2013 Year in Review

Mountain-Plains Consortium Region 8

MPC
MOUNTAIN-PLAINS CONSORTIUM

Acknowledgements

The faculty, staff and students involved in the Mountain-Plains Consortium thank the USDOT, particularly the Research and Innovative Technology Administration for its continued support of the University Transportation Centers Program. This program has allowed us to address critical transportation infrastructure issues in the Upper Great Plains and Intermountain West through research and outreach programs. At the same time the support has allowed us to launch innovative education programs that are producing the next generation of transportation professionals. We also express our gratitude to the departments of transportation in the Mountain-Plains states of Colorado, North Dakota, South Dakota, Wyoming, and Utah. Much of our work would be impossible without their support and partnership.

Mountain-Plains Consortium
Upper Great Plains Transportation Institute
North Dakota State University
Dept. 2880 • P.O. Box 6050
Fargo, ND 58108-6050
T: (701) 231-7938 • F: (701) 231-7067
www.mountain-plains.org

Table of Contents

Director's Message

The recent national debate regarding rail shipments of Bakken crude oil is only a hint of the transportation challenges and opportunities facing the Mountain-Plains region. It's those very same challenges and opportunities that make this region such an exciting place to conduct research, education and outreach related to transportation.

In addition to the transportation challenges posed by a rapidly growing energy sector, we're seeing changes in agriculture, manufacturing and personal mobility needs as well. The need for new professionals, training for the existing workforce, and innovation in solving transportation challenges has never been greater and nowhere are they greater than in the Mountain-Plains region.

MPC faculty and staff have worked with a broad variety of stakeholders, including state and local transportation agencies, Native American agencies, businesses, associations, other universities and federal agencies to develop an impressive body of work focused the rural, intermodal, and small urban transportation challenges in the Upper Great Plains and Intermountain West. In the past year, nearly 40 projects were initiated to address safety, the transportation system's state of good repair, economic competitiveness, livable communities, and environmental sustainability.

MPC member universities share a commitment to students and transportation education. Our students put classroom lectures and discussion to work in laboratories and in the field. As a result of those learning experiences, our graduates are emerging as the professionals, researchers, teachers and policy makers who will shape the transportation systems of tomorrow. Member universities offered students more than 100 transportation and transportation-related courses ranging from advanced material testing to transportation systems security.

We've offered 112 training events for those working in the transportation industry. We want to help transportation agencies assure that their professionals work safely and use the most up-to-date materials, technology, and techniques.

This annual report provides a brief overview of the latest accomplishments of the Mountain-Plains Consortium. The work undertaken by MPC collaborators and students since the MPC was established in 1988 continues to enhance transportation in our region and across the nation. We are proud to continue that tradition.

Thank you for your interest in the MPC and its work. If you have any questions about our organization, please contact us.

Best Regards.

Denver Tolliver

MPC Successful in Transportation Center Competition

The Mountain-Plains Consortium will receive nearly $2.6 million from the USDOT's Research and Innovative Technology Administration to conduct research to enhance transportation in the Upper Great Plains and intermountain west.

The MPC was one of 35 successful applications among more than 145 proposals submitted. MPC's work under the grant will emphasize work aligned with USDOT's strategic goal of keeping transportation systems in a state of good repair. In particular, the work will focus on roads and other transportation systems that have been placed under unprecedented stress by an energy boom in the region. The funds are for the 2013 and 2014 fiscal years.

Critical areas of research will include:

- Increasing the reliability of life-cycle performance predictions used in infrastructure design, construction and management
- Improving the ability of transportation agencies to deliver projects that meet expectations for timeliness, quality and cost
- Reducing user delay attributable to infrastructure system performance, maintenance, rehabilitation and construction
- Improving highway condition and performance through increased use of design, materials, construction, and maintenance innovations,
- Studying vulnerabilities of the transportation system to seismic activities and extreme events and methods to reduce those vulnerabilities.

"MPC faculty effort and success is evident in the many innovations in transportation management, engineering, and operations developed in MPC projects that are being implemented across the region and nation," MPC director Denver Tolliver said. "We look forward to the continued expertise, collaboration and innovation that will result from this latest round of funding."

MPC at a Glance

The consortium

The Mountain-Plains Consortium is one of 12 regional university transportation centers within 10 regions sponsored by the U.S. Department of Transportation. MPC is a national resource and focal point for the support of research and training concerning the transportation infrastructure and the movement of passengers and freight. The program aims to attract the nation's best talent to the study of transportation and to develop new strategies and concepts to effectively address transportation issues. The consortium is a center of excellence for rural and intermodal transportation.

Members

Colorado State University is a land grant institution with an on-campus enrollment of more than 27,000 students. Primary transportation graduate education and outreach activities occur in the College of Engineering with related activities in other colleges such as Business, Health and Human Sciences. Transportation-related graduate courses are available in civil engineering, mechanical engineering, business, remote sensing, and construction management.

North Dakota State University is a land grant institution with an annual enrollment of 14,629 students. The MPC is administered by the Upper Great Plains Transportation Institute, which also administers several other related transportation research centers at NDSU. Educational programs coordinated by the UGPTI include a PhD degree program in transportation and logistics and master's degree programs in managerial logistics and transportation and urban systems. A certificate program is also offered in transportation and urban systems and transportation options are available for master's level students in civil engineering and agricultural and applied economics.

South Dakota State University is a land grant institution with an annual enrollment of 12,554 students. MPC-supporting programs include the Geographic Information Science Center of Excellence, which is a joint collaboration between SDSU and the U. S. Geological Survey's National Center for Earth Resources Observation and Sciences. SDSU houses the South Dakota Local Transportation Assistance Program—one of five technology transfer and outreach programs provided by the Engineering Resource Center. Moreover, the Civil and Environmental Engineering Department houses state-of-the-art laboratory facilities.

The **University of Colorado Denver** joins the strengths of a comprehensive campus in Denver with the health and medical programs at the Anschutz Medical Campus in Aurora to serve 17,729 students. UCD offers more than 130 degree programs through 13 schools and colleges. UCD's transportation emphasis is multidisciplinary, spanning departments in engineering, planning, public affairs, liberal arts and sciences, and health-related professions. The Transportation Research Center (TRC) addresses local, state, national, and international issues with funding from federal, state, local, and private sources. UCD is also home to the Active Communities Transportation (ACT) group that researches the integration of alternative transportation in healthier urban communities. Students and faculty investigate new methods and technologies for analyzing the performance and safety of transportation operations and designs, and also provide services to state and local agencies through seminars, committees, and special projects.

University of Denver, an independent university, has an enrollment of 5,087 undergraduate and 6,389 graduate students. The university has 11 colleges and schools and offers 12 baccalaureate degree programs, 19 master's degree programs, and 10 doctoral degree programs. The Intermodal Transportation Institute offers a master's degree in intermodal transportation, one of the few of its kind in the world. Approximately 25 students enroll in the program each year. The programs are supported by the Daniels College of Business with faculty in finance, marketing and logistics. In addition, the Korbel School of International Studies faculty, with expertise in international transportation and transportation security policy, are also involved in the program. Faculty and staff from urban planning and the GIS Laboratory contribute to courses and research efforts. Finally, the Center for Ethical Decision Making contributes to the training and education of leaders in the field of intermodal transportation management.

The **University of Utah** has an annual enrollment of 32,077 students. The department of Civil and Environmental Engineering has well-equipped laboratories specializing in transportation, structural, geotechnical, hydraulic, environmental, and materials engineering. The Utah Traffic Laboratory is connected by fiber optic cable to the Utah DOT Traffic Operations Center. The lab has a state-of-the-art multimedia video conferencing studio with delivery, recording, and hosting capabilities for teaching, training, and research collaboration. The lab boasts the first North American installation of VISUM Online, which is an intelligent platform for traffic management.

Utah State University is a land grant university located in Logan, Utah, with an enrollment of nearly 27,812. USU offers 168 undergraduate degree programs and 143 graduate degree programs. There are eight colleges in the university with the College of Engineering being the fourth largest. It is divided into six academic departments: biological, civil & environmental, electrical & computer, engineering & technology education, mechanical & aerospace, and the aviation program. The Department of Civil & Environmental Engineering houses the Utah Transportation Center, the Utah Water Research Laboratory, Structural Materials and Structural Health Laboratory and, the Transportation Infrastructure Management & Engineering Laboratory. The transportation program at Utah State University provides learning and research opportunities for students in public transportation, traffic, safety, and planning. In addition, USU operates the Utah Local Technical Assistance Program.

The **University of Wyoming** has an annual enrollment of approximately 13,800 students. The Department of Civil and Architectural Engineering provides a core of basic engineering courses for its undergraduates and allows them to specialize in any one or a combination of the following technical areas: structures, water resources, environmental engineering, geotechnical engineering, and transportation. The transportation program at the University of Wyoming provides learning opportunities for students in paving materials, traffic, safety, and planning. In addition, the WYDOT Material Certification Program and the Wyoming Local Technical Assistance Program are hosted at the University of Wyoming.

History

The Mountain-Plains Consortium was established in 1988 as a part of the University Transportation Centers Program. MPC was selected as the center for federal Region 8 in the initial competition held by USDOT. MPC won subsequent re-competitions under ISTEA, TEA-21, and SAFETEALU legislation. From 1988 through 2012, MPC produced a library of nearly 300 research reports while attracting new faculty to the field of transportation. MPC universities continued to teach most of their pre-existing transportation courses and exceeded the targeted maintenance of effort funding levels specified by USDOT. During this period, MPC funds were used to leverage funding from agencies such as state and local transportation departments, USDA, FTA, FRA, and the American Association of Railroads.

Management structure

The management structure of the Mountain-Plains Consortium involves three main components: the center director and administrative staff, eight university program directors, and the executive committee. In addition, the MPC Advisory Board and the TLN board and programming committee play important roles in program planning and implementation.

Center director

Dr. Denver Tolliver is the MPC program director. He is involved in planning and administrative activities at all levels and sites. Although the center director is an employee of the lead university, he represents all five institutions.

University program directors & executive committee

Each university in the consortium has a designated university program director to perform local oversight and management of activities at each university. The program directors are Dr. Rebecca Atadero, Colorado State University; Dr. Kimberly Vachal, North Dakota State University; Dr. Nadim Wehbe, South Dakota State University; Dr. Wesley Marshal, University of Colorado Denver; Dr. Patrick Sherry, University of Denver; Dr. Richard Porter, University of Utah; Dr. Kevin Heaslip, Utah State University; and Dr. Khaled Ksaibati, University of Wyoming.

The center director, the eight university program directors, and a USDOT liaison form a committee to oversee program planning and administrative functions for the grant period. The 10-member committee meets each year to monitor implementation strategies, collaborate with other centers in the region, and perform other planning and administrative functions. The executive committee has final responsibility for research project selection.

Transportation Learning Network (TLN)

The Transportation Learning Network uses technology to help people work together on transportation issues in the region. Each partner provides transportation programming, training, and technology transfer to the network. Efforts include technical training, transportation short courses, peer sessions, graduate-level classes, professional management and leadership courses and seminars. The eight MPC universities are partners in the network, which also includes four state transportation departments in Region 8: Montana, North Dakota, South Dakota, and Wyoming. The system carries interactive audio and video to conference rooms and classrooms at the respective sites. TLN enhances and improves the cost-effectiveness of the MPC by reducing travel costs and maximizing use of scarce faculty and administrative time. The TLN evolved from the TEL8 telecommunications network.

TLN board and programming committee

The state transportation departments in the region provide substantial input to the MPC director and executive committee regarding educational and research needs. Much of this interaction results from a close working relationship between the MPC executive committee and the TLN board of directors. The MPC executive director holds a position on the TLN executive board. The TLN program director attends the MPC board meeting to discuss and promote research presentations to the TLN audience. The TLN programming committee, which meets monthly, brings together representatives from the four state transportation departments and the MPC universities to plan a regional education and training program.

In addition, an advisory committee helps MPC directors identify key research needs within the region and develop a research program that addresses those needs. The committee plays a key role in setting the MPC's research agenda.

Accountability for decisions

Many key decisions and actions flow from committee meetings and other deliberations. However, the MPC executive committee retains decision-making responsibilities. All UTCP-funded activities conducted on the eight campuses are approved first by the executive committee. The center director ultimately is accountable for all decisions pertaining to UTCP activities and the use of UTCP funds.

Annual site visits

The center director and USDOT liaison visit each campus annually to meet with principal investigators and program managers on each campus and to gauge progress toward program goals and objectives. The director also holds video conferences as needed to evaluate progress and ensure that milestones are being met.

Regional coordination

The director communicates with directors of the other centers in Region 8 on a regular basis.

EDUCATION AND WORKFORCE DEVELOPMENT

Student Program Activities

MPC sponsors undergraduate scholarships at NDSU

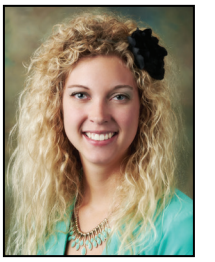
The MPC sponsored four scholarships presented by the Upper Great Plains Transportation Institute at its Annual Awards Banquet in October.

Jenna Klosterman, a senior in agricultural economics from Wyndmere, N.D., and Tiffany Swanson, a senior in agricultural economics and public relations and advertising from Norwood Young America, Minn., each received the $1,500 Paul E.R. Abrahamson Transportation Scholarship. The scholarship recognizes outstanding students at NDSU with an interest in the transportation and logistics of agricultural products.

Josh Phillips, a junior in civil engineering from Bloomington, Minn., and Faith Winings, a senior in civil engineering from Bismarck, N.D., each received the $1,500 Transportation Engineering Scholarship. The scholarship recognizes academic achievement and promotes the education of transportation students at NDSU.

The MPC provides funding for the Abrahamson and Transportation Engineering Scholarships.


Klosterman


Swanson


Phillips


Winings


Edwards

Jacqueline Edwards, a senior in civil engineering from Baudette, Minn., received the $2,000 Charles E. Herman Scholarship, which recognizes academic achievement and promotes education of transportation students with a preference to women and minorities at NDSU. The Charles E. Herman Scholarship Endowment Fund at the NDSU Development Foundation provides funding for the scholarship.

SDSU student named Region 8 Student of the Year


Ahrenstorff

SDSU student Brittney Ahrenstorff has been named Region 8 Student of the Year by the MPC in recognition of her academic and research accomplishments.

Ahrenstorff, of Lake Park, IA, earned her BS degree in civil engineering from SDSU in May 2012 and is expected to earn her MS degree from SDSU in the spring of 2014. Ahrenstorff's research focuses on measuring and evaluating ice loads on bridge piers in South Dakota. The main objective of the study is to calibrate the ice load equations given in AASHTO's LRFD Bridge Design Specifications to develop realistic estimates of the loads imposed by the ice formations found in South Dakota rivers. Based on her preliminary work, Ahrenstorff was invited to present her research in Seoul, South Korea, at the International Association of Bridge and Structural Engineering conference in September 2012.

Ahrenstorff graduated with a GPA of 3.83/4.00 in her BS degree and to date has maintained a 4.00 in her MS program. She received numerous honors, including memberships in Phi Kappa Phi national honor society, Chi Epsilon civil engineering honor society, Tau Beta Pi engineering honor society, and Phi Sigma Pi national honor society. She is also a member of the American Society of Civil Engineers and the National Society of Collegiate Scholars.

Student inducted into NDSU's Tapestry of Diverse Talents


Dharmadhikari

Nimish Dharmadhikari, PhD student in the NDSU Transportation and Logistics Program and graduate research assistant at NDSU's Upper Great Plains Transportation Institute, was inducted into the Tapestry of Diverse Talents at NDSU.

The Tapestry of Diverse Talents is a pictorial mosaic that recognizes NDSU students, staff, faculty, and alumni for the contributions and diversity they bring to the university. The program is designed to expand diversity on campus.

At NDSU, Dharmadhikari has participated in NDSU's International CORE program by volunteering to help new international students participate in Orientation Week, mentored new students in NDSU's summer intensive English learning program, and joined the Global Ambassador program in the Office of International Programs. He took part in the NDSU Memorial Union's Masters of Success leadership program and was also elected the 2011-2012 vice president of the Graduate Student Association and president the following year. As president, Dharmadhikari and the Graduate Student Association worked to expand graduate students' diversity programs. He later went on to organize a graduate research and arts forum to display research accomplishments of fellow graduate students.

USU wins regional ASCE student competition and heads to nationals

The USU ASCE Student Chapter won the overall competitions at the American Society of Civil Engineers Rocky Mountain Regional Student Conference April 4–6 at USU. For three consecutive years, USU has won the overall competition. For the third straight year, USU took first place in the concrete canoe competition. The win qualified USU for the national competition at the University of Illinois at Urbana-Champaign, Urbana, IL, where the team placed fifth. At the regional competition, they also placed second in the steel bridge competition. This year 213 teams from the United States, Canada, and Mexico competed in the student steel bridge competitions. USU was one of 49 teams that advanced to the national competition at the University of Washington May 31–June 1.

UC-Denver students receive honors

Rachael Bronson, an MS student at UC-Denver, was selected as a 2013 Eno Leadership Development Conference Fellow. She also won the Rocky Mountain Women in Defense scholarship, the CU-Denver ARCS Scholarship, the CU-Denver Shuman Scholarship, and the Association of Pedestrian and Bicycle Professionals (APBP) scholarship. At CU-Denver, Bronson served as secretary of the ITE student chapter and is a member of the ACT Research Group. She is engaged in research exploring how multi-modal transportation options make communities more resilient when faced with catastrophic events.

Kara Luckey, a PhD student at UC-Denver, was selected as a 2013 Eno Leadership Development Conference Fellow as well as a Dwight D. Eisenhower Fellow. She also won the Dr. Thomas D. Larson Fellowship in acknowledgement of her commitment to the pursuit of excellence in her doctoral studies. Her work is focused on the relationship between urban infrastructure, economic and community development, and social equity. She is studying neighborhood change processes, transportation and housing equity, and the public transit's role as a community and economic development tool.

NDSU transportation and logistics student to present paper at international conference


Agrawal

Ankush Agrawal, NDSU Transportation and Logistics PhD student, presented a research paper, "Developing Evaluation Tools for Achieving a Sustainable Concrete Design and Construction," at the 2013 International Conference on Construction and Real Estate Management Oct. 10-11 in Karlsruhe, Germany. The paper, which points out sustainable tools and methods that can be applied to the construction industry around the world, also appears in the conference proceedings. NDSU was one of the universities and organizations organizing the conference.

Students present research at American Concrete Institute convention

Graduate students from UC-Denver who are involved in MPC projects presented their research at the American Concrete Institute Convention in Minneapolis in April. Their talk was part of the special sessions titled "Advanced Materials and Sensors toward Smart Concrete Bridges: Concept, Performance, Evaluation, and Repair." Shahlaa AlWakeel, a PhD student, presented "Performance of Bridge Decks in a Cold Region and a High-Fidelity Sensing System for Damage Detection." Abdul Namrou, an MS student, presented "An Experimental Investigation into the Behavior of Concrete Elements Retrofitted with NSM Composite Strips at Elevated Temperatures." The presentations have been selected for a special publication of the ACI and the manuscripts submitted are currently under review.

