

Advance CORSIM Training Manual

Prepared for Minnesota Department of Transportation, Federal Highway Administration, and Hennepin County

1.0 Chapter 1 – Modeling Process

The modeling process and guidelines contained in this manual are intended for project work requiring operational analysis using CORSIM (CORridor SIMulation) traffic software that requires Minnesota Department of Transportation (Mn/DOT) and Federal Highway Administration (FHWA) approval. This manual contains requirements for modeling a freeway project including; model development, input documentation, output documentation, and statistical requirements. This document is also a training manual that provides guidance on how to efficiently and effectively create CORSIM models.

1.1 Manual Purpose

This manual should not be read like a “mystery novel”, where the user waits until the end of the book to see how the process ends. Before attempting to do a project for the first time using this manual, review the entire manual. Do not go directly to Chapter 4 and follow the steps of preparing a model. Chapters 5 and 6 provide guidance on documentation and calibration that are essential for preparing the model into the final product.

The purpose of this manual is to:

1. Document Mn/DOT’s CORSIM modeling requirements.
2. Document Mn/DOT’s criteria for developing CORSIM models.
3. Provide examples for how to construct a CORSIM model that satisfies the requirements and criteria.
4. Provide an approach to the calibration process.
5. Provide examples of how to document CORSIM modeling projects
6. Provide guidelines on conducting alternatives analysis.

This manual has been structured to mirror a FHWA process manual for micro-simulation modeling. The FHWA guidelines will provide general criteria that pertain to all micro-simulation modeling. The Mn/DOT CORSIM Freeway Modeling Manual is intended to provide specifics to modeling freeway corridors using CORSIM. The FHWA manual will provide complimentary information to the Mn/DOT manual.

1.2 **CORSIM Model**

CORSIM is a micro-simulation program developed by the FHWA. It is a program that has evolved over time from two separate traffic simulation programs. The first program, NETSIM or TRAF-NETSIM, is an arterial analysis program that models arterials with at-grade intersections. The second program, FRESIM, is a freeway model that models uninterrupted facilities including grade separated expressways and interstate freeways. CORSIM combined these two programs in order to have the ability to analyze complete systems. The effects of traffic operations between freeways and signalized ramp terminal intersections can be analyzed directly as opposed to analyzing the two facility types and “guessing” the potential impacts one type of facility has on the other.

CORSIM was developed for use in 1996; however, NETSIM and FRESIM are older programs that were developed and widely used well before CORSIM was available. One advantage of the CORSIM software is that it has been refined based on input from a number of different users from around the country. A number of problems have been identified and corrected as a result.

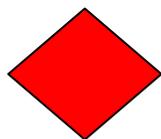
The reason micro-simulation models are used over other methods and software packages like Highway Capacity Manual (HCM) is that micro-simulation models allow us to evaluate the effects that different elements have on each other. Effects like, closely spaced intersections and interchanges or the effects of a bottleneck condition on the surrounding system. Also, as metropolitan traffic conditions experience congestion over 3 to 4 hour periods, the simulation programs allow us to evaluate the build up to congested conditions and the recovery of the system at the end of the period. The peak period of congestion is complex and evaluating solutions under these conditions can only be accomplished using micro-simulation tools like CORSIM.

1.3 **The Modeling Process**

The model process is outlined in the Figure 1. This process has been developed by FHWA and is based on the best practices of simulation modeling from across the country. The process provides a clear direction in how models should be developed, where does the calibration process occur, and at what point the alternatives analysis process is appropriate.

Unsuccessful modeling projects are projects that exceed budgets, take too long, and/or result in a model that lacks credibility. The closer the modeler adheres to a process, one that is widely accepted, the more likely major problems will be avoided, and if necessary, can be corrected with outside assistance. This manual was written with this process in mind.

One principal of preparing simulation models is to incorporate reviews at logical steps during the process. The following symbol will be used throughout this manual to indicate a point in the process that an independent review takes place.



