Albany-Bennington-Rutland-Burlington

ABRB Project

October 2004

VTrans Working to Get You There
Vermont Agency of Transportation

CHA CLOUGH, HARBOUR & ASSOCIATES LLP
ENGINEERS, SURVEYORS, PLANNERS & LANDSCAPE ARCHITECTS

Table of Contents

I. Introduction 2

A. Study Approach 4
B. Program Overview 6
C. Current Operations on the ABRB Corridor 8

II. ABRB Program Summary 17

A. Track Improvements 17
1. Crosstie Installation 17
2. Ballast Installation 18
3. Track Surfacing 19
4. Rail Replacement 20
5. Turnout Retirement / Rehabilitation / Replacement 21
6. Track Undercutting 22
7. Culverts and Drainage Improvements 23
8. Vegetation Control 24
9. Rail Testing 25
10. Grade Crossing Surfaces 26

B. Signals 28
1. Grade Crossing Warning Systems 28
2. Advance Warning and Interlocking Signals 29

C. Bridge Improvements 30
1. Bridge Deck Replacement 30
2. Bridge Structural Repairs 31
3. Bridge Replacements 32

III. Findings & Recommendations 33

A. ABRB 1 Program Update 33
B. ABRB 2 Program Update 33
C. ABRB S Program Update 33
D. ABRB SC Scoping Program 34

APPENDICES

Appendix I – Rehabilitation Programs

Appendix II – Track Chart

Appendix III – Site Photographs

I. Introduction

The primary objective of this study is 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.

The majority of the ABRB corridor is owned by the State of Vermont and is operated by the Vermont Railway (VTR). The ABRB rail corridor predominantly follows the western edge of the State of Vermont between Bennington and Burlington through Rutland and connects with the line from New York State at Hoosick Junction. A map of Vermont's Rail System that shows the ABRB corridor and the line segments studied in this report is provided in Figure 1.

At the direction of the Vermont Agency of Transportation (VTrans), Clough, Harbour & Associates LLP (CHA) conducted detailed field inspections and developed updated capital program information for the ABRB rail corridor.

As the owner of most of the rail network in the state, VTrans understands that ongoing investment in the railroad infrastructure is necessary to maintain or improve the existing operating speeds, service reliability and on time performance in the ABRB corridor.

Improving the load capacity of the track and bridges in the ABRB corridor will also generate freight transportation benefits by increasing the volume of commodities each rail car can handle and, therefore, reduce the number of trucks on the highways.

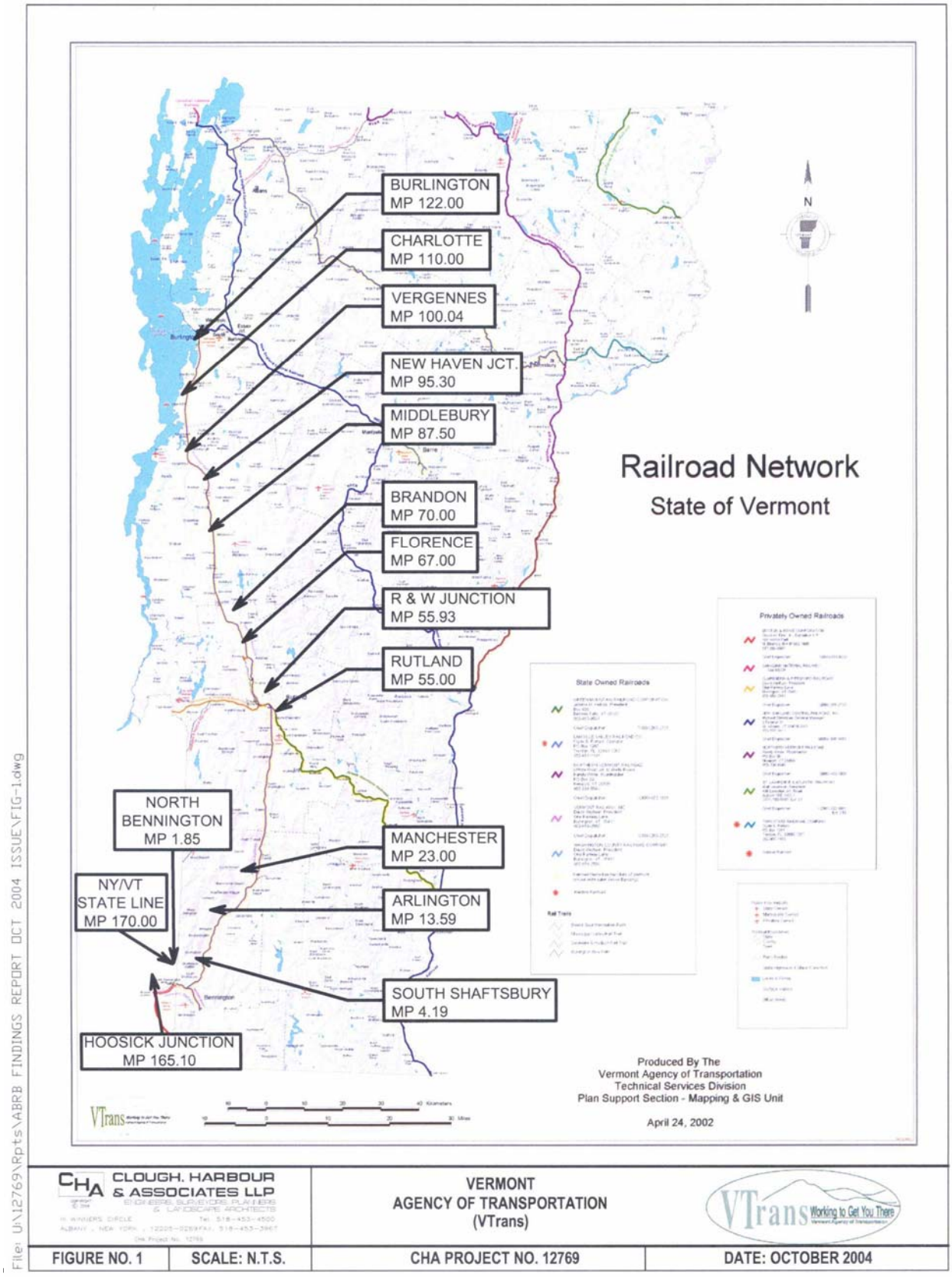
Highway surface and safety improvements at grade crossings are also considered to be important transportation user benefits.

This report will summarize the existing conditions, transportation needs, recommended improvements, estimated capital costs, anticipated service benefits and expected return on the investments programmed for the entire ABRB corridor.

The overall program summarized in this report represents the level of investment required to establish a "state of good repair" for the rail infrastructure necessary to support 60 mph passenger service, 286,000 lb. axle loadings where required for freight service, and 40 mph freight service for each segment of the ABRB corridor.

The actual level of investment and priority for each segment in the ABRB corridor depends on the proposed operating scenarios for freight and passenger service and the expected benefits. A prioritized program by segment is presented in the ABRB Program Summary section.

Detailed summaries of the overall Track, Bridge and Grade Crossing Programs for the entire ABRB Corridor are also provided as information in the appendices of this report.


