

# Research Newsletter

**Responsive - Accessible - Relevant**

## A MESSAGE FROM THE RESEARCH DIRECTOR

*By: Cameron Kergaye, PhD, PMP, PE*

Summer is here and Research is in full swing with over 20 new projects from our spring workshop. These include public transportation studies that emphasize multimodal collaboration with UTA, risk assessments for non-motorized access to transit stations, and pedestrian safety recommendations for local communities. Other more traditional emphasis areas include studies on low temperature asphalt cracking, filtration systems for industrial use water, and snow plow equipment lighting. Most of the new technical advisory teams have already met to move their research into the hands of a principal investigator.

With all the new research, we're also making plans to improve next year's workshop problem statements. That means meeting with our academic and consultant research partners this fall to discuss UDOT's transportation challenges. We plan to facilitate small group meetings that will allow UDOT division leaders to describe their research needs, and our local researchers to represent new approaches and solutions. The goal is to conduct a more efficient workshop next spring to align funded research with UDOT's immediate needs and longer-term transportation demands.

Wrong-way driving has been in the news too often lately. Yet I'm happy to report the completion of the first phase of our recent research on the state of practice of wrong-way driving detection methods and technologies. Earlier in 2016 UDOT engineers had the opportunity to participate in a scan tour to Texas to learn about cutting edge technologies they have incorporated. UDOT is now taking steps to implement LED flashing signs and

red retroreflective tape, two strategies that were found successful in Texas.

Not all of our research gets the national attention it might deserve. Our submission to AASHTO 'sweet sixteen' was not selected from a national competition. Yet that means important research from 16 other states might be of value to us. Summaries of these research projects may be found on the AASHTO website and within this newsletter.

This summer is also time to consider new problem statements to submit to NCHRP which funds about 35 new research projects each year on behalf of state DOTs. Successful problem statements must be submitted by a DOT and should address transportation issues of regional interest. Academic and consultant researchers looking to assist in developing a problem statement should work with their UDOT counterparts. The Research Division website has a list of UDOT employees who are serving on AASHTO, TRB, and NCHRP committees.

Finally, I would like to acknowledge UDOT's success in the award of three more SHRP2 grant opportunities. UDOT was recently awarded \$100,000 for Identifying and Managing Utility Conflicts, \$100,000 for Reliability Data and Analysis Tools, and \$200,000 for Reliability in Simulation and Planning Models. We appreciate those who worked on these submittals and look forward to the contributions that they will make.



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**Completed and Active Research Available at: [www.udot.utah.gov/go/research](http://www.udot.utah.gov/go/research)**

Editorial Staff: Joni DeMille [jdemille@utah.gov](mailto:jdemille@utah.gov) and David Stevens [davidstevens@utah.gov](mailto:davidstevens@utah.gov)

## Results of the 2016 Research Workshop (UTRAC)

### Projects have been selected for FY17 funding from the 2016 UDOT Research Workshop held on March 28th.

Fifty-seven problem statements were submitted this year for the UDOT Research Workshop. Of these, 20 will be funded as new research projects through the Research Division and 5 will be funded directly by other divisions and UTA. This was the first year that UDOT partnered with UTA in their research efforts, and the results were positive.

The workshop serves as one step in the research project selection process which involved UDOT, FHWA, UTA, universities, and others. UDOT's Research Division solicited problem statements for six subject areas: Materials & Pavements, Maintenance, Traffic Management & Safety, Preconstruction, Planning and Public Transportation.

At the workshop, transportation professionals met to prioritize problem statements in order to select the ones most suitable to become research projects.



After the workshop, UDOT Research Division staff reviewed prioritization and funding for each recommended problem statement

with division and group leaders and presented the list of new projects to the UTRAC Council.

