U.S. Department of Transportation
Research and Innovative Technology Administration
University Transportation Center Grant Agreement

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DTRT13-G-UTC38, Mod 1
Mountain-Plains Consortium, North Dakota State University
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North Dakota State University
Upper Great Plains Transportation Institute
NDSU Dept. 2880, P.O. Box 6050, Fargo, ND 58108-6050

Grant period: October 1, 2013 – September 30, 2017

Reporting Period End Date: September 30, 2014
Semi-Annual PPPR#2

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1. Accomplishments: What was done? What was learned?

a. What are the major goals of the program?

The overall objectives are to: (1) conduct basic and applied research, the products of which are judged by peers or other experts in the field of transportation to advance the body of knowledge in transportation; (2) offer an education program in transportation that includes multidisciplinary course work and participation in research; (3) conduct workforce development activities and programs to expand the workforce of transportation professionals; and (4) provide an ongoing program of technology transfer to make transportation research results available to potential users in a form that can be readily used. Other program goals are to select projects and activities using peer review principles and procedures and client input that: (1) address the Secretary's five strategic goals, and (2) leverage UTC funds with matching funds from state and local governments and private industry. The chief operational goals are to make important contributions to research and technology transfer in key areas related to the Secretary's goals of State of Good Repair, Safety, and Economic Competiveness, while addressing critical issues of the region and stakeholder groups.

b. What was accomplished under these goals?

i. Project Selection

More than 24 research projects were selected for the 2013-2014. Projects have been selected for the original grant, while projects are still being submitted for the Modification 1 to the original grant. Thus the peer review process is ongoing for possible selection. The projects reflect substantial input and matching resources from state departments of transportation and MPOs in the region. Collectively, this set of projects addresses all five of the Secretary's strategic goals and several of USDOT's requested emphasis areas under State of Good Repair—e.g., (1) bridge condition monitoring, (2) locating critical infrastructure defects, (3) identifying tools to prevent and detect corrosion in transportation infrastructure, (4) analytical tools for infrastructure performance management, and (5) methods and criteria to measure performance of new materials and methods. Other research projects are related to the Secretary's strategic goals of Safety, Economic Competiveness, Livable Communities, and Environmental Sustainability. MPC Projects selected under this grant include; MPC-446 through MPC-469.

Table 1: MPC Research Projects Most Directly Correlated with Safety

1. MPC-453: Speed Selection Behavior during Winter Road Conditions
2. MPC-454: Regional Implementation of Tribal Transportation Safety Program
3. MPC-455: Why Are Bike-Friendly Cities Safer for All Road Users?
4. MPC-457: Tribal Emergency Preparedness Planning
5. MPC-458: Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling
6. MPC-460: Technology and Workforce Development for Remote Sensing of the Transportation Infrastructure
7. MPC-461: Analytical Modeling for Progressive Failure Assessment of Curved and Skewed Highway Bridges Subjected to Seismic Hazards

8. MPC-465: Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges
9. MPC-467: Self-Regulation and Distraction
10. MPC-469: Improving Efficiency and Reliability of Bus Rapid Transit

Table 2: MPC Research Projects Most Directly Correlated with State of Good Repair

1. MPC-446: A Modified Approach for Predicting Fracture of Steel Components under Combined Large Inelastic Axial and Shear Strain Cycles
2. MPC-447: Post-Fire Ground Treatments for Protection of Critical Transportation Structures
3. MPC-448: Reducing Flood Vulnerability of Communities with Limited Road Access by Optimizing Bridge Elevation
4. MPC-449: Determining the Uncertainty in the Current Condition of Bridges for Use in Risk Based Inspection and Management
5. MPC-450: Using Building Information Modeling to Track and Assess Structural Condition
6. MPC-451: Assessing the Cost-Effectiveness of Wyoming's CMAQ Unpaved Road Dust Suppression Program
7. MPC-452: Updating the Highway Safety Manual 2010 - Part C: Regional Consideration of the Rocky Mountains and Plain Regions
8. MPC-456: Performance of Steel Girders Repaired with Advanced Composite Sheets in a Corrosive Environment: A Multi-Physics Approach Leading to Practical Design Recommendations
9. MPC-458: Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling
10. MPC-460: Technology and Workforce Development for Remote Sensing of the Transportation Infrastructure
11. MPC-461: Analytical Modeling for Progressive Failure Assessment of Curved and Skewed Highway Bridges Subjected to Seismic Hazards
12. MPC-462: Implementation of Aerial LiDAR Technology to Update Highway Feature Inventory
13. MPC-463: Rehabilitation Project Selection and Scheduling in Transportation Networks
14. MPC-464: Development of Network-Based Measures and Computational Methods for Evaluating the Redundancy of Transportation Networks
15. MPC-465: Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges
16. MPC-468: Performance Evaluation of Highway Surface Treatments (Phase I: Short-Term Performance)
17. MPC-469: Improving Efficiency and Reliability of Bus Rapid Transit

