

**ANNUAL REPORT for**

**Calendar Year 2018**

**NEW ENGLAND TRANSPORTATION CONSORTIUM**

**NETCR116**

**February 2019**

This report was sponsored by the New England Transportation Consortium, a cooperative effort of the Departments of Transportation and the Land Grant Universities of the six New England States, and the U.S. Department of Transportation's Federal Highway Administration.

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# INTRODUCTION

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The New England Transportation Consortium (NETC) is a cooperative effort of the transportation agencies of the six New England States, the six New England state land grant universities, and the Federal Highway Administration (FHWA). Through the Consortium, the states pool professional, academic, and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation, and maintenance of the region's transportation system. The Consortium's activities are currently being managed by the University of Vermont Transportation Research Center (UVM TRC), with the Vermont Agency of Transportation (VAOT) acting as the Lead Agency.

The program is intended to supplement, not to replace, ongoing state and federal research activities and other national programs such as the National Cooperative Highway Research Program (NCHRP). To this end, a Memorandum of Understanding (MOU), establishing NETC has been consummated by the six New England state transportation agencies.

The following goals were established for NETC in order to focus the resolve of participating state transportation agencies and universities:

- Implementation of a three-pronged program for the New England region consisting of research and development; technology transfer; and education and training.
- Development of improved methods for dealing with common transportation problems.
- Providing an important source of trained professionals for employment in the Region.

NETC membership now extends to the following agencies: Connecticut Department of Transportation (ConnDOT); Massachusetts Department of Transportation; Maine Department of Transportation; New Hampshire Department of Transportation (NHDOT); Rhode Island Department of Transportation (RIDOT); Vermont Agency of Transportation (VAOT); and, FHWA.

Each of the member state transportation agencies has designated a state university to participate with the state transportation agency in developing and conducting the transportation research program. The following universities have been designated as member universities: University of Connecticut, University of Maine, University of Massachusetts System, University of New Hampshire System, University of Rhode Island, and University of Vermont.

NETC was first established, and work began, in 1986 and, over the years, has undergone a transformative process wherein the management and administrative processes have been under the governance of various governmental and non-governmental organizations. With each change in leadership, the experiential and institutional lessons that have been learned were incorporated into the administration of the program. And so, at the current time, the collective experience of over two decades is now addressed and incorporated in the administration of the NETC program.

In 1984, the Massachusetts Institute of Technology (MIT), the state transportation agencies of five New England states (Maine, Massachusetts, New Hampshire, Rhode Island and Vermont), the American Association of State Highway and Transportation Officials (AASHTO) and FHWA initiated the first transportation pooled fund (TPF) study, administered by RIDOT, to determine the feasibility of establishing a regional consortium. In 1985, the same group of organizations initiated

a second TPF study, again administered by RIDOT, to develop a work program. From 1986 to 1995, various research projects were funded through the NETC program in five funding blocks called “Rounds.”

RIDOT was the Lead Agency for the first two pooled fund studies. For the five Rounds, state funds were transferred to AASHTO, the Lead Agency (i.e., Administrative Agency), through FHWA, and a single contract was effected between AASHTO and MIT, the Coordinator. MIT would then enter into a contract with the selected university for a particular research project.

In 1994, ConnDOT stated its intention to participate in NETC and offered to act as Lead Agency. During Federal Fiscal Year (FFY) 1994, FHWA assumed the Lead Agency designation to facilitate the transition process. MIT and AASHTO exited NETC, effective FFY1994. ConnDOT entered NETC, effective FFY1995, and was the Lead Agency until the Vermont Agency of Transportation assumed the responsibility in March 2010. Maine Department of Transportation assumed the responsibility of Lead Agency in March 2017. During 2018, most new projects were led by MaineDOT while the VTrans led pooled fund completed older projects.

# 2018 HIGHLIGHTS

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## 1. THE FOLLOWING NETC-FUNDED TRANSPORTATION RESEARCH PROJECTS, VALUED AT \$1,646,336, WERE ACTIVE AT NEW ENGLAND STATE UNIVERSITIES AND CONSULTING AGENCIES IN 2018:

### a. University of Massachusetts: \$1,041,653

- Walaa Mogawer (Dartmouth):
  - “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology”
  - “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures”
- Sergio F. Breña (Amherst): “Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections”
- Chris Ahmadjian (Amherst): “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians”
- Yuanchang Xie (Lowell): “Optimizing Future Work Zones in New England for Safety and Mobility”
- Michael Knodler (Amherst): “Using the New SHRP2 Naturalistic Driving Study Safety Databases to Examine Safety Concerns for Teens and Older Drivers”

### b. University of New Hampshire: \$504,683

- Eshan Dave:
  - “Improved Regionalization of Quality Assurance (QA) Functions”
  - “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England”
- Jeffrey Foster: “Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)”
- Jo Sias: “Quick Response: Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast”

### c. AECOM: \$50,000

- Chris Chaffee: “Quick Response: New England Connected Automated Vehicles”

### d. Vanasse Hangen Brustlin, Inc. (VHB): \$50,000

- Frank Gross: “Quick Response: Quantification of Research Benefits”

## 2. TECHNOLOGY TRANSFER:

### a. Requests for Information and Technical Assistance: The NETC Coordinator’s office responded to the following requests:

- Matt Mann (UMass University Rep) requested a copy of the 17-2 final report.
- Daniel Stomski (MassDOT) and Kay Wille (UConn) requested a copy of the 13-1 final report.



**b. Conference Attendance and Exhibiting:** The NETC Coordinator's office attended the following conferences and events: None during 2018.

**c. NETC Research Project Reports:**

1. NETC 13-3 (Phase I Report): "Improved Regionalization of Quality Assurance (QA) Functions," Eshan Dave; Jo Sias Daniel; Michael Kotowski; Alan Perkins, March 2018, NETCR110
2. NETC 10-3: "Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology," Walaa Mogawer; Alexander Austerman; March 2018, NETCR103
3. NETC 14-4: "Optimizing Future Work Zones in New England for Improved Safety and Mobility," Yuanchang Xie; Nathan H. Gartner; Polichronis Stamatiadis; Tianzhu Ren; Gustavo Salcedo; March 2018, NETCR104
4. NETC 13-2: "HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixture," Walaa Mogawer; Milad Zokaei Ashtiani; Alexander Austerman; June 2018, NETCR105
5. NETC 15-3: "Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England," Eshan Dave; Jo Sias Daniel; Rajib B. Mallick; Christopher DeCarlo; Ram Kumar Veeraragavan; Nivedya Madankara Kottayi; August 2018, NETCR109
6. NETC 17-1: "Quick Response: New England Connected Automated Vehicles," Chris Chaffee; Suzanne Murtha; Mogawer, Walaa; Austerman, Alexander; October 2018, NETCR108
7. NETC 13-1: "Development of High Early-Strength Concrete for Accelerated Bridge Construction Closure Pour Connections," Sergio Brena; Scott Civjan; Stephanie Castine; Gercelino Ramos; December 2018, NETCR115
8. NETC 15-4: "Quick Response: Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast," Jo Sias; Eshan Dave; Chibuike Ogbo; Alan Perkins; December 2018, NETCR112

**d. Technical Papers and Presentations:**

- NETC 13-1: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.
- NETC 13-3: The research team will present at the 2019 TRB Annual Meeting in Washington, D.C.
- NETC 14-1: The research team will present at the 2019 TRB Annual Meeting in Washington, D.C. The team also had a paper accepted:
  - Ryan, A., Bouchard, C., Fitzpatrick, C., Knodler Jr, M., & Ahmadjian, C. (2019). Analytical Comparison of Core Competencies across Civil Engineering Positions within New England Department of Transportation Agencies. Transportation Research Record, 0361198118822296.
- NETC 14-4:
  - A paper entitled "Cooperative Merging in Highway Work Zone

Enabled by Connected and Autonomous Vehicles” has been accepted by the 2018 ASCE International Conference on Transportation & Development to be held in Pittsburgh, Pennsylvania on July 15-18, 2018.

- Dr. Xie was invited to give a talk at the 2018 TRB Annual Meeting. The title of his talk is “Cooperative Highway Work Zone Merge Control for Improved Mobility and Safety.”
- NETC 15-3: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.
- NETC 17-2: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.

# PROGRESS OF ACTIVE PROJECTS

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**PROJECT NUMBER:** 10-3

**PROJECT TITLE:** “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Professor Walaa S. Mogawer, PE, F.ASCE, Highway Sustainability Research Center (HSRC), University of Massachusetts

**STATUS:** Closed

**AGREEMENT TERM:** 9/16/2013 – 5/31/2017

**ANTICIPATED COMPLETION:** 5/31/2017

**PROJECT OBJECTIVES:** The research project will evaluate the moisture susceptibility and low temperature cracking properties of RAP mixtures produced with WMA technologies. Plant mixtures produced with varying RAP contents and warm mix technologies will be sampled. Laboratory testing will include an evaluation of mixtures susceptibility to moisture damage using one or more of the following tests: (1) AASHTO T324 “Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)”, (2) AASHTO T-283 “Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage”, and (3) ratio of wet to dry dynamic modulus measured at 20°C. The test(s) selection will be based on the literature review conducted under Task 1. Also, the low temperature cracking susceptibility will be evaluated using the following two tests: (1) AASHTO TP10-93 “Standard Test Method for Thermal Stress Restrained Specimen Tensile Strength (TSRST)” and (2) AASHTO T322 “Standard Method of Test for Determining the Creep Compliance and Strength of Hot Mix Asphalt (HMA) Using the Indirect Tensile Test Device.” Additional testing will include evaluating the effect of the different WMA technologies on the workability of the mixtures and evaluating the degree of blending between the RAP binder and the virgin binder using a procedure developed by Bonaquist.

## **PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. UMass Dartmouth continued analysis of the test data for all the mixtures tested to date.
2. UMass Dartmouth followed up with the second contractor producing mixtures for this study. The contractor stated that the high RAP mixtures prepared using foaming as the WMA technology would be produced in the spring.
3. UMass Dartmouth received the following plant produced mixtures from the second contractor (Palmer Paving, Springfield MA) in mid-May 2017:
  - SSC 12.5mm 75 Gyration WMA with 29% RAP (1.5% Binder Replacement) Foaming WMA
  - SSC 12.5mm 75 Gyration WMA with 39% RAP (2.0% Binder Replacement) Foaming WMA
  - SSC 12.5mm 75 Gyration WMA with 48% RAP (2.5% Binder Replacement) Foaming WMA
4. The following tests were completed on each mixture using multiple replicates:
  - Volumetric verification (density, VMA, VFA, etc.)
  - Moisture susceptibility testing using the Hamburg wheel tracking device (HWTB) 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
5. Summary sheets of results were constructed and data was analyzed
  6. UMass Dartmouth began work on the draft final report.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- A Transportation Research Board (TRB) paper entitled “Understanding Influence of Moisture on Performance of Plant-Produced High Reclaimed Asphalt Pavement Content Mixtures Incorporating Warm-Mix Asphalt Technologies” was presented in at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017 in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”
- “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology.” Mogawer, Walaa S. and Austerman, Alexander, March 2018, NETCR103.

**PROJECT NUMBER:** 13-1

**PROJECT TITLE:** “Development of High Early-Strength Concrete for Accelerated Bridge Construction Closure Pour Connections”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Sergio F. Brena – University of Massachusetts Amherst

**STATUS:** Closed

**AGREEMENT TERM:** 9/1/2014 – 8/31/2018

**ANTICIPATED COMPLETION:** 8/31/2018

**PROJECT OBJECTIVES:** To develop and validate concrete mixtures capable of developing high early strength without detrimentally affecting their long-term durability. The mixtures are for use in projects using accelerated bridge construction methods.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. All testing was completed. The research team completed the final report in December 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- Reports: “Development of High Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections.” Brena, Sergio F.; Civjan, Scott A.; Castine, Stephanie; Ramos, Gercelino, December 2018, NETCR115.
- Papers and Presentations: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.

**PROJECT NUMBER:** 13-2

**PROJECT TITLE:** “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Professor Walaa S. Mogawer, PE, F.ASCE, Highway Sustainability Research Center (HSRC), University of Massachusetts

**STATUS:** Closed

**AGREEMENT TERM:** 6/1/2014 – 12/1/2017

**ANTICIPATED COMPLETION:** 12/1/2017

**PROJECT OBJECTIVES:** The goal of this research is to evaluate plant-produced HMA mixtures that contain RAS to identify the critical material properties and plant operations needed to produce RAS mixtures with fatigue and low temperature cracking properties equivalent (or better than) typical mixtures that are produced. Research objectives:

1. Determine the current state-of-practice for recycled shingle usage in paving mixtures.
2. Locate regional asphalt mixture producers in New England with capabilities and willingness to produce mixtures incorporating RAS for this study. From this list of producers, select producers so that both batch and drum plant are utilized for production.
3. Assist the selected producers in evaluating the properties of the RAS and RAP to be used in production.
4. Construct a matrix of mixtures that will be produced. An all-virgin material control mixture, 5% RAS mixture and a 5% RAS + RAP mixture will be designed.
5. Assist the selected producers in developing laboratory mixture designs utilizing RAS that meet the required volumetric criteria.
6. Produce the mixtures using a batch plant and drum plant. Produce mixtures assuming 100% blending of the RAS and virgin binder and at the calculated actual RAS binder contribution.
7. Sample the mixture at the plant and verify volumetric properties. Mixtures not meeting the volumetric properties should be produced again with alteration to the production parameters (use higher temperatures, longer silo storage or increased mixing times).
8. Construct a matrix for evaluating the performance of the mixtures with emphasis of low temperature and fatigue cracking. The matrix should contain a component to evaluate the effect of aging on the degree of blending between aged and virgin binders.
9. Identify critical material properties and plant operations that yield RAS mixtures with performance properties equivalent to typical all-virgin material mixtures.
10. Develop a guideline for the use of RAS in virgin and RAP mixtures.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The final report was completed in June 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- A Transportation Research Board (TRB) paper entitled “Performance Characterization of Asphalt Mixtures Incorporating Recycled Asphalt Shingles: Mechanical Approach to Asphalt Binder Degree of Blending” was presented at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017 in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”

- “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant Produced Mixtures.” Mogawer, Walaa S.; Zokaei, Milad; Austerman, Alexander, June 2018, NETCR105.

