Minnesota Comprehensive Statewide Freight and Passenger Rail Plan

Investment Needs

draft technical memorandum 6

prepared for

Minnesota Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

Kimley Horn & Associates
TKDA, Inc.

October 2009

www.camsys.com

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Executive Summary

This document is the sixth in a series of technical memoranda (TM) to provide the technical analysis in support of development of the Minnesota State Rail Plan. In particular, this memorandum builds on the analysis in TM 2 (Freight Rail Supply and Demand), TM 3 (Passenger Rail Network) and subsequent refinements to the ridership forecasts contained therein, and TM 4 (Freight/Passenger Network) to analyze the existing and future (2030) operations of the freight and passenger rail systems in the State in order to identify a priority investment program.

Sections 1 and 2 outline the objectives and methodologies used in this memorandum. Section 3 presents a preliminary screening of investment alternatives (particularly in passenger rail) and screens out some options from further analysis. Section 4 presents a detailed investment needs analysis of the freight rail network, the shared (or potentially shared) freight and passenger networks, and a stand-alone high-speed rail (HSR) (110 mph or above) passenger rail network. Section 5 analyzes and prioritizes potential investment programs using the performance measurement criteria developed in TM 5.

This memorandum identifies and develops costs estimates for the following four investment scenarios:

- All freight-only improvement needs = $5.1B
- All freight-passenger shared corridor improvement needs ***as individual projects*** (incl. track, signal bridges, bottlenecks, right-of-way and capacity rights) = $9.3 B
- All freight-passenger shared improvement needs ***as a system*** (incl. track, signal bridges, bottlenecks, right-of-way and capacity rights) = $7.1 B
- All freight-passenger shared corridor improvement needs ***on the priority system*** (incl. track, signal bridges, bottlenecks, right-of-way and capacity rights)= $6.2 B

Bottom line is that $11.3 B is required to satisfy all freight-only needs, and those high priority freight-passenger needs within shared corridors. These costs do not include rolling stock. Rolling stock for each corridor discussed in Section 4.2 of this report totals an additional $1.7 B. It is assumed that several corridors will be able to share rolling stock, and this total cost could potentially be reduced. Tech Memo 9 will review how rolling stock costs could be shared between corridors.

The major elements of the priority project system are as follows:

- HSR rail service of 110 to 150 mph between the Twin Cities and Duluth, Rochester, and Chicago;

- Enhanced conventional rail service of up to 90 mph between the Twin Cities and St. Cloud, Mankato, Fargo and Eau Claire, Wisconsin, and between St. Paul and Minneapolis;
- Positive Train Control (PTC) on all Class I railroads and all shared corridors;
- Grade crossing upgrades on all shared corridors; and
- Upgrade to major junctions and bridges.

These investments are intended to provide the detailed project and programmatic elements to support the revised rail vision statements included in Appendix A of this memorandum.

This memorandum is intended only to identify priority investments. Since many of these investments will need to occur on the privately owned and operated freight rail system, an approach to allocating the costs and benefits between the private railroad owners and the public sector still needs to be established. Any capital investments necessary for passenger service should be a public responsibility everywhere that it does not displace or complement upkeep of the freight railroad. Passenger operations should not in any way degrade freight rail operations, negatively impact freight customers, or limit the railroad's ability to provide service to those customers. These issues will be addressed in TM 7/8 addressing a broad array of institutional issues. This next TM will then set the stage for the preparation of the Freight and Passenger Rail Plan which will establish specific phasing and funding strategies in TM 9.

1.0 Objective

The objective of Task 6 is to establish investment needs for the freight and passenger rail systems.

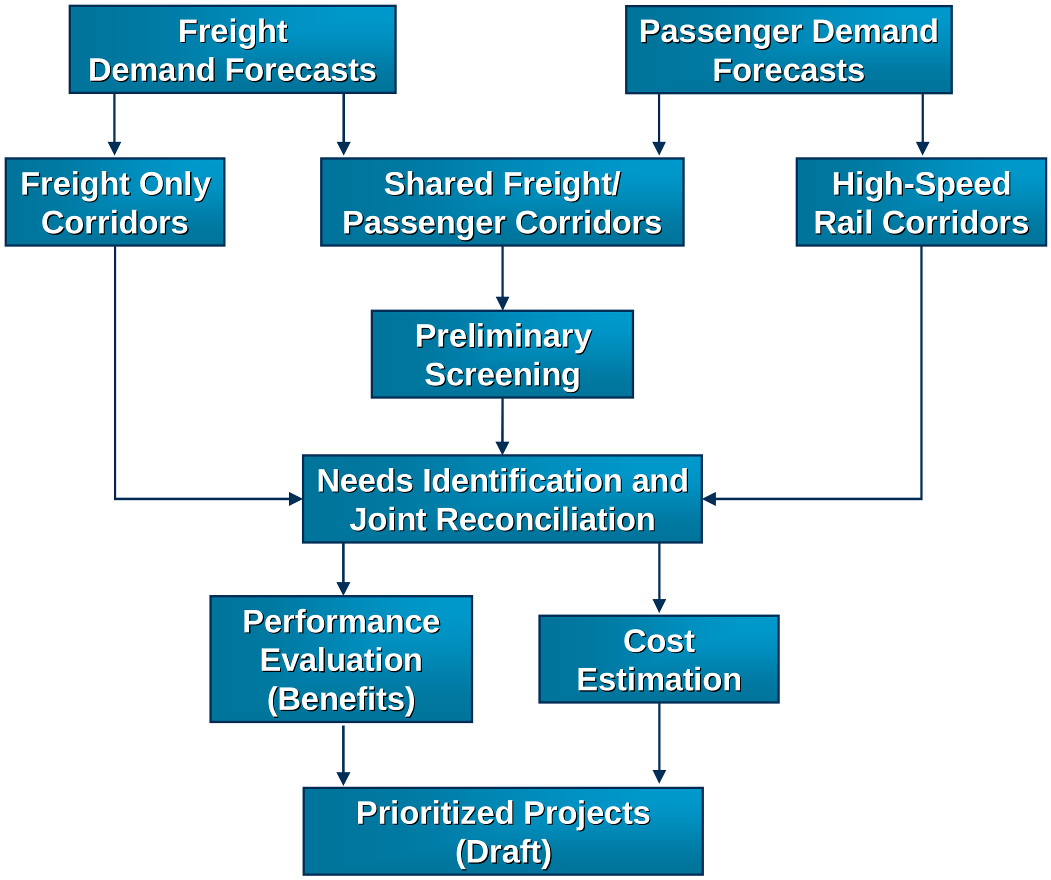
2.0 Methodology

Drawing from information compiled for previous tasks, this memorandum summarizes investment needs for passenger and freight rail corridors consistent with the visions for rail in Minnesota. The following process was used to identify and evaluate needs:

- **Preliminary Screening (Section 3.0):**
  - Refine results of TM 3 and 4 – Passenger Rail System and Freight/Passenger Integration, where an initial determination of freight and passenger needs were outlined. Conduct preliminary screening of passenger feasibility on existing network, using potential ridership, track class, and distance information.
- **Identification of Needs (Section 4.0):**
  - Provide basis for cost estimating on freight and passenger rail systems;
  - Define improvements for freight only segments of the rail system, organized first by rail operator and then by rail subdivision;
  - Define improvements for shared freight and passenger corridors that are proposed to operate conventional rail service (79 to 90 mph); and
  - Define improvements for passenger corridors that are proposed to operate high-speed rail (HSR) service (110 to 150 mph).
- **Performance Assessment (Section 5.0):**
  - TM 5 identified potential performance measures to use in evaluating both passenger and freight improvements;
  - Based on the needs identified, a subset of these performance measures was applied to each corridor to determine which corridors were likely to provide the most significant benefits; and
  - These measures were then compared to the cost identified for the needs to determine the relative cost-effectiveness of each improvement. Note, this memo does not discuss revenue based on ridership nor develop a full benefit-cost analysis for corridors. This will be done in Task 9 – Funding and Programming.

Figure 2.1 outlines the overall approach. Detailed background data and assumptions are provided in Appendix B.

Figure 2.1 Summary of Approach to Needs Identification and Evaluation



3.0 Preliminary Screening of Passenger Rail Investments

An initial screening process as shown in Table 3.1 was conducted in Task 3 of all passenger rail corridors and city pairs which have been under discussion or analysis. Different service levels were tested based on previous analyses and proposals, and likely demand. HSR services were assessed for connections to the Twin Cities from Rochester, Duluth, and Chicago. Eight train pairs per day was assumed for all HSR routings, and four to eight train pairs per day for all others. Conventional rail services were assumed to operate at 79 mph with the potential to go to 90 mph, and HSR services at a minimum of 110 mph with potential to go to 150 mph.

Table 3.1 Initial Screening, Data Evaluation

Corridor	Service Level (Round Trips)	Potential Ridership	FRA Track Class	Available Capacity
Minneapolis-Coon Rapids	4/Day	High	3	Low
Minneapolis-Coon Rapids	8/Day	High	3	Low
Minneapolis-Coon Rapids	HSR	High	N/A	N/A
Coon Rapids-Big Lake	4/Day	High	4	Medium
Coon Rapids-Big Lake	8/Day	High	4	Medium
Big Lake-St. Cloud	4/Day	High	4	Low
Big Lake-St. Cloud	8/Day	High	4	Low
St. Cloud-Fargo/Moorhead	4/Day	Medium	4	Low
Coon Rapids-Cambridge	4/Day	Medium	4	Low
Coon Rapids-Cambridge	8/Day	Medium	4	Low
Coon Rapids-Cambridge	HSR	High	N/A	N/A
Cambridge-Duluth	4/Day	Medium	4	Low
Cambridge-Duluth	8/Day	Medium	4	Low
Cambridge-Duluth	HSR	High	N/A	N/A
Minneapolis-Willmar	4/Day	Medium	3	High
Willmar-Fargo/Moorhead	**4/Day**	**Low**	**3**	**High**
Willmar-Sioux Falls, South Dakota	4/Day	Low	4	Medium
Minneapolis-St. Paul (BNSF)	4/Day	High	3	Medium
Minneapolis-St. Paul (CP)	4/Day	High	3	Medium

Corridor	Service Level (Round Trips)	Potential Ridership	FRA Track Class	Available Capacity
St. Paul-Hastings	4/Day	High	4	High
St. Paul-Hastings	HSR	High	N/A	N/A
Hastings-Winona (La Crosse)	4/Day	High	4	High
Hastings-Winona (La Crosse)	HSR	High	N/A	N/A
St. Paul-Northfield	4/Day	High	4	High
Northfield-Albert Lea (Kansas City)	4/Day	Low	4	High
Minneapolis-Mankato	4/Day	Medium	3	High
Mankato-Worthington [Sioux City]	**4/Day**	**Low**	**4**	**High**
St. Paul-Eau Claire, Wisconsin	4/Day	High	4	High
St. Paul-Owatonna-Rochester	4/Day	Medium	3	High
Minneapolis-Owatonna-Rochester	**4/Day**	**Medium**	**2**	**High**
Rochester-Winona	**4/Day**	**Low**	**2**	**High**
Minneapolis-Norwood/Young America	**4/Day**	**Low**	**3**	**High**
Norwood/Young America-Appleton	**4/Day**	**Low**	**3**	**High**
Twin Cities-Rochester	HSR	High	N/A	N/A

Based on this analysis, six city pairs were removed from the analysis, including:

- **Willmar-Fargo/Moorhead.** This corridor has lower potential ridership and comparatively poorer track conditions than the current corridor through St. Cloud. Therefore, it is not considered as a viable corridor since it serves a similar city pair.
- **Mankato-Worthington (Sioux City).** This corridor has low potential ridership. Sioux City is a relatively small metropolitan area that is a significant distance (more than 250 miles) away from the Twin Cities. This corridor is not as viable in comparison to other city pairs. The goal of this study was to evaluate potential connections to other states, but not entire multistate routes; in this instance, a likely service would continue on to Omaha, which may result in substantially higher ridership volume than was estimated.
- **Minneapolis-Owatonna-Rochester.** This corridor is circuitous and slow in comparison to the other alternatives and thus would yield relatively low ridership numbers. The HSR corridor option has far higher potential for viability than this route.

- **Rochester-Winona.** The current alignment would not allow sufficient speeds for competitive passenger rail service. A separate high-speed alignment has been carried forward for further analysis.
- **Minneapolis-Norwood/Young America.** This corridor has low potential ridership and would require significant improvements to have trip times that are competitive with automobiles.
- **Norwood/Young America-Appleton.** This corridor has very low potential ridership and would require significant improvements to have trip times that are competitive with automobiles.

Although these corridors are considered to be in the lowest tier and not being carried forward at this time, changes in assumptions or conditions may make these viable corridors in the future.

4.0 Needs Analysis

A needs analysis was conducted for all freight and potential passenger rail corridors in Minnesota. A process was developed so that a clear understanding of needs on the rail system for both freight and passenger operations, today and in the future (2030), could be derived. Key to this process is the understanding of the cumulative effect projects have on each other, and how important the underlying freight infrastructure is to the eventual development of a robust passenger rail network in the State (with a few exceptions where entirely new alignments are considered). The following evaluation process was used to establish needs.

Freight Rail Network Evaluation

- Corridors were evaluated to determine current freight Level of Service (LOS). The GIS-tool developed in Task 4 was used as a guide for determining LOS, complimented by expert opinions on Minnesota rail operations (MnDOT staff, consultant team, railroads, and others) to determine any additional system chokepoints that were not evident in the GIS-tool (see Figure 4.1). For this evaluation, a LOS of C or better was considered acceptable. LOS C conditions describe a volume-to-capacity ratio of 0.4 to 0.7, meaning there exist low to moderate train flows in the corridor and there is enough available capacity to accommodate maintenance operations and to recover from incidents. Section 4.1 describes the existing capacity chokepoints for freight rail operations and improvements required to mitigate these conditions.
- Corridors were then evaluated to determine future freight LOS, with the presence of current levels of passenger trains (Empire Builder and Northstar service). IHS-Global Insight TRANSEARCH data as presented in TM 2 (Freight Rail Supply and Demand) was used to determine 2030 future freight flows (see Figure 4.2). For corridors that were LOS D or worse (volume-to-capacity ratio of 0.7 or greater), improvements were identified to enable these corridors to be brought back to a minimum of LOS C. Improvements identified included additional tracks or signal systems, as well as more general improvements to overall operations and terminals. Section 4.1 describes 2030 capacity chokepoints for freight rail operations and improvements required to mitigate these conditions.

Section 4.1 presents the findings and improvements required for those corridors proposed to remain "freight-only" corridors in 2030. To see freight needs in shared freight and passenger corridors, see Section 4.2 as described below.

Shared Freight and Passenger Rail Corridor Evaluation

- Using the same process described for the freight rail network evaluation, shared corridors were evaluated to determine current freight LOS, and improvements were identified to the freight network to bring the service to LOS C. Section 4.2 describes the existing capacity chokepoints for freight rail operations and improvements required to mitigate these conditions.
- Using the same process described for the freight rail network evaluation, shared corridors were evaluated to determine future freight LOS, with the presence of current levels of passenger trains (Empire Builder and Northstar service). Improvements were identified to the freight network to bring the service to LOS C. Section 4.2 describes 2030 capacity chokepoints for freight rail operations and improvements required to mitigate these conditions.
- Shared corridors were then evaluated to determine how the 2030 LOS would change if additional and new passenger services were added to the corridor (see Figure 4.3). Future passenger service levels (numbers of train pairs/day) as described in TM 3 and subsequent modifications were used as 2030 inputs to the GIS-tool. Again, for corridors with LOS D and lower, improvements were identified to enable these corridors to be brought back to LOS C in 2030. In addition to overall infrastructure, right-of-way, rolling stock, and operating and maintenance costs were identified.

High-Speed Rail Corridor Evaluation

- HSR corridors are proposed to be developed in new right-of-way in some cases. Overall infrastructure, right-of-way, rolling stock, and operating and maintenance costs were identified. These improvements are effectively independent of the other improvements.

Figure 4.1 2009 Freight Level of Service, Without Improvements

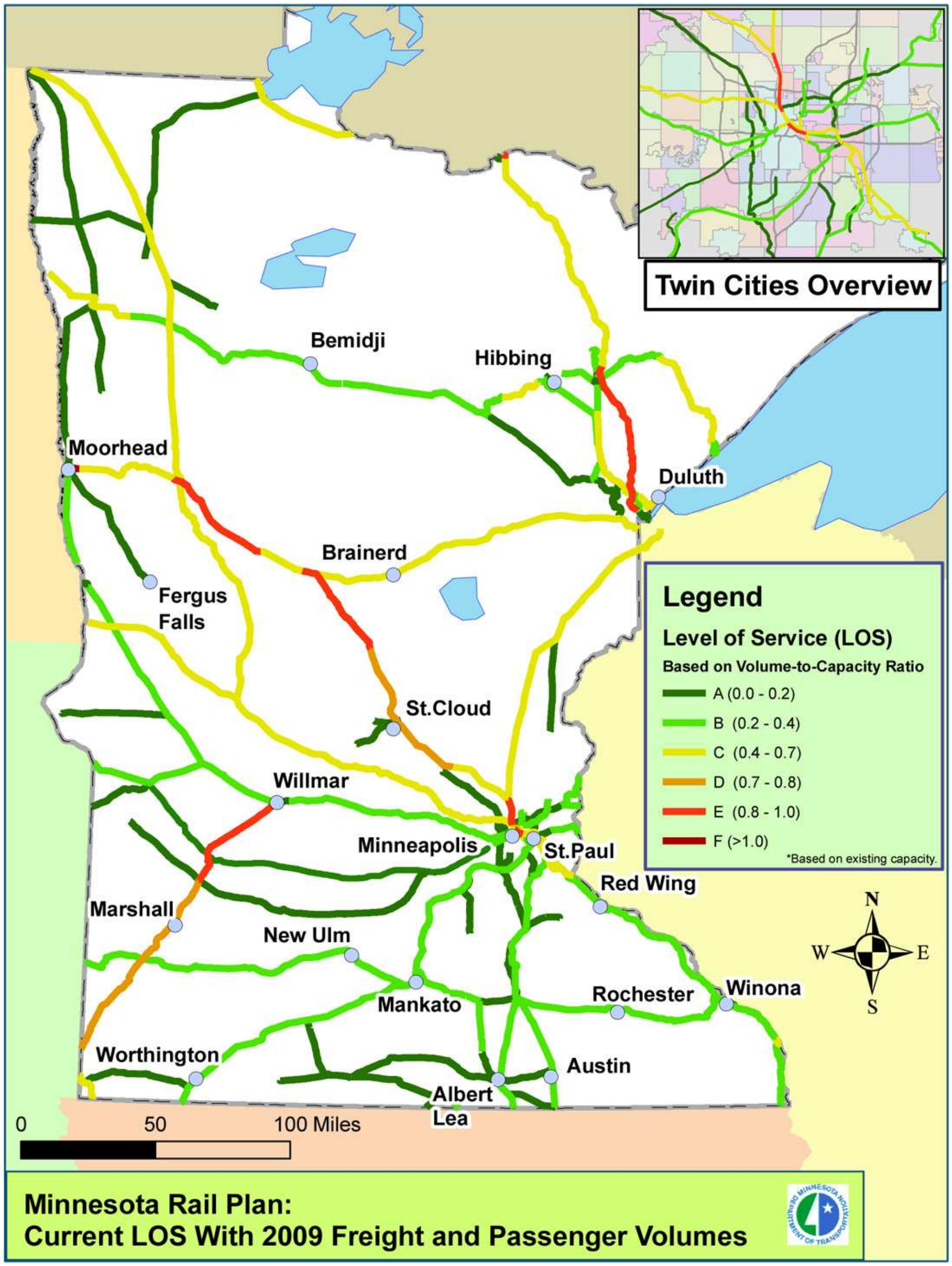


Figure 4.2 2030 Freight Plus 2009 Passenger Level of Service, Without Improvements

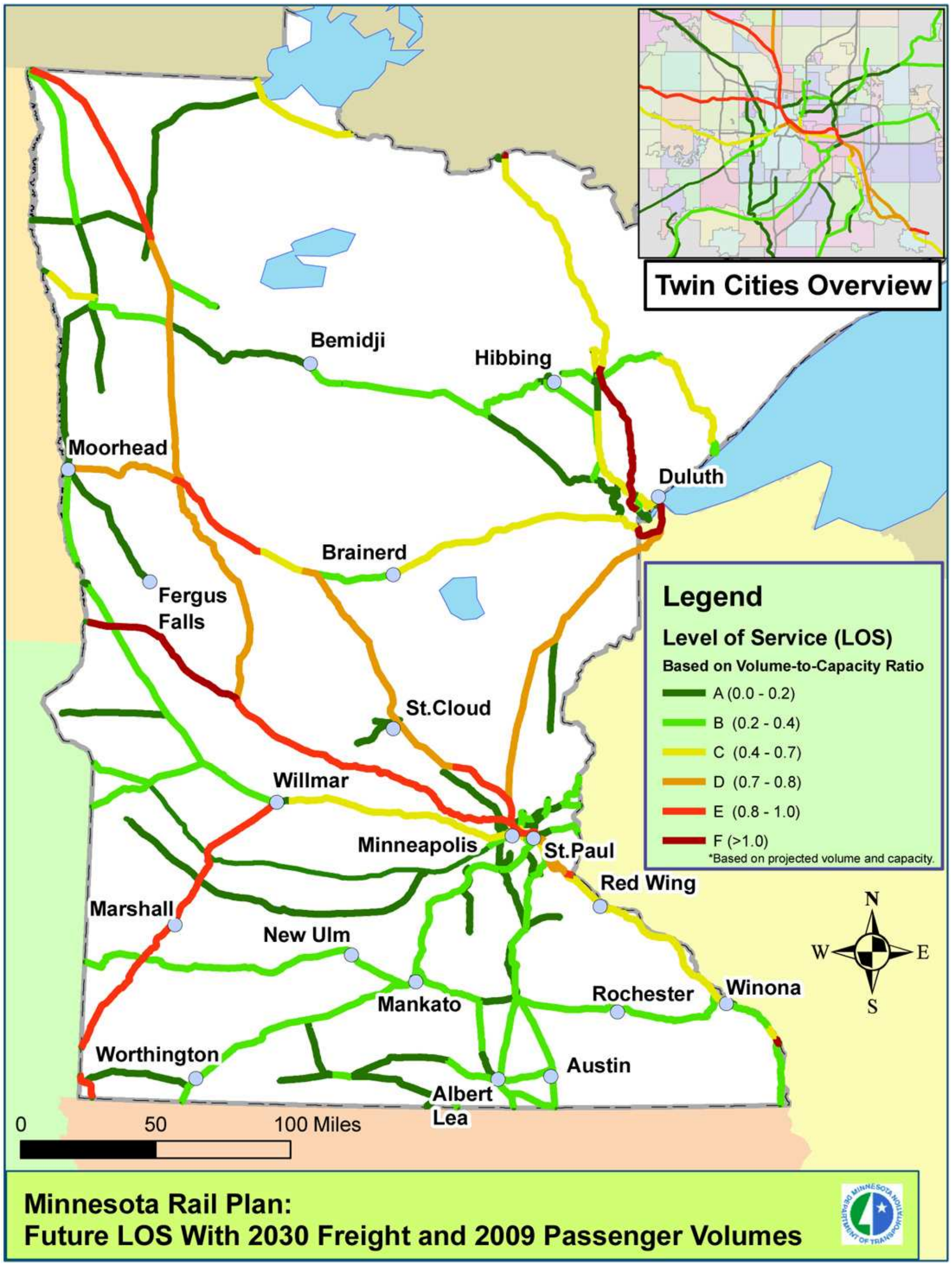
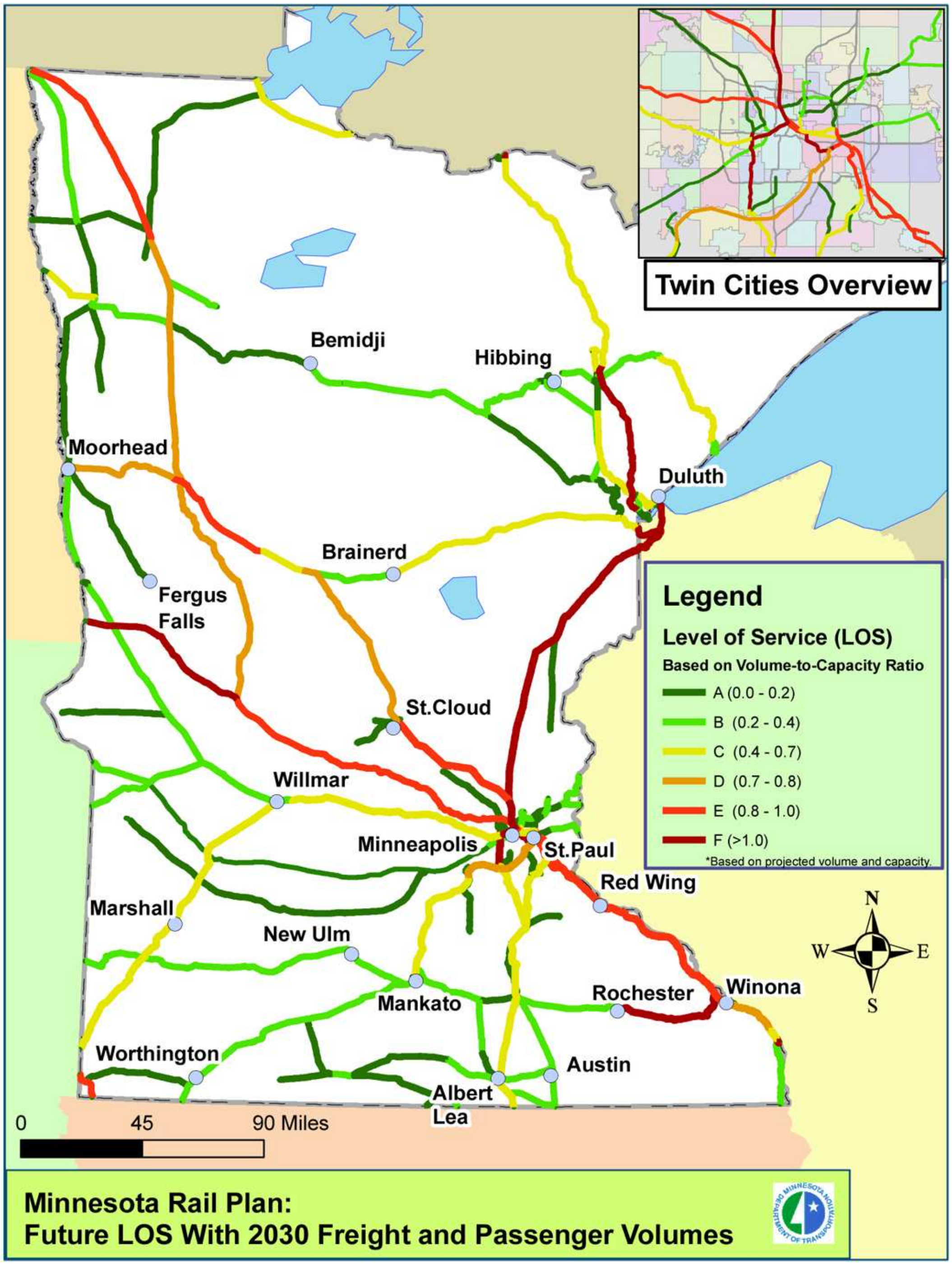


Figure 4.3 2030 Freight Plus 2030 Passenger Level of Service, Without Improvements



Improvement Cost Evaluation

After improvements were identified for each line or corridor, estimates were developed to quantify the costs of improvements and to begin to start weighing the benefits versus costs of improvements. The cost estimates presented herein are general in nature and are not detailed engineering cost estimates. The intent is to use these order-of-magnitude cost estimates for an apples-to-apples comparison between corridors – much as was done with the ridership forecasts. Even though some corridors provide connections to points beyond the state border, this evaluation only reflects costs for work in the State of Minnesota. Several of the corridors listed have gone through advanced levels of engineering assessment; those cost estimates should take precedence for evaluating subsequent steps of project development.

