



# Research and Technology Review

## NDOT Research Day 2009—”Research Quest”

The NDOT Research section hosted a warm gathering of researchers and NDOT employees on the hot Monday of August 17, 2009 from 9:00 a.m. to 4:00 p.m. “Research Quest” was the theme of the day. The theme sheds light on the implication of research on future innovations and technologies in providing a better transportation system in Nevada.



Welcome

The key note speaker of the day, Hannah Visser, from FHWA explained the implications of doing research for the improvement of transportation infrastructure in the nation. She also outlined the basic principles and procedures of Federal Highway Research funding and administration.

Presentations and discussions that elaborated the functions of research were made throughout the day. Among others Ken Chambers outlined the way research is coordinated and managed at NDOT. Roma Clewell made an interactive presentation regarding the Product Evaluation Program at NDOT. Product Evaluation Committee members participated in a panel discussion which explained how the process of product evaluation works at NDOT. Representatives from the Offices of Sponsored Programs of the Universities made informative briefings about how the management of research projects works from a financial management viewpoint.



Keynote Speech

Representatives of the University Transport Center shared important information on current NDOT-sponsored projects and research topics. Principal Investigators from both Nevada Universities and the private sector discussed their roles in research and research projects: Performance of the University Transportation Center, Project Cost Estimation for Planning, Tree Crown Mortality, Development of Surrogates for Crashes, Asphalt Bridge Deck Joints, and MSE Wall Corrosion.

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Heidi Englund also made a lively presentation with a number of tips on how to use the library facilities to get the most current and accurate information. At the conclusion of her presentation Heidi administered the raffles and rewards that were part of the activities of the day. Thanks to the support provided by Paula, Nancy, Heidi, Roma, Ken and Gizachew, food and drinks were served throughout the day.

In general, about 60 people attended the event, which was also transmitted to outlying District NDOT employees by a video conference, thanks to the technical support we received from Greg Dodson. The participation of the universities, the mix of topics and the overall organization made the day a real success. According to ex post facto evaluation of the event, future efforts are deemed essential to draw more participation within NDOT.



Product Evaluation panel discussion

## SPOTLIGHT—CURRENT RESEARCH PROJECT

### Analysis of Alternatives for Accommodating Trucks on Urban Freeways in Southern Nevada

**UNLV/TRC Project Team: Dr. Eric Sandgren, Dr. Ken Peck, Dr. Vinod Vasudevan, Dr. Alexander Paz, Dr. Pushkin Kachroo, Mr. Farhan Khan, and Mr. Majrooh James**

#### Project Objective

The objective of this research study is to evaluate: (i) short-term operational strategies (e.g., truck restriction, truck only lane) in dealing with existing and near-term growth in truck traffic, and (ii) long-term planning strategies (e.g., truck bypass and truck only lanes with toll) to accommodate the future truck traffic on urban freeways in Southern Nevada. In the evaluation, the mobility and safety benefits of various strategies on accommodating the existing and projected truck traffic in Las Vegas urban freeways will be quantified. Based on the comparison of the strategies with different future truck flow forecasts, the best strategy for short-term and long-term truck traffic management will be recommended.

