Keeping Utah Moving

Research and Innovation

Responsive, Accessible, Relevant

Fall 2017

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A MESSAGE FROM THE RESEARCH DIRECTOR

By Cameron Kergaye, Ph.D., PMP, P.E.

Research and Innovation is **reaching out to our partners this fall to improve our program**. Research team members recently met with the leading universities in Utah to discuss new paths towards transportation research. Our next step is to bring academic researchers and consultant professionals to meet UDOT technical experts before year's end. The goal is to jointly propose more useful research at our next **UTRAC workshop on March 12, 2018**.

UDOT's Innovation Manager, Patrick Cowley, recently organized a one-day visit (July 20) to the Idaho Transportation Department to learn how they run their innovation program. ITD has received national quality awards for their ability to incentivize the implementation of new ideas or adopt proven practices from others. Patrick is working with an energetic team positioned throughout UDOT that will roll out a similar program across UDOT divisions and regions.

UDOT submitted two technical proposals last month for **AASHTO's Domestic Scan program**. Each year AASHTO requests proposals from state DOTs to promote their emerging innovations through site visits from professionals around the country. This year our Traffic Management Division and Structures Division submitted proposals: Automated Variable Speed Limit Systems and Hydro-demolition For Partial Depth Removal of Bridge Decks. The last time UDOT submitted a selected proposal was in 2012 from our Central Project Management Division entitled Advances in Transportation Agency Knowledge Management.

Nationally, Research and Innovation is the name of an AASHTO Special Committee that helps select transportation research projects for the National Academy of Engineering. UDOT is one of four western states to have a place on the committee which held a meeting in August to determine **faster ways to produce and implement new research**. Beginning next year, transportation professionals and researchers should notice a faster pace for NCHRP projects from selection to adoption.

Finally, Research and Innovation will moderate a **lightning session at the UDOT Annual Conference** to present eight research projects. This fast-paced session will be presented by students and will highlight eight recent research projects. Other UDOT research projects will also be presented in full-session format throughout the conference. Please attend to learn about the Department's successes.

UTRAC

2018 UTRAC RESEARCH WORKSHOP

SAVE THE DATE

The 2018 Research Workshop (UTRAC) will be held on Monday, March 12 at SLCC Miller Campus in Sandy, Utah. Problem statements will be due in early February. Watch for more details coming soon on UDOT's Research website.

UTRAC Problem Statement Solicitation Process Change

By Vincent Liu, P.E. and Patrick Cowley, P.E.

The UDOT Research and Innovation Division solicits research problem statements each year through the UTRAC research process. Through this process we are able to identify the most applicable and implementable research projects.

This year the UTRAC problem statement solicitation process has changed. We've added the provision that **all research problem statements must be submitted by a UDOT employee**. If a problem statement comes from outside the Department, the originator must identify a UDOT champion to submit the problem statement. If a problem statement is submitted by someone other than a UDOT employee, the research idea goes no further.

To aid in identifying Department needs and help identify champions, **a series of open meetings will be scheduled this fall** for each of the subject areas. The intent is to better communicate the research needs and direction of the Department and to build relationships with our research partners. After these open meetings, it is strongly suggested outside entities discuss UDOT's research needs in their area of research interest in a one-on-one meeting with the subject area. This will help to identify specific interests and opportunities of both UDOT and our research partners and identify which have a research solution.

Research problem statements are due in early February. The selection process will include the use of Decision Lens and the earlier submittal date will allow time for literature searches and input into Decision Lens. The UTRAC workshop is scheduled for March 12, 2017 and will allow for UDOT personnel and researchers to discuss the problem statements.

These changes are needed to enhance relationships, improve the quality and applicability of problem statements, and to help streamline the selection process.

For further information and problem statement forms, visit the UDOT Research website. Please contact Vincent Liu (vliu@utah.gov 801-910-2006) or Patrick Cowley (patrickcowley@utah.gov 801-648-5459) for additional information.

INNOVATION HIGHLIGHT

Every Day Counts 4 Pathfinder Initiative based on UDOT Weather Program Model

By Jeff Williams and Jason Richins, S.E.

Winter storms, high wind, severe thunderstorms, and dense fog—these conditions and others are now closely coordinated by a collaborative group known as the "Utah Weather Partners."

The UDOT Weather Program began collaborating with the National Weather Service (NWS) in 2007 in unifying its alerts to travelers. The program now involves the UDOT, WeatherNet, and the Weather Forecast Offices in Salt Lake City and Grand Junction, Colorado. During a road weather impact study, University of Utah was also included. The Utah Weather Partners works together to collect and coordinate information and then distributes a single, unified message to area travelers via multiple platforms.

