2002 ANNUAL REPORT

Mountain-Plains Consortium

MPC Theme

The theme of the Mountain Plains Consortium is "RURAL AND INTERMODAL TRANSPORTATION." It is predicated upon the spatial and economic character of the region and a set of critical issues common to Region 8 and the broader Mountain-Plains geographic region.

MPC Vision

To be a regional and national leader in rural and intermodal transportation and a North American center for cooperative education and information exchange.

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

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The Mountain-Plains Consortium

The Universities

Colorado State University

CSU is governed by the Board of Governors of the Colorado State University System as a public land grant institution with a rural, agricultural mission. Current enrollment is more than 23,000 students. Baccalaureate degrees are offered in 55 departments in eight colleges, including agricultural sciences, applied human sciences, business, engineering, liberal arts, natural resources, natural sciences and veterinary medicine and biomedical sciences. CSU offers 40 doctoral and 61 master degree programs. Primary transportation graduate educational and outreach activities occur in the College of Engineering, with related activities in business, applied human sciences, and natural resources. Currently, 24 faculty have capabilities and activities pertinent to transportation. Graduate courses are available in civil engineering, mechanical engineering, earth resources, business, remote sensing and construction management. The College of Business offers an MBA degree and houses the Institute of Transportation Management, which serves public and private sector organizations. A $12 million expansion of the University Libraries recently was completed, and access is provided to more than three million items in four facilities in a modern computerized setting.

North Dakota State University

NDSU is a land grant institution with an annual enrollment of approximately 9,700 students and more than 800 faculty and academic staff at the central campus in Fargo. The university offers 21 doctorate and professional degree programs, 45 master's degree programs, and 76 baccalaureate degree programs. Currently, 14 graduate faculty with doctorate degrees are associated with the graduate transportation options. Collectively, these faculty members encompass a wide range of educational experience and expertise. NDSU is also part of a tri-college system, which includes Minnesota State University-Moorhead and Concordia College in Minnesota. The network promotes educational and research interchange among faculty and allows students to take courses at more than one institution for undergraduate credit.

University of Utah

The University of Utah has an annual enrollment of about 25,000 students and offers 74 undergraduate degree programs, more than 50 teaching majors and minors, and 93 graduate majors. Students are enrolled from all 29 Utah counties, all 50 states, and 102 foreign countries. There are 16 colleges. The College of Engineering is divided into seven academic departments – civil, mechanical, chemical, electrical, bioengineering, material science, and computer science – with 115 regular faculty and 180 adjunct, clinical, and research faculty. Collectively, these departments earned $50 million in external research funding in 1998. The College of Engineering has several well-equipped laboratories specializing in structural, geotechnical, hydraulic, environmental, traffic, and materials engineering.

University of Wyoming

UW is a land grant institution with an annual enrollment of about 12,000 students. The university has eight colleges and offers the master degree in 84 fields. UW's academic program features a multidisciplinary approach that expands the educational backgrounds of its MPC graduate students, and other students studying transportation areas. Supporting courses for the program are available in statistics, computer science, and management. Included, for example, are GIS training in the Department of Geography, management training in the business college, special courses and research programs that respond to the multidisciplinary needs of statewide transportation planning, analysis of recreational travel behavior and tourism, and management systems.

Milestones and 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 a subsequent re-competition during the ISTEA era, as well as the most recent competition following the passage of TEA-21.

From 1988 through 2001, MPC produced a library of 136 research reports and 40 student theses or dissertations, while attracting new faculty to the field of transportation. During 1988-2001, MPC funded 58 different principal investigators and developed or adapted 20 transportation graduate courses for delivery over the TEL8 distance learning network. The MPC universities also continued to teach most of their preexisting 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.

The following list of milestone achievements provides only a cursory view of the cumulative accomplishments of the Mountain-Plains Consortium. This year's accomplishments add to its history of achievement and growth in transportation education, research, and technology transfer activities in Region 8.

2002
- North Dakota Board of Higher Education approves proposal for new interdisciplinary Ph.D. in Transportation and Logistics.
- Rural Transit Center established at North Dakota State University.
- Colorado State University collaberates with city of Ft. Collins to establish new Transportation Planning course.

2001
- First NDDOT engineer graduates from the Master of Science program after completing all courses via TEL8
- NDSU curricula committees approves program plan for minor in Logistics
- MPC initiates short course program for state DOT personnel and offers two short courses via TEL8

2000
- MPC five-year strategic plan approved

1999
- MPC universities deliver 18 graduate courses over TEL8 network under cooperative agreement
- MPC wins TEA-21 competition for Region 8
- University of Utah joins Consortium
- Memorandum of agreement signed with Southwest University Transportation Center covering education and research exchanges

1998
- Tenth-year program plan is approved

1997
- Ninth-year program plan is approved
- Started North American Educational and Research Exchange with University of Manitoba (1997)

1996
- Eight-year program plan is approved
- TEL8 research seminar series started
- Research partnership established with American Association of Railroads
- Cooperative agreement signed by MPC universities for annual exchange of graduate courses via TEL8
- Joint MPC-state DOT program planning committee established

1995
- MPC wins re-competition during ISTEA era
- TEL8 used to deliver 44 hours of TRB sessions to state transportation departments in Region 8
- Seventh-year program plan is approved
- Partnership established with American Short Line Railroad Association and FRA, resulting in the establishment of a national short line railroad database
- First graduate courses exchanged among MPC universities

1994
- Sixth-year program plan is approved
- TEL8 telecommunications network started, connecting MPC universities with state transportation departments in Region 8 and FHWA site

1993
- Fifth-year program plan is approved
- Multi-disciplinary graduate transportation educational program is started, with options in Civil Engineering and Agricultural Economics
- Non-residency graduate transportation option for NDDOT engineers initiated using Interactive Video Network

1992
- Fourth-year program plan is approved

1991
- Third-year program plan is approved
- MPC establishes outstanding graduate student award

1990
- Second-year program plan is approved
- Reorganization of MPC to include four Region 8 universities

1989
- Regional Conference and Planning Meetings with LTAP Center Directors
- First-year program plan is approved

1988
- Mountain-Plains Consortium is founded and selected as Region 8 Center

Program Goals, Strategies and Focus Areas

The desired UTC program outcome is "to increase the number of Americans who are prepared to design, deploy and operate the complex transportation systems that will enhance America's economic competitiveness in the 21st century." MPC has developed a series of program goals and five-year strategies to help realize the desired outcome. They are detailed in the 1999 MPC Strategic Plan, which is available at our website.

Four key words help to define MPC's strategies and programs – multi-university, multi-disciplinary, multi-modal, and multi-national. We are continuing our pre-existing programs at the four universities while developing new multi-disciplinary educational, research, and technology transfer programs. Collectively, these programs coordinate and integrate concepts from many disciplines including engineering, planning, economics, business, geography, computer science, and operations research. Our educational programs feature resident and non-resident courses and use traditional and innovative delivery media. They also feature a mixture of undergraduate, graduate, and continuing education components. Our research focus areas encompass the surface modes of highway, transit, and railroad, as well as intermodal freight movements.

Our focus area in International Cross-Border Traffic addresses multinational transportation issues, as do much of our educational and technology transfer activities. One of our major strategies is to engage universities in Canada, Mexico, and the United States in a broader partnership to foster exchange and dissemination of knowledge in the midcontinent region.

This section of the report defines our focus areas and summarizes MPC's program goals and prime strategies. These strategies are organized under the guiding UTCP goals of education, research selection and performance, technology transfer, and human resources.

Educational Goal: A multi-disciplinary program of course work and experiential learning that reinforces the transportation theme of the Center

MPC Program Goals

- A multi-disciplinary attitude and environment that fosters interchange among students, academic departments, and transportation disciplines.
- A multi-university educational and research program in which transportation is viewed as a crosscutting, high-priority area of emphasis at each institution.
- A collaborative environment that features coordination and regular communication among all transportation centers and institutes in Region 8.
- A North American perspective in which Canadian and Region 8 universities cooperatively assess educational and research goals, and undertake demonstration projects to refine the scope of potential international partnerships.

Prime MPC Educational Strategies

- Continue to expand the MPC transportation curricula to encompass more disciplines and provide coverage of all modes.
- Continue to work with state transportation departments, LTAP Centers, and the TEL8 Board of Directors to meet the educational needs of mid-career transportation professionals in the region.
- Foster exchange and partnerships between U.S. and Canadian universities in curricula development and course delivery, especially in the field of international transportation and logistics.
- Foster distance learning and offer students more options by further integrating the graduate and continuing education programs of MPC institutions.
- Develop a strong internship program to provide students with first-hand experience in rural and intermodal transportation.
- Expand the dialogue and collaboration among academic departments at each MPC university through interdepartmental seminars, meetings, and regularly-scheduled events.
- Further integrate graduate, undergraduate, and community/junior college educational programs to introduce transportation concepts early in the higher educational process.
- Work with K-12 and community colleges to better inform students about modern transportation careers.

Research Selection Goal: An objective process for selecting and reviewing research that balances multiple objectives of the program

Research Performance Goal: An ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field to advance the body of knowledge in transportation

MPC Research Program Goals

- A balanced research program in rural and intermodal transportation that reflects priorities of major client groups and USDOT's strategic goals.
- A library of research material in rural and intermodal transportation which is valued and used by practitioners, researchers, and students.

- Awareness among transportation researchers and practitioners of multi-disciplinary problem-solving techniques and intermodal transportation issues.
- Access to educational programs and research findings for graduate students and transportation practitioners throughout the region, regardless of location.
- Access to transportation research findings by researchers and practitioners in related fields such as rural economic development planning, and health and human services planning.

Prime MPC Research Strategies

- Conduct research that advances the state of knowledge in *Rural and Intermodal Transportation* and addresses critical issues within the seven focus areas.
- Follow an open structured process of research selection that includes peer review and input from universities, USDOT, state transportation departments, and other transportation practitioners.
- Conduct an annual site visit of each university in which the center director and USDOT liaison meet with university program directors and principal investigators to review the status of research projects and assess the performance of each university.
- Hold quarterly MPC executive committee meetings to review research performance and monitor overall program performance.
- Conduct peer review of MPC research reports and require principal investigators to deliver a seminar over the TEL8 network for each funded research project. (All MPC-funded research must be presented to state transportation department practitioners, graduate students, and faculty at other MPC universities.)
- Encourage principal investigators to derive journal articles and technical papers from MPC reports and student theses.

Technology Transfer Goal: Availability of research results to potential users in a form that can be directly implemented, utilized or otherwise applied

MPC Program Goals

- A library of research material in rural and intermodal transportation that is valued and used by practitioners, researchers, and students.
- Awareness among transportation researchers and practitioners of multi-disciplinary problem-solving techniques and intermodal transportation issues.
- Access to educational programs and research findings for graduate students and transportation practitioners throughout the region, regardless of location.
- Access to transportation research findings by researchers and practitioners in related fields, such as rural economic development planning and health and human services planning.

Prime MPC Technology Transfer Strategies

- Continue to participate in the TEL8 telecommunication network and work with the TEl8 programming committee to plan an annual program of education and training events for state transportation departments in Region 8.
- Exchange knowledge with other universities and state transportation departments in the western United States and Canada through the Midcontinent Transportation Knowledge network and other alliances.

- Cooperate and coordinate activities with LTAP and Tribal Technical Assistance Centers. (Two of the LTAP centers in the region are co-located at MPC universities and two of the universities have ties to Tribal Technical Assistance Centers.)
- Require each principal investigator to deliver seminar over the TEL8 network for each funded research project.

Human Resource Goal: An increased number of students, faculty, and staff who are attracted to and substantively involved in the undergraduate, graduate, and professional programs of the Center

Human Capacity-Building and Program Marketing Strategies

- Disseminate information about transportation topics, programs, and careers to college freshmen and sophomores, and to high schools and community colleges.
- Work with student organizations and chapters of national organizations such as ASCE, ITE, and CLM to raise awareness of transportation issues and careers.
- Promote cooperative ventures such as internships, mentor programs, etc., with business and governmental agencies.
- Lead and participate in general transportation awareness campaigns.
- Conduct activities such as career days and facilitate the distribution of brochures and related materials.
- Enter into cooperative ventures with Native American LTAP centers, Outward Bound, and related organizations to reach reservations and other areas of the region populated by minorities.

FOCUS AREAS

Rural and Intermodal Transportation provides a basic direction for the Center's activities. However, the theme is quite broad for guiding the research and technology transfer components of the program. Therefore, seven definitive focus areas have been developed, providing further guidance to MPC faculty in developing research and technology transfer projects and assisting each university in concentrating its efforts in areas of excellence and specialization. The focus areas also provide common ground for several or all universities to collaborate on joint projects.

RURAL TRANSPORTATION SAFETY

Safety is a top priority for the USDOT and state transportation departments in the region. Much of MPC's previous research has focused on rural safety issues and potential solutions for state and local highways. Although several MPC focus areas encompass safety topics, an umbrella focus area has been created to emphasize the importance of rural transportation safety. In the next five years, MPC research will highlight emerging technologies such as rural road safety audits, which have the potential to significantly improve safety on low-volume rural highways, and potential applications of GIS and ITS technologies to highway safety. As noted earlier, many safety-related issues will be addressed by projects in other focus areas such as Low-Volume Roads and Bridges and Rural Transit.

RURAL TRANSIT

Transit plays a role in all of the market-travel segments discussed earlier. This is important, as transit may be the only travel option for households without automobiles and for elderly and handicapped residents. Critical transit planning and research issues in Region 8 include cost-effectiveness of transit systems in sparsely populated areas; transportation of economically disadvantaged and aging rural residents; access to jobs and training for people making transitions from welfare-to-work; use of ITS and other advanced technologies for rural public transit; connectivity between small towns and urban and metropolitan centers; and improved access to university campuses.

INTERMODAL FREIGHT AND LOGISTICS

This focus area encompasses topics of importance to business, government, and the transportation industries. Most of the prospective research falls into one of the following categories: railroad track and bridge rehabilitation and engineering; heavier rail car weights and transloads; location and operation of intermodal facilities and terminals; railroad cost-of-service, market structure, and productivity; issues in regulatory economics (e.g., pricing, abandonment, and competitive access for shippers); commodity flow and truck traffic analysis; farm-to-market access and critical issues in agricultural logistics; supply chain management and critical issues in manufacturing logistics; truck economics; heavy truck factors in highway and bridge design and operation; use of ITS technologies in commercial vehicle operations and truck safety; and rural plant location criteria and infrastructure demands.

LOW-VOLUME ROADS AND BRIDGES

About 75 percent of the nation's 3.7 million miles of roadway are rural in nature. Nearly two-thirds of rural mileage is under local control. According to the National Bridge Inventory, about 80 percent of U.S. bridges are located on secondary roads, and half are local in function. Use of secondary and local roads is low, representing about 20 percent of daily traffic. However, more than half of the nation's traffic fatalities occur on rural roads and bridges.

Changes in the farm sector are impacting rural highway demands. These trends include increased farm size, mechanization and productivity, and larger trucks and farm equipment. Abandonment of light-density rail lines and longer farm-to-market trips are increasing heavy truck use. Many rural counties have hundreds of highway bridges in disrepair, but are able to address only two to three annually, as low commodity prices, declining tax bases, and reductions in the purchasing power of intergovernmental assistance limit the ability of local governments to maintain low-volume roads and bridges.

The majority of prospective research for this focus area falls into the categories of financing methods and issues; cost-effective design and maintenance practices; impacts of seasonal load restrictions and extreme weather conditions on the mobility of people and goods; impacts of rail line abandonment and other railroad system changes on rural highways; and highway and bridge safety, especially in two-lane rural roads.

ENVIRONMENTAL IMPACTS

Much of the research conducted under this heading is linked to projects in other MPC focus areas such as enhancing tourism through mitigation of congestion, road and bridge management projects, and the development of master plans for recreational access. Some specific areas of environmental research that have relevance to regional planning and policy analysis are freight and hazardous materials movements; reduction of congestion-related air pollution; potential for alternate modes in heavily traveled corridors; studies of high altitude, low-emissions fuels; and safe and effective dust control. Hazardous materials issues include commodity flows and volumes; monitoring and vehicle identification procedures; routing; risk assessment and management; emergency response; and classification of new materials. Clearly, hazardous materials research has safety as well as environmental implications.

TOURISM AND RECREATIONAL TRAVEL

Several of the most visited national parks and ski areas in America are located in Region 8. Many rural tourist areas are characterized by large seasonal variations in demand and congestion during peak periods. In general, the seasonal and daily traffic impacts of tourism and recreational travel must be better understood and documented. Specific research needs include travel demand characteristics, behavioral modeling, marketing effectiveness, potential roles for new technologies, and measurement of tourism output and traffic generation factors. It is also important to understand the complex relationship between tourism/ recreational travel and the preservation of natural resources in the region, and the potential impacts of tourism on "edge communities." Finally, an aging populace will demand more local transit options and alternative modes of access along corridors

INTERNATIONAL CROSS-BORDER TRAFFIC

Most of the prospective research projects in this focus area fall into one of the following categories: cross-border variations in truck configurations, lengths, weights, and operational practices; cross-border variations in pavement design and management practices; application of advanced technologies such as automatic vehicle identification, electronic tolls and vehicle clearance, and advanced traveler information systems to improve efficiency of cross-border truck movements; merger and consolidation of North American railroads and interchange of cross-border freight movements; variations in rail car ownership and use among nations; international interline information systems and intermodal hubs; international tourism and cross-border recreational travel; and supporting infrastructure investments.