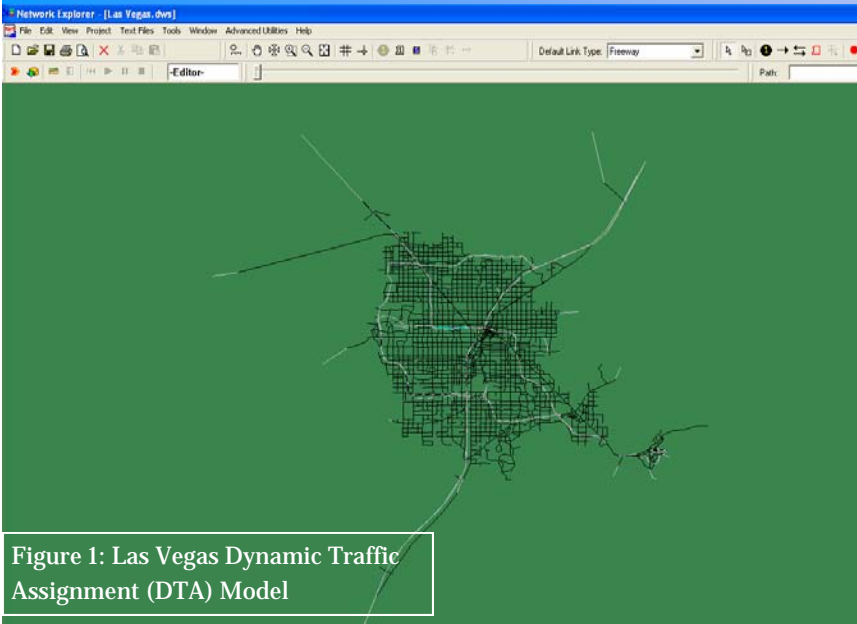


Figure 1: Las Vegas Dynamic Traffic Assignment (DTA) Model

#### Project Overview

The scope of the project is divided into the following three tasks:

**1. Analyzing alternatives for accommodating trucks using computer based models:** Various alternatives for accommodating truck traffic are being explored and analyzed using the existing RTC-SN Travel Demand Model (TDM) and the corresponding Dynamic Traffic Assignment (DTA) model. Figure 1 shows the Las Vegas DTA model developed under this task.



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The Surface Mount Delineator is the only system available which cantilevers, enabling installation on vertical slopes up to 30 degrees. The delineator posts can be turned 90 degrees on step to face delineation in any direction. Other SHUR-TITE designs include the ability to mount object markers and delineators on cable barriers, guardrail, etc.

This gives NDOT greater flexibility in traffic direction and hazard identification significantly benefiting Nevada motorists.

SHUR-TITE Products also have other complimentary highway safety products which also can help to make roadways safer and less worrisome.



**REMEMBER !!**

**CALL FOR PROBLEM STATEMENTS**

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**FOR 2011 FISCAL YEAR**

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**LIBRARY CORNER**  
*by Heidi Englund*



The NDOT Research Library holds a large selection of magazines, journals, study materials, along with publications from FHWA, TRB, TRR, and US DOT. The Research Library is located in room 115, of the NDOT Headquarters building. Stop by whenever you can, and I'll be happy to show you around. For those of you in other areas, remember; **I send any book (or requested publication) anywhere in Nevada!** So just send me a request of what you may need, and I'll put it in the mail to you!

Also, look at our webpage on the NDOT Homepage for our research publications, under, "Reports and Publications-Research Division Publications" ..... [www.nevadadot.com](http://www.nevadadot.com)

**Heidi Englund—775-888-7895**  
[henglund@dot.state.nv.us](mailto:henglund@dot.state.nv.us)  
**Library Assistant III**

*About NDOT's*  
*R&T Review*

*The NDOT Research Division administers the Department's research, development and technology transfer program and serves as the "clearing-house" for product evaluations.*

*Research and Technology Review is published quarterly by the NDOT Research Division. Its purpose is to provide the latest information on the NDOT research activities including product information and other pertinent research topics.*

*If you have comments or need additional information regarding any of the topics discussed in this issue, please contact the Research Division.*

