

## TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Iowa DOT

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

<b>Transportation Pooled Fund Program Project #</b> TPF-5(295)	<b>Transportation Pooled Fund Program - Report Period:</b> Quarter 1 (January 1 – March 31, 2015)  <input checked="" type="checkbox"/> Quarter 2 (April 1 – June 30)  Quarter 3 (July 1 – September 30)  Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> Midwest Smart Work Zone Deployment Initiative		
<b>Name of Project Manager(s):</b> Dan Sprengeler	<b>Phone Number:</b> 515-239-1823	<b>E-Mail</b> Dan.Sprengeler@dot.iowa.gov
<b>Lead Agency Project ID:</b> Keith Knapp	<b>Other Project ID (i.e., contract #):</b> Addendum 189	<b>Project Start Date:</b> July 1, 2014
<b>Original Project End Date:</b> June 30, 2020	<b>Current Project End Date:</b> June 30, 2019	<b>Number of Extensions:</b> None

Project schedule status:

On schedule     
  On revised schedule     
  Ahead of schedule     
  Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
\$455,000 (committed)	\$7,6101.73	0

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$31,339.53		0

**Project Description:**

The Midwest Smart Work Zone Deployment Initiative (MwSWZDI) was initiated in 1999 as a Federal Highway Administration (FHWA) Pooled Fund Study intended to coordinate and promote research among the participating states related to safety and mobility in highway work zones.

The program is an ongoing cooperative effort between State Departments of Transportation, universities, and industry. The studies completed have consisted of evaluations of various work zone related products, various innovative topics, and several synthesis studies. Completed reports and descriptions of ongoing projects can be obtained at the Iowa State University's Institute for Transportation (InTrans) website ([www.intrans.iastate.edu/smartwz/](http://www.intrans.iastate.edu/smartwz/)) link to the Smart Work Zone Deployment Initiative. InTrans currently operates as the program manager of the pooled fund efforts and completes administrative tasks related to request for ideas and proposals, meetings, project files, quarterly reports, and recommending reimbursement.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):****Quarter Ending June 30, 2015 (Overall)**

During this quarter we communicated with a number of principal investigators. Resolved some progress issues and continued with all four program Year 2014 project contracts. In addition, all four Year 2015 contracts are in place and progressing (see below). A request for problem statements related to Program Year 2016 has been released and the deadline is in July. The progress for all Year 2014 and 2015 projects are summarized below (some of the 2015 projects have just recently started). All the projects for this pooled fund under account number TPF-5(081) have been completed.

The pooled fund also supported a Smart Work Zone research focus group in St. Joseph, MO on April 15, 2015 (14 researchers, DOT staff, and FHWA staff attended). The information from that meeting is contained in the minutes. The pooled fund Board also had a meeting on April 16, 2015 at the same venue. Eleven Board members attended and three researchers presented their ongoing or final project results. The Board would like to have more focus group meetings and face-to-face Board meetings.

The following is a summary of accomplishments from April to June, 2015 for the Year 2014 and 2015 individual research projects under fund account TPF-5(295).

**2015 Program Projects**

- Evaluation of Alternative Work Zone Signing, University of Wisconsin – Madison, Madhav Chitturi as PI.

This project officially started June 1, 2015. A technical advisory committee has been developed. The kickoff meeting has been scheduled for July 9, 2015. This project is 0% complete. It is expected to end by August 31, 2016.

- Developing a Data Driven Traffic Impact Assessment Tool for Work Zones, University of Missouri-Columbia, Praveen Edara as PI.

This project is officially started June 1, 2015. A project TAC has been identified and a kickoff meeting scheduled for early July. Data pertaining to work zones in St. Louis, travel time probe data, and detector data (speeds, volume) are being acquired for developing the model. The literature review

has begun and will focus on studies that developed traffic impact analysis tools for work zones using real-world traffic data. The project is approximately 5% complete. It is expected to end by December 31, 2016.

- Orange Work Zone Pavement Marking Midwest Field Test, University of Wisconsin – Madison, Madhav Chitturi as PI.

This project started March 13, 2015. A technical advisory committee was developed and a kick-off meeting held in May. The literature review is ongoing and information is being collected on standards and specifications of different agencies and also material specifications from different vendors. The project is behind the original proposed schedule because of delays in setting up the project, technical advisory committee meeting, field test site selection, and staff turnover at Wisconsin and Iowa DOTs. The project is about 5% complete. It is expected to end by September 30, 2016.

