



ALTERNATIVE EVALUATION SCORING

SH 34: Alternative Evaluations

Ten criteria were listed for evaluating the basis for selecting one of three options for right-of-way acquisition. These ten criteria were chosen from judgments based on local knowledge, and descriptions of built conditions in the short, medium, and long-term improvement sections. These criteria are:

1. Cost of land acquisition
2. Time taken for acquisition
3. Right-of-Way benefits
4. Displacements, and Community Disruptions
5. Community Impact
6. Environmental Impact
7. Drainage Impact
8. Mobility Advantage
9. Safety Advantage
10. Additional Lane Benefits

As a first step, these ten criteria were categorized into four evaluation categories. These categories club the criteria on their basis of topical similarity. The classified list is as follows:

- A. Acquisition
 - a. Cost of land acquisition
 - b. Time taken for acquisition
 - c. Right-of-Way benefits
- B. Community
 - a. Displacements, and Community Disruptions
 - b. Community Impact
- C. Environmental
 - a. Environmental Impact
 - b. Drainage Impact
- D. User Access
 - a. Mobility Advantage
 - b. Safety Advantage
 - c. Additional Lane Benefits

Next, each of the criteria were given a relative mark using a Likert scale. Since the points were awarded relatively, from a neutral average, the amplitude of the scale was chosen to be five. Thus, the points have the following meaning:

- 1 Point: Highly Unacceptable
- 2 Points: Somewhat Unacceptable
- 3 Points: Neither Unacceptable, nor Acceptable
- 4 Points: Somewhat Acceptable
- 5 Points: Highly Acceptable

We shall assume that for all the criteria, the starting point is 3. Depending on the evaluation performed earlier in Chapter 4, we shall either deduct points or add points to arrive at the score for every option for every criterion.

Option A:	Eastside widening	Land acquired only to the east of the existing road
Option B:	Westside widening	Land acquires only to the west of the existing road
Option C:	Center widening	Land acquired on both sides of the existing road

ACQUISITION

Cost of Land Acquisition

For the long-term improvements, the total cost of construction is estimated to be \$76 million, and the acquisition of right-of-way is expected to cost \$17 million. Counting from the number of displacements involving buildings we see that Option A would require land from 66 plots which are designated buildings, while Option B would require land from 50 such plots. These are both higher than Option C where buildings are only on nine of the plots. Therefore, we must rate Option C higher than average, at 5. And Options A, and B at a lower than average, 2, and 3 respectively.

Time of Land Acquisition

Knowing the number of displacements in each alternative, we could differentiate in the points awarded. Options A, and B require 73, and 55 displacements, respectively. Option C requires only 24. The average number of displacements is 51. Therefore, we can award 3 points to Option B, and using this as the base, 4 points to C, and 2 points to A.

Right of Way Benefits

In all the three options, right-of-way would be impacted due to the additional right-of-way acquisition that would be required. Other than a pond located along the eastern edge of the expanded ROW, other features are unremarkable. 42' of ROW would be required to widen the existing roadway to accommodate traffic growth, congestion and safety issues. The number of parcels vary from 24 to 73. The impact, therefore will vary slightly with parcels. Based on ROW, all cases are given 3 points.

COMMUNITY

Displacements, and Community Disruptions

Options A, B, and C disrupt the community in similar ways. Disruptions to access from either side is disadvantageous because of the sporadic nature of development that are outside the cities of Greenville, and Quinlan. For the locations within city limits of Greenville, and Quinlan, the impact will be larger in magnitude, but not relatively better on either side. In total there is no discernable advantage in any one option over the other. All options are therefore awarded 3 points.

Community Impact

Options A, B, and C disrupt the community in similar ways. Disruptions to access from either side is disadvantageous because of the sporadic nature of development that are outside the cities of Greenville, and Quinlan. For the locations within city limits of Greenville, and Quinlan, the impact will be larger in magnitude, but not relatively better on either side. There is no discernable advantage in any one option over the other. All options are therefore awarded 3 points.