Table 3: MPC Research Projects Most Directly Correlated with Economic Competitiveness

1. MPC-451: Assessing the Cost-Effectiveness of Wyoming's CMAQ Unpaved Road Dust Suppression Program
2. MPC-456: Performance of Steel Girders Repaired with Advanced Composite Sheets in a Corrosive Environment: A Multi-Physics Approach Leading to Practical Design Recommendations
3. MPC-460: Technology and Workforce Development for Remote Sensing of the Transportation Infrastructure

4. MPC-463: Rehabilitation Project Selection and Scheduling in Transportation Networks
5. MPC-464: Development of Network-Based Measures and Computational Methods for Evaluating the Redundancy of Transportation Networks
6. MPC-465: Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges
7. MPC-466: First and Last Mile Strategies for Transit Systems
8. MPC-468: Performance Evaluation of Highway Surface Treatments (Phase I: Short-Term Performance)
9. MPC-469: Improving Efficiency and Reliability of Bus Rapid Transit

Table 4: MPC Research Projects Most Directly Correlated with Livable Communities

1. MPC-454: Regional Implementation of Tribal Transportation Safety Program
2. MPC-455: Why Are Bike-Friendly Cities Safer for All Road Users?
3. MPC-457: Tribal Emergency Preparedness Planning
4. MPC-465: Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges
5. MPC-466: First and Last Mile Strategies for Transit Systems
6. MPC-469: Improving Efficiency and Reliability of Bus Rapid Transit

Table 5: MPC Research Projects Most Directly Correlated with Environmental Sustainability

1. MPC-447: Post-Fire Ground Treatments for Protection of Critical Transportation Structures
2. MPC-458: Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling
3. MPC-460: Technology and Workforce Development for Remote Sensing of the Transportation Infrastructure
4. MPC-469: Improving Efficiency and Reliability of Bus Rapid Transit

ii. Programmatic Milestones

In addition to the programmatic milestones described below, several milestones embedded within individual projects have been achieved. Most of the research projects call for literature reviews. The literature reviews for those projects with the earliest starts are substantially complete. Interim reports are not required after the literature review stage. So, no publications have been produced at this time. At this time, all projects are on schedule to be completed as planned during the program period.

The accomplishments to date are summarized in Table 6 by reference to milestones.

Table 6: Program Milestones

Milestone Event	Description	Start Date	End Date
Development of Proposal Guidelines	Proposal guidelines were developed by the director, in consultation with other consortium members, to ensure a consistent solicitation and project selection process that facilitates peer review and links program activities to the Secretary's strategic goals. Similar but different guidelines were developed for education, workforce development, and technology transfer projects, to reflect the differences in tasks and outcomes associated with these projects. The proposal guidelines and related information have been posted on the Center's webpage.	09/1/2013	09/15/2013
Call for Proposals	The solicitation of proposals occurred on each university campus, using proposal guidelines developed by the director. Modification 1 call for proposals.	09/15/2013 05/19/2014	11/15/2013 09/19/2014
Execution of Grant Agreement	The grant was received from RITA and executed by NDSU's Sponsored Programs office. All of the necessary internal accounting and financial procedures were established, including subcontract agreements with consortium universities. Modification 1 execution	11/08/2013 05/19/2014	11/08/2013 05/19/2014
Center Directory	A directory of key center personnel was completed and published on the center's web page.	12/15/2013	12/15/2013
Center Webpage	The MPC webpage was updated and is fully functional for the current grant period	12/15/2013	12/15/2013
UTC/CUTC Meeting	The director and administrative staff attended the UTC/CUTC meeting at TRB and received guidance from RITA regarding the forthcoming grant.	01/11/2014 06/02/2014	01/16/2014 06/05/2014
Peer Review of Proposals	All project proposals were subjected to external and internal peer review.	01/15/2014 05/19/2014	03/15/2014 12/30/2014

