

## Technical Memorandum #6

### Option Evaluation

This document briefly summarizes the evaluation of the options developed for the Red Rock Corridor Alternatives Analysis Update.



October 24, 2013



## Contents

1. Introduction .....	1
2. Evaluation Framework, Criteria and Scores - Mobility .....	2
a. Travel Time .....	2
b. Reliability .....	3
c. Service Hours .....	3
d. Daily Ridership .....	3
e. Coverage .....	3
3. Evaluation Framework, Criteria and Scores - Costs .....	5
a. Capital Cost .....	5
b. Annual O&M Cost .....	6
c. Ability to Fund .....	6
4. Evaluation Framework, Criteria and Scores - Development .....	7
a. Service to Support TOD .....	7
b. Increase in Access to Businesses .....	8
c. Increase in Access to Population Centers .....	8
5. Evaluation Framework, Criteria and Scores - Environment .....	9
a. Historic and Natural Environment Impacts .....	9
b. Reduction in Emission .....	10
c. Equitable Distribution of Impacts .....	10
d. Infrastructure Impacts to Address Safety .....	10
6. Summary of Evaluation .....	11

## List of Figures

Figure 1 – Evaluation Summary of Red Rock Corridor Options .....	12
Figure 2 – Cost vs Ridership of Red Rock Corridor Options .....	13

## List of Tables

Table 1 - Summary of Options .....	1
Table 2 - Table Criteria for Mobility Goal .....	2
Table 3 - Mobility Criteria Scores .....	4
Table 4 - Criteria for Cost Goal .....	5
Table 5 - Cost Criteria Scores .....	6
Table 6 - Criteria for Development Goal .....	7
Table 7 - Development Criteria Scores .....	8
Table 8 - Criteria for Environment Goal .....	9
Table 9 - Environment Criteria Scores .....	10
Table 10 – Summary of Options .....	11
Table 11 - Score Summary .....	12



## 1. INTRODUCTION

This memo describes the process used to evaluate the options carried forward in the Red Rock AAU. Evaluation criteria were developed to reflect the Red Rock Corridor 2013 Alternatives Analysis Update Problem Statement, Goals and Objectives approved by the Red Rock Commission on May 30, 2013. The criteria fall into four categories related to mobility, cost, development, and the environment. This memo describes the framework for applying the criteria to the options in order to score and rank them.

A summary of the four options carried forward in the analysis is provided in Table 1.

**Table 1 - Summary of Options**

Alternative	Mode	Description
<b>Alternative 1</b>	No Build	In this alternative, Routes 361, 364, and 365 are maintained as the primary transit services in the Red Rock Corridor. An additional bus stop is added to Route 364 to serve the new Newport Park and Ride, but the route structures will generally remain the same. To accommodate modeled increases in demand in the corridor, the level of service is increased on both Routes 361 and 365. Reliability enhancements are offered in the form of bus-only shoulder lanes.
<b>Alternative 2</b>	Express Bus	In this alternative, Routes 361, 364, and 365 are maintained and the corridor is served by an additional peak period limited stop express bus route that stops in Red Wing, Prairie Island, Hastings, and Newport before continuing to Union Depot and Minneapolis. This route provides 30-minute headways during the peak periods. Reliability enhancements are offered in the form of bus-only shoulder lanes.
<b>Alternative 3</b>	Bus Rapid Transit (BRT)	In this option, Routes 361, 364, and 365 are maintained and the corridor is served by a BRT route using special BRT buses and stations. The BRT route operates largely on Highway 61 between Hastings and Union Depot. It operates at 15-minute headways throughout the day; from about 6am to 10pm. Passengers wishing to travel to Minneapolis can use existing express bus routes or transfer to the Green Line at Union Depot. Travel time and reliability enhancements are provided in the form of bus-only shoulder lanes and direct access infrastructure to the Cottage Grove and Lower Afton Road Park and Rides.
<b>Alternative 4</b>	Commuter Rail	In this option, Routes 361, 364, and 365 are discontinued and the corridor is served by commuter rail. This route operates on existing rail rights of way between Red Wing and Downtown Minneapolis. There are 30-minute headways during the peak periods.



## 2. EVALUATION FRAMEWORK, CRITERIA AND SCORES - MOBILITY

The mobility criteria and their allotted points are described in Table 2.

