CAMBRIDGE SYSTEMATICS

Minnesota Comprehensive Statewide Freight and Passenger Rail Plan

Performance Measures

draft technical

memorandum 5

prepared for

Minnesota Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

Kimley Horn & Associates
TKDA

June 30, 2009

www.camsys.com

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Cambridge Systematics, Inc.
100 CambridgePark Drive, Suite 400
Cambridge, Massachusetts 02140

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Table of Contents

List of Tables

Executive Summary

Performance measures support tradeoff analysis in the policy, planning, and programming context. They help to set appropriate targets for a policy or system plan where tradeoffs involve different system elements (e.g., rail versus ports and waterways); or different objectives (e.g., mobility versus safety), given varying assumptions about resources available in a given timeframe. For this project performance measures were specifically developed for three purposes – 1) quantitative evaluation of individual and corridor projects proposed for the strategic rail plan, 2) qualitative assessment of public and private sector roles in project implementations, and 3) establish a structure to qualitatively assess the level of financial participation which the public and private sectors should contribute toward implementation of projects and programs based on defined roles.

For the purpose of evaluation, proposed performance measures were divided into two distinct categories -those for the freight rail system and those for the passenger rail system. These categories of measures were evaluated separately, but divided into similar groupings for comparative purposes. The groupings included: System Performance, System Condition, Connectivity and Accessibility, Safety and Security, Environment, and Financial/Economic. After assessing which ones served multiple purposes and could be descriptively used with existing data to represent both the freight and passenger sides of the system, a set of 15 measures representing a cross-section of categories were moved forward into final consideration for the evaluation stages of this project.

A second review of measures was conducted to assess public and private stakeholder roles in receiving benefits and ultimately to determine financial participation in the project, a combination of quantitative and qualitative measure were developed. This review resulted in a matrix of six system stakeholders that also included state, highway, community, and shipper interests, and 21 measures representing a wide cross-section of interests. This breakdown will be expanded upon in Task 7, public and private sector roles in project implementation, and Task 9, project funding and programming.

1.0 Objective

The objective of this technical memorandum is to present a comprehensive set of freight and passenger rail performance measures for consideration in Minnesota. The listings contained herein will be used for discussion toward developing final performance measures that will assist in prioritizing freight and passenger rail improvements.

2.0 Methodology

We approached this task by means of the following steps:

- Identified relevant topics/issues for evaluation;
- Reviewed literature on measures from a variety of sources as defined below;
- Reviewed planning efforts conducted by Mn/DOT, other DOTs, Amtrak, other rail operators, FRA requirements, etc.;
- Assembled a list separately for freight rail and passenger rail and noted similarities and differences; and
- Developed a common list for consideration in future stages of this effort.

As there is currently limited development of freight performance measures and specifically freight rail performance measures, the measures for this study were developed based on a review of existing MnDOT measures incorporated in the *Minnesota Statewide Freight Plan*. These measures were expanded in consultation with best practice literature information assembled as part of AASHTO's SCORT *State Rail Planning Best Practices* document and NCFRP 03 *Performance Measures for Freight Transportation*, both still under development.

Passenger rail performance measures are much more widely researched and used than freight rail performance measures. For this study measures were built by drawing from completed state rail plans and local passenger rail studies like the California High-Speed Rail Plan. In addition, Federal Railroad Administration requirements currently under development were also referenced for consistency.

After assembling performance measures for both the freight and passenger sides of the rail system, measures were compared and suggestions made for which ones served multiple purposes and could be descriptively used with existing data to represent both sides of the system. Performance measures were then identified to move forward into final consideration for the evaluation stages of this project.

Finally, a second look was given to the full list of performance measures, this time from the perspective of which stakeholder groups may be interested in each measure (e.g. freight railroads, passenger railroads, the State, or shippers). This breakdown will be expanded upon in Task 7, public and private sector roles in project implementation, and Task 9, project funding and programming.