Management Structure

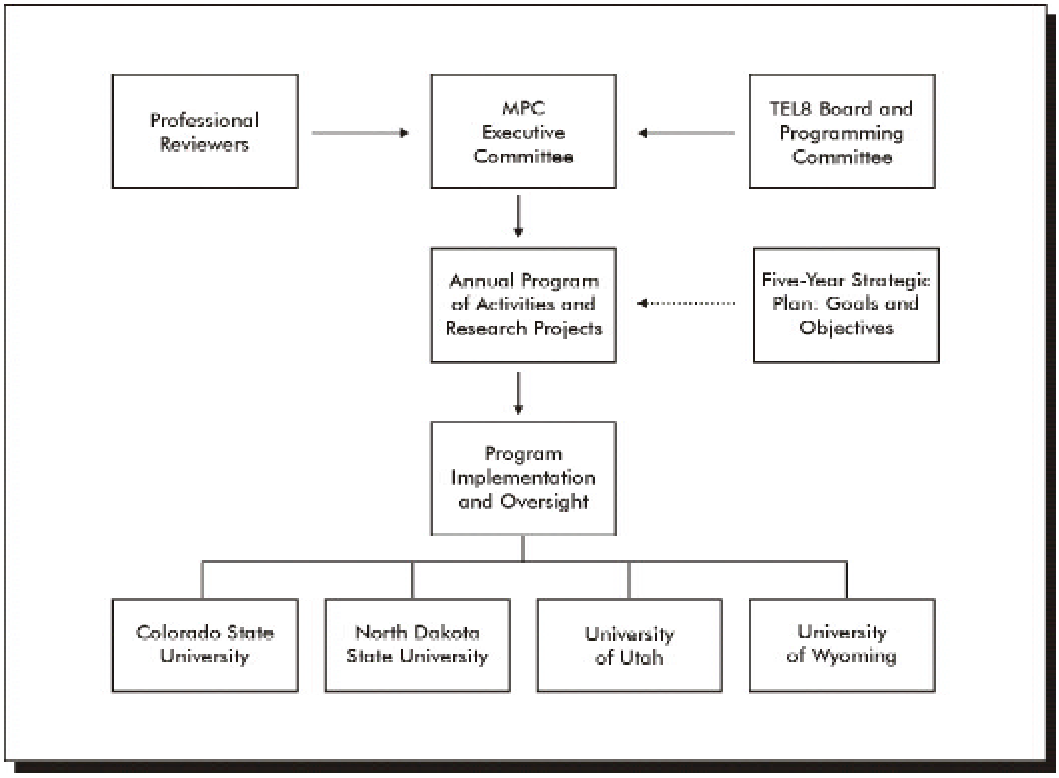
The management structure of the Mountain-Plains Consortium involves three main components – the Center Director and administrative staff, four University Program Directors, and the Executive Committee. In addition, the TEL8 Board and Programming Committee play important roles in program planning and implementation. The roles and responsibilities of each administrative component are discussed in this section. The MPC Program Planning flowchart illustrates the main sources of input and process used to develop an annual program of activities and research projects.

CENTER DIRECTOR

The Mountain-Plains Consortium is located at the Upper Great Plains Transportation Institute on the main campus of North Dakota State University. Dr. Denver Tolliver is the MPC program director. He is actively 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, not just NDSU. He administers the program in a synergistic way that takes advantage of the unique strengths and resources of each university and produces the greatest positive impact for the consortium. Kathy McCarthy of NDSU is the assistant administrator for the Center. Beverly Trittin of NDSU provides technical support and additional administrative services.

UNIVERSITY PROGRAM DIRECTORS

Each university in the consortium has a designated *university program director*. The four university program directors perform local oversight and management of approved activities at each university and 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. Ayman Smadi, North Dakota State University; Dr. Peter Martin, University of Utah; and Dr. Khaled Ksaibati, University of Wyoming.



Management Structure of the Mountain-Plains Consortium

EXECUTIVE COMMITTEE

The Center Director, the four university program directors, and a USDOT liaison form a committee to oversee program planning and administrative functions for the grant period. The six-member Executive Committee meets several times 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.

TELECOMMUNICATION SUPPORT NETWORK

The four MPC universities are members of a regional telecommunication network known as TEL8. The TEL8 network also includes five state transportation departments in Region 8: North Dakota, South Dakota, Montana, Wyoming, and Utah. The system carries a two-way interactive audio and video signal to conference and class rooms at the respective sites. TEL8 greatly enhances and improves the cost-effectiveness of the MPC administrative processes. It results in substantial travel cost savings and maximizes use of scarce faculty and administrative time.

TEL8 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 TEL8 Board of Directors. The four university program directors are members of the TEL8 board. The MPC Executive Committee and TEL8 Board hold an overlapping meeting each year. The TEL8 Executive Director and Program Director attend part of the MPC Executive Committee meeting and the Center Director attends part of the TEL8 Board meeting. The TEL8 programming committee, which meets several times each year, brings together representatives from the five state transportation departments and the MPC universities to collectively plan a regional education and training program.

PROFESSIONAL INPUT AND REVIEW

Although TEL8 is a primary source of state transportation department input, the MPC research selection process benefits greatly from professional input and review. Each year, professionals from federal, state, and local transportation departments and private industry review MPC research problem statements. In 2000-01, 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 will provide value to our primary customers, the end users of the research.

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 four campuses are approved first by the Executive Committee. The Center Director ultimately is held 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. The site visits provide opportunities for the director and USDOT liaison to meet with principal investigators and program managers on each campus and to gauge progress toward program goals and objectives. The director also holds teleconferences 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. At least one meeting per year is scheduled with the Intermodal Transportation Institute of University of Denver. The September 2001 meeting stimulated new ideas for collaboration. Another meeting is scheduled for September 6, 2002.

Executive Committee

Denver Tolliver
Executive Director

Denver Tolliver is director of the Mountain-Plains Consortium and adjunct professor of agribusiness and applied economics and civil engineering at North Dakota State University. He has been involved in the University Transportation Centers program, and in the administration of the MPC since 1992. In addition, he has served as coordinator of the NDSU graduate transportation programs since 1994 and is director of the new Ph.D. program in Transportation & Logistics. He holds a doctorate degree in Environmental Design & Planning and a master's degree in Urban and Regional Planning from the Virginia Polytechnic Institute.

During his career, Dr. Tolliver has served as principal investigator for more than 30 USDOT, USDA, and state research grants, and testified before the Interstate Commerce Commission or Surface Transportation Board on 22 occasions. He has published more than 50 technical reports and journal articles, and authored a book on highway impact assessment techniques. He has developed and taught courses in Transportation Economics, Industrial Traffic Management, Rural & Non-Metropolitan Transportation Systems, Administration of Transportation Agencies, Statewide Transportation Planning, and Rural Public Transportation Systems. In addition, he is team-teaching a course in Railroad Planning & Design during fall semester.

Dr. Tolliver's primary research interests are freight transportation, highway planning, and environmental impact analysis. His current projects include: development of a statewide freight traffic database, development of integrated highway and land-use models for analyzing the traffic effects of large agribusiness facilities, and the benefits of increased investment in county and city roads. He currently serves on the Local & Regional Railroad Freight Committee of the Transportation Research Board and is past president of the Agricultural and Rural Transportation Chapter of the Transportation Research Forum.

Richard Gutkowski
Colorado State University

Dr. Gutkowski, Ph.D., P.E., is a professor of civil engineering at Colorado State University (CSU). He has B.S. and M.S. degrees in civil engineering from Worcester Polytechnic Institute and completed a Ph.D. from the University of Wisconsin, Madison. Gutkowski is director of the Structural Engineering Laboratory at CSU's Engineering Research Center.

He is program director for CSU's membership in the Mountain-Plains Consortium for Transportation Research and Continuing Education where he manages research, graduate education, technology transfer and student internship programs. He was active in development of TEL8, a

nine-site regional transportation telecommunications network for research and graduate education, and manages CSU's site and is representative to the TEL8 board.

Gutkowski has participated extensively in international activities. He has been an Invited Professor at the Swiss Federal Institute of Technology (SFIT), Lausanne, Switzerland; and arranged formal university cooperation programs with the SFIT and Wroclaw Technical University in Poland. He directed a 1994 NATO Advanced Research Workshop (ARW) on "Challenges to Improving a Deteriorated Transportation Infrastructure within Poland and Its Neighboring Countries." Gutkowski was one of 20 invited participants in the NATO Symposium on "The Role of NATO in Scientific Cooperation in Central Europe." He was an invited expert at a 1986 UNIDO workshop on Timber Bridge Awareness in Latin American Countries. In 1990, Gutkowski presented a workshop on Design of Timber Bridges in Akita-shi, Japan, for the Ministry of Forestry and the Japanese Society of Civil Engineers.

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 has co-edited proceedings for the above NATO Advanced Research Workshops.

Ayman Smadi
North Dakota State University

Dr. Ayman Smadi is director of the Advanced Traffic Analysis Center (ATAC) at the Upper Great Plains Transportation Institute. The ATAC promotes enhancing transportation systems in small-medium size communities through the use of advanced traffic analysis and ITS solutions to safety and mobility problems. Four major programs encompass ATAC activities: traffic operations, Intelligent Transportation Systems; transportation planning and travel demand; and training. ATAC's Traffic Laboratory supports state-of-the-art traffic analysis, including traffic simulation, traffic signal control, and traffic data collection systems. ATAC is the official provider for training on the VISSIM traffic simulation model. Training on other traffic simulation and analysis models is also provided on-demand to various partner agencies.

Dr. Smadi is also involved in North Dakota State University's graduate transportation program. As an adjunct professor in civil engineering, Smadi teaches transportation planning, advanced transportation systems, and ITS graduate courses. He also serves as NDSU's program director for the Mountain-Plains Consortium.

Smadi's research interests include traffic operations, transportation planning, ITS, and safety. He has developed and worked on federally and state funded projects in those areas.

Smadi, an advanced research fellow, began his work at the UGPTI in 1993. In 1996 he became NDSU program director for MPC and in 1998 became ATAC director. He has a doctorate degree in civil engineering from Iowa State University, Ames; a master of science degree from the University of Oklahoma, Norman; and a bachelor of science degree in civil engineering from Yarmouk University, Irbid, Jordan.

Khaled Ksaibati
University of Wyoming

Dr. Ksaibati received a bachelor of science degree (1984) in Civil Engineering from Wayne State University. He later completed his master of science degree (1986) and Ph.D. (1990) from Purdue University. While completing his doctorate, Ksaibati worked full time for the Indiana Department of Transportation as a pavement structural engineer between 1988 and 1990.

Ksaibati has been a member of the civil engineering faculty at the University of Wyoming (UW) since 1990. He started his academic career as assistant professor and was promoted in 1997 to associate professor. In 2001, Dr. Ksaibati was promoted to the rank of full professor. In 1998, Ksaibati took a sabbatical leave from UW and joined the staff of the Florida Department of Transportation (FDOT). For a whole year, Ksaibati provided training, consulting, and technical support to FDOT. Several research papers, reports, and presentations resulted from the research work done in cooperation with FDOT.

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. In addition, Ksaibati is an executive committee member of the Mountain-Plains Consortium. He also is a member of the TEL8 board of directors that consists of nine partners representing universities, DOTs, and the Federal Highway Administration.

Currently Ksaibati is a member of five Transportation Research Board committees dealing with various aspects of pavements. He also is a member of two ASTM committees related to pavement smoothness. Ksaibati also served on various ITE committees and is the faculty advisor of the student chapter of ITE at UW. In addition, he served on several NCHRP research panels.

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. His research has been supported by the Wyoming Department of Transportation, Federal Highway Administration, PacifiCorp, and other DOTs.

Ksaibati is also involved in consulting work on several projects for the SBIR, Florida DOT, and the Wyoming Contractor Association.

Peter T. Martin
University of Utah

Peter T. Martin earned a bachelor of science degree in civil engineering from the University of Wales in 1975, a master of science 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 earned membership of the UK Institution of Civil Engineers (professional registration) in 1978.

Martin has authored 58 academic and professional papers and has been invited to lecture on Intelligent Transportation Systems issues in Europe, Asia and North America. He has advised traffic engineers in India, China, and the U.S. on the installation of advanced traffic signal systems.

Currently, Martin is supporting the development of an Advanced Traffic Management System associated with the I-15 Reconstruction project of the Salt Lake Valley, Utah. He is building the "Utah Traffic Laboratory," which will allow real-time connection to the Utah DOT ITS Traffic Operations Center.

Martin is an experienced communicator with an approachable style. He relies on a wide range of effective teaching techniques to communicate. Martin's distance teaching courses rely on e-mail and innovative exploitation of the Web. He has been an associate professor of civil and environmental engineering at the University of Utah since 1994.

Key Faculty

Colorado State University

Bryan Hartnagel

Dr. Bryan Hartnagel joined the Department of Civil Engineering at Colorado State University in August 1998. He has a bachelor of science, master of science and Ph.D. in civil engineering from the University of Missouri-Columbia. Hartnagel's current research interests are related to the design, analysis and rating of steel and concrete bridges. Currently, experimental tests are being conducted on high performance steel bridge girders for strength and ductility characteristics.

Tom Sanders

Thomas G. Sanders is an associate professor of civil engineering at Colorado State University. He received his master's and Ph.D. in civil engineering at the University of Massachusetts. Sanders has over 125 publications and has presented 69 short courses on hazardous wastes, water quality monitoring, and activated sludge process control.

Sandra Woods

Dr. Sandra Woods is professor and department head of the Department of Civil Engineering at CSU. Woods received a B.S. degree in civil engineering from Michigan State University in 1976. She received M.S. and Ph.D. degrees in civil engineering from the University of Washington in 1980 and 1985 respectively.

While on the Oregon State University civil engineering faculty for 16 years, Woods developed a program for under-represented engineering students, led the development of an environmental engineering degree program, established a residence hall for women engineering students and helped establish an EPA Hazardous Substance Research Center. Woods served as faculty associate to the provost and interim dean of Distance and Continuing Education. Her research focuses on the bioremediation of contaminated groundwater. She was a Presidential Young Investigator and a member of the Governor's Task Force on the State of Oregon's Environment.

NORTH DAKOTA STATE UNIVERSITY

Douglas Benson

During his 14 years in transportation research, Mr. Benson has specialized in the analysis of railroad operations and the development of computer systems used for transportation analysis. Currently, he is project director of the American Short Line and Regional Railroad Association's national database system.

Since 1997, Benson has served as executive director for TEL8, a six-state videoconference network incorporating state departments of transportation and universities dedicated to transportation research.

Benson received a master of science degree in computer science from North Dakota State University. He also holds bachelor of science degrees in computer science, education, history, and psychology.

Mark Berwick

Mr. Berwick has been involved in research with UGPTI since 1995, specializing in the areas of logistics and transportation management. Specifically he has worked in areas of business logistics and motor carrier economics.

Since 1999, Berwick has been the director for the Biennial North Dakota Strategic Freight Analysis Program, which examines the transportation and logistics of different sectors of the economy every two years.

Berwick received master of science and bachelor of science degrees in agricultural economics at North Dakota State University.

John Bitzan

Dr. Bitzan has more than 10 years of experience in economic research of transportation. His major research focus areas include railroad price and cost analysis, analysis of transportation industry structure, transport regulation and policy analysis, and railroad operations analysis. Bitzan has published numerous reports and journal articles. He has performed research for the U.S. Department of Agriculture, U.S. Department of Transportation, and the Federal Railroad Administration.

Bitzan received a Ph.D. in economics at the University of Wisconsin-Milwaukee. He received a masters of arts in applied economics at Marquette University and a bachelor of arts in economics at St. Cloud State University.

Jill Hough

Jill Hough has 12 years of experience in transportation research. Ms. Hough currently serves as the director of the Small Urban & Rural Transit Center, which focusses on research, education, and training for the public transportation industry. In addition to working in the area of public transportation, Hough has published numerous reports and articles in the areas of low-volume roads, logistics, and economic development. She has worked on several projects in cooperation with the U.S. Department of Transportation. She spent four months as interim director for the Federal Transit Administration's Transit Intelligent Vehicle Initiative in Washington, D.C.

She currently is working on a doctorate degree in Transportation Technology and Policy from the University of California-Davis. She received master of science and bachelor of science degrees in agricultural economics at North Dakota State University.

Dennis Jacobson

An associate research engineer/program director for the DOT Support Center at the Upper Great Plains Transportation Institute, Dennis Jacobson brings over 28 years of NDDOT engineering experience and over 30 years of military engineering experience to the Institute. He worked for NDDOT until November 2000 culminating in his appointment of East Region Engineer, responsible for construction and maintenance for the eastern half of North Dakota. Jacobson, a colonel, is also currently the Engineer Brigade Commander for the 34th Infantry Division. In this capacity he commands all engineer forces in North Dakota. Jacobson completed masters degrees in civil engineering and strategic studies from NDSU and the U.S. Army War College in 2001. He is currently a doctoral candidate in engineering.

Kellee Kruse

Kellee Kruse is a research assistant with the North Dakota Department of Transportation Support Center at the Upper Great Plains Transportation Institute. Her research interests include transportation maintenance management, geographical information systems, global positioning systems and workforce productivity. Current MPC projects are "Leveraging Technology Investments – Integration of GPS, GIS and Maintenance Management" and "Asset Management of Roadway Signs Through Advanced Technology."

Kruse received her bachelor's degree in management information systems at NDSU in May 2002.

Julie Rodriguez

Specializing in motor carrier economics and safety, Julie Rodriguez has worked with trucking companies and federal programs in performance-based management and job satisfaction within the motor carrier industry. She is also program director for TEL8, a six-state video conference network incorporating state Departments of Transportation and universities dedicated to transportation research. Julie began her professional career with the Institute in 1987.