Review Symbol:
Deliverable or type of
review will be identified

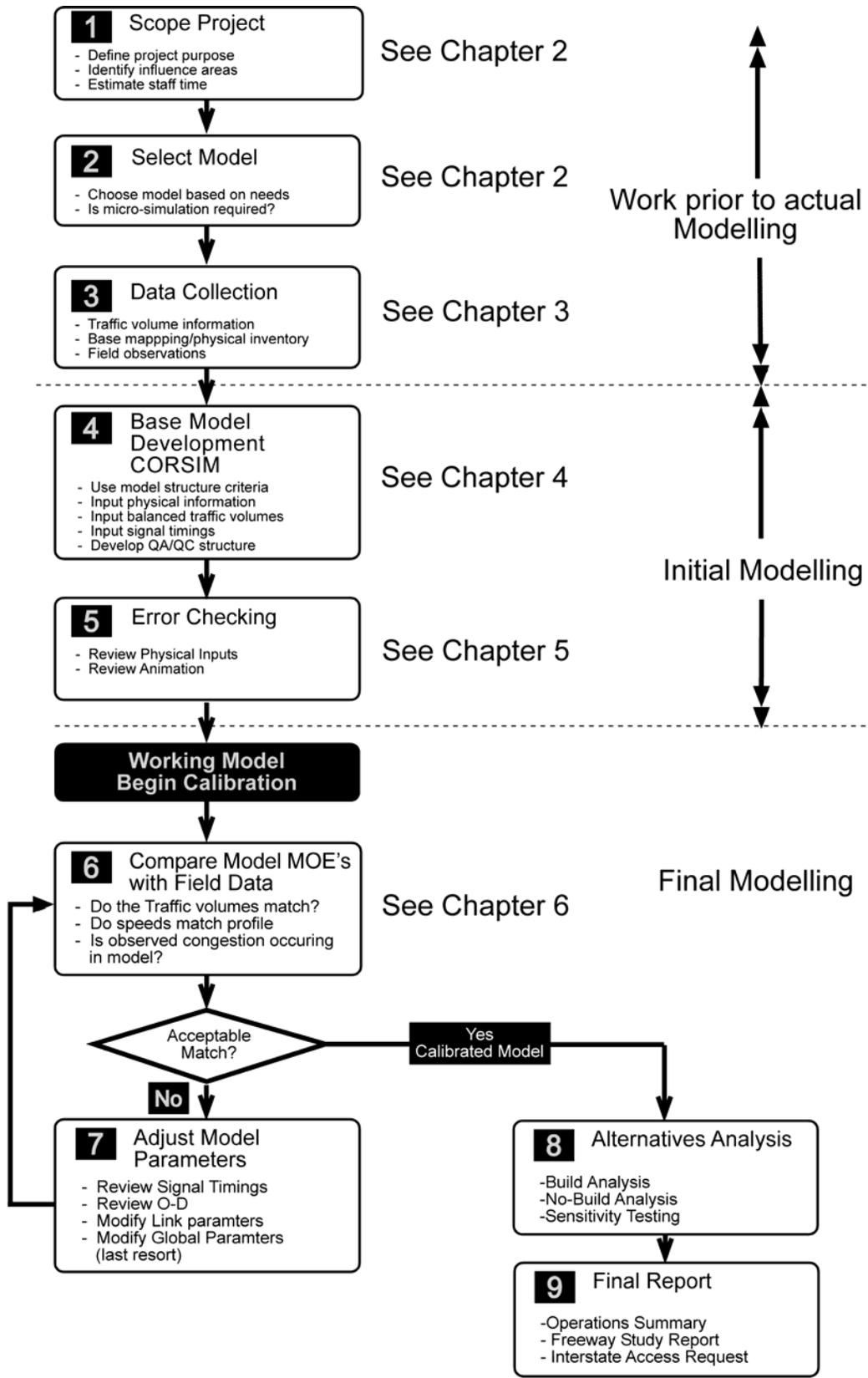


Figure 1 – Modeling Process Flow Chart

1.3.1 Goals of a Good Modeling Process

There are many ways of defining what a good modeling process is. A lot of what goes into the definition depends on the purpose of the project. Projects that require Mn/DOT and FHWA approval are usually interstate freeway projects. These types of projects tend to be very expensive and must not only satisfy local needs, but must satisfy the needs of interstate travel. Because of the importance of these projects, it is imperative that the following goals be kept in mind while preparing a simulation model for a project.

- **The model must be accurate.** Evidence needs to be provided that the model is indeed accurate. For instance, tying in the model to real world coordinates is a way to make the model more accurate.
- **The model must be reproducible.** Reproducibility in a modeling process is an important concept because there are many different ways that a “model” can be developed, and as a result, different conclusions may be reached. To ensure that conclusions are properly made, the model needs to be developed and documentation prepared that would allow an independent modeler to recreate the same model from the source data. From this common start point, the project team or independent reviewer will be able to evaluate if the finer points of the model or the calibration parameters should have been coded differently.
- **The modeling process needs to be efficient.** CORSIM models are essentially large electronic databases of information. Due to the variability of traffic forecast information and travel pattern information, it is important to evaluate projects under different traffic conditions to determine design sensitivity. If the model has been prepared in an efficient manner, the ability to evaluate different design and traffic conditions is more feasible and cost effective. If the model has been prepared using inefficient manual methods, the real value of using micro-simulation, as a design and evaluation tool, is lost.
- **The modeler must always keep the end in mind.** Preparing traffic models can be quite complex, and at times, a modeler can be completely engrossed in details and lose sight of the big picture. In the beginning of the modeling process, starting with the project scoping and data collection through the model development, a lot of information is compiled and developed that will assist in developing solutions and providing results. Every spreadsheet, sketch, and note is a valuable piece of information that is developed along the way and has value to the project; however, early in the process, this may not be evident. Think with the end in mind during the process, and rework will be minimized because that great thought or spreadsheet you developed at the beginning and threw away could be used later on.

1.4 Model Support Information On-line

Mn/DOT’s web site has a number of sample files and support files for conducting CORSIM simulation studies. These files include CORSIM input files, fleet information in the required CORSIM format. Sample tables and graphics, as well as a complete model manual are available. The web site is:

<http://www.dot.state.mn.us/trafficeng/modeling/index.html>