

Analysis of Vermont State Ownership of Rail Lines

Most states view public ownership of rail lines as an option of last resort. Rail lines are usually purchased when the line's continued operation is threatened, and the state is unwilling to allow this part of the transportation network to be lost. Generally, the benefits of state ownership are as follows:

- The state can manage rail assets for the public good in accordance with freight and passenger related goals. This preserves rail corridors that would otherwise be permanently lost.
- This model supports state-based businesses that require heavy-bulk shipping to be competitive.
- Freight and passenger movements reduce energy use and greenhouse gas emissions.
- Freight rail reduces pavement and bridge deterioration by reducing the number of trucks on the highways.
- State-owned rail lines may compete better with other modes for public funding.
- Liability and tax issues are simplified by state control, particularly when initiating passenger service.

Public ownership of rail lines is also not without risks and disadvantages as well, including:

- State ownership of rail lines ties up public investment and funding. Significant outlays may be needed to maintain and repair the lines
- State ownership does not guarantee that the rail line will remain in operation, nor that the rail operation on the line will eventually be self-sufficient
- State ownership reduces tax revenues that would be collected from private owners
- States are ineligible for certain types of financing that require the assets to be used as collateral

This report provides an analysis and evaluation of the current status of the State of Vermont's ownership of certain rail lines within the state, as a basis for ongoing discussions of this issue within VTrans, with the Vermont Rail Council, and with elected officials.

Existing Leases

As Vermont considers options for state-owned rail lines, one factor to be taken into account is the state's current leases with Vermont Rail Systems (VRS). The leases span decades and are each far from expiring, as detailed in Table 1. Each includes 10 year renewal periods, except for the Montpelier Branch which has 4-year renewal periods.

Table 1: Vermont State-Owned Rail Line Lease Periods

Railroad	Lease Year	First Renewal Year	Lease Expiration Year	Renewal Frequency
Vermont Railway, Inc.	1990	1994	2054	10 years
Green Mountain Railroad Corp.	1992	2001	2060	10 years
Washington County Railroad (CT River Line)	2003	2013	2033	10 years
Washington County Railroad (Montpelier Branch)	1999	2004	2024	4 years

The Vermont Railway (VTR) and Green Mountain Railroad Corp. (GMRC) leases each have language that provides VRS with the option to buy the State-owned lines at the State’s costs. State’s costs include the initial cost at the time the lease was established, which then is adjusted each year. For any given year, if Vermont spends more money on capital improvements to a line than it receives in rent from VRS, the difference is added to the State’s costs. If VRS spends money on capital improvements beyond its basic maintenance requirement, the difference is subtracted from the accumulated State’s costs for that year. For the GMRC lease, the initial cost was set at about \$1.9 million. For the VTR lease, the initial cost was about \$3 million. No language in either lease stipulates any adjustment for inflation. While VTrans maintains records that would enable the agency to estimate the State’s costs, this information is not routinely compiled (in part due to successive changes in the accounting system and tools used) and is not readily available at this time. Were Vermont to attempt to sell the VTR or GMRC, the State’s cost could be an area of uncertainty, since to account for the State’s cost would involve reviewing and reconciling accounting records from VTrans and potentially VRS going back 25 years. The definition of and calculation of State’s costs could be subject to interpretation.

For the VTR and GMRC leases, the State is required to notify VRS if the State receives a “bona fide” offer to buy one or all of the rail lines. VRS then has right of first refusal to purchase the lines. The State’s costs sets a cap on how much VRS would have to pay to acquire the lines. In addition, VRS can at any time buy the state-owned lines at the State’s costs. If another railroad submits a bid for less than the State’s costs, VRS has 180 days to match that bid. If the other railroad submits a bid for more than the State’s costs, VRS has 180 days to buy the lines at the State’s costs. Neither the VTR nor the GMRC lease includes language providing Vermont the right to terminate the lease without cause.

For the Washington County Railroad (WACR) Connecticut River Line, VRS has right of first refusal as well should the State decide to sell the line. The State and VRS each has the option to renew the lease during the renewal periods.

For the WACR Montpelier Branch, VRS has the right to terminate the lease without cause with 60 days notice. There is no indication that the State can similarly terminate without cause.

