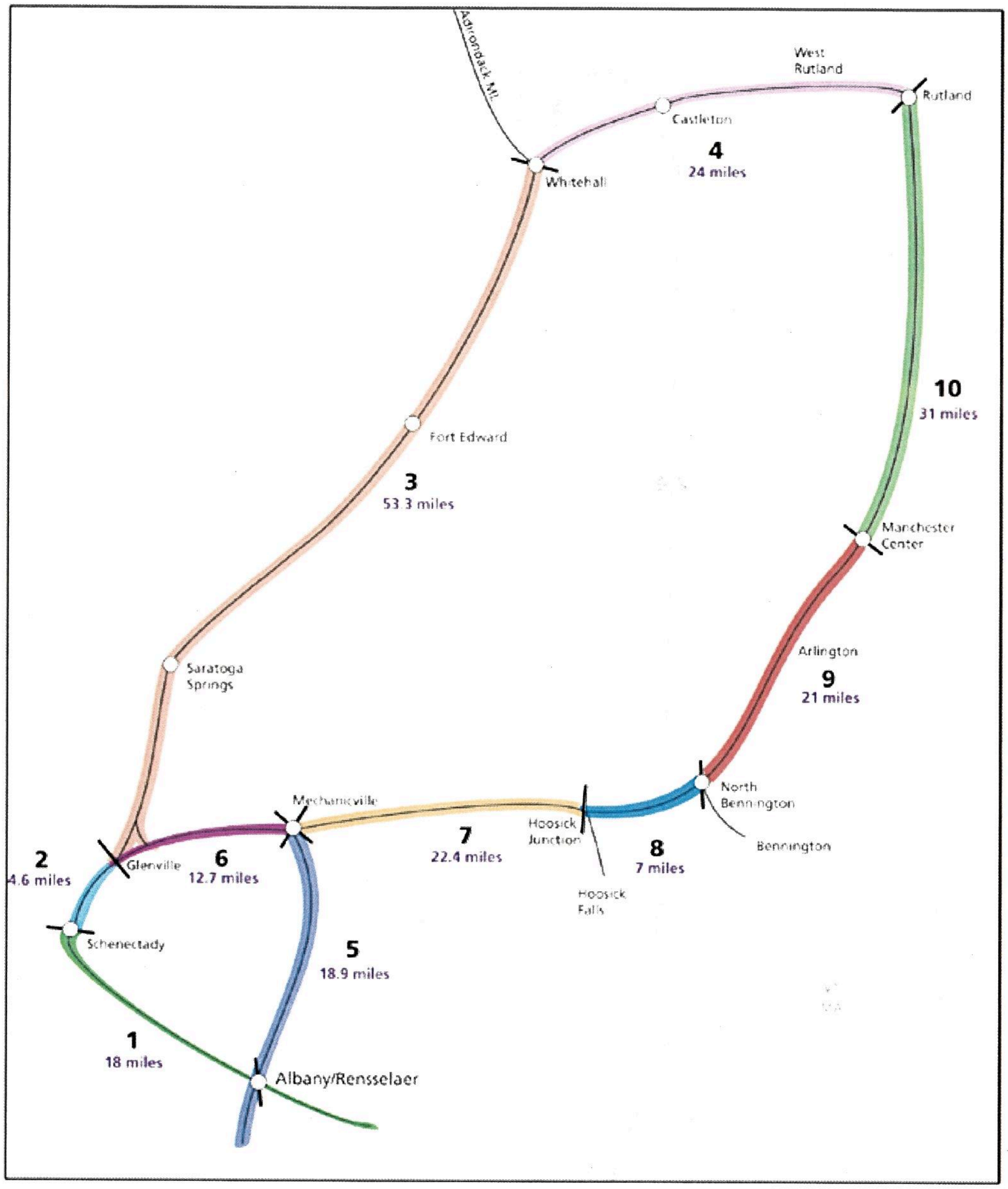


Figure 2: Study Segments[1]

[1] Segment 5 was eliminated from the study.