Freight Rail Cost Estimates

Improvement cost estimates were developed using the assumptions and unit costs listed in Tables 4.1. While use of unit costs for calculating improvements is the simplest approach, in several cases combinations of improvements were required and lump sum costs are displayed for various projects. Costs are provided for items such as track and signal upgrades, clearance restrictions, 286K-rail car compliancy, as well as other categories of improvements. Cost estimates do not include cost for right-of-way.

Passenger Rail Costs Estimates

Improvement cost estimates were developed using the assumptions and unit costs listed in Tables 4.2. Costs are provided for items such as track and signal upgrades, rolling stock, and operating and maintenance costs, and are based on a variety of sources, including recent Northstar[1] and Amtrak information.[2,3,4] Estimates do not include costs that may be associated with stations, nor do they include costs for any major structural modifications to railroad overpasses or underpasses. Cost estimates only include cost for right-of-way in greenfield construction. For passenger services planned to share existing freight lines, an estimate of the cost of securing trackage rights from the private freight railroad

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[1] Based on recent internal Northstar team communications

[2] Consolidated Financial Statements. National Railroad Passenger Corporation and Subsidiaries (Amtrak). For the Years Ended September 30, 2007 and 2006.

[3] System Mileage Within the United States. Bureau of Transportation Statistics. http://www.bts.gov/publications/national_transportation_statistics/html/table_01_01.html. Retrieved 9/22/2009.

[4] U.S. Vehicle Miles. Bureau of Transportation Statistics. http://www.bts.gov/publications/national_transportation_statistics/html/table_01_32.html. Retrieved 9/22/2009.

owners/operators of these lines has been included based on recent Minnesota experience. The trackage rights costs could vary significantly depending on the excess capacity available and the ability for the private freight railroad companies to create flexibility to allow their system to operate now and in the future. Actual cost would have to be negotiated in each case. This trackage cost is the largest unknown variable in the estimates.

Table 4.1 Cost Assumptions for Freight Rail

Cost Item	Cost	Unit	Source
Upgrade Track			
Class I to II	$63,360	Mile	TKDA
Class II to IV	$712,800	Mile	TKDA
Class III to IV	$712,800	Mile	TKDA
New Class IV	$1,709,000	Mile	TKDA
Signalization			
CTC (Single Track)	$550,000	Mile	Northstar
CTC (Double Track	$750,000	Mile	Northstar
PTC	$100,000	Mile	Estimated implementation cost of the Rail Safety Improvement Act (RSIA) of 2008 divided by Class I system mileage from the Bureau of Transportation Statistics (BTS)
Crossings			
Active Warning Device	$200,000	Signal	MnDOT
Additional Costs (applied to track and signal)			
Engineering	10%		
Contingencies	30%		

Table 4.2 Cost Assumptions for Passenger Rail

Cost Item	Cost	Unit	Source
Rolling Stock			
High-Speed Rail	$35 million	Trainset	Acela – inflated
Conventional Rail	$18 million	Trainset	Northstar
Upgrade Track			
Class I to II	$63,360	Mile	TKDA
Class II to IV	$712,800	Mile	TKDA
Class III to IV	$712,800	Mile	TKDA
Class IV to VI	$79,200	Mile	TKDA
New Class IV/VI	$2,600,000	Mile	TKDA
Signalization			
CTC (Single Track)	$550,000	Mile	Northstar
CTC (Double Track	$750,000	Mile	Northstar
PTC	$100,000	Mile	Estimated implementation cost of the Rail Safety Improvement Act (RSIA) of 2008 divided by Class I system mileage from the Bureau of Transportation Statistics (BTS)
PTC Loco	$30,000	Locomotive	Northstar
Crossings			
Grade Crossing Upgrade	$200,000	Mile	TKDA
Quad Crossing	$400,000	Mile	TKDA
Operations and Maintenance (O&M)			
HSR O&M	$70	Annual Train Miles	Amtrak expenses divided by train mileage from BTS
Conventional O&M	$70	Annual Train Miles	Amtrak expenses divided by train mileage from BTS
Right-of-way (ROW)			
ROW	$910,000	Mile	$50,000/Acre and 150-foot ROW assumed
Capacity Rights			
Capacity Rights	$85,000	Daily Train Miles	Northstar
Additional Costs (applied to track and signal)			
Engineering	10%		
Contingencies	30%		

4.1 Freight-Only Corridor Needs

Freight-only corridors were evaluated with the GIS-tool to determine what improvements are needed today and will be needed in 2030 to achieve a freight LOS C or better. This section discusses improvements identified to mitigate sections of LOS D, E, and F track as shown previously in Figure 4.1, and to mitigate sections of LOS D, E, and F as shown in Figure 4.2. Needs and improvements are organized by freight rail operator, and then by subdivision. Recommended improvements in this section have been modeled using the GIS-tool and are shown in Figures 4.4 (2009 Freight Level of Service, With Recommended Improvements) and 4.5 (2030 Freight Plus 2009 Passenger Level of Service, With Recommended Improvements). The investments are summarized in Table 4.3.

Table 4.3 Summary of Freight-Only Investments

Subdivision	2009		Cost to Upgrade (Millions of Dollars)
Track, Signal, Bridge			
	BNSF		$68.00
	CN		$68.00
	CP		$230.00
	UP		$33.00
Other Major Class I Improvements			
	Bottlenecks *(incl. in passenger line costs)*		- -
	Bridges *(incl. in passenger line costs)*		- -
	Intermodal Facility		$150.00
Positive Train Control			
	Class I Mainlines		$1,640.00
286,000-pound Restrictions			
	Tracks and Bridges		$549.00
Non-Class I Improvements [a]			
	Speed restrictions		$411.00
Grade Crossings			
	Active Warning Devices (1,400)		$280.00
Upgrade Class I and III RRs to FRA Class 2 Track			
	FRA Class 2 Track (286K restrictions removed to avoid double counting)		$244.00
		Cost of Upgrades	$ 3,672.00
		10% Engineering / 30% Contingency	$ 1,468.90
		Total Cost	**$ 5,141.30** [a]

[a] Does not include unknown costs

4.1.1 Burlington Northern Santa Fe (BNSF)

BNSF lines crisscross nearly every part of Minnesota, providing vital linkages to important freight hubs such as Chicago and the coal-rich Powder River Basin. Despite this, most BNSF freight-only corridors in the State show comfortable volume-to-capacity ratios through 2030 and do not require much investment. Two corridors – the Browns Valley and P-Line subdivisions – are recommended for investment based on either weight or speed restrictions today. Only one freight-only corridor, the St. Croix subdivision, demonstrates a need for investment based on high freight volumes, but not until 2030. Both of these subdivisions carry few trains and serve primarily grain producers in western parts of Minnesota. Only one freight-only corridor, the St. Croix subdivision, demonstrates a need for investment based on high freight volumes, but not until 2030.

Small portions of three other subdivisions also are recommended for improvement. Passenger rail service is slated for most of each of these three subdivisions, but small segments are identified as freight-only and will need investment due to volume and capacity issues. These freight-only improvements, which are recommended for small parts of the KO, Marshall, and St. Paul subdivisions, are listed here. These improvements are summarized in Table 4.4.

Table 4.4 Summary of BNSF Improvements on Freight-Only Corridors

Subdivision	2009	Cost to Upgrade (Millions of Dollars)	2030	Cost to Upgrade (Millions of Dollars)
Browns Valley	X	$54.6		
KO			X	$0.5
Marshall			X	$6.2
P-Line	X	$1.0		–
St. Croix			X	$1.4
St. Paul			X	$4.2
Cost of BNSF Upgrades				$67.9

Browns Valley Subdivision

The BNSF Browns Valley subdivision is an approximately 39-mile line which serves three counties between a bend of the Red River in western Minnesota. The line connects Beardsley, its western terminus, and Morris, where it provides linkage to BNSF's Morris subdivision. Five grain facilities are in the vicinity of the line, but only one train a day traverses the subdivision. Unfortunately, the rail line may be unable to handle additional volume without intensive upgrades, specifically to several bridges. Specifically, the line and nine bridges are restricted from carrying heavy-axle freight cars in excess of 268,000 lbs. Moreover, there are 55 grade crossings – all of them unprotected. To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- Make the subdivision 286,000 lbs. rail car compliant by upgrading the entire 39 miles of track at a cost of $51.61 million.
- Upgrade nine bridges totaling 432 feet in length at a cost of $3.024 million.

KO Subdivision

Most of the KO subdivision lies in North Dakota, where its western terminus is Minot. While only 5.5 miles of the sub resides in Minnesota, the line is invaluable to both BNSF and the State. The line comprises a part of BNSF's northernmost transcontinental railroad, linking the Midwest with the ports of the Pacific Northwest. Nearly 70 trains travel the KO subdivision daily, a figure which is expected to increase to 80 trains by 2030. The line feeds the Dilworth intermodal facility and, not surprisingly, a large portion of the traffic is intermodal in nature. Also, the line carries large amounts of coal – from Montana and Wyoming – and grain from Montana, North Dakota, and Minnesota.

Amtrak's Empire Builder service uses the eastern portion of the KO subdivision, as it exists the BNSF Staples subdivision and leaves Minnesota via the BNSF Prosper subdivision. Improvements slated for this shared-use corridor are addressed in Section 4.2.3, including details of the line's need for CTC signalization. However, due to increased freight traffic by 2030, investment in increased capacity is recommended for the remaining all-freight segment of 1.2 miles. While the KO subdivision already is double-tracked and, but 2030, posses the CTC signaling system, additional capacity is required to maintain an acceptable level of service. To maintain LOS of C by 2030, the following improvement is recommended.

- Add passing sidings or a third mainline train for 0.288 miles between Moorhead Junction to the Red River at a cost of $489,600.

Marshall Subdivision

The BNSF Marshall subdivision is a 133.9-mile line which runs northeast-to-southwest from Willmar toward Sioux Falls, South Dakota. The line briefly leaves Minnesota as it approaches Sioux Falls, then remerges in the far southwestern corner of the State. A small 11-mile segment of the line continues toward Iowa and, eventually, Nebraska. Since the line arcs across a significant portion of the State, it provides numerous connections for many east-west intrastate lines, such as the BNSF Wayzata, BNSF Hanley Falls, DME Huron, TCWR Glencoe subdivisions, as well as the Minnesota Southern and Minnesota Prairie Line railroads.

The vast majority of the Marshall subdivision is slated for possible passenger service to Sioux Falls, a corridor known as the Little Crow line. Any recommended improvements involving this 122.6-mile portion of the Marshall sub is discussed in Section 4.2.4. The remaining section, which runs between the South Dakota and Iowa borders for approximately 11.3 miles, is discussed here. Currently, volume-to-capacity ratios in this short segment are approximately 0.65, for a LOS C. The segment sees only 11 daily trains, but with limited passing sidings and the use of Track Warrant Control (TWC), capacity limits are low. By 2030, the combination of a low track ratio of 1.1 and dark territory will be unable to comfortably handle the projected 16 daily trains, and the LOS drops to E. Additionally, there are 11 unprotected at-grade crossings, or one per mile. To improve the 2030 volume-to-capacity ratio, the following improvements is recommended:

- Install and implement CTC for the 11.3-mile short segment from South Dakota to Iowa. The total cost is $6.22 million.

P-Line Subdivision

The BNSF P-Line subdivision parallels the Red River north of Moorhead, connecting three modestly sized grain facilities with the BNSF Prosper line. Part of this 15-mile line may be abandoned and, like the Browns Valley subdivision, has one daily train and a large number of unprotected crossings. Speed is restricted by BNSF to 10 mph or less due to the condition of P-Line's track, which is rated as Class I. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Upgrade the track's condition for 15.6 miles from Class I status to Class II by improving the existing track. Specifically, the track requires a new ballast surface, raising the height 2'', and replacing some ties for a cost of $988,416.

St. Croix Subdivision

Only a 2.5-mile segment of the BNSF St. Croix subdivision is within Minnesota, but it is a very important piece of track. One of the principal crossings over the St. Croix River, which forms the border with Wisconsin, the St. Croix ferries 52 daily trains across the river on BNSF's principal Twin Cities-to-Chicago route. The railroad also provides vital linkages to Canadian Pacific's River subdivision, which parallels the Mississippi River.

While busy, the 2009 volume-to-capacity ratio is an acceptable 0.59. However, by 2030 the sub will carry 75 daily trains, ballooning the volume-to-capacity ratio to 0.85 with LOS E. To improve the 2030 volume-to-capacity ratio, the following improvement is recommended:

- Increase the track ratio for the 2.5-mile Minnesota length from 2.0 to 2.32. This improvement adds a third track for 0.8 mile approaching the bridge at a cost of $1.36 million.

St. Paul Subdivision

There are two sections of the BNSF St. Paul subdivision, both mightily important to the State's freight flow patterns. One 20-mile freight-only segment shuttles BNSF and Canadian Pacific trains on the fabled River Route from Hoffman Junction just east of downtown St. Paul to Hastings on the Mississippi River. Our projections show no investment needs through 2030 on this segment.

The other 11.4-mile segment connects the central areas of the Twin Cities, running between downtown St. Paul and the crowded University Junction area north-northwest of central Minneapolis. This line segment connects 10 different subdivisions operated by four railroads and directs freight traffic through or around some of the most congested junctions and bottlenecks. Since the line connects the two primary population and employment centers of the region, a small portion of the line is identified as a potential passenger rail corridor. Improvements to the St. Paul subdivision related to passenger rail are discussed in Section 4.2.5.

A 10.4-mile segment of track from Seventh Street to University Junction likely will remain a freight-only line. Currently, 52 daily trains use this segment, which already has a double main and modern CTC signaling and a service level of C. Absent capacity improvements, conditions in 2030 are projected to degrade to LOS D, when 73 daily freight trains are forecasted to use the line. To maintain current service levels and increase capacity, the following improvement is recommended:

- Add passing sidings totaling 2.45 miles to the existing double main track between Seventh Street and University Junction at a cost of $4.16 million.

4.1.2 Canadian National (CN)

CN's Minnesota network is concentrated primarily in the northeast between Duluth and International Falls, with some segments in the Twin Cities area and near the Iowa border, plus a transcontinental line in the north part of the State. Of the freight-only corridors, three demonstrate an immediate need for improvement – two in the Duluth region and one east of the Twin Cities. The Rainy subdivision, which connects Duluth to International Falls and Ontario shows an elevated volume-to-capacity ratio, due primarily to lack of modern signalization. Additionally, both the Dresser and Osage subdivisions have weight restrictions that necessitate investment. Interestingly, none of CN's lines show any need for improvement in 2030 based on volume and capacity projections. This highlights that the immediate need for repair will be able to support traffic through 2030. These improvements are summarized in Table 4.5.

Table 4.5 Summary of CN Improvements on Freight-Only Corridors

Subdivision	2009	Cost to Upgrade (Millions of Dollars)	2030	Cost to Upgrade (Millions of Dollars)
Dresser	X	$13.1		
Osage	X	$20.6		
Rainy	X	$34.0		
Cost of CN Upgrades				$67.7

Dresser Subdivision

The CN Dresser subdivision runs from Withrow, northeast of St. Paul, to the Wisconsin border near Otisville, with connections to Dresser, Wisconsin, and Rhinelander, Wisconsin. At Withrow, the line connects to Canadian Pacific's Withrow and Minneapolis subdivisions. Currently, CN runs ballast trains to a quarry in Dresser. The St. Croix Valley Railway also runs passenger trains on weekends and holidays during the spring, summer, and fall months. There are four trains a day on the Dresser subdivision except in the winter when the line is embargoed due to snow and ice conditions.

When trains are operating on this line, they must contend with weight restrictions on the entire Minnesota portion of the subdivision, including on two bridges. One of those bridges is the 286-foot-long span over the St. Croix River, which forms Minnesota's border with Wisconsin. In all, 330 feet of bridge rail and 15.2 miles of track should be upgraded. Currently, the entire line, including the bridges, is restricted from carrying heavy-axle freight cars in excess of 268,000 lbs. To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- Upgrade 15.2 miles of track to accommodate rail cars in excess of 286,000-lbs. at a cost of $10.75 million; and
- Upgrade two weight-restricted bridges, including the St. Croix River span, so they can handle rail cars in excess of 263,000 lbs. Total cost of these improvements is $2.31 million.

Osage Subdivision

The CN Osage subdivision is an approximately 20-mile line running from the Iowa border near Lyle to the Union Pacific's Albert Lea subdivision. The line was once part of the Cedar River Railroad and operates only four daily trains. Unfortunately, the line and a number of its bridges cannot accommodate heavy rail cars in excess of 268,000 lbs. There are 10 of these bridges, one every two miles, totaling 1,087 feet, including the 401-foot bridge over the Shell Rock River. To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- Upgrade 18.4 miles of track to accommodate rail cars in excess of 286,000 lbs., at a cost of $13.016 million; and
- Upgrade 10 bridges, making them 286k compliant, for a cost of $7.609 million.

Rainy Subdivision

The CN Rainy subdivision serves the Duluth and International Falls markets, providing a north-south spine of linkages to several interconnected railroads, many owned by CN. The northern terminus is the Canadian border with Ontario, while the southern terminus is just west of Duluth. The line provides a vital outlet for mining operations in the Iron Mountain region. A large portion of this corridor is being considered for a Duluth-to-International Falls passenger service, but is not deemed a viable corridor due to low ridership projections. Aside from potential passenger service, the southern and northern segments of the line have freight-induced volume-to-capacity issues which need to be addressed.

A large 94-mile middle segment of the Rainy subdivision operates under Centralized Traffic Control (CTC). Use of modern signaling on this section increases capacity on the single main to 39 daily trains. This is a comfortable margin for the 17 daily trains the subdivision currently sees. Unfortunately, on either side of this stretch of CTC, the Rainy subdivision operates under Track Warrant Control (TWC) conditions. Between the Canadian border and the line's junction with the Minnesota, Duluth, and Western (MDW) railroad, which provides direct linkage to International Falls, capacity is limited to 18 trains daily. The capacity is similarly limited for a 60.1-mile segment between the CN Superior subdivision just west of Duluth and Rainy Junction, in the heart of the region's mining operations. In both cases, volume-to-capacity ratios exceed 0.9.

To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Install and implement CTC on the far southern and northern segments. A total of 61.9 miles of CTC at a cost of $34.045 million needs to be installed to relieve pressure on the subdivision and alleviate the bottlenecks on either side of the existing CTC territory. A track expansion option is less expensive up front than the signaling option at $32.4 million, but would require annual maintenance costs which make it more expensive eventually. CN would need to achieve a track ratio of 1.45 to attain LOS C after build-out. Unfortunately, the line would degrade by 2030 and again require either signalization or more track. If CTC is installed now, projections show the Rainy subdivision would require no substantial investments through 2030.

4.1.3 Canadian Pacific (CP)

CP's rail operations generally run southeast to northwest across the State, with Minnesota acting as a linchpin between CP's major operations on Canada's west coast and its operations in the U.S. Midwest and Montreal. In fact, a CP train could enter the far southeastern tip of the State near Minnesota Slough on the Marquette subdivision, which is owned by a CP affiliated railroad, exit into Canada at Noyes in the far northwest.

Considering the important role Minnesota plays in CP's operations, it is not surprising that five CP subdivisions demonstrate a need for investment. However, of these recommended improvements, only two are immediate needs, and both are for lightly used lines. We recommend upgrading weight-restricted track and a bridge on the Bemidji subdivision and improving the Class I track on the MN&S subdivision. This last investment may prove more important, as CP could use the MN&S sub to bypass bottlenecks such as University Junction.

The remaining four subdivisions are major CP corridors in the State. While the volume-to-capacity ratios on these subs are acceptable currently, growth is expected to occur on them by 2030, necessitating investment. These improvements are summarized in Table 4.6.

Table 4.6 Summary of CP Improvements on Freight-Only Corridors

Subdivision	2009	Cost to Upgrade (Millions of Dollars)	2030	Cost to Upgrade (Millions of Dollars)
Bemidji	X	$29.6		
Detroit Lakes			X	$84.0
Elbow Lake			X	$38.5
MN&S	X	$1.2		
Noyes			X	$28.2
Paynesville			X	$48.2
Cost of CP Upgrades				$229.7

Bemidji Subdivision

The CP Bemidji subdivision is a 22-mile branch line which connects the CP's Detroit Lakes subdivision at Plummer to communities east, terminating at Gully. It does not serve the city of Bemidji and sees only two daily trains. It has a Class I track rating, a track-wide weight restriction of 268,000 lbs., with a 50-foot, non-286,000 lb. compliant bridge near milepost 424. To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- Upgrade 22.3 miles of track from Class I to Class II, accommodating rail cars in excess of 286,000 lbs., at a cost of $29.21 million.
- Upgrade the weight-restricted bridge to accommodate 286k-lb. rail cars at a cost of $350,000.

Detroit Lakes Subdivision

The CP Detroit Lakes subdivision is a major north-south freight corridor. The 187.1-mile line begins at Glenwood in the south and terminates at Thief River Falls, providing a crucial link between CP's Paynesville and Noyes subdivisions along CP's Chicago to Winnipeg route. The line also makes numerous connections with other railroads, large and small, from the busy BNSF Staples subdivision to the Northern Plains Line. The segments of track between Detroit Lakes, where the subdivision connects with the BNSF Staples subdivision, and Thief River Falls are slated for passenger rail, although the viability of the project is in doubt due to low ridership projections. Regardless of possible passenger service, the line will experience a degradation of freight service by 2030 due primarily to lack of modern signalization and few passing sidings.

The entire subdivision operates under Track Warrant Control (TWC), while track ratios for various segments range from 1.05 to 1.0, suggesting very few passing sidings. While LOS currently is C, by 2030, the number of trains is projected to increase from the current nine per day to 14. This meager increase is enough to degrade service to LOS D and increase the volume-to-capacity ratio to 0.75.

To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- North of the city of Detroit Lakes, install and implement Centralized Traffic Control (CTC) to replace the TWC system for an 89.4-mile section by 2030. The total cost is $49.17 million; and
- South of the City of Detroit Lakes, increase the track ratio from 1.04 to 1.21 by adding 20.5 miles of additional track at a cost of $34.9 million. This increases capacity to approximately 21 daily trains, while avoiding the large outlay required to install Centralized Traffic Control (CTC) on this continuous 97.7-mile segment. This signalization would cost $54 million.

Elbow Lake Subdivision

The CP Elbow Lake subdivision is a 70-mile line which provides connectivity between western Canada, North Dakota, and Chicago. The line terminates at Glenwood where it connects with the CP's other major lines in western Minnesota; the Paynesville and Detroit Lakes subdivisions. It is a major corridor for CP even though Track Warrant Control (TWC) is utilized and few passing sidings exist. By 2030, the number of trains is forecasted to nearly double from 12 in 2009 to 22. This jump in volume will put pressure on the capacity-challenged line and warrant major investment. Unimproved, the line's volume-to-capacity ratio explodes to 1.19, or LOS F. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Install and implement CTC for the entire subdivision for a total cost of $38.5 million. This signalization will lower the volume-to-capacity ratio to 0.55, or LOS C.

MN&S Subdivision

The CP MN&S Spur line runs north and south on the western edge of greater Minneapolis, linking two principal east-west rail lines – the CP Paynesville and BNSF Wayzata subdivisions. Additionally, through its connection with the PGR's Savage subdivision, the MN&S links a third Class I railroad – the UP Mankato line. The line also crosses the CP/TCWR Bass Lake Spur, but there is no connection with this fellow CP line, only a flyover. The northern terminus is the busy CP Paynesville sub at MN&S Junction, while the southern terminus is the PGR Savage sub at Auto Club Junction.

