TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Date: __6/30/2016

Lead Agency (FHWA or State DOT): __Vermont Agency of Transportation_____

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(222)	**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: New England Transportation Consortium (VI)

Name of Project Manager(s):	**Phone Number:**	**E-Mail**
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Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
CA0306	NETC 06-4	9/16/13
	NETC 07-1	7/1/13
	NETC 09-2	9/1/13
	NETC 09-3	9/1/13
	NETC 10-3	9/16/13
	NETC 13-1	9/1/14
	NETC 13-2	6/1/14
	NETC 13-3	12/1/14
	NETC 14-1	3/1/15
	NETC 14-2	2/1/15
	NETC 14-4	07/06/15
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**
NETC 06-4 9/15/15	9/15/15, NCE to 9/15/16	1
NETC 07-1 3/31/16	3/31/16	0
NETC 09-2 2/28/16	2/28/16	0
NETC 09-3 8/31/15	8/31/15, NCE to 12/31/15	1 (NCE approved 6/23/15)
NETC 10-3 9/15/15	9/15/15	1 (for NETC)
NETC 13-1 8/31/16	4/2/16, NCE to 8/31/16	1 (for NETC)
NETC 13-2 5/31/16	4/2/16, NCE to 5/31/16	1 (for NETC)
NETC 13-3 11/30/15	3/31/16	1
NETC 14-1 4/2/16	4/2/16, NCE to 8/31/16	1 (for NETC)
NETC 14-2 4/2/16	4/2/16, NCE to 5/31/16	1 (for NETC)
NETC 14-4 07/05/17	07/05/17	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
NETC 06-4 $242,909	$76,161.37	50%
NETC 07-1 $198,154	$192,000.00	93%
NETC 09-2 $80,000	$80,000.00	100%
NETC 09-3 $165,000	$113,593.68	81%
NETC 10-3 $150,158	$57,338.40	40%
NETC 13-1 $174,923	$97,600.00	60%
NETC 13-2 $249,785	$29,820.65	30%
NETC 13-3 $100,000	$38,000.00	67%
NETC 14-1 $100,000	$19,786.00	30%
NETC 14-2 $205,554	$58,510.00	68%
NETC 14-4 $200,000	$34,267	18%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
NETC 06-4 $21,595.56 8.8%	$21,595.56	125% (based on 24 months)
NETC 07-1 $63,699.60 32.1%	$63,699.60	100% (based on 33 months)
NETC 09-2 $1,188.89 1.5%	$1,188.89	100% (based on 30 months)
NETC 09-3 $0.00 0%	$0.00	99% (based on 28 months)
NETC 10-3 $0.00 0%	$0.00	115% (based on 24 months)
NETC 13-1 $22,388.02 12.8%	$22,388.02	75% (based on 24 months)
NETC 13-2 $24,751.00 9.9%	$24,751.00	92% (based on 24 months)
NETC 13-3 $13,835.88 13.8%	$13,835.88	100% (based on 12 months)
NETC 14-1 $11,245.66 11.25%	$11,245.66	59% (based on 22 months)
NETC 14-2 $3,856.12 1.9%	$3,856.12	54% (based on 24 months)
NETC 14-4 $7376.00 3.7%	$7376.00	50% (based on 24 months)

Project Description:

06-4 Preventative Maintenance and Timing of Applications
07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations
09-2 Effective Establishment of Native Grasses on Roadsides
09-3 Advanced Composite Materials: Prototype Development and Demonstration
10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology
13-1 Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections
13-2 HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures
13-3 Improved Regionalization of Quality Assurance (QA) Functions
14-1 Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians
14-2 Investigation of Northern Long Eared Bat Roosting Sites on Bridges
14-4 Optimizing Future Work Zones in New England for Safety and Mobility

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

NETC 06-4, Work was conducted on Task 6 to develop preventive maintenance procedures for New England. The summary of this work will be included as a chapter in the final report. The project consultant conducted the timing analysis (OPTime) for two New England projects selected by the technical committee (CT 89 Chip Seal and CT Route

101 Mill with Thin HMA Overlay).

NETC 07-1, The team has been working on a draft of the final report and an appendix on B Forward Calculations to be submitted to the technical committee.