Options for Vermont's State-Owned Rail Lines

As Vermont evaluates the existing arrangements by which the state owns and leases rail lines, a range of possible courses of action could be considered, which are explored in greater detail in the subsequent sections:

1. Continue current arrangements and maintain lines to their current level;
2. Continue current arrangements and upgrade lines to a state of good repair, 286,000 pound capacity;
3. Sell selected state-owned lines; and
4. Sell all state-owned lines.

Continue Current Arrangement, Maintain at Current Level

Likely Revenues

Vermont typically receives about \$1 million in lease payments per year on state owned lines. Assuming VRS revenues remain roughly constant and the credits to or against lease payments remain the same, \$1 million would continue to be the expected level of annual lease payments into the near future.

Likely Costs

As shown in Table 2, on average about \$20 million per year has been spent by state, federal, and local sources on rail lines and services in Vermont between 2006 and 2014. By far, the largest component of the expenditure was the American Recovery and Reinvestment Act (ARRA) funded project to improve the Vermonter service, which occurred on rail lines not owned by the State. The largest state expenditures were for Amtrak subsidies, followed by bridge and track maintenance. The figures in Table 2 do not include salaries of VTrans staff.

Table 2: Spending by State, Federal and Local Sources on Rail Lines in Vermont SFY 2006 - 2014

Type of Work	FY 2006 - FY 2014 Spending Per Year			
	Federal	State	Local	Total
Amtrak Service	\$0	\$4,150,329	\$0	\$4,150,329
Bridge Maintenance/Replacement	\$771,114	\$744,062	\$0	\$1,515,177
Clearance Project	\$222,222	\$105,614	\$0	\$327,836
Yard Improvements, Sidings, Transload	\$0	\$156,878	\$0	\$156,878
Not State Owned	\$5,813,941	\$106,021	\$3,149,068	\$9,069,030
Rail Trail	\$111,717	\$100,880	\$0	\$212,597
Track Maintenance	\$340,040	\$455,889	\$16,667	\$812,596
Track Upgrade	\$1,384,685	\$398,511	\$0	\$1,783,197
Emergency Recovery*	\$0	\$490,330	\$0	\$490,330
Purchase of Rail Line or Station	\$0	\$121,997	\$0	\$121,997
Crossings	\$859,344	\$84,530	\$0	\$943,875
Grand Total	\$9,503,063	\$6,915,042	\$3,165,735	\$19,583,840

*Coded as state expenditure, although much of this work is associated with the Federal Emergency Management Agency (FEMA)

Theoretically, if the State were to sell its State-owned lines, the new owner would take responsibility for capital program maintenance. Upgrades, crossing improvements, and economic development projects such as new rail sidings would likely continue to be funded by the State. Therefore, in identifying the likely cost of continuing to own rail infrastructure, this analysis focuses on capital program maintenance, i.e. that which is spent only to keep the rail lines in their existing state of repair, not improving the lines. The amount capital spending by VTrans on Vermont State-owned lines had varied based on budget allocations, available revenues, and the relative priorities of different projects. VTrans has budgeted \$4 million from State sources for capital expenditures in the current fiscal year, most of which is spent on State-owned lines.

Continue Current Arrangements but Upgrade Lines

A major impediment to freight growth on Vermont's state-owned rail lines is their inability to accommodate 286,000 pound railcars. Much of rail on the state-owned lines is 105 pounds or higher, which would be adequate to handle 286,000 pound railcars. The one exception is a section of the GMRC which has lighter rail, but VRS has plans to replace this with heavier rail. But according to VRS, the bridges on these rail lines represent the primary reason they cannot handle heavy axle load railcars. Upgrading Vermont state-owned lines to accommodate heavier railcars would therefore primarily consist of upgrading bridges.

Likely Revenues

VRS has indicated that based on rate requests, the company must turn away as much as 30 percent of potential traffic due to its inability to accommodate 286,000 pound railcars. If VRS were able to capture the remaining 30 percent of potential traffic, and revenues of this traffic were consistent with VRS existing traffic base, then theoretically VRS revenues would increase by about 43 percent. Increasing VRS revenues by 43 percent would then increase Vermont's lease revenues to around \$1.4 million per year. Other traffic increases are possible, but these are speculative at this time.

Likely Costs

Vermont is currently completing an FRA-mandated initiative to estimate the load rating of the 165 bridges the State is responsible for maintaining. VRS is in the midst of a similar initiative for the 48 bridges that the company is responsible for maintaining on state-owned property. Of all 213 bridges on State-owned rail lines, load ratings on 120 are not available. Of the remaining 93 bridges that have been load rated, 51 have been load rated for 286,000 pounds and above, while 42 have been load rated for less than 286,000 pounds.