*Edited by*  
*Gizachew Zewdu*  
*Research Analyst*



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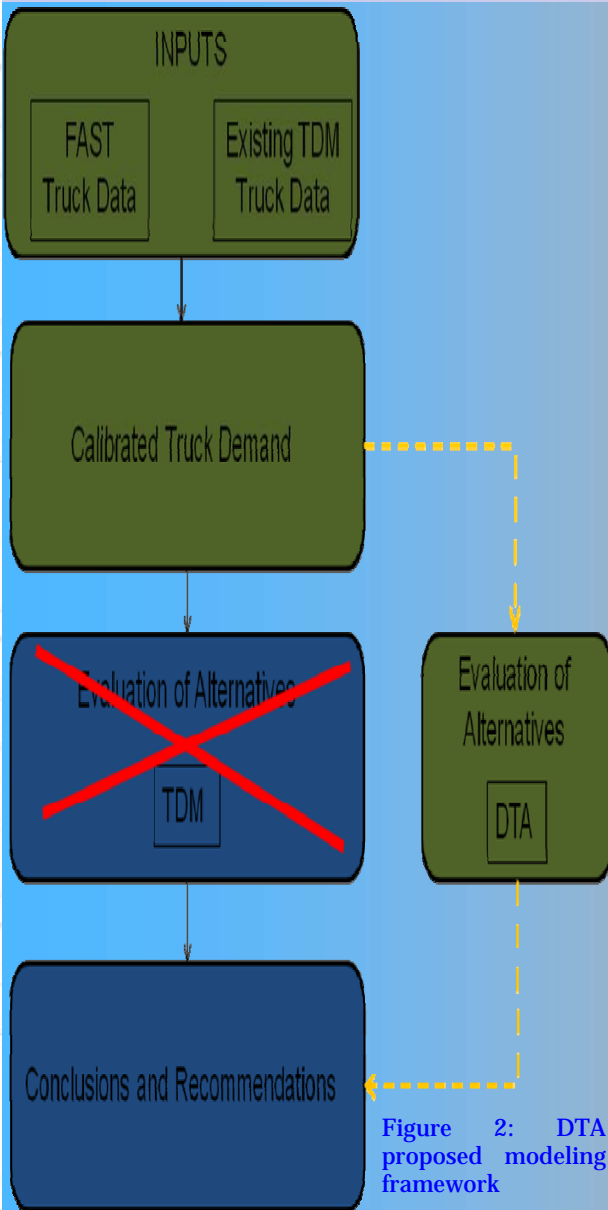


Figure 2: DTA proposed modeling framework

2. Conduct surveys: The research team will conduct surveys of stakeholder representatives. This involves the development of questionnaires to address issues such as, attitude towards the concept of restricting truck movements, willingness to pay for using enhanced facilities, operational issues, safety issues, and logistics.

3. Safety analysis: A comprehensive truck related safety study is being conducted to identify high risk locations for trucks, major contributing factors, and other relevant information using Nevada DOT crash data. Statistical methods and GIS software programs are being used to accomplish this task.

### Project Status

*Analyzing alternatives for accommodating trucks using computer based models:* After checking the available data and consulting with RTC of Southern Nevada, it is decided that a DTA model would provide the most useful results. Hence, the research team is currently working on enhancing existing and developing new datasets required for DTA modeling. In addition, a key requirement for a meaningful analysis is the explicit assurance of consistency between the model and the real-world. Hence, calibration capabilities are currently under development. This is particularly important for the problem context given that the existing data corresponding to truck demand is not reliable because it has not been updated for a long time (about 10 years). The resulting DTA model will provide superior modeling capabilities compared to the TDM model. For example, the DTA model will include traffic signal modeling capabilities. This modeling capability is not present in the TDM as these type of models cannot represent traffic signals. Figure 2 illustrates the proposed modeling framework. The crossed box denotes that the TDM is no longer considered to analyze the set of alternatives.

**Conduct surveys:** The research team has completed preliminary interviews with both Nevada DOT and RTC of Southern Nevada officials. Based on the input, it is decided that attitudes of general public, engineers/planners, and truck operators/drivers are the key information required from the survey portion of the project. Efforts are underway to develop questionnaire and data collection.

**Safety analysis:** Using crash data obtained from Nevada DOT for the year 2003 – 06, preliminary analysis of identifying high crash locations are underway. A commercial Geographical Information System (GIS) software ArcGIS is being used for this task. Figure 3, next page, shows truck related crashes in the Las Vegas metropolitan area by crash severity. This shows that although crashes are scattered all around the valley, more crashes are reported on freeways. Once high risk locations are identified, contributing factors and safety implications of various alternatives studied in this project will be analyzed.