The selected new projects include:

- Field Data for Low Temperature Cracking (U of U)
- SemiCircular Bending Test Phase III Existing Mix Validation (CMETG)
- Review and Specification for Shrinkage Cracks of Bridge Decks Phase II (U of U)
- Feasibility of Instrumenting and Monitoring Designated Roadway Sections in Utah (UDOT)
- Filter Systems to Produce Industrial Use Water for UDOT Maintenance Stations (UDOT)
- Recommended Snow Plow Blade Use Due to Various Factors (UDOT)
- Snow Plow Equipment Lighting - Best Practice Recommendation (UDOT)

- A Data Fusion Approach for Extracting Highway Maintenance Features (USU)
- Data-Based Testing & Decision Process for Traffic Signal Steel Replacement (UDOT)
- Streamlined Traffic Impact Studies for Conditional Access Permits (UDOT)
- Risk Assessment of Non-Motorized Access to Rail Transit Stations (Active Planning)
- Analysis of Left-Turn Warrants in Utah (BYU)
- Traffic Ticker (Purdue)
- Developing a Method to Identify Horizontal Curves Segments with Worst Crash Histories Using the HAF Algorithm (BYU)
- Pedestrian Safety Toolbox for Elected Officials (Active Planning)
- Index of Model Ordinances Promoting Pedestrian Safety (Active Planning)
- Project Management in Transportation Engineering - National Best Practices (UDOT)
- Trip and Parking Generation by TODs Phase II (U of U)
- Does Compact Development Increase or Reduce Traffic Congestion? (U of U)
- The Effect of Air Quality on Transit Ridership Patterns and Associated Vehicle Emissions (U of U)
- Return on Investment for Bus Stop Investments (U of U)
- Understanding Transit Ridership: Using Regression Analysis to Generate Ridership Forecasts for Better Performance Measurement of Transit Agencies (Torrey Lyons)
- Strategic Planning and Design for Electric Bus Systems (U of U)
- Quantifying Effects of Spatial Coverage and Temporal Frequency of Transit Service on Ridership (U of U)

Mike Caldwell, mayor of Ogden City, gave an insightful keynote address on the value of active transportation. Tim Biel, P.E., President of CME Transportation Engineering Group, was presented with the UTRAC Trailblazer Award for his significant research contributions in the area of pavement and materials engineering. We appreciate everyone's participation in the workshop process. The new research projects can start as early as July 2016 in coordination with UDOT Research staff and champions.

To see details on the new projects and all submitted problem statements, visit the [Research Workshop webpage](#). For more information contact Tom Hales at [tahales@utah.gov](mailto:tahales@utah.gov).

## Evaluation of Pavement Markings Under Wet-Weather Nighttime Road Conditions: Best Practices Study

*UDOT researchers evaluate strange lights at night and unusual patterns.*

### PURPOSE AND GOALS

This study was conducted with the purpose to identify best practices for the selection of pavement marking materials and products. The practices of other governmental agencies were compared to UDOT's to identify opportunities for improvement. In particular there was an emphasis to improve pavement marking visibility during wet-night conditions. The results of this study



will be used to assist UDOT in an anticipated review and updating of its current Pavement Marking Decision Matrix.

### RESEARCH PROCESS

The study began with a review of UDOT's current Pavement Marking Decision Matrix, standards, specifications, and processes. Interviews of technical experts from divisions within UDOT included: Planning, Maintenance, Traffic & Safety, Materials, and Preconstruction (design). This was followed by a web-based literature search to identify past studies that may be relevant to this study. A search of each State DOT's web page was conducted to identify their pavement marking decision practices. This was followed up by a short survey.

### CONCLUSIONS and RECOMMENDATIONS

#### 1. Communication and Team Approach:

The reintroduction of a Pavement Marking and/or Traffic & Safety Committee would be beneficial in making strategy decisions, providing effective communication and coordination between technical groups.

#### 2. Additional Selection Criteria:

The research validated that UDOT's current Pavement Marking Decision Matrix is working well to select materials and products based on durability and cost. The majority of State agencies follow a similar process. However, there is a significant opportunity to expand the matrix to include consideration for other factors such as known crash locations, climate specific locations, and construction work zones.

#### 3. Written Guide - Support Matrix Chart:

There is an opportunity to create a written Pavement Marking Guide that supplements and helps to explain the decision matrix, flowcharts, and tables. This guide could also be considered as a chapter in a larger traffic and safety manual.

#### 4. Review and Update Standards:

Review current standard drawings, specifications and decision matrix to provide greater clarity on when and where to use different products and practices such as inlaid (pavement grooving) markings.

#### 5. Decision Lens – Qualitative Approach:

UDOT's Planning Division is currently using Decision Lens Software for asset management. It could also be used in helping to develop decision strategies for the selection of different pavement marking materials under different conditions. As part of this, needs for Wet-Night conditions could be compared to other risk factors.

