



Florida Department of Transportation Research

Investigation of Freeway Capacity: a) Effect of Auxiliary Lanes on Freeway Segment Volume Throughput, and b) Freeway Segment Capacity Estimation for Florida Freeways, BDK75 977-08

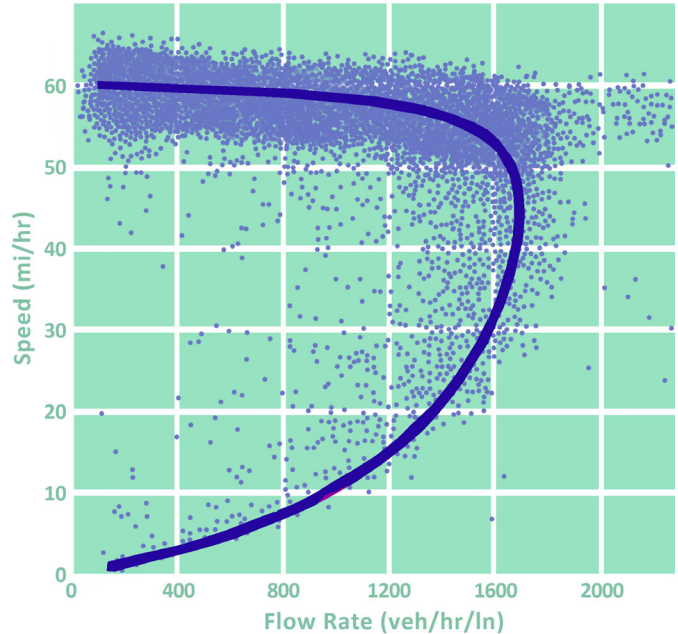
Traffic flow is an important measure in traffic engineering, but defining it is difficult, as is understanding the impact on flow of changes to highway configurations. In this project, University of Florida researchers examined both of these aspects of traffic flow.

First, researchers examined guidelines for including an auxiliary lane, which is a lane connecting an off-ramp to an on-ramp. These lanes are meant to lessen traffic turbulence due to merging and diverging movements at interchanges, but the decision to include an auxiliary lane in a design must be guided by understanding the benefits for that specific design. The Transportation Research Board's Highway Capacity Manual (HCM) gives no explicit guidance in this case. So, Florida Department of Transportation (FDOT) developed its own guidelines for adding auxiliary lanes based on the additional traffic volume accommodated on the freeway segment for any given level of service.

FDOT's guidelines have not been validated, and the researchers undertook to do so. They approached the problem by identifying the traffic volume level at which each level of service density threshold was met with and without an auxiliary lane. Results from HCM analysis methodologies were compared with CORSIM microscopic simulations. The latter was used to generate data upon which to establish the quantitative effect of an auxiliary lane.

Two versions of an adjustment equation that gives the percentage increase in volume throughput due to adding an auxiliary lane were developed. The equations depend only on the number of mainline lanes, as other factors had no significant effect on volume throughput.

Second, researchers examined the capacity values for basic freeway segments as a function of free-flow speed provided by the HCM. These values are reasonable for U.S. freeways in general, but lower



A crescent-shaped cluster of data points shows that the relationship between vehicle speed and flow rate is not simple. The data is approximated with a Van Aerde model (dark blue curve). The rightmost point of the curve gives the capacity of the highway segment.

or higher values may be more appropriate for specific locations. The HCM provides no guidance on how its values should be adjusted for local conditions, nor does the HCM give a method for measuring or estimating capacity values.

The researchers therefore investigated methods to estimate freeway capacity values, with the goal of recommending one for use on Florida freeways. A detailed review of research in this area focused research efforts on three methods. The most suitable method was based on identifying breakdown events, but guidelines for the use of the other methods were developed. For Florida freeways, the capacity estimates from all three methods were found to be lower than the capacity values given in the HCM. Requirements of a more detailed follow-on study drawing on more extensive data collection were outlined.