

## TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Wisconsin 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.*

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|--|--|---|
| <b>Transportation Pooled Fund Program Project #</b><br><b>TPF-5(432)</b>   | <b>Transportation Pooled Fund Program - Report Period:</b><br><input checked="" type="checkbox"/> Quarter 1 (January 1 – March 31)<br><input type="checkbox"/> Quarter 2 (April 1 – June 30)<br><input type="checkbox"/> Quarter 3 (July 1 – September 30)<br><input type="checkbox"/> Quarter 4 (October 1 – December 31) |   |
| <b>Project Title:</b><br><b>Bridge Element Deterioration for Midwest States</b>  |  |   |
| <b>Name of Project Manager(s):</b><br>William Oliva, P.E., Wisconsin DOT (Lead Agency)<br><br>Jonathan Groeger (Wood, performing organization) | <b>Phone Number:</b><br>608-266-0075<br><br>301-210-5105 x19   | <b>E-Mail</b><br>William.Oliva@dot.wi.gov<br><br>Jonathan.Groeger@woodplc.com |
| <b>Lead Agency Project ID:</b><br>0092-19-40   | <b>Other Project ID (i.e., contract #):</b><br>N/A   | <b>Project Start Date:</b><br>December 3, 2019                                |
| <b>Original Project End Date:</b><br>December 2, 2021  | <b>Current Project End Date:</b><br>December 2, 2021   | <b>Number of Extensions:</b><br>0   |

Project schedule status:

X 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 |
|----------------------|--------------------------------|--------------------------------------|
| \$399,317.00         | \$232,270.19                   | 58%                                  |

Quarterly Project Statistics:

| Total Project Expenses and Percentage This Quarter | Total Amount of Funds Expended This Quarter | Total Percentage of Time Used to Date |
|--|---|---------------------------------------|
| \$58,129.25 / 15%                                  | \$58,129.25                                 | 67%                                   |

## **Project Description:**

### **Scope**

The objective of this pooled fund research is to have multiple Midwest DOTs pool resources and historic Midwest DOT bridge data related to element-level deterioration, operation practices, maintenance activities, and historic design/construction details. This data will provide the basis for research to determine bridge deterioration curves. A select number of deterioration curves will provide needed utility for the time-dependent deterioration of bridge elements to be used in making estimates of future conditions and work actions. This effort will pool data and through the analysis and research processes create results that will improve the accuracy of various bridge management and asset management applications that the member DOTs use (AASHTO BrM, Agile Assets, and others).

This study is sequenced into three tiers based on the priorities of the DOTs:

Tier 1 National Bridge Elements (NBE) & National Bridge Inventory (NBI) Components:

- Develop element-level deterioration curves for Reinforced Concrete Deck.
- Develop element-level deterioration curves for Reinforced Concrete Slab.
- Develop deterioration curves for NBI component items (i.e. bridge deck, superstructure, and substructure).
- Develop element-level deterioration curves for Reinforced Concrete Deck after a major preservation activity such as mill and overlay with the rigid concrete wearing course.
- Develop predicted improvement in the condition of Reinforced Concrete Deck element after a major preservation activity such as mill and overlay.
- In addition to probabilistic deterioration curves, also develop select deterministic deterioration curves.

Tier 2 Bridge Management Elements (BME) & Remaining NBE Elements

- Develop element-level deterioration curves for each type of wearing surface (bare concrete, sealed concrete, thin polymer overlay, Polyester Polymer Concrete (PPC) overlay, ridged concrete overlay, Polymer Modified Asphalt overlay, and asphalt overlay with membrane).
- Develop element-level deterioration curves for Strip Seal Deck Joints and Modular Deck Joints.
- Determine defect-level deterioration curves that describe defect development and progression (e.g., cracking and delamination).
- Develop deterioration curves for Paint system (protective steel) effectiveness.
- Develop defect-level deterioration curves for Steel Girder corrosion, and correlate to Paint system effectiveness; specifically, how long from new paint to 75% and 50% effective and end of life.
- Develop element-level deterioration curves for substructure elements in harsh environments (e.g., pier caps under expansion joints, pier columns in spray zone from snow plows, etc.).

Tier 3 Similar Agency Defined Elements (ADE) & Inspection Related

- Identify Agency Defined Elements (ADE) that would be of use for other Midwest DOTs to consider adopting.
- Determine what type of inspection information related to Nondestructive Evaluation (NDE) Midwest DOTs have and how it is used that translates into information on element-level defects (Ground Penetrating Radar (GPR), Infrared Thermograph, or other).
- Provide a summary of policy, guidance, and practices that Midwest DOTs employ to relate NDE results to defect reporting (to describe delamination and deterioration) and how DOTs use NDE to make quantifiable inspection and actionable work actions for concrete bridge decks.

