



12.0 SCREEN 2 – DETAILED EVALUATION OF ALTERNATIVES

12.1 Evaluation Criteria

The Screen 2 evaluation process applied more refined criteria than the fatal flaw analysis, applied these measures to specific each of the alternatives. **Table 12-1** shows the criteria used in the evaluating the alternatives.

Table 12-1: Evaluation Criteria Used for the Screen 2 Evaluation

Transportation and Mobility	Economic Opportunity and Investment
2030 Average Weekday Ridership	Transit-Oriented Development Potential at Stations
Capital Cost	Employment within One-Half Mile of Stations
2030 Daily New Riders	Population within One-Half Mile of Stations
Operations and Maintenance Cost	
Annual Cost per New Rider	
Travel Time Savings	
Communities and Environment	Public Sentiment
Transit-Dependent Population within One-Half Mile of Stations	Gathered at Open Houses
Change in Vehicle Miles of Travel	
Potentially affected Population by Noise and Vibration	
Potentially affected Natural Environment	
Right-of-Way Impacts	

12.2 Transportation and Mobility

12.2.1 Ridership

The range of average weekday ridership for the Rush Line Corridor by alternative is between 1,040 (No-Build) and 9,610 (modified LRT 1B, routed to the LRT station at Tenth Street and Cedar Avenue). The range for ridership for the Build alternatives is between 1,040 (Commuter Rail 1A – East Alignment) and 8,780 (modified LRT 1B). The ridership for the four BRT alternatives ranges from 4,730 (BRT 2A) and 5,830 (BRT 1A). The two commuter rail alternatives yielded the lowest ridership – 1,040 for 1A and 1,060 for modified 1A – generally because of lower level of service and access by potential patrons that are associated with this type of transit service. Ridership for the LRT Alternatives ranged from 5,340 (LRT 1A) to

9,610 (modified LRT 1B). **Table 8-1** in Chapter 8 shows the 2030 weekday ridership for the various Rush Line Alternatives, as well as the daily new riders compared to the No Build Alternative.

This analysis also computed the change in corridor ridership for each Build Alternative relative to the TSM Alternative to determine the potential effectiveness of the proposed major transit investment. Both commuter rail alternatives would result in lower corridor ridership than the TSM Alternative. All four BRT alternatives result in either relatively no change (+30 for BRT 2A) or significant increases (+2,360 for BRT 1A). Similarly, LRT alternatives would yield either a relatively small loss (-130 for LRT 1A) or a large increase (+1,900 and +4,140 for LRT 1B and modified LRT 1B, respectively).

12.2.2 Capital Costs

Order-of-Magnitude Capital Cost Estimates were developed for each of the Rush Line Corridor Alternatives. The methodology used while developing the Capital Costs Estimates is document in the Capital Cost Methodology and Results technical memorandum found in **Appendix K**. The capital costs estimates for the BRT alternatives ranges from \$120-510 million, in general, the capital costs were proportional to the length of the alignment; per mile cost for the BRT alternatives ranged from \$6.4 million to \$12.2 million. LRT capital costs are also proportional to the length of the alignment with the per mile capital costs ranging from \$37.5-40.6 million per mile and ranged from \$270 million to \$441 million per alternative. **Table 10-1** in Chapter 10 shows the capital cost estimates for each of the alternatives.

12.2.3 Operating and Maintenance Costs

The operating and maintenance (O&M) cost methodology for each of the alternatives is detailed in Technical Memorandum #5 – Operating Cost Analysis is included in this report as **Appendix K**.

BRT and LRT Operating and Maintenance Cost Methodology

Annual O&M costs for bus and LRT service were estimated with a spreadsheet cost model that was developed for use in the Central Corridor Project. This cost model is based on Metro Transit 2007 actual expenses. Costs for specific labor and non-labor items are driven by unique service characteristics (e.g., train operator costs are estimated on the basis of annual revenue train-hours). A total of five bus-related and nine rail-related service and facility characteristics are used to drive costs (e.g., revenue train-hours, peak rail cars, revenue bus-hours, peak buses). This spreadsheet cost model is fully variable.