The costs of upgrading bridges to accommodate heavy axle load railcars can vary widely, and to produce reliable cost estimates would require extensive field work and analysis. An analyst would need to understand the specific elements that limit the load rating of that bridge and the unique circumstances of the bridge. Presented herein is a much more conceptual analysis, intended to present a sense of the order of magnitude of costs only.

The 2010 *Oregon Rail Study* by the Oregon Department of Transportation presented an assessment of 332 rail bridges located on 15 short line railroads in Oregon.¹ The study provided a software tool and set of algorithms by which sketch level costs of upgrading rail bridges to the 286,000 pound rating could be estimated. Unit costs were developed on a cost per linear foot basis. Bridges were differentiated between those that could have accommodated 286,000 pound railcars as originally constructed and only need repair to do so again, and those that would need upgrade to accommodate these heavy axle railcars. The unit costs of repair and upgrading bridges were given as a function of the type of bridge and bridge condition, and the costs of upgrading were generally estimated to be much higher than the cost of repairing bridges. The costs of upgrading bridges varied from a low of \$500 per linear foot for a steel trestle in good condition to a high of \$1,400 per linear foot for a thru plate girder bridge.

The algorithms presented by the Oregon study were applied to the 42 Vermont bridges that have been determined to have a load rating less than 286,000 pounds. This analysis accounted for the type of each bridge and the assessment of each bridge per VTrans bridge inspections. The length of these structures collectively totals 3,625 linear feet. Conservatively, all bridges were assumed to require upgrading and that none could simply be repaired. Furthermore, the cost per linear foot was applied to the total structure length, not the sum of span lengths. Given the condition and type of each bridge, the unit cost of upgrading each bridge averaged about \$1,068 per linear foot. When escalated from 2009 to 2014 using the Parsons Brinckerhoff Construction Cost Index, the average cost per linear foot was \$1,304 in 2014 dollars. The Oregon study also assumed a 10 percent additive for mobilization and an additional 28 percent for construction engineering and contingencies. Assuming a bridge upgrades average \$1,304 per linear foot and additives are applied, the cost of various scenarios is shown in Table 3.

Table 3: Cost of Upgrading Bridges on State-Owned Lines to Accommodate 286,000 Pound Railcars

Scenario	Linear Feet	Upgrade Cost (Millions)
Upgrade 42 bridges determined to have load ratings less than 286,000 pounds	3,625	\$6.7
Upgrade 42 bridges determined to have load ratings less than 286,000 pounds. Assume the frequency with which bridges are not rated to 286,000 pounds is the same for unrated bridges as those that have been rated. Upgrade estimated 45 percent of currently unrated bridges.	7,552	\$13.9
Upgrade 42 bridges determined to have load ratings less than 286,000 pounds, as well as all 120 unrated bridges.	12,321	\$22.6

Sell All Lines

Carrier Interest in Purchasing the Lines

The study team is not aware of any specific interest expressed by private rail operators in purchasing the Vermont-owned lines. VRS has previously offered to acquire the state-owned lines for a dollar. Private ownership would have enabled the rail lines to qualify for low interest loans such as the FRA's Railroad

¹ http://www.oregon.gov/ODOT/RAIL/docs/rail_study/appendix_b_oregon_rail_bridge_assessments.pdf.

Rehabilitation & Improvement Financing (RRIF). As owner, the State of Vermont cannot qualify for these loans. The offer was turned down, probably due to political considerations were Vermont to give rail lines away. VRS has mentioned that financing the acquisition of the lines at the State's cost per lease agreement would simply divert money that would otherwise be spent operating and maintaining the lines. According to VRS, Vermont would be no better off if VRS were forced to purchase the lines.

Likely Proceeds of a Sale – Vermont Rail System

As discussed previously, VRS has right of first refusal for any sale of state-owned lines per the terms of the leases. In the case of the VTR and GMRC, VRS can buy these lines at the State's cost, but the information to estimate the State's cost is not currently available. Because traffic is light on the WACR Montpelier Branch, this would be unlikely to have significant value on a going concern basis.² Similarly, traffic has historically been light on the WACR Connecticut River Line, although new opportunities may develop on this line, depending upon the fortunes of the Central Maine & Quebec (CMQ), successor to the Montreal, Maine & Atlantic.

