New Jersey Department of Transportation
Bureau of Research
Technical Brief

Feasibility of Lane Closures Using Probe Data

*This study developed an on-line system analysis tool called the **W**ork Zone **I**nteractive **M**anagement **Ap**plication - **P**lanning (WIMAP-P), an easy-to-use and easy-to-learn tool for predicting the traffic impact caused by work zone lane closures on freeways and arterials. WIMAP-P is supported by a working database that was developed based on the data feeds from various sources, including OpenReach, Plan4Safety, New Jersey Straight Line Diagram (NJSLD), New Jersey Congestion Management System (NJCMS), and INRIX.*

Background

To develop an adequate congestion mitigation plan for roadway reconstruction projects, transportation agencies need accurate and reliable estimates of traffic impacts associated with pertinent maintenance and reconstruction projects. NJDOT recognizes the shortcomings of the current analytical methods that often result in inaccurate estimates of the impact of lane closures in terms of vehicle delays and the associated costs. It is desirable to develop a tool utilizing the probe-vehicle data that can accurately predict work zone impacts, such as a delay over space and time, as well as evaluate the effectiveness of congestion mitigation strategies.

Research Objectives and Approach

The objective of this research project is to develop a methodology for integrating probe-vehicle data into the traffic impact analysis model, and to develop a user-friendly software tool that would implement the calculation methodology.

Findings

The work zone lane-closure congestion impact prediction system, consisting of a work zone speed prediction model and a web-based, user-friendly software that interacts with various data sources in an effective and efficient manner. A system analysis tool, called **W**ork Zone **I**nteractive **M**anagement **Ap**plication-**P**lanning (WIMAP-P), has been developed. WIMAP-P is expected to predict the speed, delay and delay costs caused by each planned work zone on New Jersey's freeways and arterials.

The WIMAP-P system architecture comprises of three specific modules (i.e., a working database, a work zone speed prediction model, and an on-line software application) interacting together to generate the required results as shown below.
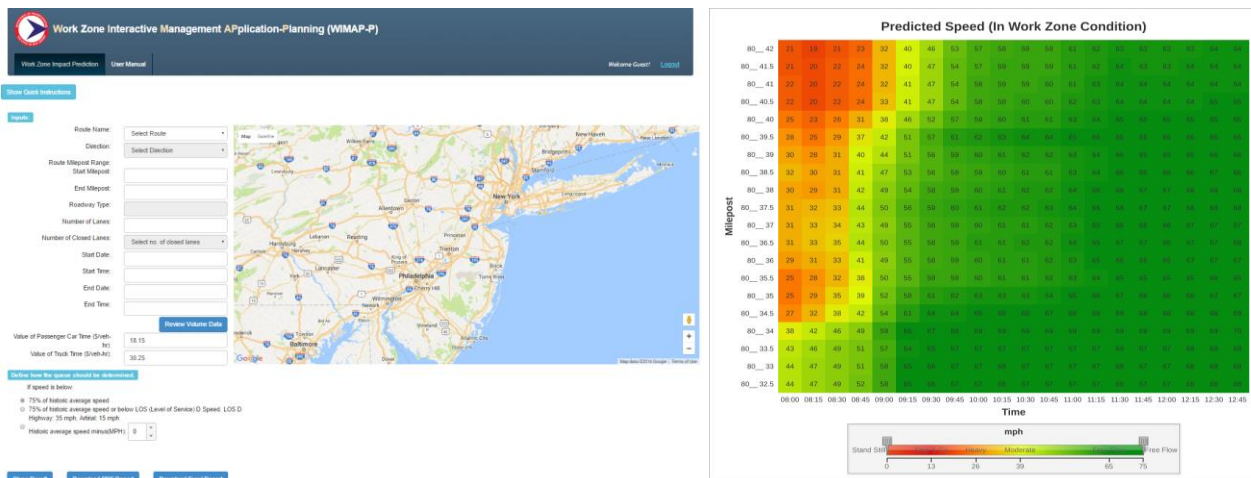
The Artificial Neural Network (ANN) and Multivariate Non-linear Regression (MNR) models were developed based on 466 work zones, which are employed by WIMAP-P to predict speed caused by work zones on NJ freeways and arterials. It was found that the ANN model is slightly more accurate for predicting delays of historic work zones, but the MNR model demonstrated better reliability and consistency in predicting delays of work zones in places where there are no historic data.

WIMAP-P is GIS-based, allowing all the roadway geometry and characteristics for the New Jersey freeways, arterials, which is a user friendly system that fuses together roadway geometry, traffic volume, and speed details by integrating data in a data warehouse from the OpenReach, Plan4Safety, SLD, NJCMS, and INRIX databases. The graphical user interface of WIMAP-P can effectively facilitate data input and analysis in an efficient and reasonably intuitive manner while producing graphical results and customized reports. In addition to predict the spatio-temporal speed impact caused by work zones, WIMAP-P also computes the associated road user cost.

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A final report is available online at: http://www.state.nj.us/transportation/refdata/research/.
If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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