Kimberly Vachal

Ms. Vachal has extensive background in grain production and market intelligence. Her work focuses on identifying trends in the activities of grain producers, elevators, agricultural processors and railroads. In addition to completing many research studies on grain and oilseed transportation issues, Ms. Vachal has worked on a number of projects in cooperation with the U.S. Department of Agriculture.

Vachal received master of science and bachelor of science degrees in agricultural economics at North Dakota State University.

She is currently working on a doctorate degree in Public Policy from George Mason University.

Affiliated Faculty – NDSU

Don Andersen, Civil Engineering
Robert Arthur, Geosciences
Lynn Kalnbach, consultant
David Lambert, Agribusiness and Applied Economics
Jay Leitch, College of Business Administration
William Nanja, Agribusiness and Applied Economics
G. Padmanabhan, Civil Engineering
Ossama Salem, Construction Management and Engineering
Rodney Traub, Business Administration
Amiy Varma, Civil Engineering
Bill Wilson, Agribusiness and Applied Economics

UNIVERSITY OF UTAH


Peter Martin

Peter T. Martin earned a bachelor of science degree in civil engineering from the University of Wales in 1975, a master of science 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 earned membership of the UK Institution of Civil Engineers (professional registration) in 1978.

Currently, Martin is supporting the development of an Advanced Traffic Management System associated with the I-15 Reconstruction project of the Salt Lake Valley, Utah. He is building the "Utah Traffic Laboratory," which will allow real-time connection to the Utah DOT ITS Traffic Operations Center.

Affiliated Faculty

Joseph Perrin, Ph.D., PE, PTOE, holds a faculty position as a research assistant professor with the Department of Civil and Environmental Engineering. He provides the day-to-day supervision of the MPC funded research in the lab.

UNIVERSITY OF WYOMING

Affiliated Faculty –
Department of Civil and Architectural Engineering

Dr. Eugene M. Wilson is director of the Wyoming Technology Transfer Center and professor emeritus of civil engineering at the University of Wyoming. He was the university's 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 bachelor and master of science degrees were earned at the University of Wyoming and his doctorate is from Arizona State University, all in civil engineering. Iowa, Wyoming, and Colorado awarded him status as a Professional Engineer.

Dr. Charles M. Dolan is professor and head of the Department of Civil Engineering at the University of Wyoming. He focuses his research on high performance materials such as glass, Kevlar and carbon fibers for reinforcing new and existing structures. He was the principal investigator for investigation of fiber-reinforced plastics for highway structures sponsored by the Federal Highway Administration. Among his other recent work is development of anchor systems for fiber reinforced plastic tendons; time behavior of non-metallic pressuring tendons; investigating long-term performance of non-metallic materials in concrete and evaluating bridge joint sealant materials.

His civil engineering degrees are a bachelor of science from the University of Massachusetts and a master of science and doctorate from Cornell University. He is a registered professional engineer in Wyoming, Washington, and Ontario.

Dr. Larry O. Pochop, professor of civil engineering at the University of Wyoming, specializes in hydrology, microclimatology, agricultural and municipal water conservation, and management.

He earned his bachelor of science degree from South Dakota State University, and his master of science degree and doctorate from the University of Missouri, Columbia. His degrees are in agricultural engineering. He is a professional engineer in Wyoming.

Dr. Jay A. Puckett is a professor of Civil Engineering at the University of Wyoming 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.

Honored with research, graduate teaching and Most Outstanding Professor awards, his bachelor of science degree is from the University of Missouri and his master of science and doctorate degrees are from Colorado State University, all in civil engineering.

Donald E. Polson, a lecturer in the University of Wyoming College of Engineering, specializes in structural engineering with an emphasis in the design and use of temperate and tropical woods. In addition to teaching, he is a private consulting structural engineer and facilities consultant.

A Fulbright Scholar in 2000, Polson holds degrees from the University of Wyoming with a bachelor of science in civil engineering with the architectural option and a master of science with the structural concentration. Polson has also been honored with teaching awards.

Dr. John P. Turner is a professor in the University of Wyoming College of Engineering who specializes in soil and rock mechanics, foundation engineering, earth retaining structures, slope stability and innovative materials for waste containment. He has also been a field geologist for geotechnical site investigations and an exploration geologist.

He was a visiting professor at the University of Sydney, Australia, and the University of Canterbury, New Zealand, for the 1993-94 academic year. He holds a bachelor of science degree in geology from James Madison University, both bachelor of science and master of science degrees in civil engineering from the University of Wyoming and a doctorate in civil engineering (geotechnical) from Cornell University.

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 University of Wyoming 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.

Edgar has received teaching awards. His bachelor of science degree is from the University of Colorado and his master of science and doctorate are from Colorado State University, all in civil engineering.

Dr. Gregory V. Wilkerson is an assistant professor in the University of Wyoming College of Engineering. He works with research and development of solutions to water resource problems, multi-disciplinary approaches to stream restoration, river mechanics, sedimentation and erosion, environmental hydraulics, engineering hydrology and statistics. Wilkerson has a number of research projects in these areas.

His bachelor of science is from Georgia Institute of Technology and his master of science and doctorate are from Colorado State University. His degrees are all in civil engineering.

Dr. Cenk Yavuzturk is an assistant professor of architectural engineering in the University of Wyoming College of 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 doctorate in mechanical engineering from Oklahoma State University and a Diplom Ingeniuer in energy and processing engineering from the Technical University of Berlin, Germany.

The Year in Review

Director's Summary

Fiscal year 2001-2002 was MPC's third year of the TEA-21 grant. Throughout the year, we maintained the high levels of productivity established in previous years. Moreover, with several key initiatives we moved closer to the achievement of our five-year goals.

During 2001-2002, MPC published 13 new peer reviewed reports and offered 25 graduate-level transportation courses at the four universities (Box 1). Many additional courses in civil engineering, economics, and business were also offered by the participating academic departments. In addition to continuing this strong level of effort, several educational milestones were achieved during FY 2001-2002.

- Advanced Pavement Analysis
- Community Transportation
- Geometric Design of Highways (2)
- Highway Bridge Engineering (2)
- Highway Design
- Highway Engineering (1)
- Intelligent Transportation Systems
- Logistics & Distribution Management (1)
- Logistics & Transportation Management (1)
- Metropolitan Transportation Planning (1)
- Pavement Design (2)
- Pavement Distress & Rehabilitation
- Pavement Materials (1)
- Railroad Planning and Design (1)
- Traffic Operations
- Traffic Engineering (1)
- Transportation Administration (2)
- Transportation Engineering (2)
- Transportation Infrastructure Maintenance
- Transportation Modeling (1)
- Transportation Planning (4)
- Transportation Systems (1)
- Transportation/Traffic Safety (2)
- Public Transportation
- Quantitative Methods in Transportation (4)

CSU Blends Practitioner and Academic Expertise in New Transportation Planning Course

One of the strategies outlined in the MPC strategic plan was to utilize the expertise and applied knowledge of transportation professionals as guest lecturers or instructors in university courses. A new CSU course captures this blend of practitioner and academic expertise and exemplifies the synergies that exist between the MPC universities and transportation professionals in the community.

In FY 2001-2002, Professor Richard Gutkowski of Colorado State University collaborated with Mr. John Daggett, Senior Transportation Planner for the City of Ft. Collins, to offer a new undergraduate course in Metropolitan Transportation Planning. In addition to Mr. Daggett, several city transportation officials served as guest lecturers in the course, which was completed by 19 CSU students.

New Interdisciplinary Doctoral Degree Approved at North Dakota State University

One of the prime strategies described in the MPC strategic plan was to assess the need for an interdisciplinary master of science degree in Transportation and Logistics at North Dakota State University and, if appropriate, develop a new interdisciplinary degree. This year, we exceeded our initial expectations. Instead of a master's degree, we developed a proposal for an overarching

doctoral degree that integrates and complements several master degree options.

On June 20, the North Dakota Board of Higher Education approved our proposal for a new Ph.D. in Transportation & Logistics. This milestone is the culmination of a two-year process of program development and committee and peer review. The Transportation & Logistics Ph.D. is a joint effort of three colleges and five departments. The program consists of a core curriculum of 25 credits, an area of concentration, and a dissertation. After completing an interdisciplinary core curriculum, students may concentrate in: (1) Logistics and Supply Chain Systems, (2) Transportation Economics and Regulation, or (3) Transportation Infrastructure and Capacity Planning. Students can enter the doctoral program from one of the Master of Science degree options in transportation or from engineering, agribusiness, business administration, economics, and related fields.

Annual Transportation Scholarship Programs Established

Attracting undergraduate students to the field of transportation is an important goal of the UTC Program and a key MPC strategy. To this end, NDSU has established an annual scholarship program designed to promote awareness of transportation careers and attract more undergraduate students to the field of transportation. Each year, four outstanding undergraduate students will be awarded scholarships: two in Civil Engineering and two in Agribusiness & Applied Economics. The students are awarded the scholarships at an annual awards banquet where they have the opportunity to interact with transportation faculty and practitioners with varied backgrounds and career interests.

Small Urban and Rural Transit Center Established at NDSU

One of MPC's focus areas is Rural Transit. In an important related development, a Small Urban and Rural Transit Center has been established at North Dakota State University. The new transit center will complement the MPC focus area and provide many opportunities for collaboration. The prime objective of the NDSU Transit Center is to work to improve the mobility and accessibility of rural and small urban city residents through public transportation. The Transit Center will conduct research and provide service, technology transfer, education and training services and work with MPC faculty members to develop and incorporate public transit into educational curriculums. Key external partners include the Federal Transit Administration, Community Transportation Association of America, American Public Transportation Association of America and state transit associations.

MPC Co-Hosts Teleconference on North American Freight Transportation

A key strategy in the MPC strategic plan is to foster exchange between U.S. and Canadian universities and form a broader partnership in the midcontinent region of North America. A couple of important events highlighted the Center's schedule of North American activities in 2001. In August, MPC co-hosted a teleconference in cooperation with the Southwest University Transportation Center at Texas A&M University, University of Manitoba Transportation Institute, and the National Center for Intermodal Transportation at the University of Denver. The theme of the conference was "North American Freight Transportation Issues and Trends: A Midcontinent Perspective." More than 50 researchers and practitioners participated in the event at four sites. In November, MPC co-hosted a second teleconference with the University of Manitoba Transportation Institute entitled "Getting Supply Chains Right." The teleconference explored public-private partnerships in supply chains, exporting identity-preserved grains, and other emerging multi-national supply chain issues.

In this brief summary, I have highlighted only some of our accomplishments during the year. In the following pages, you will find descriptions of many faculty and student accomplishments, including a description of 13 new MPC research reports.

FY2002 Program Highlights

New Doctoral Degree in Transportation & Logistics

On June 20, the North Dakota Board of Higher Education approved a proposal for a new interdisciplinary doctoral degree in Transportation & Logistics. This marked the culmination of a two-year process of program development and committee and peer review.

The University Transportation Centers program was key to the development and approval of the new degree. Over time, the UTC program has heightened interest in transportation education and research within the North Dakota University System and provided start-up funds for master degree options and graduate student support. The new doctoral degree is a natural step in the maturation of a graduate transportation program that was initiated largely with UTCP funds. During the next three years, North Dakota State University will contribute $240,000 to the new program, including funding for 2 new transportation faculty positions. In addition, North Dakota State University plans to bring 2 additional transportation faculty positions on-line in future years. These new faculty positions and resources represent a substantial long-term commitment by NDSU to graduate education in transportation.

Program Description

The Transportation & Logistics degree is a joint effort of the Colleges of Agriculture, Business Administration, and Engineering & Architecture, and the Upper Great Plains Transportation Institute. The following departments are participating in the program: Agribusiness & Applied Economics, Civil Engineering & Construction, Industrial & Manufacturing Engineering, and Management, Marketing & Finance.

The Transportation & Logistics Ph.D. requires a minimum of 90 semester credits beyond the baccalaureate degree. The program consists of 3 main components: a core curriculum of 25 credits, an area of concentration, and a dissertation. After completing the interdisciplinary core curriculum, students may enter one of three areas of concentration: (1) Logistics and Supply Chain Systems, (2) Transportation Economics and Regulation, and (3) Transportation Infrastructure and Capacity Planning. The core curriculum includes two courses in Transportation Systems and one course each in: Logistics and Distribution Management, Intermodal Freight Transportation, Spatial Analysis of Transportation Systems (which includes a GIS-transportation lab), Quantitative Modeling, Probabilistic and Deterministic Methods, and Transportation and Logistics Research. The program also includes new courses in: Economics of Transportation Systems, Transportation Corridor Planning, Public Transportation, Public Infrastructure Management, and Facilities Location. These new courses complement existing graduate transportation courses in: Urban Transportation Planning, Railroad Planning and Design, Airport Planning and Design, Pavement Design, Pavement Management Systems, and Advanced Traffic Engineering. (Contact: D. Tolliver, NDSU, 701.231.7190).

Colorado State University and City of Ft. Collins Cooperate in a New Transportation Course

The department of Civil Engineering at Colorado State University (CSU) and the City of Ft. Collins collaborated in offering a new undergraduate course in Metropolitan Transportation Planning. Mr. John Daggett, Senior Transportation Planner for the city, and Professor Richard Gutkowski developed an evening course for resident CSU students. Mr. Daggett was the instructor and other city transportation officials were guest lecturers. Mr Daggett said “Teaching the course was a valuable experience for both students

and instructor and gave an opportunity for direct exposure to transportation planning from those who do it in their own university community and nearby counties. As a visiting instructor, I had the opportunity to learn from a group of fresh bright minds."

Nineteen students completed the course. The course serves as CSU pre-requisite for a graduate course in Urban Transportation Planning being taught during Spring 2002 at North Dakota State University (NDSU). CSU students will receive that course via the TEL8 videoconferencing network, which links the MPC member universities and regional state DOTs. The course concept was fostered by Ms. Vicky McLane, Transportation Program Manager for the MPO for northern Colorado and approved by Mr. Ron Phillips, Director of Transportation Services Area for the city of Ft. Collins. (Contact: R. Gutkowski, CSU, 970.491.8291).

Small Urban & Rural Transit Center Established at NDSU

The Upper Great Plains Transportation Institute at North Dakota State University recently received funding to established a Small Urban & Rural Transit Center (SURTC). The purpose of the Transit Center is to work to improve the mobility and accessibility of rural and small urban city residents through rejuvenated public transportation.

Jill Hough, associate research fellow with the UGPTI is the new Director of the Center. She will provide leadership to facilitate the exchange of information relevant to the transit industry. SURTC will conduct research and provide service, technology transfer, education and training. Research will look particularly at social equity, transit ridership, improved technology and air quality. The Center will provide information to transit agencies, business and communities to provide a link among transit users, transit providers, business and researchers. Additionally, SURTC will work with MPC faculty members to develop and incorporate public transit into their curriculums.

The Center has and will continue to be coordinated with federal, state, and local transportation partners. Key partners include the Federal Transit Administration, Community Transportation Association of America, American Public Transportation Association of America and state transit associations. SURTC will coordinate efforts with MPC, the Advanced Traffic Analysis Center and TEL8.

States targeted by the Center are North Dakota, South Dakota, Montana, Wyoming, and western Minnesota. These states have a large proportion of elderly and disadvantaged citizens for whom public transportation is their lifeline. Transit services in these states are also under funded relative to large urban areas. (Contact: Jill Hough, NDSU, 701.231.8082).

Colorado State University Hosts Students During National Engineers Week

In February 2002 a group of 130 junior high and high school students from Colorado, Kansas, Texas, and Wyoming attended CSU's Engineerig Career Day as part of National Engineer's Week. Attendees toured the Engineering Research Center in small groups and observed current research projects. The students were introduced to MPC-supported projects on wood-concrete bridge decks, use of composite shear spikes for repair of railroad bridge members, and other laboratory studies. A session focusing on women and minority students in engineering was also offered. Discover Engineering also broadcast a national telecast from Denver, Colo., designed to introduce junior high school students to engineering. (Contact: R. Gutkowski, CSU, 970.491.8291).

MPC Co-Hosts Teleconference on North American Freight Transportation

A key strategy in the MPC strategic plan was to foster exchange between U.S. and Canadian universities and form a broader partnership in the midcontinent region of North America. A couple of important events highlighted the Center's schedule of North American activities in 2001. In August, MPC co-hosted a teleconference in cooperation with the Southwest University Transportation Center at Texas A&M University, University of Manitoba Transportation Institute, and the National Center for Intermodal Transportation at the University of Denver. The theme of the conference was "North American Freight Transportation Issues and Trends: A Midcontinent Perspective." More than 50 researchers and practitioners participated in the event at four sites.

The program featured presentations on the following topics:

- Free Trade but not Free Transport: The Mexican Standoff, Paul Dempsey, National Center for Intermodal Transportation at the University of Denver
- Economics of Congestion at a Border Gateway: The Case of Laredo, Barry Prentice, University of Manitoba Transport Institute
- Criteria and Design of a Model Border Crossing, Bill Stockton, Southwest University Transportation Center at Texas A&M University
- Barbarians at the Gate? The Issue of Mexican Truck Safety and the NAFTA, Rob Harrison, University of Texas and Southwest University Transportation Center
- Ensuring the Safety of North American Motor Carrier Operations, Brenda Lantz, Upper Great Plains Transportation Institute
- Canadian-U.S. Rail Freight Flows Since NAFTA, Denver Tolliver, MPC Director

In November, MPC co-hosted a second teleconference with the University of Manitoba Transportation Institute entitled "Getting Supply Chains Right." The teleconference explored public-private partnerships in supply chains, exporting identity-preserved grains, and other emerging multinational supply chain issues. (Contact: D. Tolliver, NDSU, 701.231.7190).