Likely Proceeds of a Sale – Going Concern Value

The proceeds of a sale of Vermont-owned lines to a company other than VRS would depend heavily on the expected capital expenditure needed to maintain the lines to a good state of repair. VRS claims that, taken as a whole, the state-owned lines have no value on a going concern basis. The value of a business is driven by expected future cash flows. Routine operating activities are expected to generate positive cash flows, whereas expected future capital expenditures reduce cash flows. According to VRS, expected capital maintenance costs for Vermont's state-owned lines are such that any expected any cash flow from operations will be consumed by capital expenditures to keep the lines operating. No cash would be available to owner-investors.

Reviewing various scenarios in regards to the likely value of Vermont-owned lines to a potential investor, several assumptions are made:

- Given typical short line railroad cost structure, cash flows from operations are around \$3 million per year
- No expected growth in earnings
- Railroad cost of capital is 8 percent, similar to cost of capital for several recent short line railroad valuation studies by Parsons Brinckerhoff
- 20 year analysis period
- Other cash outflows, such as other capital expenditures, working capital, and taxes are around \$0.5 million per year
- Several scenarios were analyzed and are summarize in Table 4:
 - New owner anticipates spending \$2 million per year on maintenance of way program, with public sector paying \$0.3 million, per public sector expenditures over past 9 years
 - New owner anticipates spending nothing on program maintenance

² Going Concern Value is the value of a business that is expected to continue operating into the future (as opposed to being liquidated for its assets).

- New owner anticipates spending more than \$2.5 million on maintenance of way program

Table 4: Valuation Scenarios for State-Owned Rail Lines

	No Program Maintenance	\$2 Million Private Program Maintenance	\$2.5 Million Private Program Maintenance
Operating Cash Flow (Millions)	\$3	\$3	\$3
Other Cash Outflows (Millions)	(\$0.5)	(\$0.5)	(\$0.5)
Capital Maintenance Program (Millions)	\$0	(\$2)	(\$2.5)
Annual Free Cash Flow (Millions)	\$2.5	\$0.5	\$0
Business Value (Millions)	\$25	\$5	\$0

As shown in the table above, the value of Vermont’s state-owned lines is highly sensitive to anticipated capital expenditure levels. In the unlikely scenario that the new owner anticipates no capital maintenance costs, Vermont’s rail lines are worth \$25 million. In a scenario where a new operator assumes most of what had been the public sector’s capital maintenance costs, the value is \$5 million. If the new owner must spend the \$4 million that VTrans has purportedly budgeted for capital spending on State-owned lines, the value becomes zero.

Several other factors could influence this valuation as well. The valuation assumes that the owner could operate in a manner similar to VRS at the outset, but depending upon the buyer, this is not necessarily the case. As discussed later, a new owner/operator may be at a disadvantage due to factors such as unfamiliarity with relevant rail markets, lack of access to key assets. Furthermore, the analysis assumes flat growth. Anticipated growth would increase the value of the State-owned lines.

Risks

New Owner’s Usage of State-Owned Lines

Some of Vermont’s State-owned rail lines are not commercially viable, at least not from the standpoint that a private investor could justify maintaining to a good state of repair. The WACR Montpelier Branch and the VTR Bennington Branch currently carry minimal traffic. The WACR Connecticut River Line as well as the VTR south of Rutland have carried low freight volumes in the past, although new opportunities could change the prospects of these lines in the future. The net liquidation value on some of these lines could be higher than the value of continued rail operations. Consequently, sale to a new owner increases the risk that it would choose to abandon these lines, sell the rails for scrap, and let the right of way revert to adjacent property owners. This risk could be mitigated by writing a clause into the sale that the state retain right of first refusal to re-purchase the lines at net liquidation value.

Even if the new owner chose not to take such drastic action, it might not maintain the lines, and cease to provide train service. The terms of the sales agreement could include a requirement that the new owner continue to operate the lines, although enforcing these conditions could become a challenge, particularly within the context of any type of bankruptcy filings.

Future Plans for Passenger Rail

Vermont would also risk future plans for passenger rail if it sold the state-owned lines. The state may need to negotiate with the new owner to allow passenger rail services, or to make improvements to the rail lines aimed at either enhancing existing services or adding new services. Theoretically, the option for the State to be able to establish passenger rail services could be written into the sales agreement, but Vermont's ability to exercise this option once the lines have been sold could be an issue.