BURLINGTON
MP 122.00
CHARLOTTE
MP 110.00
VERGENNES
MP 100.04
NEW HAVEN JCT.
MP 95.30
MIDDLEBURY
MP 87.50
BRANDON
MP 70.00
FLORENCE
MP 67.00
R & W JUNCTION
MP 55.93
RUTLAND
MP 55.00
NORTH
BENNINGTON
MP 1.85
NY/VT
STATE LINE
MP 170.00
MANCHESTER
MP 23.00
ARLINGTON
MP 13.59
SOUTH SHAFTSBURY
MP 4.19
HOOSICK JUNCTION
MP 165.10
N
Railroad Network
State of Vermont
Privately Owned Railroads
State Owned Railroads
Produced By The
Vermont Agency of Transportation
Technical Services Division
Plan Support Section - Mapping & GIS Unit
April 24, 2002
VTrans
CLOUGH, HARBOUR & ASSOCIATES LLP
VERMONT
AGENCY OF TRANSPORTATION
(VTrans)
VTrans Working to Get You There
FIGURE NO. 1
SCALE: N.T.S.
CHA PROJECT NO. 12769
DATE: OCTOBER 2004
File: U:\12769\Rpts\ABRB FINDINGS REPORT OCT 2004 ISSUE\FIG-1.dwg

A. Study Approach

This study was initiated in order to identify and document the existing conditions, transportation needs, recommended improvements, estimated capital costs, anticipated service benefits and expected return on investments programmed for the ABRB corridor.

In order to do this, a detailed inventory and data compilation of the existing conditions and train operations in the ABRB corridor was completed. This information was used to establish a baseline for sustaining current operations and programming future upgrades in the corridor in order to promote and support freight and passenger service improvements.

The inventory of the physical plant (track, bridges, and grade crossings) and its current condition relative to remaining service life under the current operating scenarios was compiled by mile post for each line segment in the corridor.

Based on VTrans, VTR and Federal Railroad Administration (FRA) standards for various operating criteria, rehabilitation programs were developed for each infrastructure element as outlined below:

Track

Maximum allowable operating speeds for freight and passenger rail service are based on the current condition of the existing track and right-of-way in accordance with FRA track maintenance standards.

In this report it is assumed that all of the mainline track in the ABRB corridor will be upgraded to support FRA Class III standards (60 mph maximum - passenger / 40 mph maximum - freight). Passing sidings in critical areas will also be upgraded.

Bridges

Bridges are load rated based on the site specific configuration and condition of the superstructure and substructure components. Typically, the bridges in the ABRB corridor were built for lower axle loads than today's railroad industry demands (263,000 lbs. vs. 286,000 lbs.). Considering the fact that the condition of these bridges has deteriorated over time, the factor of safety for a bridge rated for 263,000 lbs. to carry 286,000 lb. axle loads is

less than desirable. As bridge conditions deteriorate, operating speeds must be decreased in order to reduce the dynamic loading effects.

Although no detailed bridge inspections were conducted as part of this study, bridge program information was obtained from VTrans and VTR and compiled for inclusion in this report. Any bridge recommended for repair or replacement in the corridor was assumed to be upgraded to handle modern railroad axle loadings of 286,000 lbs or more where required for freight service.

Grade Crossings

Upgrades to highway / railroad grade crossings are also considered to generate transportation benefits to both rail and highway users. Many of the crossings in the ABRB corridor do not have automatic warning signals to warn motorists of the approach of an oncoming train. These locations are considered to be a safety risk at current track speeds, but pose an even greater risk if track speeds are raised or rail traffic is increased with the expansion of freight or passenger service.

As mentioned previously, VTrans investments in the rail infrastructure will benefit the operating freight and passenger railroads, their customers, and the State of Vermont by promoting increased operating speeds for freight and passenger service, increased load capacity, and improved safety and reliability of the rail network.

By improving the reliability and cost effectiveness of freight and passenger rail service, rail users (shippers and the traveling public) will choose to use this mode more often thereby reducing the number of trucks and cars that use Vermont's highway system. This will not only reduce the wear and tear on the existing highway system, it will reduce the need for future capacity expansion projects. It also makes the State of Vermont more attractive for economic development for new or relocated businesses and industries by providing an efficient and reliable rail network.

All of these benefits are consistent with VTrans transportation investment policies in that they would promote the use of state owned rail assets as well as decrease the level of funding required to maintain the existing state and local highway network in Vermont.

B. ABRB Program Overview

The ABRB project was originally initiated to promote passenger rail service between Albany, Bennington, Rutland and Burlington.

The ABRB rail corridor also extends outside the State of Vermont and includes the following segments in New York State (see Figure 1):

- Albany to Schenectady, NY is owned by CSX and operated by Amtrak.
- Schenectady to Mechanicville, NY is owned by Canadian Pacific Railway (CP Rail).
- Mechanicville to Hoosick, NY is owned by Springfield Terminal Railway (Guilford).
- Hoosick, NY to Burlington is owned by the State of Vermont and operated by VTR.
- Whitehall, NY to Rutland is owned and operated by the Clarendon and Pittsford Railway (CLP), a subsidiary of the Vermont Railway.

ABRB Program work began in 1999 on various segments of the Vermont owned trackage. The railroad infrastructure in the corridor was in various states of deterioration and some of the line segments had been out of service for many years.

The overall ABRB Program was initiated in phases based on conditions, needs, type of work and funding availability as outlined below:

ABRB 1 Program

The ABRB 1 Program between North Bennington and Manchester, Vergennes and Charlotte started in 1999 and continued through 2001.

The work on these segments included the track and bridge rehabilitation necessary to achieve the desired operating speeds for future Amtrak passenger service.

This phase of work was funded under ABRB CONTRACT 1 by the Federal Highway Administration (FHWA) and the State of Vermont. This project has been completed.

ABRB 2 Program

The ABRB 2 Program between North Bennington and Manchester and Florence and Brandon started in 2000 and has not yet been completed. Funding for this project has been placed on hold.

The work on these segments included the track and bridge rehabilitation necessary to

achieve the desired operating speeds for future Amtrak passenger service.

This phase of work was funded under ABRB CONTRACT 2 by the FHWA and the State of Vermont.

ABRB S Program

The ABRB S Program between Hoosick Junction, NY and North Bennington, VT started in 2000 and has not yet been completed. Funding for this project has been placed on hold.

The work on this segment included the track and bridge rehabilitation necessary to achieve the desired operating speeds for future Amtrak passenger service.

This phase of work was funded under ABRB CONTRACT 4 by the State of Vermont.

ABRB SC Scoping Program

The ABRB SC Scoping Program outlined in this report is a summary of all work required to upgrade the entire ABRB corridor from Hoosick Junction, NY to Burlington, VT to FRA Class III standards in order to accommodate future freight and passenger rail service.

The ABRB SC Program presented herein includes all of the work not yet completed under the previous ABRB Program phases described above, as well as any of the work required to upgrade line segments that were not already covered by these programs.

The track program includes all of the necessary improvements to upgrade the mainline and sidings to FRA Class III standards and 286,000 lb. axle loadings.

The bridge program includes the necessary structural repairs and upgrades to support 286,000 lb. loads now the current standard for the freight railroad industry.