U.S. Department
of Transportation

Federal Railroad Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

DEC 02 2014

Ms. Ruth L. Pierpont
Deputy State Historic Preservation Officer
New York State Division for Historic Preservation
New York State Office of Parks, Recreation & Historic Preservation
Peebles Island State Park
P.O. Box 189
Waterford, NY 12188-0189

RE: Initiation of Section 106 Consultation for the New York-Vermont Bi-State Intercity Passenger Rail Study

Dear Ms. Pierpont:

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Your office has some information on NRHP properties available electronically. Properties and districts listed in the NRHP have been geocoded by your office, and this information is available through a public GIS interface on your office's website, which also has copies of NRHP nomination forms available for download. Archaeological sensitivity is also available through the GIS interface, shown through generalized geographic areas. The potential for archaeological sensitivity has been compiled using a combination of known sites and cultural and landscape features commonly associated with prehistoric and historic period human activity. Using generalized areas to present archaeological sensitivity provides a certain degree of guidance, without compromising the confidentiality and security of the location of archaeological sites. Due to the extensive project area, staff from your office prepared GIS data results directly related to the project study area. Staff provided an ESRI shapefile on November 7, 2011, showing locations of NRHP-listed properties and archaeological sensitivity within 100 feet of all rail corridors.

The results of the background research, which included reviewing information provided by your office and by the Vermont Division for Historic Preservation, is summarized below by the nine rail segments that comprise the study area (see Figure 2):

Segment 1

There are two NRHP-listed properties or districts along Segment 1:

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- Rural Otter Creek Valley Historic District, Wallingford, VT.

Summary and Next Steps

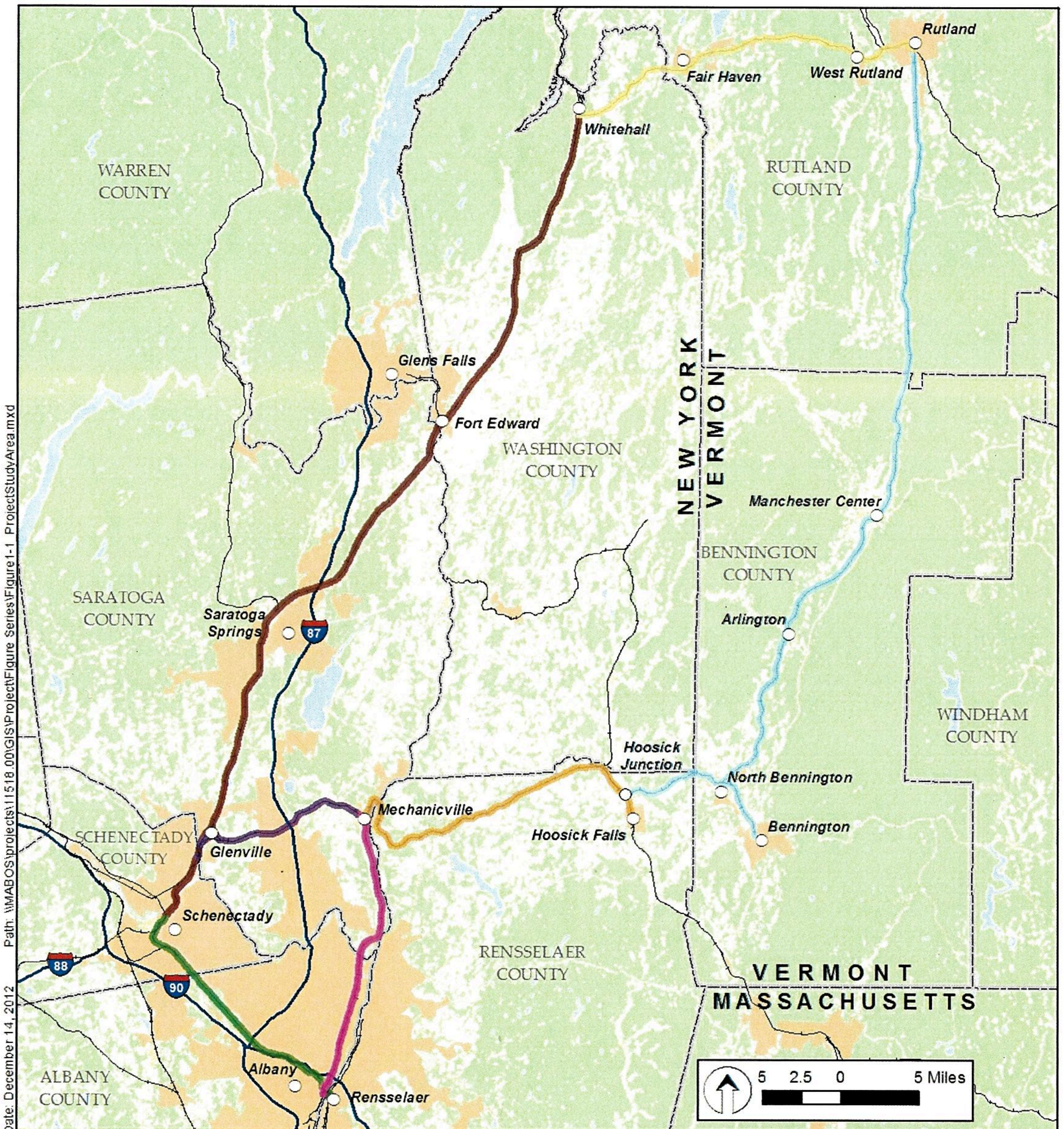
FRA is initiating the Section 106 process per 36 CFR 800.3 for purposes of the Tier I EA. Potential future Section 106 undertakings could consist of various track, crossing, and bridge improvements, as well as construction of new stations, but specific locations have not been identified at this stage. In addition to the known NRHP-listed districts and individual properties included in this letter, the background research conducted thus far indicates there may be additional NR-eligible resources present in the study area. However, no further identification of historic properties or evaluations of impacts to historic properties takes place as part of this Tier I study; such activities would take place at a later date, and would include consultation with your office for specific undertakings.

