I-80 CORRIDOR STUDY TECHNICAL REPORT

Appendix L
Criteria Alternative Evaluation

PREPARED FOR
NEVADA DEPARTMENT OF TRANSPORTATION

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NEVADA DOT

1.0 Introduction

The I-80 Corridor Study area encompasses I-80 west from the California state line to the West McCarran Boulevard (SR 651) Interchange, and I-80 east from the East McCarran Boulevard (SR650) Interchange in the City of Sparks to east of the Wadsworth-Pyramid (SR 427) Interchange. The study's intent is to provide decision-makers an action plan that will define future transportation needs along the corridor. It is also intended to provide participating agencies with a range of workable and cost-effective transportation alternatives that address current and future needs. These alternatives will be assessed for their socioeconomic, community, environmental, and fiscal impacts.

2.0 Purpose of the Memo

The I-80 Corridor Study addresses concerns related to the need for improving transportation along this corridor by evaluating future land use demands while protecting and using existing resources. The analysis of existing and future conditions provides information regarding current deficiencies as well as areas of growth and associated issues. To address these deficiencies, a set of potential solutions and several alternative treatments were proposed under the Alternative Potential Solutions Technical Memo. The purpose of this memo is to introduce the methodology, criteria, and results of that evaluation.

3.0 Alternative Potential Solution Evaluation Methodology

The I-80 Corridor Study scope of services required the use of a cost-benefit analysis for alternatives evaluation. However, the study group and the support team agreed that a cost-benefit analysis would be appropriate for more advanced alternative studies where additional information would be available for quantifying costs and benefits of each alternative. For this study, a criteria alternative matrix (CAM) methodology was considered more appropriate.

CAM is a decision tool that takes into consideration a variety of objective criteria against which preferred alternatives are evaluated. The criteria can be selected by the stakeholders and all interested parties that participate in the process; they are weighted based on collective perceived importance or how well they represent regional goals and objectives. The advantage of this method is that it takes into consideration several factors that influence the alternatives selection.

A CAM evaluation includes the following major steps:

- Identity and specify objective criterion
- Weight each criterion to total 100%
- Score each potential action and assign a value of 1 (poor) to 10 (excellent) in meeting the criterion
- Multiply each action's criterion score by the criterion weight and add them together

Figure 1 is an example of CAM.

