

# YEAR IN REVIEW • 2010 ANNUAL REPORT





Colorado State University • North Dakota State University  
South Dakota State University • University of Utah • University of Wyoming

Mountain-Plains Consortium  
Upper Great Plains Transportation Institute  
North Dakota State University • Dept 2880  
PO Box 6050 • Fargo, ND 58108-6050  
(701) 231-7938 (T) • (701) 231-7067 (F)

[www.mountain-plains.org](http://www.mountain-plains.org)

North Dakota State University does not discriminate on the basis of age, color, disability, gender identity, marital status, national origin, public assistance status, sex, sexual orientation, status as a U.S. veteran, race or religion. Direct inquiries to the Vice President for Equity, Diversity and Global Outreach, 205 Old Main, (701)231-7708.

This publication is available in alternative formats upon request.

# CONTENTS

---

Directors Message .....	1
Student Program Activities.....	3
Student Profiles.....	9
Research Highlights .....	19
Technology Transfer .....	26
Faculty Activities.....	29
The Mountain-Plains Consortium.....	33
Historical Accomplishments .....	34
Management Structure .....	34
Center Director.....	34
University Program Directors.....	34
Executive Committee.....	35
Transportation Learning Network (TLN).....	35
TLN Board and Programming Committee .....	35
Professional Input and Review .....	35
Accountability for Decisions.....	35
Annual Site Visits .....	36
Regional Coordination.....	36
Executive Committe .....	36
Key Faculty.....	38
Resources and Funding .....	44
Research Project Status.....	45

## DIRECTOR'S MESSAGE

---



Since the establishment of the Mountain-Plains Consortium in 1988, one of its hallmarks has been collaboration. Because the consortium is made up of four universities, close collaboration is not an option, but a necessity for success. But that collaboration has not been limited to the members of the consortium. MPC faculty and staff have worked with a broad variety of stakeholders including state and local transportation agencies, businesses, associations, other universities and federal agencies. This collaboration has assured that our work addresses the key transportation needs of our region and the nation.

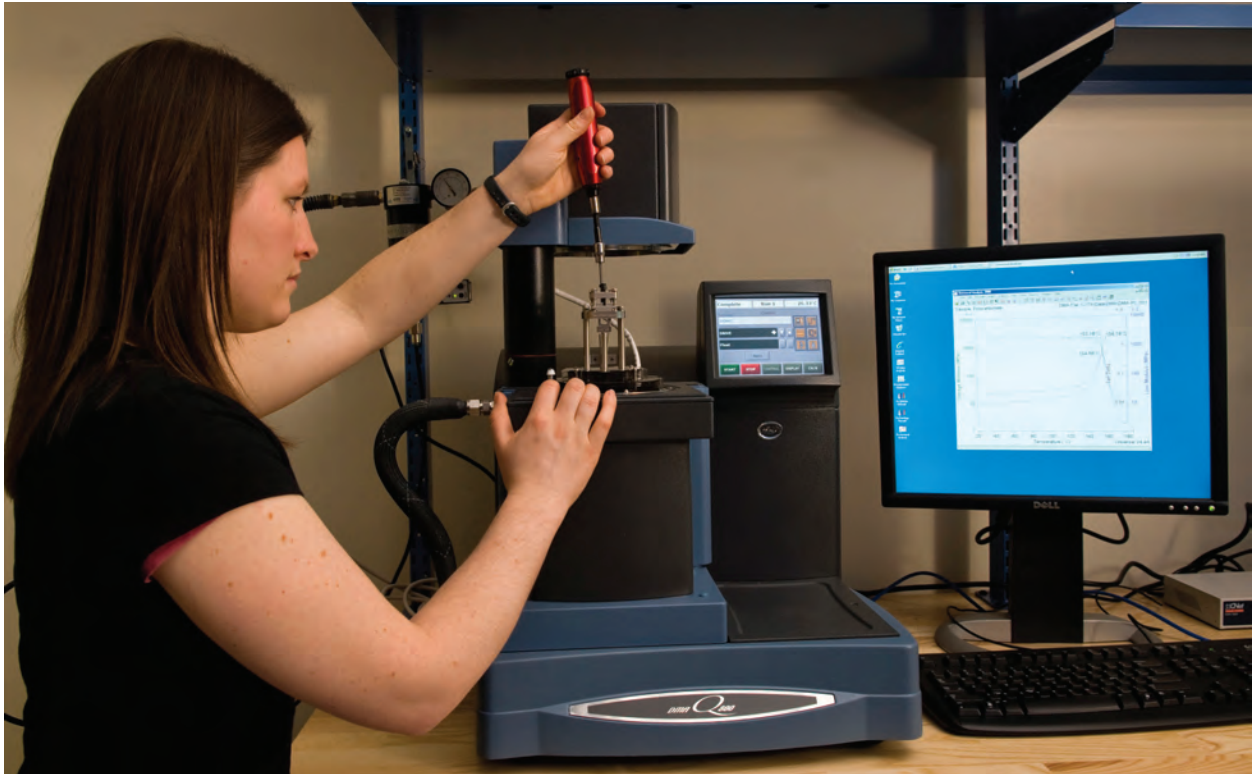
Collaborative efforts have been particularly evident in the past year. The Mountain-Plains Consortium has worked with the eight other University Transportation Centers and the Transportation Research Board on a conference on national freight planning – particularly a workshop on the performance and optimization of multimodal freight corridors and waterway transportation. This conference was the latest in a number of MPC-sponsored events over the years designed to generate innovative approaches to enhancing the capacity and efficiency of the nation's freight-transportation system.

MPC has always had a close working relationship with state departments of transportation in our region. In cooperation with the FHWA's Local Technical Assistance Programs and the Transportation Learning Network, we are meeting the training and education needs of transportation professionals across the Intermountain West. Using on-line and video technology, we are helping DOTs, counties, cities and other road agencies meet training needs and mandates while keeping travel and program costs low. MPC in conjunction with all RUTC's have joined efforts to offer the Transportation Leadership Graduate Certificate Program, which focuses on educating early career transportation professionals. In the program, University Transportation Centers provide classes via distance-education techniques to professionals who want advance their education, skills and careers.

This year, the MPC has also stepped up its interaction with Tribal transportation agencies. The MPC is helping those agencies use new tools to improve transportation planning, safety and maintenance. The Tribal Technical Assistance Centers in the region have been a key partner in this effort. MPC projects are helping tribal agencies employ new modeling and projection tools to their road planning efforts to assure that funding for infrastructure is used most effectively. At the same time, the MPC is helping to build the intellectual capital of tribal road managers and workers. Ultimately, the consortium hopes the relationship with the tribes and reservations will facilitate a flow of Native American students into university transportation programs.

These students will join a growing number of students in the transportation graduate education programs at MPC universities. The students gain a foundation in traditional transportation disciplines like engineering and logistics, but new courses in areas such as transportation modeling, geographic information systems, safety and security and other emerging areas will assure that they are equipped for the next generation of transportation-related opportunities and challenges.

Thank you for your interest in the efforts of the MPC. This report details our student and faculty successes, research programs and our technology transfer activities. These accomplishments are evidence of the creativity and hard work of our faculty and the caliber of our students.



## STUDENT PROGRAM ACTIVITIES

---

### **Koch Named Student of the Year**

Scott Koch of the University of Wyoming was named the Mountain-Plains Consortium's University Transportation Center Student of the Year for 2009. Koch received the award at the 2010 Transportation Research Board Meeting in Washington, DC, in January.

Koch received his M.S. degree in civil engineering from the University of Wyoming and earned his B.S. degree in civil engineering from UW in 2009. He was an undergraduate research assistant in the Department of Civil and Architectural Engineering in 2008 where he managed traffic counter equipment, performed traffic studies, surveyed road users, and assisted with graduate studies data collection. Since 2008, Koch has been a research assistant for the Wyoming Technology Transfer Center. His research has focused on the use of recycled asphalt pavement in gravel roads as well as exploring the implementation processes associated with the Mechanistic-Empirical Pavement design Guide. His thesis is focused on the use of recycled asphalt pavement as a dust suppressant on gravel roads. He has performed surface distress surveys, and collected dust samples and moisture samples on eight test sections throughout Wyoming. He then used the data to conduct an analysis of the performance of the material in gravel roads. A paper on the work has been completed and submitted for publication.

Koch holds a 4.0 GPA for his graduate studies and was named to the College of Engineering and Applied Science dean's list every year during his studies at UW. He has received several scholarships including the Colorado-Wyoming Institute of Transportation Engineers Scholarship for 2009.

In addition to his research duties, Koch is a teaching assistant for soil mechanics, a junior level course at UW. He is currently the president of the UW Institute of Transportation Engineers student

chapter, is a member of Tau Beta Pi (engineering honor society), and is a member of the UW Cowboy Football Program as well as the UW Rugby Program.

### **NDSU Graduate School Announces New Degree Programs**

NDSU's Graduate School added new graduate programs for the 2009-10 academic year. The Transportation and Logistics Program in the College of Graduate and Interdisciplinary Studies now offers two new graduate degrees and two new certificate programs. The programs focus on urban transportation systems; linkages between transportation, land use, the environment, emergency response, and logistical delivery systems; coordinated planning, operations and security; and the spatial dimensions of urban systems.

- The Master of Science in Transportation and Urban Systems degree is targeted at students with strong research interests and capabilities who want to work in the fields of research or education.
- The Master of Transportation and Urban Systems degree is targeted at mid-career professionals and other candidates who want to gain skills appropriate to their career without participating in advanced research.
- The Transportation and Urban Systems Certificate is a program designed to enhance working professionals' credentials in the transportation and logistics field.
- The Transportation Leadership Graduate Certificate is an online program designed to prepare future leaders of the transportation industry. This prestigious program is an initiative of the Regional University Transportation Centers.



### **Lee Inducted into Tapestry of Diverse Talents at NDSU**

NDSU transportation and logistics student Eunsu Lee was inducted into the Tapestry of Diverse Talents in December.

The Tapestry of Diverse Talents, a program of the NDSU Memorial Union, recognizes students, faculty, staff, and alumni for the diversity and contributions they bring to North Dakota State University. Each semester, individuals are added to the Tapestry, reflecting the ages, classes, ability, ethnicity, gender, races, regional differences, sexual orientations, beliefs, and values of the university community. The Tapestry kindles the spirit to diversify diversity. Lee was one of two individuals inducted into the tapestry for the fall semester.

Lee, of South Korea, received his B.S. in computer engineering from Kwandong University in South Korea in 1996. Then, Lee received his MBA from Hanyang University, also in South Korea, in 1999. Currently, Lee is working on his M.S. degree. He currently researches at the Upper Great Plains Transportation Institute in the areas of multimodal routing, logistics network simulation, and aviation planning.

The award recognizes Lee's efforts to provide information and news to people who want to share Korean language and culture for diversity and support communication among students, faculty, and Fargo-Moorhead people who are interested in Korean culture. Lee was one of the founders of the "Bison Herald," an organization, online forum and newspaper directed at those goals.

## NDSU Students Honored

Two NDSU transportation and logistics doctoral students were honored for their academic achievements. Eunsu Lee's paper, "Estimating trip diversion by using impedance in flooding regions," was one of the winners in the GIS-T Student Paper Contest. The paper was presented in April 2010 at the GIS-T Symposium in Charleston, WV. Lee won a paid registration to the symposium and a cash award. Lei Fan was awarded a \$750 scholarship by the Transportation Research Forum Foundation. He was selected for the award based on his academic record and scholastic achievement.

## Student Presents Research at World of Coal Ash



CSU student Carolyne Namagga presented her paper titled "Optimization of Fly Ash in Concrete: High Lime Fly Ash as a Replacement for Cement and Filler Material" at the 2009 World of Coal Ash Conference in Lexington, KY in May 2010.

Namagga is an M.S. student working with assistant professor of civil and environmental engineering Rebecca Atadero. Her research is funded by the MPC project Sustainable Concretes for Transportation Infrastructure. She is investigating the effect of a local fly ash on the strength, freeze-thaw durability, and bond strength of concrete.

## NDSU Hosts Senate Armed Services Committee Staffer

NDSU's Transportation and Logistics Program hosted Creighton Green, professional staff member with the U.S. Senate Armed Services Committee, on Sept. 3, 2009. Greene spoke about the policies and procedures of the committee.

Greene also gave background information on his position as the committee's staff member for transportation and logistics. He discussed the role of logistics management for the best logistic systems and suppliers in order to keep the leadership in warfare and support the needs of the warfighter and ended his presentation by taking questions from students.

Greene is a professional staff member supporting the subcommittees on Seapower, Airland Forces and Strategic Forces. His responsibilities include reviewing the Air Force, Navy, and Marine Corps aviation program; Navy shipbuilding programs; Navy and Air Force conventional investment programs; and defense-wide intelligence programs.

"Mr. Green provided some good insights on how civilian leaders focused on military logistics systems and how important these systems are for accomplishing the country's strategic objectives," said Jeremiah O'Connor, a graduate student in transportation and logistics. Other students who attended the presentation included Khalid Bachkar, Charles Briggs, Lei Fan, Xing Lu, Annie Thomison, Kartik Sundhar, as well as transportation and logistics academic program director Jody Bohn.

## Students Attend North American Freight Flows Conference

Transportation and logistics graduate students attended the North American Freight Flows Conference in Irvine, CA. Doctoral student Christopher DeHaan presented "Analyzing Freight Data between the Borders in North America" for the conference's Innovative Uses of Data session. His presentation discussed an analysis of the rail gateways on the U.S.-Canada and U.S.-Mexico border for 2008. Doctoral students Qing Liu and Eunsu Lee also attended the conference. The Association of Transportation and Logistics sponsored the students' attendance at the event. The North American Freight Flows Conference was hosted and organized by the Transportation Research Board and brought together government and industry managers, analysts, and data specialists concerned with North American freight flows. A main objective of the conference was to identify improvements in the availability and use of freight transportation data in North America and to identify areas that require future research.



### Student Attends NSF Conference

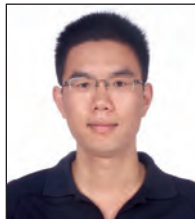


CSU Ph.D. candidate Jun Wu received student grants to attend the National Science Foundation Civil, Mechanical and Manufacturing Innovation Conference held in Hawaii. She gave a poster presentation about her research on lifetime

analysis and damage detection of long-span bridges. The conference had an international attendance of 1,500 people from academia, industry, and government, and address issues related to globalization, specifically in the context of research and education. Conference activities included more than 700 poster presentations, and plenary and breakout sessions on funding opportunities and proposal writing, research needs, opportunities, and best practices.

### Student Makes Presentation to NIOSH Center

CSU Ph.D. candidate Feng Chen gave a presentation about I-70 traffic safety study at the Mountains and Plains Education and Research Center's (MAP ERC) second annual research symposium in November 2009. The study is part of a project funded by MAP ERC, which is the education and research center of the National Institute for Occupational Safety and Health.



### Transportation and Logistics Students Tour BNSF Facilities

Students in NDSU's Association of Transportation and Logistics toured Dilworth's Burlington Northern Santa Fe (BNSF) Railway facilities last spring. The tour, which allowed students to interact with yardmasters, gave students a better understanding of railroad terminal operation.

The students study intermodal transportation and rail technology to identify shippers' and carriers' advantages. The visit to Dilworth's BNSF railroad terminal allowed the students to gain a better understanding of the concepts presented in class through first-hand observation. Students also gained a better understanding of the importance of safety and technical assistance.

"The tour was very beneficial because it gave us real experience with the rail industry," said student Lei Fan. Others who participated in the tour were EunSu Lee, leelong Chen, and Subhro Mitra.

### MPC Funds Scholarships

The Upper Great Plains Transportation Institute awarded two \$1,500 scholarships to civil engineering students at its annual awards banquet in October 2009. Garrett Brunell, a senior from Elk River, MN, and Thomas Kading, a senior from Park Rapids, MN, received Transportation Engineering Scholarships. The scholarships recognize academic achievement and promote the education of transportation students at NDSU and are funded by the Mountain-Plains Consortium.



Brunell



Kading

### Students Attend International Transport Economics Conference

NDSU transportation and logistics graduate students attended the International Transport Economics Conference June 15-16 at the University of Minnesota. The MPC sponsored their trip.

The International Transport Economics Conference brings together researchers, practitioners, and policy makers interested in questions of transport economics. Key topics of the conference included revenue and finance; congestion, pricing, and investment; production function and cost estimation; transport demand; energy and environment; safety; institutions and industrial organization; and transport and land use.

NDSU's transportation and logistics graduate student Lei Fan presented his paper, "Global Supply Chain in Container Shipments: Impacts of Congestion on Imports to United States," at the conference. Other students who attended the conference included Qing Liu, EunSu Lee, Elvis Ndembe, Khaled Bachkar, Eileen Campbell, Steven Leon, leelong Chen, and Chris DeHaan.

## **NDSU Graduate Hired by BNSF Logistics**

Ashley Goldade, an NDSU graduate with a Master's Degree in Agribusiness and Applied Economics with an emphasis on transportation, was recently hired by BNSF Logistics as Regional Business Development Manager and will be based in Minot, N.D.

In this position, Goldade will manage BNSF Logistics relationship with the North Dakota Port Services by ensuring data flow and expanding services. She also will work on improving relationships with key importers and exporters, as well as working to identify new domestic business. Finally, Goldade will be a part of carrier development to ensure sufficient ocean carriers to service Minot by providing capacity, rates and trade lanes.