#### 6. NuMetrics – Quantitative Approach:

The use of UDOT's current Nu-Metrics Traffic and Safety Software could be used to consider additional quantitative crash data, in comparison to location, climate conditions, roadway geometrics, and other factors. This analysis could be used to assist in selecting pavement markings for hot-spots, specific locations, individual projects, corridor studies or a system wide basis. These factors include:

## Evaluation of Pavement Markings Under Wet-Weather Nighttime Road Conditions: Best Practices Study (cont.)

- Selection based in response to known crashes, injuries, and fatality locations
- Roadway Geometrics (horizontal curves, steep grades, substandard shoulders, etc.)
- Traffic - Urban, high volume, high movement, fluctuations, etc.
- Pedestrian Crossings and Bike Paths
- Climate Conditions such as High Snow, Wet Weather, UV exposure, etc.
- Construction Work Zone Markings
- Driver Behavior (cell phone, impaired, elderly, etc.)

### 7. Technology Transfer and Test Sections:

There is an opportunity for UDOT to continue its ongoing research, while also efficiently building upon the work of other agencies through scanning tours, participation on national committees and pool-fund studies.

### 8. Emerging Technologies:

There are continuously emerging technologies that may help in improving the visibility of pavement markings under wet-night conditions. UDOT should continue to solicit input from vendors and place test sections for evaluation. These technologies include:

- \* LED – Light Emitting Diode Pavement Delineation
- \* Enhanced Bead Technologies for Wet Night Conditions
- \* Grooved (inlaid) pavements to recess markings
- \* Striping of Rumble Strips
- \* Profile Thermoplastics
- \* Reflective Markers for Islands, Curbs and Barriers
- \* Recessed Reflective Markers

### WHAT'S NEXT ?

Implementation of many of these findings will be undertaken in the next few months including organizational improvements, guideline enhancements, Pavement Marking Guide training, technology transfer with other organizations, and advancements in data analysis. Likely steps include:

- Reinstate Pavement Marking or Traffic and Safety Committee.
- Review of UDOT's Current Pavement Marking Selection Guide to consider additional selection criteria.
- Consider new Test Sections to consider effectiveness of emerging technologies such as LED markings, Textured Markings in Rumble Strips.
- Continue internal research and coordinate efforts by others through scanning tours, pool fund studies and national committee participation.

### RESEARCH TEAM

The study was conducted by the Eixenberger Group, and Anderson Transportation Consulting on behalf of UDOT's Division of Research. A technical advisory group was used with representation from several technical areas within UDOT, including: Research, Planning, Traffic & Safety, Materials, Maintenance, and Preconstruction (design). For more information, contact Dave Eixenberger of the Eixenberger Group at [david@eixenbergergroup.com](mailto:david@eixenbergergroup.com) or Tom Hales ([tahales@utah.gov](mailto:tahales@utah.gov)) of the Research Division.



Quote  
Unquote

Deep summer is when laziness finds respectability.  
—Sam Keen

Ah, summer, what power you have to make us suffer and like it.  
—Russell Baker

Summer afternoon, summer afternoon; to me those have always been the two most beautiful words in the English language.  
—Henry James

## Accuracy of Approach Volume Counts and Speeds Collected by Microwave Sensors

This study evaluated the accuracy of approach volumes and free-flow approach speeds collected by the Wavetronix SmartSensor Advance sensor for the Signal Performance Metrics system of the Utah Department of Transportation (UDOT), using the field data collected by JAMAR counter boards for free-flow approach volumes and a TruCam LiDAR gun for approach speeds. The Advance sensor is primarily designed for dilemma zone reduction. It does not have the capability to differentiate vehicles between lanes, but the Advance sensor currently used has a detection range of up to 600 ft. and has the capability to track vehicles approaching the intersection. UDOT wanted to use this capability to get added values from their investment in the Advance sensors.



Figure 1. Wavetronix Advance sensor (source: <http://www.wavetronix.com/de/products/smartsensor/advance>)

The approach volume accuracy was analyzed with three factors: sensor position, number of approach lanes, and approach volume level. The results showed that the high accuracy is achieved when the number of approach lanes is low, or closer to one lane, and the approach volume level is low. The overall range of accuracy for the approach volume counts was found to range from approximately 77.8% (22.2% undercount) to 105.7% (5.7% over count).