3.0 Performance Measures

Performance measures support several functions in the policy, planning, and programming context, including strategic planning, program evaluation, project evaluation, and system monitoring. Basically, 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 (e.g., rail versus ports and waterways); or different objectives (e.g., mobility versus safety), given varying assumptions about resources available in a given timeframe. With the adoption of the Minnesota Statewide Transportation Plan in 2003, Mn/DOT began implementing a performance-based approach to investment decision-making. The goal is to direct investments to address identified transportation performance problems that provide benefits to Mn/DOTs customers.

States that use performance measures broadly prioritize rail projects based on their contribution to the goals and objectives outlined in the States long-range transportation plan or Statewide rail plan. The duration of a project, its impact on capital budgets, and its relation to specific state policy initiatives and mandates are also widely used prioritization criteria. For this study, performance measures used to prioritize rail investments have been generally identified in six categories:

- **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.

These categories and their specific applicability to freight and passenger rail systems are described in more detail in the following text.

3.1 Freight Performance Measures

As performance measures have become more widely used in transportation planning, so too have freight specific performance measures. And while there is extensive research on a wide variety of potential freight-related measures that could be used by the public and private sectors, in practice state DOTs have traditionally focused on highway side freight measures that rely on easily obtained data from existing sources, such as travel time and pavement condition in freight-significant corridors, or at-grade crossing crashes. Minnesota is the rare exception; the 2005 *Minnesota Statewide Freight Plan* is one of few state freight plans that details freight performance measures and rail specific performance measures, as shown in Table 3.1.

Table 3.1 Mn/DOT Freight Rail Performance Measures

Rail Performance Measures
• Percent of rail track-miles with track speeds ≥25 mph.
• Percent of rail track-miles with 286,000-pound railcar capacity rating.
• Percent of major generators with appropriate rail access.
• Total crashes at at-grade rail crossings (three-year average).
• Percent of at-grade rail crossings meeting grade-separation guidelines.
• Number of truck-related fatalities at at-grade rail crossings (three-year average).
Multimodal Freight Indicators
• Shipment rates for selected commodities, modes, and regional and national markets.
• Mode Share (Tonnage and Value) – Amount of freight carried by each freight mode, by major commodity groups.
• Geographic Market Share – Tonnage and value of shipments to/from the State, by major commodity groups, to major trading partners.
• Travel time for selected commodities, modes, and regional and national markets.

Source: Cambridge Systematics Inc., Minnesota Statewide Freight Plan, Minnesota Department of Transportation, March 2005.

3.1.1 System Performance *Freight*

System performance measures evaluate a freight rail projects potential to maximize use of the rail system and to generate public and private benefits through design and operations. These criteria measure a projects ability to meet an identified market demand, to provide regular and reliable service for customers, and to create a cost-effective shipping alternative. System performance measures are the most commonly used criteria for evaluating freight rail projects and include such variables as number of trains, tons or value of goods carried per day. Also included in system performance is customer satisfaction; though it is a qualitative measure at best, for the freight rail system it helps to gauge private operator responsiveness to customer needs. Specific system performance measures are presented in Table 3.2.

Table 3.2 System Performance Criteria and Performance Measures *Freight*

System Performance Criteria	Measure
Demand	• Mode share (tons)/day (week, month, year) (total and by commodity)[a] • Mode share (value)/day (week, month, year) (total and by commodity)Trains/day (week, month, year)[a] • Tons/day (week, month, year) • Value/day (week, month, year) • Intermodal lifts/day (week, month, year)
Service characteristics	• Tonnage originating, terminating, and passing through state (total, by commodity and by trading partner)[a] • Value originating, terminating, and passing through state (total, by commodity and by trading partner)[a] • Travel time for selected commodities and regional and national markets[a] • Percent of system with track speeds > 25 mph/level of service[a]
Physical characteristics	• Percent of system with available/existing right-of-way
Reliability	• Number of service interruptions • Percent of delays due to infrastructure condition • Percent of delays resulting in re-routing traffic • Customer satisfaction

[a] Indicates existing MnDOT freight performance measure.

3.1.2 System Condition *Freight*

System condition measures are used to prioritize rail investment based on the condition of existing rail infrastructure and to project future needs for maintenance activities. System condition measures are often established based upon specific objectives such as reducing the number of structurally deficient bridges, enabling rail infrastructure to carry 286,000 pound cars or address system chokepoints. Additionally, system condition also considers surrounding communities and compatibility with existing plans and land use. Specific system condition measures are presented in Table 3.3.

