Traffic Projections and Levels of Service Targets By Gary Toth

Fitting a transportation solution into the community and environmental contexts while at the same time satisfying transportation needs is one of the key – if not the key – fundamentals of Context Sensitive Solutions. When thinking of how to accomplish this, most designers and stakeholders refer to flexible design as a solution. Design elements such as lane and shoulder widths, horizontal and vertical curvature and sight distances immediately come to mind when one first begins to visualize how to fit a roadway into its context.

What many overlook is that decisions to widen roadways or upgrade intersections consistently have more of an impact on a project's footprint. Such roadway expansion decisions are based on travel projection modeling assumptions, combined with selection for free flow Levels of Service (LOS) targets. Both are addressed s fundamental design controls in Chapter 2 of AASHTO's *A Policy on Geometric Design of Highways and Streets* (the "Green Book").

The following article talks about conservatism in, and limitation of, both selection of target LOS, as well as use of most current travel models.

Levels of Service Targets

Levels of Service (LOS) is a performance measure widely used in the transportation industry. According to the *Highway Capacity Manual*, Chapter 5, Level of Service is a

OUR MODEL
TELLS US THAT

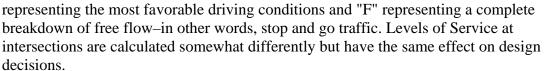
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BY 2010

"performance indicator of a traveler's satisfaction with the trip." The *Highway Capacity Manual* (HCM) is a collection of procedures and methodologies for calculating highway capacity and level of service. While often used as a bible by traffic modelers, in reality the HCM neither constitutes nor attempts to establish legal standards for highway construction.

Levels of Service (LOS) are rated much like a student's report card, with "A" generally



The Green Book and most DOTs provide guidelines for selection of LOS, but these are guidelines only. In the Green Book's own words: "Choice of an appropriate LOS for design is properly left to the highway designer." DOTs are not required to file design exceptions, nor are they subject to tort liability concerns, for selecting a LOS lower than the recommended guidelines. Rather, selection of a target LOS is a policy decision and is based on a particular jurisdiction's philosophy on whether or not to accept congestion.

Yet the number of lanes that will be built on a roadway project have generally been selected using free flowing LOS C or D targets. Furthermore, the LOS of particular design configurations are calculated using peak hour travel projections, and they generally ignore what happens the other 23 hours a day. The duration of congestion beyond the peak hour, and how travelers may spread their trips throughout the day to avoid peak congestion, is not considered. This practice—a remnant of Interstate era policy guidance—made sense when planning to invest over \$100 billion to build tens of thousands of miles of Interstate freeways. However, this logic becomes increasingly less convincing when applied to lower classes of roadway, and even more troublesome when applied at signalized intersections. Unlike Interstates and freeways, the remainder of the nation's roadways serves the dual purposes of mobility and access to adjacent land uses. Design decisions based on high-level LOS performance measures end up only aiding the through motorist at the expense of the very communities that the road is also supposed to serve. Decisions to accommodate peak hour traffic may tune the roadway to work well for motorists during that one hour, but render the road overdesigned for the rest of the day and ineffective for all other users.

Furthermore, the target year for roadway designs is often 20 to 25 years into the future. Until this anticipated growth occurs, the roadway will also likely be overdesigned, even during the peak hour, during the first five to ten years after construction is completed. Overdesigned roadways not only take major bites out of a community's fabric, they induce higher and higher speeds and, in off peak hours, can turn a road into a speedway.

Recently, primarily due to budgetary considerations, some DOTs have begun to choose lower LOS targets. In heavily congested developed areas, where LOS F may be currently occurring 3, 4 or even more hours a day, it is increasingly becoming accepted practice to accept LOS F for several of those hours, particularly at intersections. This might allow an agency to forego damaging and expensive widening projects, or at least accept scaled-back expansion plans.

The point of this discussion is that it is not etched in stone that the LOS targets for a project needs to be set at C, D or even E.