**PROJECT NUMBER:** 13-3

**PROJECT TITLE:** “Improved Regionalization of Quality Assurance (QA) Functions”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Eshan Dave, University of New Hampshire

**STATUS:** Open

**AGREEMENT TERM:** 12/1/2014 – 1/25/2019

**ANTICIPATED COMPLETION:** 1/25/2019

**PROJECT OBJECTIVES:**

1. Review of current QA process used by New England DOTs for precast and prestressed concrete elements (PCE/PSE).
2. Review of QA specifications for PCE/PSE.
3. On the basis of the review and through working with the technical review committee of the project, develop common acceptance standards for PCE/PSE to be used by NETC constituents.
4. Develop a cost-sharing mechanism to accompany the common acceptance standards.
5. Identify agencies and contractors to conduct pilot implementation of the common acceptance standards.
6. Develop a list of additional materials and services for which common acceptance standards might be beneficial and feasible.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The research team completed “Phase I” of the final report in March 2018. Note, a Phase II of the project was added in 2018 with additional funds.
2. For Phase II of the project, the following have been completed:
  - a. **Exploration of Cost-Share, Invoicing and Payment Mechanisms for Sharing of QA Resources:** In the previous task researchers initiated review of literature to determine if any published reports or papers have discussed the cost-share, invoicing and payment mechanisms that would fit the needs of the current study. Initial review did not yield fruitful results in terms of readily available framework or mechanisms that are available in published literature that has been routinely used by State transportation agencies in United States. Simultaneously to this review, researchers have been developing a questionnaire for financial administration personnel at DOTs. Once finalized, this questionnaire will be sent to each of the NETC constituent agency in form of an online survey. This survey will be followed up with phone call interviews to expand the information.
  - b. The research team has completed interviews with 4 out of 6 New England state DOT contacts (also using the survey). Interviews still need to be scheduled with RIDOT and MassDOT.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- “Improved Regionalization of Quality Assurance (QA) Functions.” Dave, Eshan V.; Sias, Jo; Kotowski, Michael, March 2018, NETCR110. (Phase I)



**PROJECT NUMBER:** 14-1

**PROJECT TITLE:** “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers and Engineering Technicians”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Chris Ahmadjian, University of Massachusetts, Amherst

**STATUS:** Closed

**AGREEMENT TERM:** 3/1/2015 – 12/31/2017

**ANTICIPATED COMPLETION:** 12/31/2017

**PROJECT OBJECTIVES:**

1. To identify and review existing Competency Models (CM) and matrices that can help in the development of a DOT specific competency model
2. To perform a gap analysis on the existing CM’s and matrices to create a DOT specific employee competency matrix
3. To create a CM framework for each of the NETC member states
4. To run a pilot program in one of the NETC member states
5. To determine the financial benefits (return on investment) of having a CM in place
6. To create an implementation plan and technology transfer strategy for the research results
7. To deliver a final report

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The final report was completed in December 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers and Engineering Technicians.” Ahmadjian, Chris; Knodler, Michael; Fitzpatrick, Cole; Ryan, Alyssa; Bouchard, Chelsea, December 2018, NETCR111.
- Ryan, A., Bouchard, C., Fitzpatrick, C., Knodler Jr, M., & Ahmadjian, C. (2019). Analytical Comparison of Core Competencies across Civil Engineering Positions within New England Department of Transportation Agencies. Transportation Research Record, 0361198118822296.

**PROJECT NUMBER:** 14-4

**PROJECT TITLE:** “Optimizing Future Work Zones in New England for Safety and Mobility”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Yuanchang Xie, University of Massachusetts, Lowell

**STATUS:** Closed

**AGREEMENT TERM:** 7/6/2015 – 12/31/2017

**ANTICIPATED COMPLETION:** 12/31/2017

**PROJECT OBJECTIVES:**

Given the aging infrastructure and the anticipated growing number of work zones in New England, it is of utmost importance to optimize their layouts to improve safety and to mitigate their impact on mobility. This study aims to use the Transportation Research Board’s SHRP2 Naturalistic Driving Study (SNDS) data for investigating driver behavior in work zones under different traffic, lighting, and weather conditions. In addition, data from the smart work zones (SWZs) in Massachusetts (and other New England states if available) to validate the findings obtained from the analysis of the SNDS data is also proposed. Based on the analysis of the SNDS and SWZs data, improved work zone TTCPs will be developed. These TTCPs will be evaluated using an advanced driving simulator and a microscopic traffic simulation tool. The main objectives of this study include:

- Literature Review: A focused review on work zone safety will be conducted.
- SNDS Data Analysis: Critical factors that may potentially affect (either positively or negatively) driver behavior in work zones under various conditions will be reviewed and analyzed based on the SNDS data. These factors may include traffic signs, variable message signs, law enforcement, work zone layout, etc.
- Identify and Quantify Strategies: The identified factors will be further examined and tools will be developed to quantify these factors’ impacts on three key aspects of improving work zone safety: reducing speed, maintaining safe distances, and preventing driver distraction. In addition, the impacts of these factors on reducing near crash events will be studied. Investigating near crash events and driver behavior/maneuvers immediately prior to them will allow us to better understand how work zone crashes occur.
- Proposed Work Zone Control Plans: Based on the SNDS data analysis results and a review of work zone control strategies, new and improved work zone TTCPs will be developed.
- Validate the Results: Field data collected from smart work zones (SWZs) in Massachusetts (and other New England states if available) will be used to evaluate the performance of certain work zone TTCPs. If there is a match between the SWZs and the work zones in the SNDS data, the corresponding data sets will be compared both quantitatively and qualitatively. In addition, an advanced driving simulator and a microscopic traffic simulator will be used to evaluate the safety and mobility performance of various work zone layouts and controls. Extensive driving simulator studies will be conducted to evaluate how drivers respond to different work zone layouts and controls.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The final report was completed in March 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- A paper entitled “Modelling Highway Work Zone Traffic Safety and Driver Behaviours in the United States Using a Virtual Reality Driving Simulator” has been accepted to the 2017 Road Safety & Simulation Conference to be held in The Hague, Netherland in October 2017.
- A paper entitled “Cooperative Merging in Highway Work Zone Enabled by Connected and Autonomous Vehicles” has been accepted by the 2018 ASCE International Conference on Transportation & Development to be held in Pittsburgh, Pennsylvania on July 15-18, 2018.
- Dr. Xie has been invited to give a talk at the 2018 TRB Annual Meeting. The title of his talk is “Cooperative Highway Work Zone Merge Control for Improved Mobility and Safety”.
- An abstract entitled “Cooperative Highway Work Zone Merge Control for Improved Mobility and Safety” has been submitted to the 2018 MassDOT Moving Together Conference.
- “Optimizing Future Work Zones in New England for Improved Safety and Mobility.” Xie, Yuanchang; Gartner, Nathan H.; Stamatiadis, Polichronis; Ren, Tianzhu; Salcedo, Gustavo, March 2018, NETCR104.

**PROJECT NUMBER:** 15-1

**PROJECT TITLE:** “Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Jeffrey Foster, University of New Hampshire

**STATUS:** Open

**AGREEMENT TERM:** 12/1/2016 – 11/30/2018

**ANTICIPATED COMPLETION:** 11/30/2018

**PROJECT OBJECTIVES:** Our overall objective addresses several major gaps in the knowledge of Northern long-eared bat (NLEB; *Myotis septentrionalis*) distributions and activity as they relate to the use of highway habitat in New England.

The research objectives will be achieved by accomplishing 8 tasks:

- Task 1. Literature review on NLEB habitat requirements and effects of anthropogenic disturbance, focusing on the effects of roadways.
- Task 2. Develop a “Zone of Influence” matrix for highway induced stressors.
- Task 3. Compile existing data on NLEB and other rare bat species distributions.
- Task 4. Request presence/absence data from State Depts of Transportation and other sources.
- Task 5. Determine land cover (habitat) being used or not used by NLEB.
- Task 6. Determine data gathering needs to improve model inference.
- Task 7. Identify data gaps in sampling of NLEB in specific habitats that may require additional data collection on presence/absence.
- Task 8. Develop screening tool and GIS model that would show zones of influence around highways.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. MYSE distribution modeling was completed.
2. A draft final report was submitted to the TAC for review.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

None thus far.

**PROJECT NUMBER:** 15-2

**PROJECT TITLE:** “Using the New SHRP2 Naturalistic Driving Study Databases to Examine Safety Concerns for Teens and Older Drivers”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Siby Samuel, University of Massachusetts, Amherst

**STATUS:** Open

**AGREEMENT TERM:** 01/01/2017 – 12/31/2018

**ANTICIPATED COMPLETION:** 12/31/2018

**PROJECT OBJECTIVES:** To examine SHRP2 NDS and identify primary concerns with older driver safety when navigating left turns at permissive and protected signalized intersections.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

- A conference call meeting was held with the project’s Technical Advisory Committee in October to discuss project progress and the latest analysis and results, and to get feedback from committee members. The UMass researchers prepared a Powerpoint presentation for the meeting.
- The research team reviewed driver videos and data tables to gather additional information about the left turn crashes and near crashes involving drivers age 65 and over.
- The research team prepared the draft final report for the project and shared it with the Technical Advisory Committee members for their review.
- A conference call meeting was held with the project’s Technical Advisory Committee in December to review the draft final report for the project and get feedback from committee members. The UMass researchers prepared a Powerpoint presentation for the meeting.
- The research team began revising the draft final report to incorporate feedback from the Technical Advisory Committee.
- The research team began preparing the factsheet and research poster to summarize the project and its findings.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

None thus far.

**PROJECT NUMBER:** 15-3

**PROJECT TITLE:** “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Eshan Dave, University of New Hampshire

**STATUS:** Closed

**AGREEMENT TERM:** 08/01/2016 – 07/31/2018

**ANTICIPATED COMPLETION:** 07/31/2018

**PROJECT OBJECTIVES:**

1. Evaluate good and poor performing asphalt mixtures in New England and determine mechanisms responsible for poor performing mixtures
2. Determine impacts of remedial measures (anti-stripping additives and hydrated lime) in reducing moisture susceptibility of poor performing mixtures
3. Assess impacts of moisture induced-damage on pavement performance and service life
4. Recommend an evaluation framework consisting of appropriate test procedure(s), specification, analysis procedure verified with field performance data that is reliable and suitable for moisture susceptibility testing of asphalt mixtures used in New England

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The final report was completed in August 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England.” Dave, Eshan V.; Sias Daniel, Jo; Mallick, Rajib B.; DeCarlo, Christopher; Veeraragavan, Ram Kumar; Kottayi, Nivedya Madankara, August 2018, NETCR109.
- The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.

**PROJECT NUMBER:** 15-4

**PROJECT TITLE:** “Quick Response: Optimizing Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Jo Sias Daniel, University of New Hampshire

**STATUS:** Open

**AGREEMENT TERM:** 07/05/2018 – 01/04/2019

**ANTICIPATED COMPLETION:** 01/04/2019

**PROJECT OBJECTIVES:**

1. Review current asphalt pavement QA processes used by each state through interviews and literature review.
2. Identify best practices by working with agencies and contractors.
3. Identify cross-border issues that may impact the implementation of a uniform QA process and determine actions to alleviate these issues.
4. Develop recommendations for use of the research products in the NETTCP QA technology program.
5. Develop a white paper that provides guidance and an initial roadmap for uniform QA processes regarding HMA Acceptance and Quality Control testing in New England

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

- The research team reviewed the current state of the practice of QA for asphalt pavement construction in the northeast, including current FHWA recommendations and requirements.
- They also conducted a survey of NETC member agencies to identify the cross-border issues that may be a challenge to the adoption of a uniform QA process.
- The response of the survey were analyzed and compiled.
- The project kickoff meeting was held with the TAC to present and further discuss the results of the survey. Proceedings of the kickoff meeting were documented and made available to the TAC members with topics for internal agency discussion in preparation for the workshop.
- The research team held a workshop on cross-border issues.
- A draft final report was completed.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

None thus far.

**PROJECT NUMBER:** 17-1

**PROJECT TITLE:** “Quick Response: New England Connected Automated Vehicles”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Chris Chaffee, AECOM

**STATUS:** Closed

**AGREEMENT TERM:** 04/10/2018 – 10/10/2018

**ANTICIPATED COMPLETION:** 10/10/2018

**PROJECT OBJECTIVES:**

- Identify multi-state issues related to the testing and deployment of CVs, AVs, and CAVs in New England
- Document opportunities and challenges related to multi-state CV, AV, and CAV issues
- Prepare an action plan that minimizes the challenges and pursues the opportunities

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. The final report was completed in October 2018.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

- “Quick Response: New England Connected Automated Vehicles.” Chaffee, Chris and Murtha, Suzanne, October 2018, NETCR108.
- NETC 17-2: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.