Primary Focus	MPC's proposal targets the following MAP-21 research and technology deployment objectives under the goal of Improving Infrastructure Integrity: A) increase the reliability of life-cycle performance predictions used in infrastructure design, construction, and management; B) improve the ability of transportation agencies to deliver projects that meet expectations for timeliness, quality, and cost; C) reduce user delay attributable to infrastructure system performance, maintenance, rehabilitation, and construction; D) improve highway condition and performance through increased use of design, materials, construction, and maintenance innovations; and E) study vulnerabilities of the transportation system to seismic activities and extreme events and methods to reduce those vulnerabilities.	03/15/2014	12/31/2014
Selection of Projects	Projects were selected from the proposals received and awards were made to principal investigators, based on the peer reviews of proposals, stakeholder commitments, and the overall availability of funds.	03/15/2014 09/19/2014	06/15/2014 12/30/2014
Posting of Projects	The selected projects were posted on the MPC webpage and added to the Research in Progress database.	05/15/2014 09/19/2014	08/15/2014 12/30/2014
Site Visit	A site visit to all MPC Universities.	06/01/2014	06/01/2015

Table 7: MPC Research Proposal Guidelines for Faculty

Title	Provide a title that is descriptive of the project and includes key terms that will facilitate internet and library searches for the project.
Universities	If the project is a multi-university proposal, list each university involved.
Principal Investigators	If the project is a multi-university proposal, list a principal investigator from each university, with the university affiliations denoted in parentheses.
Research Needs	Provide a statement of the important issues and problems that give rise to the need for the project, including a brief literature review (if appropriate) that summarizes the state of knowledge in the subject area and identifies the knowledge gaps the project seeks to fill. It must be clear from the description that there are compelling needs for the study and it will address issues of national and regional importance.

Research Objectives	Provide a clear statement of the research objectives, including any hypotheses to be tested. At least some of the objectives must be measurable—i.e., at the conclusion of the project, it must be possible to ascertain whether the stated objectives have been achieved.
Research Methods	Provide a sufficient description so that reviewers can assess the appropriateness of the research approach and methods and the quality and reliability of data, including descriptions of any mathematical, statistical, operations research, and simulation techniques to be used, as well as surveys, lab tests, and field data.
Expected Outcomes	Provide a description of the expected outcomes in terms of potential findings and impacts, including advances in modeling, practices, and procedures; implications for future research; and how the results of the project can be used by practitioners. Describe any tangible products beyond the research report, including prototype software, equipment, guidebooks, or instructional manuals that may emanate from the project.
Relevance to Strategic Goals	Describe how the proposed project and its expected outcomes are related to one or more of the following goals: State of Good Repair, Safety, Economic Competiveness, Environmental Sustainability, and Livable Communities.
Educational Benefits	If applicable, describe how students will be involved in the project and any expected classroom or instructional uses of procedures, examples, or discoveries derived from the project.
Work Plan	Provide a description of the major tasks or steps in the project, along with an expected timeline. The tasks should be numbered and an expected completion date assigned to each one. Instead of calendar dates, the timeline should be expressed in months from the starting date. Typically, a work plan includes steps such as the completion (and testing) of questionnaires, lab tests, field tests or data collection efforts, input or focus group meetings, and critical steps such as the initial runs and calibrations of models. A draft report and other milestone events should be included, as well as a technology transfer plan that includes a research seminar via the Transportation Learning Network and/or plans to collaborate with an LTAP or TTAP center (if appropriate). If the research is basic in nature, other dissemination methods may be substituted for the TLN, LTAP, or TTAP distribution channels.
Project Cost	List the amount of MPC funds requested, the amount of the expected matching contributions, and the sources of the matching resources, including all agencies expected to contribute funds or in-kind resources to the project. MPC research projects require at least a dollar-for-dollar match. However, other federal funds (e.g., federal funds other than UTC funds) cannot be used as match, except for state planning and research funds and LTAP funds, which are eligible under exclusionary provisions of the authorizing legislation. The definition of "nonfederal funds" is based on the original source of funds.

Potential Peer Reviewers	Provide the complete contact information of at least three persons who are qualified to review and critically assess the proposal, including the person's name, position title and organization, street address, city, state, zip code, and email address. Keep in mind that peer reviewers cannot have conflicts of interests, such as those that may arise if someone stands too personally or professionally benefit from the proposed project. Peer reviewers may include professionals at federal, state, metropolitan, or local agencies, as well as university and private-sector researchers. Given that at least three completed reviews are required for a proposal to move forward in the assessment process, the submission of more than three names may expedite the time frame for approval, in the event of one or more nonresponsive reviewers.
TRB Keywords	Provide a complete list of applicable TRB keywords
References	List the major references cited in the proposal and other seminal work in the field.

iii. Educational Accomplishments

The transportation and transportation-related courses offered during Summer & Fall 2014 are listed in Table 8, organized by major subject area. In some cases, courses with the same titles were offered at more than one MPC university. In these cases, the number of courses offered is shown in parenthesis.