MPC Scholarships Heighten Awareness of Transportation Opportunities and Careers Among Undergraduate Students

Attracting undergraduate students to the field of transportation and logistics is an important goal of the MPC program. In conjunction with the Upper Great Plains Transportation Institute and the Departments of Agricultural Economics and Civil Engineering, MPC has initiated an undergraduate scholarship program at North Dakota State University. Each year, four outstanding undergraduate students will be awarded scholarships: two in Civil Engineering and two in Agribusiness & Applied Economics. Students in their junior and senior years are encouraged to apply. The students are selected by committees, based on their academic backgrounds and demonstrated interests in transportation. Demonstrated interests may include transportation courses completed, transportation courses planned, career goals, or other activities. Each applicant is required to author a brief essay describing his or her interests in transportation. The students are awarded the scholarships at an annual awards banquet sponsored by the Upper Great Plains Transportation Institute.

The scholarships in Agribusiness & Applied Economics have been named after an early leader in transportation in North Dakota – Paul Abrahamson. Mr. Abrahamson was a long-time expert in railroad freight transportation. In the future, MPC funds will be leveraged with other funds. A fund

raising effort by NDSU is currently underway to establish an endowment for the Abrahamson scholarships. Potential names for the Civil Engineering scholarships are under consideration.

Each scholarship recipient receives $1,500 for the academic year, with a certificate and letter noting that: *Funding for this scholarship is provided by the Mountain-Plains Consortium through a grant from the U.S. Department of Transportation under the University Transportation Centers Program*.

The winners of the 2001 Transportation Engineering Scholarships are Nate Larson of Wahkon, MN, and Nancy Molick of Moorhead, MN. Both are seniors in the civil engineering program at NDSU. The scholarships were presented by Mr. David Sprynczynatyk, the director of the North Dakota Department of Transportation. The Paul E. R. Abrahamson scholarship awards for 2001 were presented to Jody Wosick of Minot, ND, and Kelly Schlauderaff of Detroit Lakes, MN. Both recipients are students in the department of Agribusiness and Applied Economics at North Dakota State University. (Contact: D. Tolliver, NDSU, 701.231.7190).

Italian Scholar Cooperates in CSU Research Project

Dr. Massimo Fragiacomo of the Department of Civil Engineering, University of Trieste, Italy, was a visiting researcher at Colorado State University (CSU) for six weeks during November and December 2001. Dr. Fragiacomo is an expert in computer modeling of time-dependent behavior of mixed wood-concrete structural systems. While a doctoral student at the University of Florence, Italy, he developed comprehensive mathematical models of the mechanics of the interactive effects of temperature changes, moisture changes, humidity changes, creep, shrinkage and other time-dependent exposure phenomena.

He is currently cooperating with CSU on an MPC sponsored research project dealing with concepts for short span bridges comprised of layered mixed wood-concrete decks. Potential interface of his software with structural analysis models being developed by CSU researchers is being examined based on data from their on-going full-scale experimental testing. (Contact: R. Gutkowski, CSU, 970.491.8291).

CSU Graduate Student Receives Prestigious Award

Mr. Cole Rogers, a graduate research assistant in the Department of Civil Engineering at Colorado State University (CSU), was selected as the recipient of two awards.

He received the prestigious 2001 AISC/ Rocky Mountain Steel Construction Association Fellowship, with a financial stipend of $3,000 applied toward his graduate studies, and a one year membership in the American Institute of Steel Construction, Inc. This award goes to a top student in the Rocky Mountain region.

Mr. Rogers completed a BSCE degree at CSU in May 2001. While pursuing that degree, he was active for two years as a student research aide on various MPC supported experimental projects conducted in the Structural Engineering Laboratory. These included aspects of the behavior of timber trestle railroad bridges, mixed wood-concrete highway bridges, and computer models of structural behavior of bridge substructures. Presently, he is a graduate research assistant pursing his MS degree in Civil Engineering and is partially funded by MPC. (Contact: R. Gutkowski, CSU, 970.491.8291).

German Student Contributes to CSU Research Project

Mr. Martin Wieligmann has been sponsored by the German government to spend five months of residency at Colorado State University (CSU) to conduct his practical diploma thesis work. Mr. Wieligmann is an undergraduate student from the Technical University of Dresden (TU-Dresden), Germany (of the former East Germany). He is currently at CSU working on the topic of Stress-Strain Behavior of Dowel Connections for Partially Composite Wood-Concrete Floors and Decks. He is jointly advised by Professor Richard Gutkowski of the Department of Civil Engineering at CSU and Professor Peter Haller of the Civil Engineering Department of the TU-Dresden. Dr. Gutkowski is active on MPC supported research on modeling mixed wood-concrete systems, and Professor Haller has done complementary research in Europe. (Contact: R. Gutkowski, CSU, 970.491.8291).

Wyoming Certification Program Continues

Since 1996, the WYDOT Certification Program was initiated to insure that proper material testing procedures are followed. Since inception, approximately 1,000 participants have been certified in testing aggregate, asphalt, and concrete materials. Each participant spends two to three days in the classrooms and laboratories at the University of Wyoming. A certificate is then issued after successfully completing a mandatory test demonstrating the competency level of the participant.

The course materials are currently going through a major update to reflect the national and local specification changes. (Contact: K. Ksaibati, UW, 307.766.6230).

North Dakota State University's Strategic Freight Analysis Helps State and Local Agencies and Industries Plan for Changes in Grain Transportation

Many factors are changing the way in which grains and oilseeds are moved to market. Two of the most important trends are: (1) The use of 286,000-pound covered hopper cars on rail branch lines and short-line railroads, and (2) the use of 110-car shuttle trains. Many of North Dakota's branch lines are constructed with light rail. In this study, NDSU researchers simulated the effects of moving rail cars with heavier axle loads over different types of light rail. They concluded that branch lines constructed with rails weighing less than 90 pounds per yard are likely to need upgrading to handle the heavier cars. More than 1,200 miles of rail line in North Dakota fall into this category. The cost of upgrading these lines is estimated to range between $258 million and $324 million.

Shuttle trains hold the potential for great efficiency gains in long-haul transportation. The large train size of 110 cars results in great economies of utilization. However, the location of shuttle train elevators is strongly influencing local grain flows. Ten shuttle-train facilities have the potential to draw over 30 percent of the wheat, barley, and corn produced in North Dakota each year. The potential concentration of grain trucks at a few large elevators has implications for local roads, bridges, and local businesses and communities. In this study, NDSU researchers examined potential changes in farm-to-market trip distances and truck use, as well as location factors of importance to shuttle facilities.

MPC-TEL8 Graduate Course Offered Technical Electives for Students in North Dakota, Utah, and Wyoming

MPC Continued its tradition of distance learning by offering three graduate courses over the TEL8 network: Administration of Transportation Agencies and Quantitative Methods in Transportation Operations, Fall 2001. Each course was offered to five sites.

Utah DOT and NDDOT engineers were enrolled in the courses, along with on-campus students at the University of Wyoming, North Dakota State University, and the University of Utah. Engineers from the NDDOT, SDDOT and UDOT, along with on-campus students from Colorado State University, North Dakota State University, and the University of Wyoming participated in the Urban Transportation Planning course. The classes were open to students in the Utah transportation regions, in addition to the home office in Salt Lake City. The student roster included UDOT engineers from the Orem, Ogden, and Richfield regions.

Asphalt Workshops

Dr. Khaled Ksaibati, a professor at the University of Wyoming, taught two workshops on Performance Graded (PG) Asphalt. He made learning about the new PG rating both interesting and fun for over 70 participants. Dr. Ksaibati is the university's leading expert in pavement design and teaches a wide variety of highway-related courses at UW. Although the PG rating is relatively new, it is the standard for rating the qualities of asphalt now and in the foreseeable future.

Dr. Ksaibati helped the participants work through examples so that they could figure an asphalt mix for any location in Wyoming. He was able to help the attendees find the answers to their questions due to his knowledge and practical experience. This led to a good informal atmosphere where most people enjoyed trying to answer questions and participate in a positive way. (Contact: K. Ksaibati, UW, 307.766.6230).

Research Program

To address the Center's theme and vision, the research program seeks to identify topics important to the region by incorporating input from clients and peer reviewers. The MPC is working toward its goals of balancing its research program in rural and intermodal transportation to reflect priorities of major client groups, USDOT strategic goals and the Transportation, Science & Technology strategy. These efforts are outlined in this section of the report. Brief descriptions are provided of research projects completed during the 2001-02 fiscal year and research projects initiated during the year.

Completed Research Projects 2001-02

MPC 02-132 • U.S. Containerized Grain and Oilseed Exports – Industry Profile: Phase I • Kimberly Vachal and Heidi Reichert; North Dakota State University

The objective of this report is to develop a profile of the U.S. containerized grain and oilseed export industry, including marketing activities, future expectations, information needs, and business practices. This report forms Phase I in a proposed two-phase analysis of the grain container industry. Information developed in this report regarding shipment origins, commodity volumes, and market destinations provides a base for conducting a survey of industry participants that might be used as a tool in development, planning, and enhancement of opportunities for containerized marketing of grain products. (MPC Research Project #203)

MPC 02-131 • Intelligent Transportation Systems: Helping Public Transit Support Welfare to Work Initiatives • Jill Hough, Crystal Bahe, Mary Lou Murphy, and Jennifer Swenson; North Dakota State University

This study was conducted to identify ITS technologies that transit systems are using, and particularly to aid in the progress of the Welfare to Work Initiative. Two different surveys were used to gather information for this study. First, a survey was developed and administered to identify transit systems that use ITS. A second survey was designed and administered to better target the systems that use ITS. It could be concluded that transit systems were satisfied with the ITS technologies implemented and many reported their intent to implement additional ITS technologies in the future. Costs were found to be probably the largest barrier to implementing the technologies, along with transit systems reluctance to invest in rapidly changing technologies. (MPC Research Project #171)

MPC 02-130 • Utilizing the Long-Term Pavement Peformance Database in Evaluating the Effectiveness of Pavement Smoothness • Dr. Khaled Ksaibati and Shahriar Al Mahmood; University of Wyoming

State Highway Agencies (SHAs) in the United States use smoothness specifications to insure that they are providing the public with quality roads. Monetary incentives / disincentive policies based on the initial roughness values are used by SHAs to encourage contractors to build smoother roads. To justify the extra costs associated with smoothness specifications, it is important to demonstrate that smoother roadways do stay smooth over time. This research study was conducted at the University of Wyoming to examine if the initial roughness of a pavement section has any effects on its long-

term performance. A large number of test sections from the long-term pavement performance (LTPP) database is included in the study. The statistical tests performed indicate that asphalt and concrete pavements with low initial smoothness stay smooth over time. (MPC Research Project #199)

MPC 02-129 • Safety Analysis without the Legal Paralysis: The Road Safety Audit Program • Roger Owers and Eugene Wilson; University of Wyoming

This report presents results of an investigation into the practice and legal issues of Road Safety Audits and Road Safety Audit Reviews (RSARs). These safety analysis approaches focus on identifying safety issues of proposed projects (RSA) and existing roadways (RSAR). In the United States, these approaches are just beginning to be considered. The study results show that the Road Safety Audit Program adds value to a transportation entity, and those legal doctrines such as sovereign immunity and the rules of discovery and evidence can operate to protect the transportation entity from liability. Furthermore, the public interest of improving road safety outweighs the plaintiff's interests in a potential lawsuit. (MPC Research Project #200)

MPC 01-128 • Analysis of Economies of Size and Density for Short Line Railroads • Philip Fischer, John Bitzan, and Denver Tolliver; North Dakota State University

The study demonstrated that short lines could achieve greater cost savings if they were to increase their density (revenue ton miles per mile) and their size (mile of road). Size is an important criterion that a short line must examine when evaluating the purchase of a new section of track. However, existing railroads may have difficulty increasing their size because of their connections to Class I railroads and limited financial resources. Density is critical to short line operations. By increasing their density, short lines could decrease their average cost. The cost analysis in the study demonstrates a need of longer hauls and/or larger train configurations for them to remain viable. (MPC Research Project #156)

MPC 01-127.5 • North Dakota Strategic Freight Analysis: Summary Report • Kimberly Vachal, Brenda Lantz, John Bitzan, Mark Berwick, and Denver Tolliver; North Dakota State University

In an attempt to provide some of the information that will enable North Dakota firms and policymakers to make better decisions, this project addressed four transportation issues, which are critical to the future of the state's agricultural sector: (1) the impact of 110-car shuttle trains on the marketing of grains, (2) the impact of heavier cars on light-density rail lines, (3) the changing trend in the use of truck/rail container intermodal transportation for marketing North Dakota products; and (4) the role played by logistics factors in determining the optimal location of value-added facilities. (MPC Research Project #192)

MPC 01-127.4 • North Dakota Strategic Freight Analysis: Heavier Loading Rail Cars • John Bitzan and Denver Tolliver; North Dakota State University

North Dakota's grain producers rely on an efficient rail system to move their products to export and domestic markets. A recent shift to larger grain hopper cars may threaten the viability of the state's light-density branch line network. This study simulates the impacts of handling larger rail cars on many types of rail lines, model the decision process used by railroads in deciding whether to upgrade such lines or abandon them, estimates the costs of upgrading rail lines that are unlikely to be upgraded, and estimates generalized highway impacts that could result from the abandonment of non-upgraded lines. (MPC Research Project #192)

MPC 01-127.3 • North Dakota Strategic Freight Analysis: Shuttle Trains • Kimberly Vachal; North Dakota State University

The purpose of this component of the Strategic Freight Analysis was to provide a market-based synopsis of the potential impact of shuttle train shipments on North Dakota's local grain industry. HRS wheat, durum, barley, and corn were considered in this economic analysis of shuttle rail rates on the local grain marketing.

Considering these four crops, the 10 shuttle facility draw areas have the potential to originate about 162 million bushels. This potential concentration of bushels has implications for local roads, short line railroads, bridge infrastructure, local processors, local communities, and the North Dakota elevator industry. (MPC Research Project #192)

MPC 01-127.2 • North Dakota Strategic Freight Analysis: Logistical Factors Influencing the Success of Value Added Processing Facilities • Brenda Lantz; North Dakota State University

One significant consideration when examining a business venture is to define the network for the product. The network design should take into account the number, size, and location of suppliers, producers, distributors, wholesalers and retailers. The spreadsheet model allows consideration of a number of important factors and the inputs to the model can be changed easily to allow for examining many different scenarios. For example, the model can demonstrate the benefits of a certain location over another based on such things as available freight rates and land or labor costs. However, when making a final decision, other important factors such as labor climate and quality of life, etc., should also be taken into consideration. (MPC Research Project #192)

MPC 01-127.1 • North Dakota Strategic Freight Analysis: Intermodal Highway/Rail/Container Transportation in North Dakota • Mark Berwick; North Dakota State University

This study provides a snapshot of truck/rail container intermodal shipping into and out of North Dakota. The study revealed the benefits of intermodal transportation including lower overall transportation costs, increased economic productivity and efficiency, reduced congestion and burden on over-stressed highway infrastructure, higher returns from public and private infrastructure investments, reduced energy consumption, and increased safety. (MPC Research Project #192)

MPC 01-126 • Shear Key for Strengthening Bridges • Richard Gutkowski, Geoffrey Robinson, and Abdalla Shigidi; Colorado State University

The concept of combining wood and concrete in layered composite bridge decks was investigated. A shear key/anchor detail recently used in Europe to construct floors in office buildings was adapted for this study. This connection detail provides the interlayer shear transfer between the layers. Laboratory testing included anchor pull-out tests, interlay slip tests on various key/anchor details, preliminary load tests of full-scale rectangular layered beam specimens and pilot tests of two full-size layered deck specimens. The deck specimens were realistic for short span right and skewed longitudinal deck bridges, respectively. A rigorous analytical model successfully predicted the beam behavior. Analytical work is in progress to rigorously model the composite behavior of the decks. Results show that under static loading, a high degree of composite action was achieved in the beam specimens, as compared to use of ordinary mechanical connectors. An initial analysis shows an extremely high efficiency for the deck specimens, but is overestimated in the model. (MPC Research Project #140)

MPC 01-125 • Field Load Tests of Open-Deck Timber Trestle Railroad Bridges • Richard Gutkowski, Geoffrey Robinson, and Abdalla Shigidi; Colorado State University

A field load test program was conducted to evaluate three open-deck timber railroad trestle bridges. The bridges included part of a 31-span bridge, a 4-span bridge with skewed interior bents and a 3-span bridge. Plies of the chords of the bridges were evaluated non-destructively for material properties using an ultrasonic stress wave device. The bridges were modeled using typical frame analysis techniques to predict response to loads. Deflection and strain measurements were recorded from the load testing. The responses of the bridges to various loads were compared to the predicted responses from several analytical modeling assumptions. (MPC Research Project #137)

MPC 01-116 • The Long-Term Availability of Railroads Services for U.S. Agriculture • Kimberly Vachal and John Bitzan; North Dakota State University

Future customer demands, service availability, and industry investment decisions will shape the modal marketing decisions of the grain marketing sector. The Delphi survey technique is used to engage a cross-section of grain industry experts in sharing opinions regarding future trends for service, investment and marketing in the grain marketing sector. The survey produces several interesting expectations including (1) further consolidation of the rail and elevator industries, (2) increasing prominence of the HAL cars in grain service, and (3) an increase in rail rates from one to four percent annually over the next decade, (4) expanded use of shuttle/efficiency rail programs for major grains, (5) an increased use of market-based car ordering systems, (6) growth of the short line rail network, and (7) small market-scale, but large volume, increases in the share of grain marketed via container. (MPC Research Project #174)

Ongoing Research Projects 2001-02

MPC-175 • An Evaluation of ITS/CVO Application Technology in Logistics and Supply Chain Management • B. Lantz, North Dakota State University

The truckload sector of the trucking industry is extremely competitive; companies must vie for business through lower rates, and more importantly, superior service. One potential strategy for a motor carrier company to better their service offering is through investment in technology. However, as indicated in a recent Transport Topics article, “Trucking companies risk being drowned by the flood of technologies and logistics services coming onto the market ... a quandary for trucking’s IT professionals: how to know which technologies will improve the way they do business and which may saddle them with extraneous information... to compete, trucking companies will have to provide better, faster service and at less cost.” As this quote illustrates, commercial vehicle companies are in a precarious position. They realize that they must invest in technology to remain competitive, but are unsure which innovations will give them the desired results. Although there appears to be little disagreement about the potential benefits of ITS/CVO, the information available regarding specific benefits or impacts of these technologies is lacking. The methodology developed in this project will add greatly to the knowledge in this area.