The grade crossing program includes the installation of new automatic warning signals or the upgrade of the existing systems at each grade crossing on the corridor, as well as the reconstruction of the highway grade crossing surfaces at critical locations.

VTrans performed most of the work under previous phases of the ABRB Program using railroad personnel and equipment under a Force Account Agreement with the Vermont Railway. More of the work under future phases is expected to be outsourced to railroad contractors using a unit price bidding and procurement process in accordance with FHWA guidelines for transportation improvement projects.

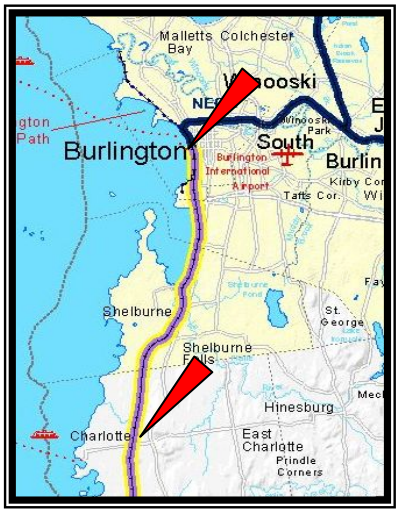
C. Current Operations in the ABRB Corridor

Currently, VTR primarily operates freight service over the entire ABRB corridor. Passenger service is also operated by Amtrak between Whitehall, NY and Rutland, VT.

This section of the report provides a brief summary of the current freight and passenger operations for each segment of the ABRB corridor (in geographic order north to south):

Burlington to Charlotte:

Freight Service



This 12-mile segment of the ABRB corridor currently supports freight rail service only.

Two freight trains (one in each direction) operate at a maximum speed of 40 mph between Burlington and Rutland every day. Primary customers on this segment include major transloading of bulk materials at Burlington Yard and an interchange with the New England Central Railroad north of the yard.

Freight rail traffic in this segment is expected to steadily expand over the next several years.

Passenger Service

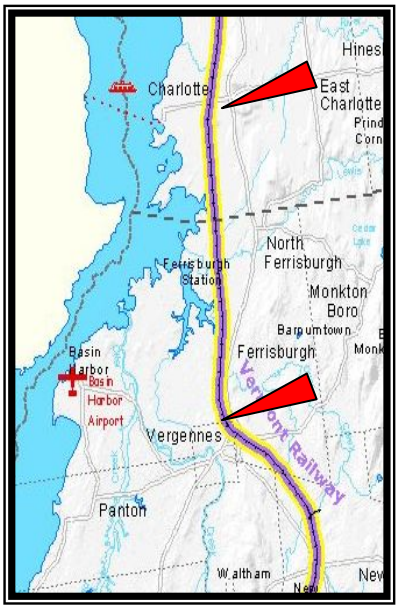
There is currently no passenger service operated on this segment other than a seasonally run excursion train. There was commuter rail train service from Burlington to Charlotte that was scheduled to provide service during reconstruction of US Route 7. Rail stations and support facilities including platforms and parking lots, as well as infrastructure upgrades such as track improvements and grade crossing warning signals were installed in order to operate this service. However, this commuter rail demonstration service was discontinued in 2003.

Burlington currently does not have direct intercity passenger train service. The nearest service is located at Essex Junction on the New England Central Railway (about 7 miles away). This service to New York City via New Haven, Connecticut is less direct than the route via Albany, NY.

The State of Vermont would like to extend the existing Amtrak intercity passenger rail service from Rutland to Burlington at some time in the future.

Charlotte to Vergennes:

Freight Service



This 10-mile segment currently supports freight service only. Two freight trains (one in each direction) operate at a maximum speed of 40 mph between Burlington and Rutland every day. Primary customers on this segment include a feed mill operated in Vergennes.

Freight rail traffic in this segment is expected to steadily expand over the next several years.

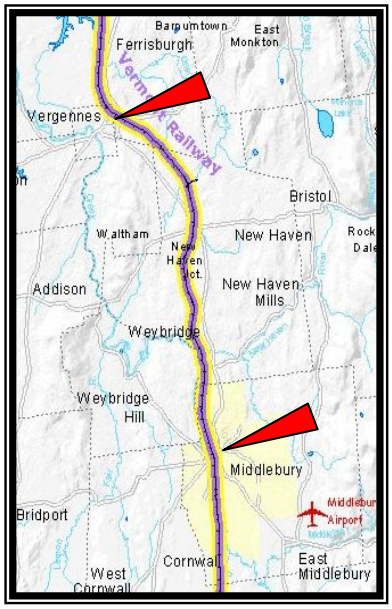
Passenger Service

There is currently no passenger service operated on this segment.

The State of Vermont would like to extend the Amtrak intercity passenger service from Rutland to Burlington at some time in the future.

Vergennes to Middlebury:

Freight Service



Existing freight service on this 13-mile segment includes two freight trains (one in each direction) each day that operate at a maximum speed of 40 mph between Burlington and Rutland. Primary customers on this segment include a bulk oil transloading facility in Middlebury.

Freight rail traffic in this segment is expected to steadily expand over the next several years.

Passenger Service

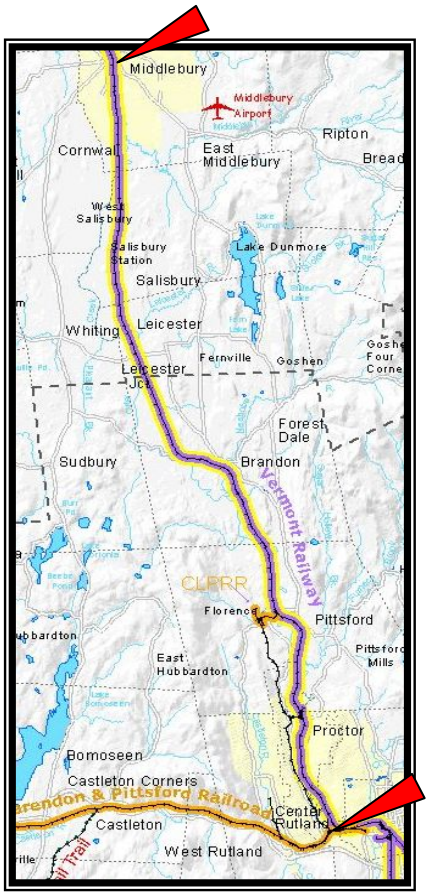
There is currently no passenger service on this segment.

The State of Vermont would like to extend the Amtrak intercity passenger rail service from Rutland to Burlington at some time in the future.

Middlebury to Rutland Junction:

Freight Service

The existing freight volumes on this 31-mile segment of the ABRB corridor are the highest of any between Burlington and Rutland. Four freight trains per day (two in each direction) operate at a maximum speed of 40 mph. Primary customers include a large mineral processing plant (OMYA) located off of the segment between Rutland Junction and Middlebury in Florence. In addition, large transloading facilities operate in both Rutland and Middlebury.



Proposed freight volumes are expected to expand significantly in the next several years. Inbound shipments of granular materials mined from OMYA's quarries near Middlebury to their plant in Florence currently move by truck primarily over US Route 7. Although there is parallel rail service available on the ABRB corridor, there is no direct rail line into the quarry at Middlebury.