The accuracy of approach speeds was analyzed with two factors: the number of lanes and offset position of the lanes relative to the location of the speed gun. The offset position was first tested and found not to affect the accuracy of approach speeds. In general, the difference in means was approximately  $\pm 2$  mph and was not considered practically signifi-

cant. The 85<sup>th</sup> percentile speed for sites with more than 50 samples were then evaluated. For these sites, the average difference in 85<sup>th</sup> percentile speed was -0.43 mph, the biggest negative difference being -1.6 mph, and the biggest positive difference being 1.5 mph. A Bootstrapping analysis was then performed to predict the expected distribution of speed differences in 85<sup>th</sup> percentile speeds. This analysis also showed the 85<sup>th</sup> percentile speeds by the LiDAR gun and the Advance sensor were not significantly different for practical traffic engineering applications.

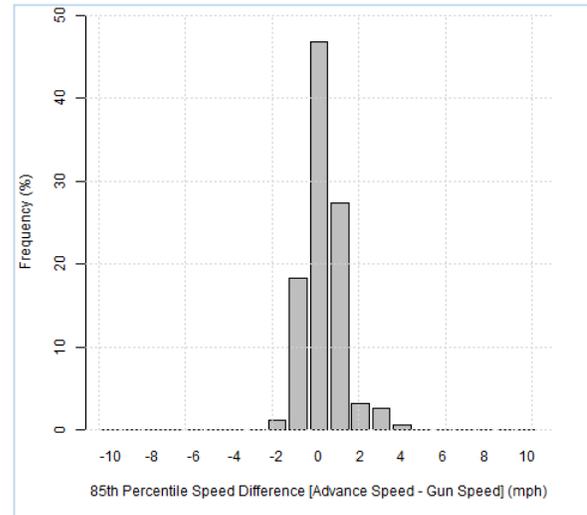


Figure 2: Expected 85<sup>th</sup> percentile speed difference distribution by Bootstrapping

For more information, contact BYU's Mitsuru Saito ([msaito@byu.edu](mailto:msaito@byu.edu)) or Mark Taylor ([marktaylor@utah.gov](mailto:marktaylor@utah.gov)) of the UDOT Traffic Operations Center.



## 2016 High Value Research from Across the Nation

Each year the AASHTO Research Advisory Committee (RAC) coordinates submittals of High Value Research projects from the four AASHTO Regions, as well as the selection of the year’s “Sweet Sixteen” awards for top research projects. Through a voting process, RAC members in each of the AASHTO Regions select submitted research projects for the Sweet Sixteen awards. These top projects, completed in recent years, are selected for their proven implementation value based on each agency’s submittal. The Sweet Sixteen research projects for 2016 will be recognized at the upcoming AASHTO RAC/TRB Representative Annual Meeting, the AASHTO Annual Meeting, and the TRB Annual Meeting.

The Sweet Sixteen research projects for 2016 are listed in the table below, along with links to the research reports or project descriptions. For those in UDOT who are interested, we encourage you to click on the links for more information. Also, the research and implementation descriptions for all of the submitted High Value Research projects for 2016 are available on the AASHTO RAC website in a document entitled [Research Impacts: Better – Faster – Cheaper](#).

For more information on the High Value Research process and projects, contact Cameron Kergaye ([ckergaye@utah.gov](mailto:ckergaye@utah.gov)) or David Stevens ([davidstevens@utah.gov](mailto:davidstevens@utah.gov)) of the Research Division.