Transportation and logistics student published in Journal of Industrial Engineering and Management


Kazemi

A paper written by NDSU transportation and logistics PhD student Yasaman Kazemi was recently published in the Journal of Industrial Engineering and Management. The paper, "Optimal Decisions and Comparison of VMI and CPFR Under Price-Sensitive Uncertain Demand," compares the performance of two advanced supply chain coordination mechanisms, vendor managed inventory and collaborative planning forecasting and replenishment, under a price-sensitive uncertain demand environment, and makes the optimal decisions on retail price and order quantity for both mechanisms. To view the article, go to http://www.jiem.org/index.php/jiem/article/view/559.

UC-Denver student wins ITE leadership award


Henao

Alejandro Henao, PhD student at UC-Denver, won the Institute of Transportation Engineers Colorado/Wyoming Executive Committee Leadership Award. The $750 award is designed to encourage students pursuing careers in transportation-related fields. Henao is conducting research focused on multi-modal transportation options, transportation economic resilience, and travel demand modeling. He is also interested in studying transportation and crowd movement for sport and major events such as the Olympic Games and FIFA Soccer World Cup, considering the long-term goals of the host cities. He currently serves as resident of the Institute of Transportation Engineers UC-Denver Student Chapter.

Utah Traffic Lab students present research

U of U students Ivana Tasic, Anusha Musunuru, Jeffrey Taylor, and Thanh Le presented their research at the Wasatch Choice for 2040 Consortium meeting Oct. 29, supported by faculty Richard J. Porter, Cathy Liu, Milan Zlatkovic, and Xuesong Zhou (now with ASU). The conference was organized and sponsored by the Wasatch Front Regional Conference to assemble state and national professionals in transportation planning, modeling, and engineering. A majority of the presented research was co-sponsored by MPC.

The Utah Traffic Lab research team also presented research co-sponsored by MPC at the Utah Department of Transportation (UDOT) Annual Conference Nov. 6. The team was represented by students Thanh Le, Ivana Tasic, Anusha Musunuru, and Kevin Croshaw, and faculty Richard J. Porter and Milan Zlatkovic. The presentations included topics in traffic operations, safety, modeling, pavement marking, and public transportation.

Transportation and Logistics PhD presents research

Fesseha Gebremikael, an NDSU transportation and logistics doctoral student, presented his research at the National Decision Science Institute (DSI) Annual Conference in Baltimore, MD, Nov. 16. His paper, "Decision Support Model for Managing Disruptive Influences in Global Supply Chain Operations: A Sensitivity Analysis Insight," will also be published in the referred DSI 2013 Proceedings. In the paper, Gebremikael identifies a proposed decision support model to examine the most important disruptive influences in a firm's food supply chain. Co-authors are Chris I. Enyinda, Canadian University of Dubai, UAE, and Khalid Backhar, California State University. Both are graduates of the NDSU PhD program in transportation and logistics.

U of U student chapter to host concrete symposium

The U of U American Concrete Institute Student Chapter will host its sixth annual Concrete Symposium with guest speakers from across the United States. The symposium will be Thursday, March 13, 2014, from 7:30 a.m. to 4 p.m. on campus. The theme will be "Is What You See, What You Get? Looking at Concrete Surfaces." Speakers will talk about surface defects, non-destructive testing of concrete, and new concrete innovations such as smog-eating concrete surfaces.

Association of Transportation and Logistics chapter visits Fargo Microsoft site

Members of the NDSU student chapter of the Association of Transportation and Logistics toured the Fargo location of Microsoft to learn more about the company's announced commitment to transform itself into a successful devices and services company. The students were particularly interested in changes being proposed and implemented to the company's supply chain structure and facility designs and to learn what role logistics plays in its operations. Students on the tour were able to visit each of the four buildings on the Fargo campus, the second-largest Microsoft facility in the world.

Civil materials students tour asphalt production plant

Students in the U of U civil engineering materials course toured the Beck Street JB Staker Parson's Aggregate Quarry and Asphalt Production Plant in October. The 60 students learned about the production process from monitoring pockets of mineral deposits to blasting, crushing, and sieving aggregates as well as the recycling, heating, mixing, and quality control testing done with asphalt concrete before arriving at a new pavement job construction site.

Transportation and logistics student presents poster at Engineering Research Summit

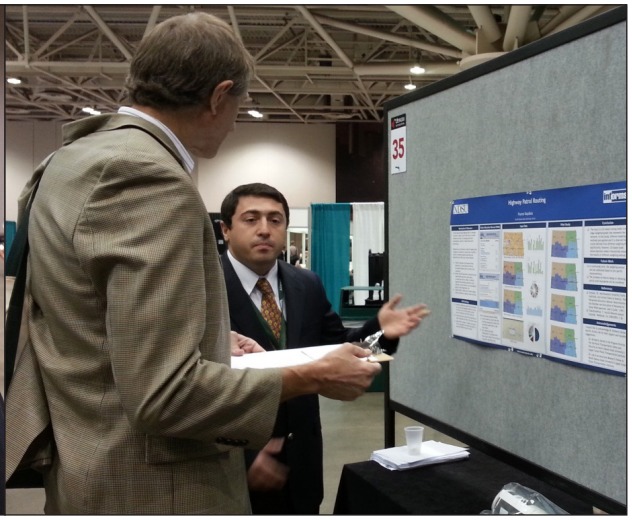
Yasaman Kazemi, PhD student in the NDSU Transportation and Logistics Program and graduate research assistant with NDSU's Upper Great Plains Transportation Institute, presented a poster titled "Application of GIS in Modeling the Supply Chain Network for Auto Industry in Midwest" at the North Dakota/South Dakota Engineering Research Summit at South Dakota State University April 23. Through her research, Yasaman developed a spatial interaction model for the auto industry in the Midwest based on minimum cost. She then integrated the model into a highway transportation network to predict the minimum flow from origins to destinations by choosing an optimal sequence of routes to minimize the total cost of the supply chain network. The poster presented the idea of utilizing GIS to model the supply chain using the real highway network.

Transportation and logistics doctoral students present research at ND GIS users conference

Several doctoral students from the NDSU Transportation and Logistics Program presented their research at the North Dakota GIS Users Conference in Grand Forks in September. The students were among the nearly 200 attendees representing higher education, utilities, businesses, local, state, and federal agencies, and other organizations.

Sumadhur Shakya presented "Impact of Disruptive Change in North American Supply Chain of Nitrogen Fertilizers." Shakya examined how changing cropping patterns and new domestic sources of natural gas may influence flows of fertilizer in the United States. Shakya is also a spatial transportation analyst with the Upper Great Plains Transportation Institute.

Sumadhur Shakya presenting.



Poyraz Kayabas presenting.

PhD student Nimish Dharmadhikari presented "Optimizing Sugar Beet Piling Center Locations Under Supply Variation." The objective of the research was to minimize transportation costs by identifying optimal locations for sugar beet piling locations. Kambiz Farahmand, professor of industrial and manufacturing engineering, was a co-author.

PhD student Poyraz Kayabas presented "An Analysis of Driver Residence Proximity to Crash Event." The results show that the majority of injury crashes occurred in close proximity to driver residence. However, there was evidence for differences in crash distance by driver categories. Kimberly Vachal, advanced research fellow at the Upper Great Plains Transportation Institute, was a co-author.

PhD student Zijian Zheng presented "Development of GIS Multimodal Capacity Model for a Northern Tier Freight Corridor." The research visualizes corridor capacity with highway and railway transportation in the region. Eunsu Lee, associate research fellow at the Upper Great Plains Transportation Institute, was a co-author.

PhD students Yasaman Kazemi and Chijioke Ifepe presented "Fixing Topological Errors in the North Dakota Road Network." The study investigates the approach and solutions to fix the topology errors in NDSU's current statewide road network model.

Additional PhD students attending the conference were Christopher DeHaan and Luke Holt. Holt is also a transportation research planning analyst with the Upper Great Plains Transportation Institute.

New courses offered at U of U


Bordelon

Amanda Bordelon, assistant professor of civil and environmental engineering at the U of U, introduced a new course offered in the fall of 2013. "Advanced Materials Testing" provides a hands-on opportunity for students to experience multiple-scale laboratory and field testing and evaluation techniques used for design and monitoring of civil engineering structures, pavements, and materials. Civil engineering graduate students are often asked to do consulting or assist in quality assurance projects that relate to existing infrastructure. This course offers students experience in recognizing and understanding the tools and resources available to them in order to perform evaluations and inspections on existing infrastructure. This course is scheduled to be re-offered the fall of 2014.

U of U assistant professor of civil and environmental engineering Richard Porter introduced a new course Fall 2013,"Statistical and Econometric Analysis." Students learn to apply various statistical and econometric analysis techniques to the analysis of data. Examples are drawn primarily from transportation, but the methods have broader applications to civil engineering, city and metropolitan planning, and beyond. A unique aspect of the course was the semester project, where students worked on any problem involving the statistical/econometric analysis of data using techniques covered in class and/or discussed with the instructor and shared their results through a research paper and in-class presentation. Topics ranged from the "Correlation between Precipitation and Stormwater Runoff Nitrogen Concentrations" to "Modeling Spatial Relationships between the Multimodal Access to Transportation and Traffic Safety Outcomes: Data from Chicago."

U of U senior Capstone design course featured in Deseret News

The Deseret News published an article about the student project presentation for a senior-level capstone class in civil engineering.

In the professional practice and design course, students studied dams, bridges, roadways, drinking water, and wastewater in Utah to develop current costs of infrastructure maintenance and improvements as well as 10-year and 20-year forecasts. Total needs anticipated in the next year totaled nearly $1 billion and nearly $18 billion over the next 20 years. Read the article at http://www.deseretnews.com/article/865583868/Student-study-18-billion-needed-for-Utah-infrastructure-maintenance-over-20-years.html.

Building information modeling facility opened at CSU

Following months of coordination, renovation, and technology installation and furniture selection, the new Mortenson Center for Virtual Design and Construction officially opened to students in the CSU Department of Construction Management with a ribbon cutting ceremony Sept. 11. The new space, housed in Guggenheim Hall, provides interactive equipment that allows students to work more effectively with Building Information Modeling technology. This facility will be used to integrate Building Information Modeling into the curriculum as well as to support research projects involving Building Information Modeling such as those funded by MPC.

High school summer camps Introduce students to engineering

Amanda Bordelon, U of U assistant professor of civil and environmental engineering, along with students Crystal Orantes and Jem Locquiao and department staff Luisa Rogers, hosted activities for two different summer camps in June 2013. The HI-GEAR (Girls Engineering Abilities Realized) camp, aimed at recruiting high-school-age females interested in engineering, focused on learning the effects of mixing procedures on materials performance and component dispersion through the use of gelatin and food. At the Exploring Engineering Camp, high school students were able to mix and test their own zombie-resistant fiber-reinforced concrete columns. The theme of the camp was "Lights, Cameras, Engineering: Engineering a Zombie Movie." Both camps were a huge success.

CSU internship highlights industry partnership

A tour of a new pedestrian bridge and bus box at Denver's Union Station marked the completion of a CSU-industry internship and research partnership.

Faculty members Caroline Clevenger and Mehmet Ozbek, along with graduate student Blaine Fanning, met with industry professional and CSU CM alumnus Sean Vonfeldt ('89) of Triunity Engineering & Management, Inc. / Regional Transportation District (RTD) to tour the station and the adjoining bus box project. The tour, led by John Harwell of RTD, consisted of accessing the pedestrian bridge over the new platforms that will be used by commuter rail and Amtrak trains, and then walking through the new 1,000-foot bus box. This meeting and tour was the final step in the successful industry internship and partnership in which Fanning took part to further his research on the MPC project entitled, "A Pilot Case Study to Evaluate the Potential Impact and Benefit of Adopting and Implementing Building Information Modeling on Bridge and Infrastructure Projects." Through this collaboration of industry and academia, Fanning worked for Triunity as a program support consultant intern while collecting the data necessary for the MPC research.

Recent graduates

Colorado State University

Alex Hesse completed his MS in May 2013. Hesse worked on MPC-394 Quantifying Uncertainty in Non-destructive Bridge Inspection Methods for use in Performance-Based Inspection.

Sherona Simpson graduated with her MS in the fall of 2013. Her thesis title is "A Framework for Assessing Transportation Sustainability Rating Systems for Implementation in U.S. State Departments of Transportation."

Matt Hardman earned his MS degree in civil and environmental engineering in 2013. His thesis focused on a study of the effects of earthquakes on bridges in combination with either traffic loads or scour of bridge piers. He is currently an entry-level structural engineer at the Denver office of engineering company Thornton Tomasettti.

Salem Abdalmaged earned his MS degree in civil and environmental engineering in 2013. His thesis was "Dynamic Analysis and Fatigue Assessment of Bridge Decks Subjected to Traffic and Corrosion Effects."

Thomas Wilson earned his MS in civil and environmental engineering in 2013. At CSU he worked on a Colorado DOT-funded project to investigate the effect of semi-rigid connections on the seismic performance of steel frames.

North Dakota State University

Brett Korporaal earned his MS degree from NDSU in transportation and urban systems in the spring of 2013. At NDSU, Korporaal was a graduate research assistant with the Small Urban and Rural Transit Center and earned first place in the student research paper competition for the 20th National Conference for Rural and Intercity Bus Transportation. He is from San Diego and earned his bachelor's degree in organizational management from Patten University, Oakland, CA. He has joined the transportation engineering and planning firm of Kittelson & Associates, Inc., as a transportation analyst in the firm's Oakland, CA, office. Korporaal had interned in the firm's Boise, ID, office.

Qing Liu earned her PhD in the fall of 2013. She has accepted a non-faculty position as a transportation economist with a university. Her dissertation is "Game Theory Approach to the Vertical Relationships for U.S. Containerized Imports."

William Lyons Jr. earned an MS from NDSU in transportation and urban systems in the summer of 2013. Lyons is the president and managing member of Fort Hill Infrastructure Services, LLC, an architect and engineering company he launched in 2008. Lyons holds a BS in electrical engineering from Norwich University as well as a J.D. from Suffolk University Law School. Additionally, Lyons holds an associate's degree in applied science in intelligence operations from Cochise College and is a graduate of both the U.S. Army Command & General Staff College and Department of Defense Joint Forces Staff College. He is a licensed professional engineer in nine states, and a licensed planner in New Jersey, and has worked in the transportation field for nearly 20 years. His career includes time spent with the Commonwealth of Massachusetts Department of Transportation; he also served as the director of Traffic & Parking for the City of Somerville, MA. He was recently promoted to colonel in the U.S. Army Reserves. He also assumed command of the 2500th Military Intelligence Group in Jacksonville, Fla. He is a 24-year veteran and has deployed to Kuwait, Bosnia, and Iraq.

Nam Nguyen earned his master of managerial logistics degree at the end of 2013 and returned to Vietnam where he will work in the transportation industry.

Chip Nsereko earned his master of managerial logistics degree at the end of 2013 and is seeking a position in the transportation industry.

Yong Shin Park earned a master of managerial logistics at NDSU in summer of 2013. He also holds a BS in industrial engineering from NDSU. A native of South Korea, Park is interested in logistical planning and the economic effect of integrating the railroad and highway systems of North Korea and South Korea. Park is now working on his PhD in transportation and logistics at NDSU.

University of Colorado Denver

Dan Piatkowski graduated with his PhD in design and planning in the fall of 2013 from the University of Colorado Denver. His dissertation is "Identifying Impacts of Interventions Aimed at Promoting Walking and Cycling: Directions for Increasing Non-motorized Transportation in U.S. Cities."

Utah State University

Derek Freckleton graduated with his MS in the fall of 2012. His thesis topic was in Automation. He is currently employed by Booz, Allen, & Hamilton in Washington DC.

Devin Squire graduated with his MS in the fall of 2012. His thesis was on Asset Management. He is currently employed by Horrocks Engineers in Pleasant Grove, UT.

Sunil Pant graduated with his MS in the fall of 2012. His thesis topic was in Transportation Resiliency. Sunil is currently employed at the Ministry of Physical Infrastructure and Transport, in Kathmandu, Nepal.

Wesley Boggs graduated with his MS in the fall of 2012. His thesis topic was Sign Management Systems. Mr. Boggs is currently employed at Felsburg, Holt, and Ullevig, in Colorado Springs, CO.

James Fishelson graduated with his MS in the fall of 2012. His research topic was Automated Electric Transportation. James Fishelson is currently pursuing his PhD at the University of Michigan in Ann Arbor, MI.

University of Wyoming

Debbie Shinstine earned a PhD in civil engineering from UW in the spring of 2014. She holds a BS in civil engineering at the University of Wyoming and an MS in civil engineering from the University of Arizona. In her research at U of A, Shinstine developed a method for identifying high risk crash locations on the Indian reservation roads to help tribes improve the safety of their roadways. This method has been successfully implemented on the Wind River Indian Reservation. This work included crash data analysis, incorporating logistic statistical modeling of crash severity, and implementation of livability and sustainability measures. Shinstine will be performing post-doctoral research to advance the implementation on reservations throughout the Mountain Plains region. She has 25 years of professional experience in civil engineering both in private practice and public service with a PE in three states. Prior to returning to the university to pursue her PhD, she worked for the Virginia Department of Transportation managing maintenance, construction, and land use. Shinstine is originally from Cheyenne, WY.

New students

Colorado State University

Blaine Fanning is an MS student in the Department of Construction Management. He received a BS in landscape architecture from CSU. His current research focuses on the benefits and impacts of building information modeling on transportation infrastructure. Last summer he completed an internship for the Regional Transportation District, the regional public transit authority, in Denver. He provided the RTD with a building information modeling implementation plan to address its infrastructure assets. With his experience gained from working on the MPC-funded study, he hopes to help the transportation infrastructure industry pursue a new way of managing and maintaining its assets.

Xiaxiang Ma is a PhD student in civil and environmental engineering. He is working as a research assistant with professor Suren Chen in a project to develop improved state-wide traffic risk prediction models for state highways. Ma earned an MS in roadway and railway engineering and a BS in transportation engineering from Tongji University in Shanghai, China.

Paula Miller is pursuing a master's degree in civil engineering with an emphasis in structural engineering. She is working as both a graduate teaching and research assistant for the Department of Civil and Environmental Engineering. Under the direction of Dr. Hussam Mahmoud, Miller is conducting research on the degradation of bridge superstructures caused

by fatigue loadings induced by traffic patterns and seismic activity. Her thesis, "Numerical Simulation of Fatigue Failure of Bridge Girders Due to Out-of-Plane Distortion Effects," describes efforts to monitor fatigue crack growth in fatigue-sensitive connections to develop predictive techniques to aid in bridge rehabilitation efforts. Paula received her BS in civil and environmental engineering in May 2012 from CSU.