There are currently plans to construct a rail connection to the quarry. When this happens, virtually all of the raw material shipments to the plant from the quarry would move by rail. This would significantly reduce the amount of truck traffic on the congested stretch of Route 7 south of Middlebury.

In addition to the rail connection, the track and bridges on this segment would have to be upgraded to handle the additional traffic and heavier axle loadings (286,000 lbs.).

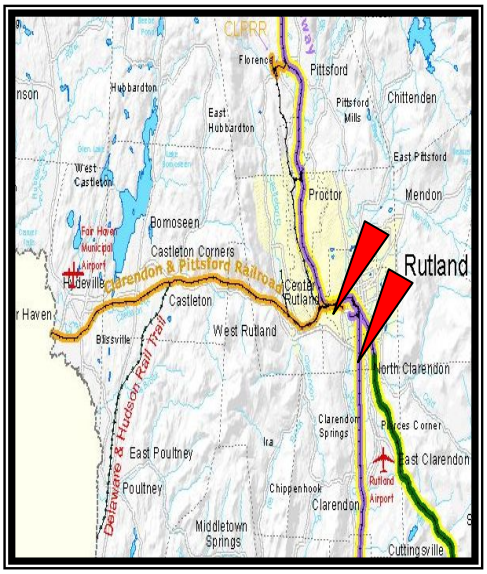
Passenger Service

There is currently no passenger service operated on this segment.

The State of Vermont would like to extend Amtrak intercity passenger rail service from Rutland to Burlington at some time in the future.

Rutland Junction to Rutland:

Freight Service



Existing freight service on this short, but busy, segment of the ABRB corridor includes 6 to 8 regular trains per day (3 to 4 in each direction). This segment is also the primary freight connection to the rest of the rail network in the United States via the Clarendon & Pittsford Railway line from Rutland Junction, VT to Whitehall, NY.

This segment is also where VTR interchanges traffic with the Canadian Pacific Railway and the Green Mountain Railway (part of the VTR System).

Significant freight transloading between rail and truck is also performed at VTR's intermodal and classification yard in Rutland.

Projected freight levels are expected to expand steadily in this segment over the next several years. There is also a proposal to relocate the existing rail yard in Rutland from its current urban location downtown to an area south of US Route 4 near Clarendon. This would minimize the current rail / highway conflicts downtown and release a large parcel of land for economic development by the City of Rutland.

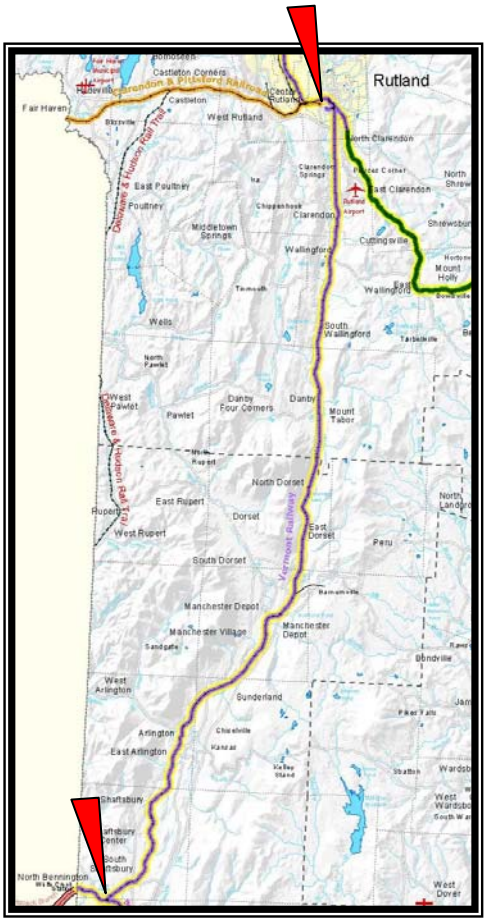
Passenger Service

This is the only segment of the ABRB corridor that currently has passenger rail service. Amtrak operates two intercity passenger trains (one in each direction) each day at a maximum speed of 60 mph (on the Clarendon & Pittsford Railway). This service originates in New York City and runs on CP Rail's tracks to Whitehall, NY where it then runs on the Clarendon & Pittsford Railway to Rutland Junction, VT. The train then runs on the ABRB Corridor for one mile to the downtown Rutland Station (at 20 mph) where the train is then turned and serviced for the return trip to New York City.

The State of Vermont would like to extend this Amtrak intercity passenger rail service from Rutland to Burlington at some time in the future.

Rutland to North Bennington:

Freight Service



The existing freight service on this 55-mile segment includes two to four trains per week (one in each direction / twice per week) as needed depending on seasonal and market demands.

The primary customers on this segment are a feed mill at North Bennington, a quarry at Shaftsbury, a propane distributor in Dorset, and a lumber yard at Manchester.

Some sections of track between Rutland and Bennington operate at 25 mph, some operate at 10 mph, but other sections are considered to be below FRA Class I standards or what is defined by the FRA as "Excepted Track". This means that only limited freight usage is allowed at 10 mph or less, and no passenger service is permitted.

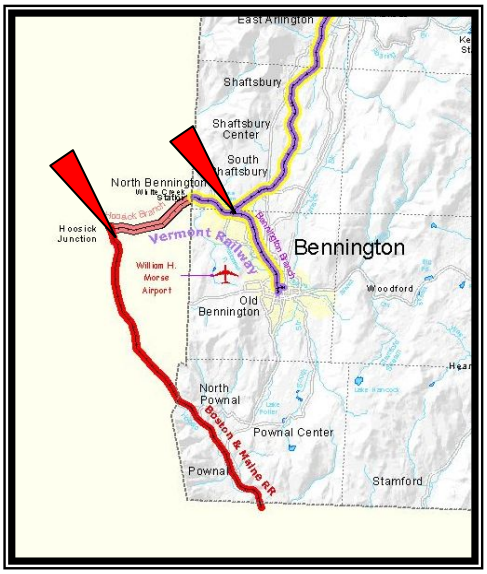
Passenger Service

As mentioned above, there is currently no passenger service operated on this segment.

The State of Vermont has had plans to extend the Amtrak intercity passenger rail service to Manchester in the past. There are no current plans for this service extension at this time.

North Bennington to Hoosick Junction, NY:

Freight Service



There is currently no freight service operating on this 5-mile segment of the ABRB corridor that extends into New York State, but is still owned by the State of Vermont.

Although there are no freight customers on this segment, it does provide a connection at Hoosick Junction that would allow for the interchange of rail traffic with the Springfield Terminal Railway, if needed.

The potential for future development in the area is limited. Proposed freight levels are not expected to change over the next several years.