### **Expected Findings and Benefits**

The project will deliver the following items:

- Literature review which will detail the current state of the practice for bridge deterioration modeling and will include the literature review, a survey, and targeted interviews.
- Data screening procedure. This will allow participating States to help understand the validity of their data and its pros and opportunities for improvement.
- A populated and documented open source database and analysis engine which the States can use to explore and model their data or data from other States in an easy to use interface.
- Tier 1 models.
- Tier 2 models.
- Tier 3 information.

Overall the main thrust of this project is to produce deterioration models to fuel the analysis of bridge performance for selected items.

The activities, tools, practices, policies, or methods in partner States that would be impacted by the research findings include:

- Bridge management practices and policies.
- Deterioration modeling of bridge components.
- Deterioration modeling processes which can be applied to other element level bridge components.
- Development of defensible system performance targets.
- Development of bridge work plans.
- Performance of risk analysis to determine which bridges are more at risk from a condition standpoint.
- This project will provide participating States strengths and opportunities for improvement in their data collection policies, procedures, and methods.

The primary benefit of this project to the participating States is the ability to plug the resultant models into their asset management systems and immediately begin to use the data to make better, data-driven decisions. A secondary benefit of this project is the provision of the online database and analysis engine that will be designed for the participating States to run their own analysis at the NBI level or NBE level using their State's data, a portion of the participating States' data, national data, or some other permutation. This will empower the participating States to explore the data and come up with deterioration models as new data are available or new analysis concepts are uncovered.

**Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**

**Task 1 – Project Management**

A progress report was issued and the project was managed. We held monthly status calls with the participating States and calls with the Wisconsin DOT Project Manager.

This task is 67% complete. No problems have been encountered to-date.

**Task 2 – Literature Review**

This task is 100% complete.

**Task 3 – Data Collection**

This task is 100% complete.

**Task 4 – Develop Data Screening Procedure**

The majority of time this quarter was spent on assembling the analysis dataset which will fuel subsequent model development. As expected, this task was very complicated because the project team was pulling data together from 12 States and the Long-Term Bridge Performance portal. The data was in 13 different formats and each field had to be mapped to the analysis dataset in a consistent format and in the same units of measurement. There were several iterations of questions asked of the States and some interviews were conducted. This challenging task is 100% complete.

**Task 5 – Develop Data Management Policy**

In a previous quarter the project team developed a draft data management framework which was presented and discussed with the States. Subsequently the States' discussed various approaches to the data management strategy and relayed these to the project team. The project team developed a memorandum for discussion with the States. The States decided to place a hold on this task until more was known about hosting the dataset. This task is 90% complete.

The project team held an end of task 5 meeting with the participating States. This meeting included a review of the progress and activities to-date, statistics from the analysis dataset and significant discussion about the plan for task 6, Developing the Tier 1 Deterioration Curves. Immediately after the call the States were polled as to whether the project team should be approved to commence with task 6 and there was unanimous consent.

**Task 6 – Develop Tier 1 Deterioration Curves**

No work was conducted on this task during the reporting period. This task is 0% complete.

**Task 7 – Develop Tier 2 Deterioration Curves**

No work was conducted on this task during the reporting period. This task is 0% complete.

**Task 8 – Develop Tier 3 Inputs**

No work was conducted on this task during the reporting period. This task is 0% complete.

**Task 9 – Final Project Deliverables**

No work was conducted on this task during the reporting period. This task is 0% complete.

**Anticipated Work Next Quarter:****Task 1 – Project Management**

We will issue a progress report and invoice. We will continue the monthly status calls with the participating States on the third Friday of every month. Keeping all States informed of progress and discussing key technical issues is a critical step in the success of this project.

**Task 2 – Literature Review**

The literature review task has been completed.

**Task 3 – Data Collection**

The data collection process has been completed.

**Task 4 – Develop Data Screening Procedure**

The data screening task has been completed.

**Task 5 – Develop Data Management Policy**

We will finalize the policy after receiving feedback from the States.

**Task 6 – Develop Tier 1 Deterioration Curves**

Work will begin on the Tier 1 deterioration curves. Frequent meetings will be held with the States to discuss progress and issues.

**Task 7 – Develop Tier 2 Deterioration Curves**

No work is anticipated on this task during the reporting quarter.

**Task 8 – Develop Tier 3 Inputs**

No work is anticipated on this task during the reporting quarter.

**Task 9 – Final Project Deliverables**

No work is anticipated on this task during the reporting quarter.

**Significant Results:**

A significant result is that the project team has a fully populated data analysis database, a critical aspect of this project.

**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).**

The project is beginning to fall behind schedule. This is due to review of datasets and development of the analysis dataset, which took longer than planned due to the complexities of merging 12 States' and the LTBP databases into one coherent analysis dataset. The project team believes this will not impact the overall schedule at this time and the project team is closely monitoring this project schedule as well as the budget of the project. We will revisit the schedule as the Tier 1 models are developed.

**Potential Implementation:**

There are no potential implementation activities identified but multiple are expected by the time the project is completed.