Mohammad Reza Hassanzadeh Gorakhki earned his BS in civil engineering from Azad University of Mashhad, Iran, in June 2012. He began his graduate studies in civil and environmental engineering in January 2013 and will focus on geotechnical engineering. He is working with Dr. Christopher Bareither on evaluating the feasibility of creating a sustainable transportation-earthwork geomaterial from mixtures of mine waste and fly ash.

Tyler Sobieck is an MS student studying structural engineering. He is a graduate research assistant performing work on MPC-410 "Predicting fatigue service life extension of RC bridges with externally bonded CFRP repairs" with Dr. Rebecca Atadero and Dr. Hussam Mahmoud. Sobieck graduated from CSU in May 2012 with his BS in civil and environmental engineering after completing two years at the Colorado School of Mines.

North Dakota State University

John Brown, MML, Fall 2013.

Jaesung Choi received his BA degree in economics, French language, and literature at Chungnam National University in South Korea. He went on and earned his graduate certificate in economics at Chungnam. While at NDSU, Choi earned his MS in agribusiness and applied economics. He is a PhD student in transportation and logistics. Choi is from Daejeon, Korea, and is conducting research in marine transportation and water resource economics. He plans to pursue a career as a university professor.

Vu Dang earned his BS degree in civil engineering and master's degree in transportation and urban systems at NDSU. He has conducted research in transportation planning, GIS applications in traffic forecasting, and in traffic and transportation engineering. He is currently a PhD student in transportation and logistics. Dang was named to the dean's list in 2008 and 2009 and was the project manager for a cooperative project with KLJ Engineering in a graduate course on transportation planning and environmental compliance. In 2012 he received 4th place on his student paper for the 2012 URISA GIS-Pro Conference.

Michael Defrancia, a support employee with the U.S. Department of Justice, is a student in the transportation and urban systems graduate certificate program. He earned his BA in geography at California State University of Northridge. After earning his certificate, Defrancia plans to earn a master's in transportation planning and ultimately become a transportation planner, specifically within a public transportation agency that administers a light rail or subway system.

James Fuller, a native of Columbia, SC, is pursuing his certificate in transportation and logistics. He earned a BS in civil engineering and transportation from Clemson University. During his childhood, Fuller's family took frequent road trips and from then on he knew he wanted a career in transportation. Fuller hopes to advance in his career from working at the state level to working for the federal government in the transportation field.

Fesseha Gebremikael of Huntsville, AL, is currently pursuing his PhD in transportation and logistics. Previously he attended Kiev State University and earned a Master of Laws degree in international law. He earned a master's degree from Alabama Agricultural/ Mechanical University in master planning/ international economic development. Gebremikael was awarded the Faculty Fellowship Award in 2008 and 2009, Best Paper Award in 2010 for Best Paper in the Supply Chain Management Track, and was the award recipient for Provost's Circle Designation in 2011. He plans to continue teaching and conducting research.

Muhammad Aslaam Mohamed Abdul Ghani (Nick), who is originally from Malaysia, earned his advanced diploma in logistics at the Chartered Institute of Logistics and Transport. He earned his MS in transportation planning at Universiti Teknologi Malaysia. Currently he is pursuing his PhD in transportation and logistics. His research interests focus on the use of logistics and supply chain systems to transport goods and passengers using water transportation. Nick plans to be a researcher in transportation and logistics.

Qianli He attended Tianjin Polytechnic University in his hometown of Tianjin, China, where he earned his bachelor's degree. He continued at Southern Methodist University in Dallas, TX, where he received his master's degree. Currently, he is a PhD student in logistics and supply chain management. Qianli's research has focused on both strategic and practical supply chain management. He plans to research strategic supply chain management, combining the business and operations aspects.

Syeda Hina, originally from Abbottabad, Pakistan, is pursuing her PhD in transportation and logistics. Previously she attended the University of Peshawar where she received her bachelor's degree in business administration with honors. Then Hina earned her MBA at the University of Liverpool in the UK. She plans to develop the quantitative and conceptual skills in analyzing business issues that will prepare her for a successful career in academia in the fields of administration and management. Once she completes the NDSU program she plans to go back to Pakistan and resume her teaching job at COMSATS.

Gina Hough is from Fargo, ND, and earned her BA in accounting and business administration at Jamestown College. She earned her MBA from NDSU and is a master's student in managerial logistics. Hough has been working at Microsoft as an accountant for the past 10 years. She plans to continue her career at Microsoft in that company's logistics functions.

Adam Hufnagel, MTUS, Fall 2013.

Mudoh Mbah of Laurel, MD, is enrolled in the transportation and urban systems graduate certificate program. Previously, he earned a bachelor's degree in geography from the University of Buea in South West Cameroon. He earned his master's degree in build environment, specializing in spatial planning, from the KTH Royal Institute of Technology in Stockholm, Sweden. Mbah also pursued a degree in electronic engineering technology at Prince George's Community College in Kettering, MD. Mbah's research consists of a case study of water quality standards in relation to the ICC road project in Maryland. He has also examined incidences of non-compliance or relaxation of environmental policies in transportation projects. Mbah plans to become a researcher and a professional transportation planner.

Bryan McCoy of Shelbyville, TN, is a student in the PhD program in transportation and logistics. Previously McCoy received his AAS in emergency medical technology at Columbia State Community College and his BS in public administration from Middle Tennessee State University. McCoy also earned an MS in public administration from the University of North Dakota. While attending UND, he was an intern with the Grand Forks Metropolitan Planning Organization, prompting his interest in transportation. McCoy plans to work with an independent research organization or operate a public transit system.

Richard Mendenhall, a native of Hazel, SD, is an MS student in managerial logistics. He earned his BS degree in economics at SDSU. Mendenhall is a Major AR in the United States Army. He became interested in logistics from his experience as a squadron logistics officer and from working 6 Sigma at Caterpillar Inc. His research interests include army personnel force reduction planning. Mendenhall hopes to serve as a combined arms battalion operations officer and executive officer.

Steve Segerlin of Washington, DC, is a master's student in transportation and urban systems. He earned a BS in construction engineering and management as well as an MBA from Auburn University in Auburn, AL. He hopes to someday lead urban master planning projects for cities undergoing rapid urbanization and economic growth. He plans to obtain a position as a project manager for urban infrastructure programs.

Yong Shin Park received his BS in industrial engineering and his masters of managerial logistics at NDSU and is currently a PhD student in transportation and logistics. Park grew up in Mokpo, South Korea. His research interest is carbon efficient supply chain networks. He is also a graduate research assistant for the Upper Great Plains Transportation Institute. He plans to become a researcher for the South Korea government and establish a consulting company.

Hamad Al Qublan is pursuing a PhD in supply chain management and logistics. He is from Saudi Arabia and earned his BS in clinical laboratory sciences at King Saud University in Riyadh, Saudi Arabia. While in Riyadh, he was awarded the internship best trainee honor for the department of pathology and laboratory medicine. He went on and received his MBA in global business & marketing at the University of Dallas. Al Qublan plans to teach, continue researching, complete consultations at local and international companies, and fund and manage his own import/ export company specializing in medical supplies.

Raghavan Srinivasan is a PhD student in the transportation and logistics program. Originally from Navi Mumbai, India, Srinivasan attended the University of Mumbai where he earned a bachelor's degree in mechanical engineering in 2006. He earned a master's degree in industrial engineering and management in May 2011. While earning his master's degree, Srinivasan worked as a research associate within the Department of Industrial and Manufacturing Engineering. He also worked as a teaching assistant for total quality management and workstation design courses at NDSU. In 2010 Srinivasan was a member of the executive council and student affairs committee for the NDSU Graduate Student Association. Srinivasan's research focuses on sustainable supply chain systems. He plans to work within the transportation and supply chain industry developing sustainable systems.

Robert Swearingen is a PhD student in transportation and logistics. He earned his bachelor's degree in liberal studies at Excelsior College in Albany, NY. He earned a master's degree in managerial logistics from NDSU in 2012. Swearingen's research interests include supply chain processes, policies and operations with change management and implementation, and analysis and improvement within logical enterprises. Swearingen is an active duty officer in the U.S. Army with more than 24 years of service. He has been awarded two bronze stars for distinguished combat service, six Army Commendation Medals for outstanding performance, and four Army Achievement Medals for excellence in mission accomplishment. Swearingen also graduated with honors from the Transportation Officers Basic Course and received superior achievements in the Combined Logistics Captains Career Course. He plans to earn his PhD from the program and apply his education in the private sector by doing research, consulting, and teaching or completing research at a university.

Robert Wetmore is earning his certificate in transportation and urban systems. He received his bachelor of architecture at Syracuse University and then earned his master of regional planning at the University of Albany. Wetmore's fields of focus are in public transportation, mass and rail transit, passenger rail, and streetcars. His career goal is to become the director of transportation planning for a major transit provider or a transportation agency.

Fang Xu, who is originally from Wuhan, China, is an MS student in managerial logistics. He attended Hubei Normal University in Huangshi, Hubei, and earned his BS in economics. Xu has studied logistics systems, transportation systems security, and transportation planning and environmental compliance. Once Xu completes his master's degree, he plans to move back to China and pursue his career there.

Fangzheng Yuan, (Johnny), from Jiangxi, China, is pursuing a master's degree in transportation and urban systems. He earned his bachelor's degree in aircraft design at Nanchang University and another bachelor's degree in manufacturing engineering from NDSU. Yuan is studying GIS modeling, network analysis, pavement design, and gravel road modeling. In 2010 and 2011, Yuan was named to the dean's list. He plans to become more familiar with GIS modeling and network analysis and hopes to gain a better understanding and knowledge about pavement design and gravel road modeling.

Sardar Muhammad Zahid is a PhD student researching risk management and optimization in operations and supply chain. He attended Hazara University in Manshera, Pakistan, where he earned his BS in math and computer science. Then he attended the COMSATS Institute of Information Technology in his hometown of Abbottabad, Pakistan, where he earned his MBA. Zahid received his MS in philosophy from the Government College University in Lahore, Pakistan.

Zijian Zheng is pursuing his PhD in transportation and urban systems. He is from China and attended Hefei University of Technology in Hefei Anhui Province where he received his bachelor's degree in 2011. Zheng's previous research has focused on highway planning, transportation planning, and traffic engineering. He was awarded second place at the Urban and Region Information System Association's GIS-Pro in 2012. He plans to further his education in transportation planning.

South Dakota State University

Michael Konrad, a native of Tripp, SD is a graduate research assistant in the Department of Civil & Environmental Engineering. He began his undergraduate studies in 2009 and graduated with a BS in civil and environmental engineering in May of 2013. The focus of his research, which is co-funded by MPC and the South Dakota Department of Transportation, is the evaluation and mitigation of longitudinal joint degradation and performance for adjacent prestressed double tee bridge girders. Konrad has gained engineering experience while working for GeoTek Engineering and Testing Services in Sioux Falls, SD, during the summers of 2011-2013. He anticipates earning his MS in civil engineering in December 2014.

Walker Olson, a native of Trimont, MN, is a graduate research assistant. He has gained engineering experience through a summer jobs with internship with Behlen Building Systems in Columbus, NE, and Daktronics in Brookings, SD. Olson graduated from SDSU in May of 2013 with a BS in civil and environmental engineering. His current research project is to develop tolerances for placement of tie bars in Portland cement concrete (PCC) pavements. The project, which is co-sponsored by MPC and the South Dakota DOT, involves testing pavement slab specimens containing tie bars with various misalignment conditions, such as longitudinal translation, vertical translation, horizontal tilt, and vertical tilt. Olson anticipates earning his MS in civil engineering in December of 2014.

Micah Underberg is a native of Sioux Falls, SD, and. He began attending SDSU in 2009 and received a BS in civil and environmental engineering in May of 2013. Underberg began graduate school in the fall of 2013 and plans to complete his MS in civil engineering by December of 2014. He gained engineering experience while working for HDR Engineering in Sioux Falls, during the summers of 2012-2013. He is currently working on a research project co-funded by MPC and SDDOT that investigates fiber-reinforced concrete (FRC) in structural bridge components.

University of Utah

Raja Nikesh Reddy Cholleti is an MS student who joined Dr. Bordelon's materials group in the fall of 2013. He earned his BS in civil engineering with an emphasis on structural engineering at the Jawaharlal Nehru Technical University in India in 2012. Cholleti is working on crushing waste glass down to a fine powder to determine if it can be used to improve concrete durability for use in structures and pavements.

Danielle Peskin is an MS student who joined Dr. Bordelon's materials group in the fall of 2013. She received her BS in civil engineering at Pennsylvania State University in May 2013. She will be working on characterizing dispersion and clumping of fibers in concrete for pavement applications.

Min Ook Kim is a PhD student who is working in Dr. Bordelon's group. He received his BS from Okayama University in Japan in 2005 and MS from Kyoto University in Japan in 2007. Kim is doing a MPC funded project to investigate the effect of fibers on the bonding performance of concrete overlay pavements.

M. Scott Shea joined the Utah Traffic Lab as a PhD student in the fall of 2013. Shea, a registered professional engineer in Texas, graduated with MS and BS degrees from Brigham Young University. Prior to returning to graduate school, he worked for a traffic modeling consultant in Salt Lake City, Avenue Consultants. As a traffic engineer, Shea performed VISSIM analysis on the I-15 South Davis project, as well as operational analysis on the I-15 Point project, both to begin construction in 2014. Shea also performed traffic analysis for UDOT, including protective, permissive/protective, and dual left turn phasing, as well as speed and ball bank studies. His research will focus on the relationship between urban design decisions and safety for all street users.

Kevin Croshaw began the MS program in the Utah Traffic Lab in the fall of 2013. Croshaw graduated with a BS in civil and environmental engineering from the U of U in the spring of 2013. His research focuses on the effectiveness of optical speed bars, pavement markings placed perpendicular to the direction of travel in order to reduce driver speeds.

Anusha Musunuru defended her master's thesis, "A Reliability-Based Geometric Design Approach to Freeway Number of Lanes Decisions," in November. MPC was the primary sponsor of this work. Musunuru will begin her PhD work at the University of Utah in the spring of 2014.

Utah State University

Antonio Fuentes graduated from USU in May 2013 with a bachelor's degree in civil and environmental engineering, along with three years of Local Technical Assistance Program (LTAP) experience. He has also been involved in the implementation of a pavement management system using the PAVERTM software for the entire Region 4 of the USDA National Forest Service. Fuentes' research focuses on assessing and improving current asset management techniques within the area of pavement infrastructure. Comparing the current ASTM methods implemented by Region 4 of the USDA Forest Service and local government pavement asset management implementation projects, he aids the asset management discipline by focusing on methods of data collection, network condition analysis, deterioration forecasting and effective economic modeling of the pavement network.

University of Wyoming

Dick Apronti worked as an assistant civil engineer in a consulting firm after earning his BS from Kwame Nkrumah University of Science and Technology in Ghana. In 2013, he obtained an MS in civil engineering from UW with a thesis research on evaluating base widening techniques in Wyoming. He is currently a PhD student working on research to predict traffic volumes on low volume roads in Wyoming. Apronti plans to become a consultant and a lecturer after he earns his PhD.

Christopher Chamberlin of Casper, WY, earned a BS degree in civil engineering from UW. He joined the graduate program at UW in the spring of 2014 and researched the effectiveness of Congestion Mitigation and Air Quality funding from the USDOT in reducing dust emissions on unpaved roads. Chamberlin plans to become a licensed professional engineer.

Danny Hellrung, E.I.T., is a graduate student from Arvada, CO. He recently graduated from UW with a BS in civil engineering with an emphasis in transportation. During his senior year he completed a design project focused on redesigning the Interstate 25 and College Drive interchange in Cheyenne, WY, to accommodate anticipated traffic growth. While completing his undergraduate degree, Hellrung worked for the Wyoming Technology Transfer Center as a student research assistant. He assisted with gravel road surface evaluations as well as analyzing truck traffic patterns to determine the appropriate time to collect traffic counts. He is a member of the Institute of Transportation Engineers student chapter.

Jaime Hepner is originally from Loveland, CO. She earned a BS degree in civil engineering from UW. She is currently a graduate research assistant in transportation and is pursuing a master's degree in civil engineering. Hepner is working on a project to predict traffic volumes of low-volume rural roadways, which entails conducting traffic counts and doing traffic analysis and traffic modeling. She is also president of the student chapter of the Institute of Transportation Engineers.

Sanjay Pokharel is a native of Nepal and is a graduate student at UW. He earned a bachelor's degree in civil engineering from Tribhuvan University, Institute of Engineering in 2010 and worked as road inspector and consulting engineer in Nepal. Pokharel is currently a graduate research assistant at UW conducting research on the evaluation and development of livability and sustainability programs for Indian reservations.

Faculty Activities

USU faculty member on sabbatical in China and Thailand

USU professor of transportation engineering Anthony Chen is on a one-year sabbatical in China and Thailand. As part of Chen's sabbatical in 2013-2014, he was invited to teach a nine-week course on "Modeling Transport and Travel Demand Analysis" to the Graduate Transportation Program at Tongji University, Shanghai, China, from September to November. During this period, Chen visited several universities in China and Thailand to initiate academic exchange and cooperation in teaching and research. Chen currently holds two professorship titles as a guest professor for the School of Traffic and Transportation Engineering at Central South University and a Shanghai Specially-Appointed Professor – Eastern Scholar for the School of Transportation Engineering at Tongji University. For the remaining sabbatical in 2014, Chen will collaborate with the logistics faculty at Burapha University, Thailand, on a sponsored project by the Department of Highways to develop a decision support tool for disaster management in Thailand.

Porter is part of TRB workshop

Richard Porter, assistant professor of civil and environmental engineering at U of U, was invited to speak at a unique Transportation Research Board (TRB) workshop, "Hitting the Ground Running: Choosing and Navigating a Successful Career Path, A Workshop for Young and New Transportation Professionals." The workshop provided a candid examination and discussion of the career paths of assorted professionals at various stages in their journey. Speakers discussed the career choices they have made and provided some insight into what it is like to work in their respective sectors. The workshop concluded with interaction in which the audience engaged the speakers and other sector representatives in an entertaining and useful format. Porter presented from an academic perspective. The workshop was part of the TRB's annual meeting Jan. 12-16, 2014 in Washington, D.C.

Marshall wins teaching award

Wesley Marshall, assistant professor of civil engineering at the University of Colorado Denver, was awarded the 2013 Outstanding Faculty in Teaching Award from the College of Engineering and Science. The award recognizes valuable contributions in teaching, particularly his efforts in redesigning several courses to better engage students.

Marshall

Bordelon

Bordelon promoted in concrete institute committee

Amanda Bordelon, U of U assistant professor of civil and environmental engineering, has been promoted to voting member of the American Concrete Institute's Committee on Fracture Mechanics (ACI 446), which is a joint committees with ASCE. The fracture mechanics committee has been developing a new report on fracture toughness testing, and Dr. Bordelon has contributed toward the implementation of fracture mechanics for concrete pavement applications.