REGION 1	Connecticut DOT	<a href="#">Repair of Steel Beam/Girder Ends with Ultra High Strength Concrete</a>
	Maryland DOT	<a href="#">Sustainable Landscaping Practices for Enhancing Vegetation Establishment</a>
	New Hampshire DOT	<a href="#">Instrumentation, Digital Image Correlation, and Modeling to Monitor Bridge Behavior and Condition Assessment</a>
	Rhode Island DOT	<a href="#">Coupling GPR and IR Thermography to Detect Damage in Reinforced Concrete Bridge Decks</a>
REGION 2	Florida DOT	<a href="#">FDOT Research Concerning the Detection, Mitigation and Prevention of Wrong Way Crashes</a>
	Georgia DOT	<a href="#">Corrosion-Free Precast Prestressed Concrete Piles Made with Stainless Steel Reinforcement: Construction, Test, and Evaluation</a>
	North Carolina DOT	<a href="#">In-Situ Determination of Emulsion Application Rate for Tack Coats and Surface Treatments</a>
	Virginia DOT	<a href="#">Continuous Friction Measurement Equipment As a Tool for Improving Crash Rate Prediction: A Pilot Study</a>
REGION 3	Illinois DOT	<a href="#">Testing Protocols to Ensure Performance of High Asphalt Binder Replacement Mixes Using RAP &amp; RAS</a>
	Iowa DOT	<a href="#">Development of Self-Cleaning Box Culvert Design: Phase II</a>
	Michigan DOT	<a href="#">Evaluation of Michigan's Engineering Improvements for Older Drivers</a>
	Minnesota DOT	<a href="#">Unmanned Aerial Vehicles Enable Safe and Cost-Effective Bridge Inspection</a>
REGION 4	California DOT	<a href="#">Research &amp; Development of Open-Source Advanced Traffic Management</a>
	New Mexico DOT	<a href="#">Optimization of Elastic Polymer Modification Rates Based on Contemporary Relative Costs vs. Benefits</a>
	Texas DOT	<a href="#">Assessment of the Effectiveness of Wrong Way Driving Countermeasures and Mitigation Methods</a>
	Wyoming DOT	<a href="#">Pronghorn and Mule Deer Use of Underpasses and Overpasses Along US Highway 191, Wyoming</a>

## Wrong-Way Driving Scan Tour in Texas

UDOT strives to be a leader in national efforts to improve roadway safety and continues to march forward toward its goal of Zero Fatalities. This holistic safety focus encompasses infrastructure improvements as well as non-infrastructure elements such as education and enforcement. Wrong-way driving (WWD) on limited access freeways has been a growing safety concern in Utah and across the US in recent years.

While Utah experiences lower rates of impaired driving (a leading contributing factor to WWD events) than its peer states, it still occurs frequently enough to merit attention from UDOT researchers and engineers. The severity of WWD crashes tends to be much higher than for other types of crashes because of the speeds involved and their propensity to yield head-on impacts. As a result, WWD crashes represent a disproportionate share of severe crashes relative to total crashes of that type. With this background in mind, UDOT embarked on an ongoing research project to study potential WWD countermeasures for deployment in Utah.



The objectives of this study are to:

- Research WWD countermeasures in use around the country
- Gather information from other roadway operators about their use of those devices
- Organize a scan tour for a group of UDOT employees to visit a few locations where the selected devices are being used
- Record activities and discussion points of the scan tour group
- Determine a subset of devices with the greatest potential for adaptation to Utah’s roadway environment
- Formulate a final report to document the study process and summarize the information gained from it

The activities mentioned in the first four bullets have been completed. UDOT is currently working to determine specific locations and devices for implementation, and the final report will be forthcoming in future months.

Discussions with other agencies highlighted many different types of countermeasures that have been deployed at freeway ramps across the US in an attempt to combat WWD. Examples include:

- Traffic Control Devices
  - Lowered DO NOT ENTER and WRONG WAY sign heights
  - WRONG WAY signs with bright LED flashers along the borders
  - Additional sets of WRONG WAY signs
  - Red reflective tape on sign posts
  - Raised reflective pavement markers
  - Directional pavement arrows
- Geometric Design
  - Road and ramp layout changes
  - Entrance/exit ramp offsets
  - Reductions to off-ramp throat width
- Intelligent Transportation Systems
  - WWD detection and notification
  - Activated in-pavement warning lights
  - Activated blank-out signs

Additionally, some agencies display alert messages on main-line overhead message boards to instruct “right way” drivers to exercise caution when a WWD event has been reported in the area. Each type of countermeasure comes with an associated set of pros and cons.

The technical advisory committee (TAC) associated with the WWD effort decided to visit two agencies in Texas based on conversations with roadway operators in multiple states. The agencies were the Harris County Toll Road Authority (HCTRA) and the San Antonio district office of the Texas Department of Transportation (TxDOT). The major factors in the decision to visit these agencies were a demonstrated willingness to host visitors, a history of WWD device deployment and testing, and geographic proximity that allowed for both visits to occur within the same week.

