

2008: THE YEAR IN REVIEW | *Annual Report*



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The Mountain-Plains Consortium (MPC) conducts research, education and training on transportation infrastructure and the movement of passengers and freight. It is a competitively selected university program sponsored by the U.S. Department of Transportation attracting the nation’s best talent to study transportation and develop new transportation strategies and concepts. The consortium includes North Dakota State University, Colorado State University, South Dakota State University, the University of Utah, and the University of Wyoming

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DIRECTOR'S MESSAGE



Denver Tolliver

A hallmark of Mountain-Plains Consortium faculty has been their desire to serve the unique transportation needs of our region, USDOT region 8. The region's wide-open spaces, sparse population and rich deposits of natural resources make for a complex variety of transportation issues, ranging from congestion in places like Denver and Salt Lake City, to road maintenance on the prairies of the western Dakotas and Wyoming.

Last year, the consortium spent considerable energy developing its strategic plan to guide our approach to those issues. The plan was developed with help from our Advisory Board and review from the USDOT.

A key element of the plan was to call together panels of experts from universities and departments of transportation in the region to assess the greatest needs of our transportation system as well as the strongest research capabilities of our universities. We held two of those panels earlier this year: one on bridges and one on pavements. As a result, we are able to direct our research dollars to areas where we expect to have the greatest impact. At the same time, the closer relationship between our faculty members and DOT professionals is making us more responsive to emerging issues and opportunities.

While the Mountain-Plains Consortium is improving the way it addresses transportation issues today, it's tough to predict what the issues of tomorrow will be. No matter what those issues are, the students of the Mountain-Plains Consortium universities will be prepared to find innovative solutions.

We continue to attract excellent students and we involve them intimately in Mountain-Plains consortium research projects. Through that involvement, they not only learn their academic discipline, they also gain contacts and experience within the industry. The Mountain-Plains Consortium universities benefit from their fresh perspective, their energy, and their considerable brain power. The growth of our academic programs and the success of our graduates are benchmarks that measure this success.

This report details our student activities, research programs, and our technology transfer activities. Within these pages, you will find evidence of the dedication and innovative spirit of our faculty and the drive and creativity of our students.



Student Program Activities

Shepherd Named UTC 2008 Student of the Year for Region VIII

Benjamin Shepherd, originally from Reidsville, North Carolina, was named the University Transportation Centers Student of the Year for 2008 at the Jan. 12 Transportation Research Board meeting in Washington, D.C.

Shepherd is enrolled at the University of Utah under the Army's Advanced Civil Schooling program. He is currently 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 2001.



Shepherd

Shepherd 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.

He has past work experience as headquarters and headquarters battery commander from 2004 to 2007. He was responsible for morale, welfare, and training of a 75-person artillery battery deployed to Tikrit, Iraq. As brigade fire control officer, Shepherd controlled all artillery and rocket fires for a field artillery brigade consisting of 54 155mm howitzer cannons and 18 multiple-launch rocket systems. He also managed hazardous and explosive brigade ammunition assets. From 2002 to 2004, he was battalion fire direction officer where he planned, coordinated and controlled all fires for an 18-gun artillery battalion and prepared operations orders for battalion-level training events and real-world deployments. He also held the positions of battery fire direction officer, platoon leader, and executive officer.

Shepherd has received numerous awards and decorations including two Bronze Star Medals, Army Commendation Medal, Army Achievement Medal, Global War on Terrorism Service Medal, Iraqi Campaign Medal, Army Service Ribbon, and National Defense Service Ribbon.

LeBorgne Completes Masters at CSU

Colorado State University (CSU) student Matthew LeBorgne completed his M.S. degree in December. He is now a doctoral student at the University of Texas at Austin. His thesis, “Analysis of Wood-Concrete Beams Incorporating Recycled Utility Poles,” detailed research on developing a design method for predicting the capacity of a composite longitudinal bridge deck section consisting of two utility poles topped with an interconnected concrete layer.



LeBorgne

Mitra and Chi Earn Ph.D.s



Mitra

North Dakota State University (NDSU) students Subhro Mitra and Junwook Chi earned their doctoral degrees in transportation and logistics. Mitra graduated at the end of the fall semester and Chi received his degree at the end of the spring semester.

Mitra’s dissertation was titled “Development of a Statewide Freight Transportation Model to Assess the Impact of Highway Spring Load Restrictions.” Mitra has been employed by the Upper Great Plains Transportation Institute (UGPTI) as a GIS-specialist/transportation engineer since November 2006 and prior to that as a graduate research assistant with UGPTI. Mitra has been working with the NDDOT on a project entitled “Analyzing the Highway Needs of a Proposed Ethanol Processing Plant at Spiritwood, ND.” Mitra also specializes in GIS and cube modeling and teaches TL 785, Spatial Analysis/Transportation Systems. Last year, Mitra’s paper, “Analyzing satellite imagery to develop freight generation data,” won a student paper contest sponsored by the American Association of State Highway and Transportation Officials at that group’s Geographic Information Systems for Transportation Symposium (GIS-T) in Nashville, TN.

While earning his Ph.D., Chi conducted research for the Upper Great Plains Transportation Institute including a study on airfare differences between small and metropolitan areas and a study on the evaluation of the viability of intermodal facilities. At the annual meeting of the Transportation Research Forum in Fort Worth in March, Chi was awarded the organization’s Graduate Paper Award. His paper was titled “Pricing Behaviors in the U.S. Airline Industry.” His adviser is Won W. Koo, professor of agricultural and applied economics and director of the Center for Agricultural Policy and Trade Studies at NDSU. Chi earned a bachelor’s degree in forest resources from Kon-kuk University in South Korea and a master’s degree in agricultural economics and business from the University of Guelph in Ontario, Canada. Chi is now on the staff of Marshall University in Huntington, WV.



Chi



Chen

Chen Nominated for Fellowship Program

NDSU Ph.D. student Xianzhe Chen has been nominated by Jun Zhang, Department of Industrial and Manufacturing Engineering, for the IBM Fellowship Program which is a worldwide competitive program. Xianzhe has been working with Zhang on his thesis topic of supply chain management. Zhang noted “Xianzhe has been doing a phenomenal job researching and apply supply chain data.”

French Students Complete Degree Requirements While at CSU

Three undergraduate students from Ecole Nationale Supérieure Des Technologies and Industries Du Bois - Epinal, France, completed a professional training degree requirement of their home institution while in residence at Colorado State University from June through August, 2007. Jonathan Guet, Adrien Mahler, and Jonathan Pernot worked at the Structural Engineering Laboratory on various research projects. These included MPC-supported studies of a shear spike repair method for application to old timber trestle bridge members, composite wood-concrete bridge construction for bridges, and recycling of salvaged wood utility poles for structural use in bridges. They also provided some assistance on projects related to seismic behavior of light frame wood buildings. They will complete degrees in The Department of Wood Science and Technology in the coming year.



Zeng

Zeng Defends Dissertation Prospectus

NDSU Ph.D. student Hai “James” Zeng defended his dissertation prospectus Oct. 23. His dissertation title is “Economical Assessment of the Impact of RFID Technology on the Pharmaceutical Supply Chain Loss Management.” Zeng anticipates completing his degree program in the fall of 2008 or spring of 2009.

First SDSU MPC Student Takes Position with Montana Firm

South Dakota State University (SDSU) alumnus Amanda Boushek of Echo, MN, landed a job with CTA, a multi-disciplinary architecture-engineering firm, in Billings, MT. She was the first SDSU graduate to work on a Mountain-Plains Consortium (MPC)-sponsored research project.

After graduating with a B.S. degree in civil engineering in May 2006, Boushek expressed interest in pursuing a master's degree in structural engineering to her professors at SDSU. Nadim Wehbe, her advisor, offered her the opportunity to be a graduate research assistant on the self-consolidating concrete project sponsored by the MPC. Boushek jumped at the opportunity and, in May 2007, she completed her M.S. degree in civil engineering.



Boushek

Her research focused on the development and evaluation of SCC mix designs for structural applications in highway box culverts. The objective of the study was to test several different designs which made use of South Dakota local aggregates. The project was cosponsored by the South Dakota Department of Transportation.

Boushek's new position at CTA allows her to put her past experiences and training into practice. Originally an innovative combination of an architect and an engineer, CTA has continued to expand this multi-disciplinary approach to now include 24 building-related disciplines under one roof. Some of the company's services include: architecture, engineering, interior design, land planning, landscape architecture, graphics, and multimedia. The company has been in business since 1938 and now employs 400 people in 15 regional offices throughout Montana, Colorado, Washington, Wyoming, Idaho, Texas, Nebraska, and Louisiana. It is also a member of the U.S. Green Building Council and embraces sustainable building practices.

At CTA, Boushek mainly focuses on structural projects involving buildings, but her experiences at SDSU continue to benefit and guide her in her day-to-day work. "My coursework provided me with the education I needed to start my career as a structural engineer. The courses at SDSU provided me with knowledge that is very relevant to the tasks I perform. I have used what I learned in those classes many times already in the first few months of my career," says Boushek.

In addition, Boushek says that her experience with the MPC played a vital role in her career search. The opportunity to do interesting and innovative research, plus earn her degree, helped her to reach her goal of working in structural engineering. Boushek says that she has already encountered many engineers who are very interested in SCC and ask her about her research.

MPC research funding was invaluable in helping Boushek reach her educational and career goals. "The MPC funding provided me with very interesting graduate research. It allowed me to complete my graduate work and focus on my research and courses. With the funding, I earned my degree more quickly than I would have without it," Boushek says.

Boushek was the first SDSU graduate to work on a MPC-sponsored research. MPC hopes to continue to partner with SDSU and support individuals like Boushek, says MPC director Denver Tolliver. "Our vision is to develop new strategies and concepts to effectively address transportation issues. If this partnership can produce more success stories like Boushek's, the future looks bright for transportation research."

Scholarships Awarded at NDSU



Geu

The UGPTI awarded four scholarships at its annual Awards Banquet Oct. 11, 2007. The \$1,500 scholarships are awarded each year through the Mountain-Plains Consortium with funding from the US DOT University Transportation Centers program.

Daniel Leek Geu received the Paul E.R. Abrahamson Scholarship. Geu is majoring in agricultural economics. Geu came to the United States from southern Sudan in east Africa 14 years ago and hopes to specialize in areas such as agricultural transportation, logistics, or marketing. The Abrahamson scholarship recognizes academic achievement and promotes the education of transportation students at NDSU. The scholarship is named in honor of Paul E.R. Abrahamson, the first administrator of the North Dakota Wheat Commission and a leader in the North Dakota agricultural community.



Bruins

David Bruins, Michael Grundman, and Joshua Loegering received Transportation Engineering Scholarships. The scholarships recognize academic achievement and promote the education of transportation students at NDSU.

David Bruins is a senior in civil engineering. A native of Watford, ND, Bruins has been employed by the Fargo District of the North Dakota Department of Transportation and at the DOT Support Center at NDSU. Bruins has been named to the dean's list twice in the College of Engineering.

Michael Grundman is a senior in civil engineering from Osakis, MN. He works at the Advanced Traffic Analysis Center. He is a member of the NDSU cycling team and the NDSU chapter of American Society of Civil Engineers. He also participates in Golden Key International Honor Society and the National Society of Collegiate Scholars and has been named to the dean's list in the College of Engineering every semester that he has been at NDSU.

Joshua Loegering is a senior in civil engineering and originally from Milaca, MN. Loegering is involved with the ASCE chapter at NDSU, Collegians for Life and is an officer in the Knights of Columbus. He has been named to the College of Engineering Deans List four times.



Grundman



Loegering



Student Profiles

Colorado State University



Balogh

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.



Boulden

John Boulden is presently conducting research on the time-dependent behavior of cambered wood-concrete beams as a predecessor to examining short span bridge system. He is an M.S.-level graduate student and was supported as a research assistant by MPC funding. Presently, he is employed at the firm of CTL Thompson Structural Consulting Engineers as a staff engineer, after previous experience as a field technician with that firm. Before his experience with CTL, he was a pavement management intern with the

City of Fort Collins, CO. John was the recipient of a Computer Science, Math and Engineering Scholarship from CSU in 2002.



Dao

Thang Dao earned his B.S. in Vietnam and his M.S. from CSU in 2005 related to genetic algorithms applied to structural optimization. He is studying spatio-temporal load control on structures such as railroad bridges and has been funded by the MPC. His anticipated graduation date is 2009.

Jesse Dunham-Friel is a research assistant working with Antonio Carraro on the expansive soil-rubber stabilization project at the Geotechnical Engineering Laboratory at CSU. He is pursuing an M.S. degree in civil and environmental engineering and earned a B.S. degree in civil engineering at the University of Vermont in 2007.

Henrik Forsling is an M.S. student in civil engineering. He earned his B.S. degree in civil engineering at Colorado State University in 2004 and is a member of Chi Epsilon, the civil engineering honors society. The research area for his thesis is shear spike rejuvenation of timber railroad bridge members. He is conducting full-scale laboratory tests to examine durability of the method under repeated loading. He is a graduate research assistant. In 2001-2002, he was awarded the Engineering Scholars Scholarship and in 2002-2003 the George T. Abell Scholarship from CSU. In 2003-2004, he was selected as a member of the President's Leadership Class at CSU. In 2001, he was an engineering intern with Water and Wastewater Works in Malmo, Sweden. In addition, he served as battle tank commander in the Swedish Army from 1998 to 1999.