The success of the group is illustrated in the handling of a winter storm that hit Salt Lake City on January 10, 2013, around 3:00 p.m. (2200 UTC). Heavy snow was forecast that day, and existing conditions (cold road surfaces and the rapidly cooling air temperatures) suggested heavy snow would accumulate on roadways during the evening commute, which would have a significant impact on driving conditions.

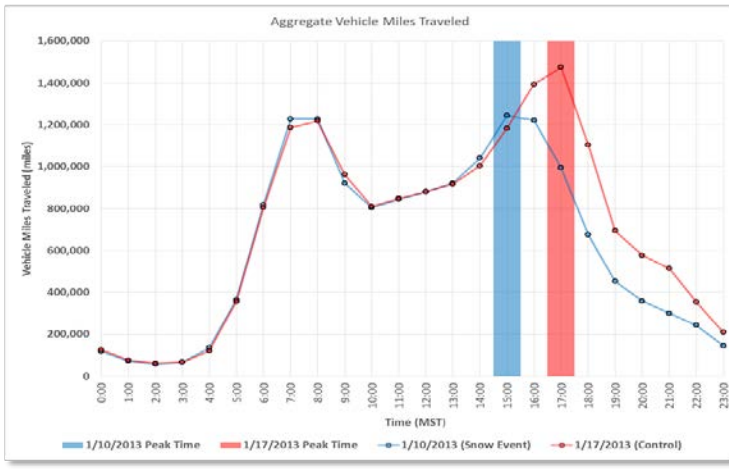
Utah Weather Partners got collaborative efforts underway three days prior to the storm in NWSChat, a messaging program used by NWS and its partners. A conference call was held on January 8th to discuss event timing, expected impacts, and affected areas. Coordination continued for the next two days.

On the morning of January 10th, this message was issued: "NWS, UDOT has decided to post VMS signs reading 'Winter Storm xxxx Time' These signs are currently indicating road impacts in Ogden at 3 p.m., SLC at 4 p.m., Provo/Utah County at 5 p.m. We are expecting the evening commute to be impacted significantly by this storm." This unified message was disseminated via UDOT's variable message signs, UDOT Road Weather Alerts, 511 service, the Salt Lake City Weather Forecast Office, Weather Story graphics, and social media.

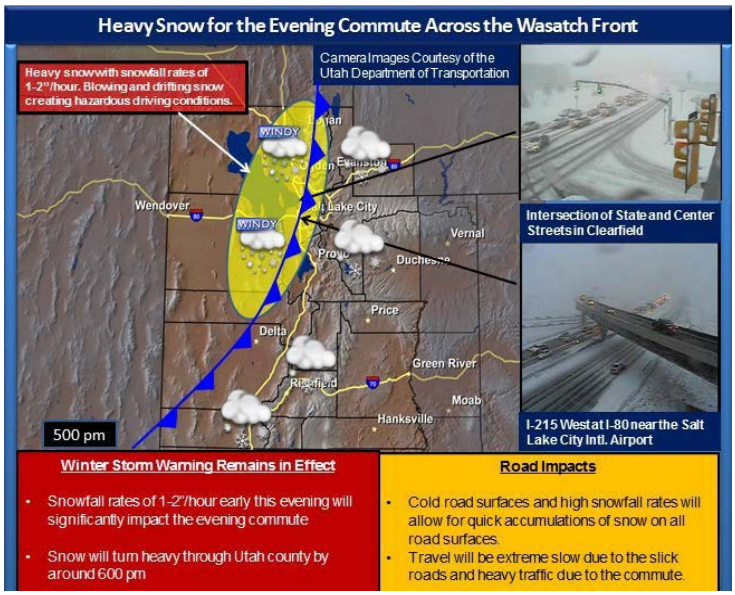
This storm occurred during a road weather impact study, which included (1) the weather information drivers possessed before and during the storm, (2) sources of weather and road information available to drivers, (3) changes in driver travel based on weather alerts, and (4) the severity of the storm's impacts.

The study revealed that 62% of respondents changed their schedules, 26% changed their routes, and 13% decided not to travel. Data obtained from the Performance Measurement System shows these results are fairly well supported.

The figure below shows that, according to the survey, the afternoon peak commute time shifted from a typical peak at 5 p.m. (red) to an actual peak at 3 p.m. (blue), with traffic volume at the typical peak commute period reduced by 43%.