**PROJECT NUMBER:** 17-2

**PROJECT TITLE:** “Quick Response: Quantification of Research Benefits”

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Frank Gross, VHB

**STATUS:** Open

**AGREEMENT TERM:** 07/05/2018 – 01/04/2019

**ANTICIPATED COMPLETION:** 01/04/2019

**PROJECT OBJECTIVES:**

- Implement or adapt the MnDOT research project Benefit Estimation Tool for 2-3 NETC projects.
- Develop detailed guidelines to identify and gather the inputs required for the benefit categories of these projects.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2018:**

1. Prepared and held the Kickoff meeting on July 16, 2018. Submitted kickoff meeting summary on July 18, 2018.
2. Performed and completed a comprehensive assessment of the MnDOT tool.
3. Performed and completed an in-depth review of one example research project: NETC 09-03: Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System.
4. Gathered inputs to demonstrate the Excel-based tool with the example research.
5. Developed a draft version of the Excel-based tool for demonstration with one example research project.
6. Gathered materials for draft guidelines for identifying and collecting inputs.
7. Scheduled the final TAC meeting for December 18, 2018 to review all draft deliverables.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2018:**

None thus far.

# FINANCIAL STATUS

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## 1. FINANCIAL STATUS OF ACTIVE PROJECTS:

NO.	PROJECT TITLE	APPROVED BUDGET	INVOICES APPROVED FOR PAYMENT	PROJECT BALANCE
10-3	Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology	\$150,158	\$87,819.56	FINAL
13-1	Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections	\$191,710	\$189,411.48	FINAL
13-2	HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures	\$249,785	\$238,408.29	FINAL
13-3	Improved Regionalization of Quality Assurance (QA) Functions	\$139,713	\$93,520.81	\$46,192.19
14-1	Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians	\$100,000	\$85,615.73	FINAL
14-4	Optimizing Future Work Zones in New England for Safety & Mobility	\$200,000	\$197,283.82	FINAL
15-1	Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)	\$164,970	\$163,095.32	\$1,874.68
15-2	Using the New SHRP2 Naturalistic Driving Study Safety Databases to Examine Safety Concerns for Teens and Older Drivers	\$150,000	\$149,413.74	\$586.26
15-3	Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England	\$150,000	\$149,677.76	FINAL
15-4	Quick Response: Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast	\$50,000	\$40,378.13	\$9,621.87

17-1	Quick Response: New England Connected Automated Vehicles	\$50,000	\$50,000	FINAL
17-2	Quick Response: Quantification of Research Benefits	\$50,000	\$44,837.00	\$5,163.00

## 2. FUND BALANCE:

NETC FUND BALANCE As of December 31, 2018							
ITEM	OBLIGATION FOR PROJECTS	TRAVEL OBLIGATION S AND EXPENDITURE S	BUDGET	EXPENSE D	INVOICE	CUMMULA TIVE BALANCE	NOTES
<b>Unexpended Balance of NETC funds from AASHTO as of 6/5/95 (Per AASHTO memo 12/4/95)</b>						132,777.07	
<b>Member Obligations 1994 = 6 X \$75,000</b>	450,000.00					450,000.00	
<b>Coord./Admin. of NETC: Calendar Year 1995 Bdgt. = \$73042</b>				58,761.32	FINAL	391,238.68	
- Construction Costs of New England Bridges-Phase II				39,500.00	FINAL/CLOSE	351,738.68	
- Tire Chips as Lightweight Backfill-Phase II: Full-Scale Testing (Supplemental Funding)				16,000.00	FINAL/CLOSE	335,738.68	
- Bridge Rail Crash Test - Phase II: Sidewalk-Mounted Rail				134,127.00	FINAL/CLOSE	201,611.68	
- New England Vehicle Classification and Truck Weight Program				6,752.57	FINAL/CLOSE	194,859.11	
94-1: Structural Analysis of New England Subbase Materials and Structures				110,057.38	FINAL/CLOSE	84,801.73	
94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques				224,801.80	FINAL/CLOSE	-140,100.07	
94-3: Procedures for The Evaluation of Sheet Membrane Waterproofing				67,002.00	FINAL/CLOSE	-207,102.07	Note: Project admin
94-4: Durability of Concrete Crack Repair Systems				72,036.04	FINAL/TERM.	-279,138.11	
<b>Member Obligations 1995 = 7 X \$75,000</b>	525,000.00					245,861.89	
95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads				75,000.00	FINAL/CLOSE	170,861.89	
95-2: Suitability of Non-Hydric Soils for Wetland Mitigation				39,867.70	FINAL/CLOSE	130,994.19	
95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic				120,812.12	FINAL/CLOSE	10,182.07	
95-5: Buried Joints in Short Span Bridges				61,705.61	FINAL/TERM.	-51,523.54	
95-6: Guidelines for Ride Quality Acceptance of Pavements				106,124.00	FINAL/CLOSE	-157,647.54	
<b>Member Obligations 1996 = 6 X \$75,000</b>	450,000.00					292,352.46	
<b>Coord./Admin. of NETC: Calendar Year 1996; Bdgt. = \$75,000</b>				69,123.85	FINAL	223,228.61	
96-1: SUPERPAVE Implementation				60,139.25	FINAL/CLOSE	163,089.36	
96-2: Optimizing GPS Use in Transportation Projects				27,008.81	FINAL/TERM.	136,080.55	
96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge Elements,				135,000.00	FINAL/CLOSE	1,080.55	
<b>Member Allocations 1997 = 6 X \$75,000</b>	450,000.00					451,080.55	
<b>Coord./Admin. of NETC: Calendar Year 1997; Bdgt. = \$82,494</b>				77,244.35	FINAL	373,836.20	
97-1: A Portable Method for Determining Chloride Concentration on Roadway Pavements				96,669.50	FINAL/CLOSE	277,166.70	Phase I
97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, etc.				90,667.79	FINAL/CLOSE	186,498.91	Phase II
97-3: Determining Properties, Standards & Performance of Wood Waste Compost, etc.				108,318.73	FINAL/CLOSE	78,180.18	
Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot)				27,779.64	FINAL/CLOSE	50,400.54	Phase I
97-4: Early Distress of Open-Graded Friction Course				16,074.30	FINAL/CLOSE	34,326.24	Phase II
				10,700.00		23,626.24	
				57,495.71	FINAL/CLOSE	-33,863.47	
<b>Member Obligations 1998 = 6 X \$75,000</b>	450,000.00					416,130.53	
<b>Coord./Admin. of NETC: Calendar Year 1998; Bdgt = \$73,021</b>				80,422.65	FINAL	335,707.88	
- Travel Tech. Comm. ( Aug. 98 tel. poll) for 1998 = \$5,000				0.00		335,707.88	
- T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = \$10,000				9,551.06	FINAL	326,156.82	
- Refund Check (No. 15-663337), for CY '98 Management of NETC, from UConn OSP; Ref. 7/19/00	336.00					326,492.82	Refund Check (No.
<b>Member Obligations 1999 = 6 X \$75,000</b>	450,000.00					776,492.82	
<b>Coord./Admin. of NETC: Calendar Year 1999; Bdgt = \$98,066</b>				79,101.20	FINAL	697,391.62	
99-1: Bridge Rail Transitions				240,000.00	FINAL/CLOSE	457,391.62	
99-2: Evaluation of Asphaltic Expansion Joints				62,234.76	FINAL/CLOSE	395,156.86	
99-3: Bridge Scour Monitoring Systems				78,523.32	FINAL/CLOSE	316,633.54	
99-4: Quantifying Roadside Rest Area Usage				44,857.00	FINAL/CLOSE	271,776.54	
99-6: The Effects of Concrete Removal Operations on Adjacent Concrete that Is to Remain				96,008.36	FINAL/CLOSE	175,768.18	
<b>Member Obligations 2000 = 6 X \$100,000</b>	600,000.00					775,768.18	
<b>Coord./Admin. of NETC: Calendar Year 2000; Bdgt = \$102,588</b>				91,899.37	FINAL	683,868.81	
00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England -				31,251.92	FINAL/CLOSE	652,616.89	

NETC FUND BALANCE As of December 31, 2018							
ITEM	OBLIGATION FOR PROJECTS	TRAVEL OBLIGATION AND EXPENDITURE RES	BUDGET	EXPENSE D	INVOICE	CUMMULATIVE BALANCE	NOTES
00-2: Evaluation of Permeability of Superpave Mixes				95,499.16	FINAL/CLOSED	557,117.73	
00-3: Composite Reinforced Timber Guard Rail - Phase I: Design, Fabrication and Testing				81,989.38	FINAL/CLOSED	475,128.35	
00-4: Falling Weight Deflectometer Study				100,000.00	FINAL/CLOSED	375,128.35	
00-5: Guard Rail Testing - Modified eccentric Loading Terminal at NCHRP 350 TL2				61,287.00	FINAL/CLOSED	313,841.35	
00-6: Implementation of Visualization Technologies to Create Simplified Presentations Within				74,914.49	FINAL/CLOSED	238,926.86	
00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and				45,369.45	FINAL/CLOSED	193,557.41	
00-8: Performance and Effectiveness of A Thin Pavement Section Using Geogrids and Drainage				150,000.00	FINAL/CLOSED	43,557.41	
<b>Member Obligations 2001 = 6 X \$100,000</b>	600,000.00					643,557.41	
<b>Coord./Admin. of NETC: Calendar Year 2001:Bdgt = \$106,248</b>				104,385.35	FINAL	539,172.06	
01-1: Advanced Composite Materials for New England's Transportation Infrastructure				47,559.27	FINAL/CLOSED	491,612.79	
01-1: Advanced Composite Materials for New England's Transportation Infrastructure - Technology				25,286.18	FINAL/CLOSED	466,326.61	
01-2: Development of A Testing Protocol for Quality Control/Quality Assurance of Hot Mix Asphalt				80,000.00	FINAL/CLOSED	386,326.61	
01-3: Design of Superpave HMA for Low Volume Roads				120,324.15	FINAL/CLOSED	266,002.46	
01-6: Field Evaluation of A New Compaction Device				49,944.50	FINAL/CLOSED	216,057.96	
<b>Member Obligations 2002 = 6 X \$100,000</b>	600,000.00					816,057.96	
<b>NY DOT Obligation = \$56,551.38</b>	56,551.38					872,609.34	
<b>Coord./Admin. Of NETC: Calendar Year 2002</b>				109,207.12	FINAL	763,402.22	
02-1: Relating Hot Mix Asphalt Pavement Density to Performance				103,260.73	FINAL/CLOSED	660,141.49	
02-2: Formulate Approach for 511 Implementation in New England Phase 1				48,158.19	FINAL/CLOSED	611,983.30	
02-2: Formulate Approach for 511 Implementation in New England Phase 2				32,813.16	FINAL/CLOSED	579,170.14	
02-3: Establish Subgrade Support Values (Mr) for Typical Soils in New England				79,936.86	FINAL/CLOSED	499,233.28	
02-5: Determination of Moisture Content of De-Icing Salt at Point of Delivery				19,679.99	FINAL/CLOSED	479,553.29	
02-6: Sealing of Expansion Joints - Phase 1				74,982.81	FINAL/CLOSED	404,570.48	
02-7: Calibrating Traffic Simulation Models to Inclement Weather Conditions with Applications to				74,037.57	FINAL/CLOSED	330,532.91	
02-8: Intelligent Transportation Systems Applications to Ski Resorts in New England				54,724.71	FINAL/CLOSED	275,808.20	
<b>Member Obligations 2003 = 6 X \$100,000</b>	600,000.00					875,808.20	
<b>NY DOT Obligation = \$50,000</b>	50,000.00					925,808.20	
<b>Coord./Admin. Of NETC Calendar Year 2003 = \$124,258</b>				118,855.19	FINAL	806,953.01	
03-1: Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff				70,690.16	FINAL/CLOSED	736,262.85	
03-2: Field Studies of Concrete Containing Salts of An Alkyl-Substituted Succinic Acid				133,385.33	FINAL/CLOSED	602,877.52	
03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England				20,682.70	FINAL/CLOSED	582,194.82	
03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England - Phase 2				13,135.80	FINAL/CLOSED	569,059.02	
03-4: Measuring Pollutant Removal Efficiencies of Storm Water Treatment Units				80,000.00	FINAL/CLOSED	489,059.02	
03-5: Evaluation of Field Permeameter As A Longitudinal Joint Quality Control Indicator				77,318.43	FINAL/CLOSED	411,740.59	
03-6: Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines for the Use of				54,085.45	FINAL/CLOSED	357,655.14	Cont'd as 03-6 (FHV)
03-6 (FHV/A): Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines for				44,479.52	FINAL/CLOSED	313,175.62	FHWA Led Project.
03-7 (Alt.): Basalt Fiber Reinforced Polymer Composites				64,092.29	FINAL/CLOSED	249,083.33	
<b>Member Obligations 2004 = 6 X \$100,000</b>	600,000.00					849,083.33	
<b>NY DOT Obligation = \$50,000</b>	50,000.00					899,083.33	
<b>Coord./Admin. Of NETC Calendar Year 2004 = \$126,559</b>				113,012.87	FINAL	786,070.46	
04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase I				27,166.58	FINAL/CLOSED	758,903.88	
04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase II				82,750.99	FINAL/CLOSED	676,152.89	
04-2: Driver-Eye-Movement-Based Investigation for Improving Work Zone Safety				70,387.66	FINAL/CLOSED	605,765.23	
04-3: Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New England. Cont'd as				98,025.49	FINAL/CLOSED	507,739.74	Cont'd as 04-3 (FHV)
04-3 (FHV/A): Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New England				21,950.37	FINAL/CLOSED	485,789.37	FHWA Led Project.
04-4: Determining the Effective PG Grade of Binder in RAP Mixes				130,876.00	FINAL/CLOSED	354,913.37	
04-5: Network-Based Highway Crash Prediction Using Geographic Information Systems				129,020.04	FINAL/CLOSED	225,893.33	