Forsling

Nathan Miller received his B.S. degree in engineering from Dordt College in Iowa. He is presently a graduate teaching assistant in the Department of Civil and Environmental Engineering. He is conducting MPC-supported research on shear spiking to stiffen and strengthen 50-75-year-old timber railroad bridge members provided by the BNSF railroad. The BNSF is interested in the feasibility of the method for field repairs. Miller's thesis will focus on time-dependent effects on wood-concrete members comprised of salvaged utility poles.



Ramirez

Fernando Ramirez is a Ph.D. student and instructor at CSU. He earned a bachelor's degree in civil engineering from the School of Engineering of Antioquia (Colombia), and has an M.S. in civil engineering from Colorado State University. After receiving his bachelor's degree, Ramirez worked as a structural design engineer for almost 10 years. His research interests are focused on the area of computational structural mechanics. Some of his current projects include low-density fibrous composites, smart materials and adaptive structures, and the mechanics of inorganic nanotubes. He was the recipient of the 2004 Chi Epsilon Gold Key Award for Excellence in teaching.

C.J. 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.



Riley

Chris Turnbull-Grimes is an M.S. student in structural engineering and solid mechanics and 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 is 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.

Giang Lam To is a graduate research assistant in civil engineering, pursuing a doctoral degree. His research interest is in advanced structural modeling of layered composite wood-concrete systems. To is studying time dependent behavior and rheological phenomena under structural loading, including creep, shrinkage, swelling, humidity, mechano-sorptive effects, etc. He completed his M.S. degree in 2001 at the University of Transport and Communications in Hanoi, Vietnam. His thesis was “Programming to Analyze Girder System with Arbitrary Boundary under Lateral Load by Finite Element Method.” He is attending CSU in part because of competitive-based funding from his government for gifted, outstanding students.



Lam To

North Dakota State University – Ph.D. Students



Bachkar

Khalid Bachkar is originally from Casablanca, Morocco. In 1999, Bachkar earned a bachelor’s degree in business administration from Hassan II University – Mohammedia, Morocco. In 2005, he earned a master’s degree in information systems from Shippensburg University – Pennsylvania. Currently, Bachkar is a member of the Association for Computing Machinery. In the future, he plans to teach and conduct research relating to international logistics and supply chain management.

Charles Briggs of Abonnema, Nigeria, is pursuing a concentration in transportation economics and regulation, and a possible second concentration in logistics and supply chain management. His research will primarily focus on the challenges facing the multinational petroleum industry supply chain. He received his B.B.A. in international business from Schiller International University in London, England. In 1986, he received his M.S. in economics from Alabama A&M University, with a concentration in finance. Upon graduation, Briggs was employed by the university to teach in the Department of Economics. Upon completing the Ph.D. program in transportation and logistics, Briggs will return to Alabama A&M University to continue his teaching career.



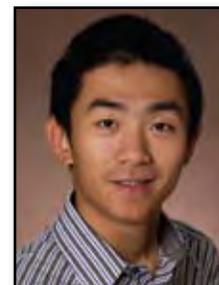
Briggs



Chen

Ieelong (Peter) Chen of Kaoshiung City, received his M.B.A. from California State University in Carson, CA, in 1999. Chen became interested in supply chain management when he noticed the distribution system in Taiwan suffering great changes due to manufacturing firms moving their production lines to other countries, where the labor cost is low. He is interested in how to apply radio frequency identification (RFID) technology and integrate it with the current information system to improve the efficiency of the distribution. He is especially interested in studying new supply chain management theories.

Xianzhe Chen is working to finish his Ph.D. and expects to graduate in 2007. 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.



Chen



Dybing

Alan Dybing is a researcher at the Upper Great Plains Transportation Institute focusing on the areas of regional economic impacts of transportation infrastructure investment in North Dakota and on modeling intermodal facility locations. Dybing received his B.S. in agricultural education from North Dakota State University in 1999, followed by his M.S. in 2002. Currently, Dybing is working on his doctoral dissertation.

Yolanda Carson is originally from Buffalo, NY. She earned her Ph.D. in industrial engineering and systems science in 1998 from the State University of New York at Binghamton under a National Science Foundation Fellowship. Her dissertation was “An Evolutionary-Strategy Based Simulation-Optimization Methodology for Multi-Objective-Optimization.” She also earned an M.S. in industrial engineering with concentrations in production systems and manufacturing engineering and a B.S. in industrial engineering from the State University of New York at Buffalo. In the future, Carson would like to teach, conduct research, and consult in the area of operations research/military operations research focusing on modeling and simulation, statistical analysis, and strategy development for applications in transportation, logistics, and supply chain systems.



Carson



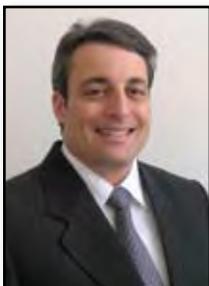
Enyinda

Chris Enyinda of Huntsville, AL, is finishing his second Ph.D. Enyinda received his M.S. in economics with an option in management and an M.B.A. in management both from Alabama A&M University, Huntsville. Enyinda then went on to receive his first Ph.D. in applied agricultural economics with primary concentration in marketing and price analysis and secondary concentration in logistics and transportation in 1995 from the University of Tennessee, Knoxville. Enyinda’s research focuses on “Modeling Risks Management in the Global Pharmaceutical Supply Chain Logistics.” Enyinda hopes to provide insight to better understand the risks and vulnerabilities that can disrupt global pharmaceutical manufacturing supply chain logistics. Upon completing the Ph.D. program, he will return to teaching, research/ publishing, and consulting in the area of transportation, logistics, and supply chain management for Alabama A&M University.

Lei Fan is working to finish his Ph.D. in transportation and logistics. In addition, Fan researches material handling, warehousing, and grain terminal engineering. He is interested in modeling border crossing, port terminal trip generation and strategic planning for supply chain systems. He earned his B.S. in engineering at Zhengzhou Grain College, now known as Henan University of Technology, in China. In 2005, Fan received his M.S. in engineering from the University of Manitoba in Canada. In the future, Fan wants to conduct consulting work in transportation and logistics engineering with a focus on research, design, and evaluation of engineering projects.



Fan



Flanagan

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.



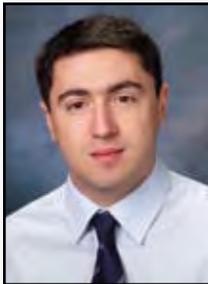
Hu

Yinan Hu is from Wuhan, China. She plans to pursue a career in consulting, teaching or research. Her main research interests include supply chain management, logistics economics and highway planning. In 2007, she earned her bachelor's degree in management from Zhongan University of Economics and Laws in Wuhan. Hu received the third prize for Undergraduate Special Scholarship for excellent individual performance in academic competition three times, and is also a three-time recipient of the first place prize of National Renmin Scholarship.

Weijun Huang of Zhangjiagang, China, received his M.S. from North Dakota State University in 2004. Prior to that, Huang studied at the University of Oklahoma City, where he received his M.B.A. In China, Huang received his B.S. in engineering at Zhengzhou Grain University. Huang is interested in researching motor carriers, logistics and economic development, grain logistics, and regional economic development. His goal is to be a researcher or consultant in transportation or logistics.



Huang



Kayabas

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.S. in computer engineering from Kwandong University in South Korea in 1996. Lee received his M.B.A. from Hanyang University, also in South Korea, in 1999. Currently, Lee is working on his M.S. in industrial engineering. Lee conducts research at the UGPTI in the areas of multimodal routing, logistics network simulation, and aviation planning. After graduation, Lee plans to work as a consultant to enhance business or work for other institutions as a researcher.



Lee



Liu

Qing Liu is from Rizhao, China. Liu earned a bachelor's degree in transportation from Dalian Maritime University in Dalian, China. She plans to eventually earn her Ph.D. from NDSU. Her primary research interests include supply chain management and port planning.

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.



Lu



Motuba

Diomo Motuba of Buea, Cameroon, earned his M.S. in agribusiness and applied economics from North Dakota State University, and may pursue a career in teaching or research. Motuba received his B.S. in botany from the University of Buea in Cameroon in 2000. At the UGPTI, Motuba researches freight transportation planning and the development and incorporation of freight into transportation planning models. In addition, he researches the use of GPS technology and logistics in improving planning models.

Jamie Paurus of Frazee, MN, is researching supply chain management. Paurus earned his B.S. in university studies in 2003 at NDSU. In 2005, Paurus received his master's of business administration also from NDSU. In the future, Paurus will continue teaching at Valley City State University, Valley City, ND, in the Business and Information Technology Division.



Paurus



Ripplinger

David Ripplinger is a researcher at the Upper Great Plains Transportation Institute in the areas of community transportation systems, intelligent transportation systems, student transportation and public transportation economics. Ripplinger received his B.S. from North Dakota State University in 2001, and his M.S. from Iowa State University in 2003.

Marc Scott hails from Trinidad and Tobago. He received his B.S. in business economics and an M.S. in transportation from South Carolina State University. Scott's research interests include: international logistics, supply chain management, transportation planning and policy, and strategy. In the future, he hopes to pursue a career in business, consulting, and research.



Scott



Singh

Meera Singh received a B.A. in economics from Banaras Hindu University, India, in 1993 and her M.A. in economics from Ch. Charan Singh University, India, in 1995. She also received her M.S. in statistics from NDSU in 2003. Singh is currently finalizing a dissertation in truck safety. Using data from the Large Truck Crash Causation Study, she has developed a statistical model to predict the likelihood of fatalities during crashes, as a function of: distractions to drivers, driver performance, roadway surface defects, roadway geometry, environmental conditions, and vehicle defects (such as inoperative brakes). Singh expects to graduate in the fall of 2008.

Napoleon Tiapo earned his Ingenieur Agronome (a five-year post-graduate degree with concentration in agricultural economics) from the University of Dschang in Cameroon in 1993. At NDSU, Tiapo earned his M.S. in agribusiness and applied economics in 2002. Tiapo's research interests include transportation and economic development, the environment and investments in transportation infrastructure and the impact of social and economic returns. Tiapo plans to pursue a career in research and teaching, the private industry or promoting development-related issues with an international organization.



Tiapo



Zeng

Hai Zeng expects to finish his Ph.D. in 2008. Zeng does research on the use of Radio Frequency Identification (RFID) in pharmaceutical loss management, as well as research on long-term pavement performance. Zeng earned his B.S. at the Guilin University of Electronic Technology in June 2003, and went on to earn his M.S. from NDSU in 2006. Zeng hopes to work at a logistics and supply chain consulting firm dealing with logistics and supply chain design and optimization or work with the applications of RFID.

NDSU Master's Students – Agribusiness and Applied Science

Steven Condon is from Clara City, MN. He graduated Summa Cum Laude with his B.A. in international business and Spanish, from Buena Vista University in Storm Lake, IA. He is currently analyzing data from 124 major trucking firms from 1999-2003 to determine which firms were most efficient and identify reasons for the lacking firms' inefficiencies.



Condon



Roberson-Zetina

Zoë Roberson-Zetina is from Belmopan, Belize. She earned her bachelor's degree in business administration from the University of Belize, Belmopan campus, in 2006. Her research will look at the spatial shifts in the U.S. potato industry to address the effects of and the extent to which variables such as land and water availability, location, environmental regulations, and transportation affect the spatial shifts and structure of processing and production in the industry. After she has completed her master's degree at NDSU, Roberson-Zetina plans to return to Belize to find a position within the government sector to assist in the development of Belize.

Master's Students – Civil Engineering

Jason Baker is an associate research fellow with the Advanced Traffic Analysis Center working in the areas of traffic operations and intelligent transportation systems. He previously worked with the center as an undergraduate research assistant. His work focuses on data collection procedures and enhanced traffic analysis through the use of advanced traffic sensors. Baker is currently working on his master's degree in civil engineering.



Baker

An additional seven students are enrolled in the transportation option in the NDSU civil engineering master's degree program. The students are: Tahsina Alam, Geas A. Bulbul, Sunil Gyawali, Scott Hagel, Amy Hardy, Jan Linnemann, and Nilesh Paliwal.

South Dakota State University



Stripling

Chad Stripling, a native of Minnesota, MN, is a graduate student at South Dakota State University. He came to SDSU in the fall of 2002 and earned a B.S. degree in civil and environmental engineering in December 2006. Stripling joined the graduate school at SDSU in January 2007 and he is expected to complete his M.S. degree in civil engineering in May 2008. His research work entails experimental and analytical evaluation of prestressed bridge girders made with self-consolidating concrete. In November, Stripling completed the experimental part of his research which involved load testing until failure of three full-scale prestressed bridge girders. The testing was done at the J. Lohr Structures Laboratory at SDSU. The project is co-sponsored by MPC, the South Dakota Department of Transportation, and Cretex West of Rapid City, SD. Following graduation, Stripling plans to work in the field of structural design.