MPC-176 • Road Dust Suppression: Effect on Maintenance, Stability, Safety, and the Environment • T. Sanders, Colorado State University

This research project will be a joint cooperative effort with the Larimer County Road and Bridge Division and Roadbind America Inc. Several one-mile sections of dirt roads in Larimer County will be used as test and control sections of the research. One or more test sections will be treated with chemical road dust suppressants and the other will remain untreated. More than one road dust

suppressant beside Roadbind America Inc.'s lignosulfanate suppressant may be tested if other vendors are found who are willing to participate in the research. The county will provide all labor and equipment for preparation of the test sections and Roadbind America Inc. will provide the dust suppressant. A record of all accidents on the roads will be kept during the research duration. In addition, Larimer County records will be investigated to determine if there is a relationship between the number of accidents (and fatalities) and the type of road treatment (or lack thereof) on the dirt roads. More than one county in the state may be investigated if better records are available.

MPC-177 • Moment-Rotation Tests of High Performance Steel (HPS) I-Girders • B. Hartnagel, Colorado State University

Bridge designers now have a new choice of steel available for bridge construction – high performance steel (HPS) grade 70W. The HPS70W was developed under a cooperative research program between the Federal Highway Administration (FHWA), the U.S. Navy, and the American Iron and Steel Institute (AISI). However, current bridge design provisions limit the flexural strength of girders with yield strength greater than 50 ksi (350 MPa) to the yield moment capacity. The flexural capacity of similar bridge girders designed with yield strength less than or equal to 50 ksi (350 MPa) is equal to the plastic moment capacity if certain restrictions are met. If the designer chooses, an inelastic analysis of the girder also is allowed with steel yield strengths less than or equal to 50 ksi (350 MPa). Inelastic analysis and design methods offer larger cost savings compared to the elastic analysis provisions. Even with the disadvantage on flexural capacity, HPS still is competitive with Grade 50 steels because of material savings obtainable with HPS. If the restrictions could be lifted or even relieved, the use of HPS would provide significant cost savings.

MPC-178 • Experimental Wood-Concrete Railroad Bridge • R. Gutkowski, Colorado State University

Due to increased train loads in recent decades, a 30 percent increase in design load requirements for timber trestle railroad bridges is imminent in the AREA design code. Existing bridges are being upgraded to more safely carry increased loads and to avoid potential structural problems leading to costly replacements. Large size solid timbers used in current configurations are increasingly difficult to obtain. Higher design loads will lead to even larger required sizes. The end result of the research is expected to be a prototype two-layer wood-concrete member, with the wood member being half the size of currently used fully solid wood members, thus obviating the industry's concern about lack of available timber sizes.

MPC-179 • Full-Scale Laboratory Testing of a Timber Railroad Bridge • R. Gutkowski, Colorado State University

This project is being conducted in the Structural Engineering Laboratory at Colorado State University (CSU). A full-scale laboratory test specimen will essentially replicate (in size) a chord of an existing three span bridge that previously was field load tested before and after its strengthening. The specimen will involve fully connecting all caps and ties and the steel rail, as a stand alone specimen fully replicating the field construction techniques. The laboratory specimen reduces some of the site specific support conditions that complicate understanding of the behavior of this type of bridge as compared to existing code design procedures. After load testing the specimen, it will be strengthened with an additional stringer ply and retested to examine the changes in response. Load tests will be conducted using existing load frame and hydraulic actuator capability. Displacement and strain will be measured at predetermined locations during load testing. These results will provide an understanding of the behavior of the timber trestle bridge and consequences of strengthening and retrofit methods.

MPC-181 • University Transportation Survey • R. Gutkowski, Colorado State University

Colorado State University (CSU) is anticipating the approval of plans and federal funding for a regional (northern Colorado) transportation center to be located on the CSU campus in Fort Collins. This will serve nearby regional populace, primarily for their access to higher education. Related to this, the University of Northern Colorado in nearby Greeley is interested in including this development in its transportation planning. Since students can take inter-university courses, transit between institutions is important. In preparation for a potential transportation center for Fort Collins and Greeley and their environs, the local and county transportation planners are investigating practices in "university" communities throughout the nation. A survey process will be used to collect data pertinent to the study and decision making process.

MPC-182 • Evaluating the Long-Term Pavement Performance Data • K. Ksaibati, University of Wyoming

In 1987, Congress funded the Strategic Highway Research Program (SHRP). As part of SHRP, several pavement test sections were selected for monitoring around the country. Construction and performance data have been collected on all test sections and saved in the Long-Term Pavement Performance Information Management System (LTPPIMS). The collected data is beneficial for researchers and practitioners in investigating the long-term performance of pavements. Recently, the Federal Highway Administration released a computer program called Data Pave to help in making LTPP data available for any interested party. It is the main objective of this study to evaluate the capabilities of Data Pave and evaluate some of the pavement performance data for Region 8.

MPC-187 • Survey of Educational and Human Capital Needs of the Transportation Construction Industry • O. Salem, North Dakota State University

The major impediment to development and implementation of new safe and productive techniques and technologies in the U.S. transportation construction industry is that there is no coordinated effort to define the educational and research needs, to communicate these needs to research organizations, and to communicate the research outcomes back to the industry. For academia to efficiently serve the industry and consequently, the public, a model for fostering innovation in terms of productivity, quality, and safety improvement should be developed and implemented in the construction industry. This includes a systematic, scientific approach for defining industry needs for knowledge, research, and human capital improvement. This project will identify the educational and human capital needs for the U.S. road construction industry through design and development of a national survey, and the analysis of the feedback results.

MPC-189 • The Differential Effects of Deregulation on Rail Rates • J. Bitzan, North Dakota State University

It is well documented that railroad deregulation in the U.S. has been successful overall. Studies have shown increased productivity, decreased rates, and increased profitability in the rail industry as a result of deregulation. However, general evidence suggests that while railroad deregulation has benefited shippers overall, through continued rail viability, rate savings, and improved service, the benefits have not been evenly shared. Before making policy changes, it is important to have a complete understanding of the impacts that regulatory change has on shippers and carriers. For the most part, the effects of deregulation on shippers and carriers have been well documented. However, one component of past regulatory change that is not well documented is the extent of differential rate

changes that have been realized as a result of deregulation. This study will investigate the rate structure in the rail industry and how it has changed as a result of deregulation, highlighting the differential impacts that deregulation has had on rates among commodities, regions, and over time.

MPC-190 • Grain Highway Network Analysis: Use of Satellite Imagery and USDA Data to Forecast Heavy Truck Trips Generated from Rural Land Use Zones • D. Tolliver, North Dakota State University

The location of new facilities such as agricultural processing plants is significantly altering truck traffic patterns in rural areas. Large processing plants create substantial inbound truck flows that typically are concentrated on several collector or arterial highways. After a facility begins operation, the annual equivalent single axle loads (ESALs) on key access highways may be significantly higher than the design values. This project will build on an existing study. A prototype network model of a large corn processing plant is being developed in southeastern North Dakota. The model will simulate flows of corn based on forecasted supply, demand, and farmer delivery criteria. It will function in a GIS environment (ArcView) and will utilize three main GIS database layers: (1) corn production, (2) elevator capacities and demands, and (3) plant demand and capacity. The model will forecast grain flows from production zones to elevators, satellites, and processing plants; assign the predicted flows to truck types and highways; and estimate ESALs on key arterial and major collector highways.

MPC-193 • Rigorous Computer Modeling of Timber Trestle Railroad Bridges • R. Gutkowski, Colorado State University

Nationally, the structural condition of short span timber trestle railroad bridges is one of concerning circumstances. Reports by the Association of American Railroads (AAR) indicate that degradation has been occurring with material failure evident at some sites. Railway car weights and train loads have increased considerably. Deterioration due to this heavy, frequent loading and aging and exposure is an important issue. Loosened connections, gaps due to shrinkage to moisture/drying cycles, support movement, differential bearing of members, etc., develop over time and are present in older bridges. These alter load capacity and stiffness from the original condition and significantly affect behavior. To improve understanding of the load paths and structural behavior, it is necessary to accurately analytically model the geometry and member condition and properties of actual bridges. A recently developed, leading edge commercial software (Axis VM) will be employed to simulate (model) the standard open deck, timber trestle bridge configuration, including representation of actual condition. The resulting model will be used to predict the displacement response of the bridge under static loadings. Predicted response will be verified by comparison with the results of past load tests of such bridges.

MPC-194 • Effects of Environmental Exposure on Timber Bridge/Track Members and Connectors • R. Gutkowski, Colorado State University

A series of pilot laboratory tests will be conducted to expose full-size timber railroad bridge and track members and connections to realistic extremes of temperature and humidity on an accelerated time basis over six to nine months. An existing environmental chamber will be used to subject specimens to controlled levels and ranges of temperature and humidity. Specimens will include connection details typically used in timber railroad bridge and track construction, e.g., the steel rail to wood ties and the wood ties to the chord piles. The condition of wood material will be monitored continuously and effectiveness of the structural connections examined by specimen testing at scheduled times during the simulated exposure periods. CSU has acquired a state-of-the-art ENVIROTONICS walk-in environmental test chamber available to conduct the planned studies. Donated to CSU by Storage Technology, Inc., in Boulder, Colo., the chamber has been put in place at the

Engineering Research Center (ERC) at CSU, where the study will be conducted.

MPC-196 • Moment-Rotation Tests of High Performance Steel (HPS) I-Girders • B. Hartnagel, Colorado State University

Bridge designers now have a new choice of steel available for consideration when planning a bridge. High-performance steel (HPS) grade 70W is currently available for bridge construction. Current bridge design provisions limit the flexural strength of girders with yield strength greater than 50 ksi (350 MPA) to the yield moment capacity. The flexural capacity of similar bridge girders designed with yield strength less than or equal to 50 ksi (350 MPa) is equal to the plastic moment capacity if certain restrictions are met. Research has shown that the capacity of girders fabricated from steel with a specified minimum yield strength greater than 50 ksi can sustain loads larger than the yield moment. However, moreresearch is necessary before changes in the design specification can be implemented. Before restrictions on the use of HPS can be removed, adequate knowledge of the material behavior must be known. This proposal is intended to provide additional information on the behavior of HPS. The analytical portion of the project will develop a finite element model of HPS I-girders. Results from this model will initially be compared to results from previous research for validation. An identical specimen will be used for this comparison. After a reliable model is developed, it will be used to predict the behavior of the experimental I-girders. It will also be used to predict the behavior of the experimental I-girders.

MPC-197 • Road Dust Suppression: Effect on Maintenance, Stability, Safety, and the Environment • T. Sanders, Colorado State University

This research project is a joint cooperative venture with the Larimer County Road and Bridge Division, Roadbind America, Inc., and other dust suppressant vendors. The research will be conducted on 10 half-mile sections of road in Larimer County. There are two types of roadbed gravel being investigated, 2.5 miles of each and five different treatments. The treatments are magnesium chloride, lignin sulfonate, a mixture of 50 percent lignin sulfonate and 50 percent magnesium chloride, a mixture of a Pennzoil and lignin sulfonate and a mixture of gravels while the Pennzoil mixes will be applied on only one gravel type. The remaining one-half mile section of each gravel type will be a control section, receiving no applications of dust suppressants. The county will provide all the labor and equipment for the preparation of the test sections and the vendors will provide the dust suppressant. The Colorado State University Dustometer, developed in previous research supported by the MPC, will be used to quantify the amounts of dust released into the air from all the test and control sections. Measurements of drivability will be defined and measured (examples of drivability are braking distance and vibrations). A record of all accidents on the roads will be kept for the duration of the research. In addition, Larimer County records will be investigated to see if there is a relationship between the number of accidents (and fatalities) and the type of road treatment (or lack thereof) on the dirt roads. More than one county in the state may be investigated if better records are available.

MPC-198 • Predicting the Fluctuations in Temperatures of Asphalt Pavements • C. Yavuzturk/K. Ksaibati, University of Wyoming

Fluctuation in temperatures significantly affects pavement stability and the selection of asphalt-grading to be used in pavements. Ability to predict the asphalt pavement temperature at different depths based on ambient air. In addition, it will help engineers in selecting the asphalt grade to be used in various pavement lifts. The top pavement layer is normally exposed to greater temperature fluctuations than the layers below it. Knowledge of the temperature distribution of asphalt slabs will allow for a more

sophisticated specification of asphalt for lower lifts (through specification of less expensive asphalt binders in lower lifts) and thus provide an economical solution to rising pavement construction costs. The study will also examine the variability of predicted pavement temperatures on various pavement materials such as dense and open-graded asphalt mixes.

MPC-201 • Updating the Uniform Rail Costing System Regressions • J. Bitzan, North Dakota State University

The Uniform Rail Costing System (URCS) is used to estimate individual railroad shipment variable costs for regulatory purposes. It is composed of a three phase process as follows: (1) Phase I. Regression equations are estimated for 16 individual cost accounts, where output and capacity variables are used as independent variables; (2) Phase II. Individual railroad unit costs are estimated by multiplying the percent of each cost account's expenses that are estimated to be variable by the railroad's total cost in that particular account and dividing by the number of service units (the percent of each cost account's expenses that are variable is estimated using the regression coefficients estimated in Phase I, along with individual railroad output and capacity measures); (3) Phase III. The number of service units (e.g. gross ton-miles) are computed from the attributes of the shipment, multiplied by each unit cost, and summed to get total variable cost. The accuracy of the entire URCS process depends on the accuracy of the Phase I regressions, as these are used to estimate the percent of various cost accounts that are variable. The regression coefficients used to estimate cost variability in URCS reflect 1978-1985 data. Many mergers have occurred since then, and many changes have occurred in the locomotive fleet, traffic control, and other aspects of railroad operations. Many smaller railroads — including some beltway railroads — were included in the 1978-1985 data set. None of the railroads in the 1978-1985 data set approaches the size of the BNSF, the UP, and the CBX and NS systems of today. Because of the concentration that has occurred since 1985, the Class I industry of today may exhibit different characteristics than the industry of the early 1980s. This study will re-estimate the Phase I URCS regressions using current data.

MPC-202 • Truck Costing Model for Transportation Managers • M. Berwick, North Dakota State University

The motor carrier industry has been a recurrent subject for cost studies. All of the referenced studies use an economic-engineering approach to estimate trucking costs. The economic-engineering model estimates the production function with a given set of factor prices. Most studies use survey as a data collecting tool to arrive at costs by averaging information received from the survey. Cost components are easily identified in the economic-engineering approach and thus cost estimates of a new startup firm are readily available. A weakness of the economic-engineering approach is that the results are based on average values of input prices and resource usage. Thus, the results are accurate for a limited population. Furthermore, a new study must be undertaken to update the results. An Owner/Operator Spreadsheet Costing Model developed in 1996 has been useful however, it is based on a spreadsheet and is not a stand-alone model or software product. The model will be a stand-alone product that may be employed by transportation managers and researchers. The model will be expanded to include many truck configurations and also capture terminal and line haul costs.

MPC-204 • Strategies for Improving DOT Retention and Motivation among Professional Staff • G. Griffin, North Dakota State University

Retention of qualified DOT employees is reportedly a problem with many, if not all, Region 8 DOTs. This appears to be true nationwide as well. This perception is based on anecdotes from several people including the chief engineer of the North Dakota DOT, director of AASHTO, and the executive di-

rector of TRB. This seems to be especially true of highly skilled technical people such as engineers. DOTs are reportedly recruiting from other DOTs in an attempt to bid engineers away to their own organization. This is not even a short term solution since such tactics are readily available to all DOTs. It results in increased salaries, turnover, possibly poor morale, and does nothing to increase retention and motivation. This project will identify the scope of the problem on a national scale. One other perceived problem that DOTs face is an organizational structure and culture that does not capitalize on the full potential of the human capital that they employ. This is part of the retention problem. The organization and culture most likely does not emphasize the job attributes that employees need to satisfy their psychological well being. These issues, although separate, are related and need to be addressed if DOTs hope to maximize their contribution to mobility with the limited resources they have available. This project will utilize the Job Characteristics Model and the corresponding Job Description Survey (JDS), or some other applicable model, to analyze the motivating potential of jobs of DOT professionals and how they would react to a job with high motivating potential. Further, strategies are developed that DOTs can implement to improve both retention and motivation simultaneously.

MPC-205 • Predicting and Classifying Voluntary Turnover Decisions for Truckload Drivers • G. Griffin, North Dakota State University

Voluntary turnover rates among truckload carriers are extremely high, ranging from 50 to over 100 percent annually. These high turnover rates result in elevated costs for carriers in terms of recruitment and training as well as costs associated with reduced productivity and decreased customer satisfaction resulting from inexperienced drivers. Although much research has been conducted to determine the relationship between the job satisfaction of drivers and the likelihood of them leaving or intending to leave an organization, research addressing other reasons why drivers may leave their organization has been lacking. Truckload carriers are not only concerned about why drivers leave their organizations, they are also interested in what they can do to predict who will leave and what interventions they can use to prevent some high performing drivers from leaving. In our current tight labor market, truckload carriers that focus on reducing voluntary turnover will have a competitive advantage over other carriers who do not understand the importance of driver retention. As a result, this project will serve to increase the understanding of voluntary turnover of drivers.