NDSU research is featured at INFORMS annual meeting

Several NDSU students and staff presented research at the annual meeting of the Institute for Operations Research and Management Science (INFORMS) in Minneapolis, Oct. 6-9. INFORMS is the largest professional society in the world for professionals in the field of operations research (O.R.), management science, and analytics.

Eunsu Lee, an associate research fellow with the Upper Great Plains Transportation Institute chaired a session on supply chain shipping and transportation. He also presented "Port Choice for U.S. Import Commodities." The study investigated the port choice behavior for U.S. import commodities from the foreign trade partners.

Luke Holt, a transportation research planning analyst with the Upper Great Plains Transportation Institute, chaired a session on vehicle routing applications. He also presented "A Static Regional Routing Model for Large Geographic Healthcare Networks." In a study of regional healthcare distribution networks, researchers developed a vehicle routing model that minimizes costs.

Transportation and logistics student Poyraz Kayabas presented "Highway Patrol Planning and Needs Assessment Using GIS." The study showed that GIS tools can be used for diverse tasks in patrol planning, needs assessments, and patrol routing.

Transportation and logistics student Yasaman Kazemi presented "Modeling the Effects of Disruption on Gasoline Supply Chain." The research developed a model for the gasoline supply chain to hedge against facility disruptions and to minimize the expected total cost of location and transportation of gasoline in the downstream oil supply chain.

Transportation and logistics student Nimish Dharmadhikari presented "Economic Model Evaluation of Sugar-beet Production in Red River Valley." In the research, a comprehensive economic model of sugar-beet growing, transportation, and processing have been developed for the Red River Valley to analyze the critical cost attributes and parameters.

Transportation and logistics student Sumadhur Shakya presented "Structural Changes in North American Fertilizer Logistics." Shakya examined how changing cropping patterns and new domestic sources of natural gas may influence flows of fertilizer in the United States with potential to allow future exports.

PhD student Christopher Dehann presented a poster entitled "Modeling Water Needs in Western North Dakota." He described how the model was critical in assessing the needs of a region that is seeing dramatic increases in water demand from the oil industry and population growth.

PhD student Chijioke Ifepe presented a poster entitled "Decision Support System to Schedule Coffee Shop Servers." Ifepe described how a decision support system can be designed to make the scheduling of coffee shop workers a less complex and timely task for managers.

Porter and Wood earn TRB best paper award

The Transportation Research Board's Geometric Design Committee awarded its 2013 Best Paper Award to Richard J. Porter, assistant professor of civil and environmental engineering at the University of Utah, and Jonathan S. Wood (2013 MPC Student of the Year) at the 2014 TRB Annual Meeting. The title of the paper is "Safety Impacts of Design Exceptions on Non-Freeway Segments" and is based on work from project MPC-360, Safety Impacts of Design Exceptions in Utah, sponsored by the Mountain-Plains Consortium and Utah Department of Transportation. The paper is published as: Wood, J.S. and Porter, R.J. "Safety Impacts of Design Exceptions on Non-Freeway Segments," in Transportation Research Record, Journal of the Transportation Research Board No. 2358, 2013, pp. 29-37. This is the second consecutive best paper award from the Geometric Design Committee awarded to Porter.

NDSU research at TRB

MPC researchers from NDSU participated in the 92nd Annual Transportation Research Board Meeting in Washington, DC, January 13-17. The event attracts more than 11,000 transportation professionals from around the world and features more than 4,000 presentations.

Brenda Lantz presided over the Truck and Bus Safety Committee meeting. She also presided over the committee's session, "Using GIS for Locating Specific Types of Truck-Bus Crashes and Countermeasures."

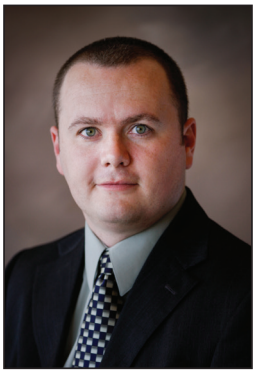
"Transportation Impacts of New Gas Developments" was presented by MPC director Denver Tolliver.

"Rolling-stock Automatic In-situ Line Quality, Car Operation, and Tracking System" was presented by Pan Lu, Raj Bridgelall, and Tolliver, all of the UGPTI.

Ibarra receives Milek faculty fellowship

Luis Ibarra, U of U assistant professor of civil and environmental engineering, recently received the 2013 Milek Faculty Fellowship from the American Institute of Steel Construction. This four-year award will provide funds to investigate the effect of buckling restrained brace boundary conditions on the seismic resilience of braced frames.


Porter


Wood


Ibarra

CSU's Atadero invited to international workshop

Rebecca Atadero, assistant professor of civil and environmental engineering at CSU, was invited to the FHWA International Workshop on Aging of Composites in September 2013 to present findings from MPC -340, Long Term Performance of FRP Repair Materials. This project was also supported by the Colorado DOT and included a field evaluation of the FRP on the Castlewood Canyon Arch Bridge.

UGPTI researcher presents work at national meetings

EunSu Lee, an associate research fellow with the Upper Great Plains Transportation Institute, recently presented research papers at two national meetings.

He presented a paper on the institute's statewide freight modeling effort at the Transportation Research Board's Strategic Highway Research Program Symposium in Washington, D.C., Oct. 21-22. Lee's paper, "Statewide Freight Demand Modeling to Support Long-Range Transportation Planning in North Dakota," was one of only 18 chosen for the symposium, which focused on strategies for integrating supply-chain models and data into public-sector freight demand modeling.

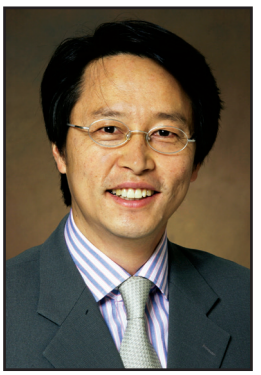
Lee presented, "Where Is the Next Drilling Location" at the GIS-Pro Annual Conference held by the Urban and Regional Information System Association (URISA) at Providence, RI, Sept. 16-19. URISA is a national association for GIS professionals. His paper described a method for predicting potential drilling sites in oil-producing regions for the next 20 years, a critical step in transportation planning for those regions.

Wehbe presents MPC-funded research findings at international forums

Dr. Nadim Wehbe attended the 7th International Conference on Structural Engineering and Construction June 19-23, 2013, in Honolulu, HI. Wehbe presented a paper entitled "Development of Highway Pavement Concrete Mixtures for Enhanced Durability and Workability."

Wehbe was also an invited speaker at a conference entitled "Future Concrete – Focus on Qatar Infrastructure," which was held Nov. 19 in Doha, Qatar. Wehbe's presentation was titled "Strength and Serviceability of Prestressed SCC Bridge Girders under Monotonic and Cyclic Loading." Qatar is host to the 2022 World Cup.


Atadero


Lee


Wehbe

CSU faculty recognized for instructional innovation

Caroline Clevenger and Mehmet Ozbek, both faculty in the CSU Department of Construction Management, were recognized recently with the Preston Davis Award for Instructional Innovation and the Institute for Learning and Teaching's 2013 Exceptional Instructional Innovation in Service-Learning award.

The awards recognized technology-related innovation and the implementation of service-learning concepts. In 2011, under the umbrella of the CM Cares initiative,

Clevenger and Ozbek developed a service-learning course focused on sustainable design and construction while engaging at-risk youth and the community through a hands-on service project. The course, Leadership of Sustainable Community Projects, empowers CSU students to be leaders and mentors while managing a real-world project from conception to completion. The course utilizes Universal Design for Learning principles that involve the development of a learning environment in which ideas and concepts are represented in multiple ways. Students express their comprehension and mastery of the subject matter, and multiple opportunities for engagement are available to students.

CSU graduate students collaborate with high school students on the construction of small-scale, sustainable projects that benefit the local community. In the spring of 2011, the class built two sustainable doghouses for the Rocky Mountain Great Dane Rescue. The project for 2012 involved 12 xylophone music stands, two of which are handicap accessible, for the Bennett Elementary School in Fort Collins.

New Faculty

Colorado State University


Bareither

Christopher Bareither is an assistant professor of civil and environmental engineering. His expertise is in geotechnical and geoenvironmental engineering. He received a BS in geological engineering from the University of Idaho and an MS and PhD in the same field from the University of Wisconsin-Madison. After earning his PhD, he was an instructor and research associate at the University of Wisconsin-Madison. Bareither's graduate research at UW focused on the mechanical properties of geomaterials. His MS research focused on geological controls on the shear strength of naturally occurring sands and gravels. The Wisconsin Department of Transportation has adopted his recommendations as standard practice for evaluating shear strength of backfill materials. Bareither's PhD research coupled physical and biological mechanisms controlling municipal solid waste compression in bioreactor landfills. His research helped advance the experimental evaluation of municipal solid waste, and also helped develop predictive tools for sustainable solid waste management. At CSU, his research will focus on scale effects in laboratory testing, scale effects between laboratory and field processes, mechanisms of geomaterial behavior, and sustainable solutions to geoengineering problems.

South Dakota State University

Dr. Seyed M. S. Ardakani is a lecturer in the Department of Civil and Environmental Engineering. Ardakani received his PhD degree in structural and earthquake engineering from the University of Nevada - Reno in July 2013. He teaches undergraduate and graduate level courses in structural engineering and manages research projects related to bridge engineering. His areas of research expertise include earthquake engineering and seismic design of bridges, near-fault earthquake effects, application of innovative materials in structures, computational modeling of structures, and performance-based design. Ardakani is a member of American Concrete Institute, American Society of Civil Engineers, and Earthquake Engineering Research Institute.

Junwon Seo is an assistant professor in the Department of Civil and Environmental Engineering. He earned a BS, two MS degrees, and a PhD in civil engineering with a focus on earthquake and bridge engineering from Konyang University, Yonsei University, Georgia Institute of Technology, and Pennsylvania State University, respectively. Prior to joining SDSU, he was an assistant research professor in the Department of Civil, Construction, and Environmental Engineering at Iowa State University. Seo's areas of research expertise include structural health monitoring of in-service bridges, seismic vulnerability assessment of bridges with geometric irregularities, reliability analysis-based load rating estimation of various bridge types, field testing and computational analyses, structural examination of curved and/or skewed bridges during erection, and lateral distribution factor examination of bridges. During his academic career, Seo authored numerous peer-reviewed journal articles in earthquake and bridge engineering. He is a Licensed Professional Engineer in Iowa.

University of Colorado Denver

Carrie Makarewicz joins the planning and design faculty as an assistant professor after finishing PhD studies in city and regional planning at the University of California Berkeley. She focuses on community development, sustainable economic development strategies, transport equity, regional planning, and urban school reform. Prior to pursuing her doctorate, Makarewicz worked as a planner and research manager for the Center for Neighborhood Technology and the Center for Transit-Oriented Development where she helped develop the Housing and Transportation Affordability Index and the National Transit Oriented Development Database. Makarewicz also

worked for the City of Chicago's Department of Planning and Development and Office of Management and Budget, and other nonprofits and private consulting firms. She has served on several local and national boards and advisory committees, including the founding board of the Andersonville Development Corporation, a neighborhood nonprofit focused on the creation and implementation of sustainable polices for small business districts in Chicago. Currently, Makarewicz serves on the Technical Advisory Group for STAR Communities, a national system to provide sustainability and assessment tools for local governments throughout the United States. She holds a bachelor of business administration from the University of Michigan, Ann Arbor, and a master's in urban planning and policy from the University of Illinois-Chicago.

Austin Troy is an associate professor of planning and design. He joined UC-Denver after more than a decade at the University of Vermont. He is the former director of the University of Vermont Transportation Research Center and focuses on land use policy, environmental planning, GIS, spatial analysis, remote sensing, and land use change modeling and simulation. Troy is the author of a recent book entitled: The Very Hungry City: Urban Energy Efficiency and the Economic Fate of Cities. Troy holds a PhD in environmental policy and economics from the University of California Berkley, a master of forestry degree from the Yale School of Forestry and Environmental Studies, and a BA in anthropology from Yale University.

University of Utah

Xiaoyue Cathy Liu joined the Department of Civil & Environmental Engineering in the fall of 2013. She has a PhD in transportation engineering from the University of Washington, a master's degree in transportation planning and management from Texas Southern University, and a bachelor's degree in electronics and electrical engineering from Beijing Jiaotong University. She serves as a member of the Transportation Research Board (TRB) Managed Lane Committee. Liu's background includes extensive research in performance analysis, highway capacity analysis, traffic sensor data analysis, traffic operations, traveler information systems, advanced traffic control systems, freeway network modeling, and traffic simulations. Liu has also won several awards, most notably, Boeing Academic Achievement awards, WTS Helene M. Overly Memorial Graduate Scholarship, ITE Washington State Outstanding Graduate Student, ITE Western District Outstanding Graduate Student, ITE Western District Best Student Paper, as well as the ITE Daniel Fambro Paper Award.

Milan Zlatkovic became a research assistant professor in the Department of Civil and Environmental Engineering in July 2013. He received his BS degree in road and urban traffic and transportation engineering from the University of Belgrade, Serbia, and MS and PhD degrees in civil engineering with emphasis in transportation from the University of Utah. His research interests include traffic signal systems, public transportation, transit signal priority, traffic modeling and simulation, intelligent transportation systems, traffic flow theory, highway design, and transportation safety. He has been involved in numerous national and state research projects. MPC provided additional support to Zlatkovic's research in public transportation and transportation modeling. His work has been published and presented in various journal and conference venues. Zlatkovic is currently a member of the Institute of Transportation Engineers, and a friend of the Transportation Research Board AHB25 (Traffic Signal Systems) and AP075 (Light Rail Transit) committees.

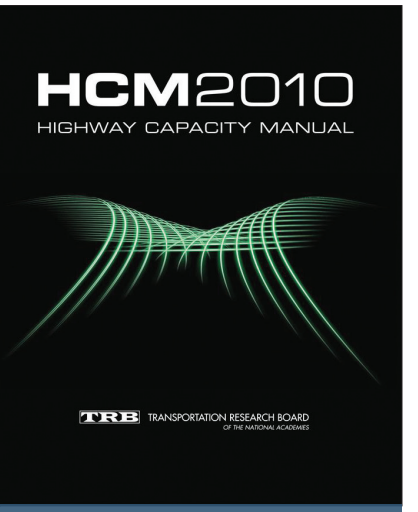
Uah State University

Ziqi Song joined USU in the fall of 2013 as an assistant research professor. He received his PhD from the University of Florida where he then went to the Technical University of Munich as a post-doctorate research fellow, followed by his return to the University of Florida to continue on as a post-doctorate research associate. His research areas include transportation economics, transportation network modeling, traffic operations and management, multimodal transportation systems, sustainable transportation development, and intelligent transportation systems. Song is currently a member of the Transportation Research Board, the Institute for Operations Research and the Management Sciences, and the Institute of Transportation Engineers.

University of Wyoming


Ahmed

Mohamed M. Ahmed is an assistant professor in the Department of Civil and Architectural Engineering. He received a BS in civil engineering from Al-Azhar University, Cairo, Egypt, and MS and PhD degrees in transportation engineering from the University of Central Florida. Prior to joining UW, Ahmed was director of the Traffic Safety Program at the Center for Advanced Transportation Systems Simulation at the University of Central Florida. He has more than 13 years of experience in transportation engineering with a focus on traffic safety. His research interests include traffic safety analysis, intelligent transportation systems, and statistical and data mining applications in transportation engineering. Ahmed has conducted research projects and provided technical assistance to a number of clients, including the Florida Department of Transportation, the Colorado Department of Transportation, the Orlando-Orange County Expressway Authority, and the Wyoming Department of Transportation. He has co-authored scientific articles in peer-reviewed journals, including *Accident Analysis and Prevention*, *Journal of Transportation Research Record*, *IEEE Transactions on Intelligent Transportation Systems, Transportation Safety and Security, and Transportation Research Part-C*. Ahmed received the Young Researcher Award for best paper from the Transportation Research Board (Safety Data, Analysis and Evaluation Committee [(ANB20)] in 2012. He received the Graduate Teaching Assistant Award from the Department of Civil, Environmental and Construction Engineering in 2010, and the Award for Excellence in Graduate Student Teaching from the College of Engineering and Computer Science in 2011.



Outreach Activities

University of Denver hosts Global Sustainability and Supply Chain Conference

A Global Sustainability, Transportation and Supply Chain Conference was held in October in Denver, CO, with support from the MPC.

The event was designed to enhance public awareness related to policy issues facing freight and passenger transportation in maintaining a sustainable, global supply chain. More than 40 participants, including university faculty and students, supply chain and logistics professionals, and representatives from transportation companies and shippers, came from across the United States and from as far away as the United Kingdom and Australia. The one-day conference was sponsored by the Intermodal Transportation Institute and the National Center for Intermodal Transportation for Economic Competitiveness at the University of Denver and the transportation and logistics organizations in Denver that participate on the NCITEC Outreach Steering Committee. Financial support was provided by the MPC.

Liu appointed to Transportation Advisory Board

U of U civil and environmental engineering assistant professor Xiaoyue Cathy Liu was recently appointed as a member of the Transportation Advisory Board in Salt Lake City. Cathy will serve as a representative of transportation academia. The board provides recommendations to the transportation division, mayor, and city council regarding transportation decisions and issues affecting Salt Lake City.

U of U's Bordelon interviewed by Salt Lake Tribune

Amanda Bordelon, U of U assistant professor of civil and environmental engineering, was interviewed and highlighted in an article in the Salt Lake Tribune about women in science, technology, engineering, and mathematics (STEM) careers. Published online on 06/07/2013 at http://m.sltrib.com/sltrib/mobile3/56422296-219/utah-women-stem-education.html.csp.

Bordelon

Porter explains yellow light dilemma zone on KSL Radio

Richard Porter, assistant professor of civil and environmental engineering was interviewed on Salt Lake City radio station KSL on the dilemmas drivers face at yellow traffic signals. Richard was interviewed by KSL's Bill Gephardt and explains the "dilemma zone" and what traffic engineers are doing to keep our roads safe. Watch and read the article, "Hit the brakes or the gas? Help for drivers at yellow lights," here: http://fw.to/GR3NbsY.

Porter

Liu selected to participate in inaugural HCQS mentoring program at TRB

U of U civil and environmental engineering assistant professor Xiaoyue Cathy Liu has been selected as mentee to participate in the inaugural mentorship program of the Highway Capacity Quality of Service (HCQS) Committee (AHB 40). The HCQS committee acts as the primary overseer for research and enhancement of the Highway Capacity Manual, and many other new projects that will significantly affect the practice. Cathy will work with her mentor, Loren Bloomberg, over the next several years to receive great exposure to the committee and inner workings of various subcommittees.



Project Updates

CSU evaluates use of mine waste materials and fly ash in earthwork projects

CSU researchers are evaluating the use of mixtures of mine waste rock and tailings stabilized with fly ash as a transportation-related earthwork material.