Table 3.3 System Condition Criteria and Performance Measures *Freight*

System Condition Criteria	Measure
Existing infrastructure condition	• Percent of system with 286K railcar capacity rating[a] • Percent of system FRA Track Class "3" or better • Percent of system with deficient conditions • Percent of system with bridge restrictions • Percent of system with speed restrictions
Capacity	• Percent of mainline? System double-stack cleared • Track to siding ratio

[a] Indicates existing MnDOT freight performance measure.

3.1.3 Connectivity and Accessibility *Freight*

Connectivity and accessibility measures refer to the number of destinations served and the proximity of desired destinations to proposed freight rail investments. For example, this measure can refer to the extent to which businesses are provided spurs for direct rail access, if there is the choice between multiple rail carriers for service, or even whether or not other modes are available for shipment besides rail. Specific connectivity and accessibility measures are presented in Table 3.4.

Table 3.4 Connectivity and Accessibility Criteria and Performance Measures *Freight*

Accessibility and Connectivity Criteria	Measure
Connectivity	• Percent of major generators with appropriate rail access [a] • Number of intermodal connections/facilities • Percent of employment (or industrial/ warehousing employment) within X minutes drive of intermodal lift?
Accessibility	• Shipment rates of selected commodities, modes and regional and national markets [a] • Availability of other modes
Transportation system impacts	• Reduction in highway congestion
Service area/population	• Proximity to major population/employment centers • Population/employment catchment area

[a] Indicates existing MnDOT freight performance measure.

3.1.4 Safety and Security *Freight*

Public and private sector rail stakeholders have a history of making improvements to the system that will decrease the rate and/or severity of accidents at rail crossings. Recent interest has been placed on the safety and security of communities due to the potential release of hazardous materials. These are categorized in the safety and security measures presented in Table 3.5.

Table 3.5 Safety and Security Criteria and Performance Measures *Freight*

Safety/Security Criteria	Measure
System safety and security	• Percent of at-grade rail crossings meeting grade-separation guidelines [a] • Total crashes at at-grade rail crossings (three-year average) [a] • Number of truck related fatalities at at-grade rail crossings (three-year average) [a] • Number of hazardous materials release incidents
Employee safety and security	• Accident rate and severity
Non-rider safety and security	• Accident rate and severity • Security/trespass prevention

[a] Indicates existing MnDOT freight performance measure

3.1.5 Environmental *Freight*

Environmental measures account for impacts on the natural, social, and cultural resource environment and can directly impact the quality of life of residents in area communities. Of particular concern to local parties during freight rail project discussion are the potential adverse visual, noise and air quality impacts associated with development. Conversely, freight rail projects can bring benefits to the transportation system through the use of green technology and an overall lower ton-mile/gallon consumption rate versus other modes of freight transport. Specific environmental measures are presented in Table 3.6.

Currently MnDOT does not have any freight rail performance measures that evaluate environmental project considerations.

Table 3.6 Environmental Criteria and Performance Measures *Freight*

Environmental Criteria	Measure
Air quality	• Reduction of air pollution (NO_x, SO_x, VOCs, PM) • Reduction of greenhouse gas emissions • Impact on state Ambient Air Quality Standards (AAQS) and Clean Air Act standards
Social and economic resources	• Farmland and agricultural impacts • Aesthetic and visual resource impacts • Environmental justice impacts • Utilities and public services
Noise and vibration	• Decibel levels
Community/Land use impacts	• Compatibility with existing and planned development • Supportive zoning • Consistency with RPC, MPO, and state plans • Support from local government • Development/land use intensity • Change in property values near the rail system • Resident attitudes, perceptions, activity levels • Extent to which railroad facilities function as community barriers

3.1.6 Financial/Economic *Freight*

Financial/economic performance measures can be used to prioritize freight rail investments based on their estimated cost and revenue generating potential. This measure also takes into account the cost-effectiveness of improvements, as well as the impact of investment on the State's economy. Specific financial/economic measures are presented in Table 3.7.