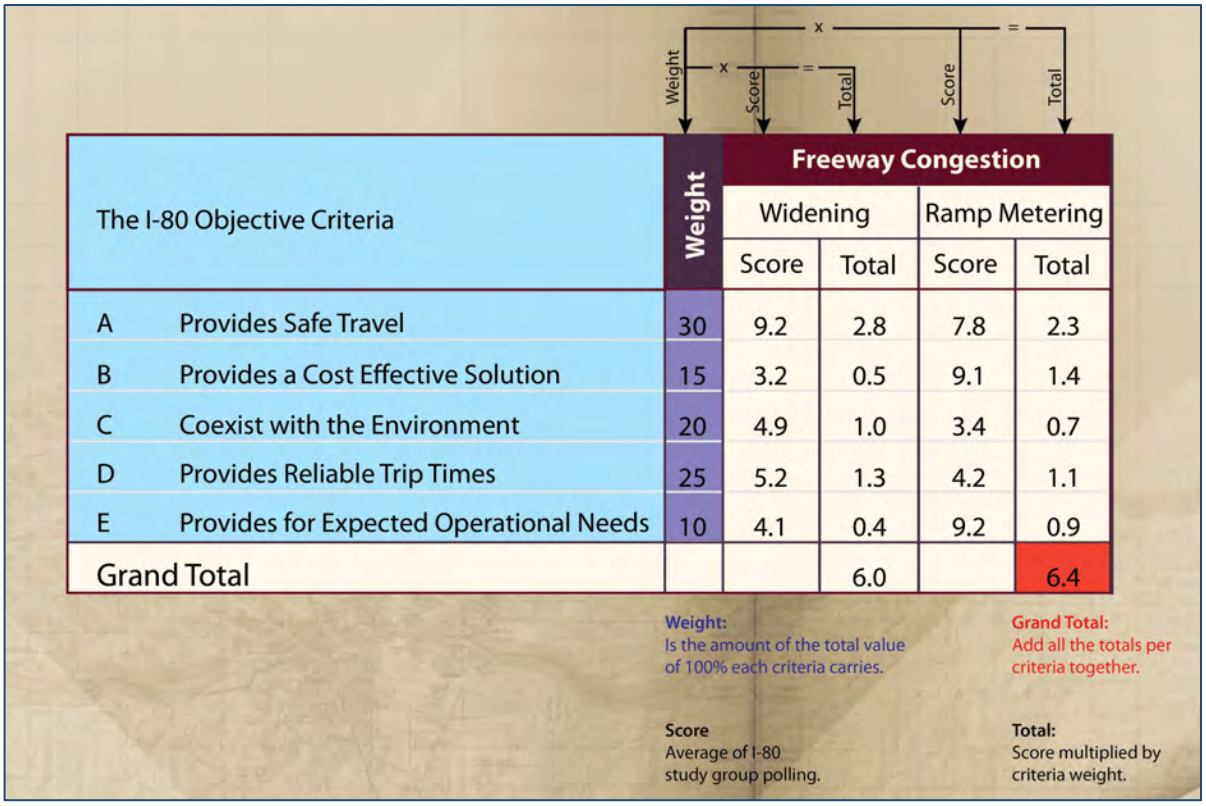

Figure 1. CAM Example

4. Objective Criteria

The project study group spent considerable time and effort establishing objective criteria. Group members were polled on the objectiveness of numerous potential criterions, concluding with three rounds of voting to select criteria and assign an evaluation weighting. The three rounds of voting had the following structure:

- Round 1. Study group members were asked to select six preferred criteria. They were not ranked, and each selection was given a 100% weighting. The number of members selecting each criterion was counted, resulting in an un-weighted vote.
- Round 2. Study group members were asked to select five criteria ranked in order of preference. Each first selection received a weight of 100% and the each second selection received a weight of 80%, and so on, with the fifth selection receiving a weight of 20%.
- Round 3. Study group members were asked to select three criteria ranked in order of preference. Each first selection received a weight of 100%, each second selection received a weight of 97%, and each third selection received a weight of 33%.

Voting in Round 1 provided the study group members an opportunity to review potential criteria as a whole. Rounds 2 and 3, with the weighted rankings, assessed the group's collective value for each criterion. Reducing the choices from five to three provided additional assessment of individual values by forcing an increasingly critical view of the potential criteria. Combining the weighted scores from rounds 2 and 3 provided a comprehensive evaluation of individual and collective values.

Table 1 includes all the initial potential criteria. The weighted percentage in the final column revealed that Future Economics and Public Policy combined for a relatively insignificant 4%. This is due to forcing the vote to three criteria, with the additions critique. Based on the lack of potential for either criterion to significantly influence strategy selection, they were removed for the next iteration of analysis.

Table 1. Initial Potential Criteria Voting

Criterion	Select Top 5	Select Top 3	Total Votes	Percentage
Trip Quality	75.31	33.00	108.31	14
Safety	76.80	90.75	167.55	22
Alternate Modes	37.38	24.75	62.13	8
Environment	75.62	49.50	125.12	16
Physical R/W	44.62	8.17	52.79	7
Operations	60.69	32.93	93.62	12
Future Economics	7.46	0	7.46	1
Public Policy	22.31	0	22.31	3
Costs	68.31	57.92	126.23	16
			765.52	100

Tables 2 and 3 provide choices. Table 2 shows how Future Economics and Public Policy votes are redistributed among the other criteria. Table 3 removes the single-digit percentage criteria of Alternative Modes and Physical Right-of-Way. This table shows how the 15% weighted contribution is reallocated to the remaining criteria. The choice becomes: what is the value of Alternative Modes and Physical/Right-of-Way criteria versus their potential for influencing the CAM analysis?

Table 2. Potential Criteria Voting with Future Economics and Public Policy Removed

Criterion	Select Top 5	Select Top 3	Total Votes	Percentage
Trip Quality	75.31	33.00	108.31	15
Safety	76.80	90.75	167.55	23
Alternate Modes	37.38	24.75	62.13	8
Environment	75.62	49.50	125.12	17
Physical R/W	44.62	8.17	52.79	7
Operations	60.69	32.93	93.62	13
Costs	68.31	57.92	126.23	17
			735.75	100

Table 3. Potential Criteria Voting with Physical R/W and Alternate Modes Removed

Criterion	Select Top 5	Select Top 3	Total Votes	Percentage
Trip Quality	75.31	33.00	108.31	17
Safety	76.80	90.75	167.55	27
Environment	75.62	49.50	125.12	20
Operations	60.69	32.93	93.62	15
Costs	68.31	57.92	126.23	20
			620.83	100

The result of the query for the number of objective criteria to use in assessing potential strategies was to use the list of five, which are shown below with their individual weightings. These draft statements included the comments and concerns raised during the February 5, 2009, meeting:

- Provides safe travel (27.0%)
- Provides a cost effective solution (20.3%)
- Coexists with the environment (20.2%)
- Provides reliable trip times (17.4%)
- Provides for expected operational needs (15.1%)

5. Potential Solution Alternatives Evaluation

Using the objective criteria, the study group conducted several rounds of polling to evaluate the potential solutions identified under latent capacity and future conditions analyses. These criteria were used in the following manner:

- Potential solution A is described.
- The following assessment is made: "Rating from 1 to 10, with 10 being the best, does potential solution A provide safe travel?"
- The question is repeated using all five criteria.
- The weighted average of the criteria is calculated for potential solution A.
- The process is repeated for each potential solution.