While over 90% of DOTs use Levels of Service as a primary performance measure, there is now discussion as to whether the current Level of Service Measurement definitions are valid. At the 2002 Annual Meeting of the Transportation Research Board, a panel debated this topic extensively, arguing that this performance measurement, as currently defined, penalizes holistic designs which provide a balance amongst all roadway users.

Traffic Modeling

There are a myriad of traffic models used in American transportation planning. All traffic models require input on current development and future growth in the study area. Assumptions on how much future growth will occur, and where and when it will be distributed, can be critical in fitting a project into its context.

Growth forecasts—typically at least 20 years in the future—can be developed using a variety of methods, ranging from quantitative models to negotiated consensus among local governments. To be truly accurate, growth projection modeling can be expensive. Therefore, absent a compelling reason to do otherwise, most growth projections will tend to be done using less expensive techniques and can produce overestimations.

There are other issues associated with the current state of the practice of traffic modeling. Most assume travel growth patterns will be the same in the future as they have been in the past. They ignore changing demographics, such as the aging of our population, rising energy prices, pending regulation and pricing policies related to desire to control climate change, and societal changes like the increase in telecommuting. Most assume that our economy will continue to grow at the same rate as it has over the last 30 years.

Without direction or a reason to do otherwise, modelers will also likely assume that future growth will occur in the business-as-usual patterns of segregated and spread out (sprawl) land uses. This is critical because research shows that compact, mixed-use development can reduce vehicle travel by 25% or more. The form of land use has a strong effect on rates of walking, trip lengths and mode choice, yet most current models exclude those effects and are ill-equipped to deal with mixed-use and compact development patterns. Structural problems with most current modeling processes are compounded when traffic assignment zones (TAZs) are created too large. This is an economic issue because larger TAZs mean less data collection, input and calibration. Unfortunately, larger zones can make the modeling process too insensitive to capture pedestrian trips or account for shorter automobile trips made within the TAZ. To deal with this, the designer/project manager should ensure that the modeling is able to handle all multimodal trips, including pedestrian. While adding complexity to the model, reducing the size of the TAZs, or adding more pedestrian and transit links, may add some cost to the modeling, but this step may be necessary to avoid overestimation of traffic projections and overdesigning the project. Pedestrian Environment Factors (PEF) which relate trip generation to characteristics of the built environment can be used to adjust mode choice at a zonal level. Model output can also be "post-processed" (adjusted later) using adjustment factors that account for the different travel characteristics of different forms of land use.

The assumptions that lead to overestimating traffic projections are policy, not regulatory, decisions. All are up for debate and negotiation. While a designer may be at a disadvantage in arguing about growth trends, there is no reason why the questions can't be raised and knowledgably discussed and debated. This conversation is a sign of a healthy planning process, and it may lead to important changes that can save the transportation agency money and produce a transportation solution that benefits everyone.

Summary

The practice of designing for high mobility standards in all contexts has become an increasing matter of debate. The DOT should not automatically impose a high Level of Service target without first considering the transportation context of the roadway. For

roads of statewide importance, high levels of mobility may need to be maintained, possibly warranting higher LOS targets. But in many cases, the road(s) in question is of secondary or tertiary importance and high levels of mobility may not be the highest priority. In these instances, maintaining or enhancing the viability of the surrounding community should take precedence. There should not be an automatic mandate to extinguish LOS F at all costs, every time it arises. LOS and traffic forecasting should be tools, not sole determinants, in project decisions.

The types of traffic models which are used and their assumptions and internal structures, such as size of travel assignment zones, have also increasingly become a matter of debate. Robust growth assumptions, large grid TAZs, trend growth scenarios, low fuel prices, and incomplete networks all served us well in the Interstate era. Continuation of these practices in our current era, however, needs scrutiny, and designers should raise questions such as:

- 1. What are the growth assumptions for the model and how were they developed?
- 2. How many TAZs were used in the modeling and are they small enough to capture walking and internal trips?
- 3. Can the model reliably predict what is going on in each neighborhood?
- 4. Did the model account for the fact that the transportation capacity needed to keep up with growth may not be provided and, if not, how could that restrain the growth assumptions?
- 5. If standard models with large zones were used to keep modeling costs down, did the modeling post-process the projections to account for various land uses?