NETC FUND BALANCE As of December 31, 2018							
ITEM	OBLIGATION FOR PROJECTS	TRAVEL OBLIGATION S AND EXPENDITURE RES	BUDGET	EXPENSE D	INVOICE	CUMMULATIVE BALANCE	NOTES
<b>Member Obligations 2005 = 6 x \$100,000</b>	600,000.00					825,893.33	
<b>NY DOT Obligation = \$50,000</b>	50,000.00					875,893.33	
<b>Coord./Admin. Of NETC Calendar Year 2005 = \$130,528</b>				128,934.25	FINAL	746,959.08	
05-1: Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft Rock				52,155.25	FINAL/CLOSE	694,803.83	Cont'd as 05-1(FHw
05-1 (FHwA) : Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft				46,820.24	FINAL/CLOSE	647,983.59	FHwA Led Project.
05-5: Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel Cont'd as 05-				104,987.55	FINAL/CLOSE	542,996.04	Cont'd as 05-5 (FHw
05-5 (FHwA) : Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel				19,907.99	FINAL/CLOSE	523,088.05	FHwA Led Project.
05-6: Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message				46,712.74	FINAL/CLOSE	476,375.31	Cont'd as 05-6 (FHw
05-6 (FHwA) : Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message				13,222.32	FINAL/CLOSE	463,152.99	FHwA Led Project.
05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways Phase I				92,000.36	FINAL/CLOSE	371,152.63	
05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways Phase II				7,431.26	FINAL/CLOSE	363,721.37	
05-8: Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis of Traffic				94,964.22	FINAL/CLOSE	268,757.15	Cont'd as 05-8 (FHw
05-8 (FHwA) : Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis of				5,035.00	FINAL/CLOSE	263,722.15	FHwA Led Project
<b>Member Obligations 2006 = 5 x \$100,000 (no ME DOT allocation)</b>	500,000.00	10,000.00				763,722.15	
<b>Note: Maine 2006 Obligation as of 1/1/06/06 per Peabody 1/1/30/06 email</b>	100,000.00					863,722.15	
<b>Coord./Admin. Of NETC Calendar Year 2006 = 131,814</b>				100,718.92	FINAL	763,003.23	
06-1: New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide With				82,209.78	FINAL/CLOSE	680,793.45	
06-1 (FHwA) : New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design				68,085.00	FINAL/CLOSE	612,708.45	FHwA Led Project
06-3 Establish Default Dynamic Modulus Values for New England				109,787.00	FINAL/CLOSE	502,921.45	
06-5 Winter Severity Indices for New England				73,639.62	FINAL/CLOSE	429,281.83	Note: Project termin
<b>Member Obligations 2007 = 600,000</b>	600,000.00	5,000.00				1,029,281.83	
<b>Coord./Admin. Of NETC Calendar Year 2007 = 136,061</b>				122,644.79	FINAL	906,637.04	
<b>Member Obligations 2008 = 600,000</b>	600,000.00	10,000.00				1,506,637.04	
<b>NY DOT Obligation (50,000)</b>	50,000.00					1,556,637.04	
<b>Coord./Admin. Of NETC Calendar Year 2008 = 134,998</b>				131,509.90	FINAL	1,425,127.14	
02-6 Phase II Sealing of Small Mvmt Bridge Expan Joints - Field Inst. & Mntng				74,558.62	FINAL/CLOSE	1,350,568.52	
<b>Member Obligations 2009 = 600,000</b>	600,000.00					1,950,568.52	
<b>Coord./Admin. Of NETC Calendar Year 2009 (Approved) = 133,309</b>				131,157.45	FINAL	1,819,411.07	
<b>Member Obligations 2010 = 600,000</b>	600,000.00	15,000.00				2,419,411.07	
<b>Coord./Admin. Of NETC Calendar Year 2010 (Approved) = 134,809</b>				127,097.21	FINAL	2,292,313.86	
<b>Member Obligations 2011 = 600,000</b>	600,000.00	10,000.00				2,892,313.86	
<b>Coord./Admin. Of NETC Calendar Year 2011 (Approved) = 133,793</b>				133,793.00	FINAL	2,758,520.86	
<b>Reconciliation of previous Pooled Fund Accounts</b>	-354,400.71					2,404,120.15	See Note 5
<b>Member Obligations 2012 = 100,000</b>	100,000.00	5,000.00				2,504,120.15	See Note 6
<b>Coord./Admin. Of NETC Calendar Year 2012 (Approved) = 179,344.49</b>				179,344.49	FINAL	2,324,775.66	
06-4 Preventative Maintenance and Timing of Applications				223,402.87	FINAL	2,101,372.79	See Note 10
07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture				199,046.37	FINAL	1,902,326.42	
07-2 Effective Establishment of Native Grasses on Roadsides				87,436.11	FINAL	1,814,890.31	
09-3 Advanced Composite Materials: Prototype Development and Demonstration				158,320.39	FINAL	1,656,569.92	See Note 3
10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology				96,444.56	FINAL	1,560,125.36	

NETC FUND BALANCE As of December 31, 2018							
ITEM	OBLIGATION FOR PROJECTS	TRAVEL OBLIGATION S AND EXPENDITURE RES	BUDGET	EXPENSE D	INVOICE	CUMMULATIVE BALANCE	NOTES
<b>Coord./Admin. Of NETC Calendar Year 2013 (Approved) = 179,344.49</b>				179,344.49	FINAL	1,380,780.87	
13-1: Development of High Early Strength Connections for Accelerated Bridge Construction				198,036.48	FINAL	1,182,744.39	
13-2: HMA Mixtures Containing Recycled Asphalt Shingles (RIAS): Low Temperature and Fatigue				247,033.29	FINAL	935,711.10	
13-3: Improved Regionalization of QA Functions			108,625.00			827,086.10	
<b>Member Obligations 2014 = 500,000</b>	600,000.00	10,000.00				1,427,086.10	See Note 6
<b>Coord./Admin. Of NETC Calendar Year 2014 (Approved) = 179,344.49</b>				179,344.49	FINAL	1,247,741.61	
14-1: Measuring the Effectiveness of Competency Models for Job-Specific Professional				94,240.73	FINAL	1,153,500.88	
14-2: Investigation of Northern Long-Eared Bat Roosting Sites on Bridges				174,876.89	FINAL	978,623.99	
14-4: Optimizing future work zones in New England for safety				205,908.82	FINAL	772,715.17	
<b>Member Obligations 2015 = 600,000</b>	600,000.00	5,000.00				1,372,715.17	
<b>Coord./Admin. Of NETC Calendar Year 2015 (Approved) = 179,344.49</b>				179,344.49	FINAL	1,372,715.17	
15-1: Use of Forested Habitat Adjacent to Highways by Northern Long ear Bats			173,595.00			1,199,120.17	
15-2: Using the New SHRP2 Naturalistic Driving Study Safety Databases to Examine Safety Concerns			158,625.00			1,040,495.17	
15-3: Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England				158,302.76		882,192.41	
15-4 Quick Response: Optimizing Quality Assurance (QA) Process for Asphalt Pavement			58,625.00			823,567.41	
<b>Member Obligations 2016 = 0</b>	0.00	0.00				823,567.41	See Note 7
<b>Coord./Admin. Of NETC Calendar Year 2016 (Approved) = 0</b>			0.00			823,567.41	
<b>Member Obligations 2017 = 0</b>	0.00					823,567.41	
<b>Coord./Admin. Of NETC Calendar Years 2016-2018 (Approved) = 176,120</b>				176,120.00	FINAL	647,447.41	
<b>Reconciliation of previous Pooled Fund Accounts (From SPR3089 and TPF5(201)</b>							See Note 9
<b>Member Obligations 2017 = 0</b>						647,447.41	
<b>Transfer of Pooled Fund Accounts (TPF5222 back to states)</b>	-200,000.00					447,447.41	
<b>Member Obligations 2018 = 0</b>	0.00						
17-1 Quick Response: Automated and Connected Vehicles				58,625.00		388,822.41	
17-2 Quick Response: Research Benefit Quantification			58,625.00			330,197.41	
17-3 Quick Response: Phase II of Project 13-3			38,713.00			290,484.41	See Note 11
<b>Travel Expenditures to date</b>		-38,385.45					
<b>Totals =</b>	10,377,486.67	31,614.55	597,808.00	10,268,538.75		111,139.92	

### **NETC Fund Balance Notes:**

1. Member FFY allocations are obligated between October 1 and December 31
2. A credit of \$6,599.70 for NETC's overpayment to UConn for CY 2004 NETC Management was applied, by UConn, to the 'Indirect Cost' for project 02-5. Therefore although the total expenditures of the project were \$26,279.69 the amount paid by NETC was \$19,679.99.
3. Per minutes of NETC Adv. Comm. Mtg. 5/12/08: "It was agreed that since the encumbered amount for NETC 05-7 was incorrectly shown in the Fund Balance Report (April 30, 2008) as \$70,000 and the correct amount is \$100,000, the amount of funding to be allocated for the third ranked problem statement for the FFY 09 research program (NETC 09-3) would be set at the amount of the revised unencumbered fund balance remaining (at that time) after the allocation of funds for NETC 09-1 and NETC 09-2, i.e., \$48,847." (Note no longer relevant. TAC revised budget. AHC 6/25/2013)
4. Work on project suspended pending resolution of authorization of payment for costs incurred prior to execution of project agreement. VAOT to submit request to FHWA for approval of costs incurred prior to execution of the project agreement in accordance with 23CFR Section 1.9.
5. During the Process to Close out SPR-3(089) and TPF-5(201), it became clear that there was a discrepancy between the NETC Coordinator's Fund Balance Tracking Sheet and what was actually left over in the accounts. The reconciliation is approximately \$-450,000. This leads me to believe that an annual contribution from the 1990s might have been canceled, but it is not reflected in the tracking sheet. Unfortunately, SPR-3(009) has been closed for a long time, so the detailed account information cannot be obtained.
6. Contributions for FY 2012 and FY 2013 were canceled in an Advisory Committee ballot dated 1/10/14. Connecticut had already made their contribution. Therefore, they will not need to make a contribution for FY 2014.
7. Contributions for FY 2016 have been waived.
8. FY2017 Contributions are listed as Obligations, but not in the balance for TPF-5(222) as those transfers are still pending/debated.
9. This is an accounting update to reflect funds transferred from previous funds SPR-3(089) and TPF-5(201) into TPF-5(222).
10. Project budgets include Proposal Budget or Final Invoice Budget and UVM Facilities and Administration fees of \$8,625.
11. Project 17-3 (i.e. 13-3 Phase II) does not have F&A added onto the initial phase of 13-3.

# REPORTS, PAPERS AND PRESENTATIONS

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## **1. POLICIES AND PROCEDURES:**

- “Policies and Procedures, New England Transportation Consortium,” July 1995.
- “Policies and Procedures, New England Transportation Consortium,” April 2002.
- “Policies and Procedures, New England Transportation Consortium,” May 2008.
- “Policies and Procedures, New England Transportation Consortium,” March 2015.
- “Policies and Procedures, New England Transportation Consortium,” Nov. 2016.
- “Policies and Procedures, New England Transportation Consortium,” Dec. 2017.

## **2. ANNUAL REPORTS:**

- “Annual Report For Calendar Year 1995,” March 1996, NETCR3
- “Annual Report For Calendar Year 1996,” January 1997, NETCR4
- “Annual Report For Calendar Year 1997,” January 1998, NETCR9
- “Annual Report For Calendar Year 1998,” January 1999, NETCR10
- “Annual Report For Calendar Year 1999,” January 2000, NETCR21
- “Annual Report For Calendar Year 2000,” August 2001, NETCR27
- “Annual Report For Calendar Year 2001,” December 2002, NETCR40
- “Annual Report For Calendar Year 2002,” November 2003, NETCR41
- “Annual Report For Calendar Year 2003,” September 2005, NETCR55
- “Annual Report For Calendar Year 2004,” December 2005, NETCR59
- “Annual Report For Calendar Year 2005,” August 2006, NETCR61
- “Annual Report For Calendar Year 2006,” April 2007, NETCR68
- “Annual Report For Calendar Year 2007,” February 2008, NETCR70
- “Annual Report For Calendar Year 2008,” April 2009, NETCR75
- “Annual Report For Calendar Year 2009,” March 2010, NETCR79
- “Annual Report For Calendar Year 2010,” April 2011, NETCR84
- “Annual Report For Calendar Year 2011,” December 2011, NETCR90
- “Annual Report For Calendar Year 2012,” February 2013, NETCR92
- “Annual Report For Calendar Year 2013,” February 2014, NETCR94
- “Annual Report For Calendar Year 2014,” February 2015, NETCR95
- “Annual Report For Calendar Year 2015,” January 2018, NETCR102
- “Annual Report For Calendar Year 2016,” April 2018, NETCR106
- “Annual Report For Calendar Year 2017,” April 2018, NETCR107
- “Annual Report For Calendar Year 2018,” February 2019, NETCR 116

## **3. REPORTS, PAPERS, AND PRESENTATIONS 1988-1995:**

- “The Development of a Common Regional System for Issuing Permits for Oversize and Overweight Trucks Engaged in Interstate Travel,” Humphrey, T.F., May 1986.
- “Agreement to Implement a Common Set of Procedures for Issuing Permits for Nondivisible Oversize and Overweight Trucks Engaged in Interstate Travel,” The New England Transportation Consortium, October 1988.