To date, researchers, led by Christopher Bareither, assistant professor of civil and environmental engineering, have collected samples of the geomaterials and are determining and describing their characteristics. Tailings have been collected from three mines, two of which are located in the western United States. Two fly ash samples were collected from power plants in North Dakota. They also collected crushed aggregate for use as a substitute for waste rock so that effects of tailings and fly ash on mixture behavior can be more effectively evaluated.

Sustainability has increased in popularity as a key indicator for planning transportation projects. In response, it has become necessary for state departments of transportation to evaluate the sustainability of transportation projects, leading to the development of transportation sustainability rating systems.

Research helps DOTs find sustainability rating systems that fit needs

CSU researchers evaluated various systems to help state DOTs select systems that best suit their needs. The systems employ various methods for determining or quantifying sustainability, and emphasize different sustainability factors. The research at CSU, led by Mehmet Ozbek, Caroline Clevenger, and Rebecca Atadero, developed a four-step framework that identifies the most important capabilities in a transportation sustainability rating system (TSRS) as preferred by a state DOT and then facilitates weighting of those capabilities via a well-established methodology, the Analytical Hierarchy Process. This research also presents the implementation of this framework for Colorado DOT, South Dakota DOT, Utah DOT, and Wyoming DOT. The framework resulted in the identification of INVEST to be the most suitable TSRS for CDOT and WYDOT, GreenLITES as the most suitable TSRS for SDDOT, and the results for UDOT were inconclusive. The framework developed for assessing TSRSs was proven to be a viable means for determining rank and suitability of TSRSs for DOTs.

Integral abutment project completed at USU

As part of a study to develop design guidelines for integral abutment bridges, a study by USU researchers was undertaken in which the bridge movement of the 400 South Street Bridge in Salt Lake City was surveyed for one year to quantify changes in bridge movement due to temperature variations.

Researchers Paul Barr and Marv Halling compared these quantitative bridge movements to predicted behavior from a finite-element model. The model was subsequently used to determine likely causes of cracking stresses in the bridge's north abutment. The modeling scheme was further implemented to investigate the influence that various bridge parameters have on the integral abutment stresses.

In general, expansion and contraction of the 400 South Street Bridge was observed as temperature increased and decreased, respectively. The observed movements were unequal when comparing the east and west sides of the bridge. Through finite-element analyses, this unequal movement is believed to be a result of lateral movement at the skewed support of the north abutment. As a result, the abutment cracking of the 400 South Street Bridge is likely a result of a combination of bridge parameters. These properties include a combination of skew, curvature, span length, and detailing. Integral abutment bridges with more than one of these conditions need to be detailed appropriately.

Gearing up for testing in the CSU structures lab

This fall, three MPC supported projects have been preparing for physical testing in the CSU Structures Lab. MPC-408 Exploring Unique Plastic-Reinforced Bridge Decks: Phase I is led by MS student Chris Bright and PIs John van de Lindt and Rebecca Atadero. The testing procedures will evaluate the overall shear and flexural performance of 12 beam specimens that will demonstrate the advantages gained by implementing strategic configurations and geometries of flexural reinforcement. Simple beam configurations with third-point loading will be used on specimens with three types of flexural reinforcement systems, each with a series of beams both reinforced and unreinforced for shear failures.

MPC-343 Laboratory Testing of Innovative Steel Bridge Designs is led by PhD student Robert Johnson with PIs Rebecca Atadero and Suren Chen. This study to investigate the continuity of steel diaphragm bridges made continuous at their supports is well underway. The continuous behavior is achieved by negative tension reinforcing in the composite deck slab and compression in the bottom flanges

of the bridge girders. This is a novel approach as up until the present, simple-made-continuous steel girder bridges had their girders encased in concrete diaphragms with various compression transfer mechanisms. One existing bridge in Colorado has this type of connection and this testing will help evaluate its performance.

Currently, a self-reacting load frame is being built in anticipation of the full scale physical test.

MPC-410 Predicting Fatigue Service Life Extension of RC Bridges with Externally Bonded CFRP Repairs is led by MS student Tyler Sobiek with PIs Rebecca Atadero and Hussam Mahmoud. This project will include experimental fatigue load testing of seven, 15-foot reinforced concrete beams with different CFRP repair schemes. The testing will focus on measuring the fatigue crack propagation rate within the steel reinforcing bars to determine the effect CFRP repairs have on slowing the crack growth rate. Results will be used to draft design recommendations for the extension of the fatigue service life of these types of retrofitted beams.

Seismic performance of SCC bridge columns

Seismic design provisions require high amounts of transverse reinforcement in reinforced concrete bridge columns. Those requirements sometimes lead to steel congestion and prevent proper placement and consolidation of conventional concrete (CC). In such cases, self-consolidating concrete (SCC) can be a better alternative to conventional concrete.

Researchers at SDSU are evaluating and comparing the seismic performance of SCC bridge columns to that of CC bridge columns. Four scaled rectangular bridge column specimens (two SCC and two CC) were constructed and tested to failure at the Lohr Structures Laboratory at SDSU. The specimens were tested under constant axial load and cyclic lateral loading with increasing displacement amplitude. The test results are being analyzed; however, initial results indicate that the SCC column specimens exhibited high ductility and good energy dissipation.

The research team comprises Dr. Nadim Wehbe and graduate student Todd Pauly. The study is co-sponsored by MPC and South Dakota State University.

Test setup

Column specimen during the test

Hazard evaluation and mitigation of truck collision with bridge columns

A research study is underway at SDSU to evaluate and mitigate the hazard of truck collisions with overpass bridge columns on South Dakota Interstate systems.

Truck collisions with bridge columns have resulted in some cases of bridge collapse and temporary closure of critical highways. The 2012 AASHTO Bridge Design Specifications (BDS) require bridge columns be designed for a lateral collision force of 600 kips applied at 5 feet above ground level. The 2012 BDS design collision force is 200 kips higher than that specified in the prior BDS editions.

Bridge columns in the Upper Midwest are designed for non-seismic requirements, and the vast majority of existing concrete bridge columns were designed prior to the introduction of the truck collision force to the code. Thus, the existing bridge columns lack sufficient shear capacity and ductility and are vulnerable to failure under truck collision loads.

The SDSU study consists of two stages. In the first stage, the researchers evaluated the likelihood of truck collisions with bridge columns at all overpasses on I-29 and I-90 in South Dakota. Combining the economic importance and collision risk, a truck collision risk index was developed for providing risk scores for the bridge bents. Structural analyses were performed to identify the structural capacity and load demand of the bridge columns under collision loads.

In the second stage of the study, two scaled specimens of bridge bents will be tested at the Lohr Structures Laboratory at SDSU. The bent specimens represent high-risk bridges that were identified in the first stage of the study and were found to be structurally deficient. Each specimen will be tested under pseudo-static lateral load applied to the bent column as required by AASHTO. One specimen will represent the as-built condition while the second specimen will incorporate a retrofit designed to mitigate column failure. The two specimens have been constructed. The esting was completed in January 2014.

The study is co-sponsored by MPC and South Dakota Department of Transportation. The research team includes Dr. Nadim Wehbe and Dr. Xiao Qin and graduate students Zhao Shen and Brett Tigges.

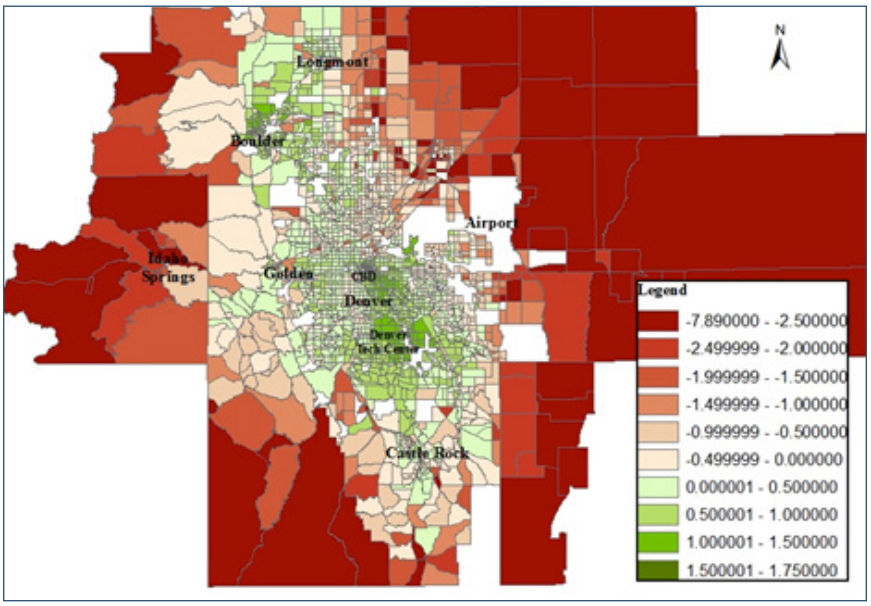
UC-Denver research identifies keys in transportation resiliency

Researchers at UC-Denver identified three key pathways to transportation resiliency in communities impacted by economic shocks.

Transportation resiliency is the ability of a transportation system to maintain or return to a previous level of service after a disruptive event. The goal of the research was to understand how the availability of transit, bicycling, and walking contributes to transportation resiliency under economic shocks to the system caused by an abrupt doubling of gas prices.

To realistically assess the alternative mode options under the resiliency scenario, the researchers, directed by Wesley Marshall, performed a series of analysis—including multinomial logistic regression—to assess resiliency disparities across the Denver region. They found that high incomes, housing proximity to employment centers such as downtown, and high quality/low stress multi-modal transportation options were the three main pathways to transportation resiliency.

The researchers also determined that there is a cumulative effect in these results; for instance, we also found high vulnerability in many suburban communities, which is exacerbated by lower income households being priced out of more accessible locations. The figure below depicts the results of the researcher's Transportation Economic Resilience (TER) rating system for the Denver region at the TAZ level, where the green color suggests better resilience and the red color indicates increased vulnerability.



The analyses provided a better understanding of how geographically and demographically diverse areas are impacted by a disruptive event such as a drastic gas price increase. The researchers were also able to measure the financial benefit of various transit, biking, and pedestrian infrastructures—even if few people are using those facilities today—and how these investments may support transportation resiliency.

U of U research addresses early pavement failures caused by thermal cracking

Thermal cracking in pavements due to stresses caused by low temperatures is a major factor in roadway degradation nationwide and especially in the Mountain West. In fact, some studies have shown that more than $50 million are spent every year on road maintenance resulting from thermal cracking in pavements. Researchers at the U of U are solving this problem by adopting a new mixture test using equipment already available to test asphalt binders.

Dr. Pedro Romero with graduate students Charan Kumar Chandika, ZacGary Jones, and Crystal Clendennen-Peirce have used the bending beam rheometer to measure low temperature response of asphalt mixtures from both laboratory-prepared and field samples. The first part of their work consisted of demonstrating that small beam slivers measuring 12.7 mm x 6.35 mm x 127 mm could be tested in bending at low temperatures to represent the global properties of the pavement mixture. Once it was clear that this test configuration satisfied the requirements for a representative volume element, field samples were obtained from cores taken from multiple roads around the Salt Lake Valley in Utah. The cores were cut into small beam slivers and prepared for bending beam rheometer testing.

The beams were tested in bending at different temperatures to obtain their time-dependent, viscoelastic, properties. The response of field cores and subsequent viscoelastic analysis showed that, even though the same binder grade is used throughout the region (PG 64-28), the resulting mixtures have significant differences in creep moduli and m-values. This indicates that binder testing alone, as it is currently done, might not be enough to control the material's creep modulus and thus its resistance to thermal cracking.

The analysis of test results and comparison to field surveys indicate that two material properties can be used to characterize the low-temperature performance of asphalt pavements. The properties are the creep modulus determined at 60 seconds of loading and slope of the creep modulus versus time curve at the same time (called m-value). Pavements with high creep moduli and low m-values are more susceptible to low-temperature thermal distress (i.e., cracking).

Field observations were conducted over two winters to determine the performance of each section; then by plotting the test results of the field samples on a Black Space Diagram (modulus versus m-value) it was observed that, as expected, those sections with high modulus and low m-value were more susceptible to thermal cracking. Based on these results it was determined that a thermal stress failure envelope might exist and could be developed into a low temperature pavement performance specification.

The results also showed that using the bending beam rheometer to test field mixtures is practical; the process is simple and the variability in the results is within acceptable values. Coring, cutting, and testing at one temperature could all be completed for a single core within one work day; thus making this test ideal for quality control or even quality acceptance of asphalt mixtures. Other less tangible benefits include the fact that this test is performed using equipment already available to the asphalt industry, thus reducing the cost of equipment acquisition and training.

U of U studies transit oriented development using traffic modeling

Transit oriented development helps communities grow in a way that promotes accessibility and mobility, but U of U researchers wanted to know how the practice impacts traffic. To find out, they studied a community using traffic modeling techniques to quantify the traffic impacts of transit oriented development.

Transit oriented development creates high density, mixed land use patterns with a pedestrian friendly environment concentrated on transit stations. This enables people to walk to transit stops or to their daily destinations, and decreases the need for private vehicle use. Throughout the Wasatch Front Metropolitan Region, the majority of land use development forces people to drive in order to access their destinations. This is due to low density and mostly single use developments, built on the poorly connected street networks with several cul-de-sacs and low number of routing options for transport system users.

The project, conducted by Xuesong Zho, assistant professor of civil and environmental engineering, quantified the traffic impacts of TOD using a study network located in West Valley City, UT, bordered by 3500 S and 4700 S (north-south), and 4800 W and 5600 W (east-west). This part of West Valley City will go through many development and land use changes in the next 15 years. The Mountain View Corridor is being built along 5600 W, and many other road and transit projects are planned in the vicinity. This area will be focused on transit use, so there is a need to design the best possible transit oriented design features for the planned conditions.

The purpose of transit oriented design is to motivate people to change their travel mode choices. Built environment could be the answer to this challenge. Changing the environment to accommodate walking and transit vehicles could increase the number of transit users. Proposed improvements evaluated through this project are enhanced street connectivity, traffic calming measures, innovative intersections, and transit friendly designs. Performance evaluation measures used are related to traffic analysis, street connectivity, and transit accessibility. The project resulted in recommendations for future development of the observed network into a transit oriented design-supportive environment.

Comparison of travel times and speeds on different segments for 2009 and 2040 showed significant increase in travel time for only one of 12 segments we compared on the test network, meaning that new network designs for 2040 need to focus on intersection operations. Increased street connectivity without improving intersection operations will not accommodate traffic demand for 2040 PM peak period, under the assumption that mode shift does not occur. Comparing street connectivity scenarios for different network segments between main intersections, street widening, and enhanced connectivity show similar results, implying that enhanced connectivity could be a good alternative approach for the corridors.

The project also includes conceptual frameworks for measuring street connectivity and transit accessibility, which could serve as indicators of transit quality of service and both spatial and temporal coverage once proposed transit service changes are implemented as a part of the future transit oriented development site.

Congress and federal railway administration look to NDSU for info on small railroads

Benson

Campbell

Ndembe

To assure that the nation's small railroads continue to provide access to rural and agricultural communities as well as the nation's ports, NDSU's Upper Great Plains Transportation Institute is studying those railroads' financial options and investment needs.

The study is the result of a request from the U.S. House of Representatives Committee on Appropriations to the U.S. Secretary of Transportation and is designed to provide background for public policy decisions that could impact investment and capital availability.

"These are the railroads that provide service to most rural and agricultural communities and communities that have a single industry," notes UGPTI research fellow Doug Benson. "These are the class II and class III railroads that more broadly extend the reach of the railroad industry." According to the American Short Line and Regional Railroad Association, 558 short line railroads operate over 50,000 miles of track in the United States.

The research, expected to be complete in early 2014, is designed to provide an assessment of the overall investment needs of small railroads and their ability to find the capital to meet those needs. Most small railroads are relatively small companies or are owned by holding companies. They face huge capital needs as infrastructure, particularly roads and bridges, deteriorates from age and from increasing loads and traffic. The average cost to upgrade a mile of track is about $1 million, and railroads must also upgrade operating systems to meet safety standards and take advantage of technologies like positive train control and radio frequency identification (RFID) that are already in use by large railroads.

Those long-term improvements are critical to the industry, but typically do not generate the kinds of returns that would make them attractive to investors. "This is part of the railroad industry that reaches out to every part of the country, but it is also the part of the industry that is least able to generate financial options," Benson explains.

Two earlier studies, one by the Federal Railroad Administration in 1993 and the other by UGPTI in 2012, contributed to Congressional development and support for the Railroad Rehabilitation and Improvement Financing loan and loan guarantee program.

The current study will assess the situation in light of current capital and investment markets. "If small railroads cannot find funding for their capital investment needs, the national transportation system will be diminished," Benson says. "Public policy must be informed by a current assessment of small railroad investment requirements and the financial options available for responding to those needs."

Anne Campbell and Elvis Ndembe, research assistants and transportation and logistics PhD students, are assisting with the study. Campbell conducted surveys of banking and railroad companies for the study. The Association of American Railroads helped conduct the small railroad survey. Ndembe, with expertise in rail logistics and econometrics, is helping to analyze the data.

Benson notes that there are not a lot data publicly available on the investment needs of short line railroads. That's why UGPTI's survey is so critical. The institute's previous work on the topic has enhanced responses to the survey because railroad managers saw the benefits of the previous study and recognize UGPTI as a trusted partner.

Understanding drivers' cell phone use and why they support legislation to restrict the practice

David Sanbonmatsu (driver) and David Strayer in the Applied Cognition Laboratory driving simulator facility at the University of Utah.

Although a great deal is known about the detrimental effects of cellular communication on driving performance, relatively little research has examined the motivations and self-regulatory factors underlying this behavior. With the support of the MPC, UU researchers David Sanbonmatsu, David Strayer, Arwen Behrends, Nathan Medeiros-Ward, and Jason Watson are investigating why people talk on a cell phone while driving and why they also support legislation to restrict this practice. Ironically, many drivers support legislation that would restrict a behavior in which they regularly engage.

Previously, the researchers examined the relationship between personality and individual differences in multitasking ability. They found that multitasking activities such as using a cell phone while driving were negatively correlated with actual multitasking ability. Multitasking was positively correlated with participants' perceived ability to multitask, which was found to be significantly inflated. Participants with high levels of impulsivity and sensation seeking also reported greater multitasking behavior while driving.

In the current research, nearly 300 drivers were surveyed about their driving attitudes, beliefs, and behaviors. In addition, they completed a series of laboratory tasks that measured their multitasking ability. As in previous studies, most participants reported talking on a cell phone at least occasionally while driving. The majority of participants also expressed support for laws restricting this behavior—a behavior they often engage in.