Zachary Gutzmer is a civil engineering graduate student at South Dakota State University (SDSU). Gutzmer, a native of Garretson, SD, earned his B.S. in civil and environmental engineering from SDSU in December 2006. His graduate research involves the development and assessment of self-consolidating (SCC) mix designs for use in prestressed bridge girders. The experimental work was conducted at the Materials Laboratory at SDSU. Based on Gutzmer's findings, special SCC provisions will be developed for use by the South Dakota Department of Transportation. The research study is co-sponsored by MPC, the South Dakota Department of Transportation, and Cretex West of Rapid City, SD. Gutzmer is expected to complete his M.S. degree in May 2008. Following graduation, he plans to work as a structural engineer.



Gutzmer



Larsen

Ryan Larsen is a civil engineering undergraduate student at South Dakota State University (SDSU). He is a native of Elk Point, SD. Larsen entered SDSU in August 2004 and became a civil engineering student in December 2004. Larsen has been working as a research assistant with Francis Ting and Allen Jones on the scour project since its start date in January 2007. He has carried out literature survey on bridge scour in cohesive soils, conducted field work at three bridge sites in relation to the subsurface exploration, measured soil erosion rates using the erosion function apparatus (EFA) as well as conducted other laboratory soil tests, used AutoCAD to prepare boring logs, conducted bridge hydraulics analyses using the Hydraulic Engineering Center River Analysis System (HEC-RAS), and performed SRICOS scour simulations. Larsen is expected to graduate in May 2008. Following graduation, he plans to attend graduate school at SDSU and continue to work on the scour project as his research thesis for a M.S. degree in civil engineering.

Jason Zemlicka is a native of Miller, SD. After graduating from SDSU in December 2005 with a B.S. degree in civil and environmental engineering, Jason joined the graduate school. He is working on his M.S. degree in engineering. His research involves experimental and analytical investigation of the structural behavior of full-scale pre-stressed self-consolidating concrete bridge girders made with quartzite aggregates.

University of Utah

Dejan Jovanovic completed his B.S. degree at the Department of Transport and Traffic Engineering at the University of Belgrade, Serbia and Montenegro in 2005. He is working on two projects: VISUM Online and Fast Track IV (I-15 and 11400-new Interchange; I-80 State Street to 1300 East). VISUM-Online is a mesoscopic traffic flow simulation software used for prediction. It computes traffic conditions and travel times used for dynamic route guidance. The Fast Track IV project researches the impact of construction on traffic flow. Jovanovic is a research assistant for the Utah Traffic Lab.

Aleksandar Stevanovic graduated from the University of Belgrade, Yugoslavia. He received a B.S. with honors in applied sciences and civil engineering in 1998. He earned his M.S. in civil and environmental engineering in 2003. He earned his Ph.D. from the University of Utah in civil and environmental engineering in 2005. Stevanovic is a post-doctorate research assistant professor in the Traffic Lab and has researched the deterioration of adaptive traffic control systems, the reliability of macroscopically optimized timing plans through microsimulation, and is developing a forecasting model for managed lanes using data from Utah's high occupancy vehicle (HOV) lanes.

Jelka Stevanovic is investigating traffic control signal settings optimization using genetic algorithms and is working on modification of the program so that it can be applied to a real network rather than a model network. She is a student at the University of Utah in civil and environmental engineering and is working on her M.S. degree in transportation. She graduated with her B.S. degree in 2003 in mathematics and informatics, at the University of Novi Sad, Serbia. Stevanovic is a research assistant at the Utah Traffic Lab.



Vladislavljevic

Ivana Vladislavljevic 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 is continuing her graduate work at the University of Utah and is currently a research assistant at the Utah Traffic Lab. She is investigating the impact of the cell phone conversation on traffic flow using microsimulation software VISSIM, and has won the Intermountain Section Student Paper Contest and the District 6 Student Paper Competition for her research in this area.

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 evaluate the impacts that the I-15 express lane (HOV/HOT) in Salt Lake City has on traffic operations through microsimulation (VISSIM). VISSIM is a microscopic simulation tool that utilizes a psycho-physical car following model.

Devin Heaps completed his B.A. degree in classics at the University of Utah in May 2005. From 1997 to 2003, he served in the Army National Guard as a light 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 fall of 2008, he intends to pursue a Ph.D. in English with an emphasis in British and American literature.



Shepherd

Benjamin Shepherd is enrolled under the Army's Advanced Civil Schooling program. He is 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.

University of Wyoming

Kamrul Ahsan is working toward his second M.S. in civil engineering. The first he earned 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.



Ahsan



Carter

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 performance 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.

Michelle Edwards will begin her master's program in January 2008 after completing 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 will focus on developing a decision-support system for dynamic message signs for the I-80 corridor between Laramie and Cheyenne.



Edwards



Keshava

Vinod Kumar Sunchu Keshava received his B.E. degree in chemistry from the Regional Engineering College in Tiruchirappalli, India. He ranked first in his class in the chemistry curriculum. He worked as a research student at the University of North Carolina in Charlotte on the Duke Power Project studying the leachability of fly ash. At the University of Wyoming, he is working as a graduate researcher studying Wyoming freight movement and wind vulnerability. He plans to pursue a career that will use his knowledge and skills in the fields of design, planning, and transportation.

Joel S. Liesman is investigating freight movement and commodity flows in Wyoming while pursuing his M.S. degree in civil engineering. He will also analyze accidents involving trucks and will identify infrastructure critical to freight movement. He earned his B.S. in civil engineering from Colorado State University in 2003, graduating cum laude. He is a member of the Tau Beta Pi and Chi Epsilon honor societies. He received the CSU Civil Engineering Achievement Award in 2003. He is planning a career in design and planning improvements to the transportation infrastructure.



Liesman



Price

Richard Price began in the Quick Start Master's program at the University of Wyoming in January 2007, while completing his bachelor's degree. 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 is 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.

Shiva Rama Krishna Sayiri is studying moisture susceptibility of bottom ash asphalt mixes using bottom ash from power plants. He earned his B.E. degree from Muffakham Jah College of Engineering and Technology near Hyderabad, India, in 2002.



Sayiri



Weaver

Benjamin Weaver is studying 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 is a member of Tau Beta Pi honor society and was named to the UW Dean's Honor Roll.

Christopher Wolffing earned his B.S. in civil engineering from the University of Wyoming in 2003. He is pursuing his M.S. in civil engineering. He is studying 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 is comparing actual economic data to perceived data from surveys. Wolffing served as the ITE student chapter vice president and plans to pursue a career in civil engineering.



Wolffing



Zhong

Cheng Zhong started his master's program in 2006. 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 will focus on traffic volume data collection and estimation for rural roads in Wyoming.



Research Highlights

MPC Convenes Panels to Focus on Research Topics

As outlined in its strategic plan, the Mountain Plains Consortium convened two advisory panels in workshops to identify key research topics and opportunities.

The first of those panels, focusing on pavements, was March 27-28. The second, focusing on bridges, was April 29. Both panels were held in Denver.

The panels included university experts, department of transportation staff, MPC university specialists, and representatives from the Federal Highway Administration and other agencies. The panels had three primary objectives:

- To collaboratively identify critical research issues in the region.
- To identify priority issues which the MPC universities have the facilities and expertise to research
- To foster long-term working relationships among MPC researchers, state transportation department research engineers, and the Federal Highway Administration.

“The advisory panels are not replacing the peer-review project selection process that the MPC has used, but will strengthen it,” comments MPC director Denver Tolliver.

“The Advisory Committee will continue to provide ongoing guidance and input to ensure that the center addresses the educational, research, and work force development needs of the region,” Tolliver notes. “The advisory panels will provide detailed input on project selection. It will formalize the input process from our stakeholders.”

Pavement Panel

In the pavement research workshop, discussion focused on escalating construction and maintenance costs. Consequently, many of the topics identified focused on extending pavement life, identifying cost-saving techniques and materials, and limiting pavement deterioration. Topics identified included:

- Pavement preservation
- Controlling construction & maintenance costs
- Low-cost rehabilitation options for low-volume roads
- Spring load restriction prediction models
- Improved ride quality through materials or methods
- Deicer impacts – pavement, vehicles, roadside vegetation
- Bridge deck cracking
- Use of recycled pavement materials
- Use of various materials such as fly ash or various classes/types of concrete to attain lower maintenance pavement.
- Justifying the use of continuously reinforced concrete pavement over jointed concrete pavement
- Use of warm asphalt, as it saves energy and expands paving season
- Incorporating new materials (synthetics or natural) to produce modified asphalt
- Life cycle cost optimization
- Effects of superwide tires
- Use of manufactured sand as a substitute for silica sand in Portland Cement Concrete
- Mechanistic-Empirical Pavement Design Guide implementation/calibration/validation
- Crack sealants/fillers/bumps
- Nondestructive testing for pavements
- Characterization of common materials for M/E design
- Mech punit design implementation
- Materials conservation
- Quantification of in-place properties of pavement sections for rehab.
- Use of marginal materials to develop high-quality pavements.
- Low-volume road design in Mechanistic-Empirical Pavement Design Guide
- Use of Mechanistic-Empirical Pavement Design Guide to evaluate load limits during weak periods.
- Benefit and cost-effectiveness of quality assurance specifications.

Bridge Panel

The collapse of the I-35 bridge in Minneapolis has focused a spotlight on bridge maintenance and construction. Participants identified topics related to bridge maintenance and management as well as inspection strategies. Topics identified in the session included:

- Concrete cracking/bridge deck cracking
- Construction practices and design
- Asset management: strategic failure risk
- Inspection vs. NBIS inspection and sufficiency rating
- Alternatives to current deicing techniques/neutralize deicer
- Scour of soft rocks
- Effectiveness, monitoring, durability of thin overlays
- Cost benefits of self consolidating concrete
- Cumulative damage due to overweight trucks

- Signal mast arms performance testing of state-specific connections
- Culvert durability/plastic/concrete pipe group
- Deck treatments
- Inspection timing and reliability
- Bridge health monitoring
- Rehabilitation using advanced composites
- Performance of thin bond overlays
- LRFD calibration and strut & tie model

“There is a two-fold benefit to this approach,” remarked Tolliver. “The first is the synergy of bringing these people together to brainstorm on common concerns and opportunities. The second will be to raise awareness among DOT staff and others of the research capabilities within the MPC.”

The input from the workshops is already reflected in the list of projects undertaken by the MPC for the coming year.

Chase the Wind Transportation Safety Studies on I-70

If you’ve ever watched the movie, “Twister,” you may remember those scientists who chased tornados using sensors floating in the air. CSU researchers recently chased strong winds along I-70 with various sensors. Professor Suren Chen and research scientist Juhua Liu, along with two graduate students in the Department of Civil and Environmental Engineering at CSU, have been working on a research project entitled “Traffic Safety Vulnerability Information Platform (TS-VIP) for Highways in Mountainous Areas Using Geospatial Multimedia Technology,” which is sponsored by Mountain-Plains Consortium.

The research team integrates an advanced 3-D ultrasonic anemometer for wind measurements, an NI mobile data acquisition system for vehicle dynamics, three accelerometers, and a GPS-based video mapping system (VMS) for collecting geospatial multimedia information of the interstate highway. The overall goal of the project is to develop a framework and Web-based platform of a “transportation safety vulnerability map” with traffic safety characteristics on feature points. A large SUV and a Penske truck were used for the field testing along I-70 as well as I-25.

I-70 is a perfect example of many interstates in the country which undergo complicated weather and topographical conditions. The adverse environmental conditions, such as wind gusts and steep grades, greatly threaten the safety of many vehicles and are blamed for many serious accidents.

The equipment used for the research includes an advanced 3-D ultrasonic anemometer for wind measurements, an NI mobile data acquisition system for vehicle dynamics and a GPS-based video mapping system (VMS) for collecting geospatial multimedia information of the driving path.

The project, for the first time in the country, integrates the real-time dynamic wind and advanced geospatial multi-media field measurements with mobile testing on major highways. The real-time wind and GPS multimedia data is to assess the environmental conditions of vulnerable vehicles, while the vehicle dynamic measurements are directly related to the varying vehicle accident risk at different locations on the highway. Based on the synchronized testing data and safety risk assessment, a GIS-based webpage is developed and put on the Internet.

The study will help transportation agencies and the trucking industry to identify those vulnerable locations on the highway during the planning stage and to study the causes and prevention strategies of high accident risks. The demonstration website includes the raw measurement data (e.g. mean wind speed

and turbulence), corresponding safety risk index, and GPS-based video clip and still pictures at different locations along I-70

This MPC project is just the first step of a series of studies on traffic safety under adverse environments. Chen has recently secured funding from Colorado Department of Transportation and the Mountain & Plain Education and Research Center (MAP-ERC) of the National Institute for Occupational Safety and Health (NIOSH) to further study large truck safety on I-70.

Study on SCC Bridge Girders Underway at SDSU

Researchers at SDSU have attained a major milestone in their latest MPC-sponsored research study on bridge girders.

The study began in July 2007 and by early November of that year, the experimental part of the study was complete. The project, identified as MPC-285: “Structural Performance of Prestressed Self-Consolidating Concrete (SCC) Bridge Girders Made with Limestone Aggregates,” seeks the development of SCC mix designs made with limestone coarse aggregates for use in prestressed bridge girders and investigates the structural performance of such girders. SCC is a highly flowable concrete that flows into the form work and consolidates without the need for mechanical vibration. The use of SCC may lead to better finished products, reduced labor, and increased safety during construction.