At this Tier 1 level, FRA wants to ensure you are informed of the planning process and understand you will see specific undertakings if/when our efforts advance to the Tier 2 stage in the future, where we would be asking for your concurrence on any effects to historic properties. If you have any questions regarding the New York-Vermont Bi-State Intercity Passenger Rail Study, please contact Laura Shick of my staff at laura.shick@dot.gov or 202-366-0340.

Sincerely,

David Valenstein
Division Chief, Environmental & Corridor Planning

cc: Costa Pappis, VTrans
Tim Conway, NYSDOT



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Legend

Potential Host Railroads

- Canadian Pacific Rail Albany to Mechanicville (Colonie Subdivision)
- CSX Albany to Schenectady (Hudson Subdivision)
- Canadian Pacific Rail Mechanicville to Schenectady (Freight Subdivision)
- Canadian Pacific Rail Schenectady to Whitehall (Canadian Subdivision)
- Pan Am Southern line Hoosick Jct. to Mechanicville (Freight Main Line)
- Clarendon & Pittsford Whitehall to Rutland (CLP Main Line)
- Vermont Railway Rutland to Bennington/Hoosick Jct. (B&R Subdivision)

- Other Railroad
- County Boundary
- Urbanized Area
- City/Town
- Interstate Highway

NY - VT Bi-State Intercity Passenger Rail Study

Figure 1-1

Project Study Area

Source: New York State GIS Clearinghouse (NYGIS); Vermont Center for Geographic Information (VCGI); The United States Geological Survey National Map; and Environmental Systems Research Institute (ESRI) Data