Participants reported using cell phones for benefits such as connecting with family and friends and getting work done. They generally acknowledged the risks of using a cell phone while operating a motor vehicle. However, they downplayed the dangers relative to behaviors such as drinking and driving. Moreover, they saw others' usage of cell phones while driving as much riskier than their own behavior. The overconfidence in their ability to drive safely while distracted contributes to their lower perceived risk and increases their willingness to use cell phones behind the wheel.

Interestingly, there was little relation between participants' self-assessments of their ability to drive safely while distracted and their actual multitasking ability (a pattern we also observed in our prior study). Alarmingly, multitasking performance was negatively correlated with self-reported cell phone usage while driving. Thus, drivers who use cell phones the most often tend to be the worst at multitasking. The pattern is surprising because decision theory would suggest that people should choose to multitask when they are good at it. However, the decision to multitask while driving appears to have little to do with the driver's proficiencies.

Study participants were much less confident about others' ability to drive safely while using a cell phone. Support for legislation to limit cell phone use appears to be based heavily on the perceived threat to public safety presented by others' usage of cell phones while driving. The perceived benefits of personal usage and others' usage of cell phones also predicted support for laws to limit cellular communication while driving. In other words, people tend to support legislation to restrict cell phone use while driving because they don't want the other guy using his cell phone on the roadway.

Our latest research is examining individual differences in driving performance in our driving simulator and in an instrumented vehicle to determine what factors predict a drivers' ability to self-regulate their behavior. This work differentiates between proactive self-regulatory decisions to not multitask (e.g., talk or text on a cell phone) while driving and reactive self-regulatory behaviors to terminate multitasking activities when driving demands increase, e.g., as traffic density increases. Early evidence suggests that the reactive form of self-regulation is more difficult because cell phone use impairs drivers' ability to monitor their actions.

Bringing intelligent compaction to Wyoming

UW researchers are investigating the implementation of new technology for improved road construction in Wyoming. The technology, known as intelligent compaction (IC), is being investigated throughout the United States, and involves the use of compaction equipment that includes a Global Positioning System (GPS), machine-integrated measuring sensors, and control systems

Working closely with FHWA, Kam Ng, associate professor of civil engineering, and Khaled Ksaibati, professor of civil engineering and MPC program director at UW, planned a 1½-day workshop for March 25 -26, 2014, in Laramie, WY, to disseminate IC technologies to state engineers, county engineers, city officers, consultants, contractors, and pavement practitioners. In conjunction with Wyoming Department of Transportation and Wyoming Contractor Association, a field demonstration of IC technologies will be arranged in the summer of 2014.

Current Challenges of Road Compaction

Road performance is highly dependent on the quality assurance and control of field compaction of each pavement structure. Compaction is a major portion of Wyoming's road construction budget, in which many resources, such as compaction equipment and manpower, are deployed to ensure that the field compaction attains the desired design requirements and specifications. Due to the heterogeneity of pavement materials, variability in compaction equipment and operators, and challenges in maintaining uniform lift thickness and a range of moisture contents for a specified percent of compaction, achieving the required compaction requirement is a daunting task during a road construction

Despite the fact that compaction is an important road construction procedure, current compaction quality assurance and control are assessed by state and local officials based on on-site spot test techniques, such as the nuclear gage, the dynamic cone penetrometer, and the lightweight falling weight deflectometer, that cover less than 1% of the compacted area. These tests reveal mechanistic properties of the soil or pavement that are measured at several points along a roadway as shown in Figure 1. These point

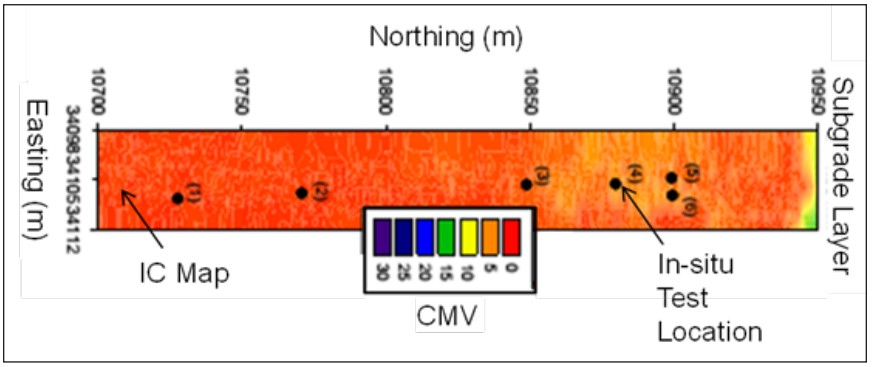


Figure 1. Spatial comparison of in-situ test locations and intelligent compaction map at a subgrade layer (adapted after White et al., 2010)

measurements are used to represent the compaction quality of the entire compaction area. However, sufficient compaction quality may not be achieved in several locations within the compaction area, which can lead to reduced long-term pavement quality and increased road maintenance costs.

What is Intelligent Compaction?

Intelligent compaction involves the use of compaction equipment that is equipped with a GPS, machine-integrated measuring sensors, and control systems as shown in Figure 2. The integrated GPS provides a complete geographic information system-based record of the construction site. Intelligent compaction technologies by different manufacturers yield different measurement values of soil and/or asphalt stiffness from each compaction lift as summarized in Table 1. The CMV value is a ratio of vertical drum acceleration amplitudes at the operating vibration frequency. The CCV is an algebraic relationship of multiple vertical drum vibration amplitudes. The HMV indicates the stiffness of soil or asphalt pavement. The Kb or Evib is a stiffness value taking into consideration of vertical drum displacement and the drum-soil contact force. Collected measurement values, in conjunction with GPS, allow for real-time compaction data to be gathered to spatially analyze the compaction levels of soils and pavements. These integrated sensor and control systems provide the capability of adjusting compaction effort (i.e., vibration amplitude and frequency) automatically based on the real-time and continuous feedback of variation in material properties during the compaction process. Unlike the spot-test techniques, intelligent compaction provides 100% coverage for compacted earth materials and pavement conditions as represented by an intelligent compaction map shown in Figure 1. By having the

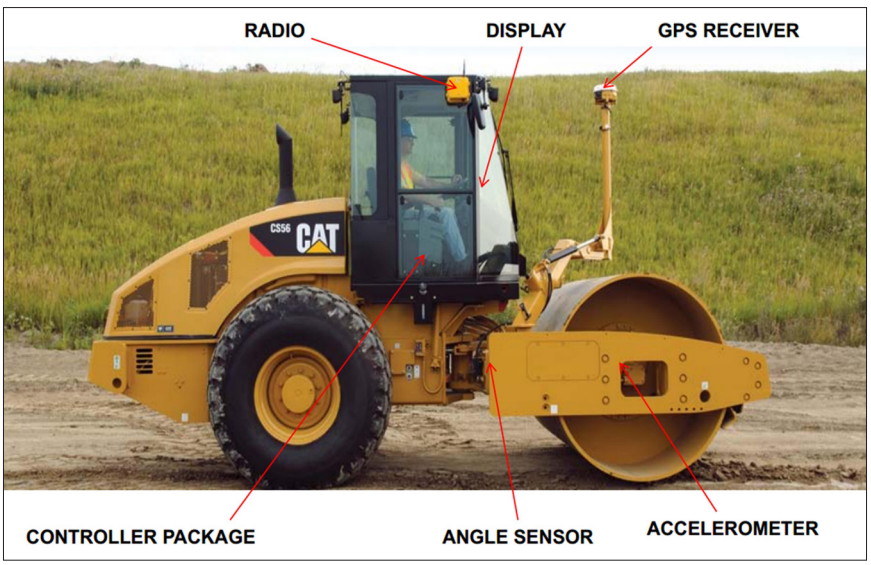


Figure 2. A typical vibratory single drum roller equipped with a GPS, sensors, and control systems

Table 1. List of IC equipped roller models and measurement values for soil and asphalt pavement compactions (adapted after the Transtec Group, Inc., 2013)

Manufacturer	Model	Soil/Asphalt	MV
Ammann/Case	ACEplus	Soil	Soil Stiffness Value (Kb)
Bomag	VarioControl	Soil	Vibration Modulus (Evib)
	AsphaltManager	Asphalt	
Caterpillar	AccuGrade	Soil/Asphalt	Compaction Meter Value (CMV)
Dynapac	DCA-S	Soil	Compaction Meter Value (CMV)
HAMM(Wirtgen)	HCQ	Soil/Asphalt	Hamm Measurement Value (HMV)
Sakai	CIS	Soil/Asphalt	Compaction Control Value (CCV)
Volvo	Trimble retrofit	Soil	Compaction Meter Value (CMV)

immediate or real-time evaluation capability, weak-compacted areas during construction can be identified instantaneously and corrected efficiently. In contrast, unnecessary over-compaction can be avoided during construction, also reducing costs.

Benefits of Intelligent Compaction

Intelligent compaction has been evaluated by many state departments of transportation as a technology to 1) improve road compaction efficiency and productivity; 2) lower construction cost and duration; 3) provide a better tool for QA/QC of field compaction; 4) improve road pavement uniformity, performance, and service life; and 5) lower overall road maintenance cost. Furthermore, the benefits of intelligent compaction synergizes with the current momentum towards the Accelerated Bridge Construction as well as the Every Day Counts initiative of the Federal Highway Administration.

Intelligent Compaction in the United States

A research initiated by the National Cooperative Highway Research Program (NCHRP) was completed by Mooney et al. (2010) to evaluate the reliability of the IC and to develop specifications for the application of IC. As part of this research, construction projects in Colorado, Florida, Maryland, Minnesota, and North Carolina (as indicated in Figure 3) were identified for data collection and analyses. The research has led to the development of preliminary recommended construction specifications for the application of IC in soils and aggregate base materials. Six options for quality assurance and guidelines for subgrade and base layers have been established as a result of this study.

Other states shaded in green in Figure 3 (California, Georgia, Indiana, Iowa, Kansas, Louisiana, Maine, Mississippi, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Vermont, and Wisconsin) have piloted research projects on intelligent compaction. Research in Iowa has led to the development of special provisions for using Roller Integrated Compaction Monitoring (RICM) technologies on three hot mix asphalt (HMA) overlay pilot projects in Iowa. A project in Texas has enabled the Texas DOT to draft a special specification titled "Quality Compaction Using Intelligent Compaction Rollers" (2012),

which outlines the construction and quality assurance/control requirements. The project in Utah has enabled the establishment of procedures to use intelligent compaction as a quality assurance tool for in-place HMA densities. Three upcoming demonstration projects will be conducted at Washington, Idaho, and Kentucky in 2014.

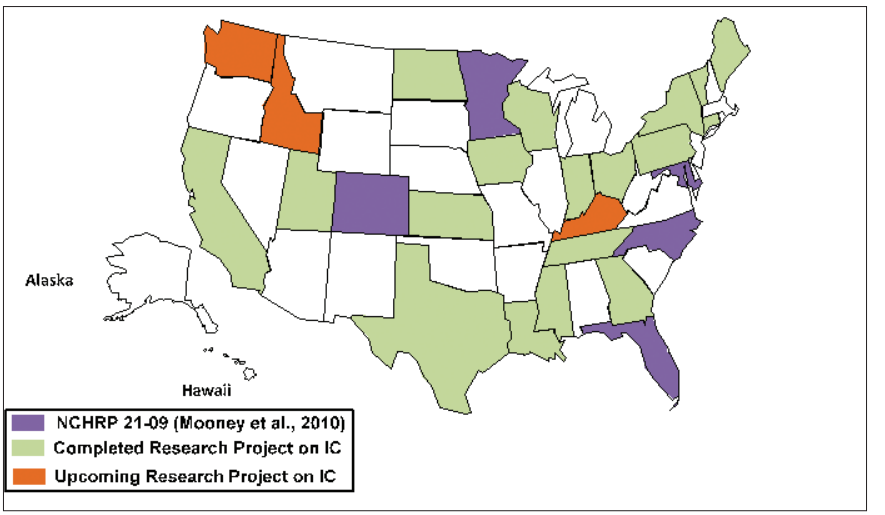


Figure 3. Status of intelligent compaction research projects in the United States

University of Wyoming researchers help improve Indian reservation road safety

While fatal crashes have declined across the United States in recent years, fatal crashes continue to increase on Tribal lands. Limited resources, lack of crash data, and little coordination across jurisdictions have made it difficult for Native American communities to address roadway safety concerns. They also face challenges that plague other rural communities: low traffic volumes, high speeds, alcohol involvement, and inadequate roadway design.

To help address this issue, UW researchers developed a five-step methodology to identify high-risk locations on Indian reservation roads. The methodology, developed by Khaled Ksaibati, professor of civil engineering and MPC program director at UW, and PhD student Debbie Shinstine, addresses the unique challenges on Tribal lands. The methodology has been successfully implemented on the Wind River Indian Reservation (WRIR). This methodology is shown in Figure 1 and includes the following steps:

1. Crash data analysis
2. Level I field evaluation
3. Combined ranking to identify potential high risk locations based on steps 1 and 2
4. Level II field evaluation to identify countermeasures
5. Benefit-cost analysis

Because the crashes on Indian Reservation Roads (IRR) had no specific locations identified, they were analyzed separately to identify trends. Crash severity is higher on the reservation than throughout the state, and crashes with fixed objects are the highest first harmful event with most crashes occurring off the roadway. Based on these trends, the similarity in quality to county roads, and the tribes' knowledge of crashes on these roads, a systemic approach to improvements was taken. As a result, three system-wide low-cost safety improvement projects were submitted to WYDOT for funding and have since been approved. These projects include improvements to signs, pavement markings, and guardrails.

Through the process, the WRIR recognized the need to develop a strategic highway safety plan and requested assistance from the University of Wyoming to apply for a grant from the Federal Highway Administration (FHWA) to partake in a Pilot Tribal Traffic Safety Management Program. Under the program, the WRIR has successfully developed a strategic plan utilizing the available crash data, identified ways to improve crash reporting and incorporated their safety improvement program into the strategic plan.

With the support of Tribal leadership, WRIR is working to reduce fatal and serious injury crashes. Key to the success of the TSMP is collaboration among safety stakeholders, including state departments of transportation, Tribal leadership, Local Technical Assistance Program (LTAP), Tribal Technical Assistance Program (TTAP), Bureau of Indian Affairs (BIA), local and Tribal law enforcement, Indian Health Services (IHS) and others.

The methodology can be adapted to the individual needs of Tribes across the United States to help them realize improved safety on their roadways.

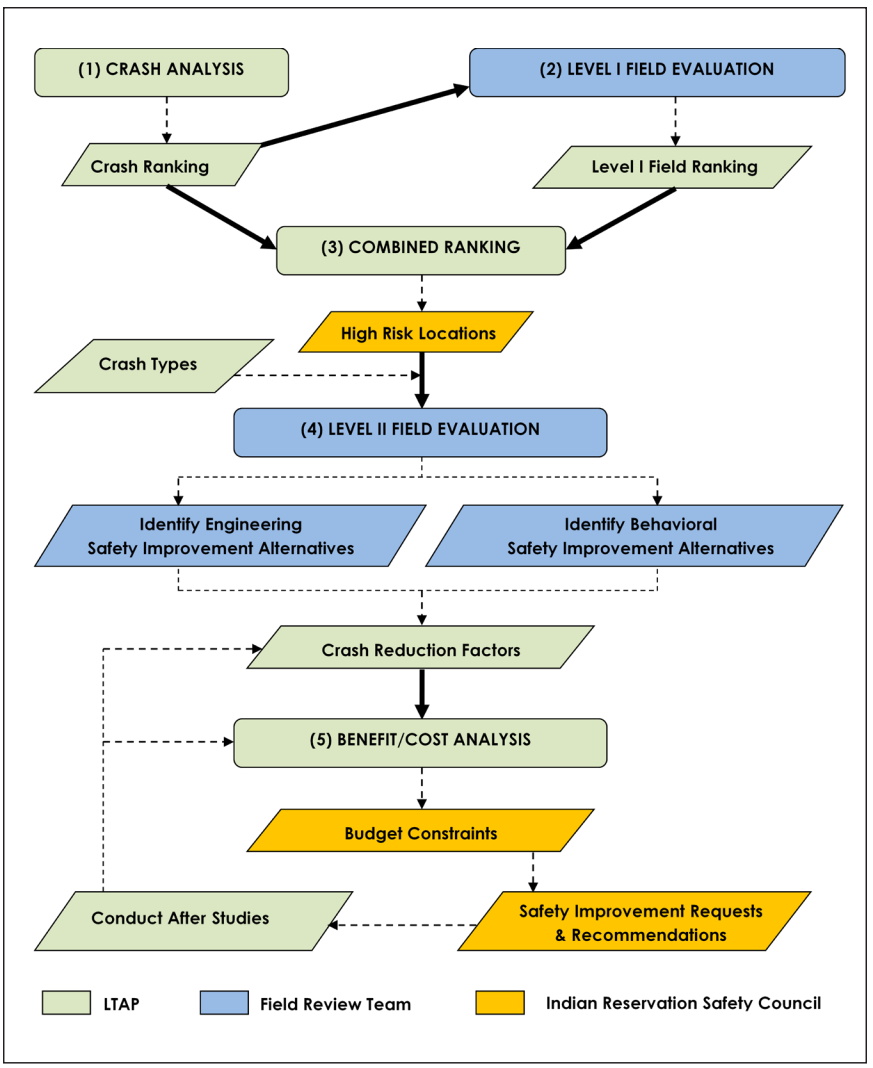


Figure 1. Five Step Process for Indian Reservation Safety Improvement Program

Research Project Status | January 1, 2012 – January 31, 2016

Grant – DTRT12-G-UTC08 - January 1, 2012
DTRT12-G-UTC08, Modification 1 – January 1, 2013
Expiration Date – January 31, 2016