NETC 09-2, The following activities were implemented during this reporting period:
January-February: preparation of the Manual. A draft version of the Manual was submitted to the members of the Technical Committee for their feedback. We produced the Manual "Effective Establishment of Native Grasses on Roadsides in New England" (Editors: Yulia Kuzovkina, John Campanelli, Cristian Schulthess, Robert Ricard, Glenn Dreyer).

The final version of the Manual, consisting of 283 pages, was submitted to the Technical Committee on June 7, 2016.

NETC 09-3, Research team provided draft final report and worked with Technical Committee to revise the report based its questions and comments.

NETC 10-3,
1. A second contractor (Palmer Paving, Springfield MA) began producing mixtures for this study in June 2106. More mixtures will be produced as the contractor schedule allows.
2. UMass Dartmouth received the following plant produced mixtures from the second contractor this month:
- SSC 12.5mm 75 Gyration WMA with 29% RAP (1.5% Binder Replacement)
- SSC 12.5mm 75 Gyration WMA with 39% RAP (2.0% Binder Replacement)

The contractor is using Evotherm as the WMA additive.
3. Moisture content of the RAP stockpile was approximately 3.0%. Moisture content of the mixture after production was approximately 0.04% or negligible.
4. UMass Dartmouth began verification and performance testing of these mixtures.
5. Due to delays in producing the mixtures, UMass Dartmouth requested a no-cost extension until 12/31/17 so that the remainder of mixtures can be produced, tested and analyzed. No response to this request has been received and the project ends this quarter June 30th, 2016.

NETC 13-1,
Task 1: Literature Search
 Performed literature review as necessary to obtain research reports and technical papers to assist in further development of mix design trial batches.
Task 3: Develop Mix Design
 Remixed multiple trial batches numerous times to understand the variability of properties of the trial batch mix designs
Task 4: Test Mixture
 The set time test (AASHTO T197 / ASTM C403) was performed on each trial batch.
 The slump test (AASHTO T119 / ASTM C143) or the spread test (ASTM C1611) was performed on each trial batch depending on the workability of the concrete mixture.
 The air content test, pressure method (AASHTO T152 / ASTM C231), was performed on concrete mixtures developed through trial batches.
 The shrinkage test (AASHTO PP 34-99) was performed on a concrete mixtures developed through trial batches.

NETC 13-2,
1. The approved survey for Task 3 was distributed to a list of regional contacts consisting of both agency and industry members for solicitation of responses. Reponses were tabulated.
2. Four 12.5mm mixtures were previously developed with similar gradations (Task 6) in the laboratory. The mixtures were:
- Control mixture using all virgin materials
- Control mixture incorporating 15% RAP (Typical)
- Control mixture incorporating 5% RAS (Using the MSW RAS Source)
- Control mixture incorporating 5% RAS and 15% RAP (Using the MSW RAS Source)

For each of these mixtures, the following testing was completed on replicate specimens this quarter:
- Mixture dynamic modulus and subsequent construction of mixture master curve
- Fatigue testing using the flexural beam fatigue in accordance with AASHTO T321
- Moisture susceptibility testing using the Hamburg wheel tracking device (HWTD) in accordance with AASHTO

T324
4. UMass Dartmouth met with the contractor to discuss production of the mixtures. A meeting with the plant operations manager will be held in April to discuss these items further.
5. Due to time delays in finding a contractor willing to produce mixtures for this study, UMass Dartmouth requested a no-cost time extension for this project in January 2016 until December 2017. To date no response has been received for this request.

NETC 13-3,
Task 1: State of the Practice Review: Revised report was edited and finalized.
Task 2: Development of Common Acceptance Standards for PCE/PSE: On basis of Task-1 activities preliminary recommendations for common acceptance standards were presented to the project review committee during the last quarter. Technical committee recommended that researchers develop spreadsheets that describe various agency activities for plant certification as well as for agency inspection process. During this quarter the initial version of spreadsheets were developed.

NETC 14-1,
Bob LePage, the project subcontractor, continued work on the gap analysis.
We completed work on a conceptual process that would create a CM model for each DOT.