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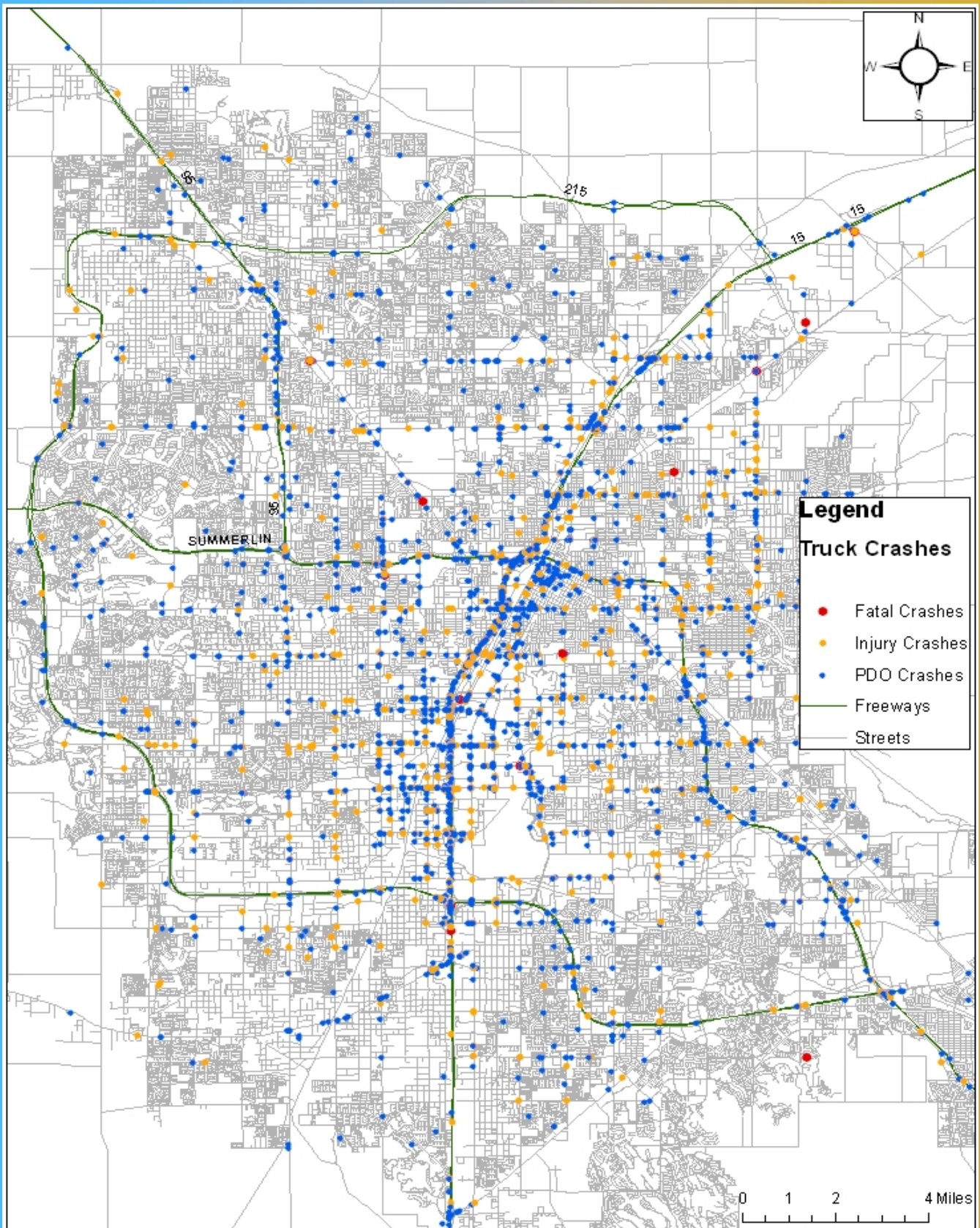


Figure 3: Truck related crashes in the Las Vegas metropolitan area (2003—2006)



## 2010 Research Proposals

The research section at NDOT received forty-three problem statements for consideration in the 2010 fiscal year. The Research Advisory Committee prioritized those problem statements and those principal investigators were requested to submit detailed research proposals for 14 of the problem statements. Subsequently the proposals, the entire list of the problem statements, and the minutes of the Research Advisory Committee meeting were forwarded to the Research Management Committee.