Ongoing Research Projects

MPC-354	Geotechnical Limit to Scour at Spill-Through Abutments (University of Wyoming, R. Ettema)
MPC-363	A two-stage approach for estimating a statewide truck trip table (Utah State University, A. Chen, K. Heaslip)
MPC-364	Do Changing Prices Portend a Shift in Fuel Consumption, Diminished Greenhouse Gas Emissions, and Lower Fuel Tax Revenue? (Utah State University, K. Heaslip, R. Bosworth)
MPC-365	Improved Understanding of Pavement Impacts and Cost-Effective Designs based on Mechanistic Empirical Methods (University of Wyoming, K. Ksaibati, D. Tolliver)
MPC-366	Structural Health Monitoring of Highway Bridges Subjected to Overweight Trucks, Phase I – Instrumentation Development and Validation (University of Wyoming, R. Schmidt, R. Erickson, H. Heininger)
MPC-367	Developing Statistical Models for Crash Severity Comparing Statewide, County and Indian Reservation Roads (University of Wyoming, K. Ksaibati)
MPC-368	Effectiveness of Advisory Letter in Preventing At-Risk Teen Driver Crashes: Pilot Project (NDSU, K. Vachal)
MPC-370	Anticipatory Guidance for Older Drivers (NDSU, A. Huseth)
MPC-371	Decision Support for Strategic Truck Safety and Weight Enforcement Planning (NDSU, M. Berwick, K. Vachal, B. Lantz)
MPC-373	Damage Assessment, Characterization, and Modeling for Enhanced Design of Concrete Bridge Decks in Cold Regions (NDSU, F. Yazdani, J. Kim, M. Yang)
MPC-374	An integrated real-time health monitoring and impact/collision detection system for bridges in cold remote regions (NDSU, M. Yang, J. Kim, F. Yazdani)
MPC-375	Small Railroad Capital Investment Needs and Financial Options (NSDU, D. Tolliver, D. Benson)
MPC-376	Improved Understanding of Pavement s Impacts and Cost-Effective Designs Based on Mechanistic-Empirical Methods (NDSU, D. Tolliver, P. Lu, K. Ksabati)
MPC-377	Assessing Existing Transportation Sustainability Rating Systems for use in the Mountain Plains Consortium States (CSU, M. Ozbek, C. Clevenger, R. Atadero)
MPC-378	MEMS Sensors for Transportation Structures (CSU, P. Heyliger)
MPC-379	Plastic-Aluminum Composites in Transportation Infrastructure (CSU, P. Heyliger)
MPC-380	Investigation of interactions between traffic law enforcement and driving behavior on rural highways in Colorado (CSU, S. Chen)
MPC-381	Performance-based Interaction Analysis of Damage on Bridge Expansion Joints and Heavy Traffic (CSU, S. Chen)
MPC-382	Seismic Behavior of Steel Bridges with Fatigue-prone Details (CSU, H. Mahmoud, R. Atadero)
MPC-383	Seismic Performance of Highway Embankments (CSU, H. Mahmoud)

MPC-384	Understanding Public Perceptions of Different Revenue Generation Systems for Highway Construction and Maintenance (CSU, M. Ozbek, R. Atadero)
MPC-385	Education & Workforce Dev, STEM Outreach at Colorado State University (CSU, R. Atadero)
MPC-386	Use of Travel Time, Travel Time Reliability, and Winter Condition Index Information for Improved Operation of Rural Interstates (University of Wyoming, R. Young)
MPC-387	Comprehensive GIS-Based Rural Regional Transportation Planning Models (NDSU, P. Lu, D. Tolliver)
MPC-390	Design and Construction Monitoring of Surcharged Embankment (University of Utah, S. Bartlett, E. Lawton)
MPC-392	Evaluation of Spliced Sleeve Connections for Precast Reinforced Concrete Bridge Piers (University of Utah, C. Pantelides, L. Reaveley)
MPC-393	Traffic Modeling of Transit Oriented Development, (University of Utah, P. Martin)
MPC-394	Quantifying Uncertainty in Nondestructive Bridge Inspection Methods for use in Performance Based Inspection, (CSU, R. Atedero, M. Ozbek)
MPC-395	Accelerated Bridge Construction in South Dakota: Pilot Study for Implementation Strategy (South Dakota State University, S. Pei, N. Wehbe)
MPC-396	Extent, Severity, and Location of Chip Seal Loss on the South Dakota State Road Network (South Dakota State University, A. Jones)
MPC-397	Evaluation and Mitigation of Vehicle Impact Hazard for Overpass Bridges in South Dakota (South Dakota State University, N. Wehbe, S. Pei)
MPC-398	Selection of Discount Rates for Infrastructure Investment (South Dakota State University, X. Qin, Z. Wang)
MPC-400	Evaluation of Ice Loads on Bridge Piers in South Dakota (South Dakota State University, S. Pei, N. Wehbe)
MPC-402	Seismic Performance of SCC Bridge Columns (South Dakota State University, N. Wehbe, S. Pei)
MPC-403	Web-Based Decision Support Tool for Traffic Management and Work Zone Analysis (University of Utah, X. Zhou)
MPC-404	Seismic Performance of Concrete Filled Steel Tube (CFST) Bridge Columns for Accelerated Bridge Construction (University of Utah, L. Ibarra)
MPC-405	Seismic Retrofit of Spliced Sleeve Connections for Precast Bridge Piers (University of Utah, C. P. Pantelides)
MPC-406	Risk- and Reliability-Based Approaches to Analyzing Road Geometric Design Criteria (University of Utah, R.J. Porter)
MPC-407	The Effect of Multi-tasking on Self-Assessments of Driving Performance Center for the Prevention of Distracted Driving, (University of Utah, D. Strayer, D. Sanbonmatsu)
MPC-408	Exploring Unique Plastic-Reinforced Bridge Decks: Phase I (CSU, R. Atadero, J. van de Lindt)
MPC-409	Identification of Low-Risk Adjusted Work Schedules Designed to Manage Fatigue during Peak Service Demand Periods in the Shortline Railroad Industry (University of Denver, P. Sherry)
MPC-410	Predicted Fatigue Service Life Extension of RC Bridges with Externally Bonded CFRP Repairs (CSU, R. Atadero)
MPC-411	Re-Use of Mine Waste Materials Amended with Fly Ash in Transportation Earthwork Projects (CSU, C. Bareither)

MPC-412	Fatigue Strength of CFRP-repaired Reinforced Concrete Bridge Girders under Service Temperature (CSU, H. Mahmoud)
MPC-413	A Pilot Case Study to Evaluate the Potential Impact and Benefit of Adopting and Implementing BIM on Bridge and Infrastructure Projects (CSU, C. Clevenger, M. Ozbek, H. Mahmoud)
MPC-414	Quantifying Sustainability Metrics for Trunkline Bridges in the Mountain Plains Region (CSU, J. van Lindt, S. Bolivar)
MPC-415	Framework of Performance-Based Earthquake Design of Curved and Skewed Bridges (CSU, S. Chen)
MPC-416	Development and Testing of Crashworthy IPE Bridge Rails (CSU, P. Heyliger)
MPC-417	Evaluation and Development of Livability and Sustainability Programs for Indian Reservations (University of Wyoming, K. Ksaibati, D. Shinstine)
MPC-418	400 South Corridor Assessment (University of Utah, X. Zhou, M. Zlatkovic)
MPC-419	Experimental and Numerical Study for the Debonding Interface between an Existing Pavement and a New Concrete Overlay (University of Utah, A. Bordelon)
MPC- 421	Seismic Rehabilitation of Skewed and Curved Bridges Using a New Generation of Bulking Restrained Braces (University of Utah, C.P. Pantelides, L. Ibarra)
MPC-422	Highway Structures Supported on Expanded Polystyrene (EPS) Embankment without Deep Foundations (University of Utah, S.F. Bartlett)
MPC-423	Impact of Energy Sector Growth on Perceived Transportation Safety in the Seventeen County Oil Region of Western North Dakota: A Longitudinal Analysis (NDSU, K. Vachal)
MPC-424	Educational and Workforce Development Proposal: Ethics and Academic Conduct (NDSU, J. Hough)
MPC-425	Building a Sustainable GIS Framework for Supporting a Tribal Transportation Program (NDSU, E. Lee, D. Tolliver)
MPC-426	Does the Livability of a Residential Street Depend on the Characteristics of the Neighboring Street Network? (University of Colorado Denver, W. Marshall, C. McAndrews)
MPC-427	Fire Performance of Bridge Members Retrofitted with Near-Surface-Mounted Carbon Fiber Reinforced Polymer Composites (University of Colorado Denver, Y. Jimmy Kim)
MPC-428	Using Recycled Concrete Aggregate in New concrete Construction (University of Wyoming, J. Tanner)
MPC- 429	A Methodology for Developing a Replacement Strategy for County/City Owned Bridges (University of Wyoming, K. Ksaibati, J. Jones)
MPC-430	Implementation of Intelligent Compaction Technologies for Road Constructions in Wyoming (University of Wyoming, K. Ng, K. Ksaibati)
MPC-431	Connected Vehicle Weather Data for Operation of Rural Variable Speed Limit Corridors (University of Wyoming, R. Young)
MPC- 432	Finding Innovative Solutions to Prevent Wildlife Access to Highways at Wildlife Guards (Utah State University, P. Cramer)
MPC-433	Real-Time Traffic Management to Maximize Throughput of Automated Vehicles (Utah State University, T. Chantem)
MPC-434	A Bicycle Network Analysis Tool for Planning Applications in Small Communities (Utah State University, A. Chen)
MPC-435	Realization of a Coarse Position Verification System for an Automated Highway System (Utah State University, R. Gerdes)

MPC-436 Using Flocculation to Reduce Turbidity of Construction Site Runoff (South Dakota State University, G. Hua)

MPC-437 Fiber Reinforced Concrete for Structure Component (South Dakota State University, N. Wehbe)

MPC-438 Calibration of HSM Predictive Methods on Rural State and Local Highways (South Dakota State University, X. Qin)

MPC-439 Precast Bridge Girder Details for Improved Performance (South Dakota State University, N. Wehbe)

MPC-440 Tolerances for Placement of Tie Bars in Portland cement Concrete Pavements (South Dakota State University, N. Wehbe)

MPC-441 Developing a Pavement Management System for Small Communities (South Dakota State University, X. Qin, H. Wang)

MPC-442 Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements-Phase II (South Dakota State University, H. Samra, H. Qin)

MPC-443 Bridge Structure Alternatives for Local Roads (South Dakota State University, A. Jones)

MPC-444 Data-driven Freeway Performance Evaluation Framework for Project Prioritization and Decision Making (University of Utah, X. Liu)

MPC-445 A Sensor Fusion Approach to Assess Pavement Condition and Maintenance Effectiveness (NDSU, R. Bridgelall, Y. Huang)

MPC Completed Research Projects

MPC-362 Develop Design Guidelines for Integral Abutment Bridges (Utah State University, P. Barr, M. Halling) **MPC Report No. 12-256**

MPC-369 ND Motor Crash Analysis and Rider Assessment for Improved Conspicuity (NDSU, K. Vachal) **Project completed 10/1/12: http://www.ugpti.org/rtssc/briefs/downloads/2011_Motorcycles.pdf**

MPC-372 A novel methodology for quantifying the performance of constructed bridges in cold regions: development, assessment, and repair (NDSU, J. Kim, F. Yazdani, M. Yang) **MPC Report No. 14-266**

MPC-388 Title I-15 Express Lane Dynamic Pricing Assessment (University of Utah, P. Martin) **Project Terminated 5/16/12 No Match**

MPC-389 Flex Lane Driver Analysis (University of Utah, P. Martin) **Project Terminated 5/16/12 No Match**

MPC-391 Implementation of Low Temperature Test for Asphalt Mixtures to Improve the Longevity of Road Surfaces (University of Utah, P. Romero) **MPC Report No. 13-260**

MPC-399 Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements (South Dakota State University, H. Samra, X, Qin) **MPC Report No. 14-267**

MPC-401 Review of Road User Costs (RUC) and Methods (South Dakota State University, X. Qin) **MPC Report No. 13-254**

MPC-420 Environmentally Benign Extraction of Bitumen from Oil Sands for Pavement Binder (University of Utah, A. Hong, O. Conroy) **Project Terminated 12/1/13 No Match**

Research Project Status | July 1, 2007 – December 31, 2013

Grant – DTRT07-G-0008 – Close out December 31, 2013
Expiration Date – December 31, 2013

Ongoing Research Projects

MPC-277	Safety Factor Increase to Fatigue Limit States through Shear Spiking for Timber Railroad Bridge Rehabilitation (CSU, J. van de Lindt)
MPC-281	The Assessment of Chloride Injury from De-Icing Salts in Trees Along State Highways in the Black Hills (SDSU, J. Ball)
MPC-294	Indian Reservation Roads (IRR) and Local Roads Modeling and Management Databases (NDSU, D. Benson)
MPC-300	Demand Estimation for Corn Transportation: A North Dakota Case Study (NDSU, A. Dybing)
MPC-305	Jointed Plain Concrete (JPC) Design and Construction Review (SDSU, N. Wehbe)
MPC-306	Optimization of Pavement Marking Performance (SDSU, N. Wehbe)
MPC-309	Rural Road Signage: Simulated Driving to Evaluate Low-Cost Safety Improvements for Older Drivers (NDSU, K. Vachal)
MPC-315	Analysis of Compound Channel Flow with Two-Dimensional Models (SDSU, F. Ting)
MPC-316	Mitigation of Corrosion in CRC Pavement (SDSU, N. Wehbe, D. Medlin)
MPC-327	Seismic Rick Assessment for the (-25/I-70 Corridor in the Mountain Plains Region of the U.S. (CSU, J. Lindt)
MPC-332	Estimation of the Generalized Truck Freight Elasticity of Demand: Case Study of the Seattle-Tacoma to Chicago Corridor (NDSU, A. Dybing)
MPC-343	Laboratory Testing of Innovative Steel Bridge Designs (CSU, R. Atadero)
MPC-349	Modeling, Analysis and Evaluation of Urban Arterial Work Zone (NDSU, A. Varma)
MPC-350	Modeling and Evaluation of Traffic Signal Preemption near Railroad Crossings in Small Urban Areas (NDSU, A. Varma)
MPC-351	Concrete Structure Design Alternatives for Rural State and Local Roads (SDSU, N. Wehbe)
MPC-352	Evaluation of Ice Loads on Bridge Piers in South Dakota (SDSU, S. Pei)
MPC-357	Freight Railway Track Maintenance Cost Model (NDSU, D. Tolliver)
MPC-358	Connecting Supply Chain Interregional Freight Flow (NDSU, D. Tolliver)
Tech Trf	Assessment of Planning Models for Indian Reservation Roads (NDSU, D. Tolliver, D. Benson)

MPC Completed Research Projects

MPC-175	An Evaluation of ITS/CVO Application Technology in Logistics and Supply Chain Management (NDSU, B. Lantz) **MPC Report No. 06-186**
MPC-176	Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment (CSU, T. Sanders) **MPC Report No. 04-156**
MPC-177	Moment-Rotation Tests of High Performance Steel (HPS) I-Girders (CSU, B. Hartnagel) **MPC Report No. 03-148**

MPC-178 Experimental Wood-Concrete Railroad Bridge (CSU, R. Gutkowski) **MPC Report No. 04-165**

MPC-179 Full-Scale Laboratory Testing of a Timber Railroad Bridge (CSU, R. Gutkowski) **Closed Letter on File 4/24/2014**

MPC-180 North Front Range Transportation Research Internships (CSU, R. Gutkowski) **MPC Report No. 01-124**

MPC-181 University Transportation Survey (CSU, R. Gutkowski) **MPC Report No. 03-150**

MPC-182 Evaluating the Long Term Pavement Performance Data (UWY, K. Ksaibati) **MPC Report No. 02-130**

MPC-183 Defining a Road Safety Audit Program for Enhancing Safety and Reducing Tort Liability (UWY, E. Wilson) **MPC Report No. 00-113**

MPC-184 Accident Data Availability (UofU, P. Martin) **MPC Report No. 01-118**

MPC-185 Incident Detection Algorithm Evaluation (UofU, P. Martin) **MPC Report No. 01-122**

MPC-186 Evaluation of Road Weather Information System Data & Dissemination of Data to the Public (UofU, P. Martin) **MPC Report No. 01-119**

MPC-187 Survey of Educational and Human Capital Needs of the Transportation Construction Industry (NDSU, O. Salem) **MPC Report No. 02-134**

MPC-188 An Evaluation of the Impacts of ITS/CVO Technologies Throughout the Supply Chain (NDSU, B. Lantz) **MPC Report No. 01-117A**

MPC-189 The Differential Effects of Deregulation on Rail Rates (NDSU, J. Bitzan) **MPC Report No. 03-144**

MPC-191 Transportation and Logistics Characteristics of the Potato Industry: Implications for Highway Planning (NDSU, M. Berwick) **MPC Report No. 01-123**

MPC-192 Biennial Strategic Transportation Analysis (NDSU, G. Griffin) **MPC Report No. 01-127.1-5**

MPC-193 Rigorous Computer Modeling of Timber Trestle Railroad Bridges (CSU, R. Gutkowski) **Closed Letter on File 4/24/2014**

MPC-194 Effects of Environmental Exposure on Timber Railroad Bridge/Track Members and Connectors (CSU, R. Gutkowski) **MPC Report No. 04-167**

MPC-195 North Front Range Transportation Research Internships (CSU, R. Gutkowski) **MPC Report No. 01-124**

MPC-196 Moment-Rotation Tests of High Performance Steel I-Girders (CSU, B. Hartnagel) **MPC Report No. 03-148**

MPC-197 Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment (CSU, T. Sanders) **MPC Report No. 04-156**

MPC-198 Predicting the Fluctuations in Temperatures of Asphalt Pavements (UWY, C. Yavuzturk/K. Ksaibati) **MPC Report No. 02-136**

MPC-199 Low Volume Roads and Bridges (UWY, K. Ksaibati) **MPC Report No. 02-130**

MPC-200 Defining a Road Safety Audit Program for Enhancing Safety and Reducing Tort Liability (UWY, E. Wilson) **MPC Report No. 02-129**

MPC-201 Updating the Uniform Rail Costing System Regressions (NDSU, J. Bitzan) **Terminated 8/31/03**

MPC-202 Truck Costing Model for Transportation Managers (NDSU, M. Berwick) **MPC Report No. 03-152**

MPC-203 Containerized Grain & Oilseed Exporters - Industry Profile and Survey (NDSU, K. Vachal) **MPC Report No. 02-132** and **MPC Report No. 03-151**

MPC-204 Strategies for Improving DOT Retention and Motivation among Professional Staff (NDSU, G. Griffin) **MPC Report No. 02-137**

MPC-205 Predicting and Classifying Voluntary Turnover Decisions for Truckload Drivers (NDSU, G. Griffin) **MPC Report No. 02-135**

MPC-207 An Evaluation of Region 8 State Departments of Transportation and Metropolitan Planning Organizations' GIS Technology Application (NDSU, D. Benson) **Terminated, Corrupt Data, Unusable 2/2/14**

MPC-208 Surface Street Level of Service Using Existing Detector Infrastructure (UofU), P. Martin) **MPC Report No. 02-133**

MPC-209 Advanced Traffic Management System Evaluation Data Collection Methodology (UofU, P. Martin) **MPC Report No. 03-142**

MPC-210 Adaptive Signal Control for Downtown Salt Lake City (UofU, P. Martin) **MPC Report No. 03-141**

MPC-211 Evaluating and Improving the Safety of Pedestrian Crossing in Utah (UofU, W. Cottrell) **MPC Report No. 04-157**

MPC-213 Paratransit Coordination for Rural Communities (UofU, P. Martin) **MPC Report No. 04-161**

MPC-214 Pultruded Composite Shear Spike for Repair of Large Timber Members (CSU, D. Radford) **MPC Report No. 04-163**

MPC-215 Support Motion Effects in a Timber Trestle Bridge: Physical and Analytical Modeling (CSU, R. Gutkowski) **MPC Report No. 06-184**

MPC-216 Experimental Thick-Deck Wood-Concrete Highway Bridge Construction Year 1 and 2 (CSU, R. Gutkowski) **MPC Report No. 04-165**