### **Goal 1: Provide Mode Choice and Service Plan that Meets the Demonstrated and Forecasted Needs of Corridor Communities**

Table 2 - Table Criteria for Mobility Goal

Objective	Criteria	Evaluation	Points Available
Time competitive with auto	Travel Time	The scoring for this item is based on the estimated travel time between Hastings and Union Depot in the morning peak. With commuter rail travel time being the shortest, at 27 minutes, it is given the maximum point value, while the BRT Option, which provides some travel time enhancements for bus service, is given 0.5 points. Options that offer no travel time advantages compared to existing express bus service are given a score of 0.	1.0
Reliable service	Reliability	The scoring for this item is based on the provision of elements that aim to improve transit service reliability. Options are given the maximum point value if they have infrastructure investments beyond bus-only shoulder lanes that improve reliability or are able to avoid auto congestion.	1.0
Improve mobility throughout the day	Service hours	The scoring for this item is determined by whether the option provides service throughout the day or just the peak periods. Full points are awarded to an option that provides all-day service.	1.0
Number of riders	Daily ridership	The scoring for this item is based on an estimate of daily weekday boardings at stations along the route. The option with the highest ridership is given a score of 6, while other options are given scores equal to their ridership values relative to the ridership value of the highest ranking option, multiplied by six and rounded to the nearest half point.	6.0
Expands destination options	Coverage	The scoring for this item is based on an option's ability to serve new destinations that are not currently accessible today. Points are awarded for: <ul style="list-style-type: none"> <li>• Access to Hastings, Prairie Island, and Red Wing: 0.5</li> <li>• Station to station access: 0.5</li> </ul>	1.0
<u>Total Score</u>			<u>10.0</u>

#### **A. TRAVEL TIME**

Full points were given to the Commuter Rail Option because it has the shortest expected travel time between Hastings and Union Depot. The BRT Option was given a half point because the ramps that would be built at the Lower Afton Road and



Cottage Grove Stations will provide travel time advantages to buses compared to what is available today. No points were given to the Express Bus Option or No Build (Current Conditions) Option due to the fact that there are no travel time enhancements incorporated into either option for service between Hastings and Union Depot.

#### **B. RELIABILITY**

No points for reliability were given to the No Build (Current Conditions) Option or the Express Bus Option. Full points were given to the BRT Option due to the inclusion of bus-only access ramps that will allow buses to bypass congestion getting to or from park and ride facilities. Full points were also given to the commuter rail option because it will be able to avoid auto congestion.

#### **C. SERVICE HOURS**

Full points were given to the BRT Option because it operates throughout the day. No points were given to the remaining options which are peak-period only.

#### **D. DAILY RIDERSHIP**

The daily ridership scores are based on the 2030 ridership forecasts described in more detail in Technical Memorandum #5. The BRT Option provided the highest ridership forecasts, and so it was allotted full points. Points were given to other options based on the ratio of their ridership forecasts to the BRT ridership forecast, multiplied by six and rounded to the nearest half point.

#### **E. COVERAGE**

No points were given to the No Build (Current Conditions) Option because it does not expand transit coverage in the corridor. However, the Express Bus Option and the Commuter Rail Option are allocated half points because they extend coverage to Hastings, Prairie Island, and Red Wing. The BRT Option does not extend serve to Prairie Island and Red Wing, but it is allocated a half point because it provides station-to-station coverage throughout the day between Hastings and Union Depot that does not exist today.

Table 3 shows a summary of the mobility scores.



**Table 3 - Mobility Criteria Scores**

Criteria	Maximum Score	Alternative 1: No Build	Alternative 2: Express Bus	Alternative 3: Bus Rapid Transit (BRT)	Alternative 4: Commuter Rail
<b>Mobility Criteria</b>					
Travel Time	1	0.0	0.0	0.5	1.0
Reliability	1	0.0	0.0	1.0	1.0
Service Hours	1	0.0	0.0	1.0	0.0
Daily Ridership	6	3.0	4.0	6.0	4.0
Coverage	1	0.0	0.5	0.5	0.5
<b>TOTAL SCORE</b>	<b>10</b>	<b>3.0</b>	<b>4.5</b>	<b>9.0</b>	<b>6.5</b>



### 3. EVALUATION FRAMEWORK, CRITERIA AND SCORES - COSTS

The cost criteria and their allotted points are described in Table 4.