“The New England Transportation Consortium, Round One Activities,” Humphrey, T.F., and Maser, K.R., MIT, December 1988.

“New Technology for Bridge Deck Assessment - Phase I Final Report,” Vols. I and II, Maser, Kenneth R., MIT Center for Transportation Studies, October 1989.

“Handbook for Use by the Trucking Industry to Implement The NETC Common Truck Permit Procedures for Certain Nondivisible Oversize/Overweight Vehicles Traveling on State Highways,” MIT Center for Transportation Studies, January 1989.

“Bridge Rail Design and Crash Worthiness - Final Report,” Elgaaly, M., Dagher, H., and Kulendran, S., University of Maine, May 1989.

“New England Transportation Consortium, Operational Procedures,” Humphrey, T.F., November 1991.

“Wetlands: Problem & Issues,” Shuldiner, P.W., University of Massachusetts, August 1990.

“Development of a Uniform Truck Management System,” Vols. I and II, Lee, K.W., and McEwen, E.E., University of Rhode Island. July 1990.

“A Study of STAA Truck Safety in New England - Phases I & II,” MIT, November 1991.

“New Technology for Bridge Deck Assessment - Phase II Final Report,” MIT, May 1990.

“Rail Service in New England,” Martland, C.P. Little, and Alvaro, A.E., MIT Center for Transportation Studies, April 1992.

“CMA Degradation and Trace Metals in Roadside Soil,” Ostendorf, D.W., Palaia, T.A., and Zutell, C.A., University of Massachusetts, March 1993.

“Tire Chips as Lightweight Backfill for Retaining Walls - Phase I,” Humphrey, D., Sandford, T.C., Cribbs, M.M., Gharegrat, H.G., and Manion, W.P., University of Maine, August 1992.

“Cooperative Regional Transportation Research Programs Underway in New England,” Humphrey, T.F., and Sussman, J.M., International Congress on Technology and Technology Exchange, June 1989.

“Uniformity Efforts in Oversize/Overweight Permits,” Humphrey, T.F., NCHRP Synthesis, No. 143, Transportation Research Board, 1988.

“Implementation of a Uniform Truck Permit System by the New England Transportation Consortium,” Humphrey, T.F., AASHTO 1987 Annual Meeting

Proceedings, pp. 84-90, 1987.

“Advantages of Oversize/Overweight Truck Permit Uniformity,” AASHTO 1990 Annual Meeting Proceedings, pp. 83-85, 1990.

“Crash Worthiness of Bridge Rails,” Dagher, H., Elgaaly, M., and Kulendran, S., Proceedings, Fourth Rail Bridge Centenary Conference, Heriot-Watt University, Edinburgh, Scotland, August 1990.

“Principles of Radar and Thermography for Bridge Deck Assessment,” Maser, R., and Roddis, W.M.K., ASCE Journal of Transportation Engineering, Vol. 116, No. 5, Sept. /Oct. 1990.

“Regional Rail Planning In New England,” Martland, C.P. Little, and Alvaro, A.E., MIT, August 1993. (Accepted for publication 1994)

“CMA Degradation in Roadside Soil: Acetate Microcosms,” Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Transportation Research Record, No. 1366, pp. 41-43, 1992.

“Aerobic Degradation of CMA in Roadside Soils: Field Simulations from Soil Microcosms,” Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Journal of Environmental Quality, Vol. 22, pp. 229-304, 1993.

“Shear Strength and Compressibility of Tire Chips for Use as Retaining Wall Backfill,” Humphrey, D.N., Sandford, T.C., Cribbs, M.M., and Manion, W.P., Transportation Research Record No. 1422, pp. 29-35, Transportation Research Board, National Research Council Washington, D.C., 1993.

“Tire Chips as Lightweight Subgrade Fill and Retaining Wall Backfill,” Humphrey, D.N., and Sandford, T.C., Proceedings of the Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, pp. 5-87 to 5-99, Federal Highway Administration, Washington, D.C., 1993.

#### 4. REPORTS, PAPERS AND PRESENTATIONS 1995-2018:

Project No.	Title
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N/A	<b>Construction Costs of New England Bridges</b>
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Reports:

“Construction Costs of New England Bridges,” Alexander, J.A., Dagher, H. and James, S., November 1996, NETCR1.

Papers and Presentations:

“Construction Costs of New England Bridges,” Alexander, J., Dagher, H. and James, S. Presented at the Annual Maine Transportation Conference, December 7, 1995.

N/A	<b>Tire Chips as Lightweight Backfill for Retaining Walls, Phase II: Full-Scale Testing</b>
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Reports:

“Tire Chips As Lightweight Backfill for Retaining Walls - Phase II,” Tweedie, Jeffrey J., Humphrey, Dana N., and Sandford, T.C., March 11, 1998, NETCR8.

Papers and Presentations:

“Tire Shreds as Lightweight Retaining Wall Backfill-Active Conditions,” Humphrey, D. Submitted for publication in the ASCE Journal of Geotechnical and Geoenvironmental Engineering.

“Civil Engineering Uses for Tire Chips,” Humphrey D.N. A six-hour short course presented to the Nebraska Department of Environmental Quality, the Maine Dept. of Transportation, the Texas Engineering Extension Service, the Manitoba Tire Stewardship Board, the Alberta Tire Recycling Management Board, and the Arkansas Department of Pollution Control and Ecology.

“Tire Chips as Lightweight Subgrade and Retaining Wall Backfill,” by Humphrey, D.N. and Sandford, T.C. Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, FHWA, Denver, Colorado, October 19-22, 1993.

“Use of Tire Chips as Subgrade Insulation and as Lightweight Fill for Highway Construction,” Humphrey, D.N. Presented at the 18<sup>th</sup> Annual Meeting of the Asphalt Recycling and Reclaiming Association, Pompano Beach, Florida, February 23-26, 1994.

“Use of Tire Chips in Highway Construction,” Humphrey, D.N. Presented to the New England Environmental Expo, Boston, Massachusetts, May 9, 1995.

N/A

**Tire Chips as Lightweight Backfill for Retaining Walls, Phase II: Full-Scale Testing (cont'd):**

Papers and Presentations (cont'd):

“Use of Tire Chips in Highway Construction,” Humphrey, D.N. Presented to the AASHTO Region 1 RAC Meeting, Portland, Maine, May 23, 1995.

“Tire Chips for Highway Construction,” Humphrey, D.N. Presented to the Northeast Recycling Council in Sturbridge, Massachusetts on December 8, 1995.

“Tire Chips: A New Road Building Geomaterial,” Humphrey, D. Presented at the Conference on Waste and Recycled Materials in the Transportation Infrastructure, held in conjunction with the 75th Annual Meeting of the Transportation Research Board, January 7, 1996.

“Use of Tire Chips in Civil Engineering.” Presented at the 76th Annual Meeting of the Rubber Association of Canada, March 7, 1996.

“Civil Engineering Uses for Scrap Tires,” Humphrey, D. Presented at Scrap Tire '96 held in Chicago, Illinois on August 16, 1996.

“Full Scale Field Trials of Tire Chips as Lightweight Retaining Wall Backfill-At Rest Conditions,” Tweedie, J.J., Humphrey, D.N., and Sandford, T.C., Transportation Research Board No. 1619, Transportation Research Board, Washington, D.C., p. 64-71, 1998.

“Tire Shreds as Retaining Wall Backfill, Active Conditions,” Tweedie, J.J., Humphrey, D.N., and Sandford, T.C., Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 124, No. 11, Nov., pp.1061-1070, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented to the RI DOT, April 1999.

N/A

**New England Vehicle Classification And Truck Weight Program, Phase I**

Reports:

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 1: Toward the Development of a Vehicle Classification Program for New England,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

N/A

**New England Vehicle Classification And Truck Weight Program, Phase I (cont'd):**

Reports (cont'd):

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 2: Toward the Development of a Truck Weight Program for New England,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 3: Supplemental Analysis of Truck Weight Data Collection at SHRP Continuous Count Stations,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

“New England Vehicle Classification and Truck Weight Program, Phase I,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T. and Shuldiner, P., April 1996, NETCR2.

Papers and Presentations:

“An Analysis of Vehicle Class and Truck Weight Patterns in New England,” Collura, J. and Orloski, F. Presented at the 1994 National Traffic Data Acquisition Conference, Rocky Hill, Connecticut, September 18-22, 1994.

“New England Vehicle Classification and Truck Weight Program,” Collura, J. and Orloski, F. Presented to the Transportation Research Board's Highway Traffic Monitoring Committee, Annual Meeting of the Transportation Research Board, Washington, D.C., January 1995.

N/A

**Bridge Rail Crash Test, Phase II: Sidewalk-Mounted Rail**

Reports:

“NETC 2-Bar Curb-Mounted Bridge Rail Design - Plans and Specifications.” Revised January 1997.

“NETC 4-Bar Sidewalk-Mounted Bridge Rail Design - Plans and Specifications.” January 1997.

“Crash Testing and Evaluation of the NETC 2-Bar Curb-Mounted Bridge Rail,” Mak, K.K., and Menges, W.L., February 1998, NETCR10.

“Full-Scale Crash Evaluation of the NETC 4-Bar Sidewalk Steel Bridge Railing,” Kimball, C.E., and Mayer, J.B., March 1999, NETCR14. Papers and Presentations: None

**Structural Analysis of New England Subbase Materials And Structures**Reports:

“Structural Analysis of New England Subbase Materials and Structures,” Lee, K.W., Huston, M.T., Davis, J., Vajjhalla, S., June 30, 2001, NETCR26.

Papers and Presentations:

“Structural Analysis of New England Subbase Materials and Structures,” Davis, J. Presented at the Rhode Island Transportation and Civil Engineering Forum, Kingston, Rhode Island, October 23, 1996.

“Structural Analysis of New England Subbase Materials and Structures.” Presented at the Northeast Graduate Student Symposium on Applied Mechanics, University of Rhode Island, April 26, 1997.

“Structural Analysis of New England Subbase Materials and Structures.” Presented at the Rhode Island Transportation and Civil Engineering Forum, University of Rhode Island, October 15, 1997.

“Structural Analysis of New England Subbase Materials and Structures,” Davis, J., Huston, M., and Lee, K.W. Presented at the 1998 Annual Transportation Research Board Meeting.

“Structural Properties of New England Subbase Materials of Flexible Pavements.” Presented at the 5<sup>th</sup> International Conference on the Bearing Capacity of Roads and Airfields, July 8, 1998.

“Structural Properties of New England Subbase Materials of Flexible Pavements.” Presented at the 5th International Conference on the Bearing Capacity of Roads and Airfields on July 8, 1998.

“Characterization of Subbase Materials of Flexible Pavements with and Without Reclaimed Asphalt Pavement,” Lee, K.W., Davis, J., and Vajjhalla, S. Presented at the 1999 World Congress for Korean Scientists and Engineers, July 7, 1999.

“Characterization of Subbase Materials of Flexible Pavements with and Without Reclaimed Asphalt Pavement,” Lee, K.W., Davis, J. and Vajjhalla, S. Presented at the 12th Rhode Island Transportation Forum, University of Rhode Island, October 15, 1999.

## **Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques**

### Reports:

“Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques,” Huston, D., Fuhr, P., Maser, K. and Weedon, W., July 1, 2002, NETCR 19.

### Papers and Presentations:

“Bridge Deck Structural Monitoring Techniques,” Huston, D. Presented at the New England State Materials Engineer Association Conference, Burlington, Vermont, October 9, 1996.

“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Maser, K., Weedon, W., Fuhr, P.L., and Adam, C., Structural Health Monitoring, Chang F., Editor, Technomic Publishing, pp. 91-109, Proceedings of the International Workshop on Structural Health Monitoring, Stanford, California, September 1997.

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“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Master, K., Hu, J.Q., Weedon, W., and Adam, C., Proceedings of the GPR '98 7th International Conference on Ground-Penetrating Radar, The University of Kansas, Lawrence, KS, May 27-30, 1998.

“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Hu, J.Q., Pelczarski, N, and Esser, B., Proceedings Second International Conference on Structural Health Monitoring, Stanford University, September 1999.

“GIMA Antenna Design for Ground Penetrating Radar in Concrete NDE Application,” Hu J.Q., Huston, D. and Fuhr, P. SPIE paper 3670-63, SPIE Conference On Sensory Phenomena and Measurement Instrumentation for Smart Structures and Materials, Newport Beach, CA, March 1999.

“Ground Penetrating Radar for Concrete Bridge Health Monitoring Applications,” Huston, D, Hu, J.Q., Maser, K., Weedon, W., and Adam, C. SPIE 3587-23, Proceedings SPIE NDE Techniques for Aging Infrastructure and Manufacturing, Newport Beach, CA, March 1999.

“Electromagnetic Interrogation of Structures,” Huston, D. Fourth Army Research Office on Smart Structures, State College, PA, August 1999.

94-2

**Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques (cont'd):**

Papers and Presentations (cont'd):

“GIMA Ground Penetrating Radar System For Infrastructure Health Monitoring,” Huston, D.R., Hu, J.Q, Maser, K., Weedon, W., and Adam, C. Journal of Applied Geophysics 43, 2000, pp. 39-146.

“Good Impedance Match Antenna (GIMA) Design and Its Applications for Ground Penetrating Radar In Concrete Structures NDE Applications,” Hu, J. M.S. Thesis, Department of Mechanical Engineering, University of Vermont, March, 2000.

“Damage Assessment in Roadways with Ground Penetrating Radar,” Huston, D., Pelczarski, N., Esser, B., Maser, K., and Weedon, W. SPIE Conference on Nondestructive Evaluation and Health Monitoring of Aging Infrastructure, 3995A-55, Newport Beach CA, March 2000.