Passenger Service

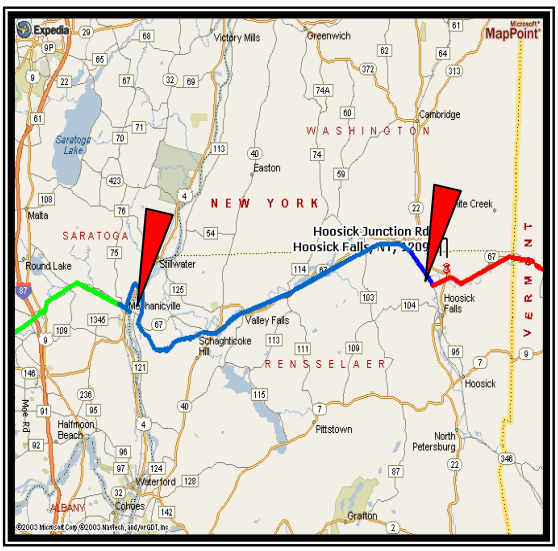
There is currently no passenger service operated on the segment.

The State of Vermont has had plans to extend the Amtrak intercity passenger rail service to Manchester in the past. There are no current plans for this service extension at this time.

Hoosick Junction to Albany, NY:

Freight Service

Freight service between Hoosick Junction and Mechanicville, NY is operated by the Springfield Terminal Railway, a subsidiary of Guilford Transportation.

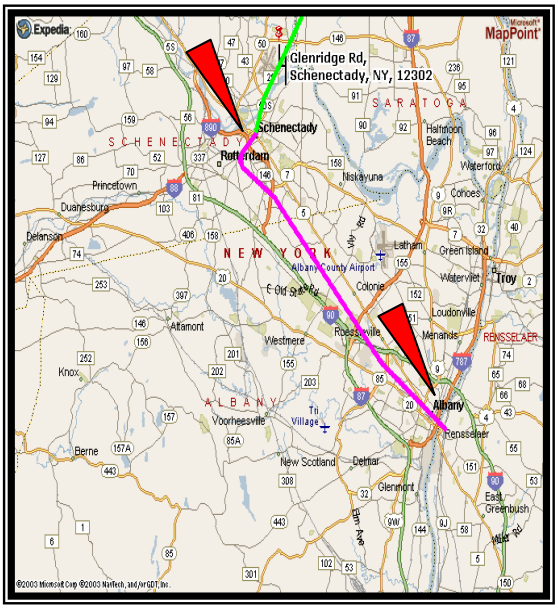


The Canadian Pacific Railway operates the segment between Mechanicville and Schenectady, NY.

CSX Transportation operates the stretch between Schenectady and Albany, NY.

All of these ABRB corridor segments in New York State are owned and operated privately by each of these freight railroads.

Projected freight levels are not expected to expand significantly on these segments over the next several years.



Passenger Service

There is currently no passenger service operated on the ABRB segments between Hoosick Junction and Schenectady, NY.

However, Amtrak operates intercity passenger rail service between Schenectady and Albany/Rensselaer, NY where it has a major train station and passenger terminal.

The State of Vermont would like to extend Amtrak intercity passenger rail service at some time in the future.

A Summary Table showing the mile post limits and the existing freight and passenger rail operations for each segment of the ABRB Corridor is shown on the following page.

SEGMENT	FROM MP	TO MP	FRA TRACK CLASS	FREIGHT		PASSENGER	
				SERVICE	SPEED	SERVICE	SPEED
BURLINGTON to CHARLOTTE	122	110	III	2 / day	40	Seasonal Excursions (4 weekend trips)	60
CHARLOTTE to VERGENNES	110	100	III	2 / day	40	None	None
VERGENNES to MIDDLEBURY	100	87	III	2 / day	40	None	None
MIDDLEBURY to RUTLAND JCT.*	87	56	III	4 / day	40	None	None
RUTLAND JCT.* to RUTLAND	56	55	III	6-8 / day	40	2 / day	60
RUTLAND to N. BENNINGTON	55	33	I	2 / week	10	None	None
	33	21	Excepted Track	2 / week (seasonally)	10**	Prohibited	Prohibited
	21	0	II	2 / week (seasonally)	25	None	None
N. BENNINGTON to HOOSICK	170	165	I	None	10	None	None

* Rutland & Whitehall Junction (Connection to Clarendon & Pittsford to New York State)

** MP 21 to MP 33 is Excepted Track, no occupied passenger trains permitted, hazardous materials under 5 cars only permitted.

The information used to evaluate and program each infrastructure element is described in the next section of this report and is itemized in detail in Appendix I.

A Track Chart that schematically represents the ABRB Program by mile post and line segment is included in Appendix II.

II. ABRB Program Summary

A. Track Improvements

1. Crosstie Installation

Crossties are used to maintain track alignment and proper gage between the rails as well as transferring live train loads to the ballast section. The crosstie installation program must meet FRA standards for Class III Track (60 mph Passenger / 40 mph Freight). This requires a minimum of 8 good crossties per 39 feet of track. General track conditions were inspected, and defective tie counts were estimated as shown below:

SEGMENT	FROM MP	TO MP	NUMBER OF TIES	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	6,000	$ 480,000
CHARLOTTE to VERGENNES	110	100	5,000	$ 400,000
VERGENNES to MIDDLEBURY	100	87	13,000	$ 1,040,000
MIDDLEBURY to RUTLAND	87	55	32,000	$ 2,560,000
RUTLAND to N. BENNINGTON	55	0	48,000	$ 3,840,000
N. BENNINGTON to HOOSICK	170	165	0	0
TOTALS			**104,000**	**$ 8,320,000**

2. Ballast Installation

Track ballast consists of crushed stone and is used to maintain the horizontal and vertical track alignment, particularly on track with continuous welded rail. Track ballast also transfers live train loads to the subgrade and promotes drainage of the track structure. A typical FRA Class III ballast section consists of a minimum of 6 inches of ballast below the bottom of tie and a 12 inch shoulder from the edge of the ties to a 2:1 slope on either side. General track conditions were inspected, and ballast quantities were estimated as shown below:

SEGMENT	FROM MP	TO MP	TONS OF BALLAST	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	9,000	$ 315,000
CHARLOTTE to VERGENNES	110	100	10,000	$ 350,000
VERGENNES to MIDDLEBURY	100	87	13,000	$ 455,000
MIDDLEBURY to RUTLAND	87	55	32,000	$ 1,120,000
RUTLAND to N. BENNINGTON	55	0	70,000	$ 2,450,000
N. BENNINGTON to HOOSICK	170	165	2,000	$ 70,000
TOTALS			**136,000**	**$ 4,760,000**

3. Track Surfacing

Track Surfacing is the process of raising and lining the track structure and then compressing the track ballast under the ties in order to provide proper horizontal and vertical alignment, super elevation on curves and proper drainage of the track.

Track surfacing is typically accomplished through a series of machines including an automatic tamper that aligns the track and compresses the ballast and then a ballast regulator then fills in any voids between the ties and shapes the ballast section to allow for proper drainage. General track conditions were inspected, and pass miles (more than one pass may be made in a given mile) of track surfacing were estimated as shown below:

SEGMENT	FROM MP	TO MP	MILES OF SURFACING	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	13	$ 206,000
CHARLOTTE to VERGENNES	110	100	14	$ 222,000
VERGENNES to MIDDLEBURY	100	87	15	$ 238,000
MIDDLEBURY to RUTLAND	87	55	35	$ 555,000
RUTLAND to N. BENNINGTON	55	0	60	$ 951,000
N. BENNINGTON to HOOSICK	170	165	7	$ 111,000
TOTALS			**144**	**$ 2,283,000**

4. Rail Replacement

Worn out jointed rails or jointed rails that have insufficient sized cross sections are typically replaced with continuous welded rail (CWR). CWR is rail that is welded into a continuous string in order to eliminate bolted rail joints along the track. CWR is typically welded into ¼ mile long strings at an off-site welding plant, then transported to the field and installed in the track. The ¼ mile long strings are then welded together in the field.