#### Goal 2: Cost Effectively Address Transportation Problems in the Corridor

Table 4 - Criteria for Cost Goal

Objective	Criteria	Evaluation	Points Available
Capital costs per rider are consistent with others in the region	Capital Cost	The scoring for this item is based on a planning level estimate of the capital cost (in 2013 dollars) for implementing the option. Points are allocated as follows: <ul style="list-style-type: none"> <li>• Under \$15 million: 4</li> <li>• Between \$15 million and \$75 million: 3</li> <li>• Between \$75 million and \$400 million: 2</li> <li>• More than \$400 million: 1</li> </ul>	4
Operating costs that are consistent with other projects in the region	Annual O&M Cost	The scoring for this item is based on a planning level estimate (in 2013 dollars) of the annual operating and maintenance cost per rider of the option. Points are allocated as follows: <ul style="list-style-type: none"> <li>• Under \$5: 4</li> <li>• Between \$5 and \$8: 3</li> <li>• Between \$8 and \$11: 2</li> <li>• Over \$11: 1</li> </ul>	4
Implement a transit service that is not dependent on other investments in the region	Ability to Fund	The scoring for this item is determined by the ability for the alternative to be constructed independently from other investments and if there is a funding model. Alternatives that have a funding model are given two points and alternatives that do not have a funding model are given zero points.	2
<u>Total Score</u>			<u>10</u>

#### A. CAPITAL COST

The capital cost scores are based on the capital cost estimates described in more detail in Technical Memorandum #4. The No Build (Current Conditions) Option and the Express Bus Option were allocated four points because they both are estimated to cost less than \$15 million. The BRT Option was allocated three points because its cost is estimated to be between \$15 million and \$75 million. The Commuter Rail Option was allocated one point because its cost is estimated to be more than \$400 million.



## B. ANNUAL O&M COST

The O&M cost scores are based on the O&M cost estimates described in more detail in Technical Memorandum #3. The No Build (Current Conditions) and Express Bus Options were given scores of 4 because their cost per trip was under \$5. The BRT Option was given a score of 3 because its cost per trip was between \$5 and \$8. The Commuter Rail Option was given a score of 1 because its cost per trip was above \$11.

## C. ABILITY TO FUND

Full points were given to those options that had a cost model in place for funding. Therefore, the no build option was given full points. Two points were also given to the BRT Option given that there is a potential funding model in place through the Small Starts program (although the option's competitiveness in this program has yet to be determined). Express bus was not given any points because there is no funding model to implement service south of Cottage Grove. The Commuter Rail Option was also given zero points because the project would not qualify for New Starts funding.

Table 5 shows a summary of the cost scores.

**Table 5 - Cost Criteria Scores**

Criteria	Maximum Score	Alternative 1: No Build	Alternative 2: Express Bus	Alternative 3: Bus Rapid Transit (BRT)	Alternative 4: Commuter Rail
<b>Cost Criteria</b>					
Capital Costs	4	4.0	4.0	3.0	1.0
Annual O&M Cost	4	4.0	4.0	3.0	1.0
Ability to Fund	2	2.0	0.0	2.0	0.0
<b>TOTAL SCORE</b>	<b>10</b>	<b>10.0</b>	<b>8.0</b>	<b>8.0</b>	<b>2.0</b>





#### 4. EVALUATION FRAMEWORK, CRITERIA AND SCORES - DEVELOPMENT

The development criteria and their allotted points are described in Table 6.

### Goal 3: Increase Opportunities for Community and Economic Development Throughout the Corridor

Table 6 - Criteria for Development Goal

Objective	Criteria	Evaluation	Points Available
Support TOD efforts within walking distance of stations	Service to Supports TOD	Because TOD development is tied to the level of investment at transit stations and level of service, points for this category have been assigned in the following way; two points are given for all day transit service at the corridor stations listed below and one point is given if there is not all-day service but significant investments are made at stations. <ul style="list-style-type: none"> <li>• Hastings</li> <li>• Cottage Grove (Langdon Village or existing site)</li> <li>• Newport</li> </ul>	6.0
Increase access for workers and customers in the corridor	Increase in Access to Businesses	The scoring for this goal is based on increasing access that is not available today. Three points are given to an alternative that provides all-day access to stations and one point is given to an alternative that provide just peak-period service to stations.	3.0
Increase access to population centers	Increase in Access to Population Centers	The population centers in the Corridor are St. Paul and Minneapolis. An alternative that provides peak period service to both is given 1 point.	1.0
<u>Total Score</u>			<u>10.0</u>

#### A. SERVICE TO SUPPORT TOD

Full points were given to the BRT Option given the fact that it provides frequent service to the stations throughout the day. While the commuter rail service only operated in the peak period, it was felt that the investment levels in the stations could effectively stimulate TOD, so it was given three points. The No Build (Current Conditions) and Express Bus Options were given no points.