It is recognized that bus service in the Rush Line corridor may be operated by multiple service providers. However, for purposes of alternatives evaluation, Metro Transit bus cost characteristics have been applied to all Rush Line Corridor bus service assumptions.

Commuter Rail Operating and Maintenance Cost Methodology

Annual O&M costs for commuter rail were estimated with a spreadsheet model that is based on Northstar's projected 1st year operating budget, but with a few adjustments. As was noted for Metro Transit's cost model, costs for specific labor and non-labor items are driven by unique service characteristics. A total of nine rail-related service and facility characteristics are used to drive costs (e.g., revenue train-hours, peak passenger cars, route-miles, stations). The spreadsheet cost model is fully variable.

The annual O&M costs for the BRT and LRT Alternatives ranged from \$11-18 million while the Commuter Rail costs were substantially higher \$32-35 million. **Table 12-2** shows the annual O&M costs for each of the alternatives.

12.2.4 Cost per New Corridor Rider

The cost per new corridor rider was determined by dividing the sum of the annualized capital costs and annual operations and maintenance costs by the number of new riders in the corridor annually. Capital Costs were Annualized by a factor of 10 percent, FTA Standard Capital Costs indicate a range of 7 to 12.6 percent, depending on category. For example, parking lots are 9.4 percent while buses are 12.6 percent.

The Annual Cost per New Corridor Rider for BRT Alternatives ranges from \$14.27 for BRT 2A to \$31.30 for BRT 1A, LRT Alternatives ranged from \$22.61 for modified LRT 1B to \$27.86 for LRT 1B. The Cost per New Corridor Rider for the Commuter Rail Alternatives was substantially higher, ranging from \$261.23 for Commuter Rail 1A to \$320.44 for Commuter Rail 1B. Cost per New Rider for each alternative is shown in **Table 12-3** Summary of Evaluation found at the end of this chapter.

12.3 Economic Opportunity and Investment

The detailed methodology used to determine the impact on economic opportunity and investment is documented in Technical Memorandum #7 – Economic Opportunity and Investment, and Community and Environment Analysis Methodology and Results included in this report as **Appendix M**.

Four criteria were used to analyze the potential for economic opportunity and investment: Population near stations, employment near station, transit-oriented development around stations and potential economic development around stations. With the seven county Twin Cities Metropolitan area the Metropolitan Councils 2030 forecasts for population and employment were used to estimate the population and employment for each of the station areas. For the northern portion of the corridor, population was based on the state demographer’s population forecasts for 2030. Employment for the northern portion of the corridor was based on the existing ratio of population to employment for each community, adjusted for the 2030 population provided by the state demographer.

Transit-oriented development and economic potential for each of the stations was determine by analysis of the various development pressures that exist near the stations. This included the percentage of the traffic in the area that would likely use transit to access potential development.

12.4 Communities and Environment

12.4.1 Methodology

The detailed methodology used to determine the impact on communities and environment is documented in Technical Memorandum #7 – Economic Opportunity and Investment, and Community and Environment Analysis Methodology and Results included in this report as **Appendix M**.

Table 12-2: Annual Operating and Maintenance Cost for each Alternative

Alternative	Local Bus	Bus Rapid Transit	Light Rail Transit	Commuter Rail	Total Corridor Costs	Change over No Build
No-Build	\$ 3.5	\$ -	\$ -	\$ -	\$ 3.5	\$ -
TSM	\$ 9.7	\$ -	\$ -	\$ -	\$ 9.7	\$ 5.8
BRT 1A	\$ 5.5	\$ 11.0	\$ -	\$ -	\$ 16.5	\$ 12.7
BRT 1B	\$ 7.4	\$ 7.1	\$ -	\$ -	\$ 14.6	\$ 10.7
BRT 2A	\$ 5.4	\$ 5.4	\$ -	\$ -	\$ 10.9	\$ 7.0
BRT 2B	\$ 4.5	\$ 7.2	\$ -	\$ -	\$ 11.7	\$ 7.9
Commuter Rail 1A	\$ 3.2	\$ -	\$ -	\$ 33.6	\$ 36.8	\$ 32.9
Commuter Rail 1B	\$ 4.2	\$ -	\$ -	\$ 34.1	\$ 38.3	\$ 34.4
LRT 1A	\$ 4.7	\$ -	\$ 6.9	\$ -	\$ 11.6	\$ 7.7
LRT 1B	\$ 4.5	\$ -	\$ 11.6	\$ -	\$ 16.1	\$ 12.2
LRT Modified 1B	\$ 4.5	\$ -	\$ 13.4	\$ -	\$ 17.9	\$ 14.0