MPC-206 • Attitudinal Analysis of Bus Rapid Transit Alternative • J. Hough, North Dakota State University

Bus Rapid Transit (BRT) is a relatively new concept in the United States. The BRT system uses a designated bus lane to service passengers along a corridor. The system is much like a rail system, except it can be implemented and maintained at a fraction of the cost. Curitiba, Brazil, implemented the first recognizable BRT system. BRT may allow second-tier cities (Populations below 400,000) to better plan their transportation strategies to effectively meet the needs of their residents. One important question is “what conditions and criteria must these cities have in order to successfully implement a BRT system?” The focus of this study is to develop a travel demand model that will predict mode share based on the individuals’ preferences within their particular city. The results of this study will help determine if individuals are likely to choose to ride the BRT system. The results from the select FTA demonstration sites will be applied to select cities in the MPC states to identify the viability of implementing BRT in the MPC region. FTA recognizes that BRT systems will help with the mobility issues that are continuous problems in large, as well as, smaller communities.

MPC-207 • An Evaluation of Region 8 State Departments of Transportation and Metropolitan Planning Organizations' GIS Technology Application • D. Benson, North Dakota State University

GIS resources have become an important tool for transportation analysis and require effective management to fully utilize its technology. This study will identify and assess the current state of GIS in the region's DOTs and MPOs, and develop a resource tool outlining potential areas of coordination and cooperation among GIS users. Additionally, the study will identify GIS resources available for transportation researchers in the region.

MPC-208 • Surface Street Level of Service Using Existing Detector Infrastructure • P. Martin, University of Utah

Interstates and freeways have a long history of the use of detection devices to record flow, speed, and other traffic measures. Increasingly, even the smallest surface streets are being instrumented as the cost of detection falls and the integrity of communications continues to improve dramatically. Traffic engineers rely on the "Level of Service" (LOS) as a standard measure of traffic conditions. With capacity known, it is now possible to determine the LOS for a road, in real time. This information can serve a variety of useful purposes – automatic identification of congestion associated with tourist areas, air quality impact assessment, traveler information, and measurement of traffic generation.

MPC-209 • Advanced Traffic Management System Evaluation Data Collection Methodology • P. Martin, University of Utah

Sophisticated micro simulation models, such as MITSIM, INTEGRATION and WATSIM are useful tools to test the potential impact of new ITS technologies, such as route diversion variable message signs, in-vehicle driver alarms, and weather sensitive speed advisory signs. Once implemented, the modeling should be tested with field observations. Rigorous experimental design demands that both pre- and post-date will be available. Frequently, the "pre data" is overlooked. Subsequent evaluations are weakened.

MPC-210 • Adaptive Signal Control for Down-town Salt Lake City • P. Martin, University of Utah

As new fixed timing plans are implemented, they already begin to age and are incapable of accommodating incidents such as accidents, inclement weather, or holiday fluctuations. Adaptive signal control reacts to traffic instead of assuming that everyday is the same and attempting to guess the most appropriate average signal timing for the peak periods. Adaptive signal timing can be thought of as an on-line Transyt or Synchro that optimizes coordinated signal timing based on the current traffic demand.

MPC-211• Evaluating and Improving the Safety of Pedestrian Crossing in Utah • W. Cottrell, University of Utah

This research would be performed in response to a recognized need for pedestrian safety improvements. During 1998, there were 748 reported pedestrian-motor vehicle crashes in Utah. A total of 41 of these involved pedestrian fatalities. The Utah Crash Outcome Data Evaluation System (Utah CODES) has been provided information on automobile accidents in the state since 1992. This database, along with supplementary information from UDOT, would be used to generate a pedestrian-vehicle incidents database. Cluster analysis and other statistical techniques would be used to measure the similarities between data groups. Upon the identification of clusters, an inventory of transportation supply and demand information would be made for the sites at which clustering pedestrian-vehicle accidents have occurred. Field work would be performed to ensure the accuracy of the supply data; some demand information may be obtained, as well.

MPC-212 • Intelligent Transportation Systems Course • P. Martin, University of Utah

The principal investigator teaches an advanced course on Intelligent Transportation Systems with a rural emphasis. Currently, the course is delivered in a traditional "chalk and talk" format. The need is to develop the course so that it may be delivered across the TEL8 network.

MPC-213 • Para-transit Coordination for Rural Communities • P. Martin, University of Utah

Rural transit systems need to improve operating performance and increase accountability. In 1999, 1,074 small urban and rural agencies provided 280 million miles of service. APTA Fact Book 1999 shows 554 agencies provided a much greater number of miles of service in urban areas total approximately 8.3 billion. The ratio suggests that coordination among rural systems may be one solution for improvement. Better vehicle utilization may also improve the ratio. The challenges faced by rural mobility managers in delivering coordinated services have been many. One challenge has been the cost/benefits of technology. This demonstration would address the following technology issues: (1) rural systems have lower access to new technological products and training; (2) agencies buying rides from mobility managers demand accountability; (3) cost of computer-aided dispatch (CAD) systems may be greater than a small system's entire annual budget; (4) how much should be invested in CAD systems by small transit agencies; and (5) institutional change forced by technology.

MPC-214 • Pultruded Composite Shear Spike for Repair of Large Timber Members • D. Radford, B. Hartnagel, R. Gutkowski

In many installations, timber railroad bridges are 50-100 years old, but still necessary for daily operation. Numerous timber-based highway bridges exist too, primarily on secondary roads. The latter are often in jurisdictions where new construction funds are very limited. Hence, economic repair of bridges is vital to the nation's infrastructure. Fiber reinforced composites are extremely popular for infrastructure and in situ infrastructure repair. Common approaches are fiberglass wrap (bandages) or adding reinforcing plates (patches) to the sides of members. These require that the members be removed from the bridge for the repair to be made. They also degrade with time due to exposure. Alternatives to these techniques that do not require member removal and are embedded in the member are invaluable to low cost, long lasting repair. A recent MPC research project explored an innovative alternative to fiberglass wrap and patch repair techniques. A "shear spike" insert approach was tried on small wood members (based on nominal 2 x 2 and 2 x 4 sizes) and show promising results for application to full-size bridge members. Shear spikes are composite rods inserted from the bottom to the top of the beam, in situ. Pre-drilled holes and an injected adhesive are used to bond the spikes to the wood. They are produced by pultrusion with principal fiber content being in the axial direction. They serve to tighten the member to restore overall stiffness and add horizontal shear resistance, among other benefits. Results of the study showed a substantial rejuvenation result. In some cases, repairs to split members resulted in strength and stiffness comparable to undamaged control specimens.

MPC-215 • Structural Modeling of Substructure Resistance for Timber Trestle Railroad Bridges • R. Gutkowski

Ordinary structural modeling of bridges does not account for the presence of "discontinuities" such as loosened connections, gaps due to shrinkage from moisture/drying cycles; support movement, differential bearing of members, etc. These alter load capacity and stiffness from the original condition and significantly affect behavior. A need exists to reflect the aspects into an improved structural analysis and design process for timber trestle railroad

bridges. Software features (e.g., gap elements; interface element, etc.) exist in available commercial software to include the above "discontinuities" and free displacement. This is proving successful for the lab specimen. A need exists to better represent the substructure resistance that exists in the field compared to laboratory support conditions.

MPC-216 • Experimental Thick-Deck Wood-Concrete Highway Bridge Construction • R. Gutkowski, J. Balogh

Commonly, deteriorating wood bridge decks are completely replaced without consideration of a possible retrofit. This is likely due to lack of potential approaches to strengthen such decks. One approach to strengthening a wood bridge deck is to add a concrete deck layer and interconnect it to the wood deck. A prior MPC project showed this to be successful using a notched shear key/anchor detail tested in the laboratory under static loads. A need exists to examine field application. A concrete overlay technique recently developed in Europe is used. It involves a unique, but readily done, interlayer connection method. While a mechanical connector is involved, it is not relied upon for interlayer shear transfer needed to affect the desired composite behavior. Instead, a notched shear key is utilized to rely on wood to concrete shear and bearing to achieve the interlayer force transfer. The mechanical connector serves to tighten the concrete to wood bearing surfaces after hydration drying of the concrete has taken place. It is not affected itself by curing of the concrete, as it is anchored into the wood by gluing or grouting. A popular tourist community in Colorado has expressed interest in such new experimental bridge construction to achieve a significant traffic re-routing to improve mobility and relieve congestion. The low cost, ease of construction and "fit" of the bridge's appearance to the community character are motivations. However, the load capacity needed greatly exceeds that of the shorter span applications envisioned in the prior study, resulting in a "thick deck." Mechanically, ordinary decks and slabs are usually governed by "thin plate theory" (Kirchoff plate theory) because their depth/span ratio is such that only flexural deformations are pertinent. The depth/span ratio of the envisioned prototype is such that shear deformation is important, too. Thus, the system may be controlled by Mindlin plate theory, which accounts for shear deformation. To proceed to any envisioned pilot field application, it is imperative to examine ultimate strength for a "thick deck" as compared to the more slender decks previously examined. Fundamentally, the thick deck mechanics differ from a thin deck in mathematical modeling, too. Extrapolation of the findings for a thin deck specimen to the loads required in the field application (HS-20 loding) is high risk without a study of the underlying mechanics differences.

MPC-217 • Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment (cont.) • T. Sanders

This research project is a joint cooperative venture with the Larimer County Road and Bridge Division, Roadbind America Inc. and other dust suppressant vendors. The research will be conducted in 10 half-mile sections of road in Larimer County. There are two types of roadbed gravel being investigated, 2.5 miles of each, and five different treatments. The treatments are magnesium chloride, lignon sulfanate, a mixture of 50 percent lignon sulfanate and 50 percent magnesium chloride, a mixture of Pennzoil and lignon sulfanate and a mixture of Pennzoil and magnesium chloride. The first three dust suppressants will be used on both gravels while the Pennzoil mixes will be applied on only one gravel type. The remaining one-half mile section of each gravel type will be a control section, receiving no applications of dust suppressants. The county will provide all the labor and equipment for the preparation of the test sections and the vendors will provide the dust suppressant. The Colorado State University Dustometer, developed in previous research supported by the

Mountain-Plains Consortium, will be used to quantify the amounts of dust released into the air from all the test and control sections. Measurements of driveability will be defined and measured (examples of driveability are braking distance and vibrations). A record of all accidents on the roads will be kept for the duration of the research. In addition, Larimer County records will be investigated to see if there is a relationship between the number of accidents (and fatalities) and the type of road treatment (or lack thereof) on the dirt roads. More than one county in the state may be investigated if better records are available.

MPC-218 • Leveraging Technology Investments - Integration of GPS, GIS and Maintenance Management • D. Jacobson

The North Dakota Department of Transportation has invested thousands of dollars in developing a Geographic Information System for managing transportation assets. One of the early benefits of this effort was the integration of all existing databases. Now all of the resident transportation data can be accessed from the Roadway Information Management System (RIMS). Another was the development of a robust mapping system that replaced an archaic manual system of mapping. Transportation managers are now searching for secondary benefits from this investment in technology. The objective of this project is to develop a methodology with accompanying software programs which will enable maintenance managers to use GPS and GIS technology to capture maintenance program needs and product graphic and tabular reports of planned and executed programs and unfunded maintenance backlogs.

MPC-219 • Bus Rapid Transit: An Examination of Political Feasibility Using Case Studies • J. Hough

Many cities in the United States would like to implement light rail service. However, the high implementation cost impedes many cities and forces them to look for alternative transportation options. As a result, several cities are considering Bus Rapid Transit (BRT). Four cities will be selected as case studies to investigate the key political factors involved in BRT. The cities will be selected based on specific criteria such as population size, technologies implemented, and whether the system is a “true” BRT or a hybrid BRT with only select BRT features adopted, e.g., guided system or mixed traffic system, low floor doors or regular doors, etc. In-depth interviews and surveys will be conducted for each of the case study cities. Interviews of transit managers and key city officials will be conducted primarily to identify key political factors that may impede or support BRT. In addition, surveys of transit employees and other local officials along with city residents will be conducted to identify their perceptions of the factors involved in the selection of BRT for the city. Economic factors will be evaluated primarily through budgets and revenue forecasts. One of the proposed tangible results of this research project will be a “decision tree” which will be developed as part of the research framework. The decision tree would provide a framework for communities that are considering implementing BRT to use to aid in their decision process.

MPC-220• Costs, Pricing, and Regulatory Alternatives for Mergers • J. Bitzan

Recently, there has been a wave of mergers in the U.S. rail industry. These mergers have included those by the Burlington Northern and Sante Fe railroads, the Union Pacific and Southern Pacific railroads, and Conrail with the CSX and Norfolk Southern Railroads. A recent study sponsored by the Federal Railroad Administration (FRA) found that railroads are natural monopolies when the alternative to a merged railroad is duplicate side-by-side rail networks, but that rail mergers extending the size of rail networks lead to increases in railroad costs. This suggests that further end-to-end mergers are not beneficial unless significant service improvements are obtained. While the study provides a useful starting point for examining the welfare implications of railroad mergers, it does not provide a

detailed analysis of specific rail mergers that have occurred, an assessment of the pricing effects of mergers, or an assessment of the impacts of mergers on service. This study will build upon the findings of the FRA study and others to provide a detailed analysis of previous rail mergers in terms of costs, pricing, and service, and to discuss the implications of these findings for the future of regulatory oversight of mergers.

MPC-221 • Trip Generation Rates for Grain Elevators: A Tool for State and Local Highway Planners • D. Tolliver, K. Vachal

This project will develop truck trip generation models and rates for grain elevators. There are 8,000 to 10,000 of these facilities located in the United States. At present, highway planners have no way of estimating potential trips to and from these facilities other than by direct surveys or local traffic counts, which are costly and time-consuming. The ITE trip generation tables, which are widely used by highway planners, include the aggregate categories of “Ports & Terminals” and “Industrial.” However, land uses such as “light industrial,” “heavy industrial,” or “warehouse” do not adequately describe grain elevators. This study will utilize data from a comprehensive inventory and field survey of more than 450 elevators in North Dakota and a broader survey of grain elevators and processors in the Great Plains region. The trip generation models will predict truck trips as a function of fixed facility attributes (e.g., train loading and storage capacities), crops handled, county crop production levels and densities, elevator density in the surrounding market area (e.g., elevators or storage capacity per square mile in the county), and transportation system access and performance factors (e.g., distance from NHS, distance from river, rail access). The trip generation models will predict both inbound and outbound truck trips and include seasonal variance factors for adjusting average daily trips.

MPC-222 • Strategies for Improving DOT Employee Retention and Motivation • L. Kalnbach, D. Jacobson

Human capital is the most critical asset in determining the success of an organization. Therefore, it is important to address issues that adversely affect the contribution that human capital can make. It is reported that there are two major issues of concern among DOTs regarding their human capital – retention and motivation. These two issues probably stem from several factors, including two that are related: (1) a shortage of qualified people, and (2) a lack of understanding of how organizational structure and culture affect the ability to realize the full potential of human capital. The study consists of two phases. Seven state DOTs, including Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Wyoming will be involved in the first part of the study, while a case study approach will be used in the second part of the project. Face-to-face interviews will be conducted in the first phase of the study, however, the objectives of the second phase of the study will be accomplished through the use of written surveys, focus group discussions, and a private seminar for participating DOTs.

MPC-225 • Evaluation of the I-15 High Occupancy Vehicle Lanes • P. Martin

One of the main objectives of the I-15 HOV lanes is to increase the average number of persons per vehicle. The HOV lanes will have an impact on travel patterns on the mainline and possibly have an effect on adjacent alternate routes. Knowing this impact is important to make policy decisions or before any changes are made. Such changes might include the decision to implement HOV lanes on other freeways in the area, or to decide the minimum passenger level (2 passengers or 3 passengers) allowed in the lane. Violation rates should also be measured because they are an indicator of the public acceptance of the new lanes. The impacts on alternate routes also need to be assessed.

MPC-226 • Adaptive Signal Control for Down-town Salt Lake City, Utah - Part II • P. Martin

As new fixed timing plans are implemented, they already begin to age and are incapable of accommodating incidents such as accidents, inclement weather, or holiday fluctuations. Adaptive signal control reacts to traffic instead of assuming that everyday is the same and attempting to guess the most appropriate average signal timing for the peak periods. Adaptive signal timing can be thought of as an on-line Transyt or Synchro that optimizes coordinated signal timing based on the current traffic demand.

New Research Projects 2002-03

Colorado State University

MPC-216 **$** Experimental Thick-Deck Wood-Concrete Highway Bridge Construction: Year 2 **$** R. Gutkowski

Commonly, deteriorating wood bridge decks are completely replaced without consideration of a possible retrofit. This is likely due to a lack of potential approaches to strengthen such decks. One approach to strengthening a wood bridge deck is to add a concrete deck layer and interconnect it to the wood deck. A prior MPC project showed this to be successful using notched shear key/anchor detail tested in the laboratory under static loads. A need exists to examine additional aspects critical to field application. However, the load capacity needed greatly exceeds that of the shorter span applications envisioned in the prior study, resulting in a Athick deck@. To proceed to such an application, it is imperative to examine repeated loads and ultimate strength for a Athick deck@ as compared to the more slender decks previously examined.

Fundamentally, the thick deck mechanics differ from a thick deck mathematically, too. Extrapolation of the findings for a think deck specimen to the loads required in the field application is high rick without a study of the underlying mechanics differences.