Currently, MnDOT does not have any freight rail performance measures that evaluate financial or economic project considerations.

Table 3.7 Financial/Economic Criteria and Performance Measures *Freight*

Financial/Economic Criteria	Measure
Costs	• Capital costs • Maintenance costs • Total operating costs • State share of costs
Revenue potential	• Tax revenues
Financing	• Non-state funding potential • Potential for public/private partnership or extended private support • Funding available for current year • Funding programmed one to five years out • Earmarks
Economic development potential	• Cost/benefit ratio • Direct and indirect construction impacts • Jobs created/payroll benefits • Induced economic growth • Support from state or regional economic agency
Cost-effectiveness	• Return on investment • Reduced highway maintenance and capital costs • User cost savings / Reduced transportation cost for customers

3.2 Passenger Rail Performance Measures

The Passenger Rail Investment and Improvement Act of 2008 (PRIIA) created multiple requirements for performance measurement and evaluation of existing passenger rail service and future passenger rail investments. Section 207 instructs the Federal Railroad Administration (FRA) and Amtrak to establish standards and metrics to measure the performance and service quality of intercity passenger trains. In order to receive Federal funding under PRIIA, a passenger rail project must be included in a state rail plan and prioritized based on a set of criteria illustrating the project will result in significant improvements to intercity rail passenger service.

This technology memorandum outlines the wide variety of performance measures used by states to assist in evaluating and prioritizing public sector investment in passenger rail projects. The measures presented are drawn from completed state rail plans, local passenger rail studies (i.e., California High-Speed Rail Plan), Amtrak, and the Federal

Railroad Administration. These measures parallel the freight rail performance measures developed as part of the *Minnesota Statewide Freight Plan* and will assist the State as it seeks to develop and improve its commuter, intercity, and high-speed passenger rail network.

The following text describes proposed measures in the same six groupings as used for Freight Rail.

3.2.1 System Performance *Passenger*

System performance measures evaluate passenger rail projects potential to maximize use of the rail system and to generate public benefits through efficient design and performance. These criteria measure a projects ability to meet an identified market demand, to provide regular and reliable service for customers, and to create an efficient and cost-effective transportation alternative. System performance measures are the most commonly used criteria for evaluating passenger rail projects and have been used by Amtrak and in the California, New Jersey, Vermont, New York, and Virginia state rail plans. Specific system performance measures used by multiple states are presented in Table 3.8.

Table 3.8 System Performance Criteria and Performance Measures *Passenger*

System Performance Criteria	Measure
Demand/Ridership potential	• Annual passenger trips/unlinked trips • Annual passenger miles • Passenger miles per train mile • Boarding and alightings per station • Impact on mode share
Service characteristics	• Number of cars originating, terminating, and passing through state • Service frequency • Travel time • Minutes of trip time reduction • Operating speed • Annual car miles
Physical characteristics	• Alignment/grade • Length • Available/existing right-of-way

Table 3.8 System Performance Criteria and Performance Measures *Passenger*

System Performance Criteria	Measure
Reliability	• On-time performance (at all stations and/or endpoint) • Change in effective speed • Operator-responsible delays per 10,000 train miles • Host-responsible delays per 10,000 train-miles • Third party delays (e.g., police actions) • Infrastructure delays • Equipment-caused service interruptions per 10,000 train-miles • Customer satisfaction
Existing infrastructure condition	• Deficient conditions • Bridge capacity conditions • Track classification • Track condition • Speed limitations • Number of grade crossings • Grade crossing ratings • Weight restrictions • Clearance constraints • ADA Compliance
Capacity	• Existing capacity constraints • Future capacity growth needs • Bottleneck/chokepoint mitigation

3.2.2 System Condition *Passenger*

System condition performance measures are used to prioritize passenger rail investment based on the condition of existing rail infrastructure to maintain the system in a state of good repair. System condition addresses the need to minimize the long-term costs of maintaining and replacing infrastructure (i.e., to obtain the lowest life-cycle costs to continue to operate rail service). System condition is also fundamental in ensuring safety of the system, as major incidents are more likely with poorly maintained infrastructure. For example, North Carolina, Florida, and many other states regularly evaluate railroad crossings and prioritize improvements based on a formal scoring system. Crossings with the highest score, indicating more deficient infrastructure or higher safety risks, are given funding priority. The measures in this section focus on the issue of state of good repair and operating rail service without restrictions (i.e., reducing the number of structurally deficient bridges or enabling rail infrastructure to operate passenger service at a certain speed).

