TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Date: __3/31/2016

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	3/27/115
	NETC 14-1	3/1/15
	NETC 14-2	2/1/15
	NETC 14-4	7/06/15
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 4/2/16	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	11/30/15, NCE to 3/31/16	1
NETC 14-1 4/2/16	4/2/16, NCE to 12/31/16	1 (for NETC)
NETC 14-2 4/2/16	4/2/16, NCE to 4/2/17	1 (for NETC)
NETC 14-4 7/5/17	7/05/17	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	$136,268.49	95%
NETC 10-3 $150,158	$57,338.40	60%
NETC 13-1 $174,923	$97,600.00	65%
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	50%
NETC 14-4 $200,000	$27,490.00	15%

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	120% (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 $10,833.20 5.4%	$10,833.20	33% (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, In this quarter the research team has continued the back calculation analysis of the Falling Weight Deflectometer (FWD) deflection data using the BACFAA software. The team has also been working on a draft of the final report 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, No progress reported this quarter.

NETC 10-3,

1. The survey results distributed for Task 2 were compiled. Responses were analyzed and respective tables and charts of the results were made.

2. Laboratory verification and testing of the plant produced mixtures from the first contractor (Aggregate Industries Wrentham, MA) continued. The following 12.5mm SSC (100 gyration) mixtures were produced using the contractors drum plant and a PG64-28 binder:

- 12.5mm with 15% RAP (typical mixture) + 0.5% SonneWarmix (Liquid) WMA
- 12.5mm with 27.8% RAP (1.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA
- 12.5mm with 46.3% RAP (2.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA

The following tests were completed on each mixture using multiple replicates:

- Binder content verification using the ignition oven.
- JMF verification by wet wash sieve analysis
- Volumetric verification (density, VMA. VFA, etc.)
- Moisture susceptibility testing using the Hamburg wheel tracking device (HWTD) in accordance with AASHTO T324 at 45°C
- Low temperature cracking using the disk-shaped compact tension (DCT) test at -18°C
- Constructed performance space diagram (HWTD vs. DCT) for each mixture
- Moisture susceptibility (TSR) in accordance with AASHTO T283
- Low temperature cracking using the thermal stress restrained specimen test (TSRST)
- Mixture dynamic modulus and subsequent construction of mixture master curve
- Dynamic modulus (E*) ratio evaluation of moisture susceptibility
- Mixture workability in the asphalt workability device.

Summary sheets of results were constructed and data was analyzed.

3. Another contractor has committed to producing mixtures for this study in the early summer of 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, In the first quarter of 2016, a major research effort was on Task-2 of the project that deals with developing first version of the regionalized QA process for precast and prestressed elements used in highway construction. The regionalized QA process is being developed for elements in three primary categories: non-structural precast elements (examples: catch basins, drop inlets, guard barriers), structural pre-cast elements (examples: precast bearing piles, MSE wall, precast gravity walls) and prestressed elements. The specifications are being developed in form of series of tables (spreadsheets) for plant inspection and certifications, and agency inspection and testing. The plant inspection and certification includes requirements for: Inspector office requirements, QC technician/personnel qualification, quality service manual/quality control manual (testing and sampling frequency). The agency testing and inspection specifications include: pre-pour inspection (inspection activities and documentation), sampling and testing during concrete pouring, post-pour inspection (inspection activities and documentation) and curing requirements.

Researchers had a web conference meeting with the project technical advisory committee on March 3rd 2016. During this meeting researchers presented the findings of the review of QA processes from various New England agencies (Task-1 findings) and also made a proposal for the regionalized QA processes (Task-2 preliminary proposal). During the meeting the agency representatives provided feedback on a number of items for modifying the draft report from Task-1. A revised report has been prepared and is currently under editorial review. The minutes from the web meeting as well as the presentation slides are attached with this report as appendix.

NETC 14-1, Work on Task 1 is complete. Specific models for DOT's were not found. We will continue to search for specific models as the research continues

Planned Schedule:

- Gaps and CM Framework – completion by July 2016.
- Pilot Program – completion by October 2016.
- Final Report – completion by December 2016.

Our subcontractor Bob LePage has started work on the gap analysis between the standard employment classifications for both technicians and civil engineers and the standard classifications in industry. Bob will also look at strategic plans and see if gaps in needed competencies exists.

He will also begin work on the pilot project in Maine

We began 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
As mentioned in the previous quarterly report, the team has finished all the required paperwork/training and has obtained the roadway information database and some shapefiles for the NDS. These shapefiles show how frequently each road segment has been traveled by NDS participants. Based on the roadway information database and the shapefiles, some candidate work zone sites in New York were identified and the list was sent to Virginia Tech in January 2016 to request the NDS data.

An agreement has to be signed between Virginia Tech and UMass Lowell before the team can obtain the requested NDS data. Virginia Tech sent an agreement to UMass Lowell for signature in January 2016. However, UMass Lowell has a template for such an agreement and asked Virginia Tech to use the UMass Lowell template. Virginia Tech also has certain required languages to be included in the agreement. There have been many email exchanges between Virginia Tech and UMass Lowell. The agreement so far has not been finalized and signed yet. The team is still awaiting the NDS data for the candidate sites.

Smart Work Zone (SWZ) Data
In addition to the SWZ data received from MassDOT, the team has acquired some data for a SWZ in Connecticut from ConnDOT. The ConnDOT data has detailed information about sensor locations. Based on the ConnDOT data, a freeway segment has been created in VISSIM. This VISSIM network will be used to investigate the mobility impacts of work zones. To ensure that the VISSIM model can accurately reflect work zone traffic operations, we are currently working on calibrating the car-following and lane-changing models in VISSIM. Such a calibration task also depends on the NDS data.

For the ConnDOT work zone, another issue we are facing now is the lack of traffic count data for on and off-ramps and the exact layout of the work zone. There are multiple ramps in the study area. The on and off-ramp traffic counts are important inputs to the simulation model. Also, we need to know precisely where the work zone started and ended and the lengths of various tapers.

Safety Data
The team has also acquired some work zone crash data from ConnDOT and the University of Connecticut (Connecticut Transportation Safety Research Center). With this data set, we were able to calculate some interesting crash statistics and the distribution of crashes among different work zone areas.

Anticipated work next quarter:

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

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

NETC 09-2, None, project completed.

NETC 09-3, No work projected at this time.

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,
March/ Early April
- 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

April / May
- 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

June
- Begin the Maine Pilot

Hold a technical committee meeting in May (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, 6 and 7 and begin the analysis of SHRP 2 NDS data once it is available. The team will acquire additional SWZ data from ConnDOT for work zone mobility analysis.

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, Some delay with the final Manual submission was caused by the considerable amount of information which we needed to incorporate in order to provide a comprehensive resource. (In the beginning of the project we were planning to have about 100, rather than 283 pages.)

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, None during the current period.

NETC 14-2, None during the current period.

NETC 14-4, An agreement has to be signed between Virginia Tech and UMass Lowell before the team can obtain the NDS data. It has taken the two universities over 2 months to negotiate the agreement. The agreement has not been signed yet.

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.