MPC-234 **$** Impact Performance Testing of Roadway Safety and Security Barriers **$** R. Gutkowski

A variety of portable safety and security barriers for directing traffic (public events, sports facilities, etc), and securing private and public locations against access (court-houses, schools, etc) have been developed. Some higher capacity systems have been developed for use on and around high speed automobile racing tracks. Generally, the barriers are hollow, plastic composite walls and use dead weight fill (sand, water) to resist impact without interconnection to the ground. Heavier solid systems, such as a concrete Jersey Wall type configuration, are used in highway construction as well. These are much more expensive and require heavy equipment to relocate them. Few of the filled, lightweight systems have been crash tested to meet federal standards, although some users have conducted their own impact tests. Typically, manufacturers are small businesses without the resources to conduct federal tests similar to crash tests of bridge guard rails. Thus, developing a comparable impact test method to conduct dependable preliminary tests has great merit.

MPC-235 **$** Highly Flexible Crash Barriers **$** P. Heyliger

Most crash barrier systems are designed to provide certain margins of safety to life and property with inherent low cost. Most barriers require immediate replacement after impact, resulting in an increase in replacement cost, additional materials, and potential danger to work crews along with inconvenience to others as the work is completed. In addition, the damage to individual motorist=s cars or trucks can be significant, as can the potential for injury and death.

In this study, we investigate a new paradigm of crash barriers that absorb energy of impact by undergoing very large deformations (thereby lessening the blow to drivers and occupants) that are completely elastic. Hence, rather than creating a rigid structure out of wood or metal that is designed

to have strength sufficient to survive an impact by either yielding or fracturing, we propose a system or network of highly flexible wood elements that can deflect a large amount but when unloaded, will return to their original position.

There are two separate phases to this research: a numerical model that allows us to predict the response given a specific design, and a small experimental prototype that will allow us to compare theoretical results and determine practical limitations of such an approach. Our numerical model uses a three-dimensional elastica representation of long wood rods, which can undergo large bending deformation but the rods have a diameter that is very small relative to the length and hence can bend a large amount while remaining below the elastic modulus of rupture. Such an analysis is highly nonlinear in the geometric sense, and developing this model will compose a large part of the research. Once completed, we will use this model to test various configurations of the wood elements in a network fashion, and also the various parameters such as cross-sectional properties, modulus, length, and orientation. Our testing specimen will be a small(less than 24 inches on a side) wood-rod network whose configuration will be determined after completion of the parametric studies using our numerical model.

Our entire hypothesis is based on the possibility of being able to design a cost-effective Asoft@ barrier that can successfully compete against modern crash barriers under certain situations where damage to vehicles or difficulty of replacement make such flexibility advantageous. Our initial work will test this hypothesis for basic design configurations with the eventual goal of developing conclusions as to the possibilities and limitations of such an approach.

North Dakota State University

MPC-203 **$** Containerized Grain & Oilseed Exporters - Industry Profile and Survey: Phase II **$** K. Vachal

Competitive access to an array of agricultural markets is critical to agricultural shippers and rural economies in the Midwest. One sector that has gained notoriety in recent years is that sector marketing its grain and oilseed products via container. It seems that technological advancements in shipping, grain production, grain handling, communications, sophistication of buyer expectations, and grain producer business developments may lend themselves to continued development of this sector.

It has been estimated that currently, less than one percent of the U.S. grain and oilseed production is marketed via container. A recent survey of grain industry experts suggests that this volume could increase by more than 300 percent over the next five years. Limited, and rather disjointed, information exists for profiling the industry or identifying trends required for regional and national logistical planning. Information ascertained through this survey would be valuable in addressing logistical planning distributing resources for economic development, addressing regulatory issues, planning infrastructure investment, and other facets associated with this sector of the grain transportation industry.

MPC-227 **$** Small Urban University Transit: A Case Study **$** Jill Hough

University campuses have unique transportation requirements that may be characterized with a high concentration of trips during multiple peak periods (ile., morning, lunch, and afternoon). These campuses are often the largest employers in small to medium size cities and it is therefore critical to coordinate campus mobility needs with the overall transportation system. Many colleges and universities recognize transit as an effective mode for meeting campus mobility and have developed transit systems to serve

those needs. However, successful campus transit systems include several factors such as careful planning, understanding user preferences, efficient design of system services, and coordination with existing city transit service. Universities are not homogenous (i.e., enrollment levels, campus location, size of community) so they will have different needs. This study will examine these factors through a case study of North Dakota State University (NDSU).

NDSU has an enrollment of approximately 10,500 students and employs just over 2,000 full-time faculty and staff, most of them living in the Fargo and Moorhead community area (two joint cities). The NDSU campus has experienced exceptional growth the past couple of years and has forecasted continued growth to more than 11,000 students next year. The campus is already experiencing parking problems. Growth with additional programs such as Equine studies will require further expansion of the land used to house the buildings and programs of study. The architecture, landscape architecture and visual arts program are scheduled to utilize buildings in downtown Fargo, requiring students to travel off-campus to take classes. In addition, NDSU is one of three colleges in the Fargo-Moorhead area which make up the Tri-College (in addition to NDSU, Concordia College and Minnesota State University-Moorhead). Students in the Tri-College program take classes from the three universities and are required to travel among the three campuses. NDSU has also expanded to include a research park housing businesses that use some of the campus facilities as well as employ students.

MPC-228 **$** Trucking Industry Churn and Its Impact on Communities and ITS Adoption **$** J. Rodriguez

The number of trucking companies has changed over the years. But perhaps more important than the total number of trucking companies is the longevity of trucking companies. If there are 100 companies this year and 120 companies next year, have we merely added 20 companies? Or have 80 companies gone out of business and 100 companies started up? There is a major difference between the two scenarios. The stability of firms in the industry impacts their ability to adopt new technologies, the relationships they have with shippers, their safety records, and their ability to compete on a regional, national, and international basis. How are shippers in the local communities affected by churn? How does churn impact the ITS network? An ITS network in an industry with high churn could be much different than in an industry with low churn. Churn may also impact the rate at which ITS technologies are adopted.

MPC-229 **$** Asset Management of Roadway Signs Through Advanced Technology **$** K. Kruse

For many years, state and local jurisdictions have developed field systems to monitor and track their street sign inventories. The current methodology is both arcane and cumbersome. Sign inspectors are required to complete and enter an onerous system of forms on the signs which they are evaluating and inspecting. The proposed research project will take current technology in the form of PDAs and GPS units to accomplish field data collection necessary for managing sign inventory. The system will also contain all of the current sign management information on the PDA with the capacity for field data analysis and reporting.

MPC-230 **$** Economics of Ride Quality on Low Volume Roads **$** D. Jacobson

Many transportation organizations are struggling with the issues of pavement quality, especially at the time of initial construction. Incentives and dis-incentives have been established in many states but there is little consistency between them. Current agency design practices may contribute more to ride quality than other factors such as initial ride numbers. Little research has been done to determine how much initial ride quality is worth to an agency as compared to other pavement factors. Analysis of two case studies is proposed to research these and provide answers or guidance to road managers at all levels.

University of Utah

MPC-231 **$** Automated Data Collection, Analysis, and Archival **$** P. Martin

Traffic Monitoring Stations (TMS) are a component of the ATMS. TMS collect traffic volumes, speed and density from the Interstate system. These devices are located each **2** mile, on each lane, of the interstate system in the Salt Lake Valley. Presently the Utah Department of Transportation does not collect nor store this information. Traffic operations, pavement management, traffic and safety and the planning divisions require this information. The research project will produce a report which will investigate data collection, analysis and archival. The first task of this study is to identify the needs of all potential internal and external users. Literature searches will be employed to identify methods used in other states. A proto-type database will be developed to verify that data is collected, and is retrievable in a useful format.

MPC-232 **$** Detector Technology Evaluation **$** P. Martin

The PI teaches an advanced course on Advanced Technical Communication. The need is to develop the course so that it may be delivered across the TEL8 network.

MPC-233 **$** Evaluate Effectiveness of Dilemma Zone Advanced Signal Warning **$** P. Martin

The Utah Department of Transportation has installed two dilemma zone advanced warning signal systems in the state. The locations of these systems are outside St. George and Brigham City. The systems alert drivers, with the use of flashing warning lights located at the dilemma zone. The lights begin flashing when the signal ahead is about to change phase from green to yellow to red. The two warning device systems were installed on high speed, low volume rural highways. Both systems were installed with the understanding that UDOT would evaluate the effectiveness of the systems. Currently, we have no standards with regard to when, how or what we will install with regard to advance signal warning devices. Before installing more, we need to determine effectiveness of the system and produce guidelines for future installation. Some of the measures of effectiveness would include reduction in accidents, decrease in red light running and reduction in speeds.

MPC-237 **$** Affordable Trip Feasibility Scheduling for Rural Paratransit Systems **$** W. Grenney

McGrane, Grenney and Johnson1 summarized the need of small to medium size paratransit agencies (2 to 50 vehicles) for software to assist with their reservations, scheduling, dispatching, record keeping, and reporting responsibilities. The developers also recognized that these agencies worked under certain constraints, paramount among which are:

a. Small budgets
b. Rural or small city settings (poor internet connectivity, spotty communications, etc.)
c. Lack of information systems (IS) experts on staff or even readily available.
d. Office staff not skilled in computer use.
e. Office staff not trained in paratransit operations.
f. Reliance on volunteers and Privately Owned Vehicles (POVs).
g. Variations in reporting requirements (desires) among states and even among agencies within a state.

University of Wyoming

MPC-223 **$** Evaluating the Impact of DOTs QC/QA Programs on Pavement Performance: Year 2 **$** K. Ksaibati

Most Department of Transportation (DOTs) have developed and implemented various types of Quality Control /Quality Assurance (QC/QA) programs. Such programs require significant resources to be invested in testing before, during and after finishing the construction of pavement structures. The testing may include aggregate gradation, asphalt content, density of compacted mix, and smoothness of finished surface. The test results are normally utilized by DOTs to calculate the incentives/disincentives based on statistical evaluation and standard procedures. It is important after QC/QA programs have been in place for several years to determine their impact on the overall quality and long-term performance of pavements.

MPC-236 **$** Evaluation of Moisture Susceptibility of Asphalt Mixtures Containing Bottom Ash **$** K. Ksaibati

Bottom ash, a waste by-product from coal-fired power plants, has been utilized in paving applications. This utilization includes the use of bottom ash as part of the aggregate in asphalt mixtures. While it is well known that moisture has an effect on the performance of traditional asphalt mixtures, the moisture susceptibility of mixtures containing bottom ash remains unknown. In particular, the following questions need to be answered:

- What are the effects of moisture condition, freeze-thaw cycle, and low temperatures on the performance of mixtures with bottom ash?

- What are the appropriate amounts of bottom ash that can be added for satisfactory performance of the mixtures?

Human Resource Development

The MPC's goal is to increase the number of students, faculty and staff interested and involved in the undergraduate, graduate and professional programs of the Center. As outlined in our strategic plan, it is the Center's intent to increase faculty involvement in transportation, increase student participation in transportation programs, and increase participation by transportation professionals. This section highlights the Center's student and faculty activities and professional development during the past year. It also includes short biographies of our current graduate students.

MPC Graduate Students

Colorado State University

Ryan Fast

Ryan Fast began as a graduate research assistant in Fall 2001. He is conducting experimental work in the area of composite wood-concrete floors and bridge decks. Prior to entering graduate school, he was a highway engineer trainee for the Federal Highway Administration, including a period of work at the Turner Fairbanks Laboratory in Virginia.

Ryan received a Special Act Award from the FHWA for work performed on Job Shadow Day during National Engineers Week. He completed an internship with Structural Reliability Technology (Boulder, Colo.) writing fatigue and crack analysis software.

He has a B.S. Applied Sciences degree from George Fox University and a B.S. Engineering – Civil Specialty degree from the Colorado School of Mines.

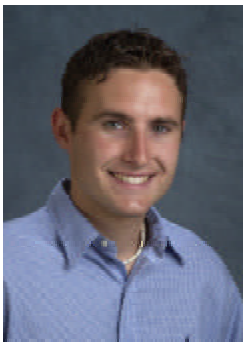
Mark Miller

Mark Miller is a registered professional engineer in the states of Wyoming and Nebraska, and has more than 13 years of experience in the structural design of government administrative, production, air-craft repair and maintenance, space craft launch and assembly, and military housing facilities.

Miller currently is the director of Operations, 302D Civil Engineer Squadron, Peterson AFB and previously has held positions as the Regional Officer in Charge of Construction, U.S. Forces Korea; Lead Structural Engineer, Dept. of Civil Engineer, U.S. Air Force Academy, Colo.; and the Structural Engineer in Charge of Launch Facilities, Cape Canaveral AFS, Fla., where he was responsible for the structural renovation and upgrade of launch complex's 17 and 41 in support of the Delta GPS and Titan IV launch programs.

Miller is a 1986 graduate of the University of Wyoming, 1999 graduate of Squadron Officer's School, Maxwell AFB, Ala.; and is a graduate student in structural engineering at Colorado State University. He is conducting master of science thesis work on the three dimensional, space frame modeling of open deck, timber trestle

railroad bridges. This work is in conjunction with an MPC-sponsored project to examine load paths in such bridges via laboratory and field testing.



Cole Rogers

Cole Rogers is presently a graduate research assistant at CSU in the department of civil engineering. His research is on theoretical modeling of partially composite wood-concrete structural systems, including bridges. He received his B.S. degree in civil engineering at CSU, in Spring 2001.

As an undergraduate student he worked as a research aide in the Structural Engineering Laboratory for two years. He is a member of the Tau Beta Pi and Chi Epsilon national honor societies.

He has work experience in construction of reinforced concrete foundations and residential home construction.

He was the recipient of the 2001 AISC/ Rocky Mountain Steel Construction Association Fellowship, given to the top student in the Rocky Mountain region.

TJ Schilling

TJ Schilling received his B.S. degree in Civil Engineering in Fall 2001. He is presently a graduate teaching assistant, teaching in the geotechnical engineering laboratory. He has a work background as an auto mechanic (Extraditions International, Inc.) and a draftsman (Glorso Murray Surveys, LLC).

TJ is proficient in Auto Cad and pursuing research studies on use of pultruded composite shear spikes for strengthening and repair timber bridge members. In Fall 2002, he will begin as a graduate research assistant and conduct thesis work on that topic.

He is a member of ASCE and two national honor societies, Chi Epsilon and Tau Beta. He participated in the steel bridge student design team during CSU's winning of the regional competition in Fall 2002.

An Vinh Tran

An Vinh Tran has earned a masters degree in Civil Engineering (Structural and Geotechnical Engineering Program), Colorado State University, May 1999. He received a bachelor's degree in Civil Engineering in 1998 from Colorado State University.

The purpose of Tran's research is to study the pier moment-rotation behavior of compact and noncompact I-shape bridge girders fabricated from high performance steel (HPS). To accomplish the purpose, the research consists of two main objectives. The first objective is to compare experimental laboratory moment-rotation tests and corresponding numerical moment-rotation finite element analysis of four HPS70W steel girders to the current AASHTO LRFD moment rotation equations. The second objective is to compare inelastic moment-rotation post peak behavior of numerical non-composite models to corresponding numerical composite models.

Tran would like to continue the doctorate's study in Structural and Geotechnical Engineering, and work as a professional engineer in the field of structural and geotechnical engineering.

North Dakota State University

Brian Gibson

Brian Gibson currently is in the Natural Resources Management graduate program and is fulfilling the requirements for the Transportation Option of the agribusiness and applied economics program at North Dakota State University. His thesis topic is a hedonic study of traffic volume and noise and their effects on housing values in the Fargo-Moorhead area.

Gibson graduated in 1999 from Minnesota State University-Moorhead with a bachelor of arts degree in economics.

Alan Dybing

Alan Dybing is working toward his M.S. degree in Agribusiness and Applied Economics. His research includes the Estimation of Elasticities of Demand for Rail and Truck Transportation of Grain in North Dakota.

Alan received his B.S. in Agricultural Education at North Dakota State University, Fargo, ND.

Weijun Huang

Weijun Huang is working toward a master's degree in Agribusiness and Applied Economics. Weijun's research, "Shuttle Adoption Strategy," tries to find key factors affecting shuttle train adoption for grain elevators. It uses a spatial logit model to analyze the data for elevators. It focuses on the geographic characteristics and elevators' own characteristics. Weijung would like to get a job in the agriculture or transportation field in the United States or Canada.

Weijung earned an M.S. in Business Administration at Oklahoma City University and a B.S. in Grain Machinery at Zhengzhon Grain University, China. He received the "Outstanding Teacher in Hunan Province" award in 1998.

Darren Koehl

Darren Koehl is completing work on his M.S. degree in Agribusiness and Applied Economics with a transportation logistics option. He is working on a wheat trade model for his thesis. The model includes the introduction of genetically modified wheat and its impact on world wheat trade.

Darren received his B.S. in Agricultural Economics at the University of Illinois at Urbana- Champaign, May 2000.

Ryan Tepley

Ryan Tepley received his bachelor of arts degree in Economics and bachelor of science in Finance in spring 1998, from NDSU. He began graduate studies at NDSU in Economics emphasizing transportation and logistics in the fall 1998 and completed his coursework in fall 1999.

Currently Tepley is working on a master's thesis in the area of grain logistics, specifically transportation by truck. The research analyzes the tradeoffs between various truck configurations to explore implications on grain supply chain efficiency, alternate transportation modes, effects on infrastructure, and impacts on other roadway users. Tepley is currently employed at Border States Electric Supply in Fargo, ND.

Heather Gibb

Heather Gibb is presently a graduate research assistant at NDSU in the agribusiness and applied economics department. Her research focuses on the North American Mid-Continent trade corridor, specifically E-commerce implementation status in trucking and rail companies throughout the trade corridor.