Specific system condition measures used by multiple states are presented in Table 3.8.

3.2.3 Connectivity and Accessibility *Passenger*

After system performance, accessibility and connectivity are the most frequently used measures of passenger rail performance. Accessibility generally refers to the number of destinations served and the proximity of desired destinations to proposed passenger rail investments. Connectivity generally refers to the number of rail, transit, and multimodal facilities linked and the degree to which proposed passenger rail investments complement the larger multimodal transportation network. These measures provide a basis for estimating demand for new or expanded passenger rail service and evaluating rail as a viable alternative to other transportation options. The most frequently used accessibility and connectivity measures include the number or share of residents and businesses located within a projects service area, the number of intermodal connections created, and the number of personal vehicle trips that can be diverted to passenger rail. These measures are used in the California, New Jersey, Vermont, New York, and Virginia state rail plans, among others. Specific accessibility and connectivity measures used by multiple states are presented in Table 3.9.

Table 3.9 Connectivity and Accessibility Criteria and Performance Measures *Passenger*

Accessibility and Connectivity Criteria	Measure
Intermodal connections	• Number of connections to other passenger rail and/or transit services • Number of intermodal connections/facilities • Percent of passengers connecting to/from other routes. • Availability of other modes
Transportation system impacts	• Reduction in airside delays • Reduction in highway congestion • Reduction in personal vehicle trips
Service area/population	• Proximity to major population/employment centers • Population/employment catchment area • Percent of passenger-trips to/from underserved communities

3.2.4 Safety and Security (Passenger)

Increasing safety and security is a primary goal of most long-range transportation plans. Improvements that will decrease the rate and/or severity of crashes at rail crossings, stations, and other areas are often given priority by states, Amtrak, and the FRA. As noted above, many projects that maintain the rail system in a state of good repair are likely to reduce the number of incidents experienced. In the case of passenger rail, the number and severity of crimes committed against passengers or customers perceptions of safety while using the service may also be used to evaluate improvements to existing services. Specific safety and security measures used by multiple states are presented in Table 3.10.

Table 3.10 Safety and Security Criteria and Performance Measures *Passenger*

Safety/Security Criteria	Measure
Rider/passenger safety and security	• Accident rate and severity • Crime rate and severity • Customer perceptions of safety and security
Employee safety and security	• Accident rate and severity
Non-rider safety and security	• Accident rate and severity • Security/trespass prevention

3.2.5 Environmental *Passenger*

Environmental measures are most frequently used during alternatives analyses and to ensure that projects are in compliance with requirements outlined by the National Environmental Policy Act of 1969, the Clean Air Act of 1970, and other legislation affecting state or Federally funded investments. Potential reduction in mobile source emissions due to diversion of personal vehicle trips to passenger rail is the measure used most frequently by State DOTs to prioritize rail investments. Other measures, such as impact on natural resources and proximity to hazards are utilized more frequently during project alternatives analysis and design phases. Specific environmental measures used by multiple states are presented in Table 3.11.