“Damage Detection in Roadways with Ground Penetrating Radar,” Huston, D.R., Pelczarski, N., Esser, B., and Master, K. GPR 2000, 8th International Conference on Ground Penetrating Radar," Gold Coast, Australia, May 2000.

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“Inspection of Bridge Columns and Retaining Walls with Electromagnetic Waves,” Huston D.R., Pelczarski N., and Key C. SPIE Symposium on Smart Systems for Bridges, Structures, and Highways, 4330-09, Newport Beach, CA, March 2001.

“Wireless Electromagnetic Interrogation of Structures,” Huston D., Pelczarski N., Fuhr P., Arms S., and Esser B. (Tentatively accepted) Smart Materials and Structures, April 2001.

“Adaptive Sensors and Sensor Networks for Structural Health Monitoring,” Huston D. SPIE 4512-24, Symposium on Complex Adaptive Structures, Hutchinson Island, FL, June 2001.

94-3

**Procedures for the Evaluation of Sheet Membrane Waterproofing:**

Reports:

“Procedures for the Evaluation Sheet Membrane Waterproofing,” Korhonen, C.J., Buska, J.S., Cortez, Edel R., and Greatorex, Alan R., August 1999, NETCR13.

Papers and Presentations: None



**94-4**

**Durability of Concrete Crack Repair Systems:**

Reports: None

Papers and Presentations:

“Durability of Concrete Crack Repair, Projects,” Robinson, J. Presented at the University of Rhode Island Graduate Seminar Series, Kingston, RI, November 19, 1997.

“Durability of Concrete Crack Repair System,” Tsiatas, G. and Robinson, J. Presentation to representatives of the Chemical Grouting Division of Kajima Corporation (Japan), University of Rhode Island, College of Engineering, October 26, 1999.

**95-1**

**Use of Tire Chip/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Road**

Reports:

“Use of Tire Chip/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Roads,” Brian, K.L., and Humphrey, D. N., June 2000, NETCR12.

Papers and Presentations:

“Laboratory and Field Measurement of the Thermal Conductivity of Tire Chips for Use as Subgrade Insulation,” Humphrey, D., Chen, L.H. and Eaton, R. A paper submitted to the Transportation Research Board for presentation at the session on “Properties of Unconventional Aggregates” at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented to the RI DOT, April 1999.

“Field Trial of Tire Shreds as Insulation for Paved Roads,” Humphrey, D., Chen, L.H., Lawrence, B. A paper presented at the 10th International Conference on Cold Regions Engineering: Putting Research into Practice, held in Hanover, NH, August 16-19, 1999.

**95-2**

**Suitability of Non-Hydric Soils for Wetland Mitigation**

Reports:

“Suitability of Non-Hydric Soils for Wetland Mitigation,” Brannaka, L.K. and Evans, C.V., February 28, 1997, NETCR5.

Papers and Presentations: None

**95-3            Implementation and Evaluation of Traffic Marking Recesses for Application of Thermo-Plastic Markings on Modified Open Graded Mixes**

Reports:

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Friction Course,” Lee, K.W., Cardi, S.A., and Corrigan, S., July 2000, NETCR23.

Papers and Presentations:

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes,” Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, Kingston, Rhode Island, October 23, 1996.

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open-Graded Mixes,” Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, University of Rhode Island, October 15, 1997.

**95-5            Buried Joints In Short Span Bridges**

Reports: None

Papers and Presentations:

“State of the Art Study of Bridge Joint Systems in New England,” Tsiatas, and Chandrasekaran, S. Submitted for presentation at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

**95-6            Guidelines for Ride Quality Acceptance of Pavements**

Reports:

“Guidelines for Ride Quality Acceptance of Pavements,” Collura, J., El-Korchi, T., Black K., Chase, M. and Li, J., April 1997, NETCR 6.

Papers and Presentations: None

**96-1            Implementation of Superpave**

Reports:

“Superpave Implementation,” Mahoney, James, Stephens, Jack E., September 1999, NETCR18.

**Effectiveness of Fiber Reinforced Composite as Structural and Protective Coverings for Bridge Elements Exposed To Deicing Salt Chlorides**Reports:

“Effectiveness of High Strength Composites as Structural and Protective Coatings for Structural Elements,” Balaguru, P., and Lee, K.W., May 2001, NETCR28.

Papers and Presentations:

“Inorganic Matrices for Composites,” NSF Workshop on Composites, Hanover, NH, March 15, 1998.

“Behavior of Geopolymer Reinforced with Various Types of Fabrics,” SAMPE 1998, Anaheim, CA, May 1998.

“Use of Ferrocement Theory for Analysis of High Strength Composites,” Ferrocement VI, Ann Arbor, MI, June 1998.

“Advances in Composites,” National University of Singapore, July 19, 1998.

“Effectiveness of Fiber Reinforced Composites as Structural and Protective Covering Bridge Elements Exposed to Deicing-Salt Chlorides,” Visiting Scholar Lecture, Transportation Forum, University of Rhode Island, October 15, 1999.

“Advanced High Strength Fiber Composites,” U.S.-Germany Workshop, Maiz, Germany, May 16-19, 1999.

“Recent Advances in Fiber Composites,” Seminar Series, University Cataleuna, Spain, June 28, 1999.

“Inorganic Coatings for Transportation Infrastructures,” Geopolymer Conference, St. Quentin, France, July 2, 1999.

“State-of-the-Art: Fiber Reinforced Concrete,” NSF Faculty Workshop, Northwestern University, Evanston, IL, July 21, 1999.

“Recent Advances in High Strength Composites and Applications for Repair and Rehabilitation,” 6th International Conference on Structural Failure, Durability, and Retrofitting, Singapore, September 15, 2000.

**96-3 Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides (cont'd):**

Papers and Presentations (cont'd):

“Durability of Carbon Composites Made With Inorganic Matrix,” Garon, R., and Balaguru, P., "SAMPE", November 2000, pp. 34-43.

“Inorganic Matrix - High Strength Fiber Composites,” University of Missouri, Rolla, July 27, 2000.

“Comparison of Inorganic and Organic Matrices for Strengthening of Reinforced Concrete Beams,” Kurtz, S., and Balaguru, P., Journal of Structural Engineering ASCE, V 127, January 2001, pp. 35-42.

“Durability of High Strength Composite Repairs under Scaling Conditions,” Garon, R., and Balaguru, P., Proceedings of Third International Conference on Concrete Under Severe Conditions, Vancouver, Canada, June 2001.

**97-1 A Portable Method to Determine Chloride Concentration on Roadway Pavements**

Reports:

“A Portable Method to Determine Chloride Concentration on Roadway Pavements,” Garrick, N., Nikolaidis, N., P. and Luo, J, September 2002, NETCR17.

Papers and Presentations: None

**97-2 Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) In Structural Concrete for the Northeast U.S.A**

Reports:

“Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast U.S.A.,” Civjan, S.A., LaFave, J.M., Lovett, D., Sund, D.J., Trybulski, J., February 2003, NETCR 36.

Papers and Presentations:

“Performance Evaluation of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete,” Sund, D., Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, September, 1999.

**97-2                    Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) In Structural Concrete for the Northeast U.S.A (cont'd):**

Papers and Presentations:

“On the Use of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete,” Lafave, J.M., Lovett, D., and Civjan, S.A., ACI Fall Convention, Toronto, Ontario, Canada, October 15-21, 2000.

“Performance Evaluation of Combinations of Durability Enhancing Admixtures in Concrete - Review and Experimental Program,” Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Lovette, D., Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, February, 2001.

**97-3                    Determining Properties, Standards and Performance of Wood Material as an Erosion Control Mulch and as a Filter Berm**

Reports:

“Performance Specifications for Wood Waste Materials as an Erosion Control Mulch and as a Filter Berm,” Demars, K.R., Long, R.P., Ives, J.R. April 2000, NETCR20.

Papers and Presentations:

“Compost Applications for Erosion Control: New and Improved Methods,” K. Demars. Presented at the Conference on ‘Putting Compost in the Specs: Practical Applications for Erosion Control’, Wrentham Development Center, Wrentham, MA, October 8, 2002.

**97-4                    Early Distress of Open-Graded Friction Course (OGFC)**

Reports:

“Early Distress in Open-Graded Friction Course,” Stephens, J.E., Mahoney, J., Dougan, C.E., July 1999, NETCR16.

Papers and Presentations: None

**99-1                    Bridge Rail Transitions – Development and Crash Testing**

Reports:

“NCHRP Report 350 Testing and Evaluation of NETC Bridge Rail Transitions,” Dean C. Alberson, C. Eugene Buth, Wanda L. Menges, and Rebecca R. Haug, Texas Transportation Institute, Texas A&M University, January 2006, NETCR 53.

Note:

Design documents for the NETC 2-Bar Curb-Mounted and 4-Bar Sidewalk-Mounted Bridge Rail Transitions are available from the NETC Coordinator.

- 99-1 Bridge Rail Transitions – Development and Crash Testing (cont’d):**  
Papers and Presentations:  
“NETC Bridge Rail Transitions,” by Dean C. Alberson and Wanda L. Menges, Concord, New Hampshire, December 13, 2005.  
  
“Summary of NCHRP Report 350,” by Dean C. Alberson, Concord, New Hampshire, December 13, 2005.
- 99-2 Evaluation of Asphaltic Expansion Joints**  
Reports:  
“Evaluation of Asphaltic Expansion Joints,” Mogawer, W.S., November 2004, NETCR 50.  
  
Papers and Presentations: None
- 99-3 Development of Priority Based Statewide Scour Monitoring Systems In New England**  
Reports:  
“Development of Priority Based Statewide Scour Monitoring Systems in New England,” Ho, C.T., Di Stasi, J.M., August 2, 2001, NETCR24.  
  
Papers and Presentations:  
“Real-Time Bridge Scour Assessment and Warning,” Di Stasi, J.M. and Ho, C.L., Proceedings of International Symposium: Technical Committee No. 33 on Scour of Foundations. Melbourne, Australia, pp. 337-352.
- 99-4 Quantifying Roadside Rest Area Usage**  
Reports:  
“Quantifying Roadside Rest Area Usage,” Garder, P. and Bosonetto, N., November 27, 2002, NETCR 38.  
  
Papers and Presentations:  
Results from the rest-area research were included in a presentation by the PI: “The Efficacy and Use of Continuous Shoulder Rumble Strips: Engineering a Solution,” presented at the November 20-21, 2002 National Summit to Prevent Drowsy Driving, National Academy of Sciences, Washington, DC, November 21, 2002 (taped by C-SPAN. Summit also covered by CNN Live Today, CNN Live on Location, CBS Early Show, National Public Radio’s Market Place, and national radio network coverage by ABC, CBS, and AP as well as two stories by nationally syndicated health columnist Jane Brody of The New York Times).

**99-6 Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Adjacent Concrete That Is To Remain**

Reports:

“Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Adjacent Concrete That is to Remain,” Masih, R., Wang, T. and Forbes, A., January 15, 2002, NETCR 29.

Papers and Presentations:

“Enhancing the Students' Learning Process Through Interaction Project Between Academia and Industry.” Presented and published in the Abstract of ASEE 2000 at the University of Massachusetts, Lowell, April 2000.

“The Effect of Powerful Demolition Equipment on the Remaining Part of the Concrete Bridge,” Masih, R. Presented and published in the proceedings of the Second International Conference on Computational Methods for Smart Structures and Material. Madrid, June 2000.

“Effect of Demolition on Remaining Part of Concrete Bridge, Numerical Analysis Vs. Experimental Results.” Presented and published in the proceedings of Internationales Kolloquium uber die Anwedungen der Informatik in Architektur und Bauwesen, Germany, June 2000

“The Effect of Bridge Rehabilitation on the Remaining Structural Parts.” Presented and published in the proceedings of the ASCE conference at Stanford University, August 2000.

**00-1 Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England - A Synthesis of Practice**

Reports:

“Ground-Based Image and Data Acquisition Systems for Roadway Inventories in New England – A Synthesis of Highway Practice,” Hancock, K. and Degray, J., August 2002, NETCR 30.

Papers and Presentations: None

**00-2 Evaluation of Permeability of Superpave Mixes**

Reports:

“Evaluation of Permeability of Superpave Mixes,” Mogawer, W., Mallick, R., Teto, M. and Crockford, C., July 3, 2002, NETCR34.

Papers and Presentations:

“An Alternative Approach to Determination of Bulk Specific Gravity and Permeability of Hot Mix Asphalt (HMA),” Bhattacharjee, S., Mallick, R. and Mogawer, W. Submitted to International Journal of Pavement Engineering.

A Presentation, by W. Mogawer, to the Northeast Asphalt User Producer Group Meeting, October 18, 2001, Albany, New York.

- 00-3      Design, Fabrication and Preliminary Testing of a Composite Reinforced Timber Guardrail**  
Reports:  
“Design, Fabrication and Preliminary Testing of a Composite Reinforced Timber Guardrail,” Davids, W., Botting, J., March 31, 2004, NETCR 39.  
  
Papers and Presentations: None
- 00-4      Portable Falling Weight Deflectometer Study**  
Reports:  
“Portable Falling Weight Deflectometer Study,” Steinert, B., Humphrey, D., Kestler, M., March 11, 2005, NETCR52.  
  
Papers and Presentations: None
- 00-5      Guardrail Testing Modified Eccentric Loader Terminal (MELT) at NCHRP 350 TL-2**  
Reports:  
“Guardrail Testing Modified Eccentric Loader Terminal (MELT) at NCHRP 350 TL-2,” Alberson, D., Menges, W. and Haug, R., July 2002, NETCR35.  
  