The success of UDOT/Weathernet/NWS collaboration caught the attention of FHWA, which supported the effort as "Pathfinder." WYDOT was the next state DOT to test the Pathfinder collaboration effort. WYDOT has a challenging environment which includes five NWS offices and three private weather information providers. After two winter seasons, the effort was deemed successful by all participating entities. In 2016, FHWA chosen Pathfinder as an Every Day Counts 4 (EDC-4) national initiative. Jeff Williams, UDOT Weather Program Manager was chosen to be the subject matter expert. More than 17 states are in the process of adopting Pathfinder as a regular function of their operations. For more information contact Jeff at jeffwilliams@utah.gov and visit the EDC-4 website.



RESEARCH HIGHLIGHT

TR News Highlights Moving Research to Practice

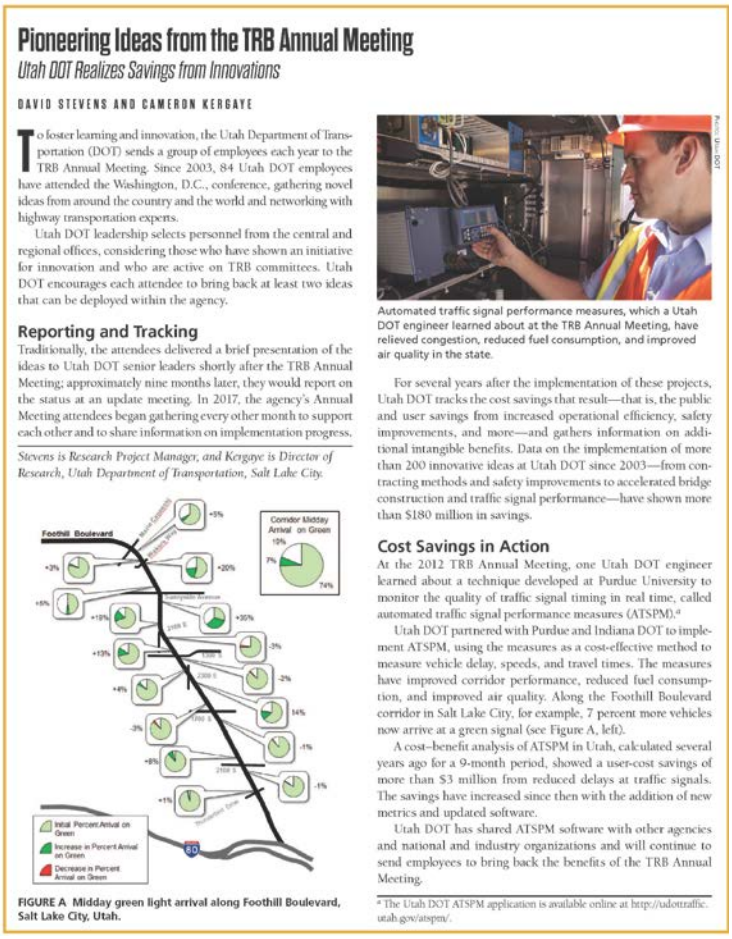
By David Stevens, P.E.

In TRB's recent *TR News* (July-August 2017), authors from several organizations have prepared articles relating to "Moving Research into Practice" and technology transfer successes. Many of the authors are members of the TRB Technology Transfer Committee. In this issue they shared their experiences and lessons learned about applying transportation research results to practical implementation. This issue offered many insights that can be very useful to UDOT and its research partners as they work together to implement research results in Utah.

Although the full electronic version of *TR News* is not yet available online, the UDOT Research and Innovation Division received a few printed copies of the issue, and these are available to borrow from the UDOT Lester Wire Library (contact Joni DeMille, jdemille@utah.gov). Many of the articles can also be viewed at the TRB Technology Transfer Committee website.

A sidebar article by David Stevens and Cameron Kergaye of UDOT Research in this issue is entitled "Pioneering Ideas from the TRB Annual Meeting: Utah DOT Realizes Savings from Innovations". An electronic version of this article is posted online on the UDOT Research website. In the article, David and Cameron describe UDOT's process for sending a few employees each year to the TRB Annual Meeting and encouraging them to gather innovative ideas and help implement when they return to Utah. Over the years many of these innovative ideas have been successfully implemented within UDOT and have resulted in significant cost savings to the public and UDOT.