If Sold to VRS

The primary risk of selling the lines to the VRS at a substantial price is that by doing so, the state could be substituting VRS reinvestment in the line with a direct payment to the state. Money spent by VRS in financing its purchase of the State-owned lines would not be spent investing in those lines.

If Sold to Another Operator

A number of issues may arise that could create difficulties for a new operator.

- **VRS would continue to own the CLP.** The CLP gateway to Whitehall is the most important access point for the VTR to the wider North American rail network. By far, VTR's largest customer is Omya, accounting for a large portion of traffic on the VRS. Much of Omya's traffic currently travels over the CLP. The CLP could impede another operator, charging higher rates and creating poor interchange connections with the VTR.
- **Vermont owns the right of way and most structures to support rail operations on state-owned lines, but VRS owns other assets needed to operate the railway, serve customers, and expand.** A new operator would not have automatic access to these assets. Items that VRS owns are as follows:
 - A significant portion of current VRS traffic is salt. VRS and private shippers own many of the salt sheds used to store this salt, including those in Burlington, Bellows Falls, and Rutland.
 - Buildings used in railway operations in Burlington, Bellows Falls, and Rutland.
 - Tank farms in Burlington and Rutland.
 - Property and building needed for maintenance of way in Rutland.
 - Areas needed for expansion, including in Shelburne, along with property needed to expand yards in Florence and Rutland.
 - Industrial area in Riverside, which will be important to the GMRC.
 - Tracks in Barton.

There are a number of other unique risk factors with other carriers taking over operations of the Vermont-owned rail lines.

- **VRS has provided evidence that, by the standards of the railroad industry, VRS has spent heavily on maintaining the state-owned lines.** According to the Association of American Railroads' *Operating Facts 2013*, railroads typically spend about 13 percent of their revenues on maintenance of way operating expense. VRS has provided records that show that VTR has spent 40 percent of revenues either on lease payments to the state and on maintenance of way, of

which 31 percent of revenues were spend on maintenance of way since 1964. Since 1983, the GMRC has spent 20 percent of revenues on maintenance of way operating expense and 24 percent of revenues either on lease payments or maintenance of way. Another carrier may be less willing to spend these amounts on maintaining the formerly State-owned lines.

- **The VRS has shown a willingness to operate rail lines that other carriers have been unwilling or unable to operate, even for rail lines for which the state was already the owner.** The VRS stepped in to operate the Montpelier Branch when another operator declined to continue service on the line. The Northern Vermont railway was the earlier operator of the portion of the Connecticut River Division north of Wells. When its parent company went bankrupt, VRS took over operations. Another carrier may not be as willing to market and operate these light density rail lines.
- **Selling state-owned lines to another operator could cause a loss of institutional knowledge and relationships within the Vermont rail network.** Many of VRS customers have long-standing business and personal relationships with VRS management.
- **Market competition if a company with a significant presence in the State purchased the rail lines.** For example, if Genesee & Wyoming were to purchase state-owned lines, a single company would own 91 percent of the rail infrastructure in Vermont. The company would have significant market power within the State.

Sell Selected Lines

Because some state-owned lines would likely be financially viable while others would not, Vermont may receive more interest from private investors in buying selected rail lines rather than acquiring all lines. Vermont could retain control of those less viable lines that otherwise would be threatened with abandonment or at least have service suspended.

While this new business model could mitigate some drawbacks of selling all state-owned lines, selling select lines could have additional drawbacks as well.

- In the past, VRS rail lines have cross-subsidized one another. For example, the VTR has subsidized operations on the WACR. If VTR were sold to a separate operator from the WACR, funding from profitable components of the VRS would no longer be available to support the development of new opportunities on lines that have historically been less financially viable, such as the WACR. The public sector would likely need to assume the subsidies that had previously occurred within VRS, providing operating subsidies for the remaining less profitable rail lines.
- The VRS operates as a system. The component railroads share train crews, locomotives, and maintenance of way resources. If separate components were sold to separate entities, synergies may be lost. However, if components were sold to the owners of other railroads operating in the region, new efficiencies could potentially emerge.