Goldade says she is excited about the opportunity with BNSF Logistics. She looks forward to being part of Minot's success and understands the importance of shipping options for North Dakota exporters. Goldade's previous research showed Minot to be a cost minimizing solution for exporters.

Goldade's graduate work was sponsored by the MPC. She conducted research on establishing an intermodal facility in North Dakota, focusing on containership lines and railroad networks. Additionally, she looked at strategies for connecting imports and exports to manage volumes in North Dakota for BNSF. Goldade believes that her research set her up for success in her new position. The research closely parallels what she will be doing with BNSF Logistics to analyze cost minimizing solutions to agriculture shippers throughout the state. Goldade credits her advisor Dr. William Wilson and Bruce Dahl for much of her success at NDSU.

## **MPC Expertise Now at Use in Peace Corps**

A former MPC student and graduate of CSU is putting his expertise to use in Kenya with the Peace Corps where he will be teaching math and will be involved in water engineering projects.

The 27-month assignment is a dream come true for Chris Turnbull-Grimes. "I love to travel," he said. "I've always wanted to go places. My long-term goal has always been to do this (join the Peace Corps)."

This is not the first time Turnbull-Grimes has gotten his hands dirty through involvement in projects outside of the United States. He travelled four times to El Salvador with the CSU chapter of Engineers Without Borders where the group drove a well, installed a pump, and developed a distribution center where area residents could get fresh water. The goal was to provide a sustainable source of clean water for a village of 500 that relied on hand-dug wells that often dried up during the area's dry season.

Turnbull-Grimes specialized in structural engineering in his degree programs. While at CSU, he was involved in MPC research to test crash barriers and to study alternative materials, such as wood, for those barriers. "The research projects at CSU, particularly the MPC projects, were a crucial part of my education," he says. "The biggest thing for me was the experience of learning how to take a project from start to finish and how to write reports to communicate your research."

While at CSU, Turnbull-Grimes served as president of the ASCE student chapter and co-captain of its steel bridge team.

## **Paper accepted for Research and Teaching Symposium**



Khalid Backhar's paper, "A Decision Support System for Supplier Selection in a Chemical Firm Supply Chain: A Case Study Leveraging Analytic Hierarchy Process Model," was selected to be presented at the 20th Annual North American

Research and Teaching Symposium on Purchasing and Supply Chain Management in March. The annual symposium is presented by the Institute for Supply Management. Co-authors of the paper are Chris Enyinda and Denver Tolliver.



# STUDENT PROFILES

---

## COLORADO STATE UNIVERSITY

**Susan Balogh** is pursuing doctoral studies and research in the area of mechanics of solid wood deck systems and connections for interfacing with concrete in layered composite deck bridges. She earned an M.S. in civil engineering in 1995 from Budapest University of Technology and Economics. Presently, she is assistant professor at Metropolitan State College of Denver, where she serves as program coordinator for the Civil Engineering Technology academic program. Following her M.S. degree, she was principal engineer and a professional structural designer for BALO, LTD., in Budapest, Hungary. Following that, she was coordinator of the testing group for INTER-CAD, LTD., a structural software development company, also located in Budapest.

**Feng Chen** received his master's degree and bachelor's degree from China Academy of Building Research and Peking University, respectively. Chen worked on wind effects on buildings between 2004 and 2007 and he has just started his second year Ph.D. study with Dr. Suren Chen at CSU. His Ph.D. research focuses primarily on transportation safety under adverse environmental conditions. He has been working on several research projects from different sponsors including one from MPC. He has published and presented his research findings in several conferences.

**Thang Dao** completed his Ph.D. in the spring of 2010 and is now a post-doctoral student in Alabama. He earned his B.S. in Vietnam and his M.S. from CSU in 2005 related to genetic algorithms applied to structural optimization. For his Ph.D., he studied spatio-temporal load control on structures such as railroad bridges.

**Jordan Jarrett** earned her M.S. degree in structural engineering from CSU in August 2009. As a student, she worked on several MPC projects including those related to flexible highway barriers. Jarrett is continuing work related to structures and dynamics as a Ph.D. candidate in civil engineering at Virginia Tech.

**Carolyne Namagga** earned her master's in the spring of 2010. She holds a B.S. degree in civil engineering and is currently pursuing an M.S. degree in structural engineering at Colorado State University. She previously was employed for two years at an engineering consulting firm as a design engineer. While at CSU she worked on various projects which involved structural design and supervision, soil investigations, and preparation of civil/structural drawings. She also worked as a research assistant at the Department of Civil and Environmental Engineering investigating the optimal usefulness of fly ash in structural concrete.

**C.J. Riley** completed his PhD in fall 2009 and is now an assistant professor at Oregon Institute of Technology. Riley received his B.S. in engineering from Swarthmore College in Pennsylvania in 2001. He came home to Colorado to obtain his master's from CSU in 2003. After two years working with the Wyoming DOT developing design software for transportation structures, Riley returned to CSU to complete a Ph.D. in structural mechanics with a focus on the numerical analysis of flexible structures.

**Chris Turnbull-Grimes** completed his master's degree in fall 2009 and is now in the Peace Corps. Turnbull-Grimes received his B.S. degree in civil engineering from Colorado State University in spring 2007. He is a past president of the ASCE student chapter and co-captain of its steel bridge team. He was a research aide on MPC projects on improved safety of bus shelters and upgrading a vehicle impact facility to Department of State standards for testing anti-terrorism structures.

**Ethan Wiechert** earned his B.S. degree in civil engineering from Colorado State University in 2002. Professionally, he has practiced in the fields of structural and geotechnical engineering. Ethan is currently a senior project engineer at Earth Engineering Consultants, Inc. of Windsor, CO, and is registered as a professional engineer in the state of Colorado. In 2008, he started his graduate studies in the geotechnical engineering program at CSU and has worked as a research assistant.

His research project is entitled “Beneficial Use of Off-Specification Coal Combustion Products to Increase the Stiffness of Expansive Soil and Rubber Mixtures.”

**Jun Wu** finished her master’s and bachelor’s degrees at Chang’an University in China and is currently pursuing her Ph.D. degree in the structure group at CSU. Wu’s research interest is focused on bridges and her research study focuses on lifetime analysis and damage detection of long-span bridges. She has been involved in several research projects including MPC research projects. Her research results have been reported in several journal and conference papers.

## **NORTH DAKOTA STATE UNIVERSITY**

### **Doctoral Students**

**Monsur Ahmed** is a Ph.D. student in transportation and logistics specializing in transportation economics. While studying for his Ph.D., Monsur has been working as a graduate research assistant at the Upper Great Plains Transportation Institute since fall 2008. Ahmed received both his bachelor’s and master’s degrees in economics in the United States. Ahmed’s research focuses on economic and financial aspects of transportation investments and operations.

**Khalid Bachkar** earned his Ph.D. in transportation and logistics from NDSU in 2010. He will teach global logistics and supply chain management at the California State University Maritime Academy where he will also conduct research in the area of supply chain security. Bachkar’s area of research interest at NDSU was in logistics and supply chain management, maritime transportation as well as supply chain security and supply chain risk management. His dissertation was titled, “Assessing the Security Risk in Global Container Supply Chains using Analytic Hierarchy Process Model.”

**Charles Briggs** earned his Ph.D. in transportation and logistics from NDSU in 2010. His primary area of study was supply chain management and his dissertation was titled, “Risk assessment in the Upstream Crude Oil Supply Chain: Leveraging Analytic Hierarchy Process.” He is returning to Alabama A&M University where he will continue his teaching and research career in the School of Business.

**Eileen Campbell** received her undergraduate degree in marketing with a concentration in e-commerce and an MBA from the Florida Gulf Coast University. Campbell began her studies at NDSU in 2008. Upon completion of her degree

Campbell hopes to continue her career at a research university where she will also teach. She is interested in the implications of port capacity on corporations with global operations particularly with regard to the outsourcing of manufacturing and the ports’ ability to facilitate the large volume of imports to the United States. Campbell is also interested in how technology can increase opportunities for companies to embrace the green supply chain and become environmentally responsible.

**Yolanda Carson** of Buffalo, NY, is working on her second Ph.D. Carson received her B.S. in industrial engineering in 1986 and M.S. in industrial engineering in 1988 both from State University of New York at Buffalo. Yolanda went on to earn her first Ph.D. in industrial engineering and systems science in 1998 from the State University of New York at Binghamton. Yolanda is interested in the research areas of transportation optimization and modeling and simulation of transportation networks. Upon completion of her Ph.D. in transportation and logistics, Carlson would like to teach, do research, publish, and consult in the area of operations research, where the focus will be on modeling and simulation, optimization, statistical analysis, and strategy development for applications in transportation, logistics, and supply chain systems. Carson spent 12 years with Lockheed Martin Corporation, working in various engineering positions. Her most recent position was project engineering manager in the logistics and sustainment organization.

**Peter Chen** of Kaoshiung City, Taiwan, recently started his Ph.D. in transportation and logistics. He received his MBA from California State University, in Carson, CA, in 1999. Chen became interested in understanding how practicing collaborative management (CTM) in the rail carriers and environmental context affect their operational decisions. Also, he is interested in implementing radio frequency identification (RFID) to improve overall supply chain performance dynamically. Chen is studying how to apply the CTM concept and RFID technology and integrate it with the current railroad service providers’ information systems to improve the efficiency of the railroad operations. He believes that the CTM and RFID aid visibility helps increase the entire logistics performance of the supply chain. Chen aims to strengthen his analytical judgment and execution skills to meet the needs of practical operations.

**Xianzhe Chen** finished his Ph.D. in the summer of 2010. Chen received his B.S. in automation and business administration from the Wuhan University of Technology in China in 2003. He came to NDSU, earning an M.S. in industrial engineering in 2006.

Chen is interested in researching quality, logistics and supply chain management, forecasting, and time series.

**Christopher DeHaan** of Fargo, ND, is currently working on the Ph.D. in transportation and logistics. DeHaan received his B.S. in manufacturing engineering from NDSU in 2006. In 2009, he received his MBA from NDSU. He is currently working part-time as an engineering manager at a local small business. He is interested in supply chain management and transportation security issues.

**Nimish Dharmadhikari** is currently working on his Ph.D. in transportation and logistics after receiving his M.S. from NDSU in industrial engineering and management. Dharmadhikari also holds a bachelor's degree in mechanical engineering from University of Pune in India. His current research addresses simulation models in the healthcare system. He plans to develop a railroad simulation model in the future.

**Lei Fan** earned his Ph.D. in transportation and logistics from NDSU in 2010. His primary interest was in supply chain logistics for freight shipments. Fan's dissertation was titled "Optimization Model and Risk Analysis for Global Supply Chain in Container Shipments: Imports to the United States." He will pursue a career in conducting analysis and planning in the merchandising and trading industry using quantitative methodologies.

**Thomas Flanagan** received his B.S. from the United States Air Force Academy in Colorado Springs, CO. He also received a M.B.A. from Chapman University in Orange, CA. He earned an M.S. in global supply chain management from the University of Alaska at Anchorage. Flanagan does research at the UGPTI on remote logistics, remote disaster response, business development, military logistics, and global air logistics. In the future, Flanagan hopes to research the impacts and implications of transportation and logistics availability on the quality of life of remote arctic communities. In addition, he would like to help the development of Alaskan businesses by lowering rural logistic costs. Finally, by teaching, he hopes to help students reach their full potential.

**Maher Itani** of Beirut, Lebanon, is currently enrolled in the transportation and logistics Ph.D. program at North Dakota State University. His current research focuses on identifying the logistical challenges faced by today's humanitarian organizations. Itani received his bachelor's degree in mathematics from the American University of Beirut in 1992. In 1996 Itani earned a master's degree in business administration. In 2008, he received his MCIPS from the Chartered Institute of

Purchasing & Supply in Stamford, United Kingdom. Upon completion of the program, Itani plans to continue his work at the United Nations

**Poyraz Kayabas** of Ankara, Turkey, received a B.S. in mathematics and computer science and another B.S. in industrial engineering from Cankaya University in Ankara, Turkey, in 2003. He moved to Fargo, ND, in 2004 and in 2007 completed his M.S. in industrial engineering and management at NDSU. Kayabas is interested in supply chain management and optimization.

**EunSu Lee** received his B.E. in computer science and engineering from Kwandong University at the city of Gangneung and M.B.A. in service and operations management from Hanyang University in Seoul, South Korea. Then, Lee received M.S. in industrial engineering and management in 2006 and currently is pursuing his Ph.D. in transportation and logistics. He has field experiences in program developing, enterprise resource planning consulting, and logistics consulting. He is currently a graduate research assistant at the Upper Great Plains Transportation Institute in the areas of general aviation planning, freight analysis, highway safety analysis, and emergency medical service routing analysis with geospatial systems. His dissertation investigates the significance and patterns of the containerized freight movement in North America based on the temporal and geospatial simulation utilizing operations research and GIS.

**Steven Leon**, originally from Odenton, MD, graduated magna cum laude from the University of North Dakota in 1990 with a degree in aeronautical sciences. He continued his education at Loyola College in Maryland where he received his MBA in International Business in 2006. Leon's research interests include transportation policy and its effect on global business strategic and operational decision making, network planning, and creating customer value through strategic partnerships. Leon would like to teach, conduct research and consult in the fields of transportation and supply chain management.

**Qing Liu** finished her college study in maritime transportation and port management from Dalian Maritime University, China, in 2007. After that, she came to NDSU, pursuing her Ph.D. degree in transportation and logistics. Her primary research interest is port operation, container shipping, and supply chain management. She is currently working on her dissertation on container port efficiency and terminal operations, and hopes to graduate by 2012. After graduation, Qing is will seek a career where she can teach and conduct research.

**Pan Lu** earned her B.S. at North China Electric Power University in 2002. She is currently a teaching assistant in the transportation and logistics program. Her primary research interest is developing mathematical models for asset management. Currently, she is working on a transportation fuel efficiency study which examines the relative efficiencies of surface transportation modes, and is using LTPP data to test statistical models of pavement performance using LTPP data.

**Jeremy Mattson** began working with UGPTI's Small Urban & Rural Transit Center in 2007. He has conducted research on alternative fuels, energy prices, transit ridership, rural intercity transportation demand, and transportation issues related to aging, disabilities, and access to health care. He holds a B.A. degree in economics and business management and an M.S. degree in agricultural economics.

**Dilip Mistry** of Dhaka, Bangladesh, came to NDSU to complete his M.S. in computer science after receiving a degree in naval architecture and marine engineering from the Bangladesh University of Engineering and Technology. His current research as he pursues a Ph.D. in transportation and logistics focuses on the optimization of supply chain management systems by integrating GIS with ERP systems.

**Elvis M. Ndembe** began studying for his Ph.D. at NDSU in the spring semester of 2009. He holds an M.S. degree from NDSU in agribusiness and applied economics. He also holds a B.S. degree in banking and finance from the University of Buea in Cameroon. His research focuses on various transportation and logistics issues with his main interest being railroad economics. After obtaining his degree, Ndembe hopes to work for an international organization that promotes growth and development in developing countries. He would also like to teach and conduct research at the university level.

**David Ripplinger** is an associate research fellow at the Small Urban & Rural Transit Center, a program of the Upper Great Plains Transportation Institute. Ripplinger has conducted research in the areas of operations research, transportation economics, ITS, coordination, and university community transportation. He is vice president-membership of the Transportation Research Forum and chair of the Paratransit Research Subcommittee of the Transportation Research Board. Mr. Ripplinger received his master's degree from Iowa State and is currently in the transportation and logistics Ph.D. program.

**Mridula Sarker** of Mymensingh, Bangladesh, is conducting research on terrorism and violence occurring on public surface transportation systems such as bus and train systems. She recently started her Ph.D. program in transportation and logistics. Sarker received her bachelor's degree in 2000 and her master's degree in 2002 with a concentration in computer science from the Institute of Science and Technology in Bangladesh. In 2009 she received her master's degree in software engineering from NDSU. In the future Sarker plans research on effective system security plan and program to protect passengers, employees, revenue, and property, especially for small urban and rural transportation systems.

**Marc Scott** received both a B.S. in business economics and an M.S. in transportation from South Carolina State University. He is presently pursuing his Ph.D. in transportation and logistics. Scott's major research is in procurement, purchasing, and supply management. Other research interests and experience include urban transit, freight logistics, transportation and infrastructure finance, and strategy. Scott has work experience in the manufacturing, energy, banking, and transportation sectors.

**Sumadhur Shakya** of Ludhiana, India, recently started his Ph.D. in transportation and logistics. His current research is in risk analysis and integration of GIS and spatial modeling in supply chain management of transportation and logistics with focus on grain and container movement. Shakya received his bachelor's degree in crop science from Punjab Agriculture University in Ludhiana, India, in 2005. In 2009, he received his masters in international agribusiness from North Dakota State University. Upon completion of the Ph.D., Shakya plans to conduct research and teach in Land Grant Universities and do consulting work in the private sector.

**Lt. Colonel Matthew Shatzkin** is working on a Ph.D. in transportation and logistics. Originally from Kansas City, MO, Shatzkin completed a B.S. in psychology from Trinity University in San Antonio, TX, and a M.A. in procurement and acquisition from Webster University in Fort Leavenworth, KS. His current research focuses on modeling emergency expeditionary support operations. In the future Shatzkin hopes to serve at the U.S. Army Logistics University.