One such innovation featured in the sidebar is the automated traffic signal performance measures (ATSPM) that Rob Clayton of UDOT Traffic Management learned about while attending the TRB Annual Meeting, which was subsequently adopted at UDOT with the help of Purdue University and Indiana DOT. Kudos goes to Rob and the Traffic Management Division for helping move this innovation from research into practice.



Pioneering Ideas from the TRB Annual Meeting

Utah DOT Realizes Savings from Innovations

DAVID STEVENS AND CAMERON KERGAYE

To foster learning and innovation, the Utah Department of Transportation (DOT) sends a group of employees each year to the TRB Annual Meeting. Since 2003, 84 Utah DOT employees have attended the Washington, D.C., conference, gathering novel ideas from around the country and the world and networking with highway transportation experts.

Utah DOT leadership selects personnel from the central and regional offices, considering those who have shown an initiative for innovation and who are active on TRB committees. Utah DOT encourages each attendee to bring back at least two ideas that can be deployed within the agency.

Reporting and Tracking

Traditionally, the attendees delivered a brief presentation of the ideas to Utah DOT senior leaders shortly after the TRB Annual Meeting; approximately nine months later, they would report on the status at an update meeting. In 2017, the agency's Annual Meeting attendees began gathering every other month to support each other and to share information on implementation progress.

Stevens is Research Project Manager, and Kergaye is Director of Research, Utah Department of Transportation, Salt Lake City.

FIGURE A Midday green light arrival along Foothill Boulevard, Salt Lake City, Utah.

Automated traffic signal performance measures, which a Utah DOT engineer learned about at the TRB Annual Meeting, have relieved congestion, reduced fuel consumption, and improved air quality in the state.

For several years after the implementation of these projects, Utah DOT tracks the cost savings that result—that is, the public and user savings from increased operational efficiency, safety improvements, and more—and gathers information on additional intangible benefits. Data on the implementation of more than 200 innovative ideas at Utah DOT since 2003—from contracting methods and safety improvements to accelerated bridge construction and traffic signal performance—have shown more than $180 million in savings.

Cost Savings in Action

At the 2012 TRB Annual Meeting, one Utah DOT engineer learned about a technique developed at Purdue University to monitor the quality of traffic signal timing in real time, called automated traffic signal performance measures (ATSPM).[a]

Utah DOT partnered with Purdue and Indiana DOT to implement ATSPM, using the measures as a cost-effective method to measure vehicle delay, speeds, and travel times. The measures have improved corridor performance, reduced fuel consumption, and improved air quality. Along the Foothill Boulevard corridor in Salt Lake City, for example, 7 percent more vehicles now arrive at a green signal (see Figure A, left).

A cost–benefit analysis of ATSPM in Utah, calculated several years ago for a 9-month period, showed a user-cost savings of more than $3 million from reduced delays at traffic signals. The savings have increased since then with the addition of new metrics and updated software.

Utah DOT has shared ATSPM software with other agencies and national and industry organizations and will continue to send employees to bring back the benefits of the TRB Annual Meeting.

[a] The Utah DOT ATSPM application is available online at http://udottraffic.utah.gov/atspm/.

RESEARCH HIGHLIGHT

Does Compact Development Increase or Reduce Traffic Congestion?

By Reid Ewing and Guang Tian

State departments of transportation and metropolitan planning organizations (MPOs) dole out billions of dollars annually for specific roadway construction projects to widen existing highways or build new corridors. And although billions of dollars have been spent on added capacity throughout the past few decades, each region in the country has experienced increased congestion over this period.

A study by the Texas Transportation Institute shows that for all but eight of the 101 urbanized areas in the sample, annual delay per commuter more than doubled between 1982 (the first year in the series) and 2014 (the last year in the series). For all but one urbanized area, annual delay per commuter increased by more than 40 percent over this same period.

For this reason and others, MPOs are increasingly resorting to land use scenario planning and land use strategies (through the local governments that comprise them) to create future growth patterns that are more compact than "trend" or "business as usual." In regional vision, scenario, and transportation plans, compact development mainly means developing a hierarchy of compact, mixed use, walkable, and transit-served centers, and using transportation investments to channel growth into these centers.

Take Portland, Oregon, for example. The Portland model has become the dominant regional planning paradigm in the United States, a paradigm that concentrates development in centers connected by high-quality transit. The Wasatch Choice for 2040 vision, and upcoming Wasatch Choice for 2050 plan, are local examples of this paradigm.

From years of research, it is known that compact development that is dense, diverse, well-designed, etc., produces fewer vehicle miles traveled (VMT) than sprawling development. But compact development also concentrates origins and destinations.