Polling the potential alternative solution was conducted through an online survey. Due to the limitations of the survey, a Likert scale from 1 to 5 was used for the evaluation. The results were converted to a 1-to-10 scale and are summarized in Tables 4 through 6.

Table 4. Mobility Potential Solutions

Potential Solution	Criteria	Weight	Average	Indiv. Score
West Side - 7 years start implementing travel demand management strategies ($100,000-1,000,000)/per year	Provides safe travel	27.0	6.7	1.8
	Provides a cost effective solution	20.3	8.2	1.7
	Coexist with the environment	20.2	8.4	1.7
	Provides reliable trip times	17.4	7.7	1.3
	Provides for expected operation needs	15.1	7.5	1.1
	Potential Solution Total Score			**7.6**
7 years establish an express transit service (1,000,000-10,000,000)/per year	Provides safe travel	27.0	6.1	1.6
	Provides a cost effective solution	20.3	7.8	1.6
	Coexist with the environment	20.2	8.2	1.7
	Provides reliable trip times	17.4	7.8	1.4
	Provides for expected operation needs	15.1	7.5	1.1
	Potential Solution Total Score			**7.4**
7 years establish a bicycle facilities network $$$$ ($1,000,000-10,000,000)	Provides safe travel	27.0	5.2	1.4
	Provides a cost effective solution	20.3	4.8	1.0
	Coexist with the environment	20.2	8.5	1.7
	Provides reliable trip times	17.4	4.5	0.8
	Provides for expected operation needs	15.1	4.4	0.7
	Potential Solution Total Score			**5.5**
25 years establish a light rail or commuter train service $100,000,000->1,000,000,000)	Provides safe travel	27.0	7.7	2.1
	Provides a cost effective solution	20.3	4.1	0.8
	Coexist with the environment	20.2	5.7	1.2
	Provides reliable trip times	17.4	7.5	1.3
	Provides for expected operation needs	15.1	8.2	1.2
	Potential Solution Total Score			**6.6**
East side - 7 years start implementing travel demand management strategies ($100,000-1,000,000)/per year	Provides safe travel	27.0	6.7	1.8
	Provides a cost effective solution	20.3	7.8	1.6
	Coexist with the environment	20.2	8.3	1.7
	Provides reliable trip times	17.4	7.7	1.3
	Provides for expected operation needs	15.1	7.8	1.2
	Potential Solution Total Score			**7.6**

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Table 5. Interchange Potential Solutions

Potential Solution	Criteria	Weight	Average	Indiv. Score
West Verdi Interchange - 7 years reconstruct ramp terminals - roundabouts recommended ($1M-$10M) - 25 years Interchange reconstruction $1M-$10M)	Provides safe travel	27.0	6.5	1.8
	Provides a cost effective solution	20.3	6.8	1.4
	Coexist with the environment	20.2	6.3	1.3
	Provides reliable trip times	17.4	6.4	1.1
	Provides for expected operation needs	15.1	6.9	1.0
	Potential Solution Total Score			**6.6**
Garson Interchange - 15 years improve eastbound ramp terminal intersection ($100K-$1M) - 25 years Interchange reconstruction or modification ($1M-$10M)	Provides safe travel	27.0	7.3	2.0
	Provides a cost effective solution	20.3	7.9	1.6
	Coexist with the environment	20.2	6.3	1.3
	Provides reliable trip times	17.4	7.3	1.3
	Provides for expected operation needs	15.1	7.3	1.1
	Potential Solution Total Score			**7.2**
Mogul Interchange - 7 years reconfigure to accommodate storage and improve connectivity ($100K-$1M) - 15 years Interchange reconstruction ($1M-$10M)	Provides safe travel	27.0	6.7	1.8
	Provides a cost effective solution	20.3	6.9	1.4
	Coexist with the environment	20.2	6.0	1.2
	Provides reliable trip times	17.4	7.6	1.3
	Provides for expected operation needs	15.1	7.6	1.1
	Potential Solution Total Score			**6.9**
Robb Dr. Interchange - 7 years reconstruct ramp terminals to improve operations, connectivity, and safety ($1M-$10M)	Provides safe travel	27.0	6.8	1.8
	Provides a cost effective solution	20.3	6.7	1.4
	Coexist with the environment	20.2	6.3	1.3
	Provides reliable trip times	17.4	7.1	1.2
	Provides for expected operation needs	15.1	7.3	1.1
	Potential Solution Total Score			**6.8**
West McCarran Interchange - 7 years reconfigure WB ramp terminals ($1M-$10M) – 15 years reconfigure EB ramp terminal ($1M-$10M) - 25 years reconstruct bridge structure ($10M-$100M)	Provides safe travel	27.0	6.5	1.8
	Provides a cost effective solution	20.3	6.4	1.3
	Coexist with the environment	20.2	6.1	1.2
	Provides reliable trip times	17.4	6.9	1.2
	Provides for expected operation needs	15.1	6.9	1.0
	Potential Solution Total Score			**6.6**
West McCarran Interchange - 7 years reconstruct interchange ($10M-$100M)	Provides safe travel	27.0	7.5	2.0
	Provides a cost effective solution	20.3	5.9	1.2
	Coexist with the environment	20.2	6.3	1.3
	Provides reliable trip times	17.4	7.2	1.3
	Provides for expected operation needs	15.1	7.6	1.1
	Potential Solution Total Score			**6.9**