The alternatives were examined for their potential impact on communities and environment around each of the alignments and stations. Seven criteria were used to measure the impact of the alternatives on the communities and environment around them: Transit Dependent population within one-half mile of station, potentially affected households within 100 feet of the alignment, potentially affected natural environment within 100 feet of stations, change in vehicle miles traveled, change in carbon dioxide emissions, connections to non-motorized transportation, right-of-way restrictions.

U.S. Census data from 2000 was used to determine the transit dependent population living within one-half mile of stations and the number of households living within 100 feet on the alignment whom maybe affected by noise and vibration from the proposed alternative.

The potential impact to the natural environment was determined using aerial photography of the corridor and identifying sensitive aspects of the natural environment (e.g. rivers, streams, lakes, wetlands, parks). In addition, aerial photography the Federal Emergency Management Agency (FEMA) Flood Plain maps to determine if station locations that have a greater than one percent chance of flooding. In addition, to the natural environment the potential impact to historical resources was also included in these criteria as they are both subject to Section 4f regulations. The National Historic Register was used to identify the historical resources that may be impacted by each alternative.¹

The Metropolitan Council's Twin Cities Regional Travel Demand Forecast Model was used to estimate of the daily Vehicle Miles Traveled (VMT) for each of the proposed alternatives. However, based on the results it was determined that the alternatives were indistinguishable from one another, the percent change in 2030 VMT were all within ± 0.1 percent of 2030 VMT for the Transportation System Management (TSM) Alternative. The Federal Transit Administration formula was used for determining the change in Carbon Dioxide (CO₂) Emissions as a factor of the change in VMT. However, due to the lack of variation in the change in VMT there was also no change in the CO₂ Emissions.

Each of the proposed alternatives was examined to identify the number of non-motorized regional facilities and relative ease of non-motorized access to the proposed stations. This included examining the connectivity of the sidewalks in the neighborhoods surrounding each of the stations. In addition to examining the connections within each of the stations neighborhoods, non-motorized access also included the relative ease with which an individual could connect to the Twin Cities extensive network of the regions non-motorized facilities. Several key links in the corridor were to the Bruce Vento Regional Trail, Gateway Trail, William Munger Trail, Prairie Sunrise Trail, and Hardwood Creek Trail.

Each of the proposed alignments were examined to identify potential right-of-way restrictions. Due to the relative different costs associated with addressing various types of right-of-way restrictions, (i.e. cost of rebuilding a bicycle trail compared to the cost rebuilding a freight railroad wye) were weighted differently.

12.4.2 Public Sentiment

Public sentiment was based on a questionnaire distributed at a series of open houses conducted the first two weeks of October 2008. The open houses were held in Maplewood and North Branch and feedback received at the open house in June 2009 in White Bear Lake, Hugo, and North Branch. Summary reports

¹ *Minnesota Historical Society*. Minnesota's National Register Properties. Available April 8, 2009, <http://nrhp.mnhs.org/NRSearch.cfm>.

of the Open Houses documenting the results of the questions and public feedback is included in **Appendices E and F** of this report.

12.5 Summary of Evaluation

The results of the Screen 2 Detailed Analysis are presented in the **Table 12-3**.