FOCUS: Traffic congestion

WHAT: Compact development relationship to traffic congestion

HOW: Measuring and relating variables

RESULTS: Developing in a more compact manner may help at the margin, but the greatest reduction in congestion appears to be achievable through expansion of surface streets and higher highway user fees.

So, does compact development increase or reduce congestion? It has yet to be determined, using credible urban form metrics and credible congestion data, what the net effect is of these countervailing forces on area-wide congestion.

Using compactness/sprawl metrics developed for the National Institutes of Health, and congestion data from the Texas Transportation Institute's Urban Mobility Scorecard Annual Report database, this study sought to determine which opposing point of view of sprawl and congestion is correct. It did so by (1) measuring compactness, congestion, and control variables using the best data available for US urbanized areas and (2) relating these variables to one another using multivariate methods to determine whether compactness is positively or negatively related to congestion.

This study and earlier studies by the same team suggest that an increase in compactness reduces the amount of driving people do, and also concentrates the driving in smaller areas, but the former effect is slightly greater than the latter. That is, congestion is slightly less severe in compact urbanized areas than in sprawling urbanized areas. Unfortunately, the relationship between compactness and congestion falls short of statistical significance at the 0.05 level. This analysis does not support the idea that sprawl acts as a "traffic safety valve," but it also does not support the reverse idea that compact development offers a one-stop solution to congestion. Developing in a more compact manner may help at the margin, but the greatest reduction in congestion appears to be achievable through expansion of surface streets and higher highway user fees.

These results have already been published in a top planning journal, *Cities* thanks to UTRAC funding.

For more information, contact Reid Ewing of the University of Utah at ewing@arch.utah.edu or Kevin Nichol in UDOT Research at knichol@utah.gov.

RESEARCH HIGHLIGHT

Utah Breaks New Ground with Connected Vehicles

By Blaine D. Leonard, P.E., F.ASCE

After participating in the Connected Vehicle Pooled Fund Study and the AASHTO Connected Vehicle Task Committee for more than a decade, UDOT began planning in late 2014 for the deployment of vehicle-to-infrastructure (V2I) systems. The goals of the initial deployment included (1) gaining hands-on experience with the procurement and installation of Dedicated Short Range Communication (DSRC) equipment, (2) deploying an application that could yield a tangible benefit to justify the cost of installation, and (3) building a connected vehicle corridor that could then be used for development, testing and implementation of other connected-vehicle applications, including those that will ultimately be installed in vehicles. After considering a number of applications, the Multi-Modal Intelligent Traffic Signal System (MMITSS) was deployed in partnership with the UTA to address schedule reliability of transit vehicles.

A segment of Redwood Road was selected as the connected-vehicle corridor for deployment of DSRC radios and the MMITSS smart transit signal priority system. This corridor is about 11 miles long with 35 signalized intersections, extending from 400 South Street to 8040 South Street. The red circles in the map below indicate the location of signalized intersections, 30 of which were chosen for installation of DSRC road-side radios by UDOT.

The DSRC on-board units were installed in several UTA buses, along with small Linux computers. These systems were connected to power and communication systems on the buses so that the bus schedule and occupancy can be queried by the MMITSS system.

When fully operational in mid-October, this will be the only operational version of MMITSS used in day-to-day operations of the UTA system, but it will also be one of the first (if not the very first) fully operational DSRC V2I deployments in the United States.

An evaluation of the system's effectiveness in improving schedule reliability of UTA buses along the corridor, and its impacts on other traffic, will be completed over the next few months.

In June 2017, members of the Connected Vehicle Pooled Fund Study from about 20 states and agencies came to see a demonstration of the MMITSS system. A UTA bus was outfitted with monitors that displayed telemetry from the bus and traffic signals. Participants were roundly impressed.

Systems such as V2I promise to transform transportation management and significantly reduce traffic crashes. UDOT's deployment of this connected vehicle corridor on Redwood Road represents a first significant step to the implementation of many safety and mobility applications using this technology, and is a model to the nation.

Additional details are included in a longer article by Blaine Leonard with the UDOT Traffic Management Division. For additional information on UDOT's deployment of connected vehicle technology, contact Blaine at bleonard@utah.gov.

FOCUS: Vehicle-to-infrastructure communication

WHAT: Can connected vehicle technology help improve schedule reliability of transit vehicles?