## Wrong-Way Driving Scan Tour in Texas (cont.)

The UDOT scan tour group was able to learn from both agencies' successes and challenges with particular products and procedures. Several overriding themes emerged from these visits. First, that maintenance of installed devices is a large consideration when determining which countermeasures to deploy. For example, HCTRA described how their efforts to use in-pavement LED lighting were hampered by maintenance headaches. The bulbs burned out much more quickly than the manufacturers had predicted and in order to replace them, shutting down the ramps temporarily was required. As a result, HCTRA no longer installs in-pavement lighting and instead has transitioned to other countermeasures that require less frequent maintenance and don't require ramp closures.

Another important theme was recognizing that most WWD events occur in a geographically random fashion throughout the roadway system. This truism has bearing on how to best approach decisions about device deployment. It would make sense to funnel greater resources into fewer locations if events were more aggregated. However, geographic randomization lends itself more to a wider dispersion of lower-cost mitigation measures system-wide.

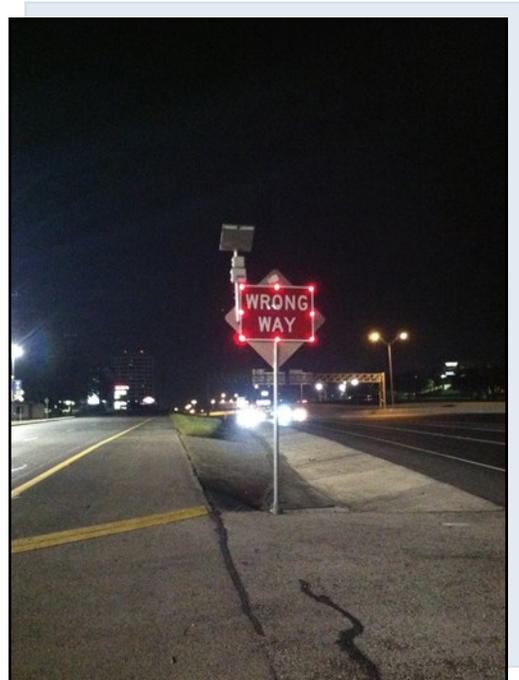
Both HCTRA and TxDOT implemented higher-cost detection systems in a few locations where WWD event clusters could be found, but for the most part their strategy has evolved toward the direction of blanketing more ramps with lower-cost measures such as additional sets of WRONG WAY signs, LED flashers around sign faces, and red retroreflective tape on sign poles. Their experience has shown that these low-cost measures are just as effective at mitigating WWD events as some of the more expensive treatments.

Several particular insights from the Texas scan tour related to low-cost measures are worth mentioning here:

- It may be easier and less expensive to equip LED flashing signs with solar power and run the flashers around the clock than to install ramp detection to activate the flashers only when an event triggers them. Right-way drivers do not see the flashers, so leaving them on all day and night has little or no impact on normal traffic flow. Also, round-the-clock operations make periodic inspection very easy because a maintenance person can see from the bottom of the ramp whether the flashers are working, whereas a detection system would require a closure for a maintenance vehicle to drive the wrong way up the ramp to verify that detection is working properly.
- HCTRA and TxDOT didn't seem to think that lowered sign heights had a measurable impact.

- HCTRA and TxDOT think the following two mitigation measures yield the best value:

- A series of two sets of WRONG WAY signs placed on the ramp (one on each side) – the first approximately 250' up from the ramp entrance and the second set another 250' further up the ramp, with the second set bordered by LED flashers
- Red retroreflective tape on the backside of sign poles (so that only those driving the wrong way will see the reflection)



UDOT is pushing ahead based on the knowledge gained in Texas. Plans are being formulated to deploy LED flashing signs and red retroreflective tape in the manner recommended by HCTRA and TxDOT at select interchange ramps later in 2016. The overall strategy is to install these low-cost mitigation measures on as many ramps as possible while leaving open the possibility of installing higher-level detection and notification systems in the future if particular WWD hotspots emerge.

For more information, contact Travis Jensen from WCEC Engineers at [tjensen@wcecengineers.com](mailto:tjensen@wcecengineers.com) or Tom Hales of UDOT's Research Division at [tahales@utah.gov](mailto:tahales@utah.gov).