VTrans NYSDOT *Vanasse Hangen Brustlin, Inc.*

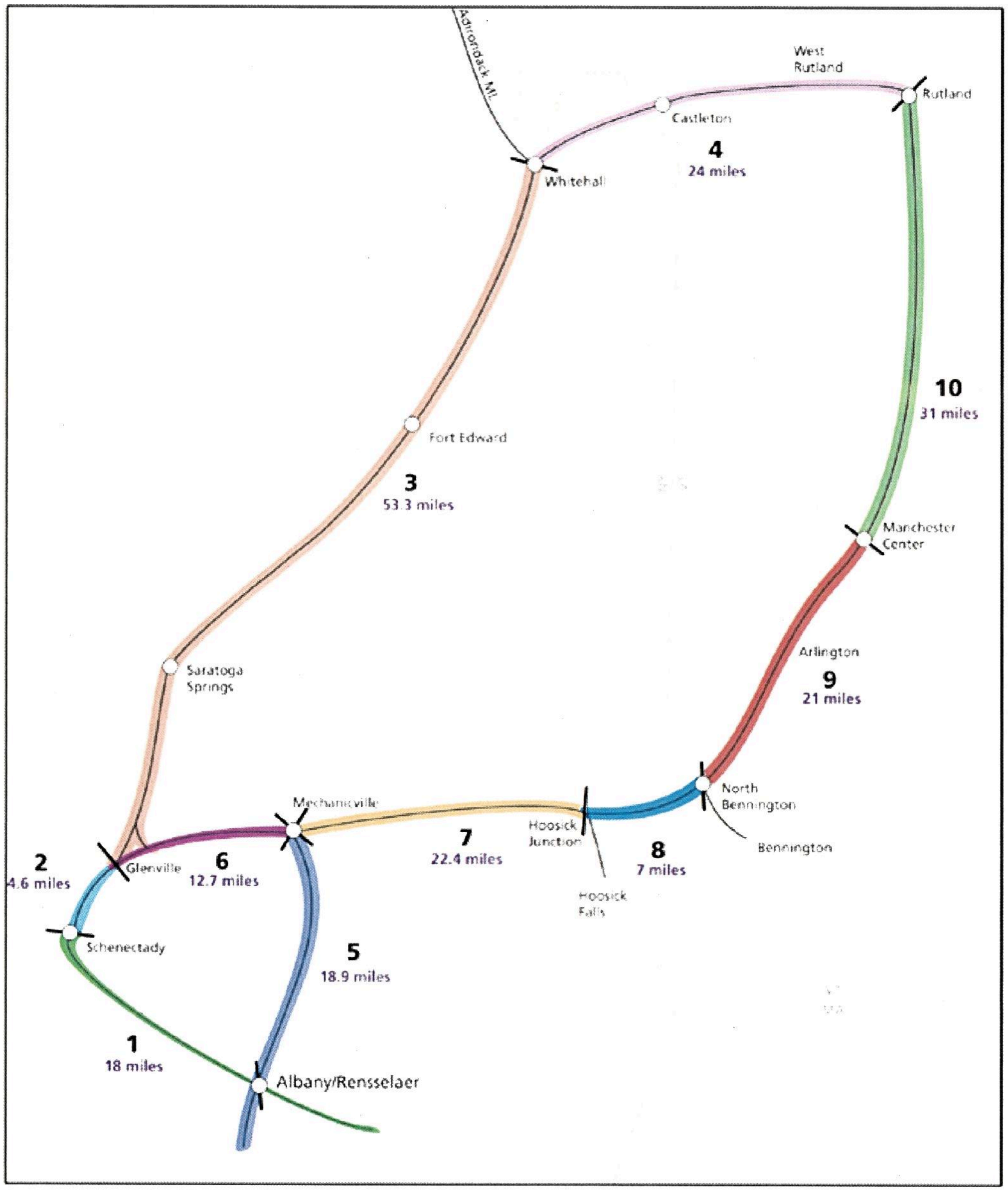

Figure 2: Study Segments[1]

[1] Segment 5 was eliminated from the study.

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Appendix E: List of Preparers

New York – Vermont Bi-State Intercity Passenger Rail Study Environmental Assessment

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