HOW: Communication and intelligent traffic signal systems using UTA buses on Redwood Road

PRODUCT: One of the first fully operational DSRC V2I deployments in the United States

RESEARCH HIGHLIGHT

Safety Forecast Models Calculate Future Safety Metrics

By Kordel Braley, PE, PTOE

One of several factors in prioritizing projects for the UDOT Long-Range Plan (LRP) is the UDOT Safety Index, which is based on historical crash data, including crash rates, severe crash rates, and crash rates and severe crash rates normalized by mile. The Safety Index provides metrics for historical trends, but it does not account for present and future conditions. UDOT has been developing more robust statistical models to address nuanced elements of crash prediction. However, these models currently consider only historical data to estimate current crashes. The new research described here seeks to identify a process to improve long-range planning prioritization by using forecasted safety metrics in place of the UDOT Safety Index.

The research team created a Safety Forecast Model using Highway Safety Manual (HSM) safety performance functions (SPFs) and crash modification factors (CMFs). The research team obtained existing roadway characteristics that served as inputs for the Safety Forecast Model from uPlan, which is UDOT's online data repository. The research team also collected condition data—such as forecast volumes and lanes—from the Utah State Travel Model (USTM), a travel demand forecasting model. Existing crash data (obtained from UDOT) helped the research team assess the base-year crash predictions of the Safety Forecast Model. The model was used to compare crashes predicted based on the current 2015–2040 UDOT LRP Build scenario to the No-Build scenario.

The figure below demonstrates how the predicted number of fatal/injury crashes changes for road segments with UDOT LRP projects. Most—but not all—segments would likely see a decrease.

A case study was also performed to evaluate several UDOT LRP projects to determine how project rankings were affected based on future forecasted safety. The research team determined, through a case study of 15 LRP widening projects, that the project prioritization ranking changes if the ranking considers future safety impacts rather than relying solely on historical crash data (see the graph below).

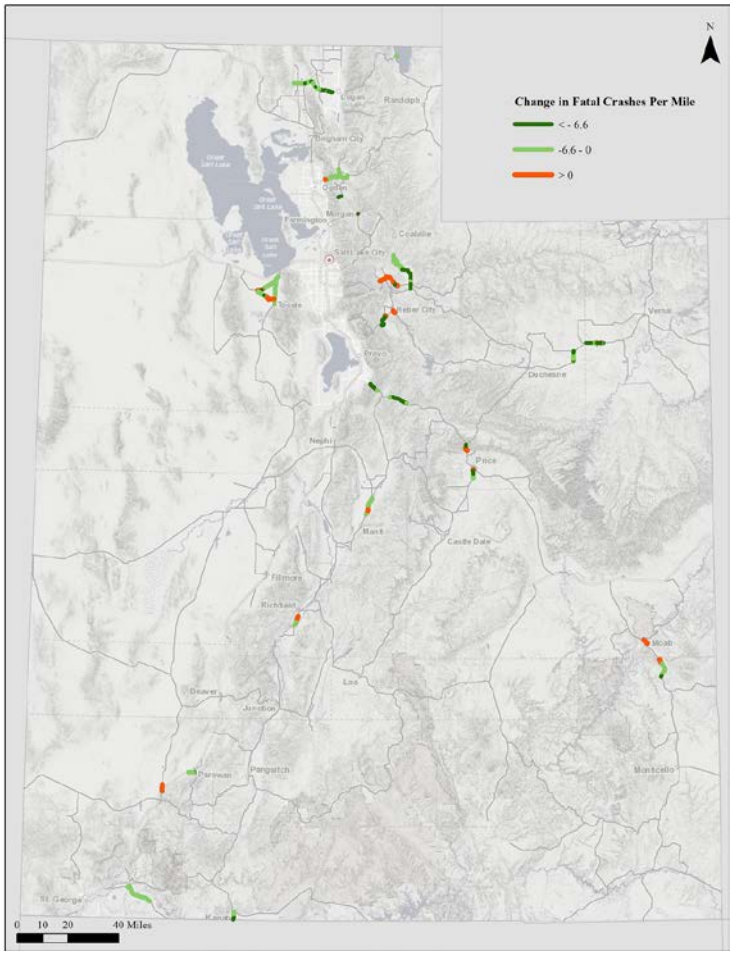
For more details, see the research report or contact Kevin Nichol (knichol@utah.gov) of the Research Division or Kordel Braley (Kordel.Braley@rsginc.com) of RSG. Data in this report are protected under 23 USC 409.