Experimental work was performed in the summer of 2007 at the Materials Laboratory at SDSU to measure the fresh and hardened properties of the SCC mix designs. Three girders were instrumented and fabricated in August 2007 at Cretex West fabrication facility in Rapid City. The girders were transported more than 330 miles to the Lohr Structures Laboratory at SDSU, where they were tested until failure.

Analysis of the data is currently being conducted to evaluate the behavior of SCC girders and compare

their performance to that of conventional concrete girders. The study is cosponsored by the South Dakota DOT and Cretex West of Rapid City, SD. The research team consists of Nadim Wehbe, associate professor of civil and environmental engineering, and Arden Sigl, professor of civil and environmental engineering, and graduate research assistants Chad Stripling and Zachary Gutzmer.



Testing on a Full-Scale Bridge Girder at the Lohr Structures Laboratory

RAP, Dust, Heavy Trucks, and Gravel Roads: Is It a Good Mix?

With the recent influx of oil and gas drilling in the Rocky Mountains region, local jurisdictions are seeing substantial increases in traffic, particularly trucks, on their road networks. Often, this results in increased maintenance costs that are out of reach of many local jurisdiction budgets.

The University of Wyoming secured funding for a study to address both structural and surfacing issues associated with unpaved roads subjected to heavier traffic applications. Funding for this study will be provided by the Wyoming Department of Transportation and the MPC. Different gravel types with various dust suppressants including recycled asphalt pavement (RAP) and soil stabilizers will be evaluated in an attempt to provide the best road surface at the least total cost.



Gravel loss, primarily in the form of dust, is a common problem on Wyoming's gravel roads. This loss both degrades the road surface and creates environmental problems. For both engineering and environmental reasons, it is in the best interests of the road owners and users to minimize dust loss and provide a good road surface. As vehicles kick up dust and it blows away, the gravel surfacing loses the binding effects of fine particles. Then, washboards – rhythmic corrugations – develop on the road surface; when the loss of fine material makes the surface more permeable, more water is trapped on the surface, leading to more potholes.

When dust enters the air, it increases the risk of violating federal air quality standards. Sheridan County, Wyoming, is a non-attainment area for PM-10 particulates as designated by the U.S. Environmental Protection Agency. “As more traffic travels Wyoming's gravel roads, the risk posed by fugitive dust will only increase unless steps are taken to reduce this air quality problem,” says Khaled Ksaibati, MPC director at University of Wyoming.

He notes that many unpaved county roads throughout Wyoming carry more than 1,000 vehicles per day (vpd), yet typical recommendations for when to pave an unpaved road range from 150 to 400 vpd. “For financial reasons, many counties are unable to pave roads even though, in the long run, paving is the most economical solution. Further complicating the issue is the knowledge that on many of these roads, traffic volumes will drop when drilling activities slow,” Ksaibati says. “Unfortunately, no one has a crystal ball that tells them just how much drilling activity will take place over the next few decades. Considering these factors, it is important to know the most cost-effective ways of managing unpaved roads, even at higher traffic volumes.”

In general, unpaved roads have lower initial construction costs but higher maintenance costs than paved roads. Balancing construction costs, maintenance costs, vehicle wear and tear, rider comfort, and safety should be the objective of any organization responsible for unpaved roads. The University of Wyoming study seeks to provide information that will allow organizations to minimize the total costs on their unpaved roads. In addition, this study will provide counties in Wyoming and across the region with specific information on the cost-effectiveness of using recycled asphalt pavement in gravel roads. WYDOT has committed to provide \$1 million of RAP to counties which makes it important to make sure that the RAP is used effectively.

As part of the study, test sections on Schoonover and Dead Horse roads in Johnson County, Wyoming, will be reconstructed during the 2007 and 2008 construction seasons. These roads carry in excess of 1,200 vpd; the predominant traffic type is trucks serving drilling activities. Construction will be administered by Johnson County and monitored by the University of Wyoming.

Gravel samples will be tested by the Wyoming Department of Transportation's materials program. Sections will be monitored for two years to track maintenance activities and expenses. Traffic and dust loss also will be monitored by University of Wyoming. In addition, weather data will be collected.

The goal of the analysis will be to determine the most cost-effective approach to constructing and maintaining unpaved roads. In addition, specific recommendations will be made on the effectiveness of using RAP on gravel roads.

UGPTI Conducts Focus Groups on Risky Driving Among Young Men



VanWechel

If you want to know what prompts young male drivers to skip using seatbelts and drive while under the influence of alcohol, the best way to find out may be to just ask them.

That's what NDSU researcher Tamara VanWechel did with 14 focus group meetings across North Dakota in October, November, and December. In each meeting, she met with 8 to 12 men ages 21 to 34 and asked them a series of questions about seatbelt use and driving while under the influence. She encouraged discussion among the participants. As the participants talked, the discussion was audio recorded while assistant Laurel Benson took notes.

VanWechel and Benson are poring through the notes and transcripts now to identify common themes, issues, and concerns. A final report will be prepared and presented to the North Dakota Department of Transportation. "Ultimately, the information will be used to develop intervention strategies to improve highway safety and reduce fatalities and injuries," she says. VanWechel is an associate research fellow with the Upper Great Plains Transportation Institute (UGPTI) at NDSU.

The project originated with a request from North Dakota Department of Transportation's Office of Traffic Safety which wanted help identifying some of the root causes for risky driving behavior by young drivers. Based on North Dakota crash data, the researchers decided to focus on seatbelt use and driving under the influence using the target group male drivers aged 21 to 34. The project is funded by the NDDOT, the MPC, and the UGPTI's Rural Transportation Safety and Security Center.

The focus groups were held around the state, with meetings held in each of the eight regions designated by the North Dakota Department of Human Services. There is at least one local Safe Communities program coordinator in each of the regions. The safe communities program uses statewide, community, and individual partnerships to identify and reduce injuries in North Dakota. The local coordinator helped identify sites and participants for the meetings.

"Driving under the influence and failing to use seatbelts are large contributors to crashes and fatalities in North Dakota," VanWechel said. "We anticipate that our findings from these focus groups will help the DOT make the most effective investment it can in an effort to reduce those crash numbers and improve safety."

Drivers on Cell Phones Clog Traffic

Motorists who talk on cell phones drive slower on the freeway, pass sluggish vehicles less often, and take longer to complete their trips, according to a University of Utah study that suggests drivers on cell phones congest traffic.

“At the end of the day, the average person’s commute is longer because of that person who is on the cell phone right in front of them,” says University of Utah psychology Professor Dave Strayer, leader of the research team.

“If you talk on the phone while you’re driving, it’s going to take you longer to get from point A to point B, and it’s going to slow down everybody else on the road,” says Joel Cooper, a doctoral student in psychology. Cooper presented the study in Washington Jan. 16 during the Transportation Research Board’s annual meeting.

Cooper and Strayer conducted the study with Ivana Vladisavljevic, a doctoral student in civil and environmental engineering, and Peter Martin, an associate professor of civil and environmental engineering and director of the University of Utah Traffic Lab. The study was partially funded by the MPC.

Martin says that, combined with Strayer’s previous research, the new study shows “cell phones not only make driving dangerous, they cause delay, too.” One survey found that during any given daytime moment, 10 percent of U.S. drivers are using cellular phones.

The earlier studies found that cell phone users follow at greater distances, are slower to hit the brakes and are slower to regain speed after braking. But such research didn’t examine how traffic efficiency is influenced by individual cell phone users. Cooper and Vladisavljevic conducted the new study as a step toward an eventual computer “microsimulation” of numerous drivers and vehicles.

The new study used a PatrolSim driving simulator. A person sits in a front seat equipped with gas pedal, brakes, steering, and displays from a Ford Crown Victoria patrol car. Realistic traffic scenes are projected on three screens around the driver. Thirty-six students drove through six, 9.2-mile-long freeway scenarios, two each in low, medium, and high density traffic, corresponding to freeway speeds of 70 mph to 40 mph. Each student spoke on a hands-free cell phone during one drive at each level of traffic density. The drivers were told to obey the 65-mph speed limit and use turn signals. That let participants decide their own speeds, following distances and lane changes.

“Results indicated that, when drivers conversed on a cell phone, they made fewer lane changes, had a lower overall mean speed and a significant increase in travel time in the medium and high density driving conditions,” the researchers wrote.

Cell Phones Impact Research Published

Ivana Vladisavljevic, a research assistant at the Utah Traffic Lab, is the lead author of “Integration of Mathematical and Physical Simulation to Calibrate Car-Following Behavior of Unimpaired and Impaired Drivers,” a peer-reviewed article published in *World Review of Intermodal Transportation Research* in 2007. Vladisavljevic earned her B.S. degree at the Department of Transportation and Traffic Engineering at the University of Belgrade, Serbia, in 2004 and an M.S. in civil engineering at the University of Utah in 2006. She is continuing her graduate work toward a Ph.D. at the University of Utah.



Vladisavljevic



Photo caption: Joel Cooper, a University of Utah doctoral student in psychology, demonstrates how subjects in a new study talked on a cell phone while operating a driving simulator. The new Utah study found that motorists on cell phones contribute to traffic congestion because they drive slower and are less likely to pass slow-moving vehicles. Photo by Ivana Vladislavjevic.

In medium and high density traffic, drivers talking on cell phones were 21 percent and 19 percent, respectively, less likely to change lanes. That may seem minor, “but if you have a lot of people who are not changing lanes and driving slower, this could substantially reduce traffic flow,” Cooper says.

In low, medium and high traffic density, cell phone users spent 31 percent, 16 percent and 12 percent, respectively, more time following within 200 feet of a slow lead vehicle than undistracted drivers.

Strayer acknowledges that, “in itself, staying in a lane and not passing might be construed as being safer, just as driving slightly slower or having a greater following distance also could be considered safer. But if you are doing that so you can take your mind off the road and talk on the phone, that isn’t safer.”

Compared with undistracted motorists, drivers on cell phones drove an average of 2 mph slower and took 15 to 19 seconds longer to complete the 9.2 miles. That may not seem like much, but is likely to be compounded if 10 percent of all drivers are talking on wireless phones at the same time, Cooper says.

Vladislavjevic already has begun computer “microsimulations” of multiple vehicles. “We saw an increase in delays for all cars in a system, and the delays increased as the percentage of drivers on cell phones increased,” she says.

Strayer says it is important to show how cell phone use affects traffic because “when people have tried to do cost-benefit analyses to decide whether we should regulate cell phones, they often don’t factor in the cost to society associated with increased commute times, excess fuel used by stop-and-go traffic, and increased air pollution, as well as hazards associated with drivers distracted by cell phone conversations.”

Martin says transportation analysts include two components – accidents and delay – when they calculate the “user costs” associated with road travel. “If we compile the millions of drivers distracted by cell phones and their small delays, and convert them to dollars, the costs are likely to be dramatic. Cell phones cost us dearly,” Martin says.

A University of Utah news release on the research was issued in early January and was picked up by the Deseret Morning News in Salt Lake City, CBS, Science Daily, CNN, USA Today, ABC, and other news outlets.

by Lee J. Siegel, science news specialist, University of Utah Public Relations.

Civil Engineers Recycle Used Utility Poles into New Idea

Colorado State University (CSU) civil engineering professor and project investigator Richard Gutkowski are turning the discards of progress into the bridge systems of tomorrow. Utilizing salvaged utility poles removed as part of road expansion projects, Gutkowski and graduate student Matthew LeBorgne are recycling reusable wood into short (20-30 foot) to medium span (40-50 foot) bridges.

Layering wood and concrete to create a composite bridge, the groundbreaking idea is an economical solution for low tax base communities dependent on agricultural economies and the related freight and shipping industry. Research and construction is taking place at the Structures Laboratory, part of CSU's Engineering Research Center (ERC).

Gutkowski aims to replace conventional reinforced concrete slabs, a costly system, with a composite design. Integrating an innovative cambering, or arching technique, the researchers are using tapered utility poles that will be set in alternating directions, beneath a thinner concrete slab, to attain a concave design. The concrete layer will provide compression strength and a hard-wearing surface for vehicle wheels, keeping snow and rain off the wood. The wood layer provides tensile strength by replacing the usual lower non-structural half of the concrete, its steel reinforcement and external temporary shoring with a structural wood layer that self-shores the concrete during the curing process.

Researchers in New Zealand, Germany, Italy, and Sweden have joined forces studying long-term creep, hygrothermal effects such as the flow of moisture between materials, and the effect of humidity changes on deflection over time in composite bridge designs. In Colorado's arid climate, Gutkowski and team have been working to overcome the special properties of dry wood, which draws water from adjacent concrete, shrinking it and negatively affecting the curing process.

Although the team is utilizing a notched shear key system – grooves cut in the wood filled with concrete when cast – interconnecting the two layers has proven to be a challenge. Because the mechanics of shrinking concrete have not been studied at relative humidity of less than 40 percent, Gutkowski has plans to examine this issue using environmental test chamber equipment at the ERC in a later phase of the project.

“Our challenge has been the need to prevent very dry wood from extracting water from the concrete in our notch connection,” said Gutkowski. “We appear to have overcome that important piece of the mechanics puzzle by using additives in the concrete and sealing the wood. With that working we can better manage the immediate and long-term deflection and stress behavior.”