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Potential Solution	Criteria	Weight	Average	Indiv. Score
East McCarran Interchange - 2 years evaluate modern roundabouts for ramp intersections ($100K-$1M) - 7 years reconstruct east and westbound ramp terminals ($1M-$10M)	Provides safe travel	27.0	6.5	1.8
	Provides a cost effective solution	20.3	7.1	1.4
	Coexist with the environment	20.2	6.1	1.2
	Provides reliable trip times	17.4	6.8	1.2
	Provides for expected operation needs	15.1	7.0	1.1
	Potential Solution Total Score			**6.7**
Sparks Interchange - 2 years construct eastbound triple left ($1M-$10M) - 7 reconstruct westbound ramp intersection terminal($1M-$10M) - 25 years reconstruct eastbound ramp intersection ($1M-$10M)	Provides safe travel	27.0	7.1	1.9
	Provides a cost effective solution	20.3	7.3	1.5
	Coexist with the environment	20.2	6.5	1.3
	Provides reliable trip times	17.4	7.5	1.3
	Provides for expected operation needs	15.1	7.3	1.1
	Potential Solution Total Score			**7.1**
Vista Interchange - 2 years construct southbound free right turn, storage westbound left and right, & eastbound triple left ($1M-10M) - 7 years construct southbound dual left turn ($1M-$10M) - 25 years terminal improvements additional ramp ($1M-$10M)	Provides safe travel	27.0	8.1	2.2
	Provides a cost effective solution	20.3	8.3	1.7
	Coexist with the environment	20.2	6.5	1.3
	Provides reliable trip times	17.4	8.0	1.4
	Provides for expected operation needs	15.1	8.0	1.2
	Potential Solution Total Score			**7.8**
Lockwood and Patrick Interchanges - 7 years or upon development install roundabouts at slip ramp terminals ($1M-$10M)	Provides safe travel	27.0	7.5	2.0
	Provides a cost effective solution	20.3	7.2	1.5
	Coexist with the environment	20.2	6.3	1.3
	Provides reliable trip times	17.4	6.8	1.2
	Provides for expected operation needs	15.1	6.9	1.0
	Potential Solution Total Score			**7.0**
Lockwood and Patrick Interchanges - Upon development reconstruct ramp terminals (to be determined) - Upon development reconstruct Interchanges (to be determined)	Provides safe travel	27.0	6.7	1.8
	Provides a cost effective solution	20.3	6.5	1.3
	Coexist with the environment	20.2	5.5	1.1
	Provides reliable trip times	17.4	6.4	1.1
	Provides for expected operation needs	15.1	6.4	1.0
	Potential Solution Total Score			**6.3**
USA Parkway Interchanges - Upon development reconstruct westbound ramp terminals (to be determined)	Provides safe travel	27.0	6.4	1.7
	Provides a cost effective solution	20.3	6.5	1.3
	Coexist with the environment	20.2	5.7	1.2
	Provides reliable trip times	17.4	6.4	1.1
	Provides for expected operation needs	15.1	6.4	1.0
	Potential Solution Total Score			**6.3**

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Table 6. Mainline Potential Solutions