- Setting Work Zone Speed Limits, Iowa State University, Anuj Sharma as PI.

The literature review on existing research and department of transportation policies on setting the work zone speed limits has been completed. A list of existing speed limit policies of SWZDI and other nearby states were obtained using an online search. The documents are currently being reviewed. A survey will be designed based on the insights gained during this review. A TAC meeting was held on March 09, 2015. The meeting was to get TAC inputs on project scope and discuss the data collection sites. Based on the TAC inputs it was decided to choose the data collection sites from the 2014 and 2015 Traffic Critical Projects in Iowa. A list of these projects was created and detailed information about the projects were collected. The reason to focus on 2014 and 2015 Traffic Critical Projects was made to ensure the high quality of data regarding speed, crash, and work zone activities collected for the projects. INRIX data was downloaded for 2014 and 2015 Traffic Critical Projects. The data is currently be explored to find important trends and anomalies using data visualization techniques. This project started March 15, 2015 and is approximately 15% complete. It is expected to end on May 31, 2016.

#### **2014 Program Projects**

- Work Zones in Innovative Geometric Designs Locations, University of Missouri, Henry Brown as PI.

Additional plan samples have been, including plan samples for MUTs. To date, 38 plan samples have been received. Project plans were received from the City of Columbia, Missouri; Kentucky Transportation Cabinet (KYTC); Minnesota DOT (MnDOT); MoDOT; Engineering Design Source, Inc.; Ohio DOT (ODOT); Omni Means; Washington County, Minnesota; Pennsylvania DOT (PennDOT); Utah DOT (UDOT); Crawford, Murphy and Tilly; New Mexico DOT (NMDOT); City of Tucson, Arizona; and PSOMAS. These plans have been reviewed to gain insight into the different methods that have been used for maintenance of traffic on projects with innovative geometric designs. Additional phone interviews were conducted. To date, 20 phone or in-person interviews have been conducted with personnel from DOTs, local agencies, and consultants from the following states: Arizona, Georgia, Indiana, Kentucky, Maryland, Minnesota, Missouri, Ohio, Pennsylvania, and Utah.

Development of the Maintenance of Traffic (MOT) Phasing diagrams for both initial construction and maintenance of roundabouts, SPUIs, DDIs, RCUTs, MUTs, and DLTs is in progress. There are 37 drawings for initial construction and 30 drawings for maintenance. Descriptive notes to these drawings are in the process of being added. Case studies for the final report are in the process of being developed.

Draft sections for the draft final report been developed for the literature review, methodology, and results. The project is currently 80 percent complete and had an original end date of June 30, 2015. A three month no-cost extension to September 30, 2015 has been granted.

- Safety Assessment Tool for Construction Work Zone Phasing Plans, University of Missouri, Henry Brown as PI.

Additional responses were received from the survey to obtain information regarding best practices of state DOTs and other agencies for incorporating safety analysis into the process of evaluating construction phasing alternatives. To date, 27 survey responses have been received. One additional response to the separate survey for contractors was received. To date, 6 survey responses have been received for the contractor survey. The survey was also sent to organizations such as Associated General Contractors of St. Louis, Heavy Contractors Association of Kansas City, and the Wisconsin Transportation Builders Association.

Coordination is in progress with Kansas, Wisconsin, and Ohio to obtain data regarding work zones and crashes to supplement the Missouri data for the project. Data for additional work zones were requested from the Ohio Department of Transportation (ODOT). A teleconference with the developer of the Wisconsin Lane Closure System (LCS) was held to discuss the possible use of the LCS as a source of work zone information. The process of obtaining work zone and crash data from the MoDOT Transportation Management System (TMS) is in progress.

The data mining process is ongoing to understand the difference between crash frequencies with and without the presence of a work zone for freeway segments. This comparison is being performed for different crash severity categories (PDO, MI, DI, F). An analysis of general trends such as urban and rural crashes has been performed. There are many fluctuations in the differences between cases with and without the presence of a work zone. The tree based classification and modeling process is ongoing to divide the population of work zones into subcategories with similar members based on characteristics such as work zone duration and length. The project currently 55 percent complete and has an end date of December 31, 2015.

