1.1 Originator

The Traffic Analysis and Safety Unit (TASU) within the Bureau of Traffic Operations (BTO) is the originator of this chapter. Submit all questions and comments concerning this chapter to the DOT Traffic Analysis & Modeling (DOTTrafficAnalysisModeling@dot.wi.gov) mailbox.

1.2 General

This chapter addresses the methodologies and tools for conducting traffic operations analyses for the evaluation and design of WisDOT facilities. Traffic operations analyses provide an assessment of how traffic demands for all modes of travel and the capacity of the facility affect the overall performance of the transportation system. The results of traffic operations analyses assist WisDOT in determining the best way to meet the department’s goal of providing a safe, reliable, and efficient multimodal transportation system.

There are multiple tools and methodologies for completing traffic operations analysis, each having their own set of capabilities and limitations. Selecting the appropriate analysis procedure and tool is not always intuitive and can prove challenging. The primary goal of this chapter is to address this challenge by providing guidance on the uniform and consistent application of the various traffic operations analysis tools, methodologies, and procedures. The policy within this chapter does not cover the travel demand models (TDMs) used to generate traffic forecasts. Refer to the Transportation Planning Manual (TPM) for additional details regarding traffic forecasting protocols.

1.3 Content

Attachment 1.1 outlines the process for the development and review of traffic models. For cost-effective traffic analyses, project managers should refer to Attachment 1.1 as they develop the project schedules, budgets, and management plans.

This chapter defines WisDOT’s policy pertaining to traffic analysis tools and methodologies. Use the policy within this chapter in conjunction with WisDOT’s Facilities Development Manual (FDM). In the event the two documents provide conflicting information, contact BTO-TASU (DOTTrafficAnalysisModeling@dot.wi.gov) to confirm the controlling methodology.

1.4 Acronyms/Terminology

The key terms and acronyms used within this chapter include:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AADT</td>
<td>Annual Average Daily Traffic</td>
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<tr>
<td>BPED</td>
<td>Bureau of Planning and Economic Development</td>
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<td>BSHP</td>
<td>Bureau of State Highway Programs</td>
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<td>BTO</td>
<td>Bureau of Traffic Operations</td>
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<tr>
<td>CDR</td>
<td>Concept Definition Report</td>
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<tr>
<td>Department</td>
<td>Wisconsin Department of Transportation</td>
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<td>DOT</td>
<td>Department of Transportation</td>
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<td>DHV</td>
<td>Design Hour Volume</td>
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<td>DTA</td>
<td>Dynamic Traffic Assignment</td>
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<td>DTIM</td>
<td>Division of Transportation Investment Management</td>
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<td>DTSD</td>
<td>Division of Transportation System Development</td>
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<td>FDM</td>
<td>Facilities Development Manual</td>
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<td>FHWA</td>
<td>Federal Highway Administration</td>
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<tr>
<td>GoF</td>
<td>Goodness of Fit</td>
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<tr>
<td>HCM</td>
<td>Highway Capacity Manual</td>
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</table>
1.5 Terminology

The key terms used within this chapter include:

**DTA** – Dynamic Traffic Assignment. DTA is a modeling approach that captures the relationship between dynamic route choice behaviors (path and start time) and transportation network characteristics (travel speeds, signal timings, level of congestion, etc.) It is possible to incorporate DTA into any level of simulation models (macroscopic, mesoscopic, microscopic); however, the most common application of DTA is for mesoscopic simulation models. Therefore; this policy assumes all DTA models are mesoscopic models.

**Macroscopic simulation** – Tools using this methodology assess the operation/capacity of a facility or network utilizing the deterministic relationships of the flow, speed, and density of the traffic stream. The simulation analyzes the movement of vehicles on a section-by-section basis. Travel demand models (TDMs) are an example of a macroscopic model. This policy does not cover the use of macroscopic simulation models.

**Mesoscopic simulation** – Tools using this methodology analyze the movement of individual vehicles or vehicle cells as they travel through a simulated network using predefined capacity and speed-density relationships. Mesoscopic models incorporate a level of network and operational detail comparable to microsimulation models with the route choice flexibility of macroscopic simulation models (TDMs). Most mesoscopic simulation models incorporate DTA, thus, this policy utilizes the term DTA model throughout to represent mesoscopic simulation models.

**Microsimulation** – Microscopic traffic simulation. Tools using this methodology analyze the movement of individual vehicles as they travel through a simulated network. As the simulation progresses, it updates factors such as the vehicle’s position and its need to increase/decrease speed or change lanes several times a second.