Table 8: Transportation and Transportation-Related Courses Offered This Period

Major Subject Area	Course Title
Engineering & Design	CE 3500 Transportation Engineering
	CEE 106 Surveying
	CEE 282 Civil Engineering Computer Aided Design
	CEE 340 Geology
	CEE 456 Reinforced Concrete Theory and Design
	CEE 447/547 Foundation Engineering
	CEE 755 Advanced Reinforced Concrete
	CEE 769 Bridge Design
	CEE 5070 Steel Design
	CEE 6130 Structural Dynamics and Seismic Design
	CEE 6140 Advanced Reinforced Concrete Design
	CIVE 302 Evaluation of Civil Engineering Materials
	CIVE 466 Design and Behavior of Steel Structures
	CIVE 566 Intermediate Structural Analysis
	CIVE 576 Engineering Applications of GIS and GPS
	CIVE 664 Mechanics of Fatigue and Fracture
	CvEEN 5510 Highway Design
Engineering & Design	CvEEN 5570 Pavement Design

Table 8: Transportation and Transportation-Related Courses Offered This Period

Major Subject Area	Course Title
	CvEEN 5920 Sustainable Materials
	CvEEN 6225 Concrete Science
	CvEEN 7920 Advanced Materials Testing
	CVEN 3602 Transportation Engineering
	CVEN 4602 Highway Engineering
	CVEN 5602 Advanced Street and Highway Design
	CVEN 5682 Pavement Design
	CVEN 5800 Highway Bridge Design
Freight & Logistics	TL 711 Logistics Systems
	TL 725 Technology Advances and Logistics
	TL 729 Adaptive Planning and Logistics Systems
	TL 731 Logistics Decision Analysis
	TRAN 4060 Transportation Marketing and Sales Tools
	TRAN 4310 Freight Transportation Systems
	TRAN 4330 Principles of Supply Chain: Management and Technologies
Planning & Environment	CEE 5240/6220 Urban and Regional Transportation Planning
	CVEN 5612 Traffic Impact Assessment
	CVEN 5460 Introduction to Sustainable Urban Infrastructures
	CvEEN 5560 Transportation Planning
	TL 752 Transportation Planning and Environmental Compliance
	URPL 5000 Planning History and Theory
	URPL 5010 Planning Methods
	URPL 5040 Urban Sustainability
	URPL 5050 Urban Development
	URPL 6300 Planning Healthy Communities
	URPL 6350 Form and Formation of Cities
	URPL 6370 Sprawl and Growth Management
	URPL 6399 Introduction to Sustainable Urban Infrastructure
	URPL 6550 Transportation Planning and Policy
	URPL 6600 Regional Planning and Economic Analysis
Public Transportation	CVEN 5800 Transit Design
	CvEEN 7590 Public Transportation
	TL 786 Public Transportation
	TRAN 4080 Transportation Law and Regulation: Domestic and International
	TRAN 4610 Passenger Transportation Systems
Traffic & Operations	CE 4530 Traffic Operation

Table 8: Transportation and Transportation-Related Courses Offered This Period

Major Subject Area	Course Title
	CE 5530 Traffic Operation
	CEE 792 Advanced Traffic Control
	CEE 5220/6220 Traffic Engineering
	CVEN 5621 Highway Capacity Analysis
	CVEN 5622 Traffic Operations and Control
	CvEEN 3520 Transportation Engineering
Transportation Safety	CVEN 5611 Traffic and Safety Data Analysis
	CvEEN 7520 Transportation Safety
	PSY 3120 Cognitive Psychology
Transportation Systems	CE 5585 Pavement Management System
	CEE 6210 Transportation Systems Analysis
	CVEN 5800 Case Studies in Sustainable Transportation
	TL 751 Transportation System Security
	TL 753 Transportation Systems Modeling
	TL 754 Urban Transportation Systems Analysis
	TL 782 Transportation Systems I
	TRAN 4310 Freight Transportation Systems
	TRAN 4320 Transportation Management, Leadership, and Values
	TRAN 4340 Supply Chain Strategy
	URPL 6555 Transportation and Land Use

Altogether, 74 transportation and transportation-related courses have been offered this reporting period, for a total of 134 total transportation courses offered this grant period. In addition to the courses listed in Table 8, foundational courses in engineering materials, mechanics, structural analysis, and geotechnical engineering were offered at most MPC universities.

iv. Workforce Development Accomplishments

Training: A list of training events provided for transportation professionals since the start of the grant is presented below.