Rail is replaced to improve ride, replace defects, increase the load carrying capacity of the track, or to remove wear and tear. General track conditions were inspected, and rail replacement quantities were estimated as shown below:

SEGMENT	FROM MP	TO MP	TRACK MILES	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	3.9	$ 2,060,000
CHARLOTTE to VERGENNES	110	100	1.6	$ 845,000
VERGENNES to MIDDLEBURY	100	87	13.0	$ 6,864,000
MIDDLEBURY to RUTLAND	87	55	29.0	$ 15,312,000
RUTLAND to N. BENNINGTON	55	0	39.0	$ 20,592,000
N. BENNINGTON to HOOSICK	170	165	0.0	$ 0
TOTALS			**86.5**	**$ 45,673,000**

5. Turnout Retirement / Rehabilitation / Replacement

Turnouts (or switches) allow trains to be diverted from one track to another. Turnouts are built on wood timbers and consist of critical components called switch points and frogs. Turnouts installed must meet FRA standards for Class III track.

Turnouts that are no longer needed should be retired and the parent track restored. Turnouts that remain should be either rehabilitated or replaced. Turnout rehabilitation consists of the replacement of worn parts and / or timbers. When turnout repairs are too extensive, then the turnouts are replaced completely.

SEGMENT	FROM MP	TO MP	RETIRE	REHAB.	REPLACE	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	2	0	2	$ 110,000
CHARLOTTE to VERGENNES	110	100	0	0	2	$ 100,000
VERGENNES to MIDDLEBURY	100	87	0	0	11	$ 550,000
MIDDLEBURY to RUTLAND	87	55	3	1	15	$ 780,000
RUTLAND to N. BENNINGTON	55	0	1	0	24	$ 1,205,000
N. BENNINGTON to HOOSICK	170	165	0	0	0	$ 0
TOTALS			**6**	**1**	**54**	**$ 2,745,000**

6. Track Undercutting

Track undercutting consists of the removal and replacement of ballast and sub-grade that has become "fouled" or contaminated with silt and fines that inhibit the proper drainage of the track. Muddy sub-grade and ballast is removed and replaced with clean stone to promote stable, well-drained track. After this procedure is completed, then the track must be surfaced in order to meet FRA standards for Class III track.

SEGMENT	FROM MP	TO MP	MILES OF UNDERCUTTING	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	0.50	$ 10,000
CHARLOTTE to VERGENNES	110	100	0.50	$ 10,000
VERGENNES to MIDDLEBURY	100	87	1.0	$ 20,000
MIDDLEBURY to RUTLAND	87	55	1.0	$ 20,000
RUTLAND to N. BENNINGTON	55	0	1.0	$ 20,000
N. BENNINGTON to HOOSICK	170	165	0.0	$ 0
TOTALS			**4.0**	**$ 80,000**

7. Culvert and Drainage Improvements

Providing adequate drainage is recognized as the most important step in maintaining a sound track structure that provides adequate support for the movement of trains and prolongs the life of track components. Railroad culverts and ditches are designed to accommodate runoff from a 100-year storm. The culvert and drainage improvements proposed under this program will promote the operation and maintenance of track to FRA Class III standards. Not all of the culverts present in the track structure required replacement.

General track conditions were inspected, and culvert quantities requiring replacement are shown below:

SEGMENT	FROM MP	TO MP	CULVERTS TO REPLACE	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	2	$ 50,000
CHARLOTTE to VERGENNES	110	100	1	$ 100,000
VERGENNES to MIDDLEBURY	100	87	2	$ 20,000
MIDDLEBURY to RUTLAND	87	55	6	$ 50,000
RUTLAND to N. BENNINGTON	55	0	10	$ 75,000
N. BENNINGTON to HOOSICK	170	165	1	$ 100,000
TOTALS			**22**	**$ 395,000**

8. Vegetation Control

Uncontrolled growth of vegetation along the right-of-way can cause damage to passing trains as well as reduce visibility for highway vehicles to view oncoming trains at grade crossings. Vegetation growth also reduces drainage through the ballast section of the track structure, thereby producing mud, and accelerating the deterioration of cross ties. Brush cutting will be required in order to restore an effective clearance envelope that meets the requirements of FRA Section 213.37.

SEGMENT	FROM MP	TO MP	MILES OF BRUSH CUTTING	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	12	$ 60,000
CHARLOTTE to VERGENNES	110	100	10	$ 50,000
VERGENNES to MIDDLEBURY	100	87	13	$ 65,000
MIDDLEBURY to RUTLAND	87	55	32	$ 160,000
RUTLAND to N. BENNINGTON	55	0	55	$ 275,000
N. BENNINGTON to HOOSICK	170	165	5	$ 25,000
TOTALS			**127**	**$ 635,000**

9. Rail Testing

The inspection of rail for structural defects is done with the aid of ultrasonic rail-testing equipment that is mounted on a self propelled rail car or highway-rail truck. This car runs along the tracks and continuously inspects the rails for internal defects in the steel. When defective rails are found the location and type of defect is documented and corrective action is then taken.

SEGMENT	FROM MP	TO MP	MILES OF TESTING	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	12	$ 4,000
CHARLOTTE to VERGENNES	110	100	10	$ 3,000
VERGENNES to MIDDLEBURY	100	87	13	$ 4,000
MIDDLEBURY to RUTLAND	87	55	32	$ 10,000
RUTLAND to N. BENNINGTON	55	0	55	$ 17,000
N. BENNINGTON to HOOSICK	170	165	5	$ 2,000
TOTALS			**127**	**$ 40,000**

10. Grade Crossing Surfaces

Grade crossing surfaces are locations where roadways cross railroad tracks at grade. They can be constructed using various types of surface materials. Grade crossing surfaces are replaced when the roadway has deteriorated, track structure is being repaired, or the rail and or ties are being replaced. Most surface upgrades consist of a rubber rail interface between the rails and the highway asphalt. The tracks are typically reconstructed also including new rails, ties, ballast, and geo-textile fabric.