Papers and Presentations:  
Dean Alberson, Texas Transportation Institute, Principal Investigator presented the results of the crash tests conducted on the MELT guardrail terminal to the Association of General Contractors/American Road Transportation Builders Association/American Association of State Highway Transportation Officials Task Force 13 meeting in Seattle, Washington, April 2002.
- 00-6      Effective Visualization Techniques for the Public Presentation of Transportation**  
Reports:  
“Effective Visualization Techniques for the Public Presentation of Transportation Projects,” Garrick, N.W., Minutti, P., Westa, M., Luo, J., Bishop, M., July 2005, NETCR 48.  
  
Papers and Presentations:  
“Effective Visualization Techniques for the Public Presentation of Transportation Projects,” Luo, J., MS Thesis, University of Connecticut, August 2002.



- 00-7                   A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn't**  
Reports:  
 "A Complete Review of Incident Detection Algorithms & Their Deployment: What Works and What Doesn't," Parkany, E., Xie C., February 7, 2005, NETCR 37.
- Papers and Presentations:  
 "Use of Driver-Based Data for Incident Detection," Parkany, Emily, Submitted to the 7<sup>th</sup> International Conference on Applications of Advanced Technologies in Transportation Engineering (AATT), Boston, August 2002.
- 00-8                   Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region**  
Reports:  
 "Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region," Helstrom, C.L., Humphrey, D.N., and Labbe, J.M., August 2007, NETCR60.
- Papers and Presentations:  
 "Geogrid Reinforced Pavement Structure in a Cold Region," Helstrom, C.L., Humphrey, D.N., and Hayden, S.A., Proceedings of the 13th International Conference on Cold Regions Engineering, ASCE, Orono, Maine, 12 pp., 2006.
- 01-1                   Advanced Composite Materials for New England's Transportation Infrastructure: A Study for Implementation and Synthesis of Technology and Practice**  
Reports:  
 "Advanced Composite Materials for New England's Transportation Infrastructure: A Study for Implementation and Synthesis of Technology and Practice," Breña, S.F., Civjan, S.A., and Goodchild, M., May 2006, NETCR62.
- Papers and Presentations: None
- 01-1                   Advanced Composite Materials in New England's Transportation**  
**T2 Phase I       Infrastructure - Technology Transfer Phase 1: Selection of Prototype**  
Reports:  
 "Advanced Composite Materials in New England's Transportation Infrastructure – Technology Transfer Phase 1: Selection of Prototype," Breña, F., and Civjan, S.A., November 1, 2009, NETCR77.
- Papers and Presentations: None

- 01-2      Development of a Testing Protocol for QC/QA of Hot Mix Asphalt**  
Reports:  
“Development of a Testing Protocol for QC/QA of Hot Mix Asphalt (HMA),” Mogawer, W.S., Mallick, R., February 5, 2004, NETCR 43.
- Papers and Presentations:  
“An Evaluation of Use of Rapid Triaxial Test In Quality Control of Hot Mix Asphalt (HMA),” Mogawer, W. S., Presented at the 82<sup>nd</sup> Annual Meeting of the Transportation Research Board, January 12-16, 2003, Washington DC.
- 01-3      Design of Superpave HMA for Low Volume Roads**  
Reports:  
“Design of Superpave HMA for Low Volume Roads,” Mogawer, W.S., Mallick, R., December 31, 2004, NETCR 51.
- Papers and Presentations:  
“Development of Mix Design Criteria for Low Traffic Volume Hot Mix Asphalt Roads,” Nanagiri, Y.V., Mallick, R., Mogawer, W.S. Proceedings of the Annual Meeting of the Canadian Technical Asphalt Association, November 2003.
- 01-6      Field Evaluation of a New Compaction Monitoring Device**  
Reports:  
“Field Evaluations of A New Compaction Monitoring Device,” Miller, H.J., June 26, 2003, NETCR 42.
- Papers and Presentations: None
- 02-1      Relating Hot Mix Asphalt Pavement Density to Performance**  
Reports:  
“Relating Hot Mix Asphalt Pavement Density to Performance,” Mogawer, W.S., Daniel, J.S., and Austerman, A.J., April 1, 2010, NETCR76.
- Papers and Presentations:  
“Evaluation of the Effects of HMA Density on Mixture Fatigue and Rutting Performance,” Mogawer, W.S., Northeast Asphalt User/Producer Group (NEAUPG) Annual Meeting, South Portland, Maine, October 8, 2009.
- “Evaluation of the Effects of Hot Mix Asphalt Density on Mixture Fatigue Performance, Rutting Performance and MEPDG Distress Predictions,” Mogawer, W.S., Austerman, A.J., Daniel, J.S., Fujie, Z., and Bennert, T., International Journal of Pavement Engineering, 2011.

- 02-2      Formulate Approach for 511 Implementation in New England**  
Reports:  
“Formulate Approach for 511 Implementation in New England,” Shuldiner, P., Loane, G., and Knapick, R., October 2005, NETCR44.  
  
Papers and Presentations: None
- 02-3      Establish Subgrade Support Values for Typical Soils in New England**  
Reports:  
“Establish Subgrade Support Values for Typical Subs in New England,” Malla, R. B., and Joshi, S., April 2006, NETCR57.  
  
Papers and Presentations:  
“Resilient Modulus Prediction Models for Some New England Subgrade Soils,” Malla, R. and Joshi, S., Electronic Proceedings of the 2005 Joint ASCE/ASME/SES Conference on Mechanics and Materials (McMat 2005), Baton Rouge, LA, June 1-3, 2005.  
  
“Resilient Modulus of Subgrade Soils A-1-b, A-3, and A-7-6 using LTPP Data: Prediction Models with Experimental Verification,” Joshi, Shraddha, and Malla, R., Proceedings, ASCE GeoCongress 2006, (Atlanta, GA, Feb. 26-March 01, 2006), ASCE, Reston, VA; Feb. 2006, 6p (CD ROM).
- 02-5      Determination of Moisture Content of Deicing Salt at Point of Delivery**  
Reports:  
“Determination of Moisture Content of Deicing Salt at Point of Delivery,” Long, R.P., Demars, K.R., and Balunaini, U., March 2004, NETCR 45.  
  
Papers and Presentations: None

**Sealing of Small Movement Bridge Expansion Joints**Reports:

“Sealing of Small Movement Bridge Expansion Joints,” Malla, R.B., Shaw, M.T., Shrestha, M.R. and Boob, S., June 2006, NETCR58.

Papers and Presentations:

“Silicone Foam Sealant for Bridge Expansion Joints,” Malla R. B., Shaw M. T., Shrestha M. R., Boob S., McMat 2005 Mechanics and Materials Conference Baton Rouge, Louisiana, June 1-3, 2005.

“Experimental Evaluation of Mechanical characteristics of Silicone Foam Sealant for Bridge Expansion Joints,” Malla R. B., Shaw M. T., Shrestha M. R., Boob S., 2005 Society for Experimental Mechanics Annual Conference Portland, Oregon, June 7-9, 2005.

“Development and Experimental Evaluation of Silicone Foam Sealant For Small Bridge Expansion Joints,” Matu Shrestha, M.S. Thesis, Dept. of Civil & Environmental Engineering, University of Connecticut, Storrs, CT, September 2005.

“Laboratory Evaluation of Weathering and Freeze-Thaw Effects on Silicone Foam Bridge Joint Sealant,” Shrestha, M.R., Malla, R.B., Boob, S. and Shaw, M.T., Paper #369, Proceedings, SEM 2006 Annual Conference and Exposition ( St. Louis, MO, June 04-07, 2006), SEM, Bethel, CT, June 2006, 8p (CD ROM).

“Development and Laboratory Analysis of Silicone Foam Sealant for Bridge Expansion Joints,” Malla, R., Shaw, M., Shrestha, M., and Brijmohan, S., Journal of Bridge Engineering, ASCE, Reston, VA, July 2006.

## **02-6 Phase 2 Sealing of Small Movement Bridge Expansion Joints - Phase II: Field Demonstration and Monitoring**

### Reports:

"Sealing of Small Movement Bridge Expansion Joints - Phase 2: Field Demonstration and Monitoring," Malla, R.B., Shaw, M., Swanson, B., and Gionet, T., July 31, 2011, NETCR86.

### Papers and Presentations:

"Laboratory Evaluation of a Silicone Foam Sealant for Field Application of Bridge Expansion Joints," Malla, R.B., Swanson, B., and Shaw M.T., Proceedings of the 2010 SEM Annual Conference & Exposition, SEM, Bethel, CT, 12 pages, June 2010.

"Development and Installation of Foam Sealant for Small Movement Bridge Expansion Joints," Malla, R.B., Swanson, B., and Shaw M.T., Poster presentation to the Proceedings, 27th Annual International Bridge Conference, Pittsburgh, PA, June 6-9, 2010.

"Laboratory Evaluation, Field Application, and Monitoring of a Silicone Foam Sealant Bonded to Various Bridge Expansion Joint Headers," Swanson, B.J., (2011), M.S. Thesis, Department of Civil and Environmental Engineering, University of Connecticut, Storrs, CT, 128 pages.

"Laboratory Evaluation of a Silicone Foam Sealant Bonded to Various Header Materials used in Bridge Expansion Joints," Malla, R.B., Swanson, B.J., and Shaw, M.T., "Construction and Building Materials – An International Journal, (published on-line <http://dx.doi.org/10.1016/j.conbuildmat.2011.04.050> ; May 26, 2011).

"Laboratory Testing Field Installation, and Monitoring of a Silicone Foam Sealant for Bridge Expansion Joints," Swanson, B.J., Malla, R.B., and Shaw, M.T., J. Bridge Engineering, ASCE, Reston, VA. (In Review).

**02-7            Validating Traffic Simulation Models to Inclement Weather Travel Conditions with Applications to Arterial Coordinated Signal Systems**  
Reports:

“Validating Traffic Simulation Models to Inclement Weather Travel Conditions with Applications to Arterial Coordinated Signal Systems,” Sadek, A., El-Dessouki, W., November 2004, NETCR 47.

Papers and Presentations:

“Inclement Weather and Traffic Flow at Signalized Intersections: A Case Study from Northern New England,” Agbolosu-Amison, S.J., Sadek, A.W., and El-Dessouki, W., (2003). Tentatively accepted for publication in the Journal of the Transportation Research Board.

“Impact of Inclement Weather on Traffic Signal Operations in New England,” Agbolosu-Amison, S.J., Sadek, A.W., (2003). Presented to the Vermont Chapter of the Institute of Transportation Engineers, Montpelier, Vermont.

“Inclement Weather and Traffic Flow at Signalized Intersections: A Case Study from Northern New England,” Agbolosu-Amison, S.J., Sadek, A.W., and El-Dessouki, W., (2003). Presented at the 83rd Annual Transportation Research Board Meeting, Washington, D.C.

**02-8            Intelligent Transportation Systems Applications to Ski Resorts in New England**

Reports:

“Intelligent Transportation Systems Applications to Ski Resorts in New England,” Sadek, A., March 2004, NETCR 46.

Papers and Presentations:

“Addressing Ski Resort Transportation Problems with Intelligent Transportation Systems Applications,” Knapick, R.J., and Sadek, A.W., (2003). Abstract submitted to the Institute of Transportation Engineers District One Meeting, Burlington, VT.

**03-1            Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff**

Reports:

“Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff”, MacKay, A.A., July 16, 2008, NETCR65.

Papers and Presentations: None

**03-2      Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Succinic Acid**

Reports:

“Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Succinic Acid,” Civjan, Scott A., and Crellin, Benjamin, June 30, 2008, NETCR73.

Papers and Presentations:

“Hycrete – DSS An Innovative Admixture for Concrete: An Update on NETC 03-2,” Civjan, Scott A., and Crellin, Benjamin, 16th Annual NE Materials and Research Meeting Concord, NH. June 7, 2005.

“Hycrete Concretes: An Update on NETC 03-2,” Civjan, Scott A., and Crellin, Benjamin, Connecticut DOT, November 2, 2005.

“A New Admixture to Mitigate Corrosion Problems,” Civjan, S.A., and Crellin, B.J., Concrete International, Volume 28, No. 8, Pp. 78-82.

**03-3      Feasibility Study of an Erosion Control Laboratory in New England**

Reports:

“Feasibility Study of an Erosion Control Laboratory in New England,” Long, R.P., and Demars, K.R., December 2004, NETCR 49.

Papers and Presentations: None

**03-3 Phase 2      Design Considerations for a Prototype Erosion Control Laboratory in New England**

Reports:

“Design Considerations for a Prototype Erosion Control Testing Plot,” Long, R.P., and Demars, K.R., December 2005, NETCR 56.

Papers and Presentations: None

**03-4      Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units**

Reports:

“Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units,” Zhang, X., September 27, 2005, NETCR54.

Papers and Presentations:

“Evaluation of Pathogenic Indicator Bacteria in Structural BMPs,” Zhang, X. and Lulla, M., to be published in the Journal of Environmental Science and Health, Volume A41 (November 2006).

“Distribution of Pathogenic Indicator Bacteria in Structural BMPs,” Zhang, X. and Lulla, M. to be published in the Journal of Environmental Science and Health, Volume A41 (August 2006).

**03-5      Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator**

Reports:

“Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator”, Daniel, J.S., Mallick, R.B., and Mogawer, W.S., April 20, 2007, NETCR64.

Papers and Presentations:

“Development of a Longitudinal Joint Permeameter as a QC/QA Tool for HMA Pavements,” Daniel, J.S., a Presentation to the Petersen Asphalt Research Conference, Cheyenne, WY, June 2005.