**The Research Management Committee reviewed the proposals and selected the following for funding in 2010:**

**1. Developing a Specification System for Hot Mix Asphalt Construction:** The objective of this research is to improve construction material value through a “Percent-within-Limits” system, and improve the cost-effectiveness of Department practices. The proposed research will be conducted over three phases for a total duration of 42-months. Dr. Peter Sebaaly, UNR, is the principal investigator.

**2. Effectiveness of U.S. Highway 93 Wildlife Overpass for Mule Deer and other Wildlife in Nevada:** The objective is to document the use of the overpass by mule deer and other species of wildlife and the level of effectiveness of the overpass for reducing deer-vehicle collisions. The scope of work calls for the research team to develop modifications for inclusion in development of future crossings to be more cost-effective and reduce vehicle collisions, evaluate human injuries or fatalities, and population level effects on mule deer resulting from high levels of mortalities. Dr. Kelly M. Stewart, Department of Natural Resources and Environmental Science, UNR, is the principal investigator.



**3. Development of Guidelines for Implementing Roundabouts in Nevada:** The objective of this research is to develop formal guidelines for determining when roundabouts may be used in Nevada. The guidelines are intended for use by NDOT and local transportation agencies in Nevada so that a roundabout design alternative will always be considered along with other conventional types of intersection improvements. Zong Tian, Ph.D., P.E., Department of Civil and Environmental Engineering, UNR, is the principal investigator.

**4. Unbonded Prestressed Columns for Accelerated Bridge Construction and Earthquake Resistance:** The objective of this research project is to develop a readily-adaptable design guide to help NDOT design cost-effective earthquake-resistant bridges. David Sanders, Professor, UNR, is the principal investigator of this project.

**5. Investigation of Corrosion of MSE Walls in Nevada, Phase II:** This proposal is to undertake Phase II of the investigation of Corrosion of MSE Walls in Nevada in accordance with the recommendations made in Phase I. Raj V. Siddharthan, Ph.D., P.E., UNR, is the principal investigator.

**6. Investigation of the Use of Different Soil Reinforcement Types for MSE Walls in Nevada:** This proposal focuses on addressing the Nevada-specific design concern associated with the elevated temperature effects on the use of geosynthetics in future Nevada walls. Raj V. Siddharthan, Ph.D., P.E., UNR, is the principal investigator.

**7. Safety and Design Guidelines for Marked and Unmarked Pedestrian Crosswalks at Unsignalized and Midblock Crossing Locations:** The research objectives are to: (i) investigate whether there is a difference in safety performance at marked and unmarked pedestrian crosswalks in Nevada’s urban areas; (ii) develop guidelines for installing marked crosswalks at unsignalized intersections and mid-block crossings. Zong Tian, Ph.D., P.E., UNR, is the principal investigator.

Another research agreement is being drafted to evaluate the effectiveness of the detour utilized during the I-15 N. design/build contract.



# Product Evaluation : A SOLUTION FOR DELINEATORS



Nevada Department of Transportation (NDOT) has experienced complications when using polyethylene delineators. High winds, extreme heat, and cold winters cause the delineators to crack, shear off, or blow over permanently. NDOT was ready to discontinue the usage altogether until we discovered a new product.



SHUR-TITE's mission is to produce innovative highway safety products in an environmentally conscious manner, while providing long-lasting, durable systems and addressing critical safety issues of exposure to traffic by field technicians.



SHUR-TITE has high density polyethylene delineators that are corrosion free and durable. Both SHUR-FLEX Driveable and SHUR-FLEX Surface Mount Delineator units are multi-hit, reboundable systems which, over time and multiple impacts, allow for quick, (approximately less than one minute) post change-outs, thus greatly reducing a worker's presence in harm's way. The delineator systems can with stand the extreme temperatures, high winds, and topography challenges of Nevada's diverse climate.