Uprooted poles spark innovative idea. The project is funded by the U.S. Department of Transportation via the Mountain-Plains Consortium within the University Transportation Centers program. In addition, Xcel Energy provided, at little to no cost, uprooted utility poles displaced as part of construction projects.

“The idea came to me when I saw them removing the poles as I passed by each day on the way to the ERC,” Gutkowski recalled. “It was like a light bulb coming on.”

by Lana Hoff, Director, CSU Engineering Marketing & Communications Office

Integrating Security into Small MPO Planning Activities

When disaster strikes, being prepared can make all the difference. That's why Mark Lofgren, a researcher with the Upper Great Plains Transportation Institute at North Dakota State University is working with the Fargo-Moorhead (F-M) Metropolitan Area Planning Organization to develop transportation security plans.

Because so much of what occurs in a community depends on transportation, planning for disruptions is essential for managing security issues and for promoting safe recovery. "A robust transportation system is a fundamental part of our society. Any disruptions to the flow of transportation, whether man-made or natural, can lead to inconveniences, economic loss, and life-and-death situations," Lofgren says.

The goal of Lofgren's study is to help the F-M area meet the U.S. Department of Transportation mandate to incorporate security into its planning documents and processes. In addition, the plan will serve as a model for smaller MPOs looking for ways to integrate and sustain security initiatives in their own transportation planning activities.

The mandate was part of the 2005 SAFETEA-LU federal highway legislation. As a result of that legislation, MPOs are paying specific attention to security elements in transportation planning. The law distinguishes safety planning and security planning as two distinct elements of planning activities.

However, in many instances, security activities may be related to other planning factors such as safety, accessibility, and efficiency. Federal instructions recognize the relationships and encourage MPOs to address security in ways that are efficient and effective.

"For a long time, planning has been an integral part of transportation and the number of stakeholders involved in the planning process is continually expanding," Lofgren notes. "MPOs, government councils, local government agencies, neighborhood groups, freight carriers, and developers all play a role. While the elements of safety planning have been recognized, studied, and understood for some time, the elements of security planning have received less attention."

The mandate for increased security in the transportation system states that metropolitan transportation plans should include "...emergency relief and disaster preparedness plans and strategies and policies that support homeland security (as appropriate) of all motorized and non-motorized users."

That's easier said than done, Lofgren notes. There is a lack of security data and performance measures. Preventing disasters is difficult because transportation is easily accessible and often vulnerable. New stakeholders must be involved in transportation security planning, and sometimes those stakeholders are new to transportation planning. In addition, the need to safeguard information that is involved in security planning can slow the process.

"The security needs and standards will be different for each MPO," Lofgren notes. "Consequently, each MPO will need to develop a holistic-approach to security planning based on the area's specific assets, resources, and environment. Our work will give smaller MPOs a framework that will assist them in the planning process."

Lofgren's work with integrating security into planning activities will provide insight for interagency coordination in transportation aspects of disaster and security events. Previous work has focused on larger cities such as New York, but Lofgren's pioneering work with smaller cities will provide an example of possibilities for areas with limited resources or personnel.

One of Lofgren's goals is to point the way toward several grant programs that exist to help MPOs obtain the funding needed to meet federal mandates for transportation security planning. These programs include the Infrastructure Protection Program, the Homeland Security Grant Program, and the Emergency Management Performance Grant. Additional grant information can be accessed via the websites of the Department of Homeland Security, the Federal Emergency Management Agency, or the Transportation Security Administration.

Utah Project Seeks Optimal Traffic Monitoring Station Spacing on Freeways

Performance measures on freeways are developed from traffic monitoring stations which gather traffic volume and speed data. State departments of transportation deploy traffic monitoring stations to track traffic congestion on the road network. How those monitoring stations are spaced on the network is a critical factor in how effective they are.

The University of Utah is developing an analytical methodology to calculate travel time reliability measures to identify the optimal locations of detectors on a freeway corridor to minimize the travel time estimation error (actual travel time - free flow travel time). The researchers will evaluate the trade-off between detector spacing and accuracy of estimates such as speed, travel time, and reliability.

The Utah DOT has typically installed traffic monitoring stations at one-half mile intervals. This spacing dates back to theories that the traffic monitoring stations would be used for incident detection. However, the stations have proven ineffective and perhaps unnecessary for this purpose. And as more monitoring stations are put into service, the operating and maintenance cost associated with the detector system increases.

However, data from the stations can be used for other valuable purposes such as travel time estimates. This use of the monitoring stations is likely to have different requirements for detector placement than the original focus on incident detection. To accomplish this new purpose, the detectors are to be placed so as to effectively sample the traffic conditions on freeways.

Consequently, there is a need to decide where to add new detectors and which detectors should continue receiving maintenance given resource constraints. For data collected from these detectors to remain meaningful and reliable, traffic data quality should not be adversely affected in these decisions.

Study Develops Comprehensive Transportation Safety Evaluation Program in Wyoming

The University of Wyoming is conducting a safety study with funding from MPC and the Wyoming Department of Transportation. The research will result in a program that can help counties identify high-risk rural locations and develop a strategy to obtain funding to reduce crashes and fatalities on rural roads statewide. Most of Wyoming's road network is rural in nature and rural roads nationwide have a significant highway safety problem. Close to 80 percent of the nation's roadway miles are in rural areas and over 58 percent of the total fatalities occur in rural areas. The fatality rate for rural areas (per 100 million vehicles miles of travel) is more than twice that of urban areas.

SAFETEA-LU requires state department of transportation agencies to address safety on local and rural roads. “It is important for state, county, and city officials to cooperate in producing a comprehensive safety plan to improve safety statewide,” notes Khaled Ksaibati, MPC program director at the University of Wyoming. “This legislation provides an opportunity to implement a more cohesive and comprehensive approach to local road safety in Wyoming.”

As part of this study, a Local Road Safety Advisory Group (LRSAG) has been established. This group includes representatives from WYDOT, Wyoming LTAP, Wyoming Association of County Engineers and Road Superintendents (WACERS), Wyoming Association of Municipalities (WAM), and FHWA. Three Wyoming counties, Carbon, Laramie, and Johnson, are included in the pilot phase of this study.

A five-step procedure has been developed as a result of this study. These steps are:

1. Crash data analysis based on historical crash 1. data provided by WYDOT. This analysis will help in identifying one-mile segments in each county with high number of crashes.
2. Level I field evaluation. This evaluation is 2. performed on sections identified as high-risk locations based on the crash data evaluation. It consists of ranking each one-mile segment in five categories on a scale of 0 to 10.
3. Combined ranking to identify potential high 3. risk locations based on steps 1 and 2.
4. Level II field evaluation. This comprehensive 4. evaluation is similar to conducting road safety audits. The objective of this evaluation is to identify appropriate safety countermeasures on the roadway sections which were identified as high risk locations based on the crash evaluation and the level I field evaluation.
5. Benefit/cost analysis. This analysis will 5. help identify the most cost-effective safety countermeasures. The counties can then develop a plan to fund these countermeasures from the High Risk Rural Road Program (HRRR) or any other county funding sources.

The Local Road Safety Advisory Group has approved the procedure developed in this study to improve safety on rural roads in Wyoming. The University of Wyoming will provide technical help and training to counties interested in implementing this program. This program will help Wyoming counties in identifying high risk locations and then develop a strategy for funding safety improvements. The Wyoming DOT will help in funding some of the counties’ safety requests from the HRRR program. This will provide an incentive for Wyoming counties to establish local safety programs.

The WYDOT safety program is now in the process of establishing guidelines and a timeline for counties to submit safety requests for funding from the HRRR program. All counties are expected to follow the five-step procedure developed in this study to submit their HRRR requests. A committee can then rank all the requests statewide and distribute the available funding.

“This program has been truly a success story, showing how Wyoming local governments can work closely with WYDOT and FHWA to improve the safety on rural roads across the state,” says Ksaibati. “Other states can greatly benefit from this procedure when they are considering the distribution of their HRRR funds. Therefore, the findings of this study will be submitted for presentation and publication at the Transportation Research Board meeting in 2009.”

Utah Traffic Lab Assists in Planning for Bus Rapid Transit Project

University of Utah researchers are helping the Utah Transit Authority plan for the implementation of its first bus rapid transit line later this year.

Bus Rapid Transit (BRT) compares favorably to standard city buses, street cars, and light rail systems. It is a flexible, high-performance form of transit mode which combines stations, vehicles, services, running ways, and Intelligent Transportation System elements (ITS) into an integrated system. It improves speed, reliability, and identity of bus transit and combines quality of rail transit with flexibility of buses.

Utah Transit Authority (UTA) is planning to implement the first regional BRT project along 3500 South Street in Salt Lake County instead of the existing bus lane No. 35. The Utah Traffic Lab is to evaluate benefits of the BRT installation. It is working on establishing transit signal priority for BRT buses and facilitating bus movements through signalized intersections along the corridor. A critical focus is on implementing transit signal priority on a segment between 2700 West Street and 5600 West Street. With 13 signalized intersections along this segment, signals need to be optimized to enable regular and reliable BRT service.

Based on traffic counts and measurements, the Utah Traffic Lab is creating a microsimulation computer model of this sub-network, which should represent the real situation in the field. Using different traffic software and other engineering tools, traffic and transit operations in this sub-network will be optimized in order to establish a reliable transit system with all its advantages.

Interdisciplinary Team at SDSU Studies New Method for Predicting Bridge Scour

Francis Ting, a hydraulic engineer, and Allen Jones, a geotechnical engineer, from South Dakota State University, are working together to evaluate a new method for predicting bridge scour in cohesive sediments.

The new method, called SRICOS (Scour Rate In COhesive Soils), was originally developed at Texas A&M University by an interdisciplinary team of researchers including Ting. Unlike conventional methods, which only predict the equilibrium depth of scour, SRICOS can predict the scour history over the lifetime of a structure. Many bridges in South Dakota are founded on cohesive soils consisting of silts and clays. The new method could lead to substantial saving in bridge construction costs if the expected scour is significantly less than the equilibrium scour.

Subsurface exploration was completed at three bridge sites (Big Sioux River near Flandreau, Split Rock Creek near Brandon, and White River near Presho) in South Dakota in the summer and fall of 2007 to determine the soil stratigraphy and to obtain soil samples for erosion rate and laboratory testing.

The SDSU researchers measured soil erosion rates using an erosion function apparatus at the Minnesota Department of Transportation Materials Laboratory. The results of the soil tests are presented combined with computed flow conditions at the bridge sites to predict their scour histories for comparison with measured scour data collected by the United States Geological Survey (USGS) during the floods in 1993.

In addition to evaluating the SRICOS method for South Dakota bridges, the researchers will also conduct a sensitivity analysis to identify the critical input parameters and to develop guidelines on the use of the method for small watersheds and ungaged streams. This project is co-sponsored by the Mountain-Plains

Consortium (MPC) and South Dakota Department of Transportation (SDDOT). Ryan Larsen, a native from Elk Point, SD, is a student research assistant on the project.

CSU Studies Shredded, Used Tires as Roadbed Filler

A Colorado State University professor is researching whether some of Colorado’s 40 million stockpiled rubber tires – the largest batch in the nation – can be reused to bolster residential foundations and road bases to mitigate the effects of expansive soils.

Antonio Carraro, assistant professor of civil and environmental engineering, is leading an experiment with the city of Loveland to test a mixture of expansive soil and scrap tire rubber just below the pavement on a 200-foot, low-volume stretch of road near I-25. Lime and fly ash are the traditional materials typically used to mitigate the shrink-swell potential of roadbed soils.

“We’re always looking for opportunities to improve our roads and do a better job with making our products more environmentally friendly,” said Keith Reester, director of Public Works for the city of Loveland. “Hopefully we have a product that works and that will allow us to take some of those tires out of the waste stream.”

Carraro also recently received a \$128,913 grant from the Colorado Commission on Higher Education to test his expansive soil-rubber mixtures in residential foundations.



Measurement of Soil Erosion Rates using the Erosion Function Apparatus

The road test section in Loveland will use only about 20 percent rubber by weight when combined with soil. But there are lots of scrap tires stockpiled in the state. With 40 million tires, Colorado leads the seven states that host 84 percent of all stockpiled tires in the United States, according to 2005 figures from the Rubber Manufacturers Association. New York ranks second with 37 million tires. Carraro has worked with Front Range Tire Recycle in Sedalia and Jai Tire Industries in Denver for tire samples.

“Only about 2 percent of scrap tire rubber products are reused in civil engineering applications in EPA Region VIII (which includes Colorado and five other western states) while other regions, such as the midwestern United States, reuse more than 25 percent,” Carraro said. “It’s a major solid waste problem, particularly in the West where the population is spread out and there is less demand and no established civil engineering markets for reusing the tires.”

“We are trying to come up with a sustainable way of mitigating the expansive soils problem in Colorado that takes into account the beneficial use of a waste material that has great recycling potential,” Carraro said. “Soil-rubber mixtures have been studied and used since the late 1980s, but the transfer of this technology to civil engineering applications that involve expansive soil mitigation is innovative. This is a new technology for expansive soils. These projects will allow us to understand in a more fundamental way the many interesting technical aspects associated with the design, construction, and performance of expansive soil-rubber mixtures.”