Table 3.11 Environmental Criteria and Performance Measures *Passenger*

Environmental Criteria	Measure
Air quality	• Reduction of air pollution / air pollution costs • Reduction of greenhouse gas emissions • Impact on state Ambient Air Quality Standards (AAQS) and Clean Air Act standards
Natural resources	• Hydrology and water resources impacts • Biological resources and wetlands impacts • Sites and acreage affected • Impact on NEPA and related state and federal standards
Avoidance of hazards	• Areas with geologic and/or seismic hazards • Areas with potential hazardous materials or wastes • Floodplains • Soil/slope constraints
Social and economic resources	• Farmland and agricultural impacts • Aesthetic and visual resource impacts • Environmental justice impacts • Utilities and public services
Cultural resources	• Archaeological resource impacts • Historical properties impacts • Publicly owned parklands and recreation areas impacts
Noise and vibration	• Compliance with FHWA standards • Decibel levels of highway and transit modes
Community/Land use impacts	• Compatibility with existing and planned development • Supportive zoning • Consistent with RPC, MPO, and State plans • Support from local government • Development/land use intensity • Property values near rail facilities • Resident attitudes, perceptions, activity levels • Extent to which rail facilities create community barriers • Existence and extent of transportation alternatives

3.2.6 Financial/Economic (Passenger)

Financial/economic performance measures are used to prioritize passenger rail investments based on their estimated costs (capital and operating), revenue generating potential, and the range of economic development benefits expected as a result of the investment. Several states, including New Jersey, Vermont, and Virginia, place additional priority on rail projects that are capable of attracting non-state funding, extensive private sector support, or can be developed as a formal public-private partnership. California, New Jersey, and other states rank projects based on economic analyses, including cost/benefit ratios, percentage of operating costs covered by service revenues, and estimated long-term returns on investment. Financial/economic measures can be applied at the route level to monitor operational performance, at the corridor level to perform alternatives analysis, or at the regional level to prioritize long-term, systemwide decisions. Specific financial/economic measures used by multiple states are presented in Table 3.12.

Table 3.12 Financial/Economic Criteria and Performance Measures *Passenger*

Financial/Economic Criteria	Measure
Costs	• Total operating costs • State share of operating costs • Maintenance costs • Capital costs • Operating expense per passenger mile • Operating expense per vehicle revenue mile • Percent of operating cost covered by passenger-related revenue • Operating loss per passenger mile
Revenue potential	• Revenue miles • Revenue vehicle miles • Farebox ratio • Tax revenues
Public financing	• Non-state funding potential • Potential for public/private partnership or extended private support • Funding available for current year • Funding programmed one to five years out • Earmarks
Economic development potential	• Cost/benefit ratio • Station area development (actual and potential) • Direct and indirect construction impacts • Jobs created/payroll benefits • Induced economic growth • Activity center growth rates • Support from state or regional economic agency
Cost-effectiveness	• Return on investment • Cost-effectiveness compared to existing routes/facilities • Reduced highway maintenance and capital costs • User cost savings/reduced transportation cost for customers • Absolute and comparative trip costs

4.0 Performance Measures for Corridor Evaluation

This task aims to identify rail-related performance measures to support investment decisions by both public and private sector stakeholders on both freight and passenger services. Reviewing the measures outlined in Section 3.0, it is evident that while there are differences between the freight and passenger systems there are also similarities between types of data collected for each. As the vast majority of passenger rail plans under consideration rely on the freight rail network, data collected for use on the freight rail side becomes a critical input in determining where future service may be implemented on the passenger rail side. This is most clearly seen by reviewing system condition information as the condition of the freight rail system directly relates to the ease of passenger rail system implementation.

For this first look at performance measures, the number of measures have been narrowed down to focus on the goals of this study -to outline a strategic rail system in Minnesota and to develop infrastructure, operations, and policy recommendations that compliment system growth. These performance measures were selected in an effort to maintain simplicity for tracking and applying the measures. As is frequently said, ideally only a few good measures should be used to evaluate the system. Additionally, as the goal is to apply these measures to the Minnesota rail system in future tasks, measures that could be calculated with existing readily available data were given priority. Finally, performance measures were also reviewed for their ability to help inform several types of decisions:

- Strategy decisions (e.g., which approach will best solve a problem?);
- Programming decisions (e.g., which projects should be selected for consideration?);
- Resource allocation decisions (e.g., how much funding should be allocated, when?); and
- Policy decisions (e.g., what other means will improve system efficiency?).

While the majority of this project deals with developing a strategic system for Minnesota, the individual measures that have been selected are to be used to evaluate corridors for improvement and future development. As in earlier text, measures have been grouped by System Performance, System Condition, Connectivity and Accessibility, Safety and Security, Environment, and Financial/Economic and are shown in Table 4.1. These measures may be further refined and reduced as the study proceeds and goals, priorities and available data to support performance measure analysis become clearer.