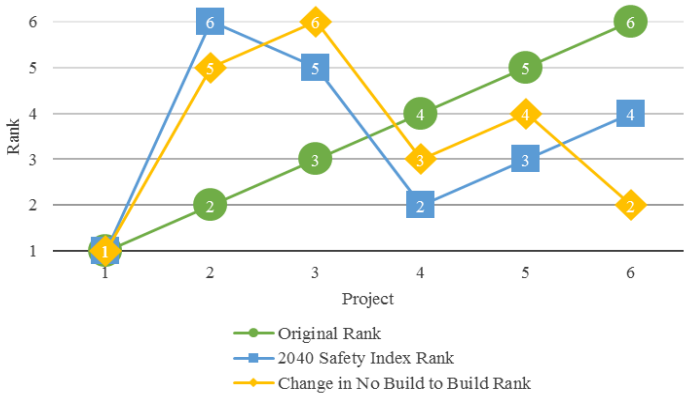
FOCUS: Safety

WHAT: Project prioritization

HOW: Forecasting future safety metrics

PRODUCT: Safety Forecast Model





RESEARCH HIGHLIGHT

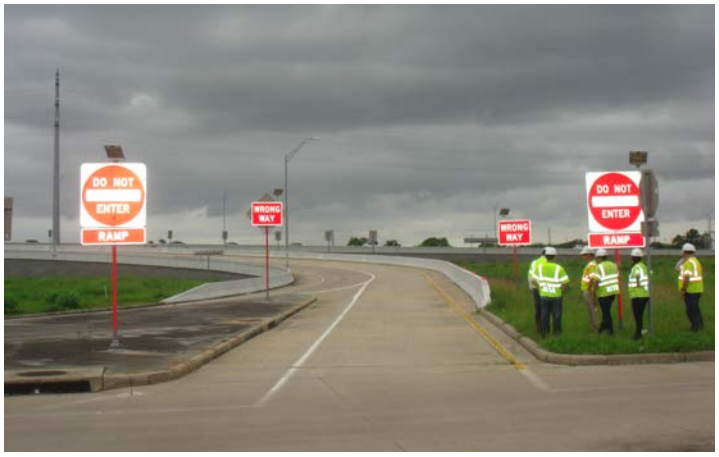
TAC Travels to Texas Seeking Right Ways to Mitigate Wrong-Way Driving

By Travis Jensen

Wrong-way driving (WWD) on freeways in Utah has been a growing safety concern in recent years. While Utah experiences lower rates of impaired driving (a leading contributing factor to WWD events) than other states, WWD still occurs frequently enough to merit attention from UDOT researchers and engineers. The severity of WWD crashes tends to be much higher than that of other types of crashes because of the speeds involved and the propensity for 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 a research project and scan tour to study WWD countermeasures that might be deployed in Utah. Staff members from key UDOT divisions and other partner agencies with an interest in WWD issues were included in the Technical Advisory Committee (TAC). Extensive literature searches had recently been published in Texas and Arizona, and these documents were used to identify potential countermeasure treatments such as those listed in the table below.

Traffic Control	ITS	Geometrics
Lowered Signing	Detection/Notification Systems	Roadway Layout Changes
LED-Enhanced Regulatory Signs	CCTV cameras	Entrance/Exit Ramp Offsets
Supplemental Sign Placards	In-Pavement Warning Lights	Off-Ramp Throat Reductions
Enhanced Static Signs	Blank Out Signs	Pavement Marking/Signing Modifications at Interchanges
Overhead Wrong-Way Signs	Right-Way Driver Warnings	
Reflective Tape on Sign Posts	IntelliDrive	
Raised Pavement Markers	Advanced In-Vehicle Technology	
Painted Arrows on Ramps		
Stop Bars at Exit Ramps		
Painted Islands		
Left Turn Pavement Marking Extensions		
Supplemental Flashers		



In May 2016 the TAC visited Houston and San Antonio in Texas. These cities were chosen because of their relatively extensive experience with WWD mitigation measures, the presence of both public and private road operators in the area, and the geographic proximity of the cities. Several themes emerged from these visits. First, the maintenance of installed devices is a major consideration when determining which countermeasures to deploy. Some agencies have transitioned from more complicated countermeasures to those 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 can determine how to best approach decisions about device deployment. For example, it might make sense to funnel greater resources into fewer locations if crashes were more aggregated, but geographic randomization lends itself more to a wider disperson of lower-cost mitigation measures systemwide.