She received her BSC in Agriculture from the University of Manitoba. Heather plans to complete her MS degree and continue on in the newly developed PhD Transportation and Logistics program at NDSU.

Mark Lofgren

Mark Lofgren is presently working on his MBA degree at NDSU and expects to graduate in December 2002. He is currently working on a research project involving the assessment analysis of the North Dakota manufacturing sector of the Biennial Strategic Transportation project to determine the feasibility of an intermodal facility in North Dakota.

Mark received his BS degree in Industrial Management from Minnesota State University-Moorhead in December 1999.

Mohammad Farooq

Mohammad Farooq is completing his MA degree in Computer Science at NDSU. His research includes the analyzing, designing, implementing and testing of various software applications. He is currently working on a generalized transportation network model with transshipment facilities.

Farooq received his M.Engg degree in Civil Engineering from the National University of Singapore and his BS degree in civil engineering from Bangladesh University of Engineering and Technology. He is a member of the Phi Kappa Phi Honor Society, NDSU chapter.

Matthew Martimo

Matthew Martimo is currently working on his Masters degree in Civil Engineering and plans to complete it in December 2002. He is currently employed with the Upper Great Plains Transportation Institute in the Advanced Traffic Analysis Center (ATAC). His research focuses on the travel demand modeling enhancements for regional metropolitan planning organizations.

He received his BS degree in Civil Engineering from NDSU in 2000. Matthew was awarded the 2001 Institute of Transportation Engineers Scholarship, the 2001 FM Transportation Club Scholarship, and took 2nd place, speaker, at the 2001 Area III Highway Engineers Exchange Program Conference.

Khaled Shouman

Khaled Shouman is presently a graduate research assistant at NDSU with the Upper Great Plains Transportation Institute, Advanced Traffic Analysis Center (ATAC). His research focuses on a case study of optimum detectors layout for intersections with high to moderate turning movements.

Khaled received his BS degree in civil engineering from the University of Jordan in 1999. Upon completion of his Masters degree, he plans to pursue a PhD degree in transportation safety issues.

Dan Vinje

Dan Vinje is currently working on his Masters degree in agribusiness and applied economics from NDSU. His research focuses on evaluating the effects of deregulation on rail rates and the differential impacts among commodities, regions, and over time.

Dan received his BS degree in Business Administration from Minnesota State University-Moorhead. He plans to complete and defend his thesis by the end of fall semester 2002 and pursue a career in logistics or

North Dakota Department of Transportation

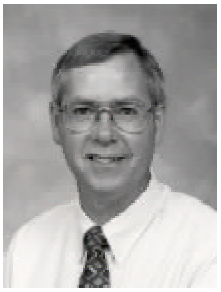
Paul Benning

Paul Benning received his B.S. degree in civil engineering from NDSU. He continues to take graduate classes at North Dakota State University toward a master of science degree in civil engineering. Paul is a registered Professional Engineer in the state of North Dakota and is currently employed by the North Dakota DOT in the local government division.

Bob Fode

Bob Fode received his B.S. in Civil Engineering from the University of North Dakota. His area of research is in traffic engineering. He previously worked with the NDDOT in the construction division, construction pool, design division, traffic section, and is currently in the construction division.

Fode is preparing a comprehensive research paper on "Synthesis of Ride Quality Initiatives." His future plans include finishing his Master's degree in Transportation Engineering.

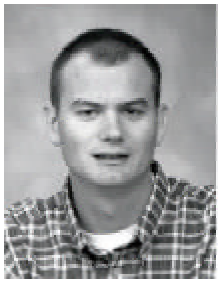


Tom Bold

Tom Bold received a B.S. degree in Civil Engineering, from North Dakota State University, a B.S. Degree in Business Administration from the University of Mary, Bismarck, ND, and an AAS degree in Electronics Technology from Bismarck State College, Bismarck, ND.

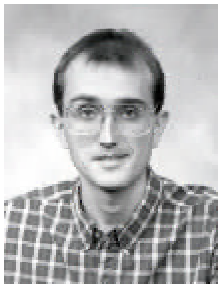
Tom is currently employed by the NDDOT in the materials and research division.

Chad Orn



Chad Orn received his B.S. degree in Civil Engineering from North Dakota State University. He is currently employed by the NDDOT in the design division.

James Rath



James Rath received a B.S.C.E. degree from the University of North Dakota,. He plans to complete graduate courses by Spring 2004 and his thesis by Spring 2005. James currently is employed by the NDDOT in the design division.

Esther Vogel

Esther Vogel received her B.S. in Civil Engineering from the University of North Dakota in 1981. She has been a hydraulic engineer in the design division of the NDDOT since 1990, and is responsible for hydraulic analysis on grading projects and investigating drainage problems.

Vogel began working with the NDDOT in 1979. She worked as a construction field engineer for seven years and a design engineer in the traffic section for four years. Currently, Vogel is preparing a comprehensive research paper on "Evaluation of Plastic Centerline Drainage Pipe."

Darcy Rosendahl

Darcy Rosendahl earned a B.S. degree in Civil Engineering from North Dakota State University in 1983. He also attended Dickinson State College for two years. His research includes working on NDDOT experimental projects, whitetopping of bituminous pavement, and chip seals. Rosendahl is currently the planning division director.

Darcy is preparing a comprehensive research paper on "Evaluation of Ride Panel Results vs Existing Measures of Ride Quality."

Joel Wilt

Joel Wilt earned his B.S. in Civil Engineering from the University of North Dakota in 1989. He currently is the assistant district engineer in Williston, N. Dak., and is responsible for construction and maintenance of highways in the district.

Wilt is a registered professional engineer and a charter member of the American Society of Highway Engineers, Central Dakotah Section.

University of Utah

Stephen Bryan is employed at MK Centennial Engineering. A previous traffic lab research assistant, Bryan holds a bachelor of science degree from the University of Utah.

Mark Bunnell, who earned a bachelor of science degree from the University of Utah, is completing his master's degree. He has been an intern with the Utah Department of Transportation in civil engineering.

Alfredo Gonzales earned a bachelor of science degree from the Institute Tecnologico de Oaxaca, Mexico, in civil engineering. He is pursuing a master of science degree in engineering. In Mexico, Gonzales designed a plan for the state of Oaxaca to allocate federal funds in rural communities. His plan consisted of developing access roads, power and portable water infrastructure, and food storage and distribution to communities.

Fredrick Kuhnow holds a bachelor of science degree from the University of La Sirena in civil engineering. While working on his master's degree, Kuhnow is a teaching assistant and has worked at Salt Lake City's materials lab since 1998.

Michael Wright, who earned his bachelor of science in civil engineering degree at the University of Utah, is pursuing his master of science degree. He earned a general science/honors degree at Weber State University in 1995. Among honors he has earned are second place Overall-ITE Intermountain Section Student Paper contest in 1998; best transportation student, Western Coal Transportation Institute, 1999; Transportation Graduate Scholarship, Thornton Department of Civil and Environmental Engineering Scholarship 1996-97; Presidential Commendation Scholarship, 1991-92 and 1994-95. Wright has completed three publications.

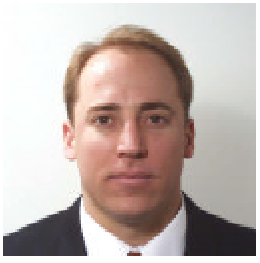
Chintan Jhaveri graduated from the S.V. Regional College of Engineering and Technology, Surat, India with honors in Civil Engineering in the summer of 2000. He is enrolled in the Master of Science program of the Department of Civil and Environmental Engineering.

Naree Kim graduated from the University of Utah with a Bachelor of Science in summer of 2000. She is enrolled in the Master of Engineering program of the Department of Civil and Environmental Engineering.

Bhargava Rama graduated from the Indian Institute of Technology, Kharagpur, with a Bachelor of Technology, with honors, in Civil Engineering in the summer of 2000. He is enrolled in the Master of Science program of the Department of Civil and Environmental Engineering.

Aleksandar Stevanovich graduated from the University of Belgrade, Yugoslavia, with a Bachelor of Science, with honors, in Applied Sciences and Civil Engineering in the summer of 1998. He is enrolled in the Master of Science program of the Department of Civil and Environmental Engineering.

University of Wyoming



Roger Owers

Roger Owers is a law student working toward a juris doctorate at the University of Wyoming. Owers received a master's degree in construction management from Arizona State University in 1995 and a bachelor's degree in civil engineering from the University of Arizona in 1993.

His research, to date, has focused on tort liability of transportation departments and on road safety audits. He also published an article in the ASCE Journal of Construction Management in September 1996. After completing his doctorate, Owers plans to work for the Transportation Department or as a transportation contractor.

Sindhu Narayan completed a B.S. in Civil Engineering from India in 1995. She started working on her master's degree at the University of Wyoming in 2001. Sindhu is currently doing research in the aspphalt moisture susceptibility area.

Elizabeth Hunter obtained a B.S. in Civil Engineering from the University of Wyoming in 2001. She then began her Master's degree program in the Pavement Materials area. Elizabeth worked for the Wyoming Design Squad part time for over two years.

Fane Sellers obtained a B.S. in Civil Engineering from the University of Wyoming in 1995. He has been working full time for the Wyoming DOT since then. Fane is currently working on his Master's degree part time at UW. He is expected to graduate in the Fall of 2002.

Khaled Al-Tarkeet completed the requirements for a B.S. in Civil Engineering at the University of Wyoming in Fall 2001. He immediately started working on his Master's degree in Spring 2002. Khaled is involved in a project evaluating the effectiveness of QC/QA programs.

Nathan Butts obtained a B.S. in Civil Engineering from the University of Wyoming in 2000. He started his Master's degree program in the Pavement Materials area in Spring 2001.

Lony Sellers obtained a B.S. in Architectural Engineering from the University of Wyoming in 2001. He has been working for the Wyoming Technology Center since that time. Lony started his M.S. program at UW in Spring 2002.

Student Program Activities

Awards • Honors • Scholarships

MPC Student Award Winner - 2001-02

Elizabeth Rae Hunter is a graduate student in the Civil Engineering Department, University of Wyoming with a grade point average of 3.5. The focus of her degree is in Transportation Materials. Currently, she is researching the effects of moisture on the mechanical properties of asphalt mixtures and utilizing the Georgia Loaded Wheel Tester to predict moisture damage. Elizabeth was nominated for her outstanding achievements in research as well as in the classroom. She has been involved in several paving materials studies.

She holds a B.S. degree in Secondary Education with majors in Mathematics and Biology. Upon completion of that degree she taught 8th grade science in Elizabeth, Colorado for two years.

In December 2000, she received a BS degree in Civil Engineering from the University of Wyoming and was initiated as a member of Tau Beta Pi. After receiving her Masters degree, she plans to return to North Dakota with her husband. She has accepted employment with the consulting firm of Kadrmas, Lee and Jackson as a Transportation Engineer.

Elizabeth is a native of Valley City, North Dakota.

Colorado State University

Clint Wood was selected to receive the Nyal L. Adams Scholarship in the amount of $5,000. This scholarship is available because of private donations made to the College of Engineering. The award recognizes outstanding academic achievement, community involvement, and financial need.

He has been a work study student employed as a research aide on MPC supported laboratory projects. He expects to graduate in Spring 2003 and continue on to graduate studies in a transportation related area of study.

Clint is presently working for the City of Loveland Transportation Department through the North Front Range Transportation Internship Program.

North Dakota State University

Junwook Chi received Honourable Mention from the Canadian Agricultural Economics Society for his Masters thesis presentation at the May 2002 Canadian Agricultural Economics Society Annual Meeting, in Calgary, Alberta, Canada. His thesis title is “The Economic Costs and Optimal Control Strategies for Four Production Limiting Dairy Cattle Diseases”

2001-02 Transportation Engineering Scholarship Recipients:
Nate Larson
Nancy Molick

2001-02 Paul E.R. Abrahamson Scholarship recipients:
Kelly Schlauderaff
Jody Wosick

Workshops • Conferences

CSU took first place in the Rocky Mountain Regional Conference. The conference was held April 12-13, 2002, at the University of Wyoming at Laramie. In addition to the first place overall trophy, the concrete canoe and steel bridge both qualified to advance to the national competition held at the University of Wisconsin-Madison on June 21-24, 2002. The steel bridge received second place for aesthetics at the national competition. Eric Broughton also qualified to go to the national competition with his first place finish at the regional Mead paper competition.

Presentations

Bryan A. Hartnagel presented the lecture, “Moment-Rotation of High Performance Steel (HPS) I-Girders,” at the AISI and AASHTO T-14 Steel Bridge HPS Design Advisory Group Semi-Annual Meeting in Jackson, Wyo., August 7, 2001.

Other Activities

October 2001. ASCE presentation to Rocky Mountain High School on what is civil engineering. There was a 15 minute initial presentation followed by about eight interactive stations where the students participated in all areas of civil engineering (i.e., flume, quicksand, strain gaged beam, etc.)

March 2002. ASCE made a similar presentation to the Fort Collins High School.

Each event had 80-100 students.

Faculty Activities

New Faculty

Kellee Kruse is a research assistant with the North Dakota Department of Transportation Support Center, NDSU. She received her bachelor's degree in management information systems at NDSU in May 2002.

A component of the Upper Great Plains Transportation Institute, DOTSC encourages the link between students and professional engineers serving the transportation industry. The Center employs students from Civil Engineering and Business Administration who are interested in becoming transportation professionals.

Her research interests include transportation maintenance management, geographical information systems, global positioning systems and workforce productivity. Papers in progress reflecting her major program activities and research activities are "Leveraging Technology Investments – Integration of GPS, GIS and Maintenance Management" and "Asset Management of Roadway Signs Through Advanced Technology."

Other Activities

National Transportation Week

The UGPTI once again hosted a luncheon for about 12 NDSU faculty in recognition of National Transportation Week. Departments represented were Agribusiness and Applied Economics, Construction Management, Civil Engineering, Computer Science, Industrial Manufacturing and Engineering, the College of Business Administration. David Berg, American Crystal Sugar Co. was the keynote speaker. He discussed the critical role of transportation in the procurement and inbound movement of sugar beets from fields to piling stations and plants; and the outbound movement of refined sugar products to markets in North Dakota.

National Ag Transportation Forum

The Upper Great Plains Transportation Institute, along with the USDA, USDOT and the American Association of State Highway and Transportation Officials, in cooperation with the Council of University Transportation Centers, sponsored a National Forum on Agricultural and Transportation Linkages, May 17 and 18, 2002 in Fargo, ND. Approximately 80 representatives from business, government and the research community attended the Forum to discuss assessing the importance of transportation to major industrial sectors of the U.S. economy.

Workshops • Conferences • Presentations • Short Courses

2002

Gutkowski, R.M., J. Balough, M. Wieligmann, and Dr. Peter Haller of the Technical University of Dresden-Germany. "Stress-Strain Behavior of Dowel Connections for Partially Composite Wood-Concrete Floor and Deck Specimens." Presented within the 2nd Material Specialty Conference at the 2002 AnnualConference of the Canadian Society of Civil Engineers in Montreal, Canada, June 2002. (CSU)

Gutkowski, R.M., J. Balough, C. Rogers, Dr. Ruy SaRibeiro of the National Institute for Amazonian Research, Brazil. "Laboratory Tests of Deep Composite Wood-Concrete Beam Specimens." Presented within the 4th Structural Specialty Conference at the 2002 Annual Conference of the Canadian Society of Civil Engineers in Montreal, Canada, June 2002. (CSU)

Lantz, Brenda, *"An Analysis of the Use of CMV Driver Traffic Conviction Data to Better Identify High Safety Risk Motor Carriers."* Transportation Research Board Annual Meeting, January 12-17, 2002. (NDSU)

Lantz, Brenda, *"An Analysis of the Use of CMV Driver Traffic Conviction Data to Better Identify High Safety Risk Motor Carriers."* International Truck & Bus Safety Research & Policy Symposium April 2-5, 2002. (NDSU)

Lantz, Brenda, *"An Analysis of the Use of CMV Driver Traffic Conviction Data to Better Identify High Safety Risk Motor Carriers."* Network of Employers for Traffic Safety Annual Meeting, May 13-15, 2002. (NDSU)

2001

Gutkowski, R.M., A.M.T. Shigidi, A.V. Tran, and M. Peterson. Field Studies of a Strengthened Timber Railway Bridge, Transportation Research Record No. 1770 Design of Structures 2001, Journal of the Transportation Research Board, National Research Council, Washington, DC. (CSU)

Gutkowski, R.M., J. Balogh, A. Shigidi. "Tests and Analysis of a Full-Scale Timber Trestle Bridge Chord," Proceedings, Innovative Wood Structures and Bridges, IABSE, Lahti, Finland.(CSU)

Gutkowski, R.M., J. Balogh. "Refined Modeling of Composite Wood-Concrete Beam and Deck Specimens," Proceedings, 9th International Conference and Exhibition in Structural Faults and Repair – 2001, ASCE, London, UK. (CSU)

Gutkowski, R.M., J. Balogh. "Refined Load Tests and Analysis of a Timber Trestle Railroad Bridge Specimen," Proceedings, 9th International Conference and Exhibition in Structural Faults and Repair – 2001, ASCE, London, UK. (CSU)

Lantz, Brenda, *"The Roadside Inspection Selection Systems (ISS) for Commercial Vehicles, and ISS2: The Integration of SafeSat into the ISS."* West Virginia Traffic Safety Conference, October 22-24, 2001. (NDSU)

Radford, D., D. Vangoethem, R. Gutkowski, and M. Peterson. "Composite Repair of Timber Bridges," Proceedings, 9th International Conference and Exhibition in Structural Faults and Repair – 2001, ASCE, London, UK. (CSU)