8.0 Chapter 8 – Alternatives Analysis

The primary purpose for using CORSIM in the context of this manual is to guide the design process and program delivery. To this point in the manual, you have been given a framework for preparing a calibrated existing conditions CORSIM model. The framework for developing a calibrated model leads to the task of analyzing future conditions. The notable exceptions to what is different in analyzing alternatives is that if simulated volumes do not match demand volumes, then the design solution tested does not work. The vehicle mix and calibration parameters identified in the calibration process are carried forward into the future model unless a design element is incorporated to eliminate the limiting condition.

8.1 Alternative Analysis Overview

The alternative analysis process begins when a project is first initiated. At that point, there are a number of issues to be identified and conceptual work that has to occur before a viable set of alternatives emerges for detailed simulation analysis. It is important to have traffic engineering staff part of the initial development of alternatives. The responsibility of the traffic engineer is to bring relevant information pertaining to existing operational deficiencies and to help guide the development of alternatives using planning level techniques. The use of micro-simulation follows this initial scoping process, and tests and refines the project design and should produce the evidence that the design is appropriate and meets Mn/DOT standards.

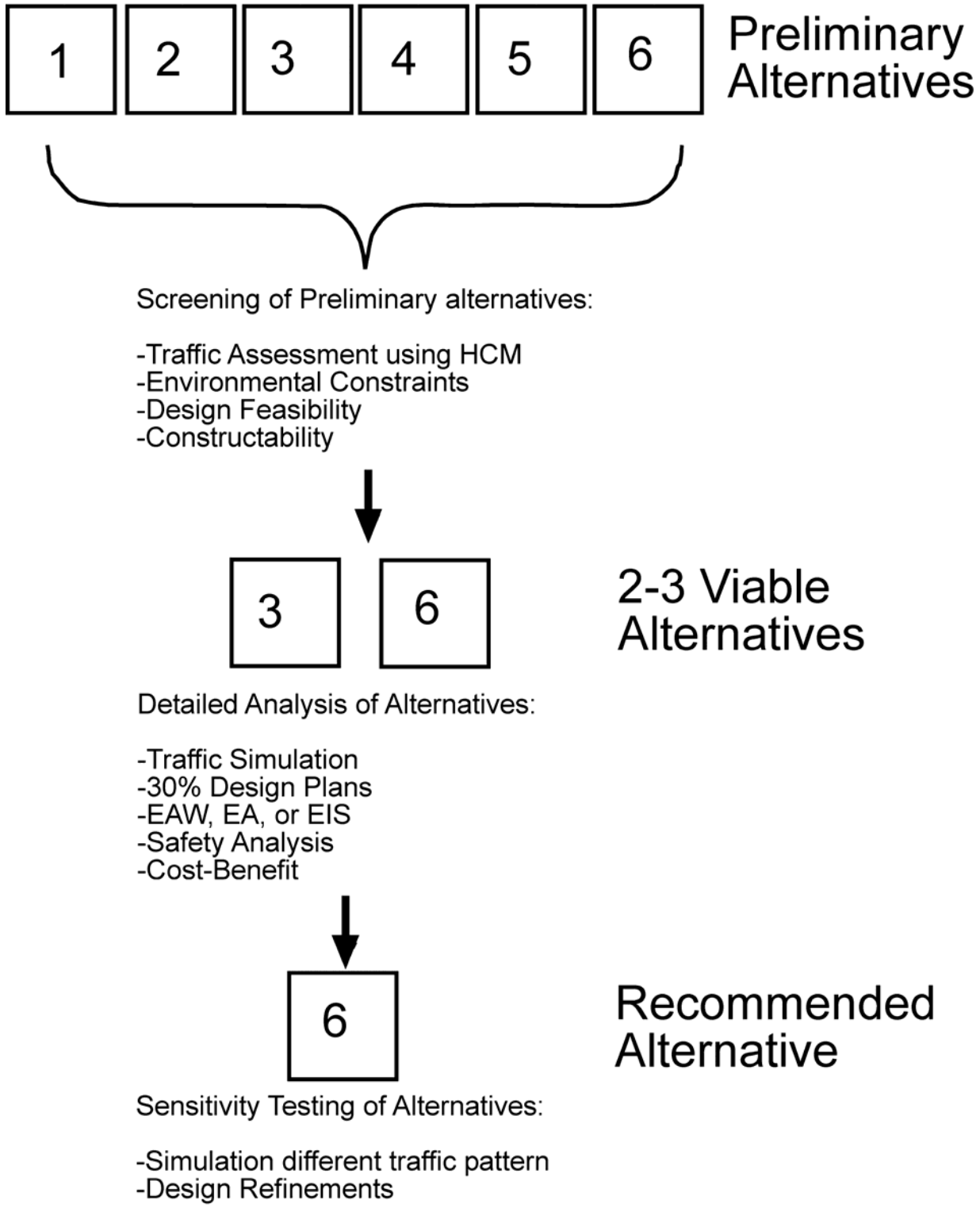

Figure 40 – Alternative Analysis Screening Process

8.2 Alternative Screening Process

During the course of the design process, a number of issues need to be considered. Environmental, design costs, right-of-way constraints, and political constraints to name a few. Along with these design constraints, the ability of the design to carry traffic effectively and safely must be determined. Due to the time commitments of micro-simulation and the uncertainty of developing concepts in the early stages of the design process, it is acceptable to use traffic tools other than simulation to screen the number of design alternatives to a few viable alternatives. We strongly recommend that only two or three viable alternatives be considered. The type of tools includes HCM techniques, per lane volume assumptions, and AASHTO/Mn/DOT design criteria. After a clear process has been established and there has been a general consensus on viable alternatives, the micro-simulation analysis may proceed.