**Meera Singh** earned her Ph.D. in transportation and logistics from NDSU in 2010. Her area of study has been highway congestion and safety as well as the study of transportation facilities and efficient uses from the cost perspective. The title of her dissertation was "A Statistical Model for Fatality Rates in Large Truck Crashes." Singh is planning a career in university teaching and research.

**Jeffrey Wendt** received his undergraduate degree in business management from Dallas Baptist University and an MBA with a concentration in supply chain management from the University of Dallas. Wendt began his studies at NDSU in 2009. His research interests are in the improvement of the supply chain distribution systems through the use of emerging technologies. Wendt is currently employed in the school book industry and plans to use the transportation and logistics knowledge he'll be gaining to improve the current supply chain structure within his organization. His long-term goals are to teach, concentrating on supply systems specifically focused on implementation and utilization of advanced systems and technologies. Wendt is a member of Sigma Iota Epsilon (S.I.E.) for his academic achievements.

#### **Ph.D. Students – Civil Engineering/ Transportation Option**

Pavan Chevuri  
Gom Ale  
Amir Ghavibazoo  
Kubar Hussin  
Mohy Ragab

#### **Master's Students**

**Viet Doan** of Bismarck, N.D., is working toward a Master of Transportation and Urban Systems. Doan previously received a B.S. in management information systems from NDSU. He plans to continue working with enrollment management at NDSU and hopes to participate in a mission trip to Central America in the future.

**Erika Hedger** of Killdeer, N.D., is starting work in the Master of Managerial Logistics Program. Hedger received her B.S. in industrial engineering and management from NDSU in 2009. She works as a research assistant at the Upper Great Plains Transportation Institute, focusing on trucking in North Dakota and rural roadway safety. Hedger plans to work for Killdeer Mountain Manufacturing as an engineer and logistician.

**John Peyrel** of Devils Lake, N.D. is pursuing his master's of managerial logistics. Peyrel is a logistics officer with the Army National Guard. He holds a bachelor's degree in business management from the University of North Dakota.

#### **Master's Students – Agribusiness and Applied Economics/Transportation Option**

Yan Heng  
Ashley Goldade

#### **Master's Students – Civil Engineering/ Transportation Option**

Jacob Bongard  
Andrew Bratlien  
Gease Bulbul  
Eric Gunderson  
Scot Hagel  
Jay Linnemann  
Kevin Mackey  
Anthony Waldenmaier

### **SOUTH DAKOTA STATE UNIVERSITY**

**Ryan Larsen** is a graduate student in civil and environmental engineering. He is a native of Elk Point, SD. Ryan entered the civil engineering program at SDSU in December 2004 and earned his B.S. degree in civil and environmental engineering in May 2008. He worked as an undergraduate research assistant with faculty members Francis Ting and Allen Jones on a study of scour simulation using the SRICOS method since the study started in January 2007. The study was co-funded by MPC. Ryan is now a graduate student at SDSU working on a co-funded project by MPC that is an extension of the work he performed as an undergraduate researcher.

**Tom Larsen** is a graduate student in civil and environmental engineering. He is a native of Morgan, MN. Tom entered the civil engineering program at SDSU in September 2004 and earned his B.S. degree in civil and environmental engineering in May 2009. He worked as a summer intern for Bolton and Menk, Inc. and performed surveying and construction observation during the summers of 2006-2008. Tom is now a graduate student at SDSU and is working on a project co-funded by MPC and the South Dakota Department of Transportation. The project investigates the durability and retroreflectivity of different pavement markings on roads throughout the different regions of South Dakota.

**Brooke Postma**, a native of Madison, SD, is currently a senior undergraduate student. She began at SDSU in the fall of 2005 and earned her B.S. degree in civil and environmental engineering in December 2009. Brooke began graduate school at SDSU in January 2010 and expects to complete her M.S. degree in civil engineering in May 2011. She is currently working on a research project



co-funded by MPC and SDDOT. Her work involves performance evaluation of jointed plain concrete pavements incorporating different construction details. Following graduation, Brooke plans to work in transportation engineering in the Midwest. Jason Stripling, a native of Minnesota, MN, is a senior undergraduate student at South Dakota State University. He came to SDSU in the fall of 2004 and earned a B.S. degree in civil and environmental engineering in December 2008. Jason joined the graduate school at SDSU in January 2009 and is expected to complete his M.S. degree in civil engineering in May 2010. His research work will involve development and evaluation of concrete mix designs for improved concrete pavement performance. The research will be part of an MPC/ SDDOT co-funded study to develop optimized design and construction methods of concrete pavement in South Dakota. Following graduation from the graduate school, Jason plans to work as a structural engineer.

**Adam Wellner** is a graduate student in civil and environmental engineering, with an emphasis in transportation. He earned his B.S. in civil and environmental engineering in May 2009 from SDSU. He anticipates graduating with his M.S. degree in May 2011. He is working on the MPC project "Development of a Safety Screening Tool for High Risk Rural Roads" under the supervision of Dr. Xiao Qin.

## UNIVERSITY OF UTAH

**Piyali Chaudhuri** is a Ph.D student in the Utah Traffic Lab from Spring, 2008. She has received her B.S. degree with honors in Civil Engineering at the Jadavpur University in India in 2002. She began working in a Consulting firm in India from 2002 to 2005. From 2006, she began her Master's program in Civil Engineering at the University of Windsor, Canada. Currently, she is continuing her doctoral studies at the University of Utah as a research assistant at the Utah Traffic Lab. She has worked on several UDOT projects namely evaluation of optimal spacing of traffic monitoring station on freeways, evaluation of tools for work zone user cost estimation, developing statewide work zone user delay cost manual. Presently, she is working on the evaluation of I-15 Express Lanes Dynamic Pricing project. She has publications in ITS World Congress in Sweden 2009, TRB 2010 and in International Conference on Urban, Regional Planning and Transportation in Paris 2010. She has earned the departmental graduate student scholarship for 2008-2009 and 2010-2011 and won second place in the ITE Student Paper Competition in the local ITE meeting in 2009.

**Jeremy Gilbert** earned a M.S. in civil engineering from the University of Utah with an emphasis in traffic engineering. He was research assistant and his project was training traffic operators for the Utah Department of Transportation. He graduated in May 2010.

**Devin Heaps** completed his B.A. degree in Classic at the University of Utah in May 2005. From 1997 to 2003, he served in the Army National Guard as a light-wheeled vehicle mechanic. He is currently working as the system administrator in the Utah Traffic Lab. His responsibilities include new acquisitions, software maintenance, and upkeep on the lab's 45 computers and network. In the December 2009, he will graduate with a masters of business administration with a special emphasis in network management.

**Cameron Kergaye** graduated from the University of Utah with a Ph.D. in civil engineering in 2009. He is a licensed professional engineer with the Utah Department of Transportation and has 20 years of experience working on some of the state's largest projects (such as I-15 design/build) as well as modest transportation studies (such as I-80 roundabouts near Park City). The focus of his dissertation was adaptive traffic signal control systems. Currently, he splits his time evenly between project management duties for UDOT and transportation research projects for the Utah Traffic Lab (utilizing a unique University of Utah/ UDOT partnering agreement).

**James Mulandi** earned a B.S. in civil engineering from the University of Nairobi and an M.S. in civil engineering from Kansas State University. He is currently working on a Ph.D. in civil engineering (emphasis in traffic engineering). His current research project seeks to improve signal timing control practices like optimization, delay estimation and quantification of the benefit of retiming traffic signals.

**Bhagavan Nadimpalli** earned his B.S. degree in civil engineering at the Jawaharlal Nehru Technological University, Hyderabad, India. He began his career as an assistant transportation planner in Halcrow Consulting India Private Ltd., New Delhi, India where he worked on traffic data collections and traffic demand forecasting for several toll revenue projects. He earned his M.S. in civil engineering (transportation) at the University of Utah working as a research assistant in Utah Traffic Lab Fall 2009. He built a microscopic traffic simulation model in VISSIM for one of the largest HOV lanes in the nation.

**Benjamin Shepherd** has graduated and is now serving in the Army in Afghanistan. He was enrolled under the Army's Advanced Civil Schooling program, pursuing a master's of civil engineering and doing research at the UDOT Traffic Operations Center in Salt Lake City. Shepherd earned a B.S. degree in engineering management from the United States Military Academy, West Point, NY, in 2007. He served with the 18th Field Artillery Brigade (Airborne) at Fort Bragg, NC, from 2002 to 2007. He was deployed to Mosul, Iraq, from 2003 to 2004 and Tikrit, Iraq, from 2005 to 2006.

**Jelka Stevanovic** earned her Ph.D. in civil engineering. While at the Traffic Lab she investigated traffic control signal settings optimization using genetic algorithms. She also earned a M.S. degree in civil engineering from the University of Utah. She graduated with her B.S. degree in 2003 in mathematics and informatics, at the University of Novi Sad, Serbia. Stevanovic was a research assistant at the Utah Traffic Lab.

**Ivana Vladislavljevic** earned her Ph.D. in civil engineering. She received her B.S. degree at the Department of Transportation and Traffic Engineering at the University of Belgrade, Serbia and Montenegro. She began her graduate studies at the Department of Transport and Traffic Engineering, at the University of Belgrade where she was awarded a scholarship for "young talents." She was a research assistant at the Utah Traffic Lab and investigated the impact of the cell phone conversation on traffic flow using microsimulation software VISSIM.

**Milan Zlatkovic** is a Ph.D. student of civil engineering at the University of Utah and a research assistant at the Utah Traffic Lab. He holds a B.S. degree from the Faculty of Transport and Traffic Engineering, University of Belgrade, Serbia, and a M.S. degree in civil engineering from the University of Utah, with a major in transportation. His field of interest includes traffic control systems, microsimulation modeling, public transportation, intelligent transportation systems, traffic flow theory, and highway design. He has been involved with several projects contracted with the Utah Transit Authority. His work consists of evaluating and analyzing benefits and impacts of transit signal priority for bus rapid transit and light rail transit using VISSIM microsimulation software, as well as analysis of urban traffic networks. He presented his research at TRB in 2009 and 2010, ITE Utah Chapter, PTV Vision User Group Meeting and National BRT Institute Workshop. He has two published papers in the fields of traffic control and public transportation.

## UNIVERSITY OF WYOMING

**Kamrul Ahsan** completed his second M.S. in civil engineering and is now employed as a consultant. The first M.S. in civil engineering he earned was from the Bangladesh University of Engineering and Technology. He also holds an M.S. in computer science from Montclair State University in New Jersey. He is studying soil stabilization of the subgrade and the effect of different agents on that process. He is also studying dust control. He plans to work as a transportation engineer in design or research. He was recognized for excellent performance as a teaching assistant at Montclair State.

**Steven Carter** received his M.S. in civil engineering in 2004. He helped the Wyoming Department of Transportation study the effectiveness of crack surfacing material for asphalt pavements including the performances of thermal stress restrained specimen test, data collection, and statistical analysis. He also earned his B.S. in civil engineering from the University of Wyoming. He is a member of the Tau Beta Pi Engineering Honor Society and is a registered engineer-in-training for the state of Wyoming.

**Zebulun Coulter** is a native of Wyoming, completing his B.S. in civil engineering at the University of Wyoming (UW) in 2009. Zeb is pursuing a master's degree in civil engineering (Transportation). He is a graduate research assistant, conducting research to determine the impact geometric roadway conditions have on crashes on local rural roads in Wyoming. He is also currently the cadet battalion commander of the Army ROTC program at Wyoming and will commission in May 2011 as a second lieutenant into the Wyoming Army National Guard. Upon completion of his Masters in August 2011, Zeb hopes to become a professional engineer while working in the field of transportation engineering in Wyoming.

**Michelle Edwards** recently completed her master's degree in civil engineering. She earned her B.S. degree in civil engineering at the University of Wyoming in December 2007. As an undergraduate, Edwards worked for the Wyoming Department of Transportation in its Laramie Design Squad for two years. Her research focused on developing a decision-support system for dynamic message signs for the I-80 corridor between Laramie and Cheyenne. She is employed as a consultant.

**Scott Koch** is from Parker, CO. Scott entered the civil engineering program at UW in the Fall of 2004 and graduated with a B.S. degree in civil engineering in the Spring of 2009. He worked as an undergraduate research assistant for Dr. Khaled Ksaibati and Dr. Rhonda Young. For Dr. Young, Scott managed traffic counting equipment and performed and analyzed traffic counts. He worked on a MPC co-funded study with Dr. Ksaibati on the use of Recycled Asphalt Pavement (RAP) in gravel roads. Scott is now a graduate student at UW and is continuing work on the RAP study.

**Florence Kothapalley** is a graduate student from Hyderabad, India who is pursuing her master's degree in civil engineering. Her research in transportation engineering focuses on pavement materials. She is working on the laboratory tests of gravel road samples and analysis of dust on gravel roads and its impact on environment. After graduation, Kothapalley plans to gain practical experience in the United States initially and return to India to use her knowledge to bring a change to the Transportation system there.

**George Dzotepe** is from Ghana in West Africa. He completed his B.S. in civil engineering at the Kwame Nkrumah University of Science and Technology and then went on to complete a master's degree in construction (project) management at Heriot-Watt University in Edinburgh, Scotland. George decided to study for a second master's degree in civil engineering (transportation) in the United States after working in that field. He chose UW due to the strength of its transportation engineering program, faculty and scholarship opportunities. He is working as a graduate research assistant and his main area of research is the new Mechanistic-Empirical Pavement Design Guide (MEPDG) developed by AAHSTO. He is studying the sensitivity of Wyoming weather for the MEPDG using its computer software program version 1.1 and data from weather stations in Wyoming. Upon completion of his degree, George intends to work and specialize in the field of pavement engineering and materials.

**Ahmed Elghriany** earned his B.S. in civil engineering from the University of Garyonis in Benghazi, Libya in 2000. Elghriany worked in survey engineering, quality control of material and transportation design. He was also a demonstrator (teaching assistant) at the University of Garyonis. He was awarded a scholarship for postgraduate studies in civil engineering from his University, and later he decided to come to United States for his higher studies. He is pursuing his master's degree in transportation area with emphasis on pavement performance.

**Richard Price** recently completed his master's degree in civil engineering from the University of Wyoming. As an undergraduate, he assisted in testing laminar wood joists and led the design and construction of the AISC-ASCE student steel bridge. Price's research topic was to establish a link between wind power maps and fatigue design of traffic signal and variable message structures, and then suggest specification modifications from the results of the findings.

**Paul Ringenberg** earned his B.S. in civil engineering in 2009 from Colorado State University. Ringenberg chose to attend UW for his master's because of the strength of the transportation engineering program, scholarship opportunities and the atmosphere of the city. Ringenberg's research interest is in the area of travel time reliability. The goal of his research is to develop a relationship between travel time and the various factors affecting driver behavior. One major goal of this project is to assist in message selection for Dynamic Message Signs (DMS's), which help drivers take appropriate driving actions in varying weather conditions along the I-80 corridor between Cheyenne and Laramie, WY. Upon graduation, Ringenberg plans to become a Professional Engineer somewhere in the West or Midwest.

**Promotes Saha** began his graduate studies in 2009, after completing his B.S. in civil engineering from the Bangladesh University of Engineering and Technology, with an emphasis in transportation engineering. After that he worked for Sami Engineering, a structural design and detailing firm. As an undergraduate, he conducted research on road safety trends, applying quantitative risk assessment techniques and statistical analysis, and working on several design projects. His current research interests include transportation network optimization and system optimization.

**Benjamin Weaver** is employed as a consultant after earning his M.S. in civil engineering. He studied the implementation of asset management systems in three Wyoming counties as part of his M.S. degree program. He earned a B.S. in civil engineering from the University of Wyoming in 2004 and an A.S. in engineering from Laramie County Community College in 2002. He was a member of Tau Beta Pi honor society and was named to the UW Dean's Honor Roll.

**Christopher Wolffing** recently earned his M.S. degree in civil engineering and is now employed as a consultant. He earned his B.S. in civil engineering from the University of Wyoming in 2003. He studied highway construction impacts on Wyoming businesses, focusing on traffic volume, tax revenue, commercial property data, and data from surveys of business owners and engineers. He compared actual economic data to perceived data from surveys. Wolffing served as the ITE student chapter vice president.

**Cheng Zhong** recently earned his master's degree in civil engineering. He graduated from Nanjing University of Technology, China, with his bachelor's degree in computer science and technology in the summer of 2004. In 2006, Zhong worked on a Wyoming county roads survey of roadway classification systems and minimum geometric standards. His research focused on traffic volume data collection and estimation for rural roads in Wyoming.

**Jonathan Zumwalt** is from Fresno, CA. He earned B.S. in civil engineering from the University of Wyoming in 2010. While specializing in transportation engineering, he spent five semesters and two summers working for the Wyoming Department of Transportation Laramie Design Squad. He has extensive training in drafting and design. Zumwalt also has experience in presenting plans and working with different viewpoints and areas of expertise. He is in the UW civil engineering masters program for transportation engineering.



# RESEARCH HIGHLIGHTS

---

## **Flexible Barriers in Transportation Systems: The Use of Novel Materials**

Many transportation systems require barriers to permanently or temporarily cordon off different zones, divide medians, provide crash resistance, or serve as a means of absorbing kinetic energy in emergency ramps. This can include systems ranging from orange traffic cones to massive concrete partitions. As part of an ongoing study to examine new designs for the latter class of structure, novel biological materials are being studied as inexpensive, renewable, and environmentally friendly elements to provide structural capacity. One of the candidates includes a class of structural systems composed of bamboo. This material, which is rapidly gaining traction in applications ranging from clothing to high-end wood flooring, has a well-deserved reputation for being 1) low cost, 2) very fast growing, and 3) relatively high strength.

