Effects of Road Construction Intensity and Operations on Rural Freeway Work Zone Capacity

INTERIM REPORT

by

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### Abstract

Capacity has been defined and measured by many researchers. Capacity is dependent on many variables that can be broadly categorized as traffic, geometric and traffic control conditions. Capacity is also affected by construction type and its intensity on adjacent open traffic lanes. The effect on capacity is a function of vehicles moving in and out of the closed lanes of the work zone, and the presence of heavy construction vehicles. Construction activity and its intensity, however, are not commonly considered in estimating capacity of a highway lane.

The main purpose of this project is to quantify the effects of construction type and intensity (e.g. maintenance, rehabilitation, reconstruction, and milling) on work zone capacity. The intensity of construction activity can be defined as the frequency of work zone vehicles ingress/egress from the open traffic lane, the presence of heavy construction vehicles like milling machines, etc., number of workers present at the work site. The objective will be to quantify the effects of construction type and its intensity on work zone capacity and to develop guidelines for MoDOT to estimate the specific operation type and intensity that will improve traffic flow and shorten the length of queues commonly associated with work zones.

### Key Words

- Work zone capacity

### Security Classification (of this report)

- unclassified
During the last quarter (January-March 2014) work continued on Task 2) analysis of the field data acquired from the ASTI Transportation Systems. The work on Task 1 has been completed and the preparation of the final report is currently underway.

An assessment of the potential contributions and deliverables was made to bring the project to completion. Only the analysis required to bring the project to a successful outcome will be made. No additional data will be collected. We have been in communication with the subject expert on smart work zones at MoDOT, Daniel Smith. A meeting with has been arranged for April 17th in Jefferson City.

Below please find the outline being used for the preparation of the final DRAFT report:

Abstract
Introduction
Literature review
   Research studies
   Factors affecting capacity
   Capacity models
Description of Data Collected
   Field Data from the work zone
   ASTI (Advanced Sensor Technologies, Inc.) data
   Conversion from TMS to SMS
   Work zone diary
Capacity Models
   Conventional Q-discharge model
   Three regime speed-flow

During the last quarter (October-December 2013) work was continued on the Subtask 1.2) analysis of the responses received for the Department of Transportation (DOT) survey, and Task 2) analysis of the field data acquired from the ASTI Transportation Systems.

The effort for identification of the work-zone related factors affecting work zone capacity continued. The literature was further reviewed for the approaches to quantify the intensity of the work zone construction and utilizing it for the type of data available for the considered work zones. This effort will be finalized with a criterion to determine a numerical metric for the construction intensity and will be used to assess its effect on the capacity.

A complete set of traffic data was re-examined to determine the work zone capacity using the methodologies identified previously. The work zone capacity was found for the highway using the new dataset as it was stored in an aggregated structure over all the open lanes. The three regime approach (Khazraee and Bham, 2012) and the speed-flow methodology proposed in chapter 5 of the "2010 Highway Capacity Manual" were used. The two capacity values were compared statistically to examine the capacity values found from two different approaches.

The DOT survey responses were further refined into more sensible and comparable answers for each question in the survey. An attempt was made to convert the qualitative answers (for a fourth of the questions) to quantitative responses and therefore be able to statistically compare and interpret the responses. The remaining responses will be presented in tabular form in the final report.