1. Access Management Training
2. ATSSA Flagger Certification
3. ATSSA Traffic Control Technician (TCT)
4. Basics of a Good Road
5. Basic Surveying
6. Casper Safety Congress
7. Casper Temporary Traffic Control Plan
8. Cement Seminar

9. Communication Skills for Supervisors
10. EDC Exchange
11. Heavy Equipment Operations
12. Integrated Roadside Vegetation Management
13. Laramie Aggregate III
14. Laramie Asphalt III
15. Registered Storm water Inspector
16. Roadway Drainage
17. Tree trimming
18. Trenching and Shoring
19. Utah Society for Professional Engineers Annual Conference Sessions
20. Winter Road Maintenance
21. Women in Transportation: Recruitment, Retention, and Advancement

Conferences, workshops, and publications are summarized under "products."

c. How have the results been disseminated?

The results are being disseminated in a variety of ways, including: (1) workshops and conferences, (2) videoconferences, (3) online modules, (4) presentations at conferences, (5) publications, (6) webpage postings and displays, and (7) Internet-based dissemination media, including broadcast emails and webinars. Because effective starting dates of most projects were after March 30, 2014, no tangible results have been produced at this time. Therefore, we have nothing to report.

d. What do you plan to do during the next reporting period to accomplish the goals/objectives?

No changes are foreseen to the accepted plan and implementation schedule.

2. Products: What has the program produced?

a. Publications, conference papers, presentations

i. Key Conferences and Workshops

- 19th National Convention of Civil Engineering (NCCE), Khon Kaen, Thailand
- 2014 American Water Works Association Annual Conference & Exposition, Boston, MA
- 2014 Joint Western/Midwestern District ITE Annual Meeting, Rapid City, SD
- 2014 Mid- continental Traffic Research Symposium, Madison, WI
- 2014 Summer Symposium Celebrating 50 Years of Traffic Flow Theory, Portland, OR
- Active Transportation and Health Summit, Salt Lake City, UT
- Alternative Intersections and Interchanges Symposium, Salt Lake City, UT
- American Concrete Institute's Spring 2014 conventions, Reno, NV

- Annual Meeting of the Amalgamated Transportation Workers Union, Orlando, FL
- Annual Meeting of the American Association of Suicidology, Los Angeles, CA
- Annual Meeting of the ASLRRA in San Diego, CA
- Annual Meeting of the Public Rail Safety Conference, Anaheim, CA
- ASCE T & DI Conference
- ASCE Structures Congress, Boston, MA
- ASEE Annual Conference
- European Bridge and Structural Faults and Repair 15th International Conference, the Imperial College, London, UK
- Future Concrete Conference, Beirut, Lebanon
- International Conference on Sustainable Urban Transportation Research and Innovation, Suwon, Korea
- ITA Midyear Meeting, Polson, MT
- National Transportation Conference, Anchorage, AK
- Rocky Mountain Psychological Association Annual Convention, Salt Lake City, UT
- TRB Highway Safety Performance/Safety Data, Analysis and Evaluation (ANB25/ANB20) Joint Midyear Meeting, Wood Hole, MA
- Tribal Transportation Planners Workshop, Bismarck, ND
- Utah Department of Transportation Research Workshop (UTRAC)
- Women in Transportation: Recruitment, Retention & Advancement, University of Denver
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ii. Key Publications

- Li, L., Wang, J. Song, Z., Dong, Z. and Wu, B. (2014) Analyzing the impact of weather on bus ridership using smart card data. IET Intelligent Transport Systems, in press.
- Md. Razaur Rahman Shaon, Xiao Qin. Improving Crash Prediction Methods with a Generalized Additive Model. Accepted for presentation at the 93rd annual meeting of the Transportation Research Board (TRB).