- Length of Need for Free-Standing, F-Shape, Portable 12.5' Concrete Protection Barrier, University of Nebraska, Ron Faller as PI

During this quarter, MwRSF completed simulation of impacts on the upstream and downstream ends of the 200 ft long barrier system to determine the length of need. Simulations were conducted at seven impact points on the upstream of end of the barrier system and eight impact points on the downstream end of the barrier system. These simulations were then reviewed to determine where the length of need starts and ends for the long system. Review of the beginning of length-of-need models found that the simulations models predict vehicle redirection for impacts as far upstream as the first barrier segment. However, barrier system deflections, joint loads, and vehicle stability tended to become significantly worse when impacting on the first three barrier segments downstream of the end of the system. Similarly, when the simulations of vehicle impacts for determination of the end of length-of-need were reviewed, impacts as far downstream as the second to last barrier segment displayed the potential for vehicle redirection. Impact on the last barrier segment partially redirected the vehicle but demonstrated more of a gating behavior. Barrier system deflections, joint loads, and vehicle stability tended to become significantly worse when impacting on the last three barrier segments downstream of the end of the system.

Based on these results, it was determined that three barriers will be recommended for both the beginning and the end of length-of-need for the TCB system, until the results can be further discussed with the TAC. The next step of the simulation analysis was to conducted impacts at the selected beginning and end of length-of-need lengths for a reduced system length in order to verify that the length-of-need definitions work for shorter lengths and to examine the minimum potential length of the TCB system. Simulation models are currently being evaluated using a seven barrier long TCB system. The results of these models have not be evaluated. These findings will be discussed in detail at the upcoming July 21st TAC meeting in order to determine what scenarios the TAC believe best fit their needs and are desired to be investigated through full-scale testing. This project is 40 percent complete and has an end date of December 31, 2015.

- Development of a TL-3 Transition between Temporary Concrete Barrier and Guardrail, University of Nebraska, Ron Faller as PI

MwRSF previously submitted the final CAD details for the first full-scale test of the guardrail to PCB transition system to the field crew at the MwRSF Outdoor Test Facility for placement into the testing que. All of the materials and hardware for the testing have been ordered and/or fabricated. It is anticipated that the testing of the system will be conducted in the 3rd quarter of 2015.

The first full-scale test will be MASH test designation no. 3-21, which will evaluate the transition from the guardrail to the PCB system by impacting upstream of the connection between the two systems. The test matrix is listed below.

1. Test no. 3-21 - Impact of the 2270P vehicle on the centerline of the fifth guardrail post upstream from the end-shoe attachment at a speed of 62 mph and an angle of 25 degrees.
2. Test no. 3-21R - Reverse direction impact of the 2270P vehicle 12 ft. – 6 in. upstream from the end-shoe attachment at a speed of 62 mph and an angle of 25 degrees.
3. Test no. 3-20 - Impact of the 1100C vehicle on the critical impact point of the guardrail to PCB transition at a speed of 62 mph and an angle of 25 degrees. MASH procedures and engineering analysis will be used to determine the critical impact point.

It is anticipated that the first full-scale test of the guardrail to PCB transition will be conducted in the upcoming quarter. The actual date for the full-scale crash testing will be determined as soon as resources are available. However, completion of the testing is dependent on the schedule of existing crash testing commitments and may not occur if projects with higher priority in the testing que prevent the test from being completed. This project is 20 percent complete and has an end date of December 31, 2015.

**Anticipated work next quarter:**

Work will continue on contracted projects. Several contracted projects, funded by the old pooled fund account (see the other quarterly report) were finalized this quarter. We will continue to work with the principal investigators of the Program Year 2014 project and the new principal investigators for Program Year 2015. In the next quarter the last Program Year 2015 project contract will be finalized and all Program Year 2014 and 2015 projects will continue.

**Significant Results:**

We will continue with all 2015 projects. We completed a focus group meeting as well as a board meeting. We started on 2016 problem statements.

**Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).**

Currently there are no problems to report with the administrative contract. Any issues that have come up with the individual projects that may impact schedule or budget are resolved on a case by case basis.

**Potential Implementation:**

None at this time. Projects funded under this account number for Program Year 2014 began about 9 months ago and two Program Year 2015 projects just recently started. The other two selected for Program Year 2015 have not yet started.