Carraro and his students will monitor the effects of the expansive soil-rubber mixture on the road in Loveland. They will assess cracks, ruts, permanent deformation, potholes, and overall quality of the pavement.

In Colorado, shredded tires are largely in demand for landfill construction, said Rick Welle, general manager of Front Range Tire Recycle in Sedalia. The tire “shreds” are also used as floor material for horse arenas and children’s playgrounds, but tire recyclers are always looking for other markets. The Loveland project is using about 25 tons of shredded tires equal to 2,225 passenger vehicle and light truck tires, Welle said.

“What we’re hoping with this study is to show that tire shreds are beneficial for road base and that over time it will be a cost-effective product,” Welle said. “It would be a huge market to really help Colorado get back with the rest of the country as far as managing scrap tires.”

Carraro is also experimenting with the amount and size of scrap tire rubber products in his projects. Larger ones, called tire chips (containing particles up to 2 inches in diameter) can cost roughly \$30 per ton, while smaller rubber products, called granulated rubber (containing particles less than 0.5 inches in diameter) can cost up to \$450 per ton.

by Emily Wilmsen, Senior Media and Community Relations Coordinator, Colorado State University

Utah Traffic Lab Models Traffic to Aid in Express Lane Pricing

Innovative lane management offers the opportunity to levy fees for premium road space. One option being used in Salt Lake City, express lanes, offers road users reduced journey time for a fee.

The Utah Department of Transportation recently converted the high-occupancy vehicle (HOV) lanes on Interstate 15 (I-15) from 600 North Street in Salt Lake City, Salt Lake County, to University Parkway (SR-265) in Orem, Utah County, to express lanes. Subscribers (single-occupant vehicles) who pay a monthly fee and high-occupancy vehicles now share the express lane. This concept will be further advanced through the application of an electronic toll-collecting system.

Consequently, UDOT management would like to learn how to best implement future High-Occupancy Toll (HOT) pricing. The Utah Traffic Lab at the University of Utah will use an I-15 VISSIM (transportation modeling software) model for that purpose. The Utah Traffic Lab has already built and calibrated a microsimulation model of I-15 from 600 N. in Salt Lake City to University Parkway in Provo, UT. The Traffic Lab has extended the original UDOT model and constructed two sub models for a.m. and p.m. traffic conditions.

The models have been calibrated and validated based on field data collected through numerous GPS travel time runs and other data collection methods. However, current HOT operations in the model, which were inherited from the original UDOT model, do not reflect the fact that HOT users can access HOT lanes only at certain points along the freeway. The VISSIM model has no access restrictions in the VISSIM model.

The existing model will be modified to properly model HOT operations. Once those modifications are made, the model will be able to simulate current HOT operations and integrate a future dynamic toll pricing to enable real-time variable congestion pricing.



Technology Transfer

UGPTI Hosts Statewide Discussion on Mobility and Transportation

NDSU's Upper Great Plains Transportation Institute hosted a statewide discussion on the mobility needs of North Dakota and the state of its transportation infrastructure. The MPC provided support for the effort.

In March and April, the Institute hosted regional workshops in Williston, Dickinson, Minot, Bismarck, Devils Lake, Jamestown, Grand Forks, and Fargo. A statewide conference to summarize input and tap input from state leaders was held in Mandan May 1. Nearly 600 people attended the sessions. A summary of the discussions was presented to the North Dakota Legislature's Interim Transportation Committee in Fargo June 19.

"People expect a lot out of North Dakota's transportation system," says Jon Mielke, an UGPTI researcher and one of the organizers of the sessions. "Demands on that system, both for personal mobility and for economic activity, are growing. At the same time, costs to maintain and improve the system are escalating and revenues are not keeping pace."

At the statewide meeting May 1, UGPTI researcher Alan Dybing presented results of a study that showed the annual roadway and bridge funding needs for North Dakota at nearly \$540 million. At the same time, the Federal Highway Trust Fund is expected to be depleted next year with the projected loss of \$70 million in federal highway funding as a consequence.

Complicating the problem has been inflation in the cost of building materials and fuel. Representatives from the city, township, county, and state levels outlined how budgets are being squeezed. Mielke notes that the producer price index increased by 32 percent from 2001 to 2005. Revenue for the state highway system increased by only 18 percent during that time. From 2001 to 2008, the North Dakota Department of Transportation experienced construction cost increases of approximately 60 percent.

“The result of that reduced buying power is deferred maintenance,” Mielke says. But deferring maintenance on the state’s road network is expensive because pavement deterioration is an accelerating process. Ride quality on new pavement declines by about 40 percent over the first 20 years of its life. After that, pavement deteriorates much more rapidly. That means a road rehabilitation project that occurs when pavement is 20 years old will cost 400 percent to 500 percent more if the project is delayed 7-8 years.

Francis Ziegler, director of the North Dakota Department of Transportation, said the state’s highway system is in a preservation mode and that 39 percent of the asphalt roadways are considered mediocre. He noted that demands on the road system are increasing. Manufacturing, energy production, and crop production have all increased substantially in the state with a corresponding need for freight mobility.

Mark Johnson, executive director of the North Dakota Association of Counties, says with about half of all county roads in the state in fair condition and about one-third considered poor, delay is not an option. “We need to invest in our road network and now is the time to do it. We no longer have the comfort of expecting or waiting for federal funds,” he says.

Expenses that are escalating faster than revenues are also a problem for the state’s transit agencies. “We need to look at the human factors involved with these issues,” Pat Hansen said. She is program director at South Central Adult Services, which provides transit services for the Valley City area.

“Roads and bridges are important, but we’re transporting people, sometimes up to 300 miles round trip, for very important medical services,” Hansen says. “Mobility is not just about cost, it’s about quality of life. I appreciated that I was able to make that point.”

Hansen says the meetings performed the important task of providing the same information to transit operators, transportation officials, and state and local decision makers across the state. “I have a much better idea of what transportation issues are facing the state and I can see the legislative issues and challenges that we’re facing.”

UGPTI director Gene Griffin told the group that several strategies could be employed to address the situation.

“We will need to continue to work smarter and make better use of our scarce resources,” he said. That ability is currently limited by technology, institutional barriers and collective and individual pride. We can make great strides if we can overcome those barriers or at least push them back.”

Griffin also noted that decision makers will need to set clear priorities that take into account transportation needs. “This rationalization requires political will,” he said. “But the result will be a transportation system that meets the state’s fundamental needs and a set of minimal demands.”

With innovation and a rationalized approach to demands within the state will come a need for additional funds, Griffin said. “There is a growing recognition among federal, state, and local agencies, as well as within the private sector, that maintaining and enhancing our transportation system needs to be a priority.”

MPC is Sponsor of Safety and Security Conference at University of Denver

The Mountain-Plains Consortium and the National Center for Intermodal Transportation hosted a one-day workshop and conference on Intermodal Safety and Security Issues in the 21st century Feb. 21, at the University of Denver.

The workshop provided an opportunity for professionals from all modes to discuss the safety and security challenges that all modes of transportation face. Colorado Congressman Ed Perlmutter was the keynote luncheon speaker. In his address, he discussed the difficulty in balancing terrorism concerns with privacy. “Help us try to figure out when we’ve gone too far,” he said.

As a member of the House Committee on Homeland Security, Perlmutter said he’s concerned not only with airlines, which present a direct point of contact with passengers for security screening, but also with rail and public transportation systems, which offer would-be attackers multiple points of contact.

The conference included speakers from the Federal Transit Administration, the Transportation Security Administration, state government, regional and state transportation agencies, and universities. Topics included security related to air cargo, transit, intermodal transportation, containerized shipping, airports, international shipping, and evacuation planning. Discussion also focused on law and public policy.

A goal of the conference and workshop was to ask participants to share their thoughts and ideas on the broad variety of issues related to transportation and security, according to Patrick Sherry, director of the National Center for Intermodal Transportation. The results of the event are now being used to frame the discussion and public outreach.

“Safety and security have become significant factors for all modes of transportation,” noted MPC director Denver Tolliver. “The terrorist attacks of Sept. 11 and subsequent events and policies have raised issues and concerns that have far-reaching implications for the mobility of freight and people. It’s important for us to identify those issues and integrate them into our research and outreach programs.”

Spring Engineering Career Fair at Colorado State University

Students interested in the North Front Range Transportation Research Internship Program (NFR-TRIP) at Colorado State University had an opportunity to meet potential employers during the Spring Engineering Career Fair.

NFR-TRIP, an MPC supported program at CSU, is an activity cosponsored with the Metropolitan Planning Organization for northern Colorado. The College of Engineering hosted more than 150 companies at the Spring Career Fair Feb. 13-14 and more than 1,000 Colorado State engineering students visited with prospective employers across all career fields.

The fair offered students a great setting in which to interview the companies, see what career choices they offer, and find out what they seek in applicants. The North Front Range-MPO shared a booth with the Northern Colorado Branch of ASCE and informed interested students about the internship program and other job opportunities in transportation-related fields. Many of the employers at the event emphasized internship experience and a strong resume as key factors for strong job applicants. The employers noted that applicants that are friendly and outgoing also have an advantage.

SDSU Annual Structural Seminar Focuses on Innovative Bridge Design

The Department of Civil and Environmental Engineering at South Dakota State University (SDSU) held the SDSU 32nd Annual Structural Seminar Nov. 8, 2007, in Sioux Falls, SD. The one-day seminar was cosponsored by the MPC and the South Dakota Department of Transportation. “High Performance Steel” was the seminar’s theme. Five speakers, who came from Boston, MA, Lincoln, NE, Irvine, CA, and Brookings, SD, made six presentations that focused mainly on recent developments in high-performance steel application in bridge design and accelerated bridge construction. The seminar was coordinated by Nadim Wehbe, MPC program director at SDSU, and was attended by more than 75 engineers and steel fabricators.

Vision Safe Drive Conference



The first Vision Safe Drive Conference was held Nov. 29-30, 2007, in Bismarck, ND. Representatives from eight states and the District of Columbia were present with more than 100 attending and almost 30 speakers participating.

“The conference was a success in providing a venue for leaders and experts in traffic safety to make exchanges on emerging issues, successes, and challenges,” notes Kim Vachal, director of the Rural Transportation Safety and Security Center, a part of the Upper Great Plains Transportation Institute at North Dakota State University. “These exchanges will be helpful in prioritizing research and outreach needs for the region as well as helping create a unified vision for traffic safety.”

Public health educators, roadway engineers, social researchers, law enforcement officials, and state and federal agency staff discussed issues they have in common, shared what they are doing, and identified future policy and legislative initiatives to improve the safety and security of transportation in rural areas. Issues emerging from the discussion included:

- primary seatbelt laws
- impaired driving initiatives
- Native American tribal safety planning
- simulation training or defensive driving courses for all ages at license renewal
- increased involvement with government officials and tribal representatives
- cultural awareness training
- increasing the accuracy of data
- creating a culture of safety
- behavioral and social marketing strategies, and
- technology and the future of rural driving.

American Association of State Highway and Transportation Officials (AASHTO) director of engineering and technical services, Tony Kane gave an opening keynote address focusing on the vision for future highway safety. He stressed the importance of safe roads in creating a safe and prosperous America. Specifically, Kane encouraged states to collectively adopt a vision to reduce highway fatalities by 50 percent by the year 2030 toward an ultimate goal of zero deaths.

Other speakers included leaders from federal and state transportation agencies including the Federal Highway Administration, the Federal Motor Carrier Safety Administration, the North Dakota Safety

Council, the Northern Plains Tribal Technical Assistance, the Montana Department of Public Instruction, North Dakota State University, and the departments of transportation in North Dakota, South Dakota, Montana, Wyoming, Missouri, and Oregon.

In addition, panel discussions were held to consider driver-based safety initiatives, how to influence rural drivers' behavior and how to provide safer roadways through design, operation, improvement, and interagency cooperation. Many speakers emphasized the importance of coordination between the "four E's" – education, engineering, enforcement, and evaluation.

Vision Safe Drive was sponsored by the Rural Transportation Safety and Security Center and Upper Great Plains Transportation Institute at North Dakota State University with support from the MPC and in cooperation with the North Dakota Department of Transportation and the Federal Highway Administration North Dakota Division Office.

TLN Offers More Graduate Courses, Professional Training

As students and transportation professionals look for ways to expand their educational options, the Transportation Learning Network is proving to be a good option.

"Our accessibility through the Internet and our relationships with universities and departments of transportation are expanding our audience," notes TLN director Julie Rodriguez. "Many career tracks within transportation are requiring more advanced knowledge. The reduced travel time and costs associated with taking graduate classes, short courses, or seminars through the TLN is a huge advantage."

Four graduate courses were offered during the past year.