Economic Benefits/Economic Impacts of State-Owned Rail Lines

Economic Impact

In operating state-owned lines, VRS directly employs 130 individuals in Vermont. Using the median household income for Vermont \$54,168 (2012 \$)³, the associated income supported is around \$7,041,840. The employment of these individuals has further or induced impacts on the local economy. Induced impacts stem from the re-spending of wages earned by workers benefitting from the direct and indirect activity within area. For example, if an increase in demand leads to new employment and earnings in a set of industries, workers in these industries will spend some proportion of their increased earnings at local retail shops, restaurants, and other places of commerce, which would further stimulate economic activity. The induced impact translates to another 91 jobs.

If Vermont's State-owned rail lines were sold, some of the direct jobs and associated induced jobs could move out of Vermont. For example, if a short line holding company were to buy these lines, some headquarters functions, such as finance, accounting, information technology, engineering, could be moved out of Vermont. On the other hand, employment associated with administrative functions is typically a small portion of total employment at most railroads. For example, at Class I railroads, Executives, Officials & Staff Assistants and Professional & Administrative staff make up only about 14 percent of the total employment Class I employment.⁴ Employees in other functions, such as Maintenance of Way, Maintenance of Equipment, and Transportation, would probably continue to work in Vermont. A greater impact on direct employment could be whether the new owner operates these rail lines at the same level of intensity or seeks to reduce costs by cutting staffing.

The largest economic impacts of Vermont's state-owned lines are associated with the customers that rely on rail service over these lines. Over the years, the state-owned lines have helped to attract employers to Vermont. When VRS began operating in 1964, the company had no customers, given that the Rutland Railroad had been shut down for a couple of years due to a strike. According to VRS, the company now has 60 Vermont online customers which together employ approximately 3,700 employees.

Using the median household income for Vermont \$54,168 (2012 \$)⁵, the 130 individuals directly employed, and the estimated 3,700 employees supported by the Vermont state rail system, the total household income supported is around \$207,463,440 (2012 \$). To quantify the annual economic impacts of this income, this analysis used an input-output modeling framework based on multipliers from MIG Inc., the developers of IMPLAN.⁶ U.S. National data were selected for the economic profile and multiplier set.

This report estimates three types of economic impacts.

³ <http://quickfacts.census.gov/qfd/states/50000.html>

⁴ Association of American Railroads, *Railroad Facts, 2013 Edition*. No comparable information is available for the short line and regional railroad industry.

⁵ <http://quickfacts.census.gov/qfd/states/50000.html>

⁶ <http://implan.com/V4/Index.php>

- **Person years:** 100 person-years may translate into 50 jobs supported for 2 years or 100 jobs supported for 1 year.
- **Earnings:** All forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income.
- **Output:** Output represents the value of industry production. For manufacturers this would be sales plus/minus change in inventory. For service sectors production equals sales. For Retail and wholesale trade, output equals gross margin (as opposed to gross sales).

The 130 individuals directly employed by the Vermont Rail system and the additional 3,700 employees it supports in turn create 2,592 induced jobs, which translates to \$134.93 million (2012 \$) in earnings, and \$404.96 million (2012 \$) in output (see Table 5).

Table 5: Impacts of the Vermont State Rail System

	Annual Impact
Direct	
Employment (person-years)	130
Earnings (2012 \$ millions)	\$7.04
Customers	
Employment (person-years)	3,700
Earnings (2012 \$ millions)	\$200.42
Induced	
Employment (person-years)	2,592
Earnings (2012 \$ millions)	\$134.93

Economic Benefits

Vermont’s state-owned rail lines also generate public and private benefits. “Benefits” differ from economic impacts as described above in that economic impacts address the changes to Vermont’s economy as a result of the state-owned rail lines, whereas “benefits” measure the extent to which the public and private costs of transportation are reduced by the operation of Vermont’s state-owned lines. According VRS, the company handled around 2,300,000 tons in 2013. For the typical rail move handled by railroads in Vermont, the Vermont portion of that move is a small component of the overall move. The average haul for freight traveling to, from, within and across Vermont as estimated from the 2011 STB Carload Waybill Sample is around 1,045 miles.

If Vermont’s state-owned rail lines were to cease operation, a significant portion of this rail traffic would switch to truck. Some could switch to other rail lines, such as freight to/from transload facilities, but a large portion would likely switch to truck. This would increase costs of the transportation network in a number of ways.

- Fuel consumption would rise, since rail is relatively fuel efficient.
- Due to the increase in fuel consumption, greenhouse gas emissions would rise.
- Highway maintenance would increase, since freight is diverted to publicly maintained roadways.

- The rate of accidents, injuries, and fatalities would increase, since rail is a relatively safe mode of transportation.