Currently, the MN&S operates as a branch line with six daily trains. However, due to the line's connectivity to other railroads and increasing rail congestion through the central Twin Cities corridor, there has been discussion of upgrading the line for increased utilization as a bypass. This would require significant investment, as issues with the line include difficult geometrics, a number of unprotected crossings, shallow crossings, limited right-of-way, proximity to neighborhoods, no passing sidings, no connectivity with the CP Bass Lake Spur, an embargoed bridge at the Minnesota River, and use of the antiquated Block Registry Transfer (BRT) control system, which is dark territory with no signals.

Regardless of future use, the entire subdivision's track is rated as Class I and trains are limited to a 10 mph speed restriction. Such conditions restrict use of the line and require improvement. To improve the ability of this rail line to accommodate freight traffic, the following investments are recommended:

- Upgrade the track for the entire 18.5-mile subdivision from Class I status to Class II. Specifically, the existing track requires a new ballast surface, raising the height 2'', and replacing some ties for a cost of $1.172 million; and
- Upgrade or replace Wirth Parkway bridge on the spur line connecting the subdivision with the BNSF Monticello subdivision. The bridge, which sees one daily train, restricts rail traffic due to a vertical clearance issue. The cost of this improvement is unknown.

Noyes Subdivision

The CP Noyes subdivision is a 79-mile line which connects CP's Detroit Lakes subdivision to the railroad's operations in Manitoba, providing a critical link in CP's Chicago to Winnipeg route. The line runs from Thief River Falls to the Canadian border at Noyes. It is a major corridor for CP, but like some other major Minnesota CP operations, lacks modern signaling and uses Track Warrant Control (TWC). Moreover, there are few passing sidings, thus limiting capacity to 18 daily trains. Currently, nine trains per day use the Noyes subdivision, but by 2030, that number is expected to increase to 15. This is near capacity and degrades to LOS E. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Increase the track ratio from 1.02 to 1.21 by adding 16.6 miles of additional track at a cost of $28.2 million. This increases capacity to approximately 21 daily trains, while avoiding the large outlay required to add Centralized Traffic Control (CTC) to the entire line.

Paynesville Subdivision

The CP Paynesville subdivision is major corridor, linking the Twin Cities to points west and north in CP's network. In fact, the subdivision acts as a funnel for CP freight traffic from Canada's west coast, prairie provinces, North Dakota, and much of Minnesota. The 118-mile line begins in Glenwood, where it joins with CP's Detroit Lakes and Elbow Lake subdivisions, which angle north and northwest respectively. The line ends at University Junction in Minneapolis, where it connects with the CP Withrow, BNSF Staples, Midway, and St. Paul subdivisions.

Unlike the other major CP corridors discussed above, the Paynesville operates Centralized Traffic Control (CTC) and has slightly more frequent passing sidings. Unfortunately, the volume on the line is projected to jump from 20 daily trains to 36 by 2030. Current capacity is 39 trains. Unimproved, the line's volume-to-capacity ratio rises to 0.91, or LOS E, clogging one of the CP's most important lines. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Increase the track ratio from 1.08 to 1.24, adding 28.34 miles of additional track at a cost of $48.2 million.

4.1.4 Union Pacific (UP)

Union Pacific is the nation's largest railroad with connections to every major port on the west and gulf coasts. In Minnesota, UP's service is concentrated in the State's south, with connections to Iowa, Nebraska, Chicago, and points beyond. Four UP subdivisions demonstrate a need for immediate improvement and all four lines are lightly used collection/distribution routes where various restrictions are found. In fact, the Hartland, Montgomery, Rake, and Winona subdivisions share many similarities. All are short in length, ranging from the 1.8-mile Winona sub to the 21-mile Montgomery sub, and all are used as branch lines. These improvements are summarized in Table 4.7.

Table 4.7 Summary of UP Improvements on Freight-Only Corridors

Subdivision	2009	Cost to Upgrade (Millions of Dollars)	2030	Cost to Upgrade (Millions of Dollars)
Hartland	X	$18.7		
Montgomery	X	$10.4		
Rake	X	$4.1		
Winona	X	$0.1		
Cost of UP Upgrades				$33.3

Hartland Subdivision

The UP Hartland subdivision is a 12.4-mile branch line which currently sees no service. It connects the community of Hartland with the UP's Albert Lea subdivision at Albert Lea, which is a major north-south corridor known as the Spine Line. The line has several deficiencies, including both weight and speed restrictions, and it carries a Class I track rating. Heavy rail cars exceeding 268,000 lbs. are barred from the entire line and four bridges totaling 345 feet in length are similarly classified. Train speeds on the line cannot exceed 10 mph. To improve the ability of this rail line to accommodate more freight traffic, the following improvements are recommended:

- Upgrade all 12.4 miles of track from Class I rating to Class II, making it 286,000 lbs. rail car compliant at a cost of $16.24 million.
- Upgrade the four weight-restricted bridges to accommodate rail cars in excess of 286,000 lbs. at a cost of $2.415 million.

Montgomery Subdivision

The UP Montgomery subdivision is a 23.5-mile branch line connecting the communities of Montgomery and New Prague to the busy UP Mankato sub southwest of the Twin Cities. Two trains a day – one round trip pair – use the line, which is rated Class III. Unfortunately, 13 bridges, approximately one every two miles, cannot accommodate heavy rail cars in excess of 268,000 lbs. Several of the bridges also are in excess of 150 feet in length, compounding the cost of upgrading the line. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Upgrade the 13 weight-restricted bridges to accommodate rail cars in excess of 263,000 lbs. at a cost of $10.423 million.

Rake Subdivision

The UP Rake subdivision is a 5.14-mile branch line connecting communities in north central Iowa to the UP Fairmont sub. Most of the extent of this subdivision is in Iowa. Two trains a day use the line, which is rated Class IV. Unfortunately, despite the track's high class rating, the line is not 286,000 lbs. heavy rail car compliant. Rail cars in excess of 268,000 lbs. are excluded from the line and one short bridge of 64 feet close to the Iowa border. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Upgrade the subdivision's track so the line may accommodate heavy rail cars of at least 286,000 lbs., at a cost of $3.636 million; and
- Upgrade the weight-restricted bridge to accommodate rail cars in excess of 286,000 lbs. at a cost of $448,000.

Winona Subdivision

The UP Winona subdivision is a 1.8-mile branch line connecting the city of Winona with the busy CP River subdivision and the intrastate DME Waseca subdivision. It serves local industry and averages one train per day. The track is rated at Class I, which requires improvement. There is an unknown horizontal clearance issue within the city of Winona, which will add to the cost of any upgrades listed here. To improve the ability of this rail line to accommodate more freight traffic, the following improvement is recommended:

- Upgrade 1.8 miles of track from Class I rating to Class II at a cost of $107,712. The track requires a new ballast surface, raising the height 2'', and replacing some ties; and
- Investigate and resolve the unknown horizontal clearance impediment.

4.1.5 Other Major Class I Improvements

Table 4.8 highlights major Class I project needs and the cost to alleviate these present day bottlenecks. Following the table is a brief description of each of these bottlenecks. While these projects are each on the freight system today, many of these upgrades only become critical as passenger service is introduced on the line. Section 4.2 discusses specific passenger corridors that require these major Class I improvements.

Table 4.8 Other Major Class I Improvements

Project	Cost to Upgrade (Millions of Dollars)
Junctions	
Coon Creek Junction	$100
Dan Patch Interchange (Savage)	$10
Hoffman Interlocking	$54
Minneapolis Junction	$33
Moorhead Junction	$5
Shakopee Realignment	$163
St. Anthony Junction	$27
St. Louis Park Interchange	$70
University Interlocking	$14
Bridges	
BNSF Bridge 28.3	$4
BNSF Bridge 30.2	$6
BNSF Bridge 62.4	$13
BNSF Bridge 91.8	$2
Grassy Point Swing Bridge (BNSF) over Saint Louis River	$51
Hastings (CP) over Mississippi River	$90
Hudson (UP) over St. Croix River	$87
La Crescent Swing Bridge (CP)	$117
Mendota Heights (UP) (Omaha Road Bridge #15) over Mississippi River	$44
Pigs Eye Bridge (UP) over Mississippi River	$76
Robert Street Vertical Lift Bridge (UP) over Mississippi River	$51
Savage (TC&W) over Minnesota River	$34
Intermodal Facility – New Twin Cities Area Facility	$150
Total Cost	**$1,201**

Junctions

Coon Creek Junction. Coon Creek junction is the location on the Staples subdivision where the Hinckley subdivision begins and heads north toward Duluth. The possibility of an additional mainline track from Coon Creek junction to Northtown would help the capacity of this junction.

Dan Patch Interchange (Savage). In order to provide passenger service from Mankato to Minneapolis a connecting piece between the Mankato subdivision and the Dan Patch line would need to be built. The two railroads are grade separated so a significant amount of track would need to be built in order to accommodate a small grade. Businesses currently function on the land that would need to be acquired.

Hoffman Interlocking. Hoffman Junction is one of the major bottlenecks in the State of Minnesota. Three of the four Class I railroads operating in Minnesota have facilities that interchange in this area. The UP movement crosses the CP and BNSF main lines to access the Pigs Eye area. This movement limits capacity for all three rail carriers. The identified improvement will provide for grade separation between the UP movement and the CP and BNSF mainlines and thus increase capacity through the junction.

Minneapolis Junction. Minneapolis Junction is one of the major bottlenecks in the State of Minnesota. The potential capacity of the junction could be increased with the addition of a second main around the west leg of the wye. This improvement would not satisfy the lack of speed through the west leg of the wye. The curve currently is a seven degree curve therefore restricting the speed of passenger trains to a speed of 25 mph. A true fix to the current bottleneck would include property acquisition and the easing of the curve around the west leg of the wye. There are many businesses within the affected area that would need to be purchased and leveled to accommodate the new alignment. Several bridges would need to be reconstructed as well. Central Ave would need extensive modifications both on the Wayzata subdivision portion as well as the Midway subdivision portion. There currently is a railroad bridge over Spring Street N.E. that would need to be rebuilt and the current profile and alignment of Spring Street would need to be changed.

Moorhead Junction. Larger turnouts to increase speed.

City of Shakopee Track Realignment. To increase the speed through the city of Shakopee a by-pass may need to be constructed for the Union Pacific's Mankato subdivision. The by-pass could provide 10 miles of track around the downtown area of Shakopee.

St. Anthony Junction. The CP alternative to connect commuter rail from St. Paul to Minneapolis requires traveling through the Minnesota Commercial's A yard. An option to increase speed through the A yard would be to relocate some of the track. This would minimize existing curvature and increase speeds.

St. Louis Park Interchange. A study currently is underway to determine the future for the St. Louis Park Interchange.

University Interlocking. University interlocking is a station location on the BNSF. The speeds though this junction are adequate for the BNSF but the CP has slow speeds as it leaves the BNSF and begins the Paynesville subdivision. To avoid congestion on the BNSF line a track could potentially be built to the east for the CP to exit the BNSF at higher speeds. In order for the CP to continue at higher speeds on the Paynesville subdivision there would need to be either easing of the curve leading to the bridge or construct a new bridge for CP over BNSF that is not as perpendicular to the BNSF as the current bridge.

Bridges

BNSF Bridges on Hinckley Subdivision. The following estimates are for the replacement of four single track bridges on the BNSF's Hinckley subdivision. A proposed replacement bridge at mile post 28.3 over the Net river would be replaced with a nine span 345-foot steel deck plate girder bridge at a cost of $4 million. A proposed replacement bridge at mile post 30.2 also over the Net river would be replaced with a 13 span 465-foot steel deck plate girder bridge at a cost of $6 million. The proposed replacement bridge at mile post 62.4 over the Kettle river would be replaced with a 14 span 743-foot steel deck plate girder bridge at a cost of $13 million. The proposed replacement bridge at mile post 91.8 over the Snake river would be replaced with a five span 257-foot-long steel deck plate girder bridge at a cost of $2 million. The cost to replace all four bridges on the Hinckley subdivision would be $25 million. The cost does not include demolition of the current bridges and it assumes the new bridges would be constructed at least 25 feet from the existing structures. Approach construction, engineering, and contingency's are not included in the cost.

Grassy Point Bridge. The Grassy Point bridge crosses the St. Louis River on the BNSF's line between Superior, Wisconsin and Duluth, Minnesota. The current bridge is a steel through truss center pivot swing span. A proposed replacement bridge would be a 240-foot-long single track vertical lift span. The remaining 1,280 feet of the bridge would be constructed using 40-foot deck plate girder spans. The estimated cost of the bridge is $51 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Hastings Bridge. The Hastings bridge crosses the Mississippi River on the Canadian Pacific's River Subdivision. The current bridge is a through truss vertical lift span. A proposed replacement bridge would be a 324-foot-long double track vertical lift span. The remaining 1,440 feet of the bridge would be constructed using 60-foot deck plate girder spans. The estimated cost of the bridge is $90 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Hudson Bridge. The Hudson bridge crosses the Mississippi River on the Union Pacific's Altoona Subdivision. The current bridge is a steel through truss center pivot swing span. A proposed replacement bridge would be a 160-foot-long single track vertical lift span. The remaining 3,780 feet of the bridge would be constructed using 60-foot deck plate girder spans. The estimated cost of the bridge is $87 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

La Crescent Bridge. The La Crescent bridge consists of four different bridges that cross the Mississippi River, the east channel of the Mississippi, the Black River, and the French slough. The bridges are located on the Canadian Pacific's Tomah Subdivision. The types of current bridges listed above are respectively a steel through truss center pivot swing span, a steel deck plate girder, a steel through truss draw span, and a steel deck plate girder. The proposed replacement bridges would all be double track fixed spans. The proposed replacement bridge over the Mississippi channel is a 360-foot-long fixed through truss span and an 880-foot-long deck plate girder bridge consisting of 11 80-foot spans. The proposed replacement bridge over the east channel is an 800-foot-long deck plate girder bridge consisting of 10 80-foot spans. The proposed replacement bridge over the Black River channel consists of a 150-foot through truss main span and an 800-foot deck plate girder bridge consisting of 10 80-foot spans. The proposed replacement bridge over the French Slough consists of a 800-foot-long deck plate girder bridge consisting of 10 80-foot spans. The estimated cost for all of the bridges is $117 million. The cost does not include demolition of the current bridges and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Mendota Heights Bridge. The Mendota Heights bridge crosses the Mississippi river on the Union Pacific's Mankato Subdivision. The current bridge is a steel through truss swing span. A proposed replacement bridge would be a 200-foot-long single track vertical lift span. The remaining 600 feet of the bridge would be constructed using 40-foot beam spans. The estimated cost of the bridge is $44 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Pigs Eye Bridge. The Pigs Eye bridge crosses the Mississippi River on the Union Pacific's Albert Lea Subdivision. The current bridge is a steel through truss center pivot swing span. A proposed replacement bridge would be a 240-foot-long single track vertical lift span. The remaining 1,040 feet of the bridge would be constructed using 44-foot deck plate girder spans. The estimated cost of the bridge is $76 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Roberts Street Bridge. The Roberts Street bridge crosses the Mississippi river on the Union Pacific's State Street Industrial Lead. The current bridge is a through truss vertical lift span. A proposed replacement bridge would be a 200-foot-long single track vertical lift span. The remaining 800 feet of the bridge would be constructed using 80-foot deck plate girder spans. The estimated cost of the bridge is $51 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Savage Bridge. The bridge in Savage, Minnesota crosses the Minnesota river on the MN&S line. The current bridge is a steel through truss center pivot swing span. A proposed replacement bridge would be a single track 160-foot-long through truss vertical lift span. The remaining 330 feet of the bridge would be constructed using 30-foot beam spans. The estimated cost of the bridge is $34 million. The cost does not include demolition of the current bridge and it assumes the new bridge would be constructed at least 25 feet from the existing structure. Approach construction, engineering, and contingency's are not included in the cost.

Intermodal Facilities

New Twin Cities Intermodal Facility. This study identified the need for enhanced intermodal connectivity either through expansion of existing intermodal facilities, reinstating service in closed facilities (e.g., Dilworth), or through the construction of a new intermodal facility in the Twin Cities. The cost estimate included in this report is for the highest cost option, a new Twin Cities intermodal facility.

4.1.6 Non-Class I Railroads

In the volume-to-capacity analysis of the State's rail network, none of the non-Class I railroads exhibited elevated volume-to-capacity issues. In most cases, train volumes on these lines are minimal. There exists, however, a number of posted restrictions which affect 2009 freight flows. Those restrictions are summarized in Table 4.9 below. No 2030 restrictions were found on these lines, indicating that these repairs, for a total investment of over $410M will carry these segments' needs through 2030.

Table 4.9 Summary of Non-Class I Improvements on Freight-Only Corridors

Owner/Sub	2009	Type of Upgrades	Cost to Upgrade (Millions of Dollars)
Cloquet Terminal	X	Speed restriction, weight-restricted bridge and track (unknown)	$6.7
DM&E Waseca	X	Weight-restricted bridge and track (263)	$77.5
ICE Owatonna	X	Speed restriction	$1.4
MDW	X	Speed restriction	$0.3
MNN Ada	X	Speed restriction	$1.0
MNN P-Line	X	Speed restriction	$2.8
MNN Warroad	X	Weight-restricted bridge and track (263), speed restriction	$146.6
MNNR Hugo	X	Speed restriction	$0.9
MNNR St. Paul-Fridley	X	Speed restriction	$0.8
MPLI Redwood Falls	X	Weight-restricted bridge and track (263), speed restriction	$110.3
MSWY LaVerne	X	Speed restriction, weight-restricted bridge and track (unknown), bridge repairs	$56.4
NLR Cold Spring	X	Speed restriction, bridge repair	$1.6
NLR East Side	X	Speed restriction	$0.1
NLR St. Joe	X	Speed restriction	$0.3
OTVR Barnsville	X	Vertical Clearance – New bridge at Union Avenue in Fergus Falls needed.	Unknown
PGR Cannon Falls	X	Speed restriction	$0.6
PGR Dan Patch	X	Speed restriction, bridge repair	$0.7
PGR Eagandale	X	Speed restriction, bridge repair	$0.7
PGR Faribault	X	Speed restriction	$0.1
PGR Savage	X	Speed restriction	$1.3
SCXY Amber	X	Bridge repair	$0.6
Total Cost			**$411.0**[a]

[a] Does not include costs for "unknown" improvements.

4.1.7 Summary of Upgrades for 286,000-lb. Compliancy

The American Short Line and Regional Railroad Association (ASLRRA) released a report in 2000 that identified $6.9 billion in costs (1999 dollars) to upgrade the track of America's short line and regional railroads to accommodate the current standard weight of 286,000 pounds. This estimate was updated as part of the AAR *National Rail Freight Infrastructure Capacity and Investment Study*[5] that derived a new value for upgrading short line and regional railroad track to accommodate 286,000-pound loads of $7.2 billion (in 2007 dollars).

In Minnesota there are 453 miles of railroads that currently are non-286,000-pound complaint. Most noncompliant lines are restricted from carrying any heavy rail car in excess of 268,000 pounds. Based on this study's assessment, the cost to upgrade these noncompliant lines to carry 286,000-pound railcars is nearly $550 million, roughly eight percent of the national total, as shown in Table 4.10.

Table 4.10 Summary of Subdivisions Requiring Upgrades to Carry 286,000-Pound Rail Cars

Owner	Sub	Miles	Track Cost (Millions of Dollars)	Bridge Cost (Millions of Dollars)	Total Cost (Millions of Dollars)
BNSF	Browns Valley	39	$52	$3	$55
CN	Dresser	15	$11	$2	$13
CN	Osage	18	$13	$8	$21
CP	Bemidji	22	$29	$0	$30
CTRR	Cloquet Terminal	3	$4	$3	$7
DME	Waseca	98	$69	$8	$78
MNN	Warroad	92	$121	$26	$147
MPLI	Redwood Falls	81	$86	$24	$110
MSWY	LaVerne	42	$54	$2	$56
UP	Hartland	12	$16	$2	$19
UP	Montgomery	24	–	$10	$10
UP	Rake	5	$4	$0	$4
Total Cost					**$549**

4.1.8 Positive Train Control

Positive Train Control (PTC) refers to technology that is capable of preventing train-to-train collisions, overspeed derailments, and casualties or injuries to roadway workers (e.g., maintenance-of-way workers, bridge workers, and signal maintainers), operating within their limits of authority, as a result of

[5] National Rail Freight Infrastructure and Investment Capacity Study, Association of American Railroads, 2007.

unauthorized incursion by a train. Prior to October 2008, PTC systems were being voluntarily installed by various carriers. However, the Rail Safety Improvement Act of 2008 (RSIA) (signed by the President on October 16, 2008, as Public Law 110-432) mandated the widespread installation of PTC systems by December 2015.[6]

For the purpose of this study it was assumed that all Class I railroads in Minnesota would be required to comply with this ruling. Calculating the cost for this systemwide upgrade involved two steps: first, identifying those signals on the Class I system that needed to be upgraded to Centralized Traffic Control (CTC); and second, calculating the cost of installing PTC along the entire Class I network. This cost was estimated to be approximately $1.64 billion. It should be noted that there are a number of passenger rail projects being pursued in the state and cost sharing for the installation of this technology is likely between the freight railroads and passenger service implementers.

4.1.9 Grade Crossings[7]

Minnesota has 4,300 public grade crossings of which 1,400 have active warning devices. The institutional structure of the Minnesota Department of Transportations (DOT) Section 130 currently requires that Central Office staff evaluate and prioritize grade crossing improvement projects on the basis of accident frequency and safety needs, as well as replacement needs. The $5 million Federal and $600,000 Minnesota Highway Safety Administration (HSA) funding allows approximately 25 projects per year to be planned. Programming is routed through the eight Area Transportation Partnerships (including the metro-area Transportation Advisory Board), and is integrated into the highway project programming. Because of local priorities, many grade crossing projects are delayed or rejected at this stage, creating deficiencies in the statewide safety program. This protocol also ignores the fact that much of this work is performed by specialty rail contractors, not local highway contractors. The result is to leave about 20 to 30 percent of the Federal funding unused before expiration. This programming protocol also doubles the delivery time for a project from needs identification to completion of construction, from three years to six years. Because of these problems and the statewide nature of the program, a change to a fully centralized program would be appropriate.

MnDOT recently conducted an analysis of grade crossing active warning devices to determine the prevalence of and need to upgrade aging infrastructure and estimated that approximately 270 signals are 20 years or older (as of 2006), while the normal lifespan for an active warning device is 25 years. Aging active

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[6] Federal Railroad Administration, www.fra.dot.gov.

[7] MnDOT Office of Freight and Commercial Vehicle Operations, September 2009 presentation.

warning devices are increasingly difficult to maintain due to lack of replacement parts, thus oftentimes entirely new warning devices must be installed at a cost of $200,000 each. As many signals were installed in the 1980s and 90s, MnDOT estimates that within 20 years, 1,400 existing warning devices will need to be upgraded. Thus, by this study's future year, 2030, all 1,400 warning devices will need replacement, for a total cost of $280 million.

It is recommended that active warning devices be upgraded or replaced on a 20-year cycle. This would necessitate roughly a three-fold increase in the number of programmed projects and two to three times the funding levels. HSA should be increased to $1 million to support this level of activity, and the availability of Federal funds also would need to be increased. There have been proposals to remove the grade crossing dedication from Federal safety funds in the new transportation authorization bill, which would severely handicap any movement toward expanding this program. In addition to work on active warning devices, Minnesota has not addressed the issue of identifying and funding potential grade crossing separations at heavily trafficked locations, and will need to consider this as a significant strategy on high-speed passenger rail routes.

Concerns regarding grade crossings go beyond simply maintaining and improving what already is present. As development patterns change and highway and rail traffic volumes grow in urbanizing areas, a range of solutions will be necessary to effectively address increased interactions between highway and rail traffic, pedestrians, and rail line abutters more generally. Ideally, interactions should be minimized, a result that can sometimes be accomplished through crossing closures at very low cost, and through grade separations, which is usually the most costly solution available. Between these two extremes are more advanced crossing systems, such as four-quadrant gates, that more effectively block vehicular and pedestrian incursions into oncoming rail traffic. More costly than conventional North American technologies, these are increasingly being adopted in locations where there are substantial train and highway volumes, as well as other risk factors. Concurrent with improvements at grade crossings, increased use of fencing, median separators, automated enforcement systems, and other technologies are being used to reduce crossing incidents. These permit the implementation of quiet zones, locations where trains do not whistle upon approaching grade crossings.[8]

Undertaking these types of improvements can be substantially more costly than simply maintaining existing active crossing systems. While grade crossing closures can sometimes be accomplished at little or no cost, advanced grade crossing systems can approach double the cost of a conventional system. Grade

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[8] http://www.bytrain.org/Safety/sealed.html provides a good summary on the available advanced technologies, as applied by North Carolina on its Raleigh-Charlotte corridor.

separations cost far more, starting at a minimum cost of $2.5 million, and easily exceeding $15 million in congested urban areas.

4.1.10 Freight Rail Relocation

Freight rail tracks and associated infrastructure represent significant capital investments at fixed locations. Nonetheless, there are circumstances under which the relocation of freight rail lines may be warranted. Similarly, freight rail traffic itself can be deployed differently across the network. States, cities, and the railroads themselves have pursued changes in the freight rail network and freight rail operations in order to accomplish a variety of objectives. These include:

- Rationalizing network operations to reduce freight rail operating costs and improve service reliability, particularly through enhanced speed, capacity, connectivity, and flexibility;
- Freeing up rail line capacity so as to accommodate passenger rail operations;
- Mitigating the impacts of rail operations in communities, including noise, vibration, and aesthetics;
- Minimize risk exposure of hazmat freight rail operations; and
- Providing service to freight facilities such as new intermodal (container) terminals or improving access to water ports.