Students at Colorado State University (CSU), including Jordan Jarrett, Karthik Rechan, Griffith D'Costa, and Thang Dao, have been completing experiments on both small-diameter bamboo elements and woven mats in collaboration with Dr. John van de Lindt of CSU. Woven bamboo mats, which are mass-produced in India and other countries in Southeast Asia, have been found to possess rather astonishing strength and toughness properties at extremely low cost. In the figure, a four-foot wide section of this woven composite under initial tension is being subjected to a line load. This particular specimen took more than a ton of load before significant damage was induced, characterized by the fracture of individual strips. Yet even after this initial damage, the mat continued to possess enough resistance that the test had to be stopped because of physical limitations of the test procedure. Dynamic tests are in progress.

Among others, bamboo structures are being further considered in various applications where a soft structure with high ultimate strength is required. These materials possess numerous

additional traits, including the ability to eventually degrade over time – something that could be beneficial for certain applications. They may provide an additional material choice to the usual selections of metal, concrete, and structural timber.

## **Mechanistic Empirical Pavement Design Guide implementation in the Northwest Region**

The University of Wyoming recently began a study to evaluate the implementation of the Mechanistic Empirical Pavement Design Guide (MEPDG) in the northwest region of the United States.

Current pavement design methodology based on the American Association of State Highway and Transportation Officials (AASHTO) Design Guide uses an empirical approach based on the results of the AASHTO Road Test conducted in 1958. But limitations of the current guide led AAHSTO to develop the new MEPDG, which combines the mechanistic and empirical methodology by making use of calculations of pavement responses such as stress, strains, and deformations while using site-specific inputs from climate, material, and traffic properties.

“As a new design guide and with large data inputs required, there are bound to be challenges,” notes Khaled Ksaibati, MPC program director in Wyoming and professor of civil engineering at the University of Wyoming. “Consequently, the MEPDG is currently undergoing a lot of changes with further research being conducted at the national, regional, and local levels into various aspects guide, especially in the areas of materials, climate, and traffic characteristics. It is hoped that the findings from the various research studies will facilitate the implementation of the MEPDG at the national, regional, and local agencies.”

The University of Wyoming has completed the first report from this study which identified the challenges to implementing the MEPDG in the northwest region. In addition, the report identified

specific areas of needed research. A second report is being prepared to demonstrate the utilization of environmental data in the implementation of the MEPDG in Wyoming. It is anticipated that more regional efforts will be undertaken by MPC to facilitate the regional implementation of MEPDG.

### **CSU Researchers Examine Coal-Based Energy by-product for Use in Concrete**

Spray dryer ash is a by-product of coal-based energy production. Disposal challenges associated with the by-product and the economic and environmental costs linked to Portland cement production inspired MPC researchers at Colorado State University to learn if spray dryer ash can be used to replace part of the cement in concrete.

The use of waste products such as fly ash in concrete has been studied extensively and results indicate that the fly ash improves numerous concrete properties. Spray dryer ash is similar to fly ash in many ways and most closely resembles class C fly ash. It is a relatively new product resulting from the use of scrubbers at power plants and little research has been done on its application. Researchers based their research on the hypothesis that spray dryer ash would perform similarly to class C ashes.

“We wanted to demonstrate whether it was feasible to use spray dryer ash as a partial replacement for Portland cement,” explained CSU researcher Rebecca Atadero. Ash obtained from a local power plant was used in concrete mixes as a partial replacement of the cement (binder) and fine aggregate (filler). Several design mixes with SDA contents ranging from 0-50% were prepared, cured, and tested for their compressive and bond strengths, durability (freeze-thaw), and corrosion properties. The results were analyzed and compared with standard concrete.

The results of the compressive strength tests showed a general increase in the ultimate strength of concrete with addition of SDA with the best strength results obtained at 25% to 35% of cement replaced with spray dryer ash. Beyond 35%, a reduction in the rate of strength gain was observed, but mixes were still able to achieve the required design strength. The addition of SDA also resulted in slightly higher bond strengths. The freeze-thaw test results indicated that replacing proportions of cement with SDA required more air entrainment admixture to achieve the same amount of entrained air, but otherwise utilization of SDA produced a negligible effect on the freeze-thaw durability of the concrete. Corrosion properties of the SDA concrete and control concrete were also similar.

“In general, the addition of SDA provided modest benefits when used in certain proportions and portrayed great potential for its utilization as a structural material in transportation infrastructure,” Atadero said.

### **SDSU Researchers Use Flow Modeling to Learn How Flow Conditions Produce Bridge Scour**

MPC researchers at South Dakota State University are using field measurements and 2-D flow modeling to gain insight into the different types of flow conditions that produce bridge scour.

Beginning in the summer of 2009, researchers studied the flow concentration around a sharp bend at the Flandreau bridge site that has produced large measured pier scour. In 2010 they studied a second bridge site where contraction scour was observed. Results of these studies would allow researchers to develop procedures and guidelines that engineers can use to improve hydraulic analysis of bridge waterways with complex channel and floodplain geometry.

Bathymetric and topographical survey was conducted at the Highway 13 bridge over the Big Sioux River near Flandreau in August 2009. A two-dimensional (2-D) flow model of the bridge site was completed in February 2010 and validated using field measurements of flow velocity and water surface elevation. The model was run for a range of flow discharges ranging from low flow to the 100-year flood. The computed results were used to better understand the hydraulics at the bridge site.

Local scour at bridges include pier scour, abutment scour, and contraction scour. Accurate results on lateral distribution of flow both upstream and at the bridge are important for reliable prediction of bridge scour depths. The project is co-sponsored by the MPC and South Dakota Department of Transportation. Francis Ting, professor of civil and environmental engineering from SDSU, is leading the effort. Graduate research assistant Ryan Larsen of Elk Point, SD, is assisting with the project. Larsen graduated in May 2010 with a master's degree in civil engineering. He plans to work as a hydraulic engineer with the U.S. Army Corps of Engineers in Omaha, NE.

### **NDSU Research Evaluates Strategies to Enhance Safety on Rural Roads**

North Dakota rural roads have a relatively high level of crashes and injuries. In fact, nearly 9 of every 10 of the state's fatal crashes take place on rural roads. Researchers at NDSU are attempting to cut those numbers by identifying strategies

that work best at encouraging drivers and their passengers to use seat belts.

State and federal safety initiatives have been directed at rural roads. NDSU researcher Andrea Huseth notes that an important aspect of those initiatives is to understand the effectiveness of individual and coordinated safety interventions. "There are limited resources available to direct at safety concerns, we need to assure that we are using them in an effective and integrated way that has the largest impact on safety."

The project will measure effectiveness for alternative levels of intervention designed to heighten awareness and safety on rural roads in a targeted corridor. Specific objectives, activities, and participants will be determined in a cooperative project planning group. The primary focus will be on seat belt use in rural areas as crash records and law enforcement observation suggests that lower rural-area use is critical traffic safety issue. In addition, seat belt use is documented in crash records, the annual statewide survey, and local seat belt events. Road departures, rollover crashes and speeding may also be considered as a focus.

Huseth notes that a multi-county case study will be designed to include single event, sustained, and multifaceted safety interventions. Three or four counties will be selected for intervention within a corridor, with another county beyond the corridor monitored as a control case. The researchers will consider seat belt use, crash numbers, and moving-violation citations as safety metrics.

Initially, suggested safety interventions include three levels:

1. Traditional, single event, two-week high visibility enforcement seat belt campaign with enforcement and media.
2. Sustained, ongoing effort, in periodic HVE seat belt enforcement or sustained seat belt emphasis through an extended time period.
3. Enriched, sustained, traffic safety effort to include sustained seat belt enforcement along with education events that may include school symposiums, business workshops, car seat checks, seat belt checks, and engineering contribution such as traffic safety evaluations.

"This research should help us better understand how to assemble various safety intervention strategies in a way that is most effective," Huseth says.

## **Wyoming Researchers Develop Gravel Roads Management Methodology**

A project is under way at the University of Wyoming to address the lack of a dirt and gravel roads management system (GRMS) for small local governmental agencies, such as rural counties. The Wyoming Technology Transfer (T2/LTAP) Center met with and solicited input from numerous experts in the fields of gravel roads and roadway management, 54 of whom participated in this project in one way or another.

A review of the published literature revealed a number of efforts to manage unsealed roads in various circumstances, while further investigations revealed other unpublished management efforts. In spite of this, no methodology was discovered that is well-suited to small, local agencies. Existing methods generally use considerably more data inputs than are available to or easily obtained by most counties of the rural west.

Before undertaking improvements to a GRMS, the current situation should be assessed, including evaluations of both the agency's current gravel roads information management processes and the resources available to improve the situation. By looking at various resources, both financial and otherwise, the potential for improvement is assessed, and the best ways to proceed are determined.

Two basic outputs from a gravel roads management system (GRMS) have been identified. First, a GRMS should provide elected officials with useful information that lets them make good financial decisions. Second, it should provide road managers with information that helps them maximize the efficiency of unsealed dirt and gravel road maintenance and rehabilitation. Two hurdles to addressing these needs are the lack of a suitable methodology for managing gravel roads and the lack of resources needed to collect adequate data. This project defines ways to deliver the desired outputs in spite of these difficulties.

Implementation processes are identified. Three basic management functions are described: inventory; cost and maintenance tracking; and condition monitoring. With each of these elements, considerable benefits may be realized, but additional effort is needed.

An element of many local agencies' information management that appears to impede unsealed roads' management is the use of accounting line items to track maintenance costs. To address this problem, the group of experts came up with a list of maintenance tasks (very similar to one put forward in the early 1990s by the National Association of County Engineers) to which



unsealed road costs should be assigned. Specific task definitions and a flow chart for determining which task a given cost should be assigned to are provided. Using these tasks will allow agencies to more effectively track and program their maintenance and rehabilitation operations.

These maintenance and rehabilitation tasks are:

- Blading
- Reshaping
- Drainage Maintenance
- Regraveling
- Dust Control
- Stabilization
- Isolated Repairs
- Major Work

Another issue that makes managing unsealed roads more difficult relates to the collection of useful performance data, largely due to the rapidly changing nature of dirt and gravel roads. Though collecting valuable performance data is problematic, it is also an essential element of a well-developed GRMS. Solutions to this problem are proposed, ranging from automated data collection to agency employees performing visual surveys as part of their routine activities.

One benefit that may be derived from taking these gravel roads management steps is the implementation of a cyclic maintenance process which may be used to program maintenance tasks in a more cost-effective manner, allowing for consideration of both user and agency costs. The figure illustrates this process:

By establishing minimum acceptable drivability standards for every section and by monitoring surface conditions when maintenance is performed, maintenance frequencies can be adjusted to reflect the performance and needs of each road section within an unsealed road network.

Finally, two guides are being developed as part of this project, an "Implementation Guide" and a "Programming Guide." They provide comprehensive advice and guidance to road managers and those working with them to develop a GRMS, presenting the information as clearly and concisely as possible. The "Implementation Guide" provides local road managers with advice on implementing and upgrading gravel roads management practices, while the "Programming Guide" provides information for data managers and programmers. These guides will provide valuable information and advice for those managing dirt and gravel roads both in Wyoming and around the world.

## Highway Safety Screening Tool for South Dakota

Xiao Qin, an SDSU professor in civil engineering, and Adam Wellner, a master's student at SDSU, are developing a highway safety screening tool for the state of South Dakota.

Their objective is to develop a data-driven, performance-based highway safety analysis tool that can screen selected rural highways using a collection of statistical, computer, and GIS techniques. It is a system-wide approach that can be used to effectively and accurately identify high-crash locations based on a suite of comprehensive safety performance measures in the context of rural roads.

South Dakota is a typical rural state. With 77,121 square miles, the state's villages, cities and towns are connected via 83,744 miles of highways, most of which are rural highways. At the same time, South Dakota only has a population of 754,844 or 9.9 persons per square mile. Given the enormous geographic size of the state, South Dakota drivers are more likely to travel a longer distance to fulfill their needs on roadways that have a speed limit of 55 mph or higher. As a result, 90% of traffic accident fatalities in South Dakota occurred in rural areas and the state fatality rate is 2.3, higher than the national average of 1.5, according to NHTSA 2008 report. Given the tightening safety improvement funds and competing resources, it is essential to identify the high risk locations that exhibit severe safety needs so that safety funds can be optimally allocated to achieve maximum return.

To identify safety problem areas on a continuous basis via a systematic approach, a sliding window algorithm is being developed. A sliding window is an analysis technique in which a "window" of a designated length, typically 1 mile, is incrementally advanced along the highway by a shorter distance, frequently 1/10 mile. As the window progresses along the length of the segment, analyses are conducted for each designated one-mile highway length. This allows for more precise identification of high crash locations along a highway. Meanwhile, safety performance functions (SPFs) are being developed using South Dakota crash data to estimate the expected number of crashes for each roadway segment.

The output of the prototype tool and the values calculated from the SPF's for a section of S.D. Highway 28 near Estelline are shown in the figure. The performance measures can be determined by the various outcomes of the observed crash frequency, expected crash frequencies or their derivations.

## **Optimizing Pavement Marking Performance on South Dakota Highways**

MPC researchers at SDSU are looking into factors that may affect the performance and durability of pavement marking installed on South Dakota highways. The project is expected to evaluate the performance of different marking materials and application techniques under varying traffic, geographic, surface, and other conditions.

Retroreflectivity measurements from test sections of newly installed marking on Interstate I-90 near Chamberlin, SD, started in June 2009 and will continue through 2010. This will allow for the incorporation of the effects of winter maintenance after one winter in service. Other test sections from different geographic locations in South Dakota will be identified during the construction season of 2010.

At the conclusion of the study, a decision matrix for performance-based type selection of pavement marking will be developed. The study is co-funded by MPC, South Dakota Department of Transportation, and SDSU.

## **PROJECTS COMPLETED**

### **Traffic Modeling to Support HOT Lanes**

Researchers at the Utah Traffic Lab at the University of Utah modified a computer model of express lanes in the Salt Lake City area so that it can be used to evaluate various toll and traffic management scenarios.

Traffic Lab director Peter Martin notes that innovative lane management offers the opportunity to levy fees for the premium road space. Express lanes in Utah offer road users reduced journey times for a fee. The Utah Department of Transportation (UDOT) has converted the high-occupancy-vehicle (HOV) lanes on Interstate 15 in the Salt Lake City metropolitan area to express lanes. Express lane subscribers and HOVs now share the same lane. UDOT is also planning to implement an electronic toll-collection system.

Martin notes that improper pricing policy for the high-occupancy-toll (HOT) lanes could cause a large debate among travelers and potentially jeopardize success of the strategy. Consequently, UDOT needed an informative decision about further HOT pricing. The I-15 VISSIM model developed by the Traffic Lab can serve as a decision support tool for those decisions. Researchers modified and calibrated the I-15 VISSIM model that integrates HOT pricing. They also propose an algorithm for HOT pricing

that would enable real-time variable congestion pricing. More detail is available in the final report, MPC Report No. 09-210, "Express Lane Genetic Algorithm Microsimulation Evaluation (Part 2) ELGAME 2." The research was conducted by Martin, and research assistants Ivana Vladisavljevic, James Ries, and Bhagavan Raju Nadimpalli.

### **Research to Improve Rural Use of Dynamic Message Signs**

University of Wyoming researchers studied the use of dynamic message signs on Interstate 80 between Laramie and Cheyenne to develop a decision support system that will use real-time weather and speed variables to improve the consistency, quality, and timeliness of rural travel information. Their research could help improve the use of the signs in other rural areas.

In their study, the researchers evaluated the consistency of past DMS messages, surveyed both frequent and random travelers, and conducted statistical analyses of the correlation between speed, weather, and DMS data. They also evaluated the current message decision system utilized by the Wyoming Department of Transportation (WYDOT).

"Traveler information systems were originally utilized in urban areas to reduce congestion. Traveler information has become increasingly important in rural areas, especially in areas with adverse weather conditions, such as Wyoming," noted Rhonda Young, a University of Wyoming associate professor of civil engineering. "Dynamic message signs are often used to provide information during a traveler's trip. Current research literature does not contain much guidance for the rural use of the signs."

Young notes that dynamic message signs are becoming more common in rural areas that experience severe weather conditions because they allow agencies to inform drivers of road and weather conditions. "By utilizing various types of collected data from speed sensors, weather stations, pavement sensors, and weather forecasts, traveler information can be accurately and efficiently supplied to drivers both before and during their trip through technologies such as dynamic message signs."

Based on the ongoing research, decision guides will be developed to assist the dispatch operators in message selection. The expert system takes real-time weather and speed data into account and suggests a recommended message for each DMS to the operator. Speed data, weather, and snowplow operator observations are included in this determination because of the lack of weather data coverage along the entire route.

In the short-term, before the complete decision support system is developed, the researchers recommended practices that can be implemented by WYDOT to improve the effectiveness of the DMSs. Because the most drivers see and read the signs, it is important that the information given on the signs be accurate, credible, timely, and consistent. Operators should:

- Utilize predetermined message sets as much as possible to improve consistency.
- Update the information more frequently, in accordance with the changing roadway and weather conditions, to improve its accuracy.
- Provide more detailed information when applicable (e.g. wind gusts, accident locations, lane closures).