This process may not take as a long as it might seem. If the project is a high priority and has been discussed previously, the simulation modeling process may proceed right away.

8.3 Alternatives vs. Scenarios

The base alternatives include the major elements of a project, such as interchange X is proposed for this location or interchange Y is being modified from a diamond interchange to a partial cloverleaf interchange or a folded diamond. The main alternatives are by definition significantly different from each other.

Scenarios on the other hand are minor modification to the base alternatives; a scenario would not involve a different number of ramp connections, but would involve different auxiliary configurations, basic lanes, and traffic control. These types of changes to a CORSIM model are minor and can be accomplished very easily.

The expectation at this point in the modeling process is that the processing of results is mostly automated; producing results for a scenario run is not equivalent to redoing an entire base alternative.

8.4 Base Alternatives Required for Interchange Access Requests

There are eight criteria that need to be satisfied for FHWA to approve an interstate access request. Generally, these criteria revolve around demonstrating there is a clear need for the proposed project and the proposed project will not adversely affect the operations of the freeway system. It is very important to remember that the IAR can only be approved if the local system cannot be improved to meet traffic demand. In order to prove these main points, an analysis of a number of time frames and build conditions are required. Due to the significant levels of traffic and congestion on the interstate system in most urban areas conflicting with the limitations of HCM techniques, a CORSIM model is usually required.

The timeframes and build conditions are summarized in the following table. In order to determine the effect of the proposed project, baseline comparison is required. The comparison is between the build condition and the no-build condition for the year of opening and the 20-year design timeframe. These times should be assumed, but may vary in unique situations.

Table 5
Interstate Access Request Analysis Requirements

Time Frame	Build Condition		
	Existing	No-Build*	Build Alternative(s)
Existing			
Year Opening			
20-Year Design			

*The No-Build alternative is the existing condition, plus other committed improvements not including the proposed project.

8.5 Sensitivity Testing

The CORSIM modeling process provides an excellent opportunity to determine the strengths and weaknesses of a design. After the recommended alternative has been selected, a series of sensitivity tests should be run on the design. What will dictate the need for sensitivity testing is the uncertainty of the traffic forecasts including total volumes and weaving patterns, if the design is at LOS E or F, or if there is perceived benefit in constructing more roadway because of constructability issues.

The type of design refinements to be considered and analyzed include:

- Auxiliary lanes
- Increasing storage lanes
- Increasing the number of basic lanes
- Traffic signal modifications

8.6 Forecasting Traffic

A significant component to the analysis of alternatives is the development of traffic forecasts. This process is quite involved and relies on estimates and assumptions to determine what the traffic volumes will be in the future. Forecasting techniques include:

- **Regional Travel Demand Models.** The regional models are large-scale models that assign traffic to the roadway system based on desired travel between areas called Traffic Analysis Zones (TAZs) and major roadways that leave the study areas. Within each TAZ, trips are estimated based on the socio-economic information including residential population and employment. Trips are assigned to the roadway network based on the desired destination between zones and the relative congestion on each road. The regional forecast model will take into account parallel routes and divert traffic accordingly. The results from travel demand models require careful review; the estimates of capacity is at a planning level and may not take into account real operational constraints. The Met Council maintains a travel demand model for the Twin Cities metropolitan area.

- **Applying Historical Growth Patterns.** Traffic forecasts are sometimes prepared based on applying historical growth trends out into the future. This type of forecast methodology can be used to compare results from the travel demand model. Strong caution must be used when historical growth is applied; a mature corridor may not grow at a high rate or the growth rate may not take into account realistic system capacities and possible diversions to other routes.

- **ITE Trip Generation Methods.** The Institute of Transportation Engineers maintains a Trip Generation Manual, which contains trip rates for different land use types and sizes. This methodology would involve adding traffic to existing traffic counts based on new development. This method would not take into account background growth outside of the study area.

- **Hybrid of all the above.** It is possible to employ all of these methods to develop traffic forecasts.

All traffic forecasts and methodologies must be submitted to Mn/DOT for review and approval. Contact Jim Hendrickson from Mn/DOT at (651) 234-7782 for traffic forecast information in the metro area.

8.6.1 Time Periods for Future Traffic Demand

The CORSIM modeling process discussed in this manual and in the modeling guidelines/requirements uses 15-minute data over a 3-hour peak period. Forecasting is not a precise science, estimating daily traffic is easier than peak hour traffic, and estimating 15-minute traffic is impossible. In order to analyze 3-hour periods in CORSIM for the future condition, you are factoring the 15-minute databased on the future peak hour divided by the existing peak hour volume. This is similar to applying peak hour factor in HCM or other analysis methods – in essence we are applying the existing peak period traffic pattern to the future in order to analyze the build up failure and recovery of the system.