**Traffic Models** – the computer models used to carry out traffic operations analysis. These include both the HCM-based traffic analyses and microsimulation analyses. This does not include TDMs.
2.1 Establish Project Purpose, Needs, and Goals

The traffic analysis requirements for a project are highly dependent on the project goals. If the project goal is to provide a preliminary or planning level assessment of the traffic operations, then a higher-level analysis may suffice. If the goal of the project is to define project-specific design requirements, then a detailed analysis is often necessary.

Every project is unique, with its own set of assumptions and applicable methodologies. A clear understanding of the purpose, needs, and goals of the project is critical in determining the necessary level of traffic analysis. When developing the project schedule and budget, consider the traffic analysis and modeling needs, including the associated peer review requirements. Ideally, the traffic analysis and modeling needs should dictate the schedule as opposed to having the project schedule dictate the level of traffic analysis. This ensures the appropriate level of traffic analysis is conducted at the most appropriate stage of the project life cycle, reducing the need for any rework. Defining the project schedule without consideration of the traffic analysis needs may compromise the integrity of the traffic models, which in turn may affect the selection of the project alternative.

2.2 Defining the Traffic Analysis Scope/Level of Effort

To provide clear guidance for the project and to ensure that the project goals and objectives are satisfied, the project team should address the following questions during the initial project kick-off meeting:

- What agencies/divisions/bureaus need to be involved in the project as it pertains to the traffic analysis (i.e., who are the intended stakeholders)? What will be their intended level of involvement (project resource, project review, traffic analysis, etc.)?

- In general, what is the purpose of the project, specifically as it pertains to the traffic analysis (i.e., what questions does the traffic analysis need to answer)?

- What type of process will the project address (planning, design, construction, etc.)?

- What type of study area will the project consider (corridor, intersection/interchange, highway segment, etc.)?

- What transportation components will the project address (travel modes, traffic control, facility type, etc.)?

- What types of outputs are important for the decision-making process? What are the intended deliverables? Is the purpose of the evaluation detailed technical assessment, visual animation, or both?

- What transportation alternatives does the project need to consider? What evaluation criteria will the project apply?

- Are there any known/key issues about the study area? If so, how will the project address them?

- What are the schedule and budget constraints (including agency review needs) associated with this effort?

- What is the critical path for the project? Does the traffic analysis fall within the critical path? When will changes in the project scope/purpose significantly affect the project schedule?

The facilitator of the kick-off meeting should use DT2290 to guide the discussion of the key aspects of the project, specifically as they pertain to the traffic analysis needs. Circulate the completed DT2290 form to the internal stakeholders immediately after the completion of the kick-off meeting and update the form as necessary as the project progresses. Although the DT2290 form should remain a fluid document, be cautious of unnecessary changes to the scope of the project or traffic model (i.e., watch out for scope creep).

2.3 Identify Need for Consultant Team

After defining the project goals, objectives, and traffic analysis needs, the internal WisDOT project team should coordinate closely with the regional traffic operations staff to assess whether the regional office has the knowledge, time, and resources available to conduct the anticipated level of traffic analysis required for the
project. Oftentimes, the regional traffic operations staff can perform the simpler traffic analyses (such as the deterministic-HCM analyses) in-house while the more complex and demanding traffic analyses (such as the microscopic traffic simulation analyses) typically require outsourcing the work to one or more consultant firms.

If in need of consultant services, the internal WisDOT project team should follow the process in FDM 8-5 to select and procure the consultant team(s) to perform the necessary traffic analyses for the project. Historically, BTO has maintained master contracts for general traffic engineering services (BTO01) and traffic modeling and analysis services (BTO03). Coordinate with BTO regarding the potential use of either of these master contracts.

After procuring the consultant team(s), the internal WisDOT stakeholders should meet with the selected consultant firm(s) to define/clarify their roles, tasks, and tentative schedule. WisDOT should procure the consultant team(s) and host the traffic analysis kick-off meeting early on during the project process to allow the consultant(s) to provide input on the traffic analysis methodologies, including the identification of the appropriate traffic analysis tool(s). Refer to TEOps 16-10 for details on defining the most appropriate traffic analysis tool(s).

### 2.4 Initiate Traffic Analyses

Follow the process illustrated in Attachment 1.1 to conduct the necessary traffic analyses. Refer to TEOps 16-10 for details on defining the most appropriate traffic analysis tool(s) and analysis methodologies, TEOps 16-20 for guidance on conducting microsimulation analyses, and TEOps 16-25 for details on conducting peer reviews.

Coordinate with WisDOT regional traffic staff as necessary to address any questions/concerns regarding the traffic analyses tool(s), methodologies, or results. If desired, the WisDOT regional traffic engineer may request additional support or guidance from BTO-TASU.