NETC 14-2
• Further/more detailed evaluation/analysis of all calls from summer 2015 with SonoBat software
• Evaluation of all calls from summer 2015 with EchoClass software
• Initial comparison of call results using SonoBat vs EchoClass
• Conducted rapid visual screenings in CT
• Determined final 15 bridges to monitor summer 2016 including replacements and sent out for committee approval
• Contacted regional personnel for updated Summer 2015 data related to NLEB and bridge use for bat roosts
• Developed preliminary recommendations related to inspection surveys
• Obtained approval for borescope use in all New England states and UMass Amherst campus
• Got verbal commitment from two interns for summer 2016
• Wrote initial draft of report detailing summer 2015 findings
• Developed field routes for summer 2016
• Continued discussions about the implications of the final 4(d) ruling
• Initial discussions on new protocol survey
• Presentation at TRB Annual Meeting
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• Presentation at MassDOT Innovation and Tech Transfer Exchange
• Submitted abstract to Northeastern Transportation and Wildlife Conference

NETC 14-4
•Task 3 – Development of Methodology for Testing and Analyzing TTCPs
Naturalistic Driving Study Data
We are making slow progress regarding the Naturalistic Driving Study data. In the previous (the 2nd) quarterly report, we mentioned that an agreement has to be signed between Virginia Tech and UMass Lowell before the team can obtain the requested Naturalistic Driving Study data. This agreement was holding up the entire process. We were able to resolve the agreement issue on May 16, 2016. However, Virginia Tech raised additional questions on our data security plan. These new problems were finally solved on June 20, 2016. According to the email response from Virginia Tech, our Naturalistic Driving Study data request is now under review by the Transportation Research Board.

• Smart Work Zone (SWZ) Data
In the previous quarter, we identified a SWZ in Connecticut. We have very detailed sensor data for this SWZ but not its layout data. In this quarter, we identified two other SWZs in Massachusetts: one in Swansea on I-195 and the other one in Raynham on Route 24. With the assistance of William Ullom, We have obtained the corresponding sensor (e.g., flow, occupancy, and speed) and layout data. The Swansea work zone has been coded in VISSIM and we are working on coding the Raynham work zone. Currently, we are in the process of obtaining data from two additional SWZs in Massachusetts.
• USDOT Work Zone Project
Recognizing the limitation of existing microscopic traffic simulation tools in modeling work zone mobility, the USDOT has funded a research to develop a work zone add- on for microsimulation tools. Their project focuses on improving the modeling accuracy of car-following behavior in work zones. They are now processing the work zone car-following data collected in Virginia and will collect more data in Massachusetts in October 2016. The processed Virginia data will be

posted at https://www.its- rde.net/. They plan to implement the developed work zone car-following model as a VISSIM DLL. We will utilize the USDOT work zone project data and the developed model for this research.
• Using Drone to Collect Additional Data
The above USDOT project only focuses on car-following behavior in work zone activity areas. To better understand the merging behavior at the beginning of a work zone, the team has purchased a drone to collect video data to derive vehicle trajectories. We are coordinating with MassDOT regarding this data collection effort using a drone.
• Virtual Reality (VR)
The team also explored the possibility of using the emerging VR technology for modeling driver behavior under different work zone scenarios. We initially proposed to use a driving simulator for this purpose. However, the VR technology offers users a much more realistic driving experience compared to existing driving simulators. It has been used in a commercial product (see http://www.novus-res.com/page/vrtraining) to train truck drivers. Compared to existing driving simulators, a VR-based driving simulator is much cheaper. We will share more information about the VR-based driving simulator during the upcoming quarterly meeting.

Anticipated work next quarter:

NETC 06-4, Continue work on Task 6 through 10.

NETC 07-1, The research team will submit a draft of the final report to the technical committee.

NETC 09-2, None, project completed.

NETC 09-3, Submit revised report.

NETC 10-3, UMass Dartmouth will continue testing the plant produce mixtures.