For more information, see the final report for the first phase of this project, MPC Report No. 09-211A, "Developing System for Consistent Messaging on Interstate 80s Dynamic Message Signs Phase 1." The research was conducted by Young and graduate student Michelle Edwards.

### **Researchers Examine Long-Term Cost of Transportation Damage from Earthquakes**

Earthquakes damage transportation infrastructure. In addition to replacement and repair costs for damage to transportation structures, large earthquakes can increase time delays resulting from a network component's loss of function. Damage to the network can severely disrupt traffic flows for several months or years.

With support from the Utah Department of Transportation, researchers estimated traffic disruption user delay costs resulting from two earthquake scenarios in Utah. The VISUM traffic macro-simulation model was used to estimate the delay-based user costs. Road segments, which are vulnerable yet critical to detour traffic following an earthquake, are prioritized for rehabilitation. The calculated user costs show that the Taylorsville Scenario would incur \$65 million, which is significantly lower than the Wasatch Scenario of \$1.312 billion. Links that are susceptible to damage in one scenario, but critical in carrying detour traffic for the other scenario, are defined as lifelines. A shortlist of lifelines is provided for each earthquake scenario with detailed information, including names, directions, and addresses.

This report presents the estimated delay-based user costs due to the traffic disruptions caused by two earthquake scenarios: (1) the Wasatch Scenario and (2) the Taylorsville Scenario. Road segments that come under fault zones are most likely to get damaged after an earthquake. These road segments are defined as vulnerable links. Links that can carry considerable detour traffic after an earthquake are defined as critical links. A list of links susceptible to damage, yet critical for each scenario, was prioritized for rehabilitation.

The objectives were to:

- Compile a list of links that would be:
  - Vulnerable to both the Wasatch Scenario and the Taylorsville Scenario (The most vulnerable links)
  - Critical to both the Wasatch Scenario and the Taylorsville Scenario (The most critical links)
  - Vulnerable in the Wasatch Scenario and critical in the Taylorsville Scenario (Lifelines for the Taylorsville Scenario)
  - Vulnerable in the Taylorsville Scenario and critical in the Wasatch Scenario (Lifelines for the Wasatch Scenario)
- Recommend UDOT potential protection, improvement, and maintenance procedures for lifelines.
- Determine how the earthquake damage influence traffic in terms of AM peak, mid day, PM peak, and off-peak traffic.
- Assess the impact of degree of damage on the traffic in terms of user delay costs.

More detail is provided in the final report, MPC Report No. 10-217, "Seismic Vulnerability and Emergency Response Analyses of UDOT Lifelines." The research was conducted by Aleksandar Stevanovic and Bhagavan Nadimpalli.

## **Testing Self-Consolidating Concrete for Structural Applications in Bridges**

Recent studies have shown that the use of self-consolidating concrete results in improved finished quality, increased production efficiency, and reduced labor cost. The Federal Highway Administration and the precast concrete industry have been promoting the research and development of self-consolidating concrete for structural applications in bridges. Researchers at SDSU studied three full-scale prestressed bridge girders. One of the three girders was cast using conventional concrete and served as a control specimen, while the other two girders were cast using self-consolidating concrete. The self-consolidating concrete mix was made with quartzite coarse aggregate that is commonly used in eastern South Dakota. The results of the study show that the structural performance of the prestressed self-consolidating girders is similar to that of the control prestressed girder. It was also observed that the self-consolidating concrete girders have a better finished surface than the conventional concrete girder. MPC Report No. 08-196, "Structural Performance of Prestressed SCC Bridge Girders Made with Limestone Aggregates," was written by Nadim Wehbe, Arden Sigl, Zachary Gutzmer, and Chad Stripling.

## **Study Examines Alternative for Predicting Bridge Scour**

The SRICOS (Scour Rates In Cohesive Soils) method had been proposed as an alternative design methodology for predicting scour at bridges founded in cohesive soils. As the new method can produce substantial savings in bridge construction costs at cohesive soil sites, it is important that the South Dakota Department of Transportation (SDDOT) evaluates the method carefully for use in bridge design. This research project at SDSU compared the predictions of the SRICOS method for pier scour with measured scour at three bridge sites in South Dakota and examined the technical issues involved in using the method. MPC Report No. 08-195, "Evaluation of SRICOS Method on Cohesive Soils in South Dakota," was written by Francis C. K. Ting, Allen L. Jones, and Ryan J. Larsen.

# TECHNOLOGY TRANSFER

---

## Workshop Brings Asset Management Concepts to Local Officials

Local road managers across the Upper Great Plains and Mountain West will do a better job of tracking needs and directing investments, thanks to a two-day video workshop sponsored by the Mountain-Plains Consortium.

The “Roadway Surface Management Workshop for Local Officials,” held Nov. 2-3, 2009, was directed at local roads officials with little or no experience with asset management. Thanks to the use of video conferencing technology, the conference included participants at 19 sites in North Dakota, South Dakota, Montana, Wyoming, Utah, and Colorado. Ten formal presentations were made from seven of the sites, with ample time for discussion and questions.

“This was a major outreach to local and tribal road planners,” noted Denver Tolliver, director of the Mountain-Plains Consortium, a major sponsor and organizer of the event. “Asset management is well-practiced at the state and federal level, but there’s not as much experience and capacity at the local level.” He notes that most road miles in the Upper Great Plains and the intermountain West are rural roads under the authority of local governments or tribal managers. “That’s a huge percentage of our infrastructure where this approach is greatly needed,” he said.

The conference had two primary goals: to learn how extensively asset management techniques are applied by road managers in the region; and to identify ways to help them implement principles of asset management that are appropriate to the limited budgets and personnel available to them.

Presentations during the conference included

- An overview of asset management concepts by Thomas Van, highway engineer with the FHWA’s Office of Infrastructure and Office of Asset Management
- First steps to an asset management program by Ron Hall, director of the Colorado State University Tribal Technical Assistance Program.

- Key steps to improving gravel and pavement management systems by George Huntington, of the Wyoming LTAP.
- Communicating infrastructure issues and priorities by Doyt Bolling, with the National Center for Pavement Preservation.

Steve Gaj, leader of the System Management and Monitoring Team in the FHWA’s Office of Asset Management, noted that the need for an asset management workshop was evident from participant comments during the 2008 Rural Roads Conference in Rapid City, SD. “Asset management could be used to help road managers answer the question, ‘If you received additional funding, how could it best be used?’ ”

Gaj noted that management systems should help agencies assess the quality of their roads and how much money would be required to maintain or improve them, and help track various performance measures. “Is your budget linked to what you’re doing?,” he asked. “A good asset management system should help you plan, implement, and evaluate your investments.”

“It was a very good session,” noted Dennis Trusty, director of the Northern Plains Tribal Technical Assistance Program in Bismarck, ND. “Unfortunately, things are not as advanced as we had hoped.”

Trusty surveyed tribes across the country to find if any were implementing asset management systems. “We caught a few in the initial stages phases of implementation,” he noted. “In North and South Dakota, Wyoming, eastern Montana, and northern Nebraska, we’re just getting a good start.”

Non-tribal agencies are a little farther ahead. In a survey of South Dakota counties, Ken Skorseth, South Dakota LTAP program manager, found that about half have a formal management system for roads, bridges, and signs while less than half have any formal management of culverts.

Skorseth gave a presentation on moving from data collection to management, urging participants to set realistic goals. “Keep things simple or pretty soon you’ll be drowning in data and starved for information. Asset management approaches must be matched to the agency,” he said. Larger agencies with many assets have a greater need for higher levels of management with a comprehensive reporting capability. Conversely, smaller agencies with very limited staff and budgets need simple systems with limited data input and the capability to provide concise, condensed reports.

Other presenters included staff from county road departments and municipal public works departments who detailed their efforts to implement asset management programs. They discussed benefits from the systems and answered questions about the budget and staffing needs required to implement them.

Tolliver noted that the use of video conferencing technology was especially appropriate for this workshop. “Video allowed us to reach a very large part of our audience. Travel is difficult for them because of the cost and the fact that they are often a one-person show and it’s difficult for them to be away from the office for any significant amount of time.”

Trusty, who participated in the workshop from a site at the NDLTAP office in Bismarck, said the video conferencing worked well. “When you use technology to reach an audience this large and spread this widely, you’re bound to have a few issues. But a lot of people got a lot out of this workshop.”

FHWA’s Gaj also observed, “Look at how people sat in and participated in this event. We saw the interest and it’s an important issue. Let’s think about how we can move forward from here.”

“We have some momentum and a good group,” Tolliver noted. “The number of states and organizations involved gives us a head start in assembling some approaches and strategies that will be useful to many of the planners and managers in our region.”

A CD of resource materials has been prepared by Thomas Van of the FHWA and contains 44 asset management documents, case studies, and manuals. The CD also contains copies of each of the presentations made during the workshop. A copy was sent to each participant.

## **MPC Safety Rural Road Safety Effort Featured in Spotlight Newsletter**

MPC research and outreach efforts were featured in the April issue of the UTC Spotlight newsletter published by the USDOT’s Research and Innovative Technology Administration. The issue, entitled: “Improving Highway Safety by Identifying High Risk Rural Road Segments and Countermeasures” details efforts to help counties identify high risk rural locations and develop a strategy to obtain funding to reduce crashes on the riskiest segments. The pilot phase of the program involved data collection and participation from Carbon, Laramie, and Johnson counties. A five-step procedure was developed and applied in these counties. As a result of the successful MPC pilot studies, the Local Road Safety Advisory Group has approved the WRRSP procedure as a means of improving safety on rural roads in Wyoming. Once a county has completed the five-step procedure, it has the necessary information to develop plans to fund safety improvements using the High Risk Rural Road Program or other funding sources. WYDOT is funding some of the counties’ safety requests, providing incentives for other Wyoming counties to establish their own local safety programs.

In the second phase of the project, MPC and WYDOT are facilitating implementation of the WRRSP on a statewide basis. The University of Wyoming is providing technical help and training to counties interested in implementing the program. So far, the University of Wyoming has helped more than one-third of the counties in Wyoming implement the WRRSP. For the full newsletter, go to [http://utc.dot.gov/publications/spotlight/2010\\_04/pdf/spotlight\\_1004.pdf](http://utc.dot.gov/publications/spotlight/2010_04/pdf/spotlight_1004.pdf)

## **UTCs Collaborate in Planning and Funding Freight Conference and Workshop**

Faced with growing congestion and higher fuel prices, one of the great challenges of the United States is how to move goods safely and efficiently with the least impact on the environment. The challenges posed by freight transportation are markedly different from the challenges posed by urban commuting and intercity air travel. Freight shipments are typically generated from distant and global demands and move long distances in intercity corridors, passing through many communities en route. Many jurisdictions are affected by freight movements and many agencies and operators are typically involved. Freight shipments both contribute to and are affected by congestion.

Nine university transportation centers have collaborated in the planning and funding of the Transportation Research Board summer conference in Minneapolis, July 11-13, which addresses the U.S. DOT's Framework for a National Freight Policy. In addition to financially co-sponsoring the event, the university transportation centers have helped plan and organize a two-day track on multimodal freight and waterway transportation. The two-day workshop focuses on the performance and optimization of multimodal freight corridors. An objective is to improve interagency planning and integration of waterway, rail, and highway planning: with the end objective of increasing efficiency and reducing congestion in key freight corridors. In addition to the Mountain-Plains Consortium of North Dakota State University, the following university transportation centers are co-sponsoring the conference:

- The Center for Intermodal Freight Transportation Studies at the University of Memphis
- The Center for Transportation Studies at the University of Minnesota The Great Lakes Maritime Research Institute at the University of Wisconsin-Superior
- The Mid-America Transportation Center at the University of Nebraska
- The Midwest Transportation Consortium at Iowa State University
- The National Center for Freight and Infrastructure Research and Education at the University of Wisconsin
- The Southeastern Transportation Center at the University of Tennessee
- The Southwest Region University Transportation Center at Texas A&M University

The conference will include 250 to 300 participants and attendees, including members of Congress, FHWA, FRA, MARAD, the U.S. Army Corps of Engineers, state transportation departments, ports, transportation operators, and many other stakeholders.

For more information, visit <http://pressamp.trb.org/conferences/programs/default.asp?event=591>

## **Union Pacific Railroad Engineer Visits CSU for Training on Shear Spiking**

Colin Hepker, engineer associate for the Union Pacific Railroad – Southern Region Structures, visited CSU March 4-5 for training regarding the implementation of shear spiking to rejuvenate timber trestle railroad bridges.

The use of shear spiking is the topic ongoing research on Z-spiking supported by the MPC. While at CSU, Hepker attended a presentation and discussion on the past and current research project activity and the technology and mechanics of the process and benefits observed in laboratory studies. The session was conducted by Don Radford and Richard Gutkowski, the CSU faculty members who have led the research. Hepker was also instructed on the technique by graduate student Karthik Rudraprasad and was able to conduct spiking himself. Faculty member Jenő Balogh and Karthik then trained Hepker on the instrumentation and data acquisition equipment used to monitor the behavior of members load tested in the laboratory.

Hepker attended a team meeting held to develop preliminary planning of a field application and load test to be conducted in cooperation with the Union Pacific Railroad. In November 2009, a candidate bridge site was visited for initial assessment with Tomasz Gawronski of the Southern Region and his bridge inspection personnel. The bridge will serve as a future demonstration of the feasibility of field application of shear spiking by railroad personnel and assessment of pre- and post-spiking stiffness via a load test.

## FACULTY ACTIVITIES

---

### Gutkowski Presents Work in Portugal



Richard Gutkowski, CSU professor of civil and environmental engineering, was a speaker in a public forum, a seminar, and meetings with officials held during the festival of the pine organized by the municipality of Oleiros, Portugal. The seminar,

"Structural Applications of Roundwood Timber," was held in August and was sponsored by the local development agency, "Pinhal Maior," and the University of Coimbra. Gutkowski spoke on the Scott Lancaster Memorial Bridge project in Colorado, an example of work he did in round pole construction. The project was constructed by the local community of Idaho Springs and named for a local high school student killed by a mountain lion. Other speakers were from the municipality of Oleiros, the National Laboratory for Science and Technology in Lisbon, Portugal, the University of Coimbra, and the Portuguese Department of Agriculture. Gutkowski is working with Rui Batista from the Portuguese Department of Agriculture to foster a wood-concrete bridge demonstration project in the Olieros region as an application of ongoing MPC-sponsored research on that topic.

### Wehbe to Serve on TRB Committee



Nadim Wehbe, SDSU professor of civil and environmental engineering, was appointed to TRB Committee AFF50: Seismic Design and Performance of Bridges. Wehbe will serve on the committee for a three-year term that began April 15, 2009.

### CSU Professor and Students Appear on History Channel

Richard Gutkowski, CSU professor of civil and environmental engineering, participated as an expert commentator in two episodes of the Life after People series on the History Channel. On June 9, 2009 he appeared in the episode, "Armed and Defenseless," which focused on Denver, CO, and Honolulu, HI, and covered the mechanisms of how exposed tall buildings eventually collapse without human intervention and illustrated the phenomena by the simulated collapse of the Wells Fargo Center (aka "the cash register building") in downtown Denver. CSU students Chris Turnbull-Grimes, Nathan Miller, and Kris Bruun constructed a model multi-story building framework and used it to physically simulate how tall buildings such as the World Trade Center twin towers experience a rapidly cascading collapse of floors and columns once one level gives way. On June 2, 2009, Dr. Gutkowski provided comments covering the eventual collapse of the Stratosphere Tower in Las Vegas as part of the episode, "Sin City Meltdown," focused on Las Vegas and Atlantic City.

### Sigl Retires After More Than 40 Years of Service



Arden Sigl, professor emeritus of civil and environmental engineering, retired from SDSU in May 2009. Sigl had a distinguished career that lasted more than 40 years in the Department of Civil and Environmental Engineering at SDSU. He taught courses in

mechanics, materials, and structural engineering analysis and design. During his tenure at SDSU, he led many research studies in the field of bridge engineering. In the last three years, Dr. Sigl was a co-principal investigator on two MPC co-sponsored research studies.



## CSU's Chen Named Outstanding Reviewer

Suren Chen, assistant professor of civil and environmental engineering at Colorado State University, was named the American Society of Civil Engineering's 2009 Outstanding Reviewer for Journal of Bridge Engineering. Chen currently serves on four technical committees of ASCE.

## CSU Researcher Wins Prize from ASCE



Suren Chen, CSU assistant professor of civil and environmental engineering, was the recipient of the 2009 Collingwood Prize from the American Society of Civil Engineers for the paper, "Equivalent Wheel Load Approach for Slender Cable-Stayed Bridge Assessment Under Traffic and Wind: Feasibility Study," published in the Journal of Bridge Engineering, November- December 2007. Currently, fatigue design only considers one truck per bridge, which may not be rational for long-span bridges. Chen's paper develops a new "equivalent dynamic wheel load approach" for considering the complicated interactions between vehicle, bridge, and wind when more than one vehicle may be present by creating equations which are independent of the number of vehicles. The simplification resulting from the new method lays a foundation for advancing bridge design codes to more accurately analyze fatigue for long-span bridges under wind and actual traffic conditions.

The Collingwood Prize is awarded to the author or authors, under 35 years of age, of a paper describing an engineering project with which the author is directly connected, or recording investigations contributing to engineering knowledge to which the author has contributed some essential contributions and which contains a rational digest of results.