PUBLIC GRADE CROSSINGS				
SEGMENT	**FROM MP**	**TO MP**	**NUMBER OF CROSSING SURFACES**	**ESTIMATED COST**
BURLINGTON to CHARLOTTE	122	110	0	$ 0
CHARLOTTE to VERGENNES	110	100	7	$ 235,000
VERGENNES to MIDDLEBURY	100	87	4	$ 156,000
MIDDLEBURY to RUTLAND	87	55	17	$ 480,000
RUTLAND to N. BENNINGTON	55	0	25	$ 784,000
N. BENNINGTON to HOOSICK	170	165	2	$ 20,000
TOTALS			**55**	**$ 1,675,000**

PRIVATE GRADE CROSSINGS				
SEGMENT	**FROM MP**	**TO MP**	**NUMBER OF CROSSING SURFACES**	**ESTIMATED COST**
BURLINGTON to CHARLOTTE	122	110	0	$ 0
CHARLOTTE to VERGENNES	110	100	6	$ 12,000
VERGENNES to MIDDLEBURY	100	87	7	$ 14,000
MIDDLEBURY to RUTLAND	87	55	36	$ 72,000
RUTLAND to N. BENNINGTON	55	0	74	$ 148,000
N. BENNINGTON to HOOSICK	170	165	2	$ 4,000
TOTALS			**125**	**$ 250,000**

B. Signal Improvements

1. Grade Crossing Warning Systems

Grade crossing warning systems are installed at locations that have the most significant safety risk to the traveling public. All grade crossings have the potential risk of a collision, but the risk is higher at crossings that have higher vehicular traffic, visibility problems, high speed or dense railroad traffic. Grade crossing warning signals are typically installed when the state or federal agencies prioritize their FHWA grade crossing (Section 130) improvement programs.

SEGMENT	FROM MP	TO MP	NUMBER OF WARNING SYSTEMS	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	0	$ 0
CHARLOTTE to VERGENNES	110	100	7	$ 850,000
VERGENNES to MIDDLEBURY	100	87	4	$ 545,000
MIDDLEBURY to RUTLAND	87	55	19	$ 2,150,000
RUTLAND to N. BENNINGTON	55	0	37	$ 4,182,000
N. BENNINGTON to HOOSICK	170	165	3	$ 360,000
TOTALS			**70**	**$ 8,087,000**

2. Advanced Warning and Interlocking Signals

Advanced warning signals are used in corridors with higher operating speeds to indicate the alignment of switch points at an upcoming turnout. Switch point positions are typically displayed with a sign at the switch stand: green indicating the switch is properly aligned and red indicating it is not. This indication method works on corridors with a maximum operating speed of less than stopping distance for the train. Above that speed, electronic signals are placed in advance of the switch in order to provide adequate stopping distance in case the switch is not lined properly.

SEGMENT	FROM MP	TO MP	NUMBER OF WARNING SIGNALS	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	0	$ 0
CHARLOTTE to VERGENNES	110	100	0	$ 0
VERGENNES to MIDDLEBURY	100	87	2	$ 165,000
MIDDLEBURY to RUTLAND	87	55	5	$ 400,000
RUTLAND to N. BENNINGTON	55	0	4	$ 320,000
N. BENNINGTON to HOOSICK	170	165	0	$ 0
TOTALS			11	$ 885,000

C. Bridge Improvements

1. Bridge Deck Replacement

Bridge timbers are installed on bridges with open decks. These timbers are larger than normal crossties and are placed directly on the steel bridge stringers to carry the track across the structure. As a result, whenever bridge timbers need to be replaced, it is necessary to replace all of the timbers (otherwise only the timbers replaced would be carrying the load). Spacer blocks and hook bolts are installed in order to keep the timbers from moving or sliding on the bridge structure.

SEGMENT	FROM MP	TO MP	NUMBER OF BRIDGES	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	0	$ 0
CHARLOTTE to VERGENNES	110	100	1	$ 41,000
VERGENNES to MIDDLEBURY	100	87	0	$ 0
MIDDLEBURY to RUTLAND	87	55	4	$ 180,000
RUTLAND to N. BENNINGTON	55	0	8	$ 177,000
N. BENNINGTON to HOOSICK	170	165	2	$ 100,000
TOTALS			**15**	**$498,000**

2. Bridge Structural Repairs

Bridge structures support the track over various waterways, highways and chasms. They are generally constructed of reinforced concrete, steel, stone, or some combination. Structural repairs are necessary to these bridges when the steel has corrosion or stress failures, or the stonework or concrete work has deteriorated. In general, the bridge's ability to support its designed weight is contingent on good repair of the overall structure.

Bridges are rated based on the capacity to carry loads. A 286K bridge is capable of supporting modern railroad freight cars which weigh up to 286,000 pounds. Bridges on the Middlebury to Rutland segment require this rating. Some of these bridges currently do not meet these requirements.

SEGMENT	FROM MP	TO MP	BRIDGE REPAIRS	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	1	$ 1,000
CHARLOTTE to VERGENNES	110	100	1	$ 50,000
VERGENNES to MIDDLEBURY	100	87	3	$ 146,000
MIDDLEBURY to RUTLAND	87	55	12	$ 1,362,000
RUTLAND to N. BENNINGTON	55	0	20	$ 504,000
N. BENNINGTON to HOOSICK	170	165	0	$ 0.00
TOTALS			**37**	**$ 2,063,000**

3. Bridge Replacements

Bridge structures that are beyond economical repair, or are being upgraded to handle heavier freight car shipments require total replacement. Some bridges in this study are being upgraded to handle 286,000 lb. freight cars as part of the VTrans railroad structure repair program. Bridge replacements can include the steel work, abutments, back walls, and track structure as well. Bridge replacement costs depend on the length and height of the structure and staging plans.

SEGMENT	FROM MP	TO MP	REPLACE BRIDGES	ESTIMATED COST
BURLINGTON to CHARLOTTE	122	110	0	$0.00
CHARLOTTE to VERGENNES	110	100	0	$ 0.00
VERGENNES to MIDDLEBURY	100	87	0	$ 0.00
MIDDLEBURY to RUTLAND	87	55	2	$ 6,425,000
RUTLAND to N. BENNINGTON	55	0	4	$ 3,510,000
N. BENNINGTON to HOOSICK	170	165	0	$ 0.00
TOTALS			**6**	**$ 9,935,000**

III. Findings and Recommendations

A. ABRB 1 Program Status

The ABRB 1 Program between North Bennington and Manchester and Vergennes and Charlotte started in 1999 and finished in 2001. This work was funded under ABRB CONTRACT 1 by the Federal Highway Administration (FHWA) and State of Vermont.

The work primarily consisted of track and bridge rehabilitation and has been completed.

B. ABRB 2 Program Status

The ABRB 2 Program between North Bennington and Manchester and Florence and Brandon started in 2000 and has not yet been completed. This work was funded under ABRB CONTRACT 2 by FHWA and the State of Vermont.

The work primarily consisted of track, bridge and grade crossing rehabilitation and was partially completed on these segments. The following items have not yet been completed:

- 1,300 crossties
- 9,200 tons of ballast
- 111,637 feet of track surfacing
- 2 rail lubricators to be installed
- 1 grade crossing surface (Richville Road)
- 16 grade crossing warning systems
- 1 advanced warning signal (Arlington)
- 1 timber bridge deck (Br. 3.13 – Paran Creek)
- 1 structural repair (Bridge 63)

C. ABRB S Program Status

The ABRB S Program between Hoosick Junction, NY and North Bennington, VT started in 2000 and is not yet completed. This work was funded under ABRB CONTRACT 4 by the State of Vermont.

The work primarily consisted of track, bridge and grade crossing rehabilitation and was partially completed on these segments. The following items are not yet completed:

- 1,280 tons of ballast
- 36,960 feet of track surfacing
- 2 rail lubricators
- 1 culvert repair (MP 0.80)
- 3 grade crossing surfaces (N. Hoosick Rd, Caretakers, Cottrell Rd.)
- 3 grade crossing warning systems (N. Hoosick Rd, Caretakers, Cottrell Rd.)