The relocation of freight rail lines or operations can ease rail bottlenecks, reduce vehicle traffic delays at grade crossings, improve safety, and spur economic development or redevelopment opportunities. At the same time, when rail service is introduced to newly served areas or significantly increased along existing lines, there is potential for realizing negative impacts on those communities, including land use, safety, and environmental concerns. These impacts may require mitigation, such as noise walls, grade separations, and other strategies.

Substantial freight rail relocation projects, such as a rail bypass, a new line or significant increases in train volumes, require the review and approval of the Federal Surface Transportation Board (STB). Such projects may be initiated either by private entities (such as a railroad) or a public agency. Typically the STB requires extensive environmental documentation and assessment to be completed for major projects. In addition, other state and Federal environmental requirements apply to such projects, particularly when public funding is involved.

In Minnesota, the issue of freight rail relocation will become increasingly important as the passenger rail network develops and as communities grow. Currently, there are several relocation projects in the State that are under consideration.

In Rochester, the Southern Rail Corridor coalition, including the Olmsted County Regional Rail Authority, the City of Rochester, and the Mayo Clinic have proposed a 48-mile freight rail bypass south of Rochester to replace downtown freight rail service operated by the Canadian Pacific (CP/DM&E). The coalition has identified far-reaching benefits that would result, including improved community safety, enhanced economic development, improved freight rail service, and better integration with passenger rail service. At the same time, the Citizens Against Rochester's Bypass (CARB) actively opposes the proposal, citing far-reaching negative impacts, including environmental concerns, loss of productive farmland, impacts on landowners, safety concerns, and lack of need for the relocation. The Dodge County Regional Rail Authority, through which a portion of the rail bypass would pass, has approved a resolution opposing the proposal for many of the same reasons. The CP/DM&E railroad has expressed neither support nor opposition to the proposal, and has recently completed a rehabilitation of track work through downtown Rochester.

In Hennepin County, the Twin Cities and Western Railroad (TC&W) currently operates freight rail service along the Kenilworth Corridor through the City of St. Louis Park and the City of Minneapolis providing a connection into downtown Minneapolis. Hennepin County owns the rail line. Kenilworth was originally intended to "temporarily" accommodate freight rail traffic that originally crossed TH55/Hiawatha LRT corridor at-grade. However, freight rail service has operated over 10 years on Kenilworth, which has required County investment for infrastructure improvements. The County and its municipal partners are exploring future alternative routings to select a long-term solution for freight rail service. A bike/pedestrian trail also operates in the Kenilworth Corridor, and the corridor also is under consideration as a segment of the preliminary locally preferred alternative for the Southwest LRT Transitway.

Both the Rochester Southern Rail Corridor and Hennepin County Kenilworth freight rail relocation examples suggest the need for full consideration of:

- A public and transparent planning process that allows all affected stakeholders to fairly represent their interests;
- State, regional, and local comprehensive, transportation, and land use plans, including those for passenger rail development;
- The impacts, costs, and benefits of proposed relocation projects, including the "no-build" alternative;
- Equitable sharing of costs and benefits for the project amongst governmental units, the railroad, and other stakeholders as warranted;
- The need to preserve and enhance freight rail service and to provide adequate capacity to meet current and future demand; and
- The need to preserve and enhance communities through which freight rail lines pass by means of effective mitigation and design strategies.

Recommendation

Both the Southern Rail Corridor and Kenilworth projects should proceed through further study development and evaluation, led by locally responsible public agencies. The State of Minnesota should cooperate in these efforts, providing technical resources, potential access to Federal funds, and to assess consistency of the proposals with the State Rail Plan. The consequences of pursuing and also not pursuing these projects should be fully understood prior to decision-making about funding and implementation. Environmental clearances would be required from all regulatory agencies.

Figure 4.4 2009 Freight Level of Service, With Recommended Improvements

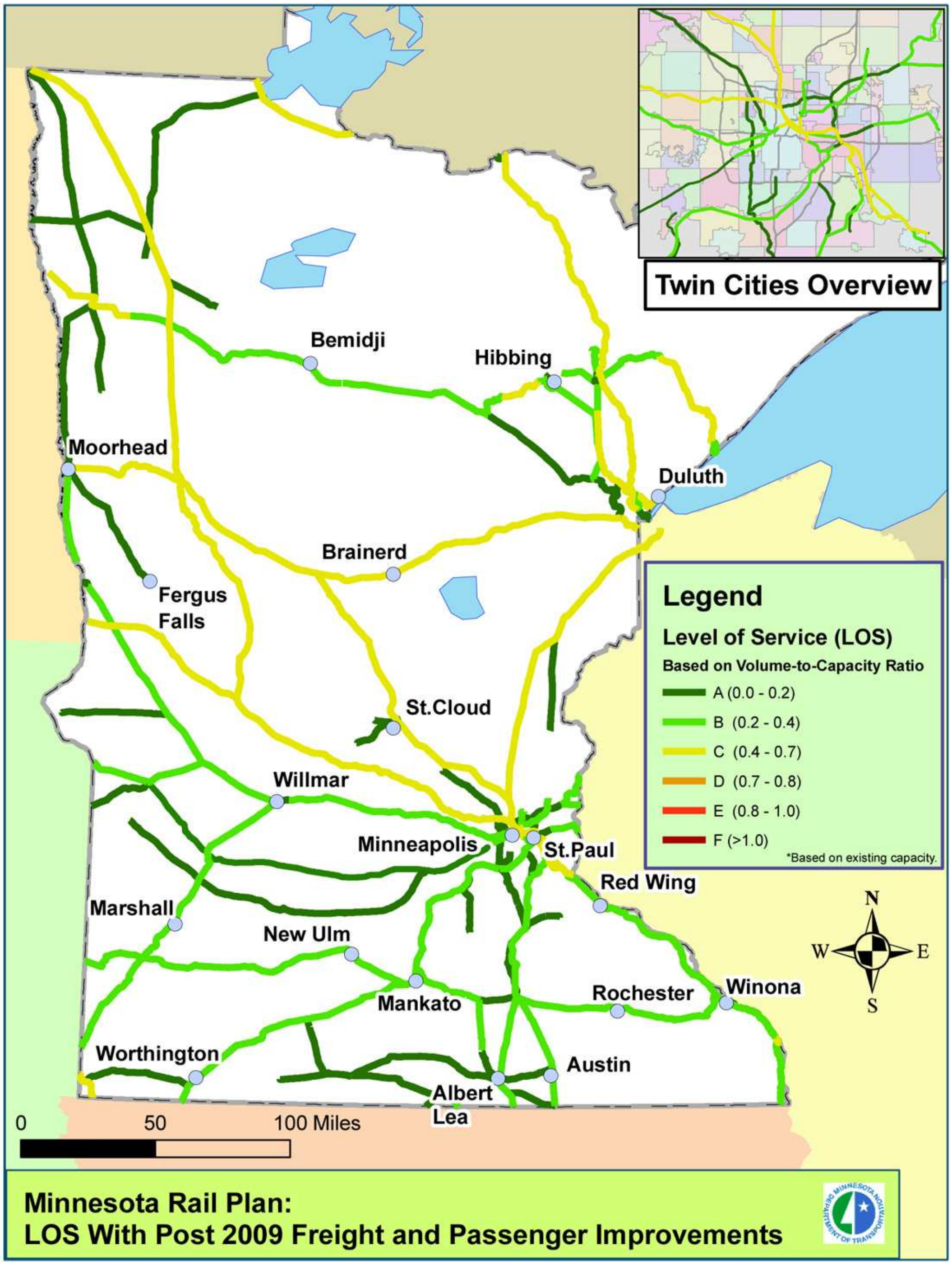
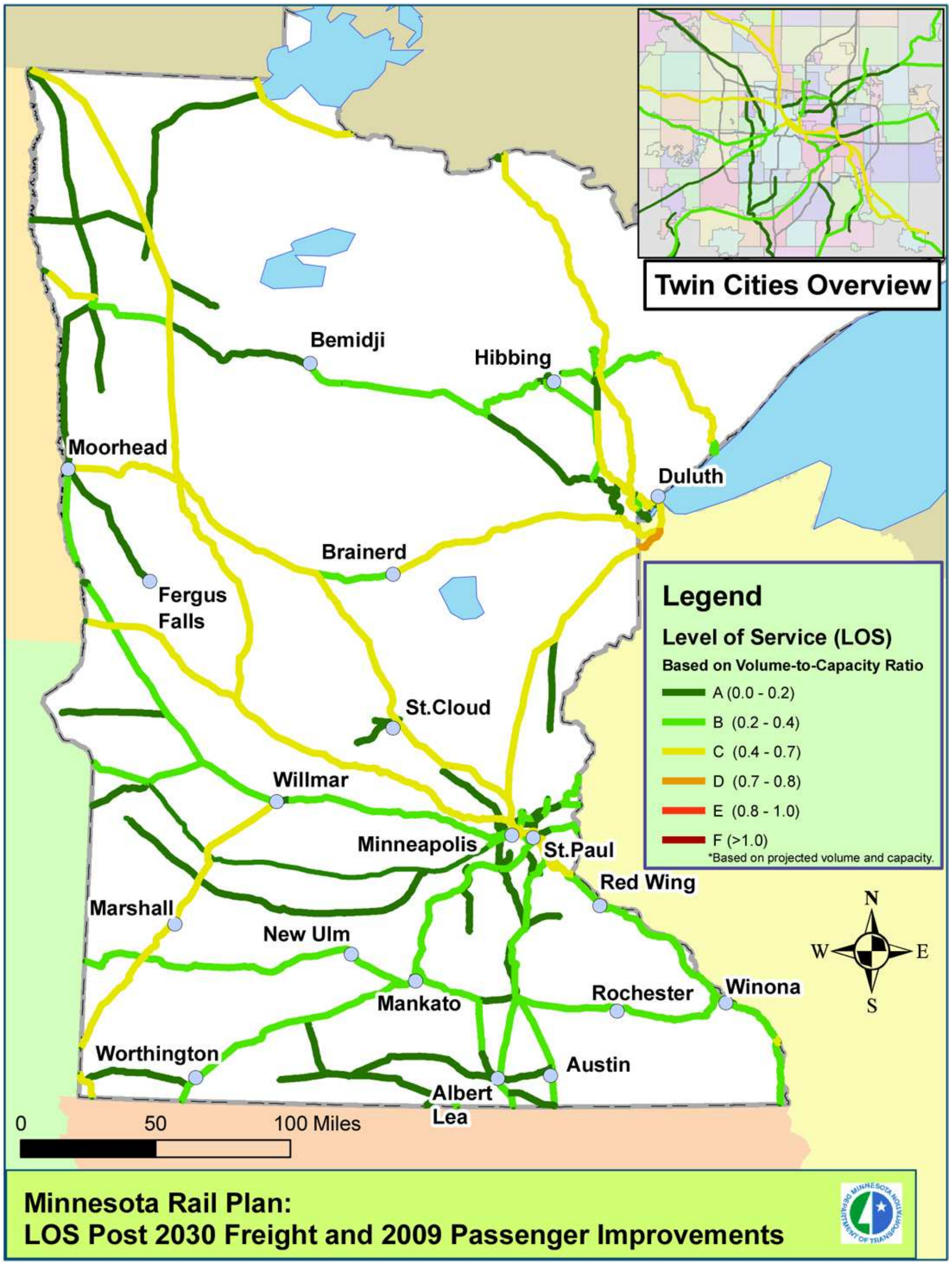


Figure 4.5 2030 Freight + 2009 Passenger Level of Service, With Recommended Improvements



4.2 Shared Freight and Passenger Rail Corridors

Shared freight and passenger rail corridors were evaluated with the GIS-tool to determine what improvements are needed today and will be needed in 2030 to achieve a freight LOS C or better. The corridors were then evaluated to determine what additional improvements would be needed when proposed passenger rail service is added to the line to maintain a LOS C or better. This section discusses specific improvements identified to mitigate sections of LOS D, E, and F, as shown previously in Figures 4.1, 4.2, and 4.3.

Needs and improvements are organized by major corridor city pair, and are then broken down by freight subdivision. Recommended improvements have been modeled using the GIS-tool and are shown in Figures 4.6 (2009 Freight Level of Service, Shared Corridors With Recommended Improvements), 4.7 (2030 Freight +2009 Passenger Level of Service, Shared Corridors With Recommended Improvements), and 4.8 (2030 Freight +2030 Passenger Level of Service, Shared Corridors With Recommended Improvements).

Figure 4.6 2009 Freight Level of Service, Shared Corridors With Recommended Improvements

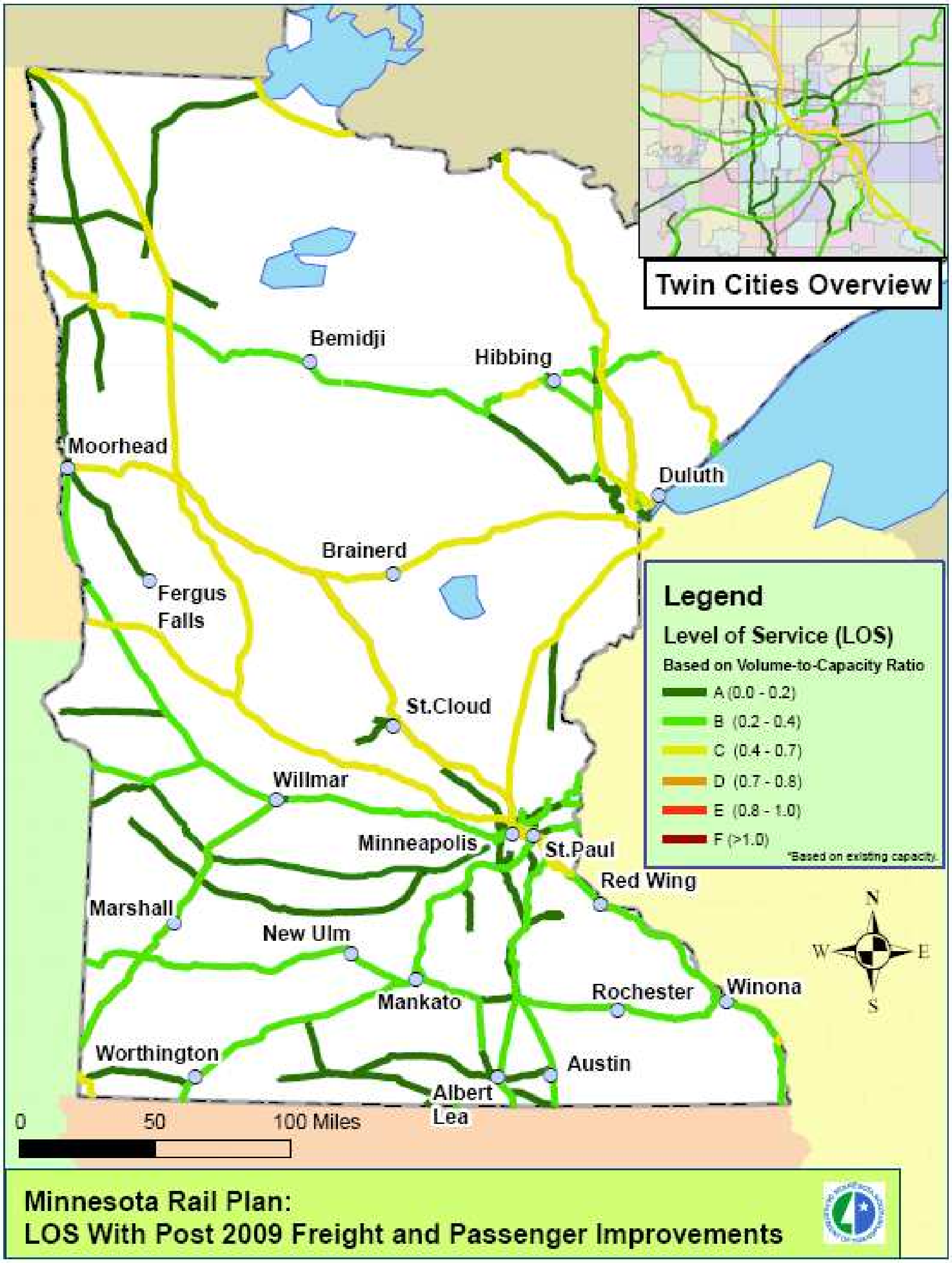


Figure 4.7 2030 Freight + 2009 Passenger Level of Service, Shared Corridors With Recommended Improvements

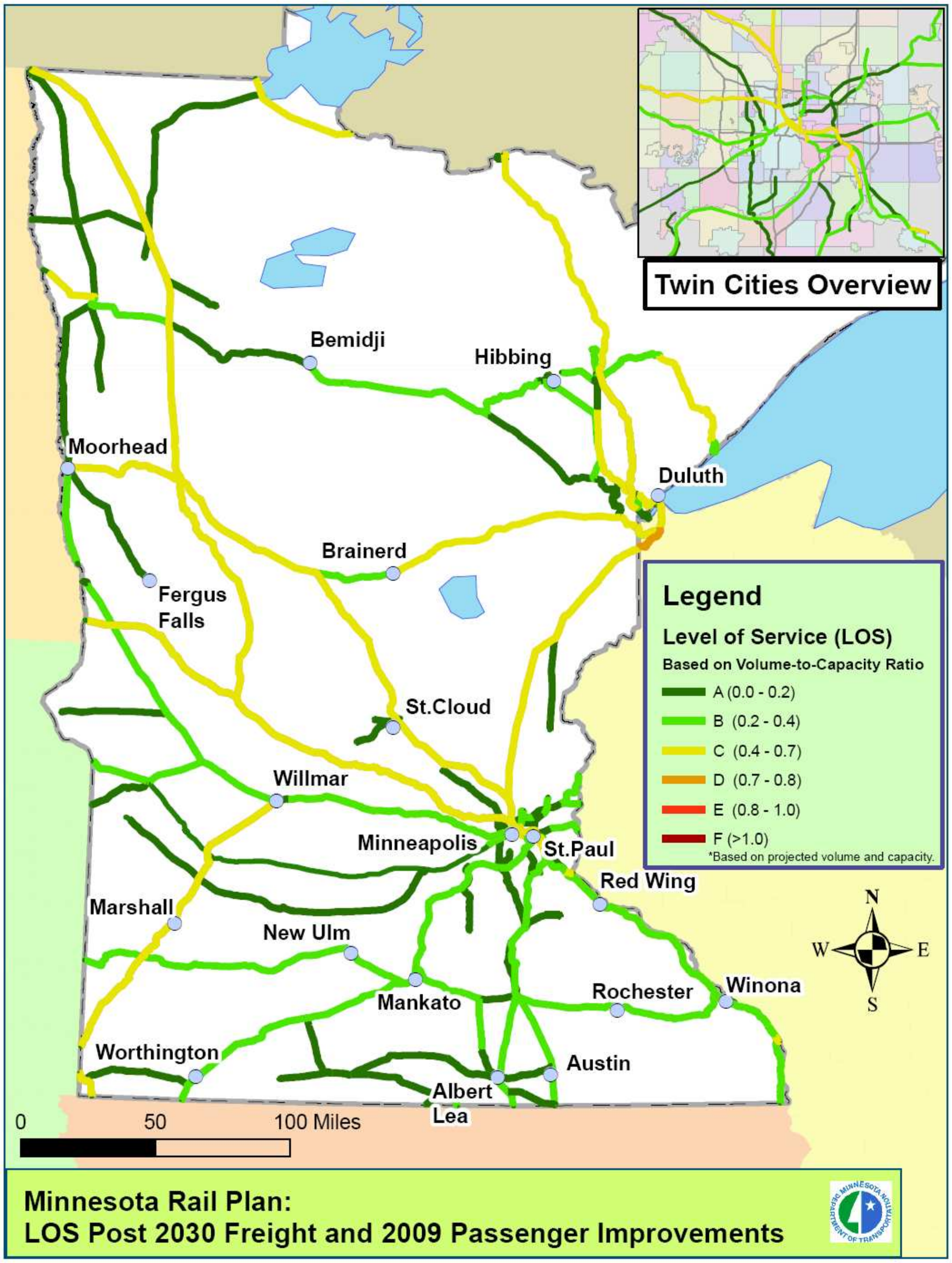
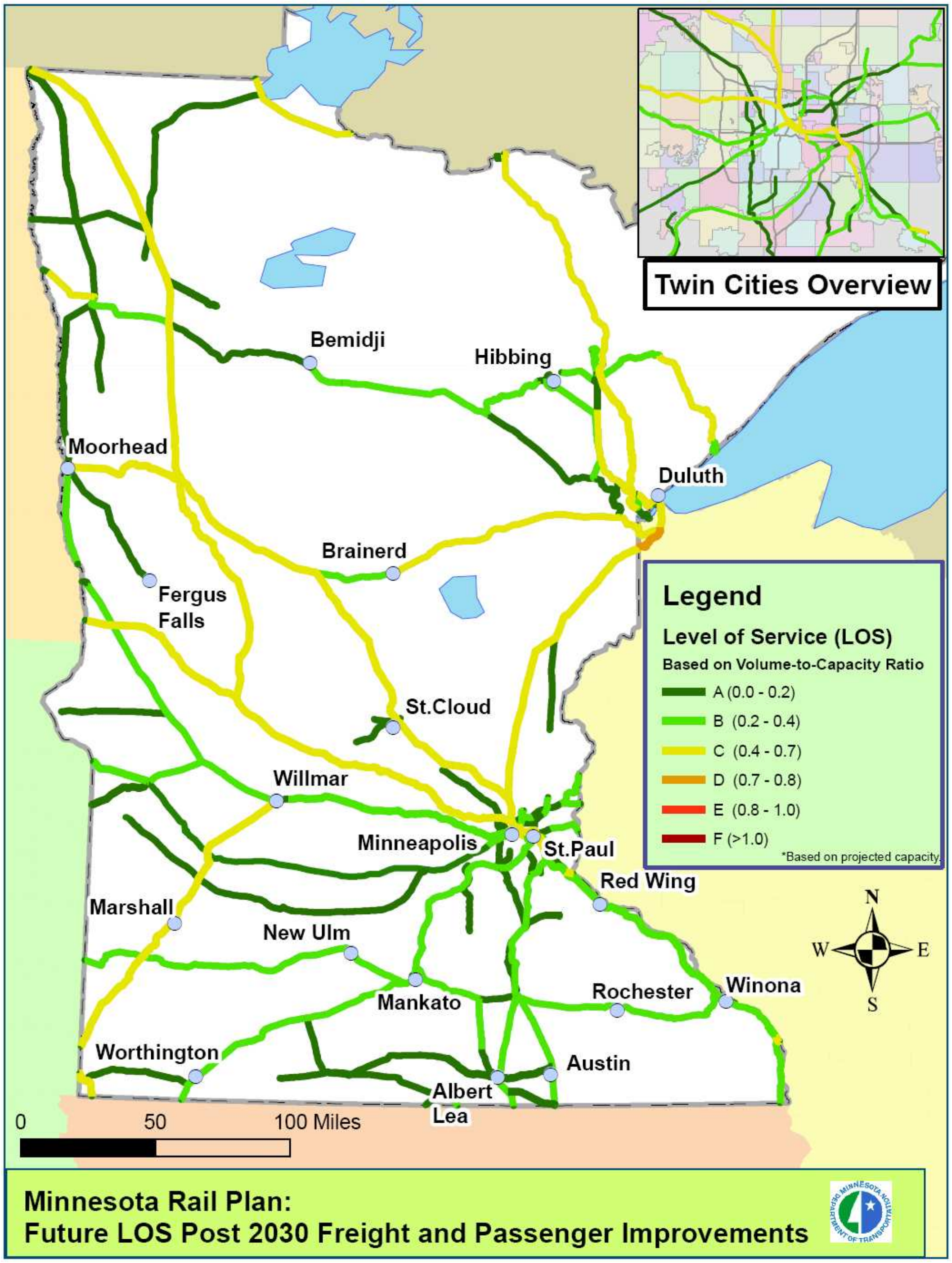


Figure 4.8 2030 Freight Plus 2030 Passenger Level of Service, Shared Corridors With Recommended Improvements



In several cases city pair segments overlap each other, and on any given corridor two or three different passenger services may be provided. The "2030 Passenger Service Needs" provided in tables within the city pair discussion include the cost for track and signal improvements, as well as other essential costs like rolling stock, capacity rights, etc., for that segment only.

The following summary tables are shown in Section 4.4:

- Table 4.24 provides the cumulative cost of implementing full build passenger service for each individual city pair;
- Table 4.25 builds on Table 4.24 and provides the cost for implementing all of these city pair corridors though sharing infrastructure between projects; and
- Table 4.26 builds on Table 4.25 and assumes those projects in shared corridors with shared infrastructure; however, it only includes those projects that have been identified as high priorities.