## van de Lindt Surveys State DOTs on Innovative Steel Bridge Experience



John van de Lindt, associate professor of civil and environmental engineering at CSU, is preparing a survey for DOTs in the MPC member states which focuses on their experience with innovative steel bridges such as double composites, FRP cover plates,

high-performance steel, post tensioning, and simple-made continuous design. The results will be

made available to the MPC community as part of an ongoing CDOT project that is being leveraged with MPC funds, i.e. cost share both ways.

## Gutkowski participates in ASCE Legislative Fly-in

CSU emeritus professor, Richard Gutkowski was selected as a private citizen by the American Society of Civil Engineers to participate in its annual Legislative Fly-in held in Washington, DC, March 23-26.

The purpose of the event was to learn about issues in Congress that affect the profession of civil engineering and then present those issues to one's elected officials in the Congress. More than 200 ASCE members came from 48 states. Gutkowski and several others from Colorado visited with Sen. Michael Bennet (D-CO) and his staff, Rep. Betsy Markey (D-CO) and one of her staff members, and two staff members of the Sen. Mark Udall (D-CO). They discussed bills related to surface transportation, aviation, dam rehabilitation and repair, and water infrastructure. The fly-in participants shared ASCE viewpoints and positions on the bills.

Gutkowski was one of a limited number of participants also selected for partial travel support via ASCE Government Relations and was also provided funds from the ASCE Northern Colorado Branch. He also represented the Colorado Section of ASCE. Gutkowski was also recently awarded the honorary status of Lifetime Member of ASCE.

## Qin Presents at TRB and TRF



Xiao Qin, assistant professor of civil and environmental engineering at SDSU, attended the 2010 Transportation Research Board TRB annual meeting in Washington, DC, in January and presented nine papers. The papers cover a wide range of issues in transportation

planning, traffic operations, safety, and GIS. The paper titles were:

- "Traffic Demand Dynamics During Urban Freeway Short-Term Lane Closures"
- "Exploratory Shock Wave Approach for Signalized Intersection Performance Measurements Using Probe Trajectories"
- "Daily O-D Matrix Estimation Using Cellular Probe Data"
- "Negotiation-Based Conflict Exposure Methodology in Roundabout Crash Pattern Analysis"

- “Injury Severity of Multivehicle Crash in Rainy Weather”
- “Safety Decision Support System for Rural Highways”
- “High-Tension Median Cable In-Service Performance Evaluation and Cost-Effectiveness Analysis”
- “Proposed Safety Index Based on Risk-Taking Behavior of Drivers”

Qin also presented “Three-wheeler Crashes in Kandy, Sri Lanka and Implications for Road Safety” at the 51st Transportation Research Forum (TRF) annual meeting in Washington, DC, this March.

In addition, Dr. Qin has three refereed journal articles published or accepted to be published in 2010, including “Identifying Crash-Prone Locations with Quantile Regression,” accepted for publication in *Accident Analysis and Prevention* in July; “An Interactive Process of Micro-simulation and Logistic Regression for Short-term Work Zone Traffic Diversion” published in the ASCE’s *Journal of Transportation Engineering*; and “Rainfall Effect of Single-vehicle Crash Severity Using Polychotomous Response Models” published in *Accident Analysis and Prevention*.

### **MPC Researchers Author Papers Presented at TRB**

The Transportation Research Board annual meeting, held Jan. 10-14, covered all transportation modes. The more than 3,000 presentations in nearly 600 sessions addressed topics of interest to attendees which included policy makers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions. A number of papers authored by MPC faculty and students were presented at the meeting. They included:

- “Performance-Based Specifications for Highway Concrete from Pennsylvania to Utah” presented by Paul J. Tikalsky, University of Utah, during a workshop on performance-based specifications in current concrete practice.
- “Road User Impacts due to Speed Limit Reduction in Work Zones: Which Tool Is Best-QuickZone or VISUM?” written by Bhagavan Nadimpalli, Peter Martin, and Piyali Chaudhuri of the University of Utah and Aleksandar Stevanovic, formerly of the University of Utah and now of Florida Atlantic University.
- “Evaluation of Transit Signal Priority in Ring Barrier Controller and Advanced System Controller Series 3 Software-in-the-loop Simulation Environment” written by Martin, Stevanovic and Milan Zlatkovic who is also at the University of Utah.

- “Practical Perspective on Benefits of Combined Traffic Assignment and Control Method” written by Muhammad Farhan at the University of Utah and by Stevanovic and Martin.
- “Cross-Evaluation of Signal Timings Optimized by Various Traffic Simulation and Signal Optimization Tools” written by James Mulandi, James of H. W. Lochner, Inc. and Stevanovic and Martin.
- “High Wind Warning System to Prevent Overturning Truck Crashes in Wyoming” written by Qiyue Dai and Rhonda Kae Young of the University of Wyoming.
- “Need to Develop Core Concepts and Learning Outcomes for Introductory Transportation Engineering Course” written by Young and Steve Beyerlein of the University of Idaho, Andrea R. Bill of the University of Wisconsin-Madison, Ida Van Schalkwyk of Oregon State University, Kristen L. Sanford Bernhardt of Lafayette College, Shashi S. Nambisan of Iowa State University, and Rod E. Turochy of Auburn University.
- “Rural Variable Speed Limit System for Southeast Wyoming” written by Young, Jenna Buddemeyer and Brendan Dorsey-Spitz of the University of Wyoming.
- “Performance of Recycled Asphalt Pavement in Gravel Roads” written by Scott B. Koch of the University of Wyoming.
- “North Dakota Teen Driver Parent Survey” written by Kimberly Vachal of North Dakota State University.
- “Assessment of Demand for Rural Intercity Transportation Services in a Changing Environment” written by Jeremy Mattson, Del Peterson, David Ripplinger, William Thoms, and Jill Hough of North Dakota State University.
- “Classifying Rural and Small Urban Transit Agencies” written by Ripplinger.
- “Local Rural Road Safety Audit Guidelines and Case Studies” written by Hesham Mahgoub, Ken Skorseth, Ronald Marshall, and Ali Selim of South Dakota State University.

## NDSU Expert Comments on Terrorism Developments

A Congressional committee, intelligence agencies, an international think tank, and national media outlets have tapped the expertise of an NDSU terrorism expert in the wake of the Fort Hood shootings, the Christmas Day airline bombing attempt and other terrorist attacks and plots.

Jarret Brachman, an associate research fellow who leads transportation security research at NDSU's Upper Great Plains Transportation Institute, has been interviewed numerous times for international, national, and local media and has been the featured speaker at several events focused on counterterrorism.

In November, in the aftermath of the Fort Hood shootings, Brachman made multiple appearances on CNN, National Public Radio, and the New York Times. He also was featured on a segment with ABC World News Tonight. In December, Brachman was invited to testify on topics related to the future of al-Qaida to the House Armed Services Committee's Subcommittee on Terrorism and Unconventional Threats.

The Christmas Day bombing attempt on Detroit-bound Northwest Flight 253 and the January suicide bombing in Afghanistan that killed American CIA officers thrust Brachman back into the national spotlight. He made a number of media appearances in January, including an extended interview with the PBS NewsHour, National Public Radio, and multiple appearances on CNN. Brachman was cited in several New

York Times articles and was quoted in Time Magazine and Newsweek. He also contributed to a feature story on detainees at the military detention facility in Guantanamo Bay with the Miami Herald.



In January, Brachman gave a talk at the Carnegie Endowment for International Peace titled, "Making the Next Bin Laden." Attended by more than 100 people from across domestic and foreign government agencies and members of the press, Brachman focused on the rising al-Qaida operatives who are positioning themselves to replace Osama bin Laden as head of the global al-Qaida movement. He also was a featured panelist for a conference at the Defense Intelligence Agency in January where he discussed al-Qaida's use of the Internet.

Brachman's research seeks to better understand how the nature of al-Qaida activism is evolving over time. "The evolution is being driven from the top-down, by the next generation of senior al-Qaida leaders. It is also being driven from the bottom-up, thanks to the grass-root examples being set by individuals like Humam al-Balawi, the Jordanian 'triple-agent' who perpetrated the January suicide bombing against the CIA base in Khost, Afghanistan," Brachman says.

## THE MOUNTAIN-PLAINS CONSORTIUM

---

MPC has a substantial set of institutional resources available to the UTC program. A description of member universities follows.

Colorado State University is a public land grant institution with an enrollment of nearly 25,000 students. The university offers 150 programs of study in eight colleges. CSU offers 40 doctoral and 62 master's degree programs. Primary transportation graduate education and outreach activities occur in the College of Engineering, with related activities in business, applied human sciences, and natural resources. Transportation-related graduate courses are available in civil engineering, mechanical engineering, earth resources, business, remote sensing, and construction management. The College of Engineering houses the Engineering Research Center (ERC) which includes facilities for river mechanics and hydraulics, especially as related to major bridge construction; and wind tunnel testing. The Structural Engineering Laboratory includes an outdoor ramp facility for vehicle crash testing of safety and security barriers. A spatio-temporal test frame is available for simulating hurricane loadings and vehicle and train loadings. CSU also operates the Engines and Energy Conversion Laboratory. The Motorsport program includes topics such as racecar vehicle dynamics, advanced engines technology, fluid dynamics, and advanced materials.

North Dakota State University is a land grant institution with an annual enrollment of more than 13,000 students. The university offers 43 doctorate and professional degree programs, 61 master's degree programs, and 106 baccalaureate degree programs. The MPC is administered by the Upper Great Plains Transportation Institute, which also administers several other related transportation research centers at NDSU. The Advanced Traffic Analysis Center focuses on traffic simulation, traffic signal control, intelligent transportation systems, and travel demand modeling. The DOT Support Center contains a highway design lab and provides experiential learning for junior and senior engineering students. The Rural Transportation

Safety and Security Center focuses on identifying and characterizing rural transportation safety and security concerns. The Small Urban & Rural Transit Center works to improve the mobility of residents in rural and small urban areas through improved public transportation. The Local Technical Assistance Program fosters the exchange of technical assistance among units of government through training and educational programs. The Transportation Safety Systems Center develops and maintains software used by state and federal safety specialists nationwide at truck weigh stations and ports-of-entry for inspecting commercial vehicles.

South Dakota State University is a land grant institution with an annual enrollment of approximately 12,000 students. The university offers 200 majors, minors and specializations with 12 Ph.D. degree programs, and two professional doctorate programs. Twenty-four master's programs are offered. 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 at SDSU houses state-of-the-art laboratory facilities. The Lohr Structures Laboratory is a high-bay structural testing facility fitted with a strong floor, modular loading frame, and a 15-ton traveling bridge crane. The asphalt laboratory is equipped to perform a broad range of tests related to performance and mix design of flexible and rigid pavement.

The University of Utah has an annual enrollment of more than 28,000 students and offers 96 undergraduate degree programs and 93 graduate majors. 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. It excels at modeling current and expected traffic conditions accurately and dynamically from real-time data. It links current and historical information intelligently.

The University of Wyoming has an annual enrollment of about 13,100 students and offers 89 undergraduate degree programs including eight teaching majors. The university offers 65 master's degree programs and 38 Ph.D. programs. 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. A significant number of funded research projects are regularly conducted by the transportation faculty members at the University of Wyoming.

## **HISTORICAL ACCOMPLISHMENTS**

The Mountain-Plains Consortium was established in 1988 in response to 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, most recently, SAFETEA-LU legislation. From 1988 through 2009, MPC produced a library of more than 200 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, four 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. The roles and responsibilities of each administrative component are discussed in this section.

### **CENTER DIRECTOR**

The Mountain-Plains Consortium is located at the Upper Great Plains Transportation Institute at NDSU. 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 four institutions. He administers the program to take advantage of the unique strengths and resources of each university and to produce the greatest impact for the consortium. Jody Bohn of NDSU provides administrative support for the center. Beverly Trittin of NDSU provides graphics support and additional administrative services. Patrick Nichols of NDSU is the center's website developer. He creates and maintains the MPC Web pages and helps design and implement Web-based applications for MPC faculty, staff and clients. Tom Jirik, MPC's communication coordinator, develops communication strategy for the center and provides editorial oversight for both traditional and electronic publications. He is also located at NDSU.

### **UNIVERSITY PROGRAM DIRECTORS**

Each university in the consortium has a designated university program director to perform local oversight and management of approved activities at each university. They also serve as coordinators of transportation activities on their respective campuses. They implement the MPC strategic plan at each institution in a coordinated manner, which considers the vision and theme of the Center and the strategies and activities of all consortium partners. The program directors are Dr. Richard Gutkowski, Colorado State University; Dr. Kimberly Vachal, North Dakota State University; Dr. Nadim Wehbe, South Dakota State University; Dr. Peter Martin, University of Utah; and Dr. Khaled Ksaibati, University of Wyoming.

## EXECUTIVE COMMITTEE

The center director, the five university program directors, and a USDOT liaison form a committee to oversee program planning and administrative functions for the grant period. The seven-member executive 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 continues to use 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 five MPC universities are partners in the network which also includes three state transportation departments in Region 8: North Dakota, Montana, 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 four university program directors are members of the TLN board. The MPC executive committee and TLN board hold an overlapping meeting each year. The TLN executive director attends part of the MPC executive committee meeting and the center director attends part of the TLN board meeting. The TLN programming committee, which meets monthly, brings together representatives from the three state transportation departments and the MPC universities to plan a regional education and training program.

## PROFESSIONAL INPUT AND REVIEW

In 2008-09, practicing engineers and administrators from Colorado, North Dakota, Utah, and Wyoming state transportation departments provided key input and critical review during the research selection process. Professionals from USDA, Federal Highway Administration, Federal Transit Administration, and the American Association of Railroads also review proposed problem statements. In this way, we ensure that we are researching problems of regional and national significance, which provides value to our primary customers, the end users of the research.

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.

The MPC advisory committee includes:

- Carlos Braceras, Utah DOT
- Peggy Catlin, Colorado DOT
- Loran Frazier, Montana DOT
- Anthony Giancola, National Association of County Engineers
- David Huft, South Dakota DOT
- Christine Johnson, FHWA - western region
- Grant Levi, North Dakota DOT
- Jeff Loftus, Federal Motor Carrier Safety Administration
- Delbert McOmie, Wyoming DOT

## 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 five 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 videoconferences 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.

## EXECUTIVE COMMITTEE



Dr. Denver Tolliver is director of the Mountain-Plains Consortium. He is also associate director of UGPTI, where he has been employed since 1980. Before joining the faculty of NDSU, Tolliver was a rail planner for the North Dakota Department of Transportation. He has been

the director of the Mountain- Plains Consortium since 1997. Moreover, he is the director of the Transportation & Logistics graduate program at NDSU- which includes an interdisciplinary Ph.D. in Transportation & Logistics (TL) and a Master of Managerial Logistics degree. He is a member of the Interdisciplinary Program Directors group at NDSU and coordinates the TL program with the transportation degree options in agribusiness and applied economics and civil engineering. Tolliver holds a baccalaureate degree in geography from Morehead State University and a master of urban and regional planning and a Ph.D. in environmental design and planning from Virginia Polytechnic Institute & State University. His primary research interests are: highway economics and planning, railroad planning and capacity analysis, cross-modal impact assessment, and energy and environmental analysis.



Dr. Rebecca Atadero is an assistant professor in the area of structural engineering in the Department of Civil and Environmental Engineering at Colorado State University. She earned her bachelor's degree in civil engineering from Colorado State University.

Atadero's master's and doctoral degrees are from the University of California in structural engineering. She developed research interests in the areas of fiber reinforced polymer composites (FRP) for civil engineering; structural reliability methods and reliability-based design; and transportation structures while working on her dissertation studying the development of load and resistance factor design (LRFD) for externally bonded FRP reinforcement for concrete bridges at the University of California, San Diego. At CSU, Atadero has continued to study reliability

considerations for design with RTP materials, while also conducting research in new areas including development of sustainable materials. She has studied the use of coal fly ash for the manufacture of building products and in a new project is studying concretes made with high volumes of fly ash.



Dr. Khaled Ksaibati received a B.S. degree in civil engineering from Wayne State University. He later completed his M.S. degree and Ph.D. from Purdue University. Ksaibati has been a member of the civil engineering faculty at the University of Wyoming since 1990. He started

his academic career as assistant professor and was promoted in 1997 to associate professor. He was promoted to the rank of full professor in 2001. Ksaibati is director of the Wyoming DOT Certification program at the UW. Between 200 and 250 highway professionals are certified every year in aggregate, asphalt, and concrete studies. He is a member of five Transportation Research Board committees dealing with various aspects of pavement. Ksaibati is the author or co-author of more than 29 technical refereed papers primarily in the areas of pavement design, performance, maintenance, and rehabilitation. Ksaibati also is the author or co-author of 33 other publications.



Dr. Peter T. Martin earned a B.S. degree in civil engineering from the University of Wales in 1975, an M.S. degree in transportation engineering from the University of Wales in 1987 and a doctorate in "Real-Time Transportation Modeling" from the University of Nottingham, England, in 1992.

From 1975 to 1984, he practiced as a civil engineer in highway planning, design and construction. He has built the "Utah Traffic Laboratory," which allows real-time connection to the Utah DOT ITS Traffic Operation Center. Currently, Martin is working on innovative funding methods through Intelligent Transportation Systems, and modeling and evaluation of Advanced Adaptive Traffic Signal Control Systems.