ENVIRONMENTAL

Environmental Impact

Loss of open land precludes its utilization for other purposes. While the environmental report does not mention any specific adverse effects to the environment because of this project, it also does mention that field testing is needed to gain more clarity. In the absence of more information, we cannot differentiate based on the relative merits of the three alternatives. Therefore, the same points shall be awarded to all of them. However, to account for the uncertainty, only 2 points shall be awarded to them all.

Drainage Impact

For the long-term improvements, a hydrology and hydraulic analysis and drainage study was completed. The capacity of existing culverts was evaluated. The size and length of ditches and culverts was also calculated for the proposed condition. The impact and mitigation due to proposed roadway improvements and increased flows was calculated. The discharges at the outfall to the downstream and channels do not increase compared to existing conditions. Therefore, no impacts to the drainage are expected in any of the alternatives.

Therefore, all the scenarios could be awarded the average, 3 points each. Detailed drainage impact information is found in Appendix C.

USER ACCESS

Mobility Benefits

The long-term option would result in potential mobility benefits. If the construction of the bridges and additional lanes were completed, users traveling the SH 34 corridor would experience improved travel times, and lesser congestion. Adding a continuous turning lane would improve safety and throughput by reducing the variation in speed.

Since all construction will obstruct mobility in the short term, all three alternatives have been penalized one point, and are awarded 2 points.

Safety Benefits

The long-term option also would potentially provide many safety benefits. Converting the interior lane into a turning lane and creating a depressed median in areas with high truck movement would provide a safe space for through and turning vehicles. It would decrease head-on collisions, and side-collisions of vehicles at the frequent road intersections along the alignment. If there are any obsolete roadway elements along the roadway, these items could be upgraded. Additional controlled-access lanes could remove commuter and long-distance traffic from local traffic, reducing crashes from traffic using SH 34.

New facilities shall improve the safety for all people. Therefore, we can begin by awarding the neutral – 3 -points to all the options.

Additional Lane Benefits

Upon the conclusion of the project, everyone will benefit from the additional facilities – signals, left turn lanes, and wider roads. Therefore, this *ex post* criterion must be indifferent to the question of land acquisition. Resultantly, all options have been awarded the neutral – 3 points.

FINAL SCORE CALCULATION

Having thus awarded points out of 5 to all the options based on all the criteria, we must now combine them all into a single utility function to calculate a single score that can convey the results of this analysis.

First, we shall calculate the category wise score of all the options. This is done by finding the average score within each category. Thus, criteria within each category are weighted equally. The category-wise averages are presented in the table below:

	Weight	Option A	Option B	Option C
Acquisition	0.30	2.33	3.00	4.00
Community	0.20	2.50	3.00	3.50
Environment	0.20	2.00	2.50	2.00
User Access	0.30	2.67	2.67	2.67

The next step is to define the utility function. For this purpose, we shall define a vector of weights for the category level points. The weights vector will be calculated by counting the number of criteria within each category. The weights vector is:

$$W = [3 \ 2 \ 2 \ 3]$$

Multiplying the vectors of weights, and points, then, we will calculate the final score thus:

$$Final\ Score = \frac{C^T \cdot W}{10}$$

Finally, the Final Score for each option is:

$$\begin{aligned} A & 2.40 \\ B & 2.80 \\ C & 3.10 \end{aligned}$$

Option C is therefore, relatively, the best alternative.

SH 34 - ALTERNATIVE EVALUATION WORKSHEET

CATEGORY	OPTION A	OPTION B	OPTION C
Acquisition			
Cost	2	3	5
Time	2	3	4
Right of Way	3	3	3
Community			
Displacements, and Disruptions	2	3	4
Community Impact	3	3	3
Environmental			
Environmental Impact	1	2	1
Drainage Impact	3	3	3
User Access			
Mobility	2	2	2
Safety	3	3	3
Additional Lane Benefit	3	3	3

CATEGORY	OPTION A	OPTION B	OPTION C	WEIGHTS
Acquisition	2.33	3.00	4.00	0.3
Community	2.50	3.00	3.50	0.2
Environmental	2.00	2.50	2.00	0.2
User Access	2.67	2.67	2.67	0.3

ALTERNATIVES	SCORE
Option A	2.40
Option B	2.80
Option C	3.10