Table 4.11 2030 Shared Freight and Passenger Rail Corridors Reviewed

City Pair/Description	Corresponding MN Subdivisions	Freight Rail Operator	Type of Service Reviewed	Train Pairs/Day
Twin Cities to Cambridge				
Northstar – Cambridge Ext.	Wayzata, Midway, Staples, Hinckley	BNSF	79 mph	4
Twin Cities to St. Cloud				
Northstar – Expanded to St. Cloud	Wayzata, Midway, Staples	BNSF	79 mph	8
Twin Cities to Fargo/Moorhead				
Expanded Empire Builder	Wayzata, Midway, Staples, KO, Prosper	BNSF	79 mph	2
Twin Cities to Willmar/Sioux Falls, South Dakota				
Little Crow	Marshall, Morris, Wayzata	BNSF	79 mph	4
Twin Cities Connection				
Minneapolis – St. Paul (BNSF)	St. Paul, Merriam Park, Midway, Wayzata	BNSF	79 mph	4
Minneapolis – St. Paul (CP)	Merriam Park, Midway, Minn. Comm., Wayzata	CP, BNSF MNNR	79 mph	4
Twin Cities to Albert Lea (Kansas City, Missouri)				
	MN&S, Savage, Merr. Park, Albert Lea	CP, UP, PGR	79 mph	4
Twin Cities to Mankato (Sioux City, Iowa)				
Minnesota Valley Line	MN&S, Wayzata, Mankato	BNSF, UP	79 mph	4
Twin Cities to Eau Claire, Wisconsin				
	Merriam Park, St. Paul, Altoona	UP, CP, BNSF	79 mph	4
Twin Cities to Chicago(via River Route) – HSR				
MWRRI	Merriam Park, River, Tomah	CP	110 mph	8
Twin Cities to Duluth – HSR				
Northern Lights Express	Midway, Staples, Hinckley	BNSF	110 mph	8
Twin Cities to Rochester – HSR				
Rochester Rail Link			110 mph	8
Twin Cities to Chicago (via Rochester) – HSR				
			110 mph	8

4.2.1 BNSF: Twin Cities to Cambridge

Needs in this corridor include freight needs and standard (79 mph) passenger service needs for Northstar's Cambridge Extension. This city pair also is designated for HSR (110 mph) passenger service to Duluth as part of the Northern Lights Express (NLX) project. This corridor has been divided into segments from Minneapolis to Coon Rapids and Coon Rapids to Cambridge. Investment needs for passenger service on the Cambridge to Duluth pair are only addressed in the HSR alternative and can be found in Section 4.3.2; however, freight needs are identified for the entire corridor. Table 4.12 summarizes corridor freight and passenger needs by year. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.12 Summary of Twin Cities to Cambridge Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
Staples Subdivision	2009	Additional passing sidings totaling 3.57 miles	$6.1
Midway Subdivision	2030	Additional passing sidings totaling 0.624 miles	$1.1
Staples Subdivision	2030	Adding third main track, a total of 6.08 miles of additional track	$10.3
Hinckley Subdivision	2030	Additional passing sidings totaling 23.54 miles	$10.7
		University Interlocking	$14.0
		Minneapolis Junction	$33.0
		Coon Creek Junction	$100.0
		10% Engineering	$17.5
		30% Contingency	$52.5
		Total Freight Needs	**$245.2**
2030 Passenger Service Needs – Twin Cities to Cambridge, only [a]			
Staples Subdivision		5.4 miles new track	$19.4
		Upgrade 14 miles of track from FRA 3 to FRA 4	$28.0
Hinckley Subdivision		29.9 miles, install CTC signals	$23.0
Midway Subdivision		0.56 miles new track	$2.0
Other Costs		Rolling Stock (four train sets)	$72.0
		Positive Train Control (four train sets)	$4.6
		Grade Crossing Improvements	$1.2
		Capacity Rights – Minneapolis to Cambridge[b]	$29.9
		Operations and Maintenance Costs[c]	$7.4

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

2009 Improvements. The **Staples subdivision** between University Junction and Coon Creek Junction already uses advanced CTC signaling and is double tracked. The issue driving down levels of service on this metro line is train volume. There are 77 daily trains – 63 freight, and 14 passenger – on this segment. Short of implementing positive train control (PTC), adding track is the only solution to relieve congestion on this line. We recommend adding 3.47 miles of additional track between these junctions, which would achieve a level of service improvement from grade E to C, as well as improving University Junction, which links the BNSF Staples, BNSF St. Paul, and BNSF Midway subdivisions with the crossing trains of the CP Paynesville and CP Withrow subdivisions, plus yard traffic. Similar upgrades need to be made to Minneapolis Junction, where the BNSF Midway, Staples, and Wayzata subdivisions meet. Cost to improve each junction is $33 million.

2030 Improvements. The **Midway subdivision** between Minneapolis Junction and University Junction currently is double tracked and operates CTC. By 2030, the train volumes will approach capacity on this segment and degrade service. With 75 daily trains on the Midway, 0.624 miles of additional track must be added to attain LOS of C.

Despite the above-mentioned improvements to the **Staples subdivision** in 2009, 102 daily trains are projected to occupy the line by 2030 between University Junction and Coon Creek Junction prior to the full passenger rail implementation, creating a volume-to-capacity ratio of 0.92, nearing LOS F. To accommodate the vast increase in volume, capacity on the segment must be increased dramatically. The entire segment between the junctions must have a third main line just to achieve a modest volume-to-capacity ratio of 0.69, which is barely LOS C. Construction of the third main line to the existing passing sidings would add 6.08 miles of track.

The BNSF **Hinckley subdivision** connects the Twin Cities to the Twin Ports of Duluth and Superior, Wisconsin. Currently, it is a single main line with Automated Block Signaling (ABS), which is not as advanced as CTC, and a moderate amount of passing sidings. Track ratios south of Hinckley exceed 1.13. However, the volume-to-capacity ratio of 0.68 for 2009 is barely acceptable. An increase of just two freight trains by 2030 forces the LOS to drop to E status. To improve LOS, the track ratio must be increased to 1.21, which calls for the installation of 23.54 miles of additional track between Coon Creek Junction and the Wisconsin border. A further 2.7 miles of track should be added to the subdivision in Wisconsin as it approaches the Twin Ports region. Additional upgrades to the **Lakes subdivision** in Wisconsin, the Grassy Point Bridge ($51 million) linking Duluth and Superior, and the BNSF Mike's Yard in Duluth also are recommended.

2030 Passenger Service Needs

Staples Subdivision. Approximately 5.4 miles of additional track are required to accommodate the four train sets per day. This brings the LOS from E to C, and the track-to-siding ratio to 3.21, indicating that a third mainline would be required if this service extension were pursued.

There currently exists 14 miles of FRA Class 3 track that is suitable for freight use, however as passenger service is introduced this must be upgraded to FRA Class 4 track. Cost to upgrade this track is nearly $28 million.

Hinckley Subdivision. Upgrading the Hinckley Subdivision ABS signals to CTC brings the LOS of the line from E to C, and provides an improvement that can allow for greater flexibility and increased traffic than would pure track addition.

Midway Subdivision. Approximately 0.9 miles of additional track are required to accommodate the four train sets per day.

Other Costs

- **Positive Train Control (PTC).** Prior to October 2008, PTC systems were being voluntarily installed by various carriers. However, the Rail Safety Improvement Act of 2008 (RSIA) (signed by the President on October 16, 2008, as Public Law 110-432) has mandated the widespread installation of PTC systems by December 2015.
- **Rolling Stock.** Additional conventional (79 mph) service would require up to four train sets.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as track is added. This study estimated that approximately $200,000 per mile will address any grade crossing upgrades for new track, for a total of $1.2 million between the Twin Cities and Cambridge.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights between Twin Cities and Cambridge with four train pairs/day are expected to cost about $29.9 million.
- **Operations and Maintenance Costs.** O&M costs between Twin Cities and Cambridge with four train pairs/day would be about $7.4 million.

4.2.2 BNSF: Twin Cities to St. Cloud

This section represents expanded Northstar service to St. Cloud with eight train sets/day. This corridor overlaps the proposed Northstar Cambridge Extension as well as the Empire Builder. Segments on this line include Minneapolis to Coon Rapids, Coon Rapids to Big Lake, and Big Lake to St. Cloud. Improvements are summarized in Table 4.13. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.13 Summary of Twin Cities to St. Cloud Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
Staples Subdivision	2009	Additional track and passing sidings totaling 4.2 miles	$7.3
Midway Subdivision	2030	Additional passing sidings totaling 0.624 miles	$1.1
Staples Subdivision	2030	Additional track totaling 37 miles, including a full third main track between University and Coon Creek junctions	$62.8
		University Interlocking	$14.0
		Minneapolis Junction	$33.0
		Coon Creek Junction	$100.0
		10% Engineering	$21.8
		30% Contingency	$65.4
		Total Freight Needs	**$305.4**
2030 Passenger Service Needs[a]			
Staples Subdivision		24 miles new track	$86.6
		Upgrade 14 miles of track from FRA 3 to FRA 4	$28.0
Midway Subdivision		0.4 miles of new track	$1.4
Other Costs		Rolling Stock (eight train sets)	$144.0
		Positive Train Control (eight train sets)	$7.4
		Grade Crossing Improvements	$3.5
		Capacity Rights – Minneapolis to St. Cloud[b]	$91.1
		Operations and Maintenance Costs[c]	$22.5

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

2009 Improvements. The **Staples subdivision** between University Junction and Coon Creek Junction already uses advanced CTC signaling and is double tracked. The culprit driving down levels of service on this metro line is train volume. There are 77 daily trains – 63 freight and 14 passenger – on this segment. Short of implementing positive train control (PTC), adding track is the only solution to relieve congestion on this line. We recommend adding 3.47 miles of additional track between these junctions, which would achieve a level of service improvement from grade E to C, as well as improving University Junction, which links the BNSF Staples, BNSF St. Paul, and BNSF Midway subdivisions with the crossing trains of the CP Paynesville and CP Withrow subdivisions, plus yard traffic. Cost to improve the junction is unknown, but should be explored. Similar upgrades need to be made to Minneapolis Junction, where the BNSF Midway and Wayzata subdivisions meet.

Beyond Coon Creek Junction to St. Cloud, we recommend adding a passing siding 0.73 mile in length to the double main line, specifically between Big Lake and St. Cloud.

2030 Improvements. The **Midway subdivision** between Minneapolis Junction and University Junction currently is double tracked and operates CTC. Unfortunately, by 2030 the train volumes approach capacity on this segment and degrade service. With 75 daily trains on the Midway, 0.624 miles of additional track must be added to attain LOS of C.

Despite the above-mentioned improvements to the **Staples subdivision** in 2009, 102 daily trains are projected to occupy the line by 2030 between University Junction and Coon Creek Junction prior to the full passenger rail implementation, creating a volume-to-capacity ratio of 0.92, nearing LOS F. To accommodate the vast increase in volume, capacity on the segment must be increased dramatically. The entire segment between the junctions must have a third main line just to achieve a modest volume-to-capacity ratio of 0.69, which is barely LOS C. Construction of the third main line to the existing passing sidings would add 6.08 miles of track.

Beyond the Twin Cities, numerous pieces of additional track are required to keep capacity in line with volumes on the Staples subdivision. A total of 20.53 miles of track from Coon Creek Junction to St. Cloud must be constructed by 2030 to maintain a LOS of C and to keep volume-to-capacity ratios in the 0.69 to 0.60 range. By 2030 track ratios on the entire subdivision must well exceed 2.00.

2030 Passenger Service Needs

Staples Subdivision. Approximately 24 miles of additional track are required to accommodate the eight train sets per day. As with the corridor to Cambridge, a third main line would be required if this service extension were pursued.

There currently exists 14 miles of FRA Class 3 track that is suitable for freight use, however, as passenger service is introduced, this must be upgraded to FRA Class 4 track. Cost to upgrade this track is nearly $10 million.

Midway Subdivision. Approximately 0.4 miles of additional track are required to accommodate the four train sets per day.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Expanded conventional (79 mph) service on Northstar to St. Cloud is expected to use eight train sets. It is assumed that rolling stock for this extension may be shared with the existing Northstar service to Big Lake, and thus, eight train sets may not be required.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as track is added. This study estimated that approximately $200,000 per mile will address any grade crossing upgrades for new track, for a total of $7.7 million between the Twin Cities and St. Cloud.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of new capital improvements, capacity rights between the Twin Cities and St. Cloud with eight train pairs/day are expected to cost about $91.1 million.
- **Operations and Maintenance Costs.** O&M costs between Twin Cities and St. Cloud with eight train pairs/day would be about $22.5 million.

4.2.3 BNSF: Twin Cities to Fargo/Moorhead

Needs in this corridor include freight needs and standard (79 mph) passenger service needs for expanded Amtrak service on the Empire Builder for a total of four trains per day. This corridor overlaps the existing Northstar service to Big Lake as well as the proposed Northstar Cambridge Extension. Segments on this line include Minneapolis to Coon Rapids (also discussed in Section 4.2.1), Coon Rapids to Big Lake, Big Lake to St. Cloud, and St. Cloud to Fargo/Moorhead. Improvements are summarized in Table 4.14. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.14 Summary of Twin Cities to Fargo/Moorhead Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
Staples Subdivision	2009	Additional track and passing sidings totaling 25.46 miles, including full double main build-out between St. Cloud and Little Falls	$43.3
Staples Subdivision	2009	Installation of CTC signaling on a 32-mile segment from St. Cloud to Little Falls	$24.6
KO Subdivision	2009	Additional passing sidings totaling 1.16 miles beyond the existing double main track	$2.0
KO Subdivision	2009	Installation of CTC signaling on entire 5.5-mile line	$4.1
Midway Subdivision	2030	Additional passing sidings totaling 0.624 miles	$1.1
Staples Subdivision	2030	Additional track totaling 80.25 miles, including a full third main track between University and Coon Creek junctions	$136.4
Staples Subdivision	2030	Installation of CTC signaling on a 45.19-mile segment from Bluffton to Detroit Lakes	$33.9
KO Subdivision	2030	Additional passing sidings totaling 1.25 miles	$2.1
		University Interlocking	$14.0
		Minneapolis Junction	$33.0
		Coon Creek Junction	$100.0
		Moorhead Junction	$5.0
		10% Engineering	$40.0
		30% Contingency	$119.9
		Total Freight Needs	**$559.3**
2030 Passenger Service Needs [a]			
Staples Subdivision		5.9 miles new track	$21.2
		Upgrade 14 miles of track from FRA 3 to FRA 4	$28.0
KO Subdivision		0.22 miles of new track	$0.8
Prosper Subdivision		0.53 miles, upgrade ABS to CTC signals	$0.6
Other Costs		Rolling Stock (one train set)	$18.0
		Positive Train Control (one train set)	$24.3
		Grade Crossing Improvements	$3.6
		Capacity Rights – Minneapolis to Fargo/Moorhead[b]	$41.1
		Operations and Maintenance Cost[c]	$10.2

[a] Passenger service need estimates include engineering and contingency costs. It is possible that from Coon Rapids to St. Cloud rolling stock could be shared with Twin Cities to Duluth.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

2009 Improvements. The **Staples subdivision** between University Junction and Coon Creek Junction already uses advanced CTC signaling and is double tracked. The issue driving down levels of service on this metro line is train volume. There are 77 daily trains – 63 freight, and 14 passenger – on this segment. Short of implementing positive train control (PTC), adding track is the only solution to relieve congestion on this line. We recommend adding 3.47 miles of additional track between these junctions, which would achieve a level of service improvement from LOS E to C, as well as improving University Junction, which links the BNSF Staples, BNSF St. Paul, and the BNSF Midway subdivisions with the crossing trains of the CP Paynesville and CP Withrow subdivisions, plus yard traffic. Cost to improve the junction is unknown, but should be explored. Similar upgrades need to be made to Minneapolis Junction, where the BNSF Midway and Wayzata subdivisions meet.

Beyond Coon Creek Junction, we recommend adding 12.4 miles of track between Big Lake and Staples. Installing CTC and completing a second main line is recommended between St. Cloud and Little Falls. The second main is relatively inexpensive given the current track ratio of 1.89 for this section. Adding an additional 9.5 miles of track also is recommended for the Bluffton to Detroit Lakes segment.

The 5.5-mile **KO subdivision** connects the Staples sub to the Fargo-Moorhead area and, like Staples, is a major corridor for BNSF. The line has direct access to the Dilworth intermodal yard. It is double tracked, but uses ABS control and is under stain from high train volumes. To alleviate congestion on this short but vital subdivision, installing CTC and adding 1.16 miles of sidings is recommended.

2030 Improvements. The **Midway subdivision** between Minneapolis Junction and University Junction currently is double tracked and operates CTC. By 2030 the train volumes will approach capacity on this segment and degrade service. With 75 daily trains on the Midway, 0.624 miles of additional track must be added to attain LOS of C.

Despite the above-mentioned improvements to the **Staples subdivision** in 2009, 102 daily trains are projected to occupy the line by 2030 between University Junction and Coon Creek Junction prior to the full passenger rail implementation, creating a volume-to-capacity ratio of 0.92, nearing LOS F. To accommodate the vast increase in volume, capacity on the segment must be increased dramatically. The entire stretch must have a third main line plus an additional 6.08 of passing sidings just to achieve a modest volume-to-capacity ratio of 0.69, barely achieving LOS C.

Beyond the Twin Cities, numerous pieces of additional track are required to keep capacity in line with volumes. A total of 74.17 miles of track from Coon Creek to Dilworth yard must be added and the implementation of CTC on all remaining ABS segments must be accomplished by 2030 to maintain a LOS of C and to keep volume-to-capacity ratios in the 0.69 to 0.60 range. By 2030 track ratios on the entire subdivision must well exceed 2.0.

Despite earlier improvements to the **KO subdivision**, train volumes continue to grow, degrading service between Minnesota and North Dakota. An additional 1.54 miles of passing sidings is needed to alleviate congestion.

2030 Passenger Service Needs

Staples Subdivision. While a third main track is being pursued for the Northstar and Northern Lights Express projects, as the system stands today, a third main is not needed for expanded Amtrak service via the Empire Builder. Approximately 5.9 miles of additional track are required, divided between various sections, to accommodate expanded Empire Builder Service to Fargo/Moorhead. These locations include 1.3 miles between Big Lake and St. Cloud, 1.6 miles from Bluffton to Perham, 1.6 miles from the bridge and approach over the Mississippi River, and 1.3 miles between Little Falls and Staples.

There currently exists 14 miles of FRA Class 3 track that is suitable for freight use; however, as passenger service is introduced this must be upgraded to FRA Class 4 track. Costs to upgrade this track is nearly $28 million.

KO Subdivision. 0.22 miles of additional track is required between Dilworth Yard and Moorhead Junction, and Moorhead Junction to Red River for a cost of $800,000.

Prosper Subdivision. The LOS on the Prosper subdivision is acceptable; however, for increased passenger operations if ABS signals are converted to CTC along a 0.53-mile segment for a cost of $600,000.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Expanded conventional (79 mph) service on the Empire Builder is expected to use one additional train set.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as track is added. This study estimated that approximately $200,000 per mile will address any grade crossing upgrades for new track, for a total of $3.7 million between the Twin Cities and Fargo/Moorhead.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights between the Twin Cities and Fargo/Moorhead with one additional train pair/day are expected to cost about $41.1 million.
- **Operations and Maintenance Costs.** O&M costs between Twin Cities and Fargo/Moorhead with one additional train pair/day would be about $10.2 million.

4.2.4 BNSF: Twin Cities to Sioux Falls, South Dakota

Needs in this corridor include freight needs and standard (79 mph) passenger service needs to accommodate four train set per day via the proposed Little Crow route. The corridor includes the segments from Minneapolis to Willmar and Willmar to Sioux Falls, South Dakota. For the purpose of this analysis, costs are only provided for the Twin Cities south to the state line only for operations within the State of Minnesota. Improvements are summarized in Table 4.15. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.15 Summary of Twin Cities to Sioux Falls, SD Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
Marshall Subdivision	2009	Installation of CTC on 122.6 miles from Willmar to South Dakota border	$67.4
		10% Engineering	$6.7
		30% Contingency	$20.2
		Total Freight Needs	**$94.4**
2030 Passenger Service Needs[a]			
Marshall Subdivision		Upgrade 91 miles of track from FRA 3 to FRA 4	$91
Other Costs		Rolling Stock (four train sets)	$72.0
		Positive Train Control (four train sets)	$23.9
		Capacity Rights – Minneapolis to State Line[b]	$161.2
		Operations and Maintenance Costs[c]	$39.8

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

2009 and 2030 Improvements. The BNSF **Marshall subdivision** provides a vital link to the Great Plains of South Dakota, Iowa, and Nebraska. It is dark territory, using TWC, and has few passing sidings between Willmar and the South Dakota border. An immediate need exists to upgrade the line's TWC control to CTC at a cost of $67.43 million.

2030 Passenger Service Needs

Marshall Subdivision. There currently exists 91 miles of FRA Class 3 track that is suitable for freight use; however, as passenger service is introduced this must be upgraded to FRA Class 4 track. Cost to upgrade this track is nearly $91 million.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service with require the purchase of four train sets.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights between Twin Cities and Sioux Falls with four train pairs/day are expected to cost about $161.2 million.
- **Operations and Maintenance Costs.** O&M costs between Twin Cities and Sioux Falls with four train pairs/day are expected to total $39.8 million.

4.2.5 Twin Cities Connection: Minneapolis and St. Paul

Needs in this corridor include freight needs and standard (79 mph) passenger service needs for expanded Amtrak service on the Empire Builder to four train sets per day. This connection is being studied to provide both Minneapolis and St. Paul with intercity rail stations connecting a future HSR station at Union Depot in St. Paul to a downtown Minneapolis station for Amtrak and potential other intercity rail services. Currently, Amtrak provides Empire Builder service between the Twin Cities (via CP, with portions of BNSF and Minnesota Commercial Railroad) with a stop at the Amtrak station in between the two downtowns.

While the CP line is the current Empire Builder route, operating with once daily service between Chicago and Seattle, either the CP or BNSF routes between the Twin Cities could serve larger purposes in the future. Red Rock commuter rail service has been studied along both the BNSF and CP alignments as part of the feasibility analysis conducted for the Red Rock Corridor Commission.[9] Coordination with existing freight rail and the associated cost for track and signal improvements have been two challenges to implementation. One of the potential drawbacks of the BNSF route is the need to "back-out" of the St. Paul Union Depot for trains coming from the south and east and wanting to go north and west. Previously, these lines have been studied as Central Corridor commuter rail alignments, but environmental documentation and design are proceeding on a new light rail alignment along University and Washington Avenues. Improvements are summarized in Table 4.16. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

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[9] http://www.redrockrail.org/.

Table 4.16 Summary of Minneapolis to St. Paul Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
BNSF Corridor			
Midway Subdivision	2009	Additional passing sidings totaling 0.52 miles	$0.9
Midway Subdivision	2030	Completing double track build-out by adding 1.9 mile new track	$3.3
St. Paul	2030	Adding 0.26 mile of additional track to the existing double main track between Seventh Street and Hoffman Junction	$0.4
		Hoffman Interlocking	$54.0
		St. Anthony Junction	$27.0
		Minneapolis Junction	$33.0
		10% Engineering	$11.9
		30% Contingency	$35.6
		Total Freight Needs	**$166.1**
CP Corridor			
		Hoffman Interlocking	$54.0
		St. Anthony Junction	$27.0
		Minneapolis Junction	$33.0
		10% Engineering	$11.4
		30% Contingency	$34.2
		Total Freight Needs	**$159.6**
2030 Passenger Service Needs[a]			
BNSF Corridor			
St. Paul Subdivision		Add 0.24 mile of track	$0.9
Midway Subdivision		0.52 miles of new track	$1.9
		Upgrade 14 miles of track from FRA 3 to FRA 4	$14.0
Other Costs[b]		Rolling Stock (four train sets)	$72.0
		Positive Train Control (four train sets)	$1.5
		Capacity Rights[c]	$9.5
		Operational and Maintenance Costs[d]	$2.4
CP Corridor			
Midway Subdivision		0.52 miles of new track	$1.9
		Upgrade 13 miles of track from FRA 3 to FRA 4	$13
Minnesota Commercial Yard		1.1 miles of CTC signal	$0.8
Other Costs[b]		Rolling Stock (four train sets)	$72.0
		Positive Train Control (four train sets)	$1.4
		Capacity Rights[c]	$8.8
		Operations and Maintenance Costs[d]	$2.2

[a] Passenger service need estimates include engineering and contingency costs.
[b] Rolling stock may not be necessary if other corridors are implemented.
[c] Negotiated on a case by case basis.
[d] Cost is post implementation.

Freight Needs

2009 Improvements. The BNSF **Midway Subdivision** provides the vital link which makes intercity passenger service possible in the Twin Cities. The Midway subdivision connects the three subdivisions which have access to the two Twin Cities depots. It links the BNSF Wayzata subdivision, which has access to Minneapolis Depot, and the BNSF St. Paul and CP Merriam Park subdivisions, which connect to Union Depot in St. Paul. Yet, even without additional passenger service, the Midway subdivision's 2009 LOS is E, due to the presence of a single main line and 34 daily trains.

Also degrading service are several bottlenecks. Existing passing sidings collapse to one single main at the SR 280 bridge, while poor geometrics affect the line at two crucial junctions: St. Anthony Junction, where the subdivision intersects the Minnesota Commercial (MNNR) line; and Minneapolis Junction, which leads trains to the BNSF Wayzata subdivision and Minneapolis Depot.

The problems at St. Anthony Junction include the crossing of MNNR trains between the Minnesota Commercial yard and the Fridley subdivision. The crossing is particularly awkward, requiring MNNR trains to enter the Midway subdivision for a short distance, then exit shortly thereafter, in an "S" motion. At Minneapolis Junction, BNSF Wayzata-bound trains must navigate a tight turning radius at the wye of the junction and vice versa. All of these deficiencies degrade service and create challenges for train operators.

To relieve current congestion on the Midway subdivision east of Minneapolis Junction, we recommend the following:

- Add 0.52 mile of passing sidings to single double main, raising the track ratio to 1.21, at a cost of $878,220.
- Reconstruct/improve the St. Anthony and Minneapolis junctions and relieve the SR 280 bridge bottleneck. Extent of these improvements and their associated costs are unknown.

2030 Improvements. Despite the above-mentioned 2009 improvements east of Minneapolis Junction, the service on the BNSF **Midway subdivision** continues to degrade for years to come. By 2030, regardless of additional passenger service, the LOS for the subdivision east of Minneapolis Junction falls to F. At this stage, we recommend a full build-out of a double main line. This requires an additional 1.94 mile of track at a cost of $3.3 million.