Dr. Nadim Wehbe is an associate professor in the Department of Civil & Environmental Engineering, the director of the Mountain-Plains Consortium Program at SDSU, and the coordinator of the J. Lohr Structures Laboratory. He earned a B.E. in civil engineering from the American University of Beirut in 1980. He earned a M.S. and Ph.D. in civil engineering from the University of Nevada – Reno in 1992 and 1997 respectively. His areas of research interest relate to reinforced and pre-stressed concrete structures, earthquake resistant bridges, and advanced composites structural systems.



Dr. Kimberly Vachal is an advanced research fellow for UGPTI and works with local, regional, and national freight groups to identify logistical opportunities and assess policy implications. Her work focuses on promoting a competitive logistical system that will

enhance the position of the region's products in both domestic and export markets. In addition, Vachal has completed many research studies on grain and oilseed transportation issues, and she has worked on a number of projects in cooperation with the USDA. She has published more than 30 research papers and journal articles related to agricultural logistics and rural economic development. She also directs the UGPTI's Rural Transportation Safety and Security Center. Vachal received M.S. and B.S. degrees in agricultural economics at North Dakota State University. She received her Ph.D. in Public Policy from George Mason University in 2004.

Dr. Christine Johnson serves on the board as the liaison from the FHWA. She is the Director of Field Services for the FHWA's western region. The FHWA field organization delivers program services to the FHWA's partners and customers. The western region includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Johnson is based in Salt Lake City, UT.



## KEY FACULTY

---

### Colorado State University

**Dr. Jenó Balogh** is an affiliate faculty member in the Department of Civil and Environmental Engineering. He has B.S. and Ph.D. degrees from Budapest University of Technology and Economics (Hungary). Presently, he is an assistant professor at Metropolitan State College of Denver, teaching in structural engineering. His research interests are computational mechanics, CAD, steel structures, and timber structures. Dr. Balogh is involved in several MPC projects including composite repair of bridge members, laboratory studies of timber railroad bridge members, and layered wood-concrete systems among others. He also teaches advanced finite element modeling using commercial software.

**Dr. Antonio Carraro** is an assistant professor in the Department of Civil and Environmental Engineering. He earned his B.S. and M.S. degrees from Universidade Federal do Rio Grande do Sul. He earned his Ph.D. degree from Purdue University. Dr. Carraro has extensive experience on laboratory testing of geo-materials and has served as a consultant for the Department of Public Works in Brazil. He is a member of the International Society for Soil Mechanics and Geotechnical Engineering, the American Society of Civil Engineers, and the Earthquake Engineering Research Institute. His research interests include soil behavior and experimental methods, geotechnical earthquake engineering, foundation engineering, and beneficial use of waste materials.

**Dr. Suren Chen** is an assistant professor in the Department of Civil and Environmental Engineering. He holds a Ph.D. degree from Louisiana State University where he earned the Michael A. Clause Memorial Outstanding Ph.D. student award. His doctoral dissertation was "Dynamic Performance of Bridges and Vehicles under Strong Winds." His research interests include performance of transportation infrastructure and vehicles under natural hazards, natural hazards using GIS, new materials application and health monitoring, and structural

control of vibrations. He has worked on projects funded by the National Science Foundation, the National Research Council-NCHRP IDEA program, and the FHWA-IBRC program. Prior to accepting the CSU appointment, he was a civil engineer with Michael Baker Jr. Corporation, a major international firm.

**Dr. Marvin Criswell** is professor of civil engineering and the associate department head for academic affairs in the Department of Civil and Environmental Engineering. He earned a B.S. degree from the University of Nebraska, Lincoln, and M.S. and Ph.D. degrees from the University of Illinois Urbana-Champaign. He served as an ABET engineering accreditation visitor and has served on the ASEE Board of Directors, as geographic zone (Zone IV) chairman, and as chairman of the ASEE Civil Engineering Division. His research interests include development of buildings and design code provisions related to reinforced concrete. Marvin advises on MPC supported research on composite wood/ concrete bridge systems and timber trestle railroad bridges. He assists with graduate education activities on the TLN network.

**Dr. Richard Gutkowski** is a professor of civil engineering at CSU. He has B.S. and M.S. degrees in civil engineering from Worcester Polytechnic Institute and a Ph.D. from the University of Wisconsin-Madison. Gutkowski is director of the Structural Engineering Laboratory at CSU's Engineering Research Center. He manages research, graduate education, technology transfer, summer diversity research activities, and student internship programs. He has published and presented more than 160 papers and reports and guided numerous theses and dissertations. Gutkowski wrote "Structures: Fundamental Theory and Behavior" (two editions) and co-authored the chapter "Composite Construction in Wood and Timber" in the Handbook of Composite Construction.

Dr. Paul Heyliger has been on the faculty of the Department of Civil and Environmental Engineering for 15 years. He was awarded his Ph.D. in engineering mechanics from Virginia Tech and subsequently did a two-year National Research Council post-doctorate at the National Bureau of Standards. He has been a visiting faculty at the University of California at Santa Barbara, the University of Stuttgart, and the University of Hamburg. His primary research interests are in structural mechanics and analysis with special applications to highly flexible structural elements for energy absorption with application to transportation structures and crash barriers. He has more than 60 refereed journal articles and has been presented with several teaching awards. His research sponsors include the USDOT, National Science Foundation, NASA, USDA, the Army Research Office, AFOSR, and NIST.

**Dr. Juhua Liu** is a research scientist in the Department of Civil and Environmental Engineering. Liu's research and teaching interests are in the areas of off-road vehicle engineering, power and machinery systems, biological and agricultural engineering technology, instrumentation and sensor, control and system engineering, precision farming, GPS/GIS application in engineering. Liu holds a B.S. degree from Jiangsu Institute of Technology, an M.S. from Wageningen University and a Ph.D. from CSU.

**Dr. Don Radford** is an associate professor in the Department of Mechanical engineering. He earned his B.S. in mechanical engineering and his M.S. in metallurgical engineering from the University of British Columbia. He earned his Ph.D. in materials engineering from Rensselaer Polytechnic Institute. His research interests include process-induced distortion in composites, viscoelastic constitutive modeling, advanced polymer processing, and polymer foams, damage assessment and repair of composites and high temperature composites.

### **North Dakota State University**

**Doug Benson** is an associate research fellow at the UGPTI. Benson earned B.S. degrees in psychology, history, education, and computer science from the University of North Dakota in 1978, 1986, 1987, and 1988 respectively. He earned his M.S. in computer science from North Dakota State University in 1996. Some of his recent research involvements include development of a database management system for the American short line railroad industry, software analyst for a branch line benefit/cost modeling system, and Uniform Rail Costing System (URCS) analyst for the study of time-series grain railroad revenue/cost ratios. He

also served as executive director for TEL8 (now TLN) from 1997 to 2004. His research interests include computerized transportation analysis, railroad operations, transportation database, and GIS transportation applications.

**Mark Berwick** has been involved with the UGPTI since 1995, specializing in the areas of logistics and transportation management, specifically in the areas of motor carrier costing, economic development, and business logistics. Most recently, he has been involved in studying cross-border transportation issues and intermodal transportation challenges and issues in North Dakota and surrounding states and provinces. Additional research has focused on motor carrier economics, the logistics of the North Dakota potato industry and characteristics of the farm truck fleet in the Upper Great Plains states. Berwick is the director of the UGPTI's Agriculture, Energy and Industrial Freight Center. Berwick holds master's and bachelor's degrees in agricultural economics from North Dakota State University.

**Dr. John Bitzan** is an assistant professor of management. He earned his B.S. degree in economics from St. Cloud State University, his M.A. in applied economics from Marquette University, and his Ph.D. in economics from the University of Wisconsin - Milwaukee, where he specialized in industrial organization and labor economics. Before joining the College of Business, he worked as a transportation economist with the UGPTI and an adjunct professor in agricultural economics.

**Jarrett Brachman** previously worked for the Central Intelligence Agency and West Point and has one published book on terrorist strategies. He received his undergraduate degree in government and international affairs from Augustana College in 2000 and went on to receive his master's and Ph.D. from the University of Delaware in political science and international relations. It was during his time at the University of Delaware that the attacks on the Twin Towers occurred. The attacks sparked Brachman's interest in why the event happened and what he could do to keep it from happening again. He is establishing a center for transportation and homeland security and teaches courses in the transportation and security fields for the master's of managerial logistics program.

**Alan Dybing** is an associate research fellow at the UGPTI. He is working toward his Ph.D. in transportation and logistics from NDSU. He earned his M.S. in agribusiness and applied economics and his B.S. in agricultural education from NDSU. He is a member of the Transportation Research Forum and has been doing research relating to the HERS-

ST analysis of the North Dakota Highway System, the NDDOT rail plan update, economic impacts of transportation in North Dakota, and truck trip generation of large elevators in North Dakota.

**Dr. Jill Hough** is an advanced research fellow at the UGPTI and the director of UGPTI's Small Urban & Rural Transit Center (SURTC), which focuses on research, education, and training for the public transportation industry. She earned her Ph.D. in the transportation technology and policy program at the University of California - Davis. She earned B.S. and M.S. degrees in agricultural economics at NDSU. She has published more than 35 reports and journal articles in the areas of public transportation, low-volume roads, logistics, and economic development. Her primary research areas presently relate to mobility of the elderly and disadvantaged as well as transit planning and management. She serves on the National Academies of Science Transit Cooperative Research Program Oversight Project Selection Committee and the National Transit Institute Board of Directors at Rutgers University in New Jersey.

**Andrea Huseuth-Zosel** joined the Upper Great Plains Transportation Institute as an associate research fellow at UGPTI. She was previously a research analyst with MeritCare Health System in Fargo, ND. Huseuth-Zosel holds a B.S. in secondary social studies education from Minnesota State University-Moorhead and B.A. and M.S. degrees in sociology from North Dakota State University. She is working with the UGPTI's Rural Transportation Safety and Security Center which promotes and enhances the region's transportation safety and security through research, education, and outreach. Her work focuses primarily on studying and enhancing rural traffic safety by addressing driver behavior issues. She is currently involved in an MPC project partnering with the NDSU Extension Service that is designed to raise awareness and reduce traffic deaths and injuries for North Dakota youth through a pilot educational program.

**Dr. Brenda Lantz** is an associate research fellow at the UGPTI and is the program director for the Transportation Safety Systems Center. She earned her Ph.D. in business administration and supply chain and information systems at Pennsylvania State University in 2006. She also received a M.S. in applied statistics and a B.S. in sociology from NDSU. She specializes in the areas of intelligent transportation systems for commercial vehicle operations, business logistics and commercial vehicle safety - subjects on which she has authored and presented numerous articles.

Mark Lofgren is an associate research fellow at the UGPTI. He earned his M.B.A. from NDSU and his B.S. in industrial management from Minnesota State University - Moorhead. His research interests include freight movement in North Dakota and the region, logistics and economic development, supply chain management, intermodal transportation, regional transportation issues and the effects on rural businesses and agriculture producers, transportation safety/security, and motor carriers.

**David Ripplinger** is an associate research fellow at the Small Urban & Rural Transit Center, a program of the Upper Great Plains Transportation Institute, located at North Dakota State University. Mr. Ripplinger has conducted research in the areas of operations research, transportation economics, ITS, coordination, and university community transportation. He is Vice President-Membership of the Transportation Research Forum and chair of the Paratransit Research Subcommittee of the Transportation Research Board. Mr. Ripplinger received his master's degree from Iowa State and is currently in the Transportation & Logistics Ph.D. program at North Dakota State University.

### **South Dakota State University**

**Dr. John Ball** is part of the Department of Horticulture, Forestry, Landscape & Parks. He earned a B.S. in forest management from Michigan Technological University. He earned a M.S. and Ph.D. in forest entomology from Michigan State University. His areas of research interest include the influence of urban development on forest fragmentation; the influence of tree cover on residential heating and cooling cost; the competitive relationships between ornamental trees and turf grasses; and industry training opportunities such as utility line clearance electrical hazards, logger education to advance professionalism (LEAP), and plant health care for arborists.

**Dr. Allen Jones** is an associate professor in the Department of Civil & Environmental Engineering. He earned his B.S. and M.S. in geological engineering, geotechnical option from the University of Idaho. He earned his Ph.D. in civil engineering from the University of Washington. His research interests include the following: probabilistic seismic hazard assessments, liquefaction induced ground damage, paleoliquefaction, time series analysis, probability and spatial statistics, lateral earth pressures and earth retaining structures, abandoned mine lands (AML) reclamation, AML data integration, and mine subsidence.

**Dr. Hesham Mahgoub** joined the Department of Civil and Environmental Engineering at SDSU as an assistant professor soon after the university became a partner in MPC. His previous research work includes virtual commercial vehicle inspection stations, sustainable infrastructure development for rural communities, pavement materials and construction, infrared technology in pavement evaluation, and recycled materials properties. Before joining SDSU in August 2006, Mahgoub was a visiting professor at the University of Central Florida in Orlando from 2001 until 2006. Mahgoub has a B.S., M.S., and Ph.D. degrees in civil engineering, all from the Cairo University, Egypt.

**Dr. Richard Reid** has extensive experience in design and construction of rigid pavement. He is investigating optimized design and construction methods of concrete pavement for South Dakota highways. The study, which will extend over a period of three years, is co-sponsored by South Dakota Department of Transportation and SDSU. Reid is the assistant dean of engineering and professor of civil and environmental engineering at SDSU. He has a B.S. in civil engineering from the Citadel, and his M.S. and Ph.D. degrees in civil engineering were earned at The Georgia Institute of Technology. He spent 13 years serving as an engineering officer in the US Air Force where he developed experience as an environmental, pavement and research engineer. His previous research includes investigating the effects of explosions on reinforced soil systems, performance of integral bridge abutments, pavement maintenance and soil testing. Since coming to SDSU in 1995, Reid has served as a civil engineering faculty member, interim department head and assistant dean. He has been named College of Engineering Teacher of the Year three times and was also recognized as Brookings Area Educator of the Year. He is a licensed professional engineer and also serves in the South Dakota Air National Guard.

**Dr. Arden Sigl** is a professor in the Department of Civil & Environmental Engineering. He received his B.S. and M.S. in civil engineering. He earned his Ph.D. in civil engineering from Northwestern University. His research has been in areas relating to concrete materials, high-performance concrete, instrumentation and assessment of the performance of full-scale structures, non-linear structures, and structural stability. Sigl retired in 2009.

**Xiao Qin** joined SDSU faculty and is leading a MPC project to develop a safety screening tool for the identification of high-risk rural roads with the aid of computer techniques, GIS, and statistical modeling. Qin is an assistant professor of civil

and environmental engineering. He holds B.S. and M.S. degrees in civil engineering from Southeast University, Nanjing, China, and a Ph.D. degree in civil engineering (Transportation and Urban Engineering) from the University of Connecticut. Prior to joining the SDSU faculty, Qin was an assistant scientist at the University of Wisconsin-Madison where he managed the traffic safety program at the UW Traffic Operations and Safety Laboratory. Qin also spent two years working as an ITS/safety engineer for Maricopa Associations of Governments (MAG) in Phoenix, AZ. Qin's main research interests are traffic operations and safety, statistical modeling and application in transportation, GIS and GPS application and spatial data analysis, and sustainable transportation planning. He is a member of the Institute of Transportation Engineers, the American Society of Civil Engineers, Intelligent Transportation Systems America and is a licensed professional engineer in Arizona.

**Dr. Francis Ting** is a professor in the Department of Civil & Environmental Engineering. He earned his B.S. in civil engineering from the University of Manchester Institute of Science and Technology. He received his M.S. and Ph.D. from the California Institute of Technology. His research interests include breaking waves, fluid turbulence, sediment transport, bridge scour, and open-channel hydraulics.

## **University of Utah**

**Dr. R.J. Porter** joined the University of Utah's Civil and Environmental Engineering Department as an Assistant Professor in July 2009. He comes to Utah following two years of post-doctoral research work at the Texas Transportation Institute of the Texas A&M University System. Dr. Porter holds a B.S. (1999), M.Eng. (2000) and Ph.D. (2007) in Civil Engineering from The Pennsylvania State University. He was a full-time research assistant at the Pennsylvania Transportation Institute during completion of his doctoral degree. Prior to that, Dr. Porter was a Research Associate at the Virginia Tech Transportation Institute in Blacksburg, Virginia and a Research Assistant at the Last Resource Inc., in Bellefonte, Pennsylvania. Dr. Porter is a member of the Transportation Research Board (of the National Academies) Operational Effects of Geometrics Committee [AHB65] and Chair of the Subcommittee on Performance-Based Analysis of Geometric Design [AHB65(3)]. He was honored as a Leadership Fellow of the Eno Transportation Foundation in May 2005. He was also recognized at the 2006 Council of University Transportation Centers Awards Banquet as the Student-of-the-Year for the Mid-Atlantic Universities Transportation Center.

Dr. Paul J. Tikalsky is professor and chair of the Department of Civil & Environmental Engineering. He joined the University of Utah in that position in 2006. Previously, he was professor of civil and environmental engineering at Pennsylvania State University, deputy director of the Pennsylvania Transportation Institute at Penn State; senior research fellow at the Czech National Academy of Sciences, and associate professor of civil engineering at Santa Clara University. He is a registered professional engineer in the State of California and a Fellow of the American Concrete Institute (ACI). He received his B.S. degree in civil and environmental engineering from the University of Wisconsin at Madison and his M.S. and Ph.D. degrees in structural engineering from the University of Texas at Austin. Tikalsky's research is in the area of the development and implementation of higher durability concrete structures and the use of admixtures and supplementary cementitious materials.