D. ABRB SC Scoping Program Recommendations

The ABRB SC Scoping Program outlined in this report is a summary of the work required to upgrade 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.

The program presented in this section includes all of the work not yet completed under the previous ABRB Program phases described above, as well as the remaining work necessary to upgrade the line segments not already addressed by these programs.

The track program includes all of the necessary improvements to upgrade the mainline and sidings to FRA Class III standards and 286,000 lb. axle loadings where required for freight service. Currently the rail service requirements for 286,000 lbs is only required on the rail segment between Middlebury and Rutland.

The bridge program primarily addresses the structural repairs and upgrades necessary to support 286,000 lb. loads that are now the current standard for the freight rail industry. When bridges are repaired or replaced, they are repaired to 315,000 lb axle loadings for future use.

The grade crossing program includes the installation of automatic warning signals at each grade crossing on the corridor. In addition costs for advanced warning signals for selected turnouts with visibility problems are included in this program.

The chart listed below shows a proposed prioritization schedule of proposed work with the associated costs for each segment:

SEGMENT	FROM MP	TO MP	COST	PRIORITY
BURLINGTON to CHARLOTTE	122	110	$ 3,296,000	5
CHARLOTTE to VERGENNES	110	100	$ 3,268,000	2
VERGENNES to MIDDLEBURY	100	87	$ 10,282,000	3
MIDDLEBURY to RUTLAND	87	55	$ 32,676,000	1
RUTLAND to N. BENNINGTON	55	0	$ 38,010,000	4
N. BENNINGTON to HOOSICK	170	165	$ 792,000	6

Middlebury to Rutland (Priority 1)

Freight Service

This 31-mile segment of the ABRB corridor is the highest priority for VTrans and VTR at this time. OMYA, a large mineral processing plant located on this segment, is already Vermont Railway's largest customer and is planning to expand their facilities. In order for this to occur, this segment of the corridor would need to be upgraded to allow for the heavier axle loads and higher freight traffic volumes.

OMYA currently ships outbound product via Rutland by rail, but most of their raw materials inbound move by truck from their quarry near Middlebury. The average truck volume for OMYA shipments alone is about 25,000 to 30,000 trucks per year.

However, VTrans is currently studying the potential for transferring the inbound shipments from the quarry in Middlebury to the plant in Florence from truck to rail by building a new track connection from the quarry and the VTR mainline. A high-sided rail gondola can handle the equivalent of about 5 truckloads of raw materials. If implemented, this action would significantly reduce the truck traffic volumes on the most congested sections of US Route 7 south of Middlebury and through Brandon.

In addition to this potential new traffic, there is still a need to upgrade the track and bridges south of Florence to handle the increasing outbound shipments from the plant. This traffic moves in the types of rail cars (covered hoppers) that generate the heavier axle loads now the design standard for infrastructure improvements in the freight industry.

Below is a summary of work and estimated costs for this segment:

- 32 miles of track rehabilitation - $20.6 million
- 18 bridge rehabilitations – $9.0 million
- 17 grade crossing surface restoration - $0.5 million
- 19 grade crossing warning systems – $2.2 million
- Other miscellaneous work - $0.4 million

Passenger Service

If the investment outlined above is made on this segment of the ABRB corridor, it would benefit the future extension of the Amtrak service from Rutland to Burlington.

Charlotte to Vergennes (Priority 2)

Freight Service

This 10-mile segment of the ABRB corridor is the second highest priority because the freight traffic volumes are very high. Upgrading this segment of the corridor would provide a longer service life of the track for freight service. Below is a summary of work and associated costs for this segment of the corridor.

- 10 miles of track rehabilitation – $2.1 million
- 1 bridge rehabilitations – $0.1 million
- 7 grade crossing surfaces - $0.2 million
- 7 grade crossing warning systems – $0.9 million

Passenger Service

These improvements would promote the future extension of Amtrak passenger rail service from Rutland to Burlington. The State of Vermont was also interested in extending commuter rail service from Charlotte to Vergennes, but that train is no longer in operation.

Vergennes to Middlebury (Priority 3)

Freight Service

This 13-mile segment of the ABRB corridor is at about the same priority level as the segment above because the freight traffic volumes are high in this segment. Below is a summary of work and estimated costs for this segment of the corridor.

- 13 miles of track rehabilitation – $9.3 million
- 3 bridge rehabilitations – $0.2 million
- 4 grade crossing surface restoration - $0.2 million
- 4 grade crossing warning systems – $0.5 million
- Other miscellaneous work – $0.2 million

Passenger Service

These improvements would promote the future extension of Amtrak passenger rail service from Rutland to Burlington.

Rutland to North Bennington (Priority 4)

Freight Service

This 55-mile segment of the ABRB corridor has many freight customers including a quarry, a lumber yard and Haskins Propane. Since the general track conditions are poor and this segment has limited potential for future economic development, it is not a top investment priority for VTrans. Critical individual projects may have to be completed in order to maintain existing service levels. Below is a summary of work and estimated costs for this segment of the corridor.

- 55 miles of track rehabilitation – $29.4 million
- 32 bridge rehabilitations – $3.2 million
- 25 grade crossing surface restoration - $0.8 million
- 37 grade crossing warning systems – $4.2 million
- Other miscellaneous work - $0.4 million

Passenger Service

There is currently no passenger service operated on the segment of the corridor. However, these improvements would promote the future extension of passenger rail service to Manchester, if desired.

Burlington to Charlotte (Priority 5)

Freight Service

Although the freight traffic volumes are high on this segment of the ABRB corridor, the railroad infrastructure investments made in previous ABRB Program phases and the Commuter Rail demonstration project have left this segment in a state of good repair for FRA Class III operations. Below is a summary of work and estimated costs for this segment of the corridor.

- 12 miles of track rehabilitation – $3.3 million

Passenger Service

There is currently no passenger service operated on this segment of the corridor. The State would like to extend Amtrak service to Burlington in the future. The commuter train that had operated on this segment has been discontinued, but most of the upgrades associated with operating that service are still in place.

North Bennington to Hoosick (Priority 6)

Freight Service

Currently there are no freight train operations occurring on this 5-mile segment of the ABRB corridor. Projected freight volumes are not expected to increase in the near future, so this remains a low investment priority for VTrans and VTR. Below is a summary of work and the associated costs for this segment of the corridor.

- 5 miles of track rehabilitation – $0.3 million
- 3 grade crossing warning systems – $0.4 million
- 2 bridge rehabilitations – $0.1 million

Passenger Service

There is currently no passenger service on this segment of the corridor. A majority of this segment of track is located in New York State. This is no longer a priority since there is currently no freight or passenger rail traffic on this segment.

Hoosick Junction to Albany, NY

In order to provide passenger service to Manchester, service and infrastructure improvements would be required to the West and South into New York State on the Springfield Terminal Railway and the Canadian Pacific Railway.

The improvements on these rail lines are outside the scope of this project.

Program summaries showing all of the proposed improvements, including the remaining work from previous phases of the ABRB Program, are presented in this section including the following:

- Track Program Summary
- Grade Crossing / Signal Program Summary
- Bridge Program Summary
- Overall ABRB Program Summary