At the eastern terminus of the BNSF Midway is Seventh Street Junction in St. Paul. Here trains empty onto the BNSF **St. Paul subdivision**. This vital subdivision shoulders trains around the central areas of the Twin Cities, avoiding or intersecting some of the regions largest bottlenecks and busiest subdivisions. The line runs from University Junction north-northwest of downtown Minneapolis, parallels the Midway subdivision, curves around downtown St. Paul to the north and east, passes through St. Paul Yard, and continues southeast as part of the busy river route shared with CP. Intercity passenger service associated with the BNSF Twin Cities route is slated for only a two-mile segment of track between Seventh Street Junction and Hoffman Junction approaching St. Paul depot. Independent of any passenger service, 72 daily freight trains are projected to use the St. Paul subdivision. Despite CTC and a double main, LOS drops to E as the line nears capacity by 2030. To ease congestion on this route, we recommend adding passing sidings totaling 0.61 mile at a cost of slightly over $1 million.

2030 Passenger Service Needs – BNSF Route

St. Paul Subdivision. Expansion of Empire Builder service and introduction of the service to this previously freight-only line will require 0.24 miles of new track for a cost of $0.9 million.

There currently exists 14 miles of FRA Class 3 track that is suitable for freight use; however, as passenger service is introduced this must be upgraded to FRA Class 4 track. Cost to upgrade this track is nearly $14 million.

Midway Subdivision. Expansion of Empire Builder service and introduction of other service will require 0.52 miles of new track for a cost of $1.9 million.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service will require the purchase of four train sets.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights between the Twin Cities with four train pairs/day are expected to cost about $9.5 million.
- **Operations and Maintenance Costs.** O&M costs between the Twin Cities with four train pairs/day are expected to total $2.4 million.

2030 Passenger Service Needs – CP Route

Midway and Merriam Park Subdivisions. Expansion of Empire Builder service and introduction of other service will require 0.52 miles of new track for a cost of $1.9.

There currently exists 13 miles of FRA Class 3 track that is suitable for freight use; however, as additional passenger service is introduced this must be upgraded to FRA Class 4 track. Cost to upgrade this track is nearly $13 million.

Minnesota Commercial Yard. Currently, there are no signals controlling operations at the Minnesota Commercial (MNNR) Yard. Addition of 1.1 miles of CTC will cost approximately $850,000.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service with require the purchase of four train sets.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights between the Twin Cities with four train pairs/day are expected to cost about $8.8 million.
- **Operations and Maintenance Costs.** O&M costs between the Twin Cities with four train pairs/day are expected to total $2.2 million.

In reviewing this city pair, it is apparent that there are several advantages along with disadvantages to each alignment. Points to consider are as follows:

BNSF Route:

- Avoids the Minnesota Commercial rail yard;
- Has the potential for higher speeds;
- Track currently is in better condition;
- Predominantly double-tracked corridor; and
- Requires back-out movement from Union Depot in St. Paul.

CP Route:

- Less freight traffic may allow for higher passenger rail capacity;
- Shorter distance between Minneapolis and St. Paul;
- Better maneuverability out of St Paul Union Depot;
- Potential steam line relocation; and
- Predominantly single-tracked corridor.

Two separate studies, one for Red Rock commuter service and a second for the Central Corridor project, have not concluded which alignment is preferred. This issue cannot be resolved in a high level statewide study of this type. Both routes (BNSF and CP) will be carried forward and considered as potential alignments as part of this study. Detailed engineering is required to make a final determination on preferred alignment.

4.2.6 UP: Twin Cities to Albert Lea (Kansas City, Missouri)

Needs in this corridor include freight needs and standard (79 mph) passenger service needs to accommodate four train sets per day. The corridor includes the segments from St. Paul and Minneapolis to Northfield, Northfield to Albert Lea, and Albert Lea to Kansas City, Missouri, utilizing the previously proposed Dan Patch commuter rail corridor alignment. For the purpose of this analysis, costs are provided from the Twin Cities south to Albert Lea; therefore, all costs here are only for operations within the State of Minnesota. Improvements are summarized in Table 4.17. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.17 Summary of Twin Cities to Albert Lea Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
Albert Lea Subdivision	2030	Installing CTC signaling between St. Paul Yard across the St. Paul Union Pacific Bridge	$1.6
		Hoffman Interlocking	$54.0
		St. Louis Park Interchange	$70.0
		Dan Patch Interchange (Savage)	$10.0
		Savage (TC&W) over Minnesota River	$34.0
		Robert Street Vertical Lift Bridge (UP) over Mississippi River	$51.0
		Pigs Eye Bridge (UP) over Mississippi River	$76.0
		10% Engineering	$29.7
		30% Contingency	$89.0
		Total Freight Needs	**$415.2**
2030 Passenger Service Needs[a]			
MN&S Subdivision		12.7 miles, install CTC signal	$9.8
Savage Subdivision		20.9 miles, install CTC signal	$16.1
Albert Lea Subdivision		5.6 miles, convert ABS to CTC signal	$4.3
Other Costs		Rolling Stock (four train sets)	$72.0
		Positive Train Control (four train sets)	$11.5
		Capacity Rights[b]	$76.8
		Operations and Maintenance Costs[c]	$19.0

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

2030 Improvements. The UP **Albert Lea subdivision** forms part of the old Spine Line, as it travels south from the Twin Cities toward Northfield, Faribault, Owatonna, Albert Lea, and eventually Des Moines. Volume-to-capacity ratios are reasonable for the entire corridor for 2009 and 2030, except between the Mississippi River and Hoffman Junction, which includes the St. Paul Yard, Pigs Eye area, and the Union Pacific bridge over the river. This is a busy area and critical to the local economy. The CP River, CP Merriam Park, and BNSF St. Paul subdivisions all converge here. The River and St. Paul subdivisions comprise the backbone of a Chicago-Twin Cities rail network. For much of this stretch, Yard Limits preside on the Albert Lea subdivision, creating areas of slow traffic and congestion. We recommend improving Hoffman Junction and also implementing modern signaling through this critical area.

2030 Passenger Service Needs

MN&S Subdivision. For its entire length from MN&S Junction in Crystal to the Minnesota River, CP employs Block Registry Transfer (BRT) controls instead of modern signalization. Installing 12.7 miles of CTC between the Wayzata Sub and the Minnesota River will cost approximately $9.8 million, and will be crucial for passenger service.

Savage Subdivision. With the introduction of passenger service nearly 21 miles of CTC signals also will need to be installed where there currently are none, from Park Junction to University Junction and University Junction to Coon Creek Junction.

Albert Lea Subdivisions. The Albert Lea has ABS signal control, but with the introduction of passenger service this will need to be upgraded to CTC. Just over of 5.5 miles of CTC signal upgrades total $4.3 million.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service with require the purchase of four train sets.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of capital improvements, capacity rights with four train pairs/day are expected to cost about $76.8 million.
- **Operations and Maintenance Costs.** O&M costs from the Twin Cities to Albert Lea with four train pairs/day are expected to total $19 million.

4.2.7 UP: Twin Cities to Mankato (Sioux City, Iowa)

Needs in this corridor include freight needs and standard (79 mph) passenger service needs to accommodate four train sets per day via the proposed Minnesota Valley Line. The corridor includes the segments from Minneapolis to Mankato, Mankato to Worthington, and Worthington to Sioux City, Iowa. As discussed in the preliminary screening (Section 3.0) service between Mankato and Worthington had low ridership potential due to the relatively small metropolitan area around Sioux City, as well as the significant distance (more than 250 miles) from the Twin Cities. Thus, only the segment between Minneapolis and Mankato was evaluated and all costs are only for operations within the State of Minnesota. Improvements are summarized in Table 4.18. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.18 Summary of Twin Cities to Mankato Improvements

Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight		
	St. Louis Park Interchange	$70.0
	Dan Patch Interchange (Savage)	$10.0
	Shakopee Realignment	$163.0
	Savage (TC&W) over Minnesota River	$34.0
	Mendota Heights (UP) (Omaha Road Bridge #15) over Mississippi River	$44.0
	10% Engineering	$32.1
	30% Contingency	$96.3
	Total Freight Needs	**$449.4**
2030 Passenger Service Needs[a]		
MN&S Subdivision	12.7 miles, install CTC signal	$9.8
Mankato Subdivision	82.6 miles, convert NS, ABS and TWC to CTC signal	$63.6
	Upgrade 84 miles of track from FRA 3 to FRA 4	$84
Other Costs	Rolling Stock (four train sets)	$72.0
	Positive Train Control (four train sets)	$8.5
	Capacity Rights[b]	$57.1
	Operations and Maintenance Costs[c]	$14.1

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

No improvements are necessary to maintain acceptable levels of service for freight in this corridor, through 2030.

2030 Passenger Service Needs

MN&S Subdivision. For its entire length from MN&S Junction in Crystal to the Minnesota River, CP employs Block Registry Transfer (BRT) controls instead of modern signalization. Installing 12.7 miles of CTC between the Wayzata subdivision and the Minnesota River will cost approximately $9.8 million, and will be crucial for passenger service.

Mankato Subdivision. With the introduction of passenger service 82.6 miles of track that have either no signal, TWC, or ABS will need to be converted to CTC for a cost of $63.6 million.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service will require the purchase of four train sets.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as passenger service is introduced. This study estimated that approximately $95,000 per mile will address any grade crossing upgrades for conventional rail service, for a total of $8 million from the Twin Cities to Mankato.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per daily train mile exclusive of improvements, capacity rights with four train pairs/day are expected to cost about $57.1 million.
- **Operations and Maintenance Costs.** O&M costs from the Twin Cities to Albert Lea with four train pairs/day are expected to total $14.1 million.

4.2.8 UP: Twin Cities to Eau Claire, Wisconsin

Needs in this corridor include freight needs and standard (79 mph) passenger service needs to accommodate four train sets per day between the Twin Cities and Eau Claire, Wisconsin. This route has potential to be a bistate intercity commuter corridor, and while ridership has been reviewed to take into consideration Wisconsin ridership, costs are summarized by state. Improvements are summarized in Table 4.19. For information on bridge, interlocking, and junctions, refer to Section 4.1.5, Other Class I Improvements.

Table 4.19 Summary of Twin Cities to Eau Claire, Wisconsin Improvements

	Year	Need	Cost to Upgrade (Millions of Dollars)
Needs for Freight			
St. Paul Subdivision	2030	Adding 0.26 mile of additional track to the existing double main track between Seventh Street and Hoffman Junction	$0.4
		Hoffman Interlocking	$54.0
		Hudson (UP) over St. Croix River	$87.0
		10% Engineering	$14.1
		30% Contingency	$42.4
		Total Freight Needs	**$198.0**
2030 Passenger Service Needs[a]			
Minnesota			
St. Paul Subdivision		Add 0.24 mile of track	$0.9
Altoona Subdivision		Minnesota – 18 miles, convert ABS to CTC signal	$13.9
Other Costs		Rolling Stock (4 train sets)	$72.0
		Minnesota – Positive Train Control (4 train sets)	$1.9
		Minnesota – Capacity Rights[b]	$12.2
		Minnesota – Operations and Maintenance Costs[c]	$3.0
Wisconsin			
Altoona Subdivision		Wisconsin – 68.9 miles, convert ABS to CTC signal	$73.2
Other Costs		Wisconsin – Positive Train Control (4 train sets)	$7.0
		Wisconsin – Capacity Rights[b]	$46.9
		Wisconsin – Operations and Maintenance Costs[c]	$11.6

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

Freight Needs

The BNSF **St. Paul subdivision** forms a critical link in the Chicago-to-Twin Cities route for BNSF and provides numerous interactions between other railroads. This vital subdivision shoulders trains around the central areas of the Twin Cities, avoiding or intersecting some of the regions largest bottlenecks and busiest subdivisions. The line runs from University Junction north-northwest of downtown Minneapolis, parallels the Midway subdivision, curves around downtown St. Paul to the north and east, passes through St. Paul Yard, and continues southeast as part of the busy river route shared with CP. A one-mile section of this line links St. Paul Depot to the UP Altoona subdivision, which takes trains into Wisconsin, east of downtown. This short segment will be utilized by any service to Eau Claire. Volume-to-capacity ratios are reasonable in 2009 for this segment, but the cumulative effect of increasing traffic from all directions finally degrades service, despite modern signaling and a double main line. This is a busy area and critical to the local economy. The CP River, CP Merriam Park, CP St. Paul, UP Altoona, UP Albert Lea, and BNSF Midway subdivisions all affect traffic on the BNSF St. Paul subdivision. To alleviate capacity issues, we recommend adding 0.26 mile of additional track, increasing the track ratio from 2.0 to 2.26.

2030 Passenger Service Needs

St. Paul Subdivision. Approximately 0.24 miles of new track is required between Hoffman Junction and Seventh Street to bring the LOS from D to C. The cost for this improvements is roughly $900,000.

Altoona Subdivision. With the introduction of passenger service, 18 miles of ABS signaled track in Minnesota will need to be converted to CTC for a cost of $13.9 million. A further 68.9 miles of track in Wisconsin to Eau Claire will need CTC signaling, for an approximate cost of $72.3 million.

Other Costs

- **Positive Train Control (PTC).** PTC is required for all passenger systems, as described in Section 4.2.1.
- **Rolling Stock.** Introducing this service with require the purchase of four train sets.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $225,000 per daily train mile exclusive of capital improvements, capacity rights with four train pairs/day are expected to cost about $59 million.
- **Operations and Maintenance Costs.** O&M costs from the Twin Cities to Eau Claire with four train pairs/day are expected to total $14.6 million.

4.3 High-Speed Rail Passenger Service Needs

In addition to the needs identified for conventional passenger service (79 mph) in Section 4.2, needs were identified for HSR, 110-service implementation in four corridors that showed significant potential for an upgraded level of service between the Twin Cities, Chicago (via the River Route and via Rochester), Duluth, and Rochester. The specific needs for implementing high-speed service are described for each of these corridors below.

Any new construction should not preclude 150 mph service implementation at a later date. Other than larger radius curves, 150 mph service will require complete grade separation and tighter tolerances in track construction. In addition, electrification may be desirable depending on rolling stock options procured for higher speed service. High-speed service may share right-of-way with existing freight lines, but it is assumed in this memorandum that it will operate on dedicated track.

4.3.1 Midwest High-Speed Regional Rail Initiative – Twin Cities to Chicago (via River Route)

This scenario addresses HSR service between the Twin Cities and Chicago for the portions of the corridor that are within Minnesota. The segments evaluated include St. Paul to Hastings and Hastings to Winona. While this service is proposed to be on dedicated track, and not interfere or require improvements to the freight railroads, implementing HSR service on this corridor will still require significant investment.

- **New and Upgraded Track.** 99 miles of dedicated, FRA Class 6 track for this line totals just under $357.1 million in addition to the upgrade of the existing FRA Class 4 track to FRA Class 6 at a cost of $16 million.
- **New Signals.** CTC signals are required for all passenger rail operations. For the 127-mile portion of this line in Minnesota, CTC is expected to cost $79.2 million.
- **Positive Train Control (PTC).** PTC will be required for all passenger rail operations beginning in 2015. For the 127-mile portion of this line in Minnesota, PTC is expected to cost $13.2 million.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as passenger service is introduced. This study estimated that approximately $400,000 per mile will address any grade crossing upgrades for HSR to quad-gates, for a total of $50.8 million.
- **Rolling Stock.** Rolling stock to accommodate eight train pairs/day is estimated to be $280 million.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per train mile exclusive of capital improvements, capacity rights with eight train pairs/day are expected to cost about $172.7 million.

- **Operations and Maintenance Costs.** O&M costs for the Minnesota portion of the line with eight train pairs/day are expected to total $42.7 million.

These improvements are summarized in Table 4.20. For information on bridge, interlocking, and junctions, refer to Section 4.1.5 (Other Class I Improvements).

Table 4.20 Summary of Midwest High-Speed Regional Rail Initiative Twin Cities to Chicago (River Route) Improvements
Minnesota Costs

	Need	Cost to Upgrade (Millions of Dollars)
Existing Line Costs		
	Merriam Park Sub, add 1.05 miles track	$1.8
	MNNR Yard, add 0.3 miles track, 1.4 miles signal	$1.3
	Midway Sub, add 0.59 miles track	$0.1
	Wayzata Sub, add 0.5 miles track	$0.8
	Hoffman Interlocking	$54.0
	St. Anthony Junction	$27.0
	Minneapolis Junction	$33.0
	La Crescent Swing Bridge (CP)	$117.0
	Hastings (CP) over Mississippi River	$90.0
	10% Engineering	$32.5
	30% Contingency	$97.5
	Total Freight Needs	**$455.0**
Capital Costs[a]		
	Upgrade 127 miles from Class 4 to Class 6 track	$16.0
	Add 99.2 miles of new Class 6 track	$357.1
	Upgrade 127 miles to CTC	$79.2
	Add 127 miles of Positive Train Control	$13.2
	Grade Crossing Improvements	$50.8
	Rolling Stock (eight train sets)	$280.0
	Capacity Rights[b]	$172.7
O&M Costs		
	Operations and Maintenance Costs[c]	$42.7

[a] Passenger service need estimates include engineering and contingency costs.
[b] Negotiated on a case by case basis.
[c] Cost is post implementation.

4.3.2 HSR: Twin Cities to Duluth

This scenario addresses HSR (110 mph) service between the Twin Cities and Duluth, as prescribed in the Northern Lights Express study.[10] The segments evaluated include Twin Cities to Coon Rapids, Coon Rapids to Cambridge, and Cambridge to Duluth. While this service is proposed to be on dedicated track, and not interfere or require improvements for the freight railroads, implementing HSR service on this corridor will require significant investment.

- **New, Dedicated Track.** 152 miles of dedicated, FRA Class 6 track for this line totals just under $547.2 million.
- **New Signals.** CTC signals are required for all passenger rail operations. For the 152-mile portion of this line in Minnesota, CTC is expected to cost $159.6 million.
- **Positive Train Control (PTC).** PTC will be required for all passenger rail operations beginning in 2015. For the 152-mile portion of this line in Minnesota, PTC is expected to cost $15.9 million.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as track is added. This study estimated that approximately $400,000 per mile will address any grade crossing upgrades for HSR to quad-gates, for a total of $60.8 million.
- **Rolling Stock.** Rolling stock to accommodate eight train pairs/day is estimated to be $280 million.
- **Right-of-Way.** It is assumed that any HSR service in this corridor would use new track, but the same right-of-way as the existing BNSF corridor. No cost.
- **Capacity Rights.** Based on the recent Northstar negotiated rate of $85,000 per train mile exclusive of capital improvements, capacity rights with eight train pairs/day are expected to cost about $206.7 million.
- **Operations and Maintenance Costs.** O&M costs for the Minnesota portion of the line with eight train pairs/day are expected to total $51.7 million.

These improvements are summarized in Table 4.21. For information on bridge, interlocking, and junctions, refer to Section 4.1.5 (Other Class I Improvements).

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[10] http://www.northernlightsexpress.org/joomla/index.php.

Table 4.21 Summary of Twin Cities to Duluth High-Speed Rail Improvements
Minnesota Costs

	Need	Cost to Upgrade (Millions of Dollars)
Existing Line Costs		
	Staples Sub, add 5.4 miles new track	$9.2
	Midway Sub, add 0.94 miles new track	$1.6
	Wayzata Sub, add 0.47 miles new track	$0.8
	University Interlocking	$14.0
	Minneapolis Junction	$33.0
	Coon Creek Junction	$100.0
	Grassy Point Swing Bridge (BNSF) over Saint Louis River	$51.0
	BNSF bridge 28.3	$4.0
	BNSF bridge 30.2	$6.0
	BNSF bridge 62.4	$13.0
	BNSF bridge 91.8	$2.0
	10% Engineering	$23.5
	30% Contingency	$70.4
	Total Freight Needs	**$328.4**
Capital Costs[a]		
	Add 152 miles for new Class 6 track	$547.2
	Add 152 miles to CTC	$159.6
	Add 152 miles of Positive Train Control	$15.9
	Grade Crossing Improvements	$60.8
	Rolling Stock (eight train sets)	$280.0
	Capacity Rights[b]	$206.7
O&M Costs		
	Operations and Maintenance Costs[c]	$51.1

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

4.3.3 HSR: Twin Cities to Rochester

This scenario addresses HSR (110 mph) service between the Twin Cities and Rochester, as prescribed in the Rochester Rail Link Feasibility study.[11] A large portion of this alignment is Greenfield; however, there are still significant investment requirements for HSR implementation.

- **New, Dedicated Track.** 111 miles (90 miles of main line and 21 miles of sidings) of dedicated, FRA Class 6 track for this line totals just under $400 million.
- **New Signals.** CTC signals are required for all passenger rail operations. For the 90-mile portion of this line in Minnesota, CTC is expected to cost $69.3 million.
- **Positive Train Control (PTC).** PTC will be required for all passenger rail operations beginning in 2015. For the 90-mile portion of this line in Minnesota, PTC is expected to cost $9.2 million.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as passenger service is introduced. This study estimated that approximately $400,000 per mile will address any grade crossing upgrades for HSR to quad-gates, for a total of $36 million.
- **Rolling Stock.** Rolling stock to accommodate eight train pairs/day is estimated to be $280 million.
- **Right-of-Way.** The majority of this corridor is proposed along a Greenfield alignment and land acquisition is estimated to be close to $82 million.
- **Operations and Maintenance Costs.** O&M costs for the line with eight train pairs/day are expected to total $38.9 million.

These improvements are summarized in Table 4.22. For information on bridge, interlocking, and junctions, refer to Section 4.1.5 (Other Class I Improvements).

[11] http://www.dot.state.mn.us/passengerrail/onepagers/rochesterstudy.pdf.

Table 4.22 Summary of Twin Cities to Rochester High-Speed Rail Improvements

	Need	Cost to Upgrade (Millions of Dollars)
Existing Line Costs		
	MN&S Sub, upgrade 12.7 miles signal	$6.7
	Wayzata Sub, add 0.9 miles new track	$1.5
	Albert Lea Sub, add 0.6 miles new track	$1.0
	Hoffman Interlocking	$54.0
	St. Louis Park Interchange	$70.0
	Dan Patch Interchange (Savage)	$10.0
	Savage (TC&W) over Minnesota River	$34.0
	Robert Street Vertical Lift Bridge (UP) over Mississippi River	$51.0
	Pigs Eye Bridge (UP) over Mississippi River	$76.0
	10% Engineering	$30.4
	30% Contingency	$91.3
	Total Freight Needs	**$425.9**
Capital Costs[a]		
	Add 90 miles for new Class 6 track	$399.6
	Add 90 miles to CTC	$69.3
	Add 90 miles of Positive Train Control	$9.2
	Grade Crossing Improvements	$36.0
	Rolling Stock (eight train sets)	$280.0
	Right-of-way[b]	$81.9
O&M Costs		
	Operational and Maintenance Costs[c]	$30.2

[a] Passenger service need estimates include engineering and contingency costs.

[b] Negotiated on a case by case basis.

[c] Cost is post implementation.

4.7.4 HSR: Twin Cities to Chicago (via Rochester Route)

This scenario addresses HSR (110 mph) service between the Twin Cities and Chicago via the Greenfield route through Rochester. This scenario includes all of the costs associated with the stand-alone Greenfield route between Rochester and the Twin Cities as detailed in Section 4.3.3, plus the costs of a Greenfield route connecting Rochester to the rest of the MWRRI alignment probably in the vicinity of LaCrosse, Wisconsin. A large portion of this alignment is Greenfield; however, there are still significant investment requirements for HSR implementation.

- **New, Dedicated Track.** 202 miles (160 miles of main line and 42 miles of sidings) of dedicated, FRA Class 6 track for this line totals just under $727 million.
- **New Signals.** CTC signals are required for all passenger rail operations. For the 160-mile portion of this line in Minnesota, CTC is expected to cost $123 million.
- **Positive Train Control (PTC).** PTC will be required for all passenger rail operations beginning in 2015. For the 160-mile portion of this line in Minnesota, PTC is expected to cost $16.5 million.
- **Grade Crossing Improvements.** It is assumed that grade crossing improvements will be required as passenger service is introduced. This study estimated that approximately $400,000 per mile will address any grade crossing upgrades for HSR to quad-gates, for a total of $64 million.
- **Rolling Stock.** Rolling stock to accommodate eight train pairs/day is estimated to be $280 million.
- **Right-of-Way.** The majority of this corridor is proposed along a Greenfield alignment and land acquisition is estimated to be close to $145.6 million.
- **Operations and Maintenance Costs.** O&M costs for the line with eight train pairs/day are expected to total $53.8 million.

These improvements are summarized in Table 4.23. For information on bridge, interlocking, and junctions, refer to Section 4.1.5 (Other Class I Improvements).