**Xuesong Zhou** is an assistant professor in the Department of Civil and Environmental Engineering at the University of Utah. He received his Ph.D. degree in civil engineering from the University of Maryland in 2004. Prior to joining the University of Utah, Zhou worked as a traffic data architect and senior software engineer at Dash Navigation Inc., designing and developing real-time traffic estimation and prediction algorithms for the first commercialized internet-connected GPS navigation system in the United States. Zhou's research interests include modeling and simulation of dynamic traffic systems, estimation and prediction of network traffic conditions using advanced sensor technologies. For the past seven years, he has been assisting the FHWA to develop and provide technical support for a large-scale simulation-based dynamic traffic assignment system, namely DYNASMART-P, which is one of FHWA's 24 priority, market-ready technologies and innovations.

## **University of Wyoming**

**Dr. Michael Barker** is a professor of civil engineering. He specializes in steel bridges and bridge engineering and also does experimental and field testing. Barker's research centers on bridge serviceability and performance. Barker received his B.S. in civil engineering from Purdue University. Also at Purdue, he earned his M.S. in civil engineering. He received his Ph.D. in civil engineering from the University of Minnesota.

**Stephen Boyles** joined the Department of Civil and Architectural Engineering as an assistant professor in the Department of Civil and Architectural Engineering in August 2009.

He is originally from the Seattle area and earned degrees in civil engineering and mathematics from the University of Washington in 2004. He was an intern with the Washington State Department of Transportation, working at a traffic management center where he gained experience in ITS operations, working with ramp meters, variable message signs, and recording highway advisory radio messages and traffic reports on WSDOT's hotline. He earned his master's and Ph.D. from the University of Texas, focusing network analysis and transportation planning under uncertainty. He was also involved in several projects with the Texas Department of Transportation on incident management, traffic data archiving, and large-scale simulation of the Austin metropolitan area. Boyles says the most exciting part of transportation research is its multidisciplinary nature, bringing together economics, mathematics, electrical engineering, structural and geotechnical engineering, psychology, public policy, statistics -- and a host of other fields -- in order to solve highly practical and urgent problems in society. Within all of these fields, his primary interests are in planning and optimization. He is interested in the possibility of developing a very large-scale simulation model, perhaps encompassing an entire state or multistate region, combining aspects of dynamic assignment planning models and operational microsimulators. Recent advances in mesoscopic traffic modeling and in computing make such a large-scale model feasible in rural areas such as those comprising most of the MPC states, and can allow the statewide impacts of different alternatives to be measured, as well as making planning and operations models more consistent with each other.

Another topic of interest is roadway tolling, which is especially topical as states are struggling to find alternate revenue streams at a time when freight volumes are increasing. This is especially important in the MPC region, which is crossed by several major trucking corridors, and also because relatively little research has been done on how roadway tolling uniquely impacts rural regions.

Dr. Boyles conducts research in transportation network analysis, infrastructure management, and the application of optimization techniques to transportation problems.

His research has been recognized by awards from the Institute of Transportation Engineers and Council of University Transportation Centers, and his doctoral studies were supported by a fellowship from the Federal Highway Administration.

**Dr. Thomas V. Edgar** works with flow, deformation and pollutant migration in saturated and unsaturated porous media, slope stability, and expansive soils. An associate professor in the College of Engineering, Edgar recently worked with soil additives for unpaved road stability and long-term maintenance, investigated effects of freeze and thaw on highway soils, studied protection of wellhead areas for public water supplies and conducted research on consolidation of partially saturated soils due to applied stress, moisture and thermal gradients. His B.S. degree is from the University of Colorado and his M.S. and Ph.D. are from Colorado State University, all in civil engineering.

**Dr. Jay A. Puckett** is a professor of civil engineering and a licensed engineer who has worked in research and development for 22 years. He was a subconsultant in the development of the LRFD Bridge Design Specification. Puckett has conducted numerous research projects in the area of software development and physical testing of bridges and bridge components ranging from lightly reinforced bridge decks, fiber-reinforced approach embankment fills, asphalt joints, temperature effects and wood girders. Software development efforts include analysis, design and rating tools for steel, concrete, pre-stressed concrete and wood. He has been honored with research, graduate teaching and Most Outstanding Professor awards. His B.S. degree is from the University of Missouri and his M.S. and Ph.D. degrees are from Colorado State University, all in civil engineering.

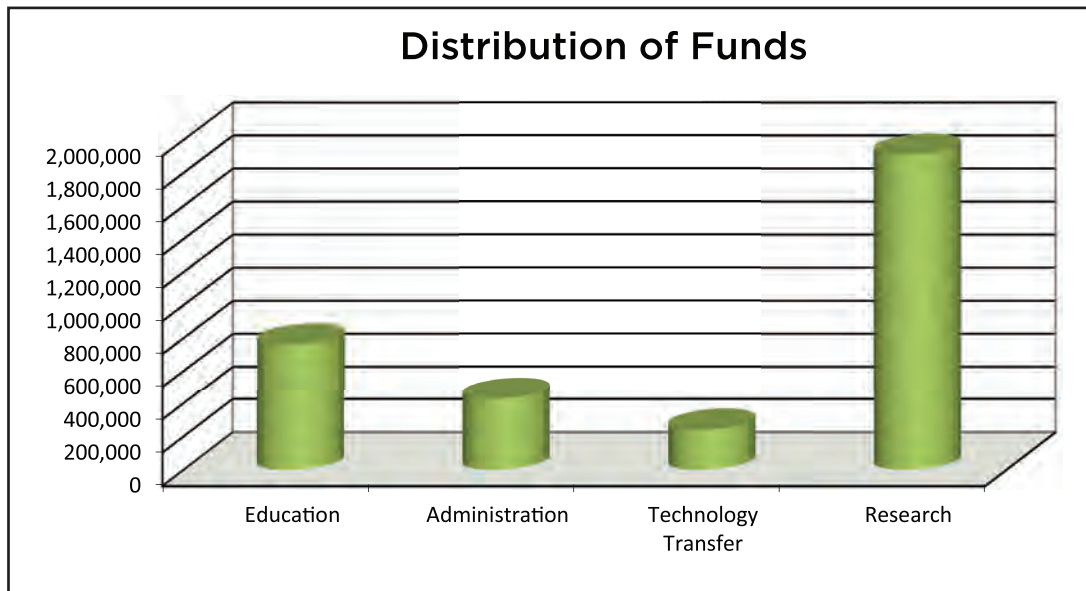
**Dr. Eugene M. Wilson** is professor emeritus of civil engineering and past program coordinator for the Mountain-Plains Consortium – Rural Transportation Research Program. Since 1975, he has been a traffic-engineering consultant working with both private and public sectors. Wilson is nationally certified as a Professional Traffic Operations Engineer. Named the 59th honorary member of ITE's international board of directors, he also earned the ITE Lifetime Achievement Award for the Colorado-Wyoming section. His B.S. and M.S. degrees were earned at the University of Wyoming and his Ph.D. is from Arizona State University, all in civil engineering. Iowa, Wyoming, and Colorado awarded him status as a professional engineer.

**Dr. Rhonda K. Young** is an assistant professor of civil engineering. Her research interests include transportation decision-making, statewide multimodal planning, and freight transportation. Her research efforts in transportation decision-making and multimodal planning stem from her work with the Washington State Department of Transportation in developing a computer-based tool to aid in funding decisions entitled Multimodal Investment Choice Analysis (MICA). Young's general interests in this area focus on methods to increase the efficiency of agency spending toward transportation infrastructure. Her work in the area of freight transportation deals with freight mobility issues and how freight transportation stakeholders can be brought into the statewide planning process. She received her bachelor degree in civil engineering from Oregon State University, master's and Ph.D. degrees in civil engineering from the University of Washington, and has a graduate certificate in transportation, trade, and logistics (GTTL) from the University of Washington.

### **University of Wyoming Staff**

**George Huntington** works with the Wyoming T2/ LTAP Center where he has taught workshops on erosion and sediment control, soils, work zone traffic control, pavement design, and other topics. He has also worked extensively on the Center's asset management project. Huntington received his bachelor's and master's degrees in civil engineering from the University of Wyoming. He spent eight years with WYDOT, including five years as a materials engineer in Cheyenne and three years as a project engineer in Sundance and Rawlins.

## RESOURCES AND FUNDING July 1, 2009 – June 30, 2010



### Funding Sources

North Dakota Department of Transportation  
 Utah Department of Transportation  
 Wyoming Department of Transportation  
 Colorado State University  
 Bismarck/Mandan Metropolitan Planning Organization  
 North Dakota Wheat Commission  
 South Dakota Department of Transportation  
 Grand Forks/East Grand Forks Metropolitan Planning Organization  
 Utah Transit Authority  
 North Dakota State University  
 Fargo-Moorhead Council of Governments  
 Safe Kids Fargo/Moorhead  
 Meritcare  
 North Dakota Department of Health  
 Safe Communities of the Red River Valley  
 AAA  
 South Dakota State University  
 University of Utah  
 University of Wyoming  
 Upper Great Plains Transportation Institute  
 Colorado Department of Local Affairs  
 BNSF Railroad  
 TLN Telecommunications Network (includes the NDDOT, WYDOT, MTDOT)

## RESEARCH PROJECT STATUS July 1, 2009 – June 30, 2010

---

### New Research Projects

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-317	Development of Safety Screening Tool for High Risk Rural Roads (SDSU, X. Qin)
MPC-318	Investigating Crashes and Geometric Conditions in the State of Wyoming (UWY, K. Ksaibati)
MPC-319	Gravel Roads Management: Developing a Methodology (UWY, K. Ksaibati, G. Huntington)
MPC-320	Pricing Strategies for Rural Freeways (UWY, S. Boyles)
MPC-321	Salt Lake City Internship (UUT, P. Martin)
MPC-322	Driver Simulation (UUT, P. Martin)
MPC-323	Risk-based Advisory Prevention System for Commercial Trucks Under Hazardous Conditions (CSU, S. Chen)
MPC-324	Reliability-based Safety Risk and Cost Prediction of Large Trucks on Rural Highways (CSU, J. Balough, R. Atadero)
MPC-325	Fatigue Testing of Wood-Concrete Composite Beams (CSU, J. Balough, R. Atadero)
MPC-326	Rapid Load Rating of Short Rural Bridges (CSU, J. Lindt)
MPC-327	Seismic Risk Assessment for the (-25/I-70 Corridor in the Mountain Plains Region of the U.S. (CSU, J. Lindt)
MPC-328	Low-Impact High-Toughness Transportation Barriers (CSU, P. Heyliger)
MPC-329	Traffic Safety: Pilot Study to Assess Sustained and Multifaceted Activity on North Dakota's Rural Roads (NDSU, K. Vachal, A. Huseth)
MPC-330	Integrate Supply Chain Model in Urban Freight Planning (NDSU, S.Mitra, D. Tolliver)
MPC-331	Using ND Traffic Records to Identify Higher Risk Teen Drivers (NDSU, K. Vachal, D. Malchose)
MPC-332	Estimation of the Generalized Truck Freight Elasticity of Demand: Case Study of the Seattle-Tacoma to Chicago Corridor (NDSU, A. Dybing)
MPC-333	Implementing Traffic Safety Evaluations to Enhance Roadway Safety (NDSU, J.Baker, K. Johnson, M. Berwick, K. Vachal)
MPC-334	Proper Seat Placement of Children Aged 4 to 12 within Vehicles (NDSU, A. Huseth)
MPC-335	Misinformation Contributing to Safety Issues in Vehicle Restraints for Children (NDSU, A. Huseth)
MPC-336	ND Wheat Transportation Knowledge for Market Enhancement (NDSU, K. Vachal, D. Benson)
MPC-337	Analysis of Freight Fuel Efficiency with Comparisons to Waterways and Truck Transportation (NDSU, D. Tolliver, D. Benson, P. Lu)
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)



## On-going Research Projects

MPC-179	Full-Scale Laboratory Testing of a Timber Railroad Bridge (CSU, R. Gutkowski)
MPC-193	Rigorous Computer Modeling of Timber Trestle Railroad Bridges (CSU, R. Gutkowski)
MPC-207	An Evaluation of Region 8 State Departments of Transportation and Metropolitan Planning Organizations' GIS Technology Application (NDSU, D. Benson)
MPC-248	Wyoming Freight Movement System Vulnerabilities and ITS (UWY, R. Young)
MPC-250	Interactive Effects of Traffic- and Environmental-Related Pavement Deteriorations (NDSU/UWY, D. Tolliver/K. Ksaibati)
MPC-266	Small Urban and Rural Transportation - Phase II (NDSU, A. Smadi)
MPC-271	A Comprehensive Transportation Safety Evaluation Program in the State of Wyoming (UWY, K. Ksaibati)
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-287	Effectiveness of Using Recycled Asphalt Materials and other Dust Suppressants in Gravel Roads (UWY, K. Ksaibati)
MPC-288	Utah Department of Transportation Traffic Operations Center Operator Training (UUT, P. Martin)
MPC-290	A Comprehensive Transportation Safety Evaluation Program in the State of Wyoming (UUT, A. Stevanovic)
MPC-291	A New Generation of Emergency Escape Ramps (CSU, J. van de Lindt)
MPC-293	Development of GIS Multimodal Capacity Model for Northern Tier Freight Corridor (NDSU, S. Mitra)
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-302	Enabling Innovate Steel Plate Grider Bridges: Simple Made Continuous (CSU, J. van de Lindt)
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-305	Jointed Plain Concrete (JPC) Design and Construction Review (SDSU, N. Wehbe)
MPC-306	Optimization of Pavement Marking Performance (SDSU, N. Wehbe)
MPC-307	Maximum Velocity and Shear Stress in Flow Fields around Bridge-Abutments in Compound Channels (University of Wyoming, R. Ettema)
MPC-308	Phase I: Pilot Project to Develop Rural Youth Occupant Protection Education Platform (NDSU, T. VanWechel)
MPC-309	Rural Road Signage: Simulated Driving to Evaluate Low-Cost Safety Improvements for Older Drivers (NDSU, K. Vachal)
MPC-311	Forecasting Bridge Deterioration Rates and Improvement Costs (NDSU, S. Mitra, D. Tolliver, K. Johnson)
MPC-312	A GIS Model for Bridge Management and Routing (NDSU, S. Mitra, A. Dybing, K. Johnson, D. Tolliver)
MPC-314	Assessing the User Impacts of Fast-Track Highway Construction (ABC) (University of Utah, P. Martin)

## 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-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-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-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-249	Pultruded Composite Shear Spike for Repair of Timber Bridge Members (CSU, R. Gutkowski) MPC Report No. 05-173
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 Letter of Completion 6/2/10
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) Formal Letter of Completion 6/2/10
MPC-263	Traffic Operations in Small Urban and Rural Areas (NDSU, A. Smadi) Web site: <a href="http://www.surto.org">www.surto.org</a> 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-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) MPC 03-151
MPC-270	Serviceability Limits and Economical Steel Bridge Design (UWY, M. Barker) MPC 08-206
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-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) MPC 10-223
MPC-279	Structural Applications of Self-Consolidating Concrete (SDSU, N. Wehbe) MPC 08-194
MPC-280	Bridge Scour in Cohesive Soils (SDSU, F. Ting) MPC 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-289	Evaluation of Optimal Traffic Monitoring Station Spacing on Freeways (UUT, P. Martin) MPC Report No. 09-214
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-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-297	Understanding Influence of Transportation and Other Factors on the Economic Growth on Non-metropolitan Cities (NDSU, K. Vachal)
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-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-310	Evacuation Modeling for Small to Medium Sized Metropolitan Areas (NDSU, S. Birst, M. Lofgren) MPC 10-222
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 09-213 and MPC 09-213A (Before TEA21 Funding)
MPC-042	Dynamic Impact Load Tests on a Moderate-Weight Bridge Guardrail (CSU, R. Gutkowski) MPC Report No. 07-188
MPC-125	Factors Affecting Rail Car Supply (NDSU, K. Vachal) MPC Report No. 01-121
MPC-137	Railroad Bridge Strengthening Needs - Year 2 (CSU, R. Gutkowski) MPC Report No. 03-147
MPC-138	Full Scale Laboratory Testing of a Timber Trestle Railroad Bridge (CSU, R. Gutkowski) MPC Report No. 02-139
MPC-140	Shear Key for Strengthening Bridges (CSU, R. Gutkowski) MPC Report No. 01-126
MPC-149	ATM for Non-Metro Communities During Special Events and Severe Weather Conditions Using Remote Weather Information Systems (USU, B. Grenney) MPC Report No. 01-120
MPC-154	An Assessment of Rural Road Needs in the Mountain-Plains Region (NDSU, J. Hough) MPC Report No. 03-140
MPC-156	Short Line Railroad-Factors Contributing to Success (NDSU, J. Bitzan, D. Tolliver, P. Fisher) MPC Report No. 01-128
MPC-162	Field Evaluation of Cement Treated Bases (UWY, K. Ksaibati) MPC Report No. 00-115
MPC-164	Refining the Road Safety Audit Process for Local Rural Roads (UWY, E. Wilson) MPC Report No. 00-114
MPC-169	County Road Planning Workbook (NDSU, J. Hough) MPC Report No. 06-183
MPC-171	An Evaluation of ITS Transit Applications Used to Facilitate the Welfare to Work Program (NDSU, J. Hough) MPC Report No. 02-131
MPC-174	Assessing Agriculture's Long-Term Rail Needs (NDSU, J. Bitzan) MPC Report No. 01-116