- **Airport Planning and Design** was taught by Hesham Mahgoub at South Dakota State University. The course was oriented to engineering students who would like to understand how airports are designed and planned. The course covered aircraft vehicle performance and airport interaction, airport planning, and analysis methods in airport engineering.
- **Public Transportation** was taught by Jill Hough at North Dakota State University. The course included concepts and models used in the transit industry for both rural and urban settings. The course also covered policy issues, government's role in transit, transit planning, demand forecasting, performance evaluation, and system costing.
- **Transportation Modeling** was taught by Aleksandar Stevanovic at the University of Utah. The course addressed important transportation modeling techniques from theoretical and practical perspectives. The course taught modeling through the application of various commercial transportation modeling packages. The packages are used to support the most important aspects of traffic and transportation analyses.
- **Pavement Materials** was taught by Khaled Ksaibati at the University of Wyoming. The course focused on the most important aspects of asphalt pavements, giving students a working knowledge in selecting materials for pavement constructions, testing aggregates and bituminous materials, designing and testing asphalt mixtures, evaluating the performance of flexible pavements, and rehabilitation strategies for deteriorated pavements.

The graduate courses were in addition to a significant effort focused on providing safety training to state and local road workers to meet requirements of the USDOT. In that effort, the TLN hosted training from the American Road and Transportation Builders Association, Occupational Safety and Health Administration, and the American Traffic Safety Services Association. The safety courses reached nearly 1,200 participants.

Rodriguez notes that TLN continues to offer short courses in technical subjects like concrete placement, pavement preservation, seal coating, and other topics. DOT employees can also enroll in courses on personnel management, conflict resolution, personal financial management, and preparing for the professional engineers exam.

UGPTI Hosts Seminar Series at NDSU

For the second year, the Upper Great Plains Transportation Institute at North Dakota State University is hosting a transportation seminar series for students, faculty, and others interested in the topics. The series has been sponsored by the MPC.

There were 14 seminars in the fall series and topics included metropolitan freight modeling; demand and cost models for small urban and rural transit; alternative fuel use and regulation; exploring the travel behavior of elderly women in rural and small urban North Dakota; and longer-term forecasting of commodity flows in the Mississippi River. Presenters included NDSU staff, faculty members, and students.

Guest presenters included Patricia Mokhtarian from the University of California, Davis, who presented on the positive utility of travel; Richard Kasper, president of Global Electric Motorcars, discussed his 10 years in the neighborhood electric vehicle industry; and Wade Kline, community planner for the Fargo-Moorhead Area Metropolitan Council of Governments, discussed transit planning in the region.

“The seminars are an opportunity for faculty and staff to learn about each others’ research and activities as well as a chance for us to introduce some new concepts and ideas,” says Jill Hough, advanced research fellow at the UGPTI. Hough helped plan and organize the seminars. Another series of seminars is being planned for the spring semester.



Faculty Activities

Papers Accepted for Publication

“Integration of Mathematical and Physical Simulation to Calibrate Car-Following Behavior of Unimpaired and Impaired Drivers” was accepted for publication in a special issue of the World Review of Intermodal Research on computer simulations in transportation research. Authors are Ivana Vladislavljevic, Peter Martin, and Aleksandar Stevanovic, all of the Utah Traffic Lab.

Stevanovic and Martin also wrote “An Assessment of the Suitability of Microsimulation as a Tool for the Evaluation of Macroscopically Optimized Traffic Signal Timings.” The paper (TE23469) was accepted for publication in the Journal of Transportation Engineering, published by the American Society of Civil Engineers.

“Influences of Repeated and Sustained Loading on the Performance of Layered Wood-Concrete Composite Beams” (ST/2007/025562) was accepted for publication in the Journal of Structural Engineering published by the American Society of Civil Engineers. Authors are Jenő Balogh, Metropolitan State College of Denver; Massimo Fragiaco, University of Sassari, Italy; and Richard M. Gutkowski and R.S. Fast from Colorado State University.

“FRP Z-Spike Repairing of Wood Railroad Crossties” ST/2007/025449 was accepted for publication in the Journal of Structural Engineering published by the American Society of Civil Engineers. Authors are Richard Gutkowski, T.J. Schilling, Jenő Balogh and Donald Radford. Gutkowski, Schilling, and Radford are at Colorado State University. Balogh is at Metropolitan State College of Denver.

“Repair of Full-Scale Timber Bridge Chord Members by Shear Spiking” (BE/2006/023206) was accepted for publication in the Journal of Bridge Engineering published by the American Society of Civil Engineers. Authors are Travis Burgers, Richard Gutkowski, Jenő Balogh, and Donald Radford. Burgers, Gutkowski, and Radford are at Colorado State University. Balogh is at Metropolitan State College of Denver.

Wyoming Faculty Present on Gravel Road Performance

George Huntington and Khaled Ksaibati, MPC program director at the University of Wyoming, presented a paper on gravel roads performance at the seventh national conference on transportation asset management which was held in New Orleans, Nov. 6-8, 2007.

CSU Prof Shares Research in Portugal

CSU professor of civil and environmental engineering Richard Gutkowski and graduate research assistant Chris Turnbull-Grimes presented “Facility for Performance Tests of Security Structures to U.S. Department of State Standards” at the 10th Annual Conference on Structures Under Shock and Impact in Algarve, Portugal. The conference was May 14-16.

Their presentation described a vehicle crash testing facility for roadway/safety barriers that was constructed in 2004 and allows manufacturers to test safety barriers under vehicle impact prior to full-scale federal testing. The facility enables a simplified, yet standard, test according to federal regulations at considerably lower cost. This provides the user an opportunity to observe the outcome and, if necessary, make improvements before conducting federal tests. Construction and a pilot test use of the ramp’s capabilities were described.

From May 17-20, Gutkowski of Colorado State University visited the Department of Civil Engineering at the University of Coimbra (UC), Coimbra, Portugal, for discussions of further cooperation in research on composite-wood concrete bridge systems. Gutkowski presented an overview of his recent and ongoing MPC research on that subject and other MPC supported topics to faculty and students. He observed summary presentations on wood- and bridge-related research by UC graduate students and participated in a discussion session with them to offer advice and guidance on their research directions.

CSU Professor Reflects on Year in Iraq

Steve Abt, professor of civil and environmental engineering at Colorado State University, presented “Reflections – A Year’s Experience with the U.S. Embassy in Iraq” to the CSU campus community April 17, 2008.

In May 2006, Abt was mobilized by the U.S. Army and deployed to Iraq to serve as the Director of Operations, Iraq Reconstruction Management Office within the U.S. Embassy in Baghdad, Iraq. His responsibilities encompassed the project selection, approval, allocation, and accountability of nearly \$3.5 billion of reconstruction funds and \$1.5 billion of security and capacity building funds. These project funds supported over 1,200 projects to build/rebuild Iraqi infrastructure in the areas of electrical generation and distribution; oil production and distribution; rail, roadway, and air travel systems; hospitals and health clinics; water and wastewater treatment plants; and fire, police, and postal stations. Abt supervised nearly 100 civilian subject matter experts and technical staff. During his tour, he routinely worked with Iraqi national ministers and director generals, and the leadership of the U.S. Embassy and Multi-National Force-Iraq. He traveled to over 140 project sites throughout the country and left the Green Zone visiting the Iraqi leadership over 150 times during his tour.

Abt discussed the events leading to his deployment, provided insights in the unity of effort between U.S. Embassy and Coalition Military leaders, and presented a brief overview of some the projects in which he was directly linked.

Gutkowski Published in the Denver Post

Richard Gutkowski, MPC program director at Colorado State University, had an article published in The Denver Post in August 2007. As a follow-up to the bridge collapse in Minneapolis, MN, Gutkowski addressed bridge design and structural engineering of the past, present, and future. The reader-friendly opinion-page article, “Forty years of progress in bridge engineering, well done but more is needed,” was published Sunday, Aug. 12. The article is available at http://www.denverpost.com/opinion/ci_6587016/.

CSU Engineering Innovations Breakfast Continues

For CSU engineering alumni along the Front Range area in Colorado, the CSU College of Engineering offers a special opportunity to network. Each month, the college hosts Engineering Innovations Breakfasts, which are a great opportunity to interact with alumni, friends, and former professors, as well as to hear updates on technological trends and innovative research projects.

Italian at CSU Works on Wood-Concrete Composite Floor/Deck Systems

Massimo Fragiaco, associate professor of structural design at the faculty of architecture of the University of Sassari, Italy, visited the Department of Civil Engineering of Colorado State University from May 28 to June 1. During that week, Fragiaco gave some seminars to graduate students to introduce a finite element program for numerical analyses of wood-concrete composite deck/floor and bridge systems he developed during his PhD work.

He also discussed a number of topics with different students, including finite element modeling of composite structures using software packages such as ABAQUS, experimental results obtained in previous tests to failure and in the long-term, experimental set-up of new tests, and simplified design formulas for composite structures. “It was a real pleasure to spend this week of work at CSU,” Dr. Fragiaco said. He noted that his work had much in common with CSU research and that the work could have extensive applications for refurbishing existing short-span wooden bridges and construction of new medium-to-long span floors.

Wehbe Appointed as Chair of ACI-ASCE Joint Committee 441

Nadim Wehbe, MPC program director at South Dakota State University, accepted the invitation by the Technical Activities Committee (TAC) of the American Concrete Institute (ACI) to chair ACI-ASCE Joint Committee 441: Reinforced Concrete Columns. Wehbe will serve as the committee chair for a two-year term starting in April 2008. The two-year term is renewable twice for a maximum of six years.

MPC is Active at Annual TRB Meeting

Several researchers from the Mountain-Plains Consortium participated in the Transportation Research Board's (TRB) 87th Annual Meeting Jan. 13-17 in Washington, D.C.

The TRB Annual Meeting brings together more than 10,000 policymakers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions for a comprehensive look at all modes of transportation. The meeting offered more than 3,000 presentations in nearly 600 sessions. The TRB is a part of the National Academies of Science.

Colorado State University

MPC faculty member Suren Chen was an author of "Control of Long-Span Bridge and Moving Trucks Under Wind Using Tuned Mass Dampers." The paper outlines research designed to better take into account the dynamic impacts of moving vehicles and wind on long-span bridges. Jun Wu of CSU was also an author.

North Dakota State University

Kimberly Vachal presided over a panel discussion addressing concerns about transportation and energy. Specifically, the panel discussed the implications of bio-energy in transportation and the demand for ethanol. Vachal also chaired a meeting of the Agricultural Transportation Committee. The meeting featured a presentation on the importance of a reliable waterway system to agriculture, and committee members worked through logistics of the Food Aid Workshop, participated in a roundtable discussion, and generated research topics among other items on the agenda.

Jill Hough gave a presentation on exploring travel behavior of elderly women in rural and small urban North Dakota using an ecological modeling approach. Her presentation was part of a panel discussion on the reality of travel behavior implications for an aging population.

Dave Ripplinger facilitated a panel discussion titled "New Approaches to Improving Paratransit Services." Panel topics addressed transit schedules, demand-response and fixed-route transit, agency-dedicated vehicle transportation, and coordinated transportation.

Subhro Mitra presented the paper, "Development of Statewide Freight Transportation Model to Assess Impact of Highway Spring Load Restrictions." The paper details his development of a model to estimate freight transportation cost savings that would be realized by removing spring load restrictions from North Dakota roads.

University of Utah

Ivana Vladislavljevic presented "High-Occupancy Toll Lane Experiment on I-15 in Salt Lake City Metropolitan Region: Traffic Flow Evaluation." The paper details a two-year experiment that is an assessment of the traffic impacts of expanding the scope of the HOV lanes on the corridor. Additional authors were Peter T. Martin, Dejan Jovanovic, and Aleksandar Stevanovic.

Aleksandar Stevanovic presented "SCOOT and Coordinated Actuated Traffic Control Evaluated Through Microsimulation." This paper presents a construction of a comparison between the best offline tools and adaptive signal control. Peter T. Martin was also an author.

Ivana Vladislavljevic also presented “Drivers’ Lane-Changing Behavior While Conversing on Cell Phone in Variable-Density Simulated Highway Environment.” This research examined the effect of naturalistic, hands-free, cell phone conversation on driver’s lane-changing behavior. Additional authors were Joel M. Cooper, David L. Strayer, and Peter T. Martin.

South Dakota State University

Nadim Wehbe, MPC program director at SDSU presented “Laboratory Evaluation of Self-Consolidating Concrete Mixtures for Highway Structures in South Dakota.” The paper details part of a comprehensive study to evaluate the feasibility and performance of self-consolidating concrete (SCC) made with South Dakota local aggregates, and to develop SCC draft specifications, acceptance criteria, mix qualifications, and guidelines that the South Dakota Department of Transportation (SDDOT) can use for the construction of precast and cast-in-place non-prestressed structural applications. Additional authors are Arden Sigl, Amanda Boushek (former research assistant), and Zachary Gutzmer (research assistant).

Ali Selim presided at a session showcasing the best papers from TRB 9th International Conference on Low-Volume Roads.

Hesham Mahgoub was an author of “Commercial Vehicle Remotely Operated Compliance Stations in Florida.” The paper reported on research aimed at design and deployment of the first Florida Remotely Operated Compliance Station (aka Virtual Weigh Station). The paper describes the design and installation of the Sneads ROCSTM in July 2006, and the software for capture and display, which has been developed by the researchers. Additional authors included Amr Oloufa, University of Central Florida, and Sami Spahi, University of Central Florida.

University of Wyoming

Rhonda Young was an author of “Relating Vehicle-Wildlife Crashes to Road Reconstruction.” The research focused on determining the effect of road reconstruction on the number of reported wild animal crashes using changes in the animal-vehicle crash rates along those segments of roadway. Christopher Vokurka, Drexel, Barrell & Co., was also an author. Young also moderated a session on innovations in statewide planning.