## UDOT Staff Participation on National Committees

Employees of UDOT have multiple opportunities to participate in committees, projects, and other activities organized by the American Association of State Highway & Transportation Officials (AASHTO) and the Transportation Research Board (TRB). In an effort to inform UDOT employees, the Research Division has posted [a list on our website](#) showing those from UDOT who are currently on AASHTO and TRB committees and NCHRP project panels. We plan to update the list periodically. To update the list, the Research Division relies primarily on information available on the [AASHTO](#) and [TRB](#) websites, updates from the AASHTO membership database, and feedback from UDOT's members. In preparation for the recent updates to the UDOT list, the Research Division also conducted a survey of national committee members from UDOT about their experience with the committees.



By sharing the list of UDOT's memberships on national committees, the Research Division hopes to promote networking and collaboration within UDOT, with our transportation partners, and between committees for purposes of communicating research needs and sharing practical innovations. Some within UDOT may also benefit from contacting current members of committees to learn more about what it's like to be on a particular committee and how to get involved with a committee.

Approximately 69 UDOT employees currently participate as members on AASHTO and/or TRB committees. In the recent survey, 37 individuals responded regarding

their experience with the committees. Some of the questions and summaries of responses are given below:

### How has your participation on your committee been valuable to you and UDOT?

- Learn from other states and share expertise (collaboration, source of education and ideas)
- UDOT has a voice in national policy formation
- Establish professional connections with peers and national leaders (networking)
- Present UDOT in a positive way
- Keep up on newest technologies and developments

### How could UDOT better support your role on your committee?

- There is appreciation for travel allowed and recognition of the need for limitations
- There is also a desire for additional support for travel, allowing for more participation in committee meetings

### Please recommend any ways that UDOT could learn from your committee participation.

- Ideas brought back from committees are being implemented and shared within UDOT
- Involve more groups in UDOT in committee-sponsored webinars
- Hold internal peer exchanges to learn about committee happenings and how to get involved
- Committee members present in Leadership Team (or similar) meetings on a periodic basis
- Share committee news in UDOT newsletters and blog

We look forward to supporting UDOT's members on national committees and learning more from their experience in the coming months.

For more information on UDOT's involvement on national committees, see the links above or contact David Stevens ([davidstevens@utah.gov](mailto:davidstevens@utah.gov)) or Joni DeMille ([jdemille@utah.gov](mailto:jdemille@utah.gov)) of the Research Division.

## Research Calendar of Events

### RESEARCH FUNDING OPPORTUNITIES (click online to see the full document)

NCHRP Highway IDEA Proposals, DUE on September 1, 2016

2016 AASHTO Innovation Initiative Nominations, DUE on October 1, 2016

NCHRP FY 2018 Problem Statements, DUE on October 15, 2016



### WEBINARS (click online to see webinar details)

Title	Day/Date	Time
Visualization of Geotechnical Data for Hazard Mitigation and Disaster Response, a Practical Update (TRB)	Wednesday, July 20	12:00 PM -1:30 PM
Use of Geothermal Energy in Snow Melting and Deicing of Transportation Infrastructures (TRB)	Thursday, July 21	12:00 PM – 1:30 PM
Controlling Corrosion of Infrastructure Systems (TRB)	Thursday, August 4	12:00 AM – 1:30 PM
Volume Reduction of Highway Runoff in Urban Areas (TRB)	Wednesday, Aug 10	11:00 AM – 12:30 PM
Guidance on Developing Crash Modification Factors (TRB)	Thursday, Aug 11	12:00 PM – 1:30 PM
Development and Implementation of the Reflective Cracking Model in the Mechanistic-Empirical Pavement Design Guide (TRB)	Wednesday, Aug 17	12:00 PM – 1:30 PM
Moisture and Compaction Measurement during Unbound Aggregate Layer Construction (TRB)	Monday, Aug 22	11:00 AM – 12:30 PM
Concepts in Soil-Foundation-Bridge Structure Interaction (TRB)	Monday, Aug 29	12:00 PM – 1:30 PM
Measurement and Evaluation of Pavement Splash and Spray (TRB)	Wednesday, Aug 31	12:00 PM – 1:30 PM
<b>NON-ENGINEERING WEBINARS</b>		
Influence: Managing Up, Across, & Down	On Demand	On Demand
Develop Your Signature Voice	On Demand	On Demand
Communicating What Matters	On Demand	On Demand