- Ryu, S., Chen, A., Xu, X., Choi, K. (2014) A dual approach for solving the combined distribution and assignment problem with link capacity constraints. Networks and Spatial Economics 14(2), 245-270.
- Ryu, S., Chen, A., Choi, K. (2014) A modified gradient projection algorithm for solving the elastic demand traffic equilibrium problem. Computers and Operations Research 47, 61-71.
- Ryu, S., Chen, A., Zhang, H.M., Recker, W. (2014) Path flow estimator for planning applications of small communities. Transportation Research Part A 69, 212-242.
- Samra, Haifa, Xiao Qin, and Zhaoxiang He. Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements,

MPC-14-267. North Dakota State University - Upper Great Plains Transportation Institute, Fargo: Mountain-Plains Consortium, 2014.

- Shinstine, Debbie, and Khaled Ksaibati: Road Safety Improvement Program on Indian Reservations in North Dakota and South Dakota. 15-1877: Transportation Research Record, TRB, Recommended for publication and presentation, 2014.
- Song, Z. (2014) Transition to a transit city: case of Beijing. Transportation Research Record: Journal of the Transportation Research Board, vol. 2394, 38-44.
- Song, Z., Yin, Y., Lawphongpanich, S. and Yang, H. (2014) A Pareto-improving hybrid policy for transportation networks. Journal of Advanced Transportation, vol. 48(3), 272-286.
- Xiao Qin, Zhaoxiang He, Haifa Samra. Rural Emergency Medical Service Needs Assessment, Accepted for presentation at the 93rd annual meeting of the Transportation Research Board (TRB).
- Xiao Qin, Zhao Shen, Nadim Wehbe. Risk Analysis of Collisions Between Trucks and Interstate Overpasses. Accepted for presentation at the 93rd annual meeting of the Transportation Research Board (TRB).
- Xiao Qin, Zhao Shen, Nadim Wehbe, Shiling Pei, Zhaoxiang He. Evaluation of Truck Impact Hazards for Interstate Overpasses, Transportation Research Record 2402, pp. 1-8, 2014.
- Yao, J., Chen, A. (2014) An analysis of logit and weibit route choices in stochastic assignment paradox. Transportation Research Part B 69, 31-49.

iii. Key Conference Papers

- Bridgelall, R., "Remote Sensing of Oilfield Logistics with Unmanned Aircraft Systems," Proceedings of the Sensors 2014 Conference, June 25, 2014 (Best of Sensors 2014 Award).
- Jansuwan, S., Chen, A., Subprasom, K., Indra-Payoong, N. (2014) Assessing redundancy of freight transportation network for pre-disaster highway planning. Proceedings of the 19th National Convention on Civil Engineering (NCCE), Khon Kaen, Thailand, 14-16 May 2014.
- Wehbe, N. and Tigges, B. "Experimental Evaluation of As-Built and Retrofitted Two-Column Bridge Bents under Vehicular Collision Force at the Bent Column." European Bridge and Structural Faults and Repair 15th International Conference. Imperial College, London, UK, 2014.

iv. Key Presentations

- Jacob Humburg, Guanghui Hua. "Reduction of Turbidity in South Dakota Construction Site Stormwater Runoff Using Polyacrylamide." 2014 International Prairie Student Conference, Fargo, ND, August 6–8, 2014.
- Jansuwan, S., Chen, A., Subprasom, K., Indra-Payoong, N. (2014) Assessing redundancy of freight transportation network for pre-disaster highway planning, The 19th National Convention on Civil Engineering (NCCE), Khon Kaen, Thailand, 14-16 May 2014.