NETC 13-1,
Task 1: Literature Search
 Continue literature search as required.
Task 2: Develop Mixture Design Specification
 Adjust existing concrete mix design specifications based on feedback from the NETC Project Technical Committee, trial batch results, and feedback from the PCI Bridge Tech Committee.
Task 3: Develop Mix Design
 Adjust concrete mix design and perform select short and long-term tests on additional trial batches as required by results of further testing.
Task 4: Test Mixture
 Continue design and begin fabrication of bar pullout test (ASTM A944) setup.
 Begin the full-scale mockup test setup design to be used for the large-scale specimen representing a longitudinal concrete bridge deck joint.
 Perform shrinkage bar test (ASTM C157) on concrete mixtures developed through trial batches and compare to results from shrinkage ring test (AASHTO PP 34-99). This activity was not included in the original proposal but might be useful for comparison with results from ring shrinkage test.
 Prepare concrete specimens to be sent to regional state DOTs to be tested for freeze-thaw resistance (ASTM C666).
 Contact Readymix plants for fabrication of larger concrete batches.

NETC 13-2, Compile survey results (Task 3). Continue mixture design testing. Meet with contractor to discuss production.

NETC 13-3,
- Submission of the draft common acceptance standards for agencies to provide feedback
- Revision of the common acceptance standards on basis of agency feedback
- Selection of agencies and manufacturers for pilot implementation of common acceptance standards

NETC 14-1, Waiting on approval of contract extension
- Review Strategic Plans
- Review job profile and matrix (BLS)
- Identify Competency Matrix components and resources
- Review state labor data and projections

- Draft Maine pilot tool kit for industry engagement
- Create template to Inventory education programs (use Maine as example)
- Draft workforce needs discover interview form
- Conduct leadership interviews
- Draft capacity and role survey as follow up
- Draft career pathways map
- Draft Maine pilot schedule
- Finalize CM and complete with state leader and supervisors
- Begin the Maine Pilot

Hold a technical committee meeting (in Maine)
Complete the conceptual CM process for each DOT

NETC 14-2
• Continue call analysis from summer 2015 data
• Conduct rapid visual screenings of eastern MA bridges
• Develop protocol survey to be used in summer 2016 monitoring and distribute to Technical Committee for comment and approval
• Prepare for summer field work including training interns
• Begin initial field survey of bridges for summer 2016

NETC 14-4
The project team will continue working on Tasks 3, 4, 6 and 7 and begin the analysis of SHRP 2 Naturalistic Driving Study data once it is available.

Significant Results:

None as of this reporting period.

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).

NETC 06-4, None during the current period.

NETC 07-1, None during the current period.

NETC 09-2, None during the current period.

NETC 09-3, None during the current period.

NETC 10-3, The research team has been making arrangements with contractors to provide plant produced mixtures as stated in the scope of work. However, only one contactor has committed to produce the mixtures. The research team is still searching for additional contractors.

NETC 13-1, No serious problems encountered to date. The only issue we have encountered is that the ring shrinkage tests have taken longer than the 3 weeks we anticipated/mix thereby delaying other activities in the project.

NETC 13-2,
1. The contractor assisting producing the mixtures for this study only utilizes one source of RAS which is manufacturers shingle waste (MSW). The contractor does not utilize post-consumer asphalt shingles (PCAS) or a blend of MSW and PCAS.
2. The project PI has continued efforts to find another contractor willing to produce mixtures for this study, preferably one that utilizes other RAS sources. To date, the PI has only been able to get commitment from one local contactor.
3. Due to time delays in finding a contractor willing to produce mixtures for this study, UMass Dartmouth requested a no-cost time extension for this project in January 2016 until December 2017. To date no response has been received for this request.

NETC 13-3, As indicated in the last quarterly report, the project is currently behind schedule. The project fell behind due to longer than anticipated time it took for researchers to coordinate visits to various DOTs for QA review and interviews. A no-cost extension (NCE) was submitted by the researchers on February 29th 2016 requesting the project end date to be extended to 30th September 2016.

NETC 14-1, The research team reported that it was forced to stop formal work on the project in May until the project extension was approved. However, the graduate student continued work in support of her academic needs.

NETC 14-2, None during the current period.

NETC 14-4, None during the current period.

Potential Implementation:
The 11 research projects listed above are still in progress. Implementations of the results of those projects are not anticipated in the near future.