**B. INCREASE IN ACCESS TO BUSINESSES**

The BRT Option was given full points because it provides all-day service. The Express Bus and Commuter Rail Options were given one point due to the fact that they increase service in the peak period.

**C. INCREASE IN ACCESS TO POPULATION CENTERS**

Full points were given to the No Build (Current Conditions), Express Bus, and Commuter Rail Options because they offered one-seat rides to both downtown St. Paul and Minneapolis. No points were given to the BRT Option.

Table 7 shows a summary of the development scores.

**Table 7 - Development Criteria Scores**

Criteria	Maximum Score	Alternative 1: No Build	Alternative 2: Express Bus	Alternative 3: Bus Rapid Transit (BRT)	Alternative 4: Commuter Rail
<b>Development Criteria</b>					
Service to support TOD	6	0	0	6	3
Increase in access for businesses	3	0	1	3	1
Increase in access to population centers	1	1	1	1	1
<b>TOTAL SCORE</b>	<b>10</b>	<b>1.0</b>	<b>2.0</b>	<b>10.0</b>	<b>5.0</b>



## 5. EVALUATION FRAMEWORK, CRITERIA AND SCORES - ENVIRONMENT

The environment criteria and their allotted points are described in Table 8.

### Goal 4: Improve Quality of Natural and Built Environment

Table 8 - Criteria for Environment Goal

Objective	Criteria	Evaluation	Points Available
Limit adverse effects on natural and cultural resources	Historic and Natural Environment Impacts	Points are provided based on the: <ul style="list-style-type: none"> <li>Likelihood to not have impacts to historic properties – 1</li> <li>Likelihood to not require significant infrastructure in undeveloped areas – 1</li> <li>Likelihood to not have significant impact to floodplains – 1</li> </ul>	3.0
Reduce emissions	Reduction in Emissions	Provides a low-emission transportation alternative to driving for many trips. Note: full points given for all options.	3.0
Provide an equitable distribution of impacts	Equitable Distribution of Impacts	Points are provided based on the equitable distribution of impacts. Note: full points were given to every alternative	2.0
Address existing safety issues	Infrastructure that will address safety	The largest known safety issue in the Corridor is the at-grade pedestrian crossing at the Lower Afton station. Two points were given to alternatives that address this issue. Zero points were given to the alternatives that don't address this issue.	2.0
<u>Total Score</u>			<u>10.0</u>

#### A. HISTORIC AND NATURAL ENVIRONMENT IMPACTS

The No Build (Current Conditions) Option received full points because it is not expected to have any historic or natural environment impacts. The Express Bus and BRT Options also received full points because it was expected that the bus-only shoulder lanes and bus-only ramps and stations would be creating impacts in an area that was already developed. The Commuter Rail Option was only given one point because it is expected that its stations and corridor investments will have some impacts on historic properties and in floodplains. .



## B. REDUCTION IN EMISSION

All of the options received a full score due to their ability to attract customers to transit and encourage a mode shift away from single occupant driving. While there are methods for calculating the emissions impacts of the options, they rely on information about the vehicle-miles of travel by automobile averted by an option, as well as the direct emissions from the operation of an option. It is felt that there is not enough information available at this stage of analysis to produce results that would be meaningful for this AAU. For one, the emissions profiles of vehicles in 2030 are unknown. Secondly, changes in vehicle-miles traveled were not directly measured in this analysis.

## C. EQUITABLE DISTRIBUTION OF IMPACTS

All of the options received a full score because it is felt that the distribution of impacts is fairly distributed.

## D. INFRASTRUCTURE IMPACTS TO ADDRESS SAFETY

The BRT and Commuter Rail Options were given full points because they included new pedestrian crossings at Lower Afton Road.

Table 9 shows a summary of the environment scores.

**Table 9 - Environment Criteria Scores**

Criteria	Maximum Score	Alternative 1: No Build	Alternative 2: Express Bus	Alternative 3: Bus Rapid Transit (BRT)	Alternative 4: Commuter Rail
<b>Environment Criteria</b>					
Historic and natural environment impacts	3	3	3	3	1
Reduction in emissions	3	3	3	3	3
Equitable distribution of impacts	2	2	2	2	2
Infrastructure investments to address safety	2	0	0	2	2
<b>TOTAL SCORE</b>	<b>10</b>	<b>8</b>	<b>8</b>	<b>10</b>	<b>8</b>



## 6. SUMMARY OF EVALUATION

Table 10 shows a summary of the options.

