

7.0 EVALUATION OF ALTERNATIVES

2045 Network-Wide Performance

Table 7-1 summarizes the network-wide performance results for the 2021 SIMR Concept and FCE SIMR Concept during the 2045 AM and PM peak periods. Comparison of the alternatives shows that the FCE SIMR Concept exhibited similar performance to the 2021 SIMR Concept in terms of average speed, delay, demand, travel time, total stops and vehicles arrived. The slight differences shown between the two alternatives are likely due to model variability. All differences are within 5% which is typically considered statistically negligible.

In the AM peak, the average speed of the FCE SIMR concept was identical to the 2021 SIMR, with an average speed of 49 mph. The total delay increased by a negligible 1% with the FCE SIMR concept. The FCE SIMR concept also decreased latent delay by -2%, decreased latent demand by -4% and increased total stops by 3%. Lastly, the total travel time and vehicles arrived were essentially identical between the two alternatives.

In the PM peak, the average speed of the FCE SIMR concept was identical to the 2021 SIMR, with an average speed of 49 mph. The total delay was similar between the two alternatives. The FCE SIMR concept also increased latent delay by 4%, decreased latent demand by -2% and increased total stops by 1%. Lastly, the total travel time and vehicles arrived were essentially identical between the two alternatives.

This upholds the results observed in the previous sections, in which, the FCE SIMR Concept operates similar to the 2021 SIMR Concept.

Table 7-1 Design Year 2045 Network-Wide Performance

AM PEAK	2021 SIMR	FCE SIMR	Δ
Average Speed (mph)	49	49	0%
Total Delay (hr)	11,411	11,518	1%
Latent Delay (hr)	2,499	2,440	-2%
Latent Demand	175	168	-4%
Total Travel Time (hr)	58,881	59,027	0%
Total Stops	906,361	930,695	3%
Vehicles Arrived	444,703	445,052	0%
PM PEAK	2021 SIMR	FCE SIMR	Δ
Average Speed (mph)	49	49	0%
Total Delay (hr)	10,830	10,954	0%
Latent Delay (hr)	1,791	1,867	4%
Latent Demand	199	196	-2%
Total Travel Time (hr)	56,997	57,152	0%
Total Stops	816,038	830,563	1%
Vehicles Arrived	450,830	451,045	0%

Note: Percentages indicate comparisons to the 2021 SIMR Concept.

7.4 Future Conditions Safety Analysis

The AASHTO Highway Safety Manual (HSM) methodology was used to compare the predicted crashes of the 2021 SIMR Concept and FCE SIMR Concept. The safety analysis performed for this SIMR Re-evaluation

focused solely on the proposed modifications at the FCE interchange. The predictive safety analysis was performed from north of the IGP interchange to south of the CR 210 interchange. It is not expected the modifications will impact the future conditions safety analysis at any other location within the study area. To gain an understanding of the future safety conditions for the rest of the study area, please refer to the approved 2021 SIMR Re-evaluation provided in **Appendix A**.

The Enhanced Interchange Safety Analysis Tool (ISATe) was used to apply the HSM predictive methodologies for this analysis. ISATe is a spreadsheet-based tool that helps to streamline the application of Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) as specified for freeway segments from the 2014 HSM Supplement. The SPF for Multiple-Vehicle Crashes is represented by HSM Equation 18-15 and the SPF for Single-Vehicle Crashes is represented by HSM Equation 18-18. The SPFs were also specified by crash severity, Fatal and Injury (FI) and Property Damage Only (PDO), and area type, Urban, using coefficients from HSM Tables 18-5 and 18-7 for Multiple-Vehicle and Single-Vehicle crashes, respectively. The base conditions for the SPFs used are the following:

- Lane width of 12 feet
- Inside shoulder width of 6 feet
- Median width of 60 feet
- No presence of a median barrier
- No presence of shoulder rumble strip
- Outside shoulder width of 10 feet
- A clear zone of 30 feet
- No presence of an outside barrier

CMFs are applied to SPFs to estimate the Predicted Crashes for scenarios where the geometry does not match the base conditions of the SPF. The following CMFs were applied to the SPFs for FI crashes and PDO crashes during the HSM analysis:

- Lane Width
- Inside Shoulder Width
- Median Width
- Median Barrier
- Outside Shoulder Width
- Outside Clearance
- Outside Barrier

The 2030 and 2045 AADTs were utilized in the freeway segment safety analysis. **Table 7-2** contains the total annual predicted crashes for the analysis alternatives as well as the percent difference between the 2021 SIMR Concept and the FCE SIMR Concept. The FCE SIMR Concept provides enhanced safety benefits compared to the 2021 SIMR Concept as a result of the FCE northbound access ramps being relocated from the left side of I-95 to the right side. Based on this analysis, the FCE SIMR Concept is expected to reduce crashes by 22% annually along the I-95 mainline at the northbound off ramp to FCE and 20% annually at the northbound on ramp from FCE. Overall, crashes within the study area are expected to reduce by 16% annually compared to the 2021 SIMR Concept. **Appendix C** contains the detailed ISATe input and output sheets.

Table 7-2 Total Predicted Crashes (per year) for Proposed FCE Interchange Modifications

Segment	2021 SIMR Concept	FCE SIMR Concept ¹
I-95 from N of IGP to FCE NB Off/SB On Ramps	20.96	16.45 (-22%)
I-95 between FCE ramps	16.03	16.03 (0%)
I-95 from FCE NB On/SB Off Ramps to S of CR 210	26.49	21.16 (-20%)
Total	63.48	53.64 (-16%)

¹Percentage represents the percent change in predicted crashes when compared to the 2021 SIMR Concept.

7.5 Recommended Alternative

Both alternatives provide acceptable operations through Design Year 2045. The 2021 SIMR Concept and FCE SIMR Concept provide similar results in terms of operations. The FCE SIMR Concept does show potential safety improvements. Based on predictive safety analysis it is expected the FCE SIMR Concept could reduce approximately 10 crashes per year. This report supports the conclusion that the proposed FCE northbound access ramp modifications for the FCE SIMR Concept will benefit both the interstate and regional transportation systems.

The FCE SIMR Concept operational analysis results show that the I-95 facility experiences similar operations compared to the 2021 SIMR Concept. The FCE SIMR Concept does show minor improvements in speed, demand and density along northbound I-95 within the FCE interchange. The results indicate that the FCE SIMR Concept will provide free-flow operations along I-95.

The FCE SIMR Concept also provided significant safety improvements along I-95. Using the HSM methodology, it is predicted the total number of annual crashes will reduce along I-95 by 16% as a result of the northbound access ramps modification.

There are no known environmental concerns or fatal flaws with the proposed design changes. The environmental considerations are provided in the PD&E study.

Based on the safety and traffic operations of the FCE SIMR Concept, it is considered as the preferred alternative for this SIMR. **Appendix D** provides the conceptual signing plan for the FCE SIMR Concept.