TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Louisiana Transportation Research Center (LTRC)

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.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* TPF-5(242)		**Transportation Pooled Fund Program - Report Period:** ☑ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 1 – December 31)
Project Title: Traffic and Data Preparation for AASHTO MEPDG Analysis and Design		
Name of Project Manager(s): Doc Zhang	**Phone Number:** 225-767-9162	**E-Mail** Doc.Zhang@LA.GOV
Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:** Sept 1 2011
Original Project End Date: Aug 31 2014	**Current Project End Date:** Aug 31 2014	**Number of Extensions:** 0

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
$683,334	About $280,000	40%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$70,000 and 12%	$70,000	44%

Project Description:

Background:
The Mechanistic Empirical Pavement Design Guide (MEPDG) is a significant advancement in pavement design, but requires significantly more inputs from designers. Many data sets need to be pre-processed before their use in the MEPDG procedure, such as Weigh-In-Motion (WIM) traffic data.

Under contract with the Federal Highway Administration (FHWA) and the Office of Pavement Technology, and co-sponsored by the Arkansas Highway Department, the University of Arkansas recently developed a software program called Prep-ME with comprehensive database features to store and process climate, traffic and materials data and to: (1) identify all the required inputs and analysis parameters; (2) develop algorithms and procedures to locate the available data sets, pre-process raw data, check data quality, and import the traffic and other data sets to the designed database tables, including conducting quality checks on both weight and classification WIM data based on LTPP and FHWA methods; (3) implement database algorithms for uploading, data checking, and generating the required data files for the MEPDG software; and, (4) develop a user•]friendly software interface, Prep-ME, to generate the required input files for the MEPDG software.

Objectives:
The objective of the Prep-ME software is to assist state DOTs in the data preparation and improve the management and workflow of the MEPDG input data to make the MEPDG software more accessible. Additionally, it can be used as a critical tool for calibrating and implementing the MEPDG as well.

Scope of Work:
In order to make Prep-ME full production software assist states use the MEPDG, the software and services need to be

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

This quarter (January - March 2013) is the 7th quarter of the project. In this quarter the research team made progresses in the following activities:

1. Continue improving computation efficiency of Prep-ME
This task is primarily to improve the speed of execution of the numerical engines in Prep-ME, and functions of the raw data import/update and user's data interpolation. The project team has investigated and implemented possible run time efficiencies that can be realized, such as storage procedure and multi-threading technique as the project progresses in this quarter. Currently, it takes around 5 minutes to import 6GB of WIM raw data into Prep-ME database.

2. Completed Tasks
By December 2012, the following tasks in the original proposal have been completed and programmed in the interface of Prep-ME:
(1) Task 1 - Make current features of Prep-ME software compatible with DARWin-ME
(2) Task 2 - Survey participating states for state polices on SQL Server/Oracle and GIS/Arch information transition and management: The Prep-ME software has been updated to work with SQL server for both data import function and updated QC function, and standalone SQL LocalDB database is programmed in Prep-ME. Task 4 - Accept quality-checked traffic data without processing.
(3) Task 5 - Provide three levels of traffic data input for DARWin-ME
(4) Task 8 - Make traffic QC more flexible so states can choose not to use certain features
(5) The first draft of the technical documentation of Prep-ME has been completed and distributed to participating states. The updated version of Prep-ME that is compatible with DARWin-ME has been distributed to the participating agencies in

Anticipated work next quarter:

The following Tasks will be implemented during the next quarter, and an updated version of Prep-ME software will be released to participating states in June 2013. It is planned that a Prep-ME face-to-face meeting to be held 30 days after the new release and a Prep-ME workshop at the 2014 TRB meeting on Sunday January 12, 2014.

(1) Task 3 - Preprocess raw WIM data for individual states, QC for Weight & Classification Data: By the end of March, the research team has processed data for Michigan, Hawaii, and New Hemisphere. When data from all participating states are delivered, this Task will be executed accordingly.

(2) Task 6 - Group and characterize pre-clustered WIM sites: This Task has been mostly completed and will be finished in the next quarter. The Michigan clustering approach and North Carolina approach will be developed in Prep-ME. In addition, for those states that don't have a clustering approach in place, Truck Traffic Classification (TTC) based approach and simplified clustering approach are to be developed for their usage for preparing Level 2 traffic input. This original Task includes the two Tasks recommended in the Detroit ace-to-face meeting in September 2012, which are Task 1 - Implement NCDOT cluster analysis algorithms in Prep-ME, and Task 2 - Implement Michigan cluster analysis algorithms in Prep-ME.

(3) In addition, the research team will continue working on the following Tasks that were recommended from the Detroit face-to-face meeting in 2012:
Task 6 - Generate a report documenting file names read into DARWin-ME, and DARWin-ME output files with Prep-ME traffic data in order to differentiate and reuse multiple run results;
Task 9. Include options on how to use incomplete data or short-term data that don't cover an entire year from January to December, such as using four seasons' data, factoring up monthly data, borrowing data from stations that have same TTC grouping, etc.;
Task 10 - Study LTPP tier 1 and LTPP tier 2 traffic default inputs from the LTPP pooled fund study (LTPP tier 2 is of higher quality);

Significant Results:

The success of Prep-ME project depends on its capability in detecting and filtering out various input errors of raw traffic data. However, in general, error checking is time consuming, considering millions lines of raw input data. In this quarter, the research team has investigated and developed effective error handling methods and codes. Specifically, TMAS 2.0 checking rules have been implemented into Prep-ME framework. QC checking codes have been rewritten in Prep-ME to take fully advantages of relational SQL database for efficiency. The new codes adopt the Object-Oriented Programming conception to ease software maintainability.

The new QC process interface can be used as a diagnostic tool to identify poor traffic data. QC checks can be conducted for each station by direction and lane independently. The new designed QC interface also allows a user to use sampled weekly data.

The research team has carefully developed an integrated Database Management system (DBMS) to store and analysis traffic data based on robust relational database Microsoft SQL server. The current preliminary testing shows that TMAS checking and the redesigned QC module provide correct results.

In summary, the newly designed Prep-ME is effective and efficient in error handling and its QC checking modules will benefit our next step development for clustering analysis, since more error-free station data is the basis for finding different traffic patterns.

Clustering analysis algorithms will be finished in the quarter of April to June 2013.

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).

There is no circumstance affecting the project or budget at this time.

Potential Implementation:

No new information on implementation at this time