Table 4.23 Summary of Twin Cities to Chicago (via Rochester) High-Speed Rail Improvements

	Need	Cost to Upgrade (Millions of Dollars)
Existing Line Costs		
	MN&S Sub, upgrade 12.7 miles signal	$6.7
	Wayzata Sub, add 0.9 miles new track	$1.5
	Albert Lea Sub, add 0.6 miles new track	$1.0
	Hoffman Interlocking	$54.0
	St. Louis Park Interchange	$70.0
	Dan Patch Interchange (Savage)	$10.0
	Savage (TC&W) over Minnesota River	$34.0
	Robert Street Vertical Lift Bridge (UP) over Mississippi River	$51.0
	Pigs Eye Bridge (UP) over Mississippi River	$76.0
	La Crescent Swing Bridge (CP)	$117.0
	Hastings (CP) over Mississippi River	$90.0
	10% Engineering	$51.1
	30% Contingency	$153.4
	Total Freight Needs	**$715.7**
Capital Costs[a]		
	Add 160 miles for new Class 6 track	$727.2
	Add 160 miles to CTC	$123.2
	Add 160 miles of Positive Train Control	$16.5
	Grade Crossing Improvements	$64.0
	Rolling Stock (8 train sets)	$280.0
	Right-of-way[b]	$145.6
O&M Costs		
	Operations and Maintenance Costs[c]	$53.8

[a] Passenger service need estimates include engineering and contingency costs.
[b] Negotiated on a case by case basis
[c] Cost is post implementation

4.4 Cost of Project Implementation

As previously noted in this study, Minnesotans have been active in the pursuit of passenger rail service; from studying corridors to actual service implementation. Much ground work has been laid to help development of this state rail plan. In fact, a number of passenger rail studies have developed cost estimates for line construction, capacity rights, and annual operating and maintenance. This study's estimates are not intended to supersede engineering studies that already have been conducted using much more detailed data. It is important to note that freight and passenger needs identified in this study have been determined through use of a GIS-tool developed specifically for this project – each corridor in the State has been analyzed using the same assumptions and costs derived to provide a high-level apples-to-apples comparison. Output from the GIS-tool has been augmented by expert advice throughout cost development.

This study shows that cost of project implementation can vary depending on how the program is developed (to be discussed in further detail in TM 9, Funding and Programming). Sections 4.2 and 4.3 provided a city-pair by city-pair analysis to describe project costs, and Table 4.24 provides this cumulative cost of implementing full build passenger service for each individual city pair. Review of track and signal costs, only, indicate the total cost for implementing passenger service on a corridor-by-corridor basis is roughly $8.4 billion.

In several cases city pair segments overlap each other, and on any given corridor two or three different passenger services may be provided. A key corridor where this can be shown is along BNSF's Staples subdivision; this corridor is a conduit for service to Duluth, Cambridge, St. Cloud, and Fargo/Moorhead. Table 4.25 builds on Table 4.24 and provides the cost for implementing all of these city pair corridors though sharing infrastructure among projects. Review of track and signal costs, only, indicate the total cost for implementing passenger service as a system is $2.4 billion.

While it is important to proceed with a "system approach" for implementation, it is possible to identify those projects that provide the biggest bang for the buck investment. Table 4.26 builds on Table 4.25 and assumes that projects in shared corridors with shared infrastructure are pursued; however, it only includes those projects that have been identified as higher priorities. Those higher-priority projects include:

- HSR service of 110 to 150 mph between the Twin Cities and Duluth, Rochester, and Chicago.
- Enhanced conventional rail service of up to 90 mph between the Twin Cities and St. Cloud, Mankato, Fargo and Eau Claire, Wisconsin, and between St. Paul and Minneapolis.

As shown in Figure 4.9, higher priority projects are described as Phase I projects, and all other projects are described as Phase II projects. These phases will be referred to again in Section 5.0 Performance Evaluation. Review of track and signal costs, only, indicate the total cost for implementing higher priority passenger corridors as a system is $2.2 billion.

Figure 4.9 Phase I and Phase II Passenger Corridors

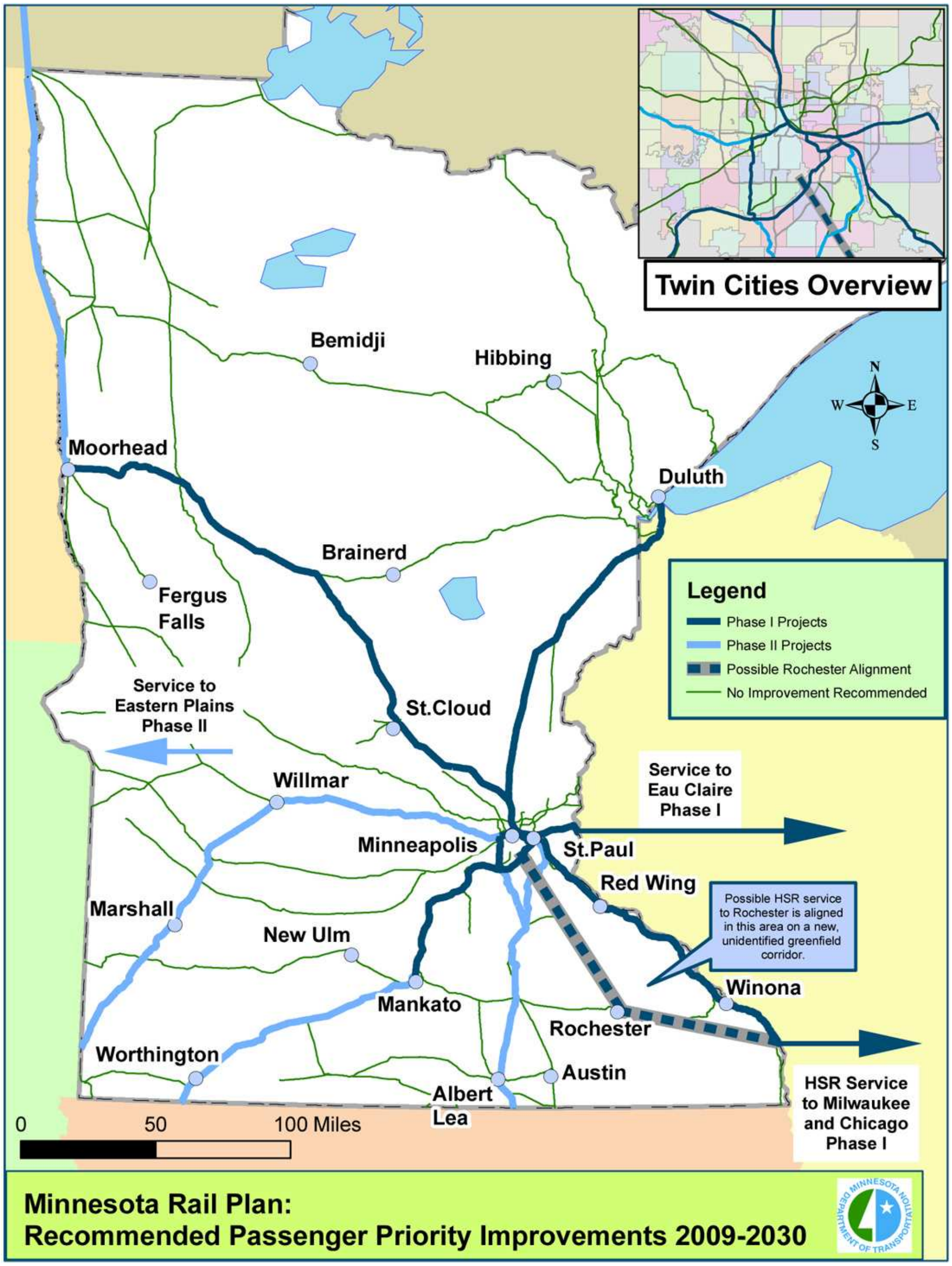


Table 4.24 2030 Shared Freight and Passenger Rail Corridors Reviewed
Costs for All Improvements between City Pairs (Does not assume improvements build upon each other)

City Pair/Description	Type of Service Reviewed	Train Pairs/Day	Freight Capital Costs 2009-2030[a] (Millions of Dollars)	2030 Passenger Infrastructure Costs (Millions of Dollars)	Infrastructure Total (Millions of Dollars)	Rolling Stock (Millions of Dollars)	Capacity Rights (Millions of Dollars)	Annual O&M Costs (Millions of Dollars)
Twin Cities to Cambridge								
Northstar-Cambridge Extension	79 mph	4	$245.2	$222.2	$467.4	$72.0	$29.9	$7.4
Twin Cities to St. Cloud								
Northstar-Expanded to St. Cloud	79 mph	8	$305.4	$126.9	$432.3	$144.0	$91.1	$22.5
Twin Cities to Fargo/Moorhead								
Expanded Empire Builder	79 mph	2	$559.3	$78.5	$637.8	$18.0	$41.1	$10.2
Twin Cities to Fargo/Sioux Falls, SD								
Little Crow	79 mph	4	$94.4	$114.9	$209.3	$72.0	$161.2	$39.8
Twin Cities Connection[b]								
Minneapolis-St. Paul (BNSF)	79 mph	4	$166.1	$18.3	$184.4	$72.0	$9.5	$2.4
Twin Cities to Albert Lea (Kansas City, MO)								
	79 mph	4	$415.2	$41.7	$456.9	$72.0	$76.8	$19.0
Twin Cities to Mankato (Sioux City, IA)								
Minnesota Valley Line	79 mph	4	$449.4	$165.9	$615.3	$72.0	$57.1	$14.1
Twin Cities to Eau Claire, WI								
MN	79 mph	4	$198.0	$16.7	$214.7	$72.0	$12.2	$3.0
WI	79 mph	4	$198.0	$80.2	$278.2	*(incl. in MN)*	$46.9	$11.6
Twin Cities to Chicago (via River)-HSR								

City Pair/Description	Type of Service Reviewed	Train Pairs/Day	Freight Capital Costs 2009-2030[a] (Millions of Dollars)	2030 Passenger Infrastructure Costs (Millions of Dollars)	Infrastructure Total (Millions of Dollars)	Rolling Stock (Millions of Dollars)	Capacity Rights (Millions of Dollars)	Annual O&M Costs (Millions of Dollars)
MWRRI	110 mph	8	$455.0	$516.3	$971.3	$280.0	$172.7	$42.7
Twin Cities to Duluth-HSR								
Northern Lights Express	110 mph	8	$328.4	$783.5	$1,111.9	$280.0	$206.7	$51.1
Twin Cities to Rochester-HSR								
Rochester Rail Link	110 mph	8	$425.9	$596.0	$1,021.9	$280.0	–	$30.2
Twin Cities to Chicago (via Rochester)-HSR								
	110 mph	8	$715.7	$1,076.5	$1,792.2	$280.0	–	$53.8
TOTALS			**$ 4,556.1**	**$ 3,837.7**	**$ 8,393.8**	**$ 1,714.0**	**$ 905.2**	**$ 307.8**

[a] Some unknown freight costs have not been accounted for.

[b] Higher-cost option used between BNSF and CP.

Table 4.25 2030 Shared Freight and Passenger Rail Corridors Reviewed – Built as a System *Costs for All Improvements between City Pairs (Assumes improvements build upon each other)*

	Improvement Type	Cost (Millions of Dollars)
Junctions, Bottlenecks and Bridges	BNSF Bridge 28.3	$4.0
	BNSF Bridge 30.2	$6.0
	BNSF Bridge 62.4	$13.0
	BNSF Bridge 91.8	$2.0
	Coon Creek Junction	$100.0
	Dan Patch Interchange (Savage)	$10.0
	Grassy Point Swing Bridge (BNSF) over Saint Louis River	$51.0
	Hastings Bridge (CP) over Mississippi River	$90.0
	Hoffman Interlocking	$54.0
	Hudson Bridge (UP) over St. Croix River	$87.0
	La Crescent Swing Bridge (CP)	$117.0
	Mendota Heights (UP) (Omaha Road Bridge #15) over Mississippi River	$44.0
	Minneapolis Junction	$33.0
	Moorhead Junction	$5.0
	Pigs Eye Bridge (UP) over Mississippi River	$76.0
	Roberts Street Vertical Lift Bridge (UP) over Mississippi River	$51.0
	Savage Bridge (TC&W) over Minnesota River	$34.0
	Shakopee Realignment	$163.0
	St. Anthony Junction	$27.0
	St. Louis Park Interchange	$70.0
	University Interlocking	$6.1
	10% Engineering/30% Contingency	$417.2
	Total Existing Line Costs	**$1,460.3**
Shared Corridors	2009 Freight Shared Track and Signal	$246.5
	2030 Freight Shared Track and Signal	$269.6
	2030 Conv. - Passenger Track & Signal	$356.2
	2030 HSR - Passenger Track, Signal & ROW	$3,875.4
	Capacity Rights	$905.2
	Total Shared Corridor Track & Signal Cost	**$5,653.0**
	Total Cost	**$7,113.3**

Note: Does not include rolling stock or annual operations and maintenance costs.

Table 4.26 2030 Shared Freight and Passenger Rail Corridors Reviewed – High-Priority Corridors *Costs for All Improvements between City Pairs (Assumes improvements build upon each other)*

	Improvement Type	Cost (Millions of Dollars))
Junctions, Bottlenecks and Bridges	BNSF Bridge 28.3	$4.0
	BNSF Bridge 30.2	$6.0
	BNSF Bridge 62.4	$13.0
	BNSF Bridge 91.8	$2.0
	Coon Creek Junction	$100.0
	Dan Patch Interchange (Savage)	$10.0
	Grassy Point Swing Bridge (BNSF) over Saint Louis River	$51.0
	Hastings Bridge (CP) over Mississippi River	$90.0
	Hoffman Interlocking	$54.0
	Hudson Bridge (UP) over St. Croix River	$87.0
	La Crescent Swing Bridge (CP)	$117.0
	Mendota Heights (UP) (Omaha Road Bridge #15) over Mississippi River	$44.0
	Minneapolis Junction	$33.0
	Moorhead Junction	$5.0
	Pigs Eye Bridge (UP) over Mississippi River	$76.0
	Roberts Street Vertical Lift Bridge (UP) over Mississippi River	$51.0
	Savage Bridge (TC&W) over Minnesota River	$34.0
	Shakopee Realignment	$163.0
	St. Anthony Junction	$27.0
	St. Louis Park Interchange	$70.0
	University Interlocking	$6.1
	10% Engineering/30% Contingency	$417.2
	Total Existing Line Costs	**$1,460.3**
Shared Corridors	2009 Freight Shared Track and Signal	$152.5
	2030 Freight Shared Track and Signal	$269.6
	2030 Conv. - Passenger Track & Signal	$302.8
	2030 HSR - Passenger Track, Signal & ROW	$3,105.1
	Capacity Rights	$905.2
	Total Shared Corridor Track & Signal Cost	**$4,735.2**
	Total Cost	**$6,195.5**

Note: Does not include rolling stock or annual operations and maintenance costs.

Review of Tables 4.25 and 4.26 show that there is a long list (21 projects) of junctions and bridges that require improvement. And while a few of these projects are related to a specific corridors' implementation (e.g., four BNSF bridges on the Hinckley Subdivision for the Duluth NLX project) even more of these projects are required due to the complex intertwined network of railroads present in the Twin Cities area. This web of rails is further challenged by the fact that the Twin Cities is proposed as the "hub" for a network of rail "spokes" emanating throughout the State and Midwest. This means that improvements to a bottleneck like Hoffman Junction will provide benefits to multiple passenger rail projects, as well as to freight service in general, and highlights the importance of building projects as a "system." As previously stated, a project like BNSF's 3rd mainline on the Staples subdivision can provide increased capacity to several services.

Work already is underway to secure funding for several projects that have detailed engineering studies already complete. Table 4.27 shows the estimated capital and operating and maintenance costs anticipated for these studies, as well as the amount of funding applied for by source.

Table 4.27 Passenger Rail Project Earmark Requests

Study/Corridor	Capital Cost Estimate	Operating and Maintenance Cost Estimate	Requested Grant Amount	Grant Source
Rochester Rail Link Study	$697,327,000 to $768,719,000	$37.59 per train mile		
Tri-State III	$973,000,000			
Southern Rail Corridor	$334,253,853		$10,000,000	TIGER
NLX	$360,000,000	$33.34 per train mile	$45,000,000	HSIPR
BNSF Staples Subdivision 3rd Main	$113,500,000		$99,000,000	TIGER
Northstar Phase II	$150,000,000	$125 per train mile	$75,000,000	TIGER

5.0 Performance Assessment

Performance measures are a tool used in all steps of the planning and project development process. They help to set appropriate targets for a policy or system plan where tradeoffs involve different system elements or different objectives given varying assumptions about resources available in a set timeframe. This project's performance assessment was based on the six performance factors identified in TM 5 (Performance Measures), applied to both the passenger and freight systems. These factors include:

- **System Performance**. The operating characteristics of the rail service and existing or potential demand for the service.
- **System Condition**. Condition of existing infrastructure relative to a state of good repair.
- **Connectivity and Accessibility**. Population and businesses served by new or expanded rail service and the impact of rail investments on the larger multimodal transportation network.
- **Safety and Security**. Ability of rail investments to enhance safety (reduced crashes, injuries, and fatalities) and security of the system.
- **Environmental**. Impact of rail investments on the natural and built environments, as overall quality of life, and consistency with community land use plans.
- **Financial/Economic**. Estimated cost, revenue generating potential, and economic development benefits resulting from new or expanded rail service.

Section 5.1 describes passenger rail project evaluation, and Section 5.2 describes freight rail project evaluation. The end product of this effort is intended to be a passenger and freight rail system that provides Minnesota with improved transportation options, costs, and speeds for intrastate and interstate travelers.

5.1 Passenger Evaluation

This section describes the potential system performance benefits of expanding passenger rail in Minnesota as discussed in the needs assessment. The process for evaluating passenger rail was conducted first at the corridor level and then at the system level. The first step in the approach is to screen the passenger needs identified in the shared freight and passenger corridors in Section 3.0 to determine if these needs are feasible within the current planning cycle. Performance measures were then used to evaluate each of the criteria areas described in Table 5.1.

Table 5.1 Passenger Variable Estimation Procedure

Category	Measure
System Performance	**Ridership**. Total ridership by corridor and scenario (Vision Phase I, Phase II, and Passenger build-out). **System efficiency.** Average riders per train.
System Condition	*Impacts cost estimate, not directly considered in performance analysis.*
Connectivity and Accessibility	**System accessibility.** Total number and percent of Minnesota residents outside of the Twin City metro area with access to the rail system.
Safety and Security	*Not evaluated for passenger investments.*
Environmental	**Environmental impact**. Qualitative assessment of the impact of new track or right-of-way on the environment.
Financial/Economic	**Cost**. Cost of implementing each scenario. **Cost per rider**. Total cost per passenger (over a 30-year period). **Qualitative cost effectiveness.** Summary of overall benefits achieved by scenario relative to total cost.

5.1.1 Performance Measure Calculation Methodology

The specific measures outlined in Table 5.1 were calculated and applied based on the following methodology. Results of the performance evaluation can be found in Tables 5.2 (Benefits) and 5.3 (Cost and Cost Effectiveness).

Ridership

Ridership was estimated as part of TM 3 (Passenger Rail System) and subsequent sensitivity analyses to produce the most favorable results for each city pair. Specific changes since TM 3 include the following:

- For each of the HSR corridors, a low-fare high-speed (110 mph) service combination was calculated and compared to other models;
- For Duluth HSR service, ridership demand for Superior, Wisconsin was included in the estimates; and
- For HSR service to Rochester (or via Rochester on the MWRRI), the Minneapolis-St. Paul International Airport was included as a stop.

In addition to overall ridership, system efficiency was calculated by estimating the total number of riders on an average train and the total number of riders per train mile. These were calculated by estimating daily ridership (assuming 300 service days per year) and dividing it by the number of trains in service each of those days and number of train miles operated each day.

System Accessibility

System accessibility was calculated as the total population and percent of population living outside the Twin Cities Metropolitan area that would have access to rail service in the future. County and metropolitan area population projections from the Minnesota Department of Administration were used to evaluate this measure. Every county or metro area with a station was considered to have access to the rail system. Metropolitan estimates were used for stations in Duluth, Fargo, La Crosse, Rochester, and St. Cloud. Only the Minnesota population within each of these metropolitan areas was used. County-level estimates were used for Albert Lea, Mankato, Marshall, Northfield, Red Wing, Willmar, and Winona.

The total population estimated was compared to the total population of the State outside of the Twin City area to estimate the percent with access.

Environmental Impact

A qualitative assessment was made of environmental impacts. Corridors using new alignments have a high potential of impact. Only Rochester currently is expected to be built on entirely new right-of-way at this time. Corridors that would require significant new track, including high-speed corridors that would, in many cases, need separate track, are identified as having a medium potential for impact. Passenger services that would use shared track with freight railroads are expected to have a low potential for environmental impact.

VMT and Greenhouse Gas Emissions

The likely impact on the roadway system was identified through estimates of expected changes in auto vehicle miles of travel (VMT) and greenhouse gas emissions.

VMT changes were estimated based on the changing mode share predicted by the demand modeling exercise. These changes in mode share were multiplied by auto distances for the city pairs and average vehicle occupancy to generate an estimate of change in VMT. The National Highway Travel Survey estimates average vehicle occupancy for nonwork trips of 1.14 persons per vehicle. However, given the long distances for many of these corridors, the likely excursion nature of many of the riders, and a desire to be relatively conservative in estimating both VMT changes (and greenhouse gas emissions), the work-based average vehicle occupancy (1.6) was used for all trips.

Greenhouse gas emissions were estimated using data developed by the Center for Clean Air Policy and the Center for Neighborhood Technology for evaluating the impact of HSR.[12] These estimates were based primarily on 90 to 100 mph

[12] High Speed Rail and Greenhouse Gas Emissions in the U.S., July 2006, Center for Clean Air Policy and Center for Neighborhood Technology.

diesel-powered rail systems. Increased greenhouse gas emissions from rail were estimated by multiplying the total number of train trips by the distance they travel by the emissions factor. Only the overall rail trip was examined (i.e., Twin Cities to Chicago) to avoid double counting. Decreased greenhouse gas emissions from automobiles were estimated by multiplying the estimated VMT change by the automobile emission factor. The difference between the two is the overall greenhouse gas emissions expected to be reduced.

Cost

Several cost values were estimated and a qualitative scale was developed. Because any passenger rail service operating on a freight route would need to be negotiated between the passenger rail provider and the freight railroad, it is difficult to establish a definitive cost. The cost values that were estimated include:

- **Infrastructure Cost**. This value represents the infrastructure needs for passenger service in 2030 above and beyond the total infrastructure needs identified for freight. For example, if the level of freight investment identified in Section 4.0 also can accommodate four passenger trains per day, that scenario would produce no additional infrastructure cost for passenger rail. Track, signal systems, and crossings are included in this cost.
- **Rolling Stock**. This is the cost to purchase rolling stock to operate these services. In general, it is assumed that new rolling stock will be required for each new route, with the exception of the Twin Cities Connection, which can readily be operated as part of another service. There may be opportunities for synergies among the several services, especially if Phase II services are brought on-line. However, these cannot be addressed at this time.
- **Capacity Rights Cost**. Because the actual cost must be negotiated with the freight railroad for use of the network, it is likely that the freight railroad will expect passenger rail to pay more than just the additional infrastructure cost. This also addresses that the owner (freight railroad) has invested in their own reserve capacity and would likely attempt to maintain the same level of reserve capacity after implementation of passenger service. Further, there is no guarantee that all of the freight needs will be addressed prior to implementing passenger rail service. To account for this, a "capacity rights cost" was estimated based on the negotiated public investment made as part of the Northstar service, roughly $85,000 per train mile. This represents a best guess for a potential negotiation and is useful only in helping to qualitatively assess costs.
- **Operations and Maintenance Costs**. This value represents the costs required to operate the service and maintain the track and rolling stock. This is reported as an annual cost. Operating and maintenance costs were estimated at $70 per train mile of service, based on current Amtrak operating costs. Operating and maintenance costs were estimated for entire distance of each route, with the exception of the high-speed routes to Chicago. For these, only the Minnesota portion is estimated.

Revenue

Potential revenue for each of the services is based on the fares used to estimate ridership. The model includes fare estimates on a per mile basis. These were multiplied by ridership by segment to calculate revenue. Except for high-speed routes to Chicago, revenue was estimated for the entire corridor. For the Chicago routes, the revenue was prorated to Minnesota based on the number of trip ends within the State. A minimum of 50 percent of the revenue was assumed to accrue against Minnesota's costs because all trip ends have an origin or destination in the Twin Cities. If the other trip end was also in Minnesota (i.e., Red Wing for the River Route or Rochester for the Rochester alignment), 100 percent of the revenue is assumed to accrue against Minnesota's costs.

Cost Effectiveness

In addition to overall cost, cost-effectiveness was evaluated using several metrics, including:

- **Capital Cost per Mile of Service**. This is the total capital cost divided by the corridor length. This shows the average cost of implementation of each new route and allows a normalized comparison of routes.
- **Farebox Recovery Ratio.** The farebox recovery ratio is the total revenue divided by operations and maintenance costs. It captures the extent to which a new service, once implemented, can pay for itself. According to July, 2009 Amtrak data, farebox ratios for single or bistate corridors range from 18 percent for the Hoosier State service to 96 percent for Washington-Newport News service, with an average of 69 percent. Long distance, multistate Amtrak routes average about 44 percent. Only the Acela has consistently covered its operating costs through revenues.
- **Operating Subsidy per Rider.** In addition to the farebox recovery ratio, an average operating subsidy per rider is estimated. In combination with the capital cost, this captures the magnitude of public expenditures required to support each service.

5.1.2 Summary of Passenger Performance

Passenger service was evaluated first by the corridors and then as an overall system. Table 5.2 presents a subset of the performance measures identified above for each of the corridors. Some key findings include:

- Three routes have potential for over 500,000 riders per year – St. Cloud, Chicago, and Rochester;
- Four routes have ridership better than one passenger per train mile – St. Cloud, Mankato, Eau Claire, and Rochester. St. Cloud has over three riders per train mile, indicating a high likelihood of success for this line.
- Three routes provide access to the passenger rail system for over 200,000 residents – St. Cloud, Duluth, and Rochester.