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. Baccalaureate degrees are offered in 64 fields in eight colleges. CSU offers 39 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 approximately 12,500 students. The university offers 41 doctorate and professional degree programs, 51 master's degree programs, and 103 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 11,000 students. The university offers 104 baccalaureate degree and post-baccalaureate certificate programs, 23 master's degree and post-master's certificate programs, eight Ph.D. degree programs, and one professional program. Supporting programs include the newly developed 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 about 29,000 students and offers 77 undergraduate degree programs, more than 80 minors and certificates, more than 45 teaching majors and minors, and 95 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 12,400 students and offers 85 undergraduate degree programs including eight teaching majors. The university offers 58 master's degree programs and 32 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 2008, MPC produced a library of nearly 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. Dr. Ayman Smadi of NDSU is the external programs coordinator. 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 2006-07, 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 ñ western region
- Grant Levi, North Dakota DOT
- Jeff Loftus, Federal Motor Carrier Safety Administration
- Delbert McOmie, Wyoming DOT
- Craig Rockey, Association of American Railroads

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



Tolliver

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 Military 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.



Gutkowski

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. He also has co-edited proceedings for the above NATO workshops.



Ksaibati

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 pavements. 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.



Martin



Wehbe

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 prestressed concrete structures, earthquake resistant bridges, and advanced composites structural systems.

Dr. Kimberly Vachal joined the executive committee this year as NDSU’s program director. She 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.



Vachal



Smadi

Dr. Ayman Smadi is MPC external programs coordinator. He is director of the Advanced Traffic Analysis Center (ATAC) at UGPTI. The ATAC enhances transportation systems in small-medium size communities through the use of advanced traffic analysis and ITS solutions to safety and mobility problems. ATAC's Traffic Laboratory supports state-of-the art traffic analysis, including traffic simulation, traffic signal control, and traffic data collection systems. As an adjunct professor in civil engineering, Smadi teaches transportation planning, advanced transportation systems, and ITS graduate courses. Smadi's research interests include traffic operations, transportation planning, ITS, and safety. Smadi, an advanced research fellow, began his work at the UGPTI in 1993. He served as NDSU's

program director for the MPC from 1996 until 2006. He has a Ph.D. in civil engineering from Iowa State University; an M.S. from the University of Oklahoma; and a B.S. in civil engineering from Yarmouk University, Irbid, Jordan.

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. Rebecca Atadero joined the faculty as an assistant professor in July. For the past two years, as a research scientist/instructor, she has taught Structural Analysis and Steel Design to undergraduate students. Rebecca earned her bachelor's degree in civil engineering from Colorado State University in 2002. She went on to the University of California, San Diego, to earn a M.S. and Ph.D. in structural engineering. Rebecca first returned to Colorado State University in 2006 as a research scientist. As a doctoral student Rebecca studied fiber reinforced polymer (FRP) composite materials for use in the repair and strengthening of existing reinforced concrete structures. She will continue her research on the repair and rehabilitation of existing structures, giving particular emphasis to the reliability of inspection processes and the condition of the existing structure at the time when repairs are made. She will also continue to study new structural materials such as FRP and fly-ash-based products.



Balogh

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.



Carraro

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.



Chen



Criswell

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. 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.



Heyliger



Liu

Dr. Juhua Liu is a research scientist in the Department of Civil and Environmental Engineering. He earned a B.S. degree in the Department of Vehicle Engineering at Juangsu Institute of Technology (China), an M.S degree in the Department of Physics and Agricultural Engineering at Wageningen University (Netherlands), and a Ph.D. degree in Chemical and Bioresource Engineering at Colorado State University. His research interests include off-highway vehicle stability and engineering contro strategies; GPS and GIS applications in engineering; and information technology and computer applications.

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 is 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.0

Dr. John W. van de Lindt is an associate professor in the structural engineering program. He earned his B.S. in civil engineering from California State University at Sacramento and both his M.S. and Ph.D. in civil engineering from Texas A&M University. His research interests include nonlinear dynamics, structural reliability, and woodframe structures subjected to seismic and wind loads. He currently chairs the ASCE Committee on the Reliability-Based Design of Wood Structures.



van de Lindt

North Dakota State University



Benson

Doug Benson is an associate research fellow at the Upper Great Plains Transportation Institute. 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 Upper Great Plains Transportation Institute 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. Since 1999 Berwick has been the director of the North Dakota Strategic Freight Analysis Program, which examines the transportation and logistics of different sectors of the economy every two years. Berwick holds master's and bachelor's degrees in agricultural economics from North Dakota State University.



Berwick



Bitzan

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 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 Upper Great Plains Transportation Institute and an adjunct professor in agricultural economics.

Alan Dybing is an associate research fellow at the Upper Great Plains Transportation Institute. He is expected to earn his Ph.D. in transportation and logistics from NDSU in 2007. 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.



Dybing



Herabat

Dr. Pannapa Herabat joined the Department of Construction Management and Engineering at NDSU in 2006 as an assistant professor. She specializes in asset management systems, bridge management systems, pavement management systems, deterioration modeling and infrastructure management. She is a graduate of Carnegie Mellon University in Pittsburgh where she earned B.S., M.S., and Ph.D. degrees in civil engineering. Before coming to NDSU, she was an assistant professor in the School of Engineering and Technology at the Asian Institute of Technology in Thailand.

Dr. Jill Hough is an advanced research fellow at the Upper Great Plains Transportation Institute 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 currently 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.



Hough



Lantz

Dr. Brenda Lantz is an associate research fellow at the Upper Great Plains Transportation Institute 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.



Lofgren

Mark Lofgren is an associate research fellow at the Upper Great Plains Transportation Institute. 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.

Tamara VanWechel is an associate research fellow at the Upper Great Plains Transportation Institute. She works on agricultural and freight transportation. She has interests in rural freight logistics and infrastructure, bulk grain and oilseed logistics, and railroad pricing and service. As a native of rural North Dakota, she understands the fundamental relationship between economics and agriculture. She earned her B.S. and M.S. degrees from NDSU in natural resources management. Her M.S. degree emphasis area is in agribusiness and applied economics.



VanWechel

Dr. Jun Zhang joined the Department of Industrial and Manufacturing Engineering at NDSU in October as an assistant professor. Her research interests include: lean manufacturing and logistics; production planning and inventory control; scheduling; simulation optimization; models and methodologies of stochastic optimization; health care engineering; facility design; supply chain management; artificial intelligence; machine learning and data mining; and computer integrated manufacturing. Zhang holds a B.S. and an M.S. in mechanical engineering from Beijing Institute of Technology, China, and a Ph.D. in industrial engineering from Purdue University. Before coming to NDSU, she was a research assistant for the School of Industrial Engineering at Purdue.

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 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.



Mahgoub

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. Dr. Mahgoub has a B.S., M.S., and Ph.D. degrees in civil engineering, all from the Cairo University, Egypt.

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.

Dr. Ali Selim is director of the South Dakota Local Transportation Assistance Program and professor of civil and environmental engineering at South Dakota State University. In Selim's 30 years of experience, he has taught courses in highways and traffic engineering; bituminous materials; transportation engineering; highway capacity analysis; pavement management and rehabilitation; and statics. His research interests include: low-volume roads, gravel roads maintenance and design, asphalt mix technology, geometric design of roads and traffic accident investigations. Selim earned a B.S. from Ain-Shams University, Cairo, Egypt. He received his M.S. and Ph. D. from the University of Missouri-Rolla.

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. 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.

Dr. Aleksandar Stevanovic, is a post-doctoral research associate at the Utah Traffic Lab. He earned his B.S. degree in transportation and traffic engineering from the University of Belgrade in Serbia. He earned his M.S. and Ph.D. degrees in civil and environmental engineering from the University of Utah. At the University of Utah, he has been involved in research on traffic management through the use of traffic signal control systems, high-occupancy vehicle lanes.

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.



Edgar

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.

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.

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.



Puckett



Wilson

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. Cenk Yavuzturk is an assistant professor of architectural engineering. His research interests are in HVAC-R equipment and systems, thermal systems modeling and simulation, ground-source heat pumps, building energy analysis and energy management and building thermodynamics. He holds a Ph.D. in mechanical engineering from Oklahoma State University and a Diplom Ingeniuer in energy and processing engineering from the Technical University of Berlin, Germany.



Yavuzturk



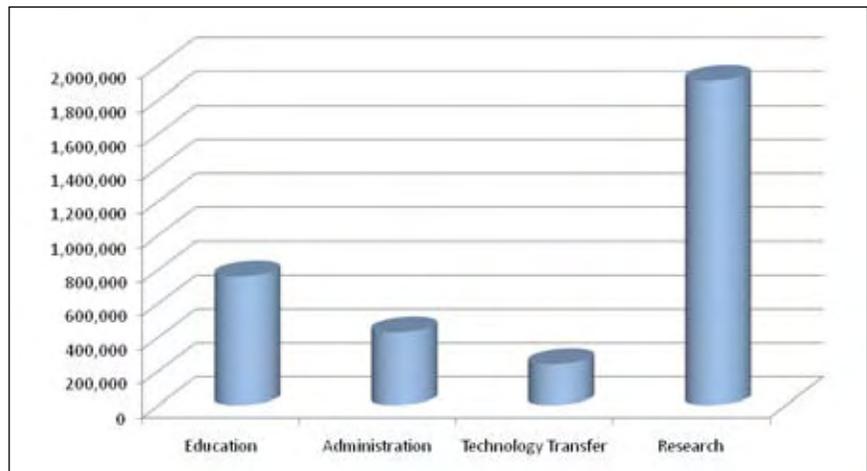
Young

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, masters 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.



Resources and Funding

July 1, 2007 - June 30, 2008
Distribution of Funds



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
- 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, 2007 - June 30, 2008*

New Research Projects

MPC-285	Structural Performance of Self Consolidating Concrete Made with Limestone Aggregates (SDSU, N. Wehbe)
MPC-286	Developing System for Consistent Messaging on Interstate 80's Dynamic Message Signs (UWY, R. Youngs)
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-289	Evaluation of Optimal Traffic Monitoring Station Spacing on Freeways (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-292	Traffic Safety Vulnerability Information Platform for Highways in Mountainous Areas Using Geospatial Multimedia Technology (CSU, S. Chen)
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-297	Understanding Influence of Transportation and Other Factors on the Economic Growth on Non-metropolitan Cities (NDSU, K. Vachal)
MPC-299	Integrating Planning and Operations Models to Predict Work Zone Traffic (NDSU, A. Smadi)
MPC-300	Demand Estimation for Corn Transportation: A North Dakota Case Study (NDSU, A. Dybing)

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-260	Impact Performance Testing of Roadway Safety & Security Barriers - Phase 3 (CSU, R. Gutkowski)
MPC-262	Cambering of Wood-Concrete Highway Bridges (CSU, R. Gutkowski)
MPC-266	Small Urban and Rural Transportation - Phase II (NDSU, A. Smadi)
MPC-268	Accessing International Container Markets from the Northern Plains (NDSU, K. Vachal)
MPC-270	Serviceability Limits and Economical Steel Bridge Design (UWY, M. Barker)
MPC-271	A Comprehensive Transportation Safety Evaluation Program in the State of Wyoming (UWY, K. Ksaibati)
MPC-272	Use of Wind Power Maps to Establish Fatigue Design Criteria for Traffic Signal and Variable Message Structures (UWY, J. Puckett)
MPC-274	Beneficial Use of Waste Tire Rubber in Low-Volume Road and Bridge Construction (CSU, J. Carraro)
MPC-275	Z-Spike Rejuvenation to Salvage Timber Railroad Bridge Members (CSU, R. Gutkowski)
MPC-277	Safety Factor Increase to Fatigue Limit States through Shear Spiking for Timber Railroad Bridge Rehabilitation (CSU, J. van de Lindt)
MPC-278	Bus-Stop Shelters - Improved Safety (CSU, W. Charlie)
MPC-279	Structural Applications of Self-Consolidating Concrete (SDSU, N. Wehbe)
MPC-280	Bridge Scour in Cohesive Soils (SDSU, F. Ting)
MPC-281	The Assessment of Chloride Injury from De-Icing Salts in Trees Along State Highways in the Black Hills (SDSU, J. Ball)
MPC-282	Express Lane Genetic Algorithm Microsimulation Modeling (UofU, 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-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-263 Traffic Operations in Small Urban and Rural Areas (NDSU, A. Smadi) Website: www.surtoc.org
with on-line survey 11/1/07
- MPC-264 Evaluation, Definition, and Identification of the Criteria for Establishing Freight Corridors (NDSU, M. Berwick) MPC Report No. 08-201
- MPC-265 Design/Build vs. Traditional Construction User Delay Modeling: An Evaluation of the Cost Effectiveness of Innovative Construction Methods for New Construction (UofU, P. Martin)
MPC Report No. 07-187A and MPC Report No. 07-187B
- MPC-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-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-273 Low-Cost Soft Crash Barriers (CSU, P. Heyliger) MPC Report No. 08-198
- MPC-276 Use of Salvaged Utility Poles in Roadway Bridges (CSU, R. Gutkowski) MPC Report No. 08-197
- 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-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-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.

(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