“Longitudinal Joint Permeameter: New Non-Destructive Pavement Joint Test,” Daniel, J.S., a Presentation to the North East Asphalt User/Producer Group Meeting, Burlington, VT, October 2005.

“Longitudinal Joint Permeameter: Non-Destructive Test for QC,” Daniel, J.S., a presentation to PennDOT Bituminous Technician Certification Program, March 14, 2006.

“Development and Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator,” Mallick, R.B., and Daniel, J.S., International Journal of Pavement Engineering, Vol. 7, No. 1, March 2006. pp. 11-21.

**03-6      Fix It First: Utilizing the Seismic Property Analyzer and MMLS to Develop Guidelines for the Use of Polymer Modified Thin Lift HMA vs. Surface Treatments**

Reports:

“Fix It First: Utilizing the Seismic Property Analyzer and MMLS to Develop Guidelines for the Use of Polymer Modified Thin Lift HMA vs. Surface Treatments”, Mogawer, W.S. and Daniel, J.S., September 1, 2012, NETCR91.

Papers and Presentations: None



**03-7**

**Basalt Fiber Reinforced Polymer Composites**

Reports:

“Basalt Fiber Reinforced Polymer Composites,” Parnas, R., Shaw, M., and Liu, Q., August 2007, NETCR63.

Papers and Presentations:

“Preliminary Investigation of Basalt Fiber Composite Properties for Applications in Transportation,” Liu, Q., Shaw, M.T., Parnas, R.S., McDonnell, A., Transportation Research Board Annual Meeting, January 2005, Washington, D.C., Paper 05-1117, Session 487.

“Investigation of Basalt Fiber Composite Mechanical Properties for Applications in Transportation,” Q. Liu, M.T. Shaw, R.S. Parnas and A.M. McDonnell, Polymer Composites, 27(1), 41-48, 2006.

“Investigation of Basalt Fiber Composite Aging Behavior for Applications in Transportation,” Q. Liu, M. T. Shaw, R. S. Parnas, A.M. McDonnell, Polymer Composites.

“Basalt Fiber Reinforced Polymer Composites,” Q. Liu, R.S. Parnas, M.T. Shaw, A.M. McDonnell, SAMPE, Seattle, WA, November 2005.

“New Set-up for Permeability Measurement,” Q. Liu, R.S. Parnas, SAMPE, Seattle, WA, November 2005.

**04-1 Phase2 Recycling Asphalt Pavements Containing Modified Binders - Phase 2**

Reports:

“Recycling Asphalt Pavements Containing Modified Binders,” Mahoney, J., Zinke, S., DaDalt, J., Zofka, A., Bernier, A. and Yut, I., March 3, 2011, NETCR66.

Papers and Presentations:

“Laboratory Evaluation of HMA Containing RAP and PMB,” Zofka A., Bernier A., Mahoney J., and Zinke S., presented at NEAUPG Annual Meeting Poster Session, October 6-7, 2010, Saratoga, New York.

“Laboratory Evaluation of HMA Containing RAP and PMB,” Zofka A., Bernier A., Mahoney J., and Zinke S., presented at ASCE 1st T&DI Green Streets & Highways Conference Poster Session, November 14-17, 2010, Denver, Colorado.

**Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety**Reports:

“Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety,” Fisher, D.L., Knodler, M., and Muttart, J., January 28, 2009, NETCR71.

Papers and Presentations:

“Human Factors: Understanding & Evaluating Driver Response,” Muttart, J.W., Anne Arundel County Police Special Operations Building, Sponsored by the Maryland Association of Traffic Accident Investigators, Hanover, MD. March 20 - 23, 2006.

“Understanding and Quantifying Driver Response,” Muttart, J.W., Texas Association of Accident Reconstructionist Specials, Houston, TX, February 17 & 18, 2006.

“Using Event Data Recorder Information for Driver Response Research and Intelligent Transportation Systems in Rear End Collision,” Muttart, J.W., CDR Users Conference, Dallas, TX. February 13, 2006.

“Human Factors: Understanding & Evaluating Driver Response,” Muttart, J.W., Canadian Association of Traffic Accident Investigators & Reconstructionists, Fredericton, NB, Canada. July 10 - 13, 2006.

“Driving Simulator Evaluation of Situational Awareness during Hands- Free Communication,” Muttart, J.W., New England Institute of Transportation Engineers Technology Day, Amherst, MA. July 20, 2006.

“Accounting for Moderate Driver Distractions in Work Zones,” Muttart, J.W., Factors, Formulae, Forensic, Technology, & Training Conference, Houston, TX. September 17, 2006.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue,” Muttart, J., Fisher, D. L., and Pollatsek, A., (January 2007), Presentation given at the 86th Transportation Research Board Annual Meeting, TRB, National Research Council, Washington, D.C.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue”, Muttart, J., Fisher, D. L., Knodler, M. and Pollatsek, A., (2007), Transportation Research Record, 2018, pp 9-14.

**04-3            Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England**

Reports:

“Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England,” Jacobs, J., November 17, 2010, NETCR81.

Papers and Presentations:

2006 Maine Water Conference, Augusta, ME, March 22, 2006, Poster presentation.

**04-4            Determining the Effective PG Grade of Binder in RAP Mixes**

Reports:

“Determining the Effective PG Grade of Binder in RAP Mixes,” Daniel, J.S. and Mogawer, W.S., January 2010, NETCR78.

Papers and Presentations:

“The Impact of RAP on the Volumetric, Stiffness, Strength and Low Temperature Properties of HMA,” Krishna Swamy, A., Mitchell, L.F., Hall, S.J., and Daniel, J.S., Journal of Materials in Civil Engineering.

**04-5            Network-Based Highway Crash Prediction Using Geographic Information Systems**

Reports:

“Network-Based Highway Crash Prediction Using Geographic Information Systems,” Ivan, J.N., Gårder, P.E., Bindra, S., Jonsson, B.T., Shin, H., Deng, Z., June 2007, NETCR67.

Papers and Presentations:

“A Procedure for Allocating Zonal Attributes to a Link Network in a GIS Environment,” Jonsson, T., Deng, Z., Ivan, J.N., presented at 85th TRB Annual meeting, Jan. 2006, Paper No.: 06-2561.

“Using Land Use Data to Estimate Exposure for Improving Road Accident Prediction,” Jonsson, T., Ivan, J.N., Zhang, C., presented at 32<sup>nd</sup> Annual Traffic Records Forum, Palm Desert CA, Aug. 3, 2006.

**05-1            Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets**

Reports:

“Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets,” Sandford, T.C., McCarthy, J., and Bussiere, J., March 31, 2011, NETCR83.

Papers and Presentations: None

**05-5 Measurement of Adhesion Properties Between Topcoat Paint and Metalized/Galvanized Steel with Surface Energy Measurement Equipment**

Reports:

“Measurement of Adhesion Properties Between Topcoat Paint and Metalized/Galvanized Steel with Surface Energy Measurement Equipment,” Yang, S.C., Lee, K.W., Lu, C., Mirville, M. and Pahram, A., September 23, 2013, NETCR93.

Papers and Presentations:

“Measurement of Adhesion Properties Between Topcoat Paint and Metalized / Galvanized Steel With Surface Energy Measurement Equipment,” Paper # CET-25, Yang, S.C., Lee, K.W., Lu, C., and Mirville, M., Presented at the US-Korea Conference on Science, Technology, and Entrepreneurship (UKC2010), Seattle, Washington, August 14, 2010.

**05-6 Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers’ Message Comprehension**

Reports:

“Employing Graphic-Aided DMS to Assist Elder Drivers’ Message Comprehension,” Wang, J.H. and Clark, A. Y., December 30, 2010, NETCR82.

Papers and Presentations:

“Improving Elder Drivers Comprehension of Dynamic Message through a Human Factors Study,” Clark, A., Wang, J.H., Maier-Sperdelozzi, V., and Collyer, C., Proceedings of the 12th International Conference on Industrial Engineering – Theory, Application, and Practice, p.747-753, 2007.

“Assisting Elder Drivers’ Comprehension of Dynamic Message Signs,” Clark, A.T., Wang, J.H., Maier-Sperdelozzi, V., and Collyer, C.E., Proceedings of the 87th Annual Meeting of Transportation Research Board, Paper No. 08-2276, p.1-16, CD-ROM, 2008.

“Age Effect on Driver Comprehension of Messages Displayed on Dynamic Message Signs,” Wang, J.H., Clark, A.Y., and Maier- Sperdelozzi, V., Proceedings of IIE Research Conference, Paper No. 307, p.1-6, CD-ROM, 2008.

**05-7 Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways**

Reports:

“Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways,” Ivan, J.N., Sadek, A.W., Hongmei, Z., and Surang, R., February 12, 2009, NETCR72.

**05-7                    Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways (cont'd):**

Papers and Presentations:

“A Decision Support System for Predicting the likely Benefits of Left-turn Lane Installation,” Ranade, S., Sadek, A.W. and Ivan, J., 2007, TRB Annual meeting, Paper No. 07-0992; January 2007; Transportation Research Record, 2023:28-36, 2007. This paper received the Best Paper Award from the Committee on Operational Effects of Geometrics at the 2008 Annual Meeting.

“Safety Effects of Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways,” Zhou, H., Ivan, J. and Sadek, A., Transportation Research Board Annual Meeting; Paper No. 09-2000, Washington, DC, Jan. 2009.

**05-8                    Evaluation and Implementation of Traffic Simulation Models for Work Zones**

Reports:

“Evaluation and Implementation of Traffic Simulation Models for Work Zones,” Collura, J., June 18, 2010, NETCR80.

Papers and Presentations:

“Using Simulation Models to Assess the Impacts of Highway Work Zone Strategies: Case Studies Along Interstate Highways in Massachusetts and Rhode Island,” Moriarty, K.D., Collura, J., Knodler Jr., M.A., Daiheng, N., and Heaslip, K., Paper presented at the TRB Annual Meeting in January 2008.

“Using Simulation Models to Assess the Impacts of Highway Work Zone Strategies,” Collura, J., Heaslip, K., Moriarty, K., Wu, F., Khanta, R., and Berthaume, A., Paper presented at the TRB Annual Meeting in January 2010.

**06-1                    New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs**

Reports:

“New England Verification of National Cooperative Highway Research Program (NCHRP) 1-37A Mechanistic-Empirical Pavement Design Guide (MEPDG),” Daniel, J. S., Chehab, G. R., Ayyala, D., and Nogaj, I.M., November 2012, NETCR87.

Papers and Presentations:

“Sensitivity of MEPDG Level 2 and 3 Inputs using Statistical Analysis Techniques for New England States,” Ayyala, D., Chehab, G. R., and Daniel, J. S., accepted for publication in the Transportation Research Record 2010.

- 06-1 New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs (cont'd):**  
Papers and Presentations:  
 “Sensitivity of RAP Binder Grade on Performance Predictions in the MEPDG,” Daniel, J. S., Chehab, G. R., and Ayyala, D., Journal of the Association of Asphalt Pavement Technologists, Vol. 78, 2009, pp. 352-376.  
 “Sensitivity of RAP Binder Grade on Performance Predictions in the MEPDG,” Presentation by Jo Sias Daniel to the Association of Asphalt Paving Technologists Annual Meeting, March 2009.
- 06-3 Establishing Default Dynamic Modulus Values for New England**  
Reports:  
 “Establishing Default Dynamic Modulus Values for New England,” Jackson, E., Jingcheng, L., Zofka, A., Iliya, Y., and Mahoney, J., April 11, 2011, NETCR85.  
Papers and Presentations: None
- 06-4 Preventative Maintenance and Timing of Applications**  
Reports: NETC 06-4: “Preventative Maintenance and Timing of Applications,” Smith, Kelly; Peshkin, David; Mogawer, Walaa; Austerman, Alexander; June 2017, NETCR101  
Papers and Presentations: None
- 07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations**  
Reports:  
 “In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations,” Daniel, J.S.; Mallick, Rajib B.; Kestler, Maureen A.; Miller, Heather J, November 2016, NETCR96.  
Papers and Presentations: None
- 09-2 Effective Establishment of Native Grasses on Roadsides**  
Reports:  
 “Effective Establishment of Native Grasses on Roadsides,” Kuzovkina, Julia; Schulthess, Cristina P.; Ricard, Robert; Dryer, Glenn, June 2016, NETCR97.  
Papers and Presentations: None
- 09-3 Advanced Composite Materials: Prototype Development and Demonstration**  
Reports:

“Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System.” Lopez-Anido, Roberto A. and Goslin, Keenan, August 2016, NETCR98.

Papers and Presentations: None

**10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology**

Reports: “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology.” Mogawer, Walaa S. and Austerman, Alexander, March 2018, NETCR103.

Papers and Presentations: “Understanding Influence of Moisture on Performance of Plant-Produced High Reclaimed Asphalt Pavement Content Mixtures Incorporating Warm-Mix Asphalt Technologies” was presented in at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017 in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”

**13-1 Development of High Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections**

Reports: “Development of High Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections.” Brena, Sergio F.; Civjan, Scott A.; Castine, Stephanie; Ramos, Gercelino, December 2018, NETCR115.

Papers and Presentations: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.

**13-2 HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures**

Reports: “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant Produced Mixtures.” Mogawer, Walaa S.; Zokaei, Milad; Austerman, Alexander, June 2018, NETCR105.

Papers and Presentations: “Performance Characterization of Asphalt Mixtures Incorporating Recycled Asphalt Shingles: Mechanical Approach to Asphalt Binder Degree of Blending” was presented at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017 in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”

**13-3 Improved Regionalization of Quality Assurance (QA) Functions**