- Mulholland, R. & Sherry, P. (2014). "Being Female in the Traditionally Male Industries: Exploring the Characteristics of Women in Transportation and Engineering." A paper presented at the Rocky Mountain Psychological Association Annual Convention. Salt Lake City, Utah. April 26, 2014.
- Sherry, P. (2014). "Fatigue Countermeasures for Shortline Railroad Operations." A paper presented to the Annual Meeting of the ASLRRA in San Diego CA. April 23, 2014.
- Sherry, P. (2014). "The Impact of Suicide by Train on the Community, First Responders and Rail Workers." A paper presented at the Annual Meeting of the Public Rail Safety Conference, Anaheim, CA. April 10, 2014.
- Sherry, P. & Zucker, K. (2014). "Effects of Suicide Prevention Training On Rail Transit Workers Knowledge and Attitudes." A paper presented at the Annual Meeting of the American Association of Suicidology, Los Angeles, CA. April 10, 2014.
- Sherry, P., & Zucker, K. (2014) "The Efficacy of Pedestrian Suicide Prevention and Safety Promotion Interventions in the Public Transit Industry" A paper presented at the Rocky Mountain Psychological Association Annual Convention. Salt Lake City, Utah. April 25, 2014.
- Shinstine, D. (2014). "Indian Reservation Safety Improvement Program." Ongoing research presented to the Intertribal Transportation Association at the ITA Mid-year meeting in Polson, MT. June 5, 2014.
- Shinstine, D. (2014). "Tribal Roadway Safety Improvement Program." Ongoing research presented at the National Tribal Transportation Conference in Anchorage, AK. September 24, 2014.
- Shinstine, D. (2014). "Tribal Roadway Safety Improvement Program." Ongoing research presented at the Northern Plains Tribal Technical Assistance Program Tribal Transportation Planners Workshop in Bismarck, ND. September 3, 2014.
- Song, Z. (2014). "Innovative Pricing Strategies for Traffic Congestion Mitigation." College of Transport and Communications Seminar, Shanghai, China. August 6, 2014.
- Wehbe, N. and Pauly, T. "Square SCC Bridge Columns under High Lateral Drifts." American Concrete Institute Spring 2014 Convention, Reno, NV, March 24, 2014.
- Wehbe, N. and Tigges, B., and Boudaqa, A. "Vulnerability of Concrete Bridge Columns to Truck Collision Loads." Future Concrete Conference. Beirut, Lebanon, June 19, 2014.
- Wehbe, N. and Tigges, B. "Experimental Evaluation of As-Built and Retrofitted Two-Column Bridge Bents under Vehicular Collision Force at the Bent Column." European Bridge and Structural Faults and Repair 15th International Conference. Imperial College, London, UK, July 8, 2014
- Zhaoxiang He, Xiao Qin. "Using GIS to Evaluate Rural Emergency Medical Services (EMS)." 2014 Mid-continental Traffic Research Symposium, Madison, Wisconsin, August 21-22, 2014.

- Zlatkovic, M. "Performance Matrix for Evaluating Alternative Designs." Alternative Intersections & Interchanges Symposium, Salt Lake City, UT, July 20-24, 2014.
- Zucker, K., Bondanza, A., & Sherry, P. (2014). “"The Effects of Shift Work on Women’s Health." A paper presented at the Annual Meeting of the Amalgamated Transportation Workers Union, Orlando, FL. May 23rd, 2014.

v. Other Items Produced During this Period

- Bridgelall, R., Rafert, B.J., Tolliver, D., “Multi-resolution Hyperspectral Remote Sensing,” research paper in progress
- Bridgelall, R., Rafert, B.J., Tolliver, D., “Utilities of Hyperspectral Image Analysis in Transportation,” research paper in draft for review
- Final drafts a Master's Thesis entitled, "Using Building Information Modeling to Track and Asses the Structural Conditions of Bridges” and a journal paper nearing submission have been produced.
- Rachel Mulholland's thesis on women’s attitudes towards entering and remaining in the transportation workforce has been very helpful and well received.
- Research References for Hyperspectral Imaging Applications in Transportation, webpage development in progress
- The University of Denver UTC has been working on developing and perfecting a "Training program for the prevention of railroad Trespasser Fatalities" to assist employees of railroad companies and agencies in preventing trespasser fatalities. This training program is currently in an online form, but not accessible to the general public. But will be made available to interested parties.

b. Books or other non-periodical, one-time publications

Nothing to report at this time.

c. Website(s) or other internet site(s)

The MPC website is fully operational at: http://www.mountain-plains.org/

The MPC Center Director can be found at: http://www.mountain-plains.org/resources/downloads/KeyCenterDirectory.pdf?year=2014

d. Technologies or Techniques

Nothing to report at this time.

e. Inventions, patent applications, and/or licenses?

Nothing to report at this time.

f. Other

Nothing to report at this time.

3. Participants and Other Collaborating Organizations: Who has been involved?

a. What individuals have worked on the program?

The principle investigators, faculty, and administrators participating in MPC projects:

Eight principle investigators, faculty, and administrators participating in MPC projects at **Colorado State University** are: Rebecca Atadero, CSU MPC Program Director and PI; Christopher Bareither, PI; Paul Heyliger, Co-PI; John W. van de Lindt, PI; Hussam Mahmoud, PI; Suren Chen, PI; Mehmet Ozbek, Co-PI; and Caroline Clevenger, Co-PI. In addition, seven graduate students are working on MPC research projects at **Colorado State University**: Doctorate Students- Luke Chen, Yufen Zhou and Kirsten Peterson, Masters Students- Brendan McGuire, Patrick Sanders, Taylor Ray and David Turner.