Summary of Evaluation

Criteria	No-Build	TSM	Bus Rapid Transit			Commuter Rail		Light Rail Transit			
			Alternative 1A (I-35/I-35E to Hinckley)	Alternative 1B (I-35/I-35E to Forest Lake)	Alternative 2A (RCRRA ROW to White Bear Lake)	Alternative 2B (County RRA ROW to Forest Lake)	Alternative 1A (County RRA ROW to Hinckley) ⁷	Alternative 1B (CP ROW to Hinckley) ⁷	Alternative 1A (RCRRA ROW to Maplewood) ⁶	Alternative 1B (RCRRA ROW to White Bear Lake) ⁵	Modified Alternative 1B (RCRRA ROW to White Bear Lake ⁵ w/ downtown thru route)
Length of Alignment (Miles)			79.9	26.3	9.9	21.5	75.8	77.4	7.1	10.9	10.9
Number of Stations			17	10	9	11	14	14	7	9	11
Transportation and Mobility											
2030 Average Weekday Ridership (roundtrips)	n/a	n/a	5,830	5,150	4,730	5,350	1,040	1,440	3,260	6,490	8,780
2030 New Corridor Riders vs. No-Build	n/a	4,430	6,790	6,690	4,460	4,990	1,480	1,280	4,300	6,330	8,570
Capital Cost (2008 dollars) (Millions)	\$18.8	\$39.1	\$510.7	\$169.3	\$120.6	\$173.4	\$758-\$903	\$814-\$959	\$270.1	\$407.1	\$441.2
Operating and Maintenance Cost (2008 dollars) (Millions)	\$3.9	\$9.7	\$16.5	\$14.6	\$10.9	\$11.7	\$36.8	\$38.3	\$11.6	\$16.1	\$17.9
Cost per New Corridor Rider vs. No-Build ¹⁻²	n/a	\$7.34	\$31.30	\$14.77	\$14.27	\$17.19	\$261.23	\$20.44	\$26.93	\$27.86	\$22.61
Economic Opportunity and Investment											
Population Near Stations ³	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Employment Near Stations ³	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Transit-Oriented Development Potential at Stations	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Economic Development Potential at Stations	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Communities and Environment											
Transit-Dependent: Population within One-Half Mile of Station	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Potentially Affected Households within 100 Feet of Alignment	●	●	●	●	●	●	●	●	○	○	○
Potentially Affected Natural Environmental within 100 Feet of Stations	●	●	●	●	●	●	●	●	○	○	○
Change in Vehicle Miles Traveled	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Change in Carbon Emissions	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Connections to Non-Motorized Transportation	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Right-of-Way Restrictions	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Public Involvement											
Public Sentiment (As of October 2008) ⁴	n/a	n/a	●	⊙	○	○	○	○	○	○	○

Rating	Definition
●	Alternative meets criterion very well
⊙	Alternative meets criterion well
○	Alternative meets criterion sufficiently
○	Alternative does not meet criterion
○	Alternative significantly does not meet criterion

 Recommended for Advanced Conceptual Design

¹Capital Costs were annualized by a factor of 10 percent. FTA Standard cost Categories indicate a range of 7 to 12.6 percent depending on the category. For example, parking lots are 9.4 percent while buses are 12.6 percent.
²Cost per New Corridor Rider is being used as a proxy for the FTA Cost Effectiveness Index (CEI). A project must receive a cost effectiveness under \$24.00 to be eligible to receive Federal New Starts funding. This typically represents 50 percent of capital costs.
³Population and Employment near stations are reported for a three-mile area around stations for alternatives that provide service to Hinckley, and within one-half mile for all other alternatives.
⁴Population and households that are currently within 100 feet of I-35E/I35 or TH 61 were not included because existing noise and vibration from traffic would exceed that introduced by BRT service.
⁵Based on questionnaire from Open Houses in October 2008. This information will be finalized / updated with public input from June 2009 open houses.
⁶To determine the potential ride effects of interlining the Rush Line LRT 1B with the Central Corridor LRT in downtown St. Paul, URS ran two modified sub-alternatives. The sub-alternative used the same headways as Central Corridor, i.e. 7.5 minutes, with a terminus at Cedar 10th Street Station. This model run was completed for the purpose of comparing terminating service at the Union Depot.
⁷Upon implementation of passenger rail service for the Corridor, identify opportunities to collaborate on developing commuter Rail service.

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