The overarching recommendation brought back from Texas was to blanket potential WWD entry points systemically with low-cost treatments as an initial measure, and then to continue monitoring crash events thereafter to see if specific locations warrant more advanced treatments. Following the scan tour, the WWD TAC helped to develop a standard drawing that incorporates low-cost elements. This drawing was included in the 2017 standards as *SN 2C – Wrong Way Signing, Delineation, and Markings for Off-Ramps and Divided Highways*. It features a combination of solutions including pavement markings, LED flashers, and red retroreflective tape on sign poles in addition to the standard dual array of WRONG WAY and DO NOT ENTER signs. This drawing can be downloaded from the UDOT Standards webpage. UDOT is pushing ahead with plans to deploy the measures shown in Standard Drawing SN 2C at select interchange ramps.

The published report can be found here. For more information, contact Travis Jensen at travisljensen@utah.gov or Kevin Nichol at knichol@utah.gov.

NATIONAL INNOVATIONS

*Click on innovation titles for more information.

New Web Page Puts Information on State Innovations at Your Fingertips

Use the Center for Accelerating Innovation's new State Innovation Accomplishments map to explore how States are using proven innovations to enhance projects and improve the management of their transportation programs. Click on a State for details on Accelerated Innovation Deployment Demonstration and State Transportation Innovation Council (STIC) Incentive projects, innovation deployment examples from articles and reports, and STIC network contacts.

Nevada Quake Lab Tests New Bridge Design After Mexico Quake

In research funded by Caltrans, scientists at University of Nevada, Reno declared success after testing new bridge designs created to better withstand earthquake shaking and speed reconstruction damage after a quake. The testing involved new connector types between prefabricated bridge parts, using ultra-high performance concrete, and worked better than expected.

Major Heavy-Truck Maker Testing Platoons on Oregon, Nevada Highways

Daimler Trucks North America is testing the use of "digitally connected" trucks on some highways in Oregon and Nevada. In these tests the electronics allow the second truck to closely follow the lead vehicle, cutting fuel costs and increasing shipment efficiency. UDOT and the Utah trucking industry could learn from this testing. A similar test demonstration was conducted by Peloton Technology, in partnership with UDOT, in 2015.

Michigan DOT implements first all-wet reflective work zone standard in U.S.

Building on their experience with wet reflective optics in permanent pavement markings, Michigan DOT (MDOT) tested and developed a few products and implemented a new standard for all wet reflective work zones in the state in 2016. The guideline mandates the use of temporary wet reflective tape and paint in work zones, is the first of its kind in the country, and goes into full effect in 2017.

FUNDING OPPORTUNITIES

Month	Description	Day/Date	More Info
Multi-Year	**FHWA AID Demonstration Grant Program (under the FAST Act).** Applications started in September 2016.	2016-2020	Website
November	**Transit IDEA Proposals.** The Transit IDEA program, which is funded by the FTA as part of TRB's Transit Cooperative Research Program (TCRP), seeks proposals for innovations to improve the efficiency, safety, security, maintenance, and ridership of transit systems. Proposals are due to TCRP on November 1, 2017.	November 1, 2017	Website

Full 2017 Research Funding Calendar

WEBINARS

Topic	Event	Day/Date	Time	Join
Transportation Research Board Webinars				
Pavement	Long-Term Field Performance of Warm Mix Asphalt Pavements	Wednesday, October 25	12:00 PM – 1:30 PM	**Register**
Geotech	Geotech Tools: Information and Technology Guidance for Embankment, Ground Improvement and Pavement Applications	Thursday, November 2	12:00 PM – 1:30 PM	**Register**
Materials	Optimizing the Risk and Cost of Materials Quality Assurance	Monday, November 6	12:00 PM – 1:30 PM	**Register**
Roundabouts	Right-Sizing Roundabout Intersections for State Highways	Tuesday, November 7	12:00 PM – 1:30 PM	**Register**
Communication	Practical Techniques for Successfully Communicating Technical Topics	Thursday, November 9	12:00 PM – 1:30 PM	**Register**
Personal Development Webinars				
Leadership	Neuroscience of Trust: Setting Leaders Up for Success	On Demand	On Demand	**Register**
Change	Change Readiness	On Demand	On Demand	**Register**
Stress	Stress in the Workplace: Using Mind Over Matter to Become a Star Performer	On Demand	On Demand	**Register**

*Webinars are open to all interested employees. Register individually for TRB webinars. On-demand webinars may be viewed at your convenience. Contact Joni DeMille at jdemille@utah.gov with any questions.

Webinar Details