MPC-217 Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment (CSU, T. Sanders) **MPC Report No. 04-156**

MPC-220 Costs, Pricing, and Regulatory Alternatives for Mergers (NDSU, J. Bitzan) **MPC Report No. 03-145**

MPC-221 Trip Generation Rates for Grain Elevators: A Tool for State and Local Highway Planners (NDSU, D. Tolliver) MPC **Report No. 06-185**

MPC-222 Strategies for Improving DOT Employee Retention and Motivation (NDSU, L. Kalnbach) **MPC Report No. 02-137**

MPC-223 Evaluating the Impact of DOTs QC/QA Programs on Pavement Performance: Year 2 (UWY, K. Ksaibati) **MPC Report No. 03-146 and MPC Report No. 04-160**

MPC-224 Utilizing the GLWT in Evaluating Moisture Susceptibility of Asphalt Mixes (UWY, K. Ksaibati) **MPC Report No. 02-138**

MPC-225 Evaluation of the I-15 High Occupancy Vehicle Lanes (UofU, P. Martin) **MPC Report No. 04-158**

MPC-226 Adaptive Signal Control for Downtown Salt Lake City, Part II (UofU, P. Martin) **MPC Report No. 03-141**

MPC-227 Small Urban University Transit: A Case Study (NDSU, J. Hough) **MPC Report No. 05-169**

MPC-228 Trucking Industry Churn and Its Impact on Communities and ITS Adoption (NDSU, J. Rodriguez) **MPC Report No. 08-193**

MPC-229 Asset Management of Roadway Signs through Advanced Technology (NDSU, Kellee Kruse) **MPC Report No. 03-149**

MPC-231 Automated Data Collection, Analysis, and Archival (UofU, P. Martin) **MPC Report No. 03-153**

MPC-232 Detector Technology Evaluation (UofU, P. Martin) **MPC Report No. 03-154**

MPC-233 Evaluate Effectiveness of Dilemma Zone Advanced Signal Warning (UofU, P. Martin) **MPC Report No. 03-155**

MPC-234 Simplified Impact Testing of Traffic Barrier Systems (CSU, R. Gutkowski) **MPC Report No. 03-143 & 05-172**

MPC-235 Highly Flexible Crash Barriers (CSU, P. Heyliger) **MPC Report No. 04-162**

MPC-236 Evaluation of Moisture Susceptibility of Asphalt Mixtures Containing Bottom Ash (UWY, K. Ksaibati) **MPC Report No. 04-159**

MPC-237 Affordable Trip Feasibility Scheduling for Rural Paratransit Systems (UofU, W. Grenney) **MPC Report No. 05-171**

MPC-238 Evaluation of Strategic Logistics of Rural Firms (NDSU, M. Berwick) **MPC Report No. 05-177**

MPC-239 Investment in Rural Roads: Willingness-to-Pay for Improved Gravel Road Services in Freight Transportation (NDSU, T VanWechel) **MPC Report No. 04-168**

MPC-240 Evaluation of Moisture Susceptibility of Asphalt Mixtures Containing Bottom Ash (UWY, K. Ksaibati) **MPC Report No. 06-179**

MPC-241 Evaluation of Pavement Crack Filling Materials (UWY, K. Ksaibati) **MPC Report No. 06-180**

MPC-242 Wyoming Freight Movement and Wind Vulnerability (UWY, R. Young) **MPC Report No. 05-170**

MPC-243 Assessment of Thermal Stresses in Asphalt Pavements Due to Environmental Conditions Including Freeze and Thaw Cycles (UWY, D. Yavuzturk) **MPC Report No. 06-181**

MPC-245 Video Imaging System Evaluation (UofU, P. Martin) **MPC Report No. 04-166**

MPC-246 High Occupancy Vehicle Evaluation II (UofU, P. Martin) **MPC Report No. 04-164**

MPC-247 Utilizing Recycled Glass in Roadway (UWY, K. Ksaibati) **MPC Report No. 07-192**

MPC-248 Wyoming Freight Movement System Vulnerabilities and ITS (UWY, R. Young) **MPC Report No. 13-261**

MPC-249 Pultruded Composite Shear Spike for Repair of Timber Bridge Members (CSU, R. Gutkowski) **MPC Report No. 05-173**

MPC-250 Interactive Effects of Traffic- and Environmental-Related Pavement Deteriorations (NDSU/UWY, D. Tolliver/K. Ksaibati) **MPC Report No. 10-255B**

MPC-251 Adaptive Signal Control IV (UofU, P. Martin) **MPC Report No. 06-182**

MPC-252 High Occupancy Vehicle Lanes Evaluation III (UofU, P. Martin) **MPC Report No. 05-174**

MPC-253 Effectiveness of Traveler Information (UofU, P. Martin) **MPC Report No. 05-175**

MPC-254 Utah Intersection Safety: Issues, Contributing Factors and Mitigations (UofU, W. Cottrell) **MPC Report No. 05-176**

MPC-255 Network Planning Model for Local and Regional Railroad Systems (NDSU, D. Tolliver) **Published in the State Rail Plan (2005)**

MPC-256 Legal Establishment of County Roads in Wyoming (UWY, K. Ksaibati) **MPC Report No. 07-191**

MPC-257 Legal Establishment of County Roads (UWY, K. Ksaibati) **MPC Report No. 07-191**

MPC-258 Utilizing Recycled Glass in Roadways (UWY, K. Ksaibati) **MPC Report No. 07-192**

MPC-259 Relating Vehicle-Wildlife Crash Rates to Roadway Improvements (UWY, R. Young) **MPC Report No. 07-189**

MPC-260 Impact Performance Testing of Roadway Safety & Security Barriers - Phase 3 (CSU, R. Gutkowski) **Formal Report, Letter on File Jun10**

MPC-261 Time-Dependent Loading of Repaired Timber Railroad Bridge Members (CSU, R. Gutkowski) **MPC Report No. 07-190 New Title: Durability and Ultimate Flexural Loading of Shear Spike Repaired, Large-Scale Timber Railroad Bridge Members**

MPC-262 Cambering of Wood-Concrete Highway Bridges (CSU, R. Gutkowski) **Closed/letter on file 4/24/2013**

MPC-263 Traffic Operations in Small Urban and Rural Areas (NDSU, A. Smadi) **Website: www.surtoc.org with on-line survey 11/1/07**

MPC-264 Evaluation, Definition, and Identification of the Criteria for Establishing Freight Corridors (NDSU, M. Berwick) **MPC Report No. 08-201**

MPC-265 Design/Build vs. Traditional Construction User Delay Modeling: An Evaluation of the Cost Effectiveness of Innovative Construction Methods for New Construction (UofU, P. Martin) **MPC Report No. 07-187A and MPC Report No. 07-187B**

MPC-266 Small Urban and Rural Transportation - Phase II (NDSU, A. Smadi) **Web Page established at http://www.surtc.org**

MPC-267 Estimating Local Economic Impacts of Rail Investments and Rail Capacity Constraints in the HRS Wheat Market (NDSU, K. Vachal) **Project Terminated 2/7/08**

MPC-268 Accessing International Container Markets from the Northern Plains (NDSU, K. Vachal) **Department Publication 149**

MPC-269 Economic and Environmental Implications of Alternative Fuel Use and Regulations in the Mountain-Plains Region (NDSU, M. Berwick) **MPC Report No. 08-203**

MPC-270 Serviceability Limits and Economical Steel Bridge Design (UWY, M. Barker) **MPC Report No. 08-203 (I)**

MPC-271 A Comprehensive Transportation Safety Evaluation Program in the State of Wyoming (UWY, K. Ksaibati) **MPC Report No. 09-215**

MPC-272 Use of Wind Power Maps to Establish Fatigue Design Criteria for Traffic Signal and Variable Message Structures (UWY, J. Puckett) **MPC Report No. 08-201**

MPC-273 Low-Cost Soft Crash Barriers (CSU, P. Heyliger) **MPC Report No. 08-198**

MPC-274 Beneficial Use of Waste Tire Rubber in Low-Volume Road and Bridge Construction (CSU, J. Carraro) **MPC Report No. 08-202**

MPC-275 Z-Spike Rejuvenation to Salvage Timber Railroad Bridge Members (CSU, R. Gutkowski) **MPC Report No. 08-208**

MPC-276 Use of Salvaged Utility Poles in Roadway Bridges (CSU, R. Gutkowski) **MPC Report No. 08-197**

MPC-278 Bus-Stop Shelters - Improved Safety (CSU, W. Charlie) **Closed/letter on file 10/25/2013**

MPC-279 Structural Applications of Self-Consolidating Concrete (SDSU, N. Wehbe) **MPC Report No. 11-194**

MPC-280 Bridge Scour in Cohesive Soils (SDSU, F. Ting) **MPC Report No. 08-195**

MPC-282 Express Lane Genetic Algorithm Microsimulation Modeling (UofU, P. Martin) **MPC Report No. 09-210**

MPC-283 Seismic Vulnerability and Emergency Response of UDOT Lifelines (UofU, P. Martin) **Project Postponed until further discussion 6/7/07**

MPC-284 Adaptive Signal Control Evaluation V (UofU, P. Martin) **MPC Report No. 08-200**

MPC-285 Structural Performance of Self Consolidating Concrete Made with Limestone Aggregates (SDSU, N. Wehbe) **MPC Report No. 08-186**

MPC-286 Developing System for Consistent Messaging on Interstate 80's Dynamic Message Signs (UWY, R. Youngs) **MPC Report No. 09-211**

MPC-288 Utah Department of Transportation Traffic Operations Center Operator Training (UUT, P. Martin) **MPC Report No. 10-229C, 10-229D, 10-229E, 10-229F**

MPC-287 Effectiveness of Using Recycled Asphalt Materials and other Dust Suppressants in Gravel Roads (UWY, K. Ksaibati) **MPC Report No, 13-251**

MPC-289 Evaluation of Optimal Traffic Monitoring Station Spacing on Freeways (UUT, P. Martin) **MPC Report No. 09-214**

MPC-290 Evaluation of Transit Signal Priority Strategies for Bus Rapid Transit Project on 3500 South Street in Salt Lake City, UT (SP) (UUT, A. Stevanovic) **MPC Report No. 09-215**

MPC-291 A New Generation of Emergency Escape Ramps (CSU, J. van de Lindt) **Merged and combined with MPC-328**

MPC-292 Traffic Safety Vulnerability Information Platform for Highways in Mountainous Areas Using Geospatial Multimedia Technology (CSU, S. Chen) **MPC Report No. 08-209**

MPC-293 Development of GIS Multimodal Capacity Model for Northern Tier Freight Corridor (NDSU, S. Mitra) **MPC Report No. 13-258**

MPC-295 Integrating Security into Small MPO Planning Activities (NDSU, M. Lofgren) **MPC Report No. 08-199**

MPC-296 Phase II, Driver Knowledge, Attitude, Behavior and Beliefs: Focus Group - Young Male Drivers (NDSU, T. VanWechel) **MPC Report No. 08-204**

MPC-297 Understanding Influence of Transportation and Other Factors on the Economic Growth on Non-metropolitan Cities (NDSU, K. Vachal) **Published at George Mason University, City Centers in Agricultural Regions: Nexus for Rural Economic Growth and Development, George Mason University, School of Public Policy, Dissertation Publication, 2005.**

MPC-298 Generating Public Involvement in Transportation Policy and Funding Decision Making Process (NDSU, J. Mielke) **Report on file with NDDOT due to confidentiality of data.**

MPC-299 Integrating Planning and Operations Models to Predict Work Zone Traffic (NDSU, A. Smadi) **MPC Report No. 08-205**

MPC-301 Sustainable Concretes for Transportation Infrastructure (CSU, R. Atadero) **MPC Report No. 10-220**

MPC-302 Enabling Innovate Steel Plate Grider Bridges: Simple Made Continuous (CSU, J.van de Lindt) **MPC Report No. 11-234**

MPC-303 Seed Project- Beneficial Use of Off Specification Coal Combustion Products to Increase the Stiffness of Expansive Soil-Rubber Mixtures (CSU, A. Carraro) **MPC Report No. 11-235**

MPC-304 Feasibility Study of Mobile Scanning Technology for Fast Damage Detection of Rural Bridges Using Wireless Sensors (CSU, S. Chen) **MPC Report No. 10-219**

MPC-307 Maximum Velocity and Shear Stress in Flow Fields around Bridge-Abutments in Compound Channels (University of Wyoming, R. Ettema) **MPC Report No. 11-237**

MPC-308 Phase I: Pilot Project to Develop Rural Youth Occupant Protection Education Platform (NDSU, T. VanWechel) **MPC Report No. 11-230**

MPC-310 Evacuation Modeling for Small to Medium Sized Metropolitan Areas (NDSU, S. Birst, M. Lofgren) **MPC Report No. 10-222**

MPC-311 Forecasting Bridge Deterioration Rates and Improvement Costs (NDSU, S. Mitra, D. Tolliver, K. Johnson) **JTRF, Summer 2011**

MPC-312 A GIS Model for Bridge Management and Routing (NDSU, S. Mitra, A. Dybing, K. Johnson, D. Tolliver) **JTRF, Summer 2011**

MPC-313 Evaluation of LRT and BRT Impact on Traffic Operations in Salt Lake City Metropolitan Region (University of Utah, A. Stevanovic, P. Martin) **MPC Report No. 09-213, 09-213B**

MPC-314 Assessing the User Impacts of Fast-Track Highway Construction (ABC)(University of Utah, P. Martin) **MPC Report No. 10-228A, 10-228B**

MPC-317 Development of Safety Screening Tool for High Risk Rural Roads (SDSU, X. Qin) **MPC Report No. 11-231**

MPC-318 Investigating Crashes and Geometric Conditions in the State of Wyoming (UWY, K. Ksaibati) **MPC Report No. 13-262**

MPC-319 Gravel Roads Management: Developing a Methodology (UWY, K. Ksaibati, G. Huntington) **MPC Report No. 11-238**

MPC-320 Pricing Strategies for Rural Freeways (UWY, S. Boyles) **MPC Report No. 12-246**

MPC-321 Salt Lake City Internship (UUT, P. Martin) **Project terminated, unable to secure match funding.**

MPC-322 Driver Simulation (UUT, P. Martin) **MPC Report No. 12-247**

MPC-323 Risk-based Advisory Prevention System for Commercial Trucks Under Hazardous Conditions (CSU, S. Chen) **MPC Report No. 11-242**

MPC-324 Reliability-based Safety Risk and Cost Prediction of Large Trucks on Rural Highways (CSU, J. Balough, R. Atadero) **MPC Report No. 11-243**

MPC-325 Fatigue Testing of Wood-Concrete Composite Beams (CSU, J. Balough, R. Atadero) **MPC Report No. 13-252**

MPC-326 Rapid Load Rating of Short Rural Bridges (CSU, J. Lindt) **MPC Report No. 11-236**

MPC-328 Low-Impact High-Toughness Transportation Barriers (CSU, P. Heyliger) **MPC Report No. 12-249**

MPC-329 Traffic Safety: Pilot Study to Assess Sustained and Multifaceted Activity on North Dakota's Rural Roads (NDSU, K. Vachal, A. Huseth) **MPC Report No. 11-233**

MPC-330 Integrate Supply Chain Model in Urban Freight Planning (NDSU, S.Mitra, D. Tolliver) **MPC Report No. 13-259**

MPC-331 Using ND Traffic Records to Identify Higher Rist Teen Drivers (NDSU, K. Vachal, D. Malchose) **MPC Report No. 11-232**

MPC-333 Implementing Traffic Safety Evaluations to Enhance Roadway Safety (NDSU, J.Baker, K. Johnson, M. Berwick, K. Vachal) **MPC Report No. 10-218**

MPC-334 Proper Seat Placement of Children Aged 4 to 12 within Vehicles (NDSU, A. Huseth) **MPC Report No. 10-227**

MPC-335 Misinformation Contributing to Safety Issues in Vehicle Restraints for Children (NDSU, A. Huseth) **MPC Report No. 13-264**

MPC-336 ND Wheat Transportation Knowledge for Market Enhancement (NDSU, K. Vachal, D. Benson) **MPC Report No. 10-224**

MPC-337 Analysis of Freight Fuel Efficiency with Comparisons to Waterways and Truck Transportation (NDSU, D. Tolliver, D. Benson, P. Lu) **MPC Report No. 12-250**

MPC-338 Use of Wind Power Maps to Establish Fatigue Design Criteria for Traffic Signal and High Mast Poles-Phase II (UWY, J. Puckett, M. Barker) **MPC Report No. 11-240**

MPC-339 MEPDG Analysis of ESR Subgrade Stabilized with Off-Specification Fly Ash (CSU, A. Carraro) **CSU Thesis, "Fatigue and Rutting Alalyses of a Pavement Structure with Expansive Soil-Rubber (ESR) Base Stabilixzed with Off-Specification Fly Ash, Baudagher, Emily, Fall 2012.**

MPC-340 Long Term Performance of FRP Repair Materials (CSU, R. Atadero) **MPC Report No. 13-253**

MPC-341 Off-grid MEMS Sensor Configurations for Transportation Structures (CSU, P. Heyliger) **MPC Report No. 13-257**

MPC-342 Seismic Vulnerability Analysis of Bridges in Mountainous States (CSU, S. Chen) **MPC Report No. 13-255**

MPC-344 What Can We Learn About Making Driving Safer for Teen Drivers from Crashes in Three Rural States? (NDSU, K. Vachal) **NDSU, Thesis, Early Experiences with Teen Graduated Driver Licensing in Wyoming, Nelson, Joshua, MS and Vachal, Kim UGPTI, NDSU, May 2012**

MPC-345 Systems Analysis to Improve Local Road Safety; Phase I (NDSU, K. Vachal) **Department Publication 256**

MPC-346 Marginal Cost Pricing and Subsidy of Transit in Small Urbanized Areas (NDSU, J. Mattson) **MPC Report No. 11-241**

MPC-347 Misinformation Contributing to Safety Issues in Vehicular Restraints for Children (NDSU, A. Huseth-Zosel) **MPC Report No. 13-264**

MPC-348 Transit Ridership and the Built Environment (NDSU, D. Peterson) **MPC Report No. 11-239**

MPC-353 Comparing Crash Trends and Severity in the MPC Region (UWY, K. Ksaibati) **Department Publication 241**

MPC-355 Quantifying the Impact of Very High Heavy Vehicle Proportion on Rural Freeways (UWY, S. Boyles) **MPC Report No. 13-265**

MPC-356 Truck Size and Weight Education (NDSU, M. Berwick) **Powerpoint, ND Truck Size and Weight Education Program, NDSU, RTSSC, UGPTI**

MPC-359 Regional Roadway Surface Management Guidance Documents (NDSU, D. Tolliver) **Closed/Department Publication 2012**

MPC-360 Safety Impacts of Design Exceptions in Utah (UUT, R. Porter) **MPC Report No. 11-248**