- High-speed routes have potential environmental issues that will need to be addressed through detailed studies.
- High-speed routes are the most costly to implement, ranging from just under $900 million for service to Rochester to $1.4 billion for service to Chicago via the Rochester alignment (this is based on passenger-only infrastructure costs, rolling stock and capacity rights). These also cost the most on a per mile basis at about $10 million per mile, though Duluth is under $8 million per mile. Providing a connection between the Twin Cities also is around $8 million per mile.
- St. Cloud is the most cost effective generator of new riders, with just under $350 in capital cost per new rider and an operating subsidy of under $7 per rider. High-speed service to Chicago (via River Route or Rochester) does not require an operating subsidy and may contribute an operating surplus to other services, though it is difficult to assess without considering the service over its entire length.
- Service to several destinations requires significant capital investment for each annual rider generated. Sioux Falls ($4,300), Fargo ($3,800), and Duluth ($2,900) are the least cost effective. Albert Lea ($1,700), Rochester ($1,600), and Mankato ($1,300) are in the next tier.
- Annual operating subsidies are highest for Sioux Falls (over $450 per rider), Fargo (over $200 per rider), and Albert Lea (over $150 per rider). All other routes have subsidies under $100 per rider.

Table 5.2 Passenger Project Performance Measures – Benefits
In Millions

Corridor	Scenario Evaluated	Phase	Distance	Ridership	Ridership per train mile	Population with Rail Service outside Twin Cities	Potential Environmental Impact
Twin Cities-St. Cloud	Conventional, 8 round trips	Phase I	67	1,044,300	3.25	245,700	Low
Twin Cities-Fargo	Conventional 2 RTs	Phase I	242	36,500	0.13	66,900	Low
Twin Cities-Duluth	High speed, 8 RTs	Phase I	152	430,155	0.59	283,750	Medium/High
Twin Cities-Willmar/Sioux Falls, SD	Conventional, 4 RTs	None	237	81,000	0.14	68,330	Low
Twin Cities Connection	Conventional, 4 RTs	Phase I	13	N/A	–	N/A	Low
Twin Cities-Northfield-Albert Lea	Conventional, 4 RTs	Phase II	113	110,500	0.46	114,250	Low
Twin Cities-Mankato	Conventional, 4 RTs	Phase I	84	228,000	1.13	68,080	Low
Twin Cities-Eau Claire, Wisconsin	Conventional, 4 RTs	Phase II	86	257,000	1.07		Low
Twin Cities to Chicago (*River Route)*	High speed, 8 RTs	Phase I	410	1,629,800	0.83	106,180	Medium/High
Twin Cities to Rochester	High Speed, 8 RTs new ROW	Phase I	46	531,100	1.23	236,200	High
	MWRRI Rochester alternative	*Alt*	*420*	*1,917,516*	*0.95*	*236,200*	*High*

Table 5.3 Passenger Project Performance Measures – Costs and Cost Effectiveness *(In Millions)*

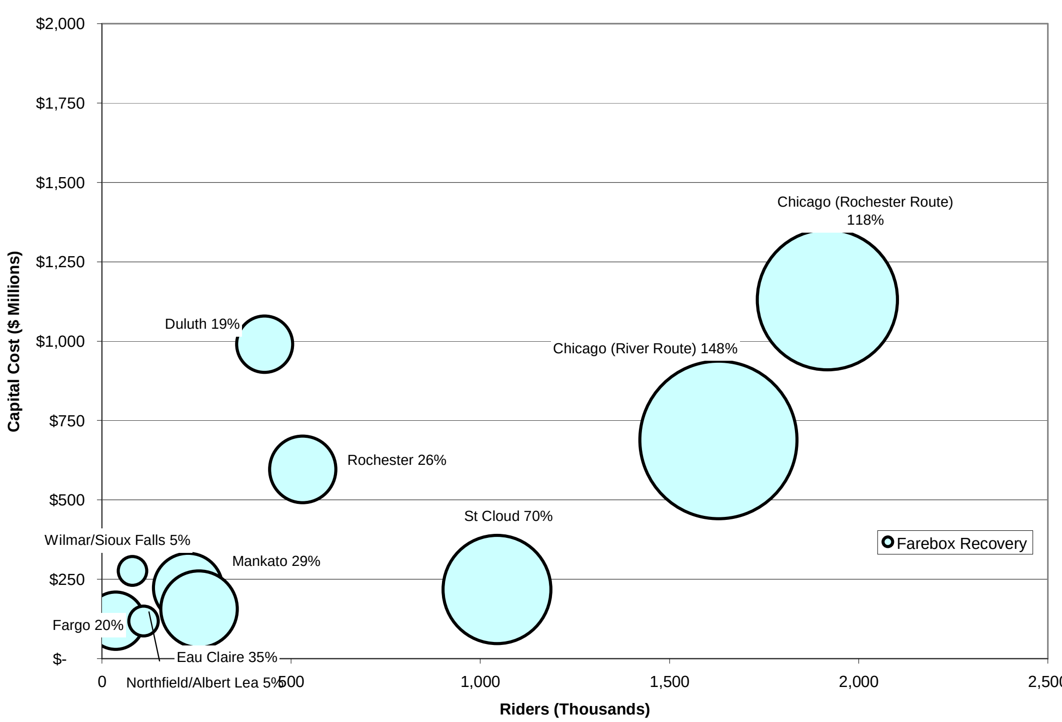
Corridor	Scenario Evaluated	Phase	Capital Cost (Millions of Dollars One-Time)*	Operating and Maintenance Cost (Millions of Dollars annual)	Revenue (Millions of Dollars)	Farebox Recovery (Percent)	Capital Cost per Mile (Dollars)	Capital Cost per Rider (Dollars)	Operating Subsidy per Rider (Dollars)
Twin Cities-St. Cloud	Conventional, 8 round trips	Phase I	$218.0	$22.5	$15.7	70%	$209	$3.3	$6.56
Twin Cities-Fargo	Conventional 2 RTs	Phase I	$119.6	$10.2	$2.0	20%	$3,277	$0.5	$223.47
Twin Cities-Duluth	High speed, 8 RTs	Phase I	$990.2	$51.1	$9.6	19%	$2,302	$6.5	$96.31
Twin Cities-Willmar/ Sioux Falls, SD	Conventional, 4 RTs	None	$276.1	$39.8	$2.0	5%	$3,409	$1.2	$466.98
Twin Cities Connection	Conventional, 4 RTs	Phase I	$27.8	$2.4	*Not est.*	*Not est.*	*Not est.*	$2.0	*Not est.*
Twin Cities-Northfield-Albert Lea	Conventional, 4 RTs	Phase II	$118.5	$19.0	$1.0	5%	$1,072	$1.0	$162.81
Twin Cities-Mankato	Conventional, 4 RTs	Phase I	$223.0	$14.1	$4.1	29%	$978	$2.7	$44.08
Twin Cities-Eau Claire, Wisconsin	Conventional, 4 RTs	Phase II	$ 156.0	$14.6	$5.1	35%	$607	$1.8	$36.88
Twin Cities to Chicago (*River Route)*	High speed, 8 RTs	Phase I	$689.0	$42.7	$63.1	148%	$423	$5.4	–
Twin Cities to Rochester	High Speed, 8 RTs new ROW	Phase I	$596.0	$30.2	$8.0	26%	$1,122	$6.6	$41.94
	MWRRI Rochester alternative	*Alt*	*$1,130.3*	*$53.8*	*$63.2*	*118%*	*$589*	*$7.1*	–

*Does not include rolling stock.

Figure 5.1 summarizes three key factors for consideration of new service – ridership, total capital cost, and farebox recovery (i.e., the percent of operating and maintenance costs expected to be covered by revenue from ridership). Dividing the figure into four quadrants suggests the following findings:

- High-speed services to Chicago (via River and Rochester routes) are in the upper right quadrant. These services are expensive to implement, but generate significant ridership and are likely to cover operating costs or even provide a surplus.
- Service to St. Cloud, in the bottom right quadrant, is a relatively low-cost high-ridership service with ability to cover a significant portion of operating costs. This service has clear, outstanding performance.
- In the top left quadrant, high-speed service to Duluth and Rochester (separate from service to Chicago) provide modest ridership, but at significant capital expense. These services also have somewhat limited ability to cover operating costs with revenue as they currently are configured.
- In the bottom left quadrant, the remaining services are all relatively inexpensive to implement, but the routes generate only modest or minimal ridership and many are unable to cover operating expenses with revenues. Services to Mankato and Eau Claire are clear exceptions.

Figure 5.1 Summary of Individual Passenger Route Performance



In addition to examining the performance of individual routes, overall system performance was considered, taking into account the cost efficiencies described above. Table 5.4 summarizes performance at the system level.

Table 5.4 Passenger System Performance Analysis

	Scenario		
Metric	Vision – Passenger Rail Build Out	High-Priority Corridors (Phase I)	High-Priority Alternate (MWRRI via Rochester)
Miles of New Service	1,495	1,145	1,065
Train Miles	16,500	12,252	12,406
Ridership (Thousands)	4,348	4,157	3,914
Pax/Vehicle	136.7	154.0	176.3
Pax/Train mile	0.9	1.1	1.1
VMT savings (millions)	501	489	447
Tons GHG reduced	301	318	292
Minnesota Pop w/Access	1,189	1,007	901
Pct w/access	48%	41%	36%
Capital cost [a] ($M one time)	$3,237.9	$2,852.4	$2,609.9
Capital cost [a] /rider	$744.6	$686.2	$666.9
Infrastructure cost [a] /mile ($M)	$2.2	$2.5	$2.5
O&M (millions of dollars annual)	$246.5	$187.7	$168.6
Revenue (millions of dollars annual)	$110.6	$107.6	$99.7
Farebox recovery	45%	57%	59%
Operating subsidy/rider (dollars)	$31.3	$19.3	$17.6

[a] Does not include rolling stock costs.

Building as a system significantly reduces the total cost to build, increasing overall cost effectiveness. Capital costs come to $1.6 million per mile and just over $500 per new rider. The overall system achieves a 45 percent farebox recovery ratio, comparable to Amtrak's long-distance routes.

Building just the high-priority corridors improves cost effectiveness further. The Phase I system has 96 percent of the overall ridership at only three quarters of the infrastructure cost. These services achieve greater efficiencies (13 percent more passengers per vehicle and almost 30 percent more passengers per train mile of service). From an operating perspective, farebox recovery increases to 57 percent and total subsidy per rider declines by over one-third.

The environmental impacts also are better for the high-priority corridors compared to build out (318 million fewer pounds of greenhouse gases compared to 301 million pounds). Several of the corridors actually yield net increases in greenhouse gases due to low ridership and the resulting limited reduction in VMT.

Following the Rochester alignment for the Midwest Regional Rail Initiative high speed route yields over $200 million in infrastructure cost savings because high speed service to Rochester is included on its own in the high priority corridors. The Rochester Route would not serve about 200,000 passengers boarding in Red Wing.

5.2 Freight Evaluation

This section describes the performance metrics reviewed related to investing in freight rail in Minnesota as discussed in the needs assessment. The freight rail system evaluation was conducted at the subdivision level within the performance criteria areas described in Table 5.5.

Table 5.5 Freight Variable Estimation Procedure

Category	Measure
System Performance	**Operating Speed.** Operating speed/percent of system with track speeds > 25 mph.
System Condition	**Railcar Capacity Rating.** Percent of system with 286K railcar capacity rating. **FRA Track Class.** All tracks FRA Class 2 or better. **Track-to-siding Ratio.** Increase in number of mainline tracks to siding tracks by subdivision.
Connectivity and Accessibility	**Intermodal Connectivity**. Proximity to an intermodal facility.
Safety and Security	**Active Warning Devices**. Annual active warning device upgrades. **Positive Train Control.** Implement PTC on all Class I rail lines.

5.2.1 Performance Measure Calculation Methodology

Each metric was reviewed by comparing the 2009 freight condition to the 2030 freight condition by subdivision. The intent was to determine to what extent improvements have been recommended to the freight system.

Operating Speed

A goal of this study is to improve freight track speeds to 25 mph or greater, as warranted. This is needed to ensure commercial viability and safety for operators and current and future shippers that rely on them. Table 5.6 highlights the percent of subdivisions with freight rail speeds greater than 25 mph, and indicates what percent of these subdivisions have been upgraded by 2030. Note that after recommendations are implemented the majority of subdivisions in the State have speeds of 25 mph, or greater. Though not noted in this table, the DM&E railroad currently is upgrading the Waseca Subdivision.

Table 5.6 Percent Freight Rail Lines > 25 MPH

Railroad	Subdivision	2009 Percent of miles > 25 mph	2030 Percent of miles > 25 mph	Percent of Subdivision Upgraded
BNSF	Marshall	99.8	100.0	0.2
BNSF	Midway	39.4	93.1	53.7
BNSF	Staples	96.5	100.0	3.5
BNSF	St. Paul	47.1	61.4	14.3
BNSF	St. Croix	96.0	100.0	4.0
CN	Rainy	99.9	100.0	0.1
CN	Osage	32.6	100.0	67.4
CP	Detroit Lakes	97.4	100.0	2.6
CP	Elbow Lake	97.3	100.0	2.7
CP	Noyes	94.1	100.0	5.9
CP	Paynesville	87.9	100.0	12.1
DME	Waseca	31.4	31.4	–
UP	Albert Lea	93.9	100.0	6.1
UP	Rake	99.8	100.0	0.2
UP	Montgomery	69.9	100.0	30.1
CP/BNSF	River Route	98.0	100.0	2.0

Railcar Capacity Rating

A goal of this study is to improve the freight rail network to support the use of 286,000 pound railcars throughout the State. This weight limit has become the industry-wide standard, and the viability of lines that do not have this capacity will diminish over time. Table 5.7 highlights the percent of each subdivision that is not 286K-lb. compliant in 2009, and what percent of these subdivisions have been upgraded by 2030, based on this plan. It is recommended that all rail lines are 286K-lb. compliant by 2030.

Table 5.7 Percent Freight Rail Lines with 286K-lb. Railcar Capacity

Railroad	Subdivision	2009 Percent of Line 286K-lb. Compliant	2030 Percent of Line 286K-lb. Compliant	Percent of Subdivision Upgraded
BNSF	Browns Valley	–	100.0	100.0
CN	Dresser	–	100.0	100.0
CN	Osage	–	100.0	100.0
CP	Bemidji	–	100.0	100.0
CTRR	Cloquet Terminal	–	100.0	100.0
DME	Waseca	–	100.0	100.0
MNN	Warroad	–	100.0	100.0
MPLI	Redwood Falls	31.0	100.0	69.0
MSWY	LaVerne	–	100.0	100.0
UP	Hartland	–	100.0	100.0
UP	Rake	–	100.0	100.0
UP	Montgomery	98.8	100.0	1.2

FRA Track Class

A goal of this study is to upgrade the existing freight rail infrastructure to support increased volumes, and faster transport of goods. FRA track class is a means of measuring these upgrades. Table 5.8 highlights the percent of each subdivision that is not FRA Class 2 or better in 2009, and indicates that these tracks will all be upgraded to FRA Class 2, based on this plan. It is recommended that all rail lines are FRA Class 2, or better, by 2030.

Table 5.8 Percent Freight Rail Lines with Upgraded FRA Track

Railroad	Subdivision	2009 FRA Track Class	2030 FRA Track Class
CP	Bemidji	1	2
CP	MN&S	1	2
CTRR	Cloquet Terminal	1	2
MDW	MDW	1	2
MNN	Ada	1	2
MNN	P-Line	1	2
MNN	Warroad	1	2
MNNR	Hugo	1	2
MNNR	MNNR Yard	1	2
MNNR	Fridley	1	2
MPLI	Redwood Falls	1	2
MSWY	LaVerne	1	2
NLR	Cold Spring	1	2
NLR	East Side	1	2
NLR	St. Joe	1	2
PGR	Cannon Falls	1	2
PGR	Dan Patch	1	2
PGR	Eagandale	1	2
PGR	Faribault	1	2
PGR	Savage	1	2
UP	Hartland	1	2
UP	Winona	1	2

Track to Siding Ratio

Track to siding ratio is a measure by which capacity of a line is determined. Table 5.9 highlights the 2009 and 2030 track to siding ratios. In order to accommodate the high traffic freight corridors in the State in 2030 investments in track will be required, e.g., the Staples and Midway subdivisions.

Table 5.9 Percent Freight Rail Lines with Increased Track to Siding Ratio

Railroad	Subdivision	2009 Track to Siding Ratio	2030 Track to Siding Ratio	Increase in Track to Siding Ratio
BNSF	KO	2.00	2.49	0.49
BNSF	Marshall	1.09	1.22	0.13
BNSF	Midway	1.77	2.06	0.28
BNSF	Staples	1.85	2.29	0.44
BNSF	Hinckley	1.11	1.21	0.10
BNSF	St. Paul	2.00	2.27	0.27
BNSF	St. Croix	2.00	2.32	0.32
CP	Detroit Lakes	1.03	1.13	0.09
CP	Noyes	1.02	1.21	0.19
CP	Paynesville	1.08	1.24	0.15
CP	Tomah	1.75	1.82	0.07
CP/BNSF	River Route	2.00	2.35	0.35

Connectivity and Accessibility

A qualitative assessment of freight connectivity and accessibility was made using intermodal connectivity as a measure. This study identified the need for enhanced intermodal connectivity either through expansion of existing intermodal facilities, reinstating service in closed facilities, or through the construction of a new intermodal facility in the Twin Cities. Each of these options will provide enhanced connectivity and accessibility to shippers in the State of Minnesota.

Safety and Security

A qualitative assessment of freight system safety and security was made using active warning devices and positive train controls as measures. It is recommended that through 2030 1,400 active warning devices be replaced, enhancing the safety of the system for railroads and the motoring and nonmotoring public, alike. Similarly, it is recommended that by 2030 Positive Train Control (PTC) be added to all Class I rail lines, increasing the efficiency of operations for freight railroads, but also enhancing safety in those freight corridors with shared passenger operations.

In conclusion, based on this cursory evaluation, recommended freight rail system improvements are anticipated to provide enhancements to freight service, shared corridor passenger service, as well as additional benefits to the motoring and nonmotoring public.

A. Vision Statements

DRAFT PASSENGER RAIL VISION

Passenger Rail System

Minnesota currently has one active intercity passenger rail service – Amtrak's Empire Builder which provides service between Chicago and points west, and one light rail line – Hiawatha – which operates between Minneapolis/St. Paul International Airport (MSP) and downtown Minneapolis. Minnesota's first commuter rail service – Northstar – is scheduled to open shortly in late 2009 providing service between Big Lake and the Twin Cities.

Many conditions exist which make it desirable for Minnesota to develop an intrastate and interstate intercity rail system. These conditions include: 1) expected continued population and economic growth once the State emerges from the current recession, putting further demands on the State's capacity constrained highway system; 2) the sudden availability of significant Federal funds dedicated to intercity passenger rail; and 3) macroeconomic and global environmental and energy trends and policies which are likely to significantly increase long-term fuel prices and require significant controls on greenhouse gas emissions.

Given these conditions, Minnesota should undertake the following steps to accomplish a vision which will develop a robust intrastate and interstate intercity passenger rail system which results in improved travel options, costs, and speeds for Minnesota and interstate travelers.

Continue to participate in the Midwest Regional Rail Initiative (MWRRI) and support the development of minimum 110 mph service for connections from the Twin Cities to Wisconsin and the Chicago Hub Network.

Develop an intrastate intercity passenger rail network connecting the Twin Cities with viable service to major outlying regional centers. These services can be started-up as stand-alone projects and coordinated as part of a larger regional/national system. These services should use interchangeable and interoperable equipment. Local transit services in the major MPO regions should be coordinated to support the rail system. System speeds should be a minimum of 90 mph, with a short-term goal of achieving 110 to 150 mph where track conditions and market demand permit and warrant. Systems should be built out on existing freight lines where possible, and on new dedicated passenger tracks where desirable and necessary.

All services should ultimately connect to both the new Minneapolis downtown terminal and St Paul Union Depot.

Corridors should be advanced incrementally, to build ridership and system advantages, leaving open all future options for viable improvements – stand-alone branches, through routes, new alignments, potential airport connections and true HSR.

Corridors should advance simultaneously with MnDOT's support; sequencing depending on financing, ROW acquisition, and agreements with freight railroads.

In Phase II, rail connections should be established to additional intercity and commuter rail markets in Wisconsin and Minnesota, and to an Interstate/I-35 Corridor, Red River Valley, Eastern Plains, and Canada.

Draft Freight Rail Vision

Freight Rail System

Minnesota's rail system forms a critical part of the State's multimodal freight transportation system. Many of the State's major industries rely on the rail network for efficient delivery of goods, and economic and demographic trends indicate a continued need into the future. The rail network is particularly critical in providing efficient connections to markets beyond the State's borders, throughout North America, and to the world through the seaports on the Pacific and Atlantic coasts, and the Great Lakes. Rail provides critical options to shippers in terms of market access, modal economics, and service. With expected higher energy costs, the inherent energy efficiency of rail will make it a more appealing choice for many shippers.

For Minnesota, a strong rail system supports economic development, enhances environmental sustainability, helps to preserve the publicly owned roadway infrastructure, and increases the business marketability of the State. A future of increasing regional and international economic competition, constrained highway capacity, environmental challenges, and rising energy costs, calls for effectively developing and utilizing a rail system that can support expanded traffic volumes and a more diverse customer base. Ownership of Minnesota's rail system, which is largely private, presents unique challenges and opportunities, requiring strategies and solutions that are unique to the mode.

The rail industry in Minnesota is a vital and vibrant rail sector consisting of 24 carriers, ranging from four large Class I railroads to many smaller regional and local carriers. In recent years, growth in traffic hauled by Minnesota's small railroads has outpaced the industry as a whole, and has shown success in locations where prior efforts failed. This success has been recognized by industry, with several receiving awards for innovative marketing and operations. Maintaining and expanding this vitality should be central to the State's involvement with the rail industry.

Therefore, Minnesota should undertake the following steps to accomplish a vision which will develop a balanced multimodal freight system which can respond to increased regional and international economic competition, constrained highway capacity, environmental challenges, a diverse customer base, and rising energy costs.

Infrastructure

A successful, viable rail industry that meets the future needs of Minnesota's economy requires continued investment and improvement to its infrastructure. As private firms, the freight railroad industry is unique in that it has largely borne the cost of maintaining its own infrastructure. This is expected to continue, but further improvements to the infrastructure will be necessary, not all of which may be fully self-funded. Key elements are as follows:

- **Continue improvements to the condition and capacity of Minnesota's primary railroad arterials to accommodate existing and future demand.** At present, these lines are in the best condition that they have ever been.
- **Address critical network bottlenecks** that degrade existing service and inhibit the ability of the State's railroads to effectively absorb future traffic.
- **Upgrade all main line track to 25 mph minimum speed, as warranted.** This is needed to ensure commercial viability and safety for operators and current and future shippers that rely on them.
- **Improve the network to support the use of 286,000 pound railcars throughout**. This weight limit has become the industry-wide standard, and the viability of lines that do not have this capacity will diminish over time.
- **Implement state-of-the-art traffic control and safety systems** to ensure a safe and efficient rail system on key arterials.
- **Expand intermodal service options at several locations throughout the State**. Presently, rail intermodal (the haulage of containers and trailers) services available in Minnesota are limited geographically and capacity-wise. Existing terminals are all located in the Twin Cities, and the only direct services available connect to Chicago and the Pacific Northwest. Service to other regions is either unavailable or circuitous, which has made intermodal a relevant and economical choice for only a small subset of shippers. Quality service to a broader set of markets beyond the State's borders is needed from a competitive and environmental standpoint, as is development of a major new Twin Cities terminal, and one or more intermodal terminals in regions distant from the Twin Cities. These expanded services must be achieved through cooperative agreement among private entities, but the State may facilitate through policy development, targeted financial incentives, and facilitation of discussions among parties.

Planning and Policy Development

- **Maintain and ensure broad access to competitive freight rail services for shippers throughout the State.** The relevance of rail service to Minnesota's industry is directly related to geographic coverage, service times, reliability, availability of appropriate rolling stock, and cost. Meeting these needs requires strong cooperation among the interconnected carriers that make up Minnesota's rail network, and can be met through a range of competitive service offerings, from single carload to high-volume unit train shipments, bulk transloading, intermodal, and innovative solutions that are yet to be developed.

- **Rail should be better integrated into the planning process**, including modal tradeoff analysis, local and regional comprehensive plans, modal diversion, industrial development strategies and public ports planning.

Existing Rail Programs

- **State rail assistance should go beyond the limited MRSI program** which until 2008 had been focused around low-cost loans to rehabilitate and/or construct industrial sidings for rail shippers. Funding limits have become wholly inadequate, and a broader program should go beyond small loans for infrastructure improvements. The program should include a range of solutions and financing options, including branch and shortline preservation.
- **The Rail/Highway Grade Crossing program should expand** to consider a broader array of strategies beyond active warning devices, and match or exceed device replacement needs**.** The Federal Section 130 grade crossing program has provided an institutional structure and a modest source of funds to improve rail/highway grade crossings primarily through the installation of active warning devices. Substantial reductions in grade crossing incidents have been the result, and Minnesota has embraced the program and the public/private partnership model that lies at its foundation. Going forward a more dynamic approach to grade crossings will be necessary, as regions of the State continue to urbanize and rail traffic volumes and speeds increase. While grade crossing warning devices and other low-cost improvements will remain an important part of the mix, other, more complex and costly strategies – such as quiet zones, advanced crossing systems, and even grade separations – are increasingly being demanded by the public. With resources being insufficient to meet existing program mandates, expanded state involvement will necessitate development of a range of creative solutions.
- **Preserved Rail Corridors should be better maintained and managed for possible future use**. While interim uses of preserved rail corridors, typically as recreational trails, have seemingly maintained their integrity for future transportation use, the likelihood of their reuse for freight rail transportation purposes is very modest. Encroachment by abutters, regulations and political considerations make conversion to an active railroad extremely difficult and costly. If demand for rail service continues to increase, the ability to reconstitute some of these trails as rail lines may be desirable. A more nuanced rail banking strategy that establishes clear policies for line acquisition and disposition, and that differentiates rail banking for purposes of future rail use versus other indefinite "interim" public uses should be established.