Potential Solution	Criteria	Weight	Average	Indiv. Score
Stateline to West McCarran Interchange - 25 years eastbound Garson to Robb Drive add general purpose lane, eastbound Verdi to Garson add a full auxiliary lane, & eastbound McCarran off easterly add one through lane (10,000,000-100,000,000)	Provides safe travel	27.0	5.9	1.6
	Provides a cost effective solution	20.3	5.0	1.0
	Coexist with the environment	20.2	4.8	1.0
	Provides reliable trip times	17.4	6.3	1.1
	Provides for expected operation needs	15.1	7.3	1.1
	Potential Solution Total Score			**5.7**
West McCarran Interchange to Stateline - 25 years westbound McCarran to Garson add one general purpose lane & westbound Garson to Verdi add one full auxiliary lane (10,000,000-100,000,000)	Provides safe travel	27.0	6.1	1.7
	Provides a cost effective solution	20.3	5.6	1.1
	Coexist with the environment	20.2	4.6	0.9
	Provides reliable trip times	17.4	6.0	1.0
	Provides for expected operation needs	15.1	6.1	0.9
	Potential Solution Total Score			**5.7**
East McCarran Interchange to Wadsworth Interchange (see Note A)	Provides safe travel	27.0	6.9	1.9
	Provides a cost effective solution	20.3	3.8	0.8
	Coexist with the environment	20.2	4.5	0.9
	Provides reliable trip times	17.4	6.9	1.2
	Provides for expected operation needs	15.1	6.1	0.9
	Potential Solution Total Score			**5.6**
Option A Wadsworth Interchange to East McCarran Interchange (see Note B)	Provides safe travel	27.0	7.0	1.9
	Provides a cost effective solution	20.3	4.9	1.0
	Coexist with the environment	20.2	4.3	0.9
	Provides reliable trip times	17.4	7.0	1.2
	Provides for expected operation needs	15.1	5.9	0.9
	Potential Solution Total Score			**5.8**
Option B Wadsworth Interchange to East McCarran Interchange (see Note C)	Provides safe travel	27.0	7.2	1.9
	Provides a cost effective solution	20.3	4.9	1.0
	Coexist with the environment	20.2	4.5	0.9
	Provides reliable trip times	17.4	6.3	1.1
	Provides for expected operation needs	15.1	7.2	1.1
	Potential Solution Total Score			**6.0**

Notes A, B, and C on following page

Note A
7 years eastbound McCarran to Sparks add on full auxiliary lane (100,000-1,000,000)
15 years eastbound McCarran to Vista add one general purpose lane
15 years eastbound Vista to Lockwood add one full auxiliary lane (10,000,000-100-000,000)
25 years eastbound Vista to Patrick add one general purpose lane
25 years eastbound McCarran to Sparks add one full auxiliary lane
25 years eastbound 4 general purpose lanes entering this section (10,000,000-100-000,000)

Note B
2 years westbound Sparks on ramp extend (100,000-1,000,000)
7 years westbound Sparks to McCarran add 1 full auxiliary lane
7 years westbound between McCarran on-ramps add 1 general purpose lane
15 years westbound Vista to McCarran add 1 general purpose lane
15 years westbound Lockwood to Vista add 1 full auxiliary lane (10,000,000-100-000,000)
25 years westbound Patrick to Vista add 1 general purpose lane
25 years westbound Sparks to McCarran add 1 full auxiliary lane
25 years westbound 4 general purpose lanes leaving this section (10,000,000-100-000,000)

Note C
2 years westbound Sparks to McCarran add 1 full auxiliary lane (100,000-1,000,000)
7 years westbound between McCarran on-ramps add 1 general purpose lane (1,000,000-10,000,000)
15 years westbound Vista to McCarran add 1 general purpose lane
15 years westbound Lockwood to Vista add 1 full auxiliary lane
25 years westbound Patrick to Vista add 1 general purpose lane
25 years westbound Sparks to McCarran add 1 full auxiliary lane
25 years westbound 4 general purpose lanes leaving this section (10,000,000-100-000,000)

6. Summary of Evaluation Results

The CAM analysis provided information on how stakeholders view the presented alternatives in terms of five pre-established criteria; it did not in any way preclude less important alternatives or the alternatives not included in the evaluation from further and future consideration or evaluation.

The analysis of the results indicated that stakeholders consider travel demand management strategy initiation a much more effective action than simply performing capacity improvements. Also, establishing an express transit service was considered much more cost-effective than a light-rail or commuter rail.

The comparison of results between interchange improvements and mainline improvements indicates that the interchange improvements provided more cost-effective solutions than mainline improvements. The results also indicate that the improvements at the Vista Boulevard interchange on the east and the Garson Road interchange on the west are considered more critical to safety than the others.