**Table 10 - Summary of Options**

<b>Key Service Attributes</b>	<b>Alternative 1: No Build</b>	<b>Alternative 2: Express Bus</b>	<b>Alternative 3: Bus Rapid Transit (BRT)</b>	<b>Alternative 4: Commuter Rail</b>
Service in the midday	No	No	Yes	No
Service to Hastings	No	Yes	Yes	Yes
Service to Red Wing / Prairie Island	No	Yes	No	Yes
One-seat ride to Minneapolis	Yes (only in the peak periods and from Cottage Grove and Lower Afton)	Yes (only in the peak period)	Yes (only in the peak periods and from Cottage Grove and Lower Afton)	Yes (only in the peak period)
Travel time / reliability enhancements	Yes (bus-only shoulder lanes)	Yes (bus-only shoulder lanes)	Yes (bus-only shoulder lanes and bus-only ramps)	Yes (no auto congestion)
Key Stations served	Downtown Minneapolis (3 locations), Downtown St. Paul (1 location), Lower Afton Road Park-and-Ride, Newport Park-and-Ride, and Cottage Grove Park-and-Ride	Downtown Minneapolis (3 locations), Downtown St. Paul (2 locations, inc. Union Depot), Lower Afton Road Park-and-Ride, Newport Park-and-Ride, Cottage Grove Park-and-Ride (at Langdon Village site), Hastings Park-and-Ride, Prairie Island, and Red Wing	Downtown Minneapolis (3 locations), Downtown St. Paul (2 locations, inc. Union Depot), Lower Afton Road Park-and-Ride, Newport Park-and-Ride, Cottage Grove Park-and-Ride (at Langdon Village site), and Hastings Park-and-Ride	Minneapolis Interchange, Union Depot, Lower Afton Road Park-and-Ride, Newport Park-and-Ride, Cottage Grove Park-and-Ride (at Langdon Village site), Hastings Park-and-Ride, Prairie Island, and Red Wing
Trips per weekday	56	66	170	10
Annual weekday revenue hours	10,100	14,000	28,600	3,600
Weekday boardings	1,300	1,560	2,420	1,640
Boardings per revenue hour	32	28	21	114
Cost per mile (excluding vehicles)	\$70,000	\$30,000	\$1,500,000	\$9,570,000
O & M Costs per Boarding	\$4.11	\$4.75	\$6.28	\$13.98
Capital Costs (including vehicles)	\$8,540,000	\$11,700,000	\$45,810,000	\$584,590,000
Annual O&M Costs	\$1,340,000	\$1,850,000	\$3,805,000	\$5,720,000
Fare structure	Express / local fares	Express / local fares	Local fares	Distance-based



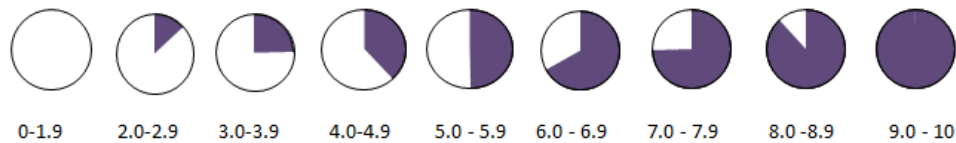
A summary of points is shown in Table 11. The evaluation is also depicted in Figures 1 and 2.

**Table 11 - Score Summary**

Options	Mobility	Cost	Development	Environment	40/40/10/10 Weighting
No Build (Current Conditions)	3.0	10.0	1.0	8.0	6.1
Express Bus	4.5	8.0	2.0	8.0	6.0
BRT	9.0	8.0	10.0	10.0	8.8
Commuter Rail	6.5	2.0	5.0	8.0	4.7

Figure 1 summarizes the evaluation with circles.

**Figure 1 – Evaluation Summary of Red Rock Corridor Options**



Alternatives	Mobility	Cost	Development	Environment	Total (40/40/10/10 weighting)
	No Build (Current Conditions)	3.0	10.0	1.0	8.0
Express Bus - Peak Only	4.5	8.0	2.0	8.0	6.0
Bus Rapid Transit (BRT)	9.0	8.0	10.0	10.0	8.8
Commuter Rail - Peak Only	6.5	2.0	5.0	8.0	4.7



Figure 2 plots ridership against costs, as defined by capital costs plus 25 years of operating and maintenance costs

Figure 2 – Cost vs Ridership of Red Rock Corridor Options