Table 4.1 Rail Criteria and Performance Measures

Criteria	Applicable To	Measure
System Performance	Freight/Passenger	• Mode share (tons and value)/day (week, month, year); riders versus total city pair O/Ds[a]
	Passenger	• Annual passenger trips
	Passenger	• Alignment (and grade)
	Freight/Passenger	• Operating speed/percent of system with track speeds > 25 mph[a]
	Freight/Passenger	• Percent of system with available /existing right-of-way
System Condition	Freight/Passenger	• Percent of system with 286K railcar capacity rating[a]
	Freight/Passenger	• FRA track class
	Freight/Passenger	• System deficient conditions (bridge, track)
	Freight/Passenger	• Number of at-grade crossings/segment
	Freight/Passenger	• Track to siding ratio
	Freight/Passenger	• Development / land use intensity
Connectivity and Accessibility	Freight/Passenger	• Availability of other modes
	Freight/Passenger	• Proximity to major population/employment/activity centers
Safety and Security	Freight/Passenger	• Total crashes at at-grade crossings (three-year average) [a]
	Freight/Passenger	• Hazmat operations
Environmental	Freight/Passenger	• Impact (positive and negative) to the surrounding natural and built environment, quality of life, and community land use plans
	Freight/Passenger	• Reduction in passenger trips by auto and resulting emissions and energy use reductions
Financial/Economic	Freight/Passenger	• Capital costs
	Freight/Passenger	• OandM costs
	Freight/Passenger	• Local economic development benefits
	Freight/Passenger	• Jobs
	Freight/Passenger	• Gross State Product (GSP)
	Freight/Passenger	• Revenue–tax and operating
	Freight/Passenger	• Cost/benefit ratio

[a] Indicates existing MnDOT freight performance measure.

5.0 Performance Measures by Stakeholder

A review was conducted on the list of performance measures keeping in mind the perspective of which stakeholder groups may be interested in each measure. Oftentimes this way of presenting measures helps senior DOT officials and state legislators understand the full extent of projects; who benefits and who receives disbenefits when projects move forward. Understanding stakeholder perspective aids in comprehensive assessment of policies, programs, and projects. While several of the measures are duplicative to those listed in Section 4.0, others have been added for consideration and may not have readily available quantitative data to support them. It is suggested that qualitative measures be agreed upon and applied to get an approximation of the impact of individual and corridor project implementation.

The breakdown provided in Table 5.1 is brief and will be expanded upon in Task 7, public and private sector roles in project implementation, and Task 9, project funding and programming.

Table 5.1 Primary Performance Measures by Type of Stakeholder *Based on Washington State Example*

Stakeholder	Group	Measure
State	System Performance	• Enhanced system efficiency
	Environmental	• Reduction in energy consumed and reducing greenhouse gas emissions
	Financial/Economic	• Jobs created/growth in GSP
	Financial/Economic	• Tax/fee revenues generated
	Financial/Economic	• Benefit/cost ratio
Highways (State)	System Performance	• Reduction in highway hours of delay
	Safety and Security	• Enhanced safety
	Financial/Economic	• Reduction in maintenance, driver and fuel costs and use
Communities	System Performance	• Reduction in local roadway delay hours
	Safety and Security	• Enhanced safety
	Environmental	• Improvements to built and natural environments and quality of life
	Financial/Economic	• Local jobs created/economic development
Freight Railroads	System Performance	• Operating speed/Percent of system with track speeds > 25 mph[a]
	System Performance	• Hours of train delay
	System Performance	• Mode share (tons and value)/day (week, month, year) [a]
Passenger Railroads	System Performance	• Operating speed
	System Performance	• Hours of train delay
	System Performance	• Annual passenger trips
Shippers	System Performance	• Travel Time/Reliability
	Connectivity and Accessibility	• Improved access
	Financial/Economic	• Competitive cost

[a] Indicates existing MnDOT freight performance measure