According to the U.S. Census Bureau’s Vehicle Inventory and Use Survey (VIUS), the average 5 axle truck has a payload when loaded of around 23 tons. Based upon the ton-miles associated with VRS, total equivalent truck vehicle miles traveled (VMT) would be 104,500,000. Table 6 below shows the benefits of VRS rail service by assessing the increase in costs under a series of scenarios whereby freight that currently moves by rail shifts to truck. The results suggest that if 25 percent of VRS traffic were to shift to truck, costs would increase by \$24,735,324, whereas a 50 percent shift to truck would result in costs increasing by \$49,470,648, and a 75 percent shift to truck would increase costs by \$74,205,972.

Table 6: Annual Benefits of the Vermont Rail System, 2013 Traffic Base

Category	25% VRS Traffic Diverts to Truck		50% Traffic Diverts to Truck		75% Traffic Diverts to Truck	
	Units	Cost	Units	Cost	Units	Cost
Fuel Consumption	3.23m Gallons	\$11,953,115	6.46m Gallons	\$23,906,230	9.7m Gallons	\$35,859,346
Carbon Dioxide	45k Tons	\$1,301,946	90k Tons	\$2,603,892	135k Tons	\$3,905,837
Highway Maintenance	26m VMT	\$10,685,125	52m VMT	\$21,370,250	78m VMT	\$32,055,375
Fatalities	0.24 Fatalities	\$2,206,204	0.48 Fatalities	\$4,412,408	0.73 Fatalities	\$6,618,612
Injuries	6 Injuries	\$607,025	11 Injuries	\$1,214,049	17 Injuries	\$1,821,074
Property only Accidents	19 Property only Accidents	\$76,452	39 Property only Accidents	\$152,904	58 Property only Accidents	\$229,357
Total Costs	\$26,829,867		\$53,659,734		\$80,489,600	

These estimates were developed by the following assumptions and sources:

- Rail fuel efficiency is 480 ton-miles per gallon based on estimates from the Vermont Rail Action Network⁷, while truck fuel consumption is 134 ton-miles per gallon based on estimates from the Mother Nature Network⁸. The cost of fuel is \$3.7 per gallon per the most recent estimates of the EIA⁹.
- Each gallon of fuel consumed emits 22.2 pounds of carbon dioxide per the US EPA. The cost per ton of carbon dioxide is \$40 per US DOT TIGER guidance¹⁰.
- The cost of highway maintenance per VMT for a five axle truck is \$0.409 per the US DOT Federal Highway Administration¹¹.

⁷ <http://www.railvermont.org/why-railroads/environmental-benifits.html>

⁸ <http://www.mnn.com/earth-matters/energy/stories/fuel-efficient-transportation-an-overview>

⁹ <http://www.eia.gov/petroleum/gasdiesel/>

¹⁰ http://www.dot.gov/sites/dot.gov/files/docs/TIGER_BCARG_2014.pdf

¹¹ <http://www.portofcateslanding.com/TIGER/Engineering%20Study%20Maintenance%20Savings/COST%20OF%20HIGHWAY%20MAINTENANCE%20PER%20VEHICLE%20MILE%20TRAVELED%20REDUCED%20BY%20PORT.pdf>

- The rate of fatalities for rail is 0.00014 per million ton-miles per the FRA, whereas the rate of fatalities for trucking is 0.0125 per million VMT per the FMCSA. Per federal guidelines, the value of a statistical life is \$9.1 million.
- The rate of injuries for rail is 0.00058 per million ton-miles per the FRA, whereas the rate of injuries associated with trucking is 0.22455 per million VMT. Injuries are assumed to be equivalent to a weighted average of MAIS non-fatal, non-property damage only (PDO) accidents. This value is equal to \$110,011 per injury.
- The rate of property only accidents for rail is 0.00177 per million ton-miles per the FRA, and the rate of property damage only accidents for trucks 0.78591 per million VMT per the FMCSA. The cost per accident is \$3,927 per US DOT¹².

Earlier in this paper were enumerated a number of risk factors that would be associated with selling some or all of Vermont's State-owned rail lines. While it is not certain exactly what would occur if Vermont were to sell its lines either to VRS or to another buyer, such a sale could place some risks on the economic impacts and benefits that are enumerated above.

¹² http://www.dot.gov/sites/dot.gov/files/docs/TIGER_BCARG_2014.pdf