Three principle investigators, faculty, and administrators participating in MPC projects at **North Dakota State University** are: Bruce J. Rafert, PI; Raj Bridgelall, Co-PI; Eunsu Lee, PI and Jon Mielke, Faculty. Others participating in MPC projects at **North Dakota State University** include Dick Winchell, Eastern Washington University and Graduate Research Assistant Ashley Murphy, Eastern Washington University.

Five principle investigators, faculty, and administrators participating in MPC projects at the **University of Colorado Denver** are: Wesley Marshall, MPC Director and PI; Carolyn McAndrews, Co-PI; Bruce Janson, Co-PI; Jimmy Kimm PI and Krista Norback, postdoctoral student and Co-PI. In addition, four graduate students are working on MPC research projects at the **University of Colorado Denver**: Doctorate Student- Nick Ferenchak; Masters Students- Jennifer Niemann, Ibrahim Bumadian and Kun Jiang.

Seven principle investigators, faculty, and administrators participating in MPC projects at the **University of Utah** are: Richard J. Porter, MPC Program Director; Milan Zlatkovic, PI; Cathy Liu, PI; David Sanbonmatsu, PI; David Strayer, Co-PI; Pedro Romero, PI; and Joel Cooper, technical advisor. In addition, eight graduate and undergraduate students are working on MPC research projects at the **University of Utah**: Doctorate Students- Jeff Taylor, Arwen Behrends, Yu Song, Kiavash Fayyaz, Masters Students- Margaret Corrigan, Jem Locquaio, Daniel Sudbury, Undergraduate Students- Dawn Sweeney.

Three principle investigators, faculty, and administrators participating in MPC projects at the **University of Wyoming** are: Khaled Ksaibati, PI; Mohamed Ahmed, PI and Rhonda Young, PI. In addition, three graduate students are working on MPC research projects at the **University of Wyoming**: Masters Students- Chris Chamberlin, Rameshwor Chalise, and Sandeep Thapa. Others participating in MPC projects at the **University of Wyoming** include Dennis Trusty, Director NP TTAP and George Huntington, Wyoming T^2/LTAP Center.

Five principle investigators, faculty, and administrators participating in MPC projects at **Utah State University** are: Ziqi Song, PI; Kevin Heaslip, Co PI and Anthony Chen, PI. In addition, two graduate students are working on MPC research projects at **Utah State University**: Doctorate Student- Seungkyu Ryu, Masters Student- Yi He.

b. What other organizations have been involved as partners?

1. AAA Foundation for Traffic Safety
2. Amalgamated Transportation Workers Union
3. American Short Line Railroad Association
4. Campbell County Road and Bridge Department
5. Colorado Department of Transportation
6. Converse County Road and Bridge Department
7. Crook County Road and Bridge Department
8. Denver - RTD, Regional Transportation District
9. Faculty of Logistics, Burapha University, Chonburi, Thailand
10. Fehr & Peers
11. GREENbike
12. Inberg Miller Engineers, Casper WY
13. Key Laboratory of Road and Traffic Engineering, Tongji University, Shanghai, China
14. LA Metro Rail
15. Lincoln County Road and Bridge Department
16. Metrolink - Los Angeles, SCRRA
17. Mineta Transportation Institute
18. Northern Plains Tribal Technical Assistance Program
19. Northwest Tribal Technical Assistance Program
20. Sisseton Wahpeton Oyate Reservation
21. Standing Rock Sioux Tribe Indian Reservation
22. Teton County Road and Bridge Department
23. The Colorado Department of Transportation
24. Tribal Transportation Program - Federal Highway Administration
25. Union Pacific Railroad
26. Utah Department of Transportation (UDOT)
27. Utah Transit Authority (UTA)
28. Virginia Tech
29. Wyoming Department of Transportation
30. Yankton Sioux Tribe

c. Have other collaborators or contacts been involved?

The list of collaborating organizations in 3(b) is complete, as of this grant period.

4. Impact

Nothing to report at this time.

5. Changes/Problems

No changes are foreseen at this time.

5a. Additional Information Regarding Products and Impacts

Nothing to report at this time.

PROGRAM OUTPUTS: Nothing to report at this time.

PROGRAM OUTCOMES: Nothing to report at this time.

PROGRAM IMPACTS: Nothing to report at this time.

6. SPECIAL REPORTING REQUIREMENTS: None