UTC RESEARCH PROJECT DESCRIPTION

PROJECT NUMBER
07211

PROJECT TITLE
Traffic Responsive Signals and Weather Related Congestion

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OBJECTIVE
The objective of the project is to evaluate the effectiveness of using traffic responsive/closed-loop signal systems to address weather-related congestion, specifically congestion caused by rain. Issues to be addressed include determination of the effectiveness of traffic responsive/closed-loop signal systems to address weather-related congestion; determination of environments and operating regimes under which closed-loop signal systems are most effective at reducing weather-related congestion; development of estimates of potential congestion reduction resulting from use of weather-responsive signal systems and determine whether benefits justify implementation; and determination of whether traffic responsive systems could implement weather timing plans without human intervention.

ABSTRACT
The goal of traffic responsive signal systems is to reduce congestion and move traffic more efficiently than conventional coordinated signal systems that rely on preset time-of-day plans. One application that has been suggested is that these signal systems also be used to adjust timings based on weather conditions. Weather events have been found to clearly impact vehicle speeds, volumes, and saturation flow rates and studies indicate that weather-specific timing plans...
can significantly reduce delays and improve traffic flows. It has also been found, though, that the greatest benefits may occur during winter weather events (i.e., snow, ice, and slush) rather than rain events. This study will examine whether it is practical and beneficial to implement weather-specific timing plans for rain events, which are the most common weather event in the South, and determine under what conditions (volume, duration, time of day) they are most effective. It will also investigate whether there are unique, predictable, and clearly discernable changes in traffic flow which would indicate a rain event and allow a traffic responsive signal system to implement weather-specific timing plans without human intervention. Traffic data will be collected in two Alabama corridors under both dry and wet conditions. Simulation models will be developed for both corridors and various timing scenarios will be evaluated.

TASK DESCRIPTIONS
The proposed project will be accomplished via the following tasks:

Task 1: Review and synthesize literature, particularly as it relates to the use traffic responsive signal systems to address weather-related and non-recurring congestion.
Task 2: Compare and select appropriate traffic analysis tools with the ability to model complex signal systems.
Task 3: Download and archive from local signal systems for several months under both wet and dry conditions. Collect vehicle and driver performance data under wet/dry conditions.
Task 4: Develop and calibrate arterial micro-simulation models and test a variety of signal control scenarios including traditional and traffic-responsive coordination under wet and dry conditions.
Task 5: Study results will be presented at local and national transportation conferences. We will also develop presentation materials to educate transportation professionals.
Task 6: Document the findings from the previous tasks in a Final Report.

MILESTONE DATES
Task 1: Jan-Feb 2007
Task 2: Feb
Task 3: Jan-Jun
Task 4: Apr-Oct
Task 5: Oct-Dec
Task 6: Dec 2007

RELATIONSHIP TO OTHER RESEARCH PROJECTS
The proposal is directly related to item I.1 (Mobility/Capacity) of the 2007 UTCA Annual Research/Training Plan as it investigates ways to improve the operation and efficiency of existing facilities. Moreover, the proposed work directly addresses the “Operations and Mobility” theme from the R&T Partnership Report entitled Highway Research and Technology: the Need for Greater Investment and, in particular, Theme 2. Maximizing Efficiency and Minimizing Congestion. The proposed project also falls directly under the “Key Traffic Management Research” portion of the FHWA Highway Operations section of the 2005 USDOT Research, Development and Technology Plan, specifically “Advanced Control Systems (ACS)” and “Weather Responsive Travel Management”. This project will also coordinate with two other

TECHNOLOGY TRANSFER ACTIVITIES
Plans include development of technical papers and delivery of presentations based on project results.

POTENTIAL BENEFITS OF THE PROJECT
It is anticipated that the project will provide guidance to transportation professionals with regard to the use of traffic responsive signal systems to address weather-related congestion.

TRB KEYWORDS
Traffic control devices; weather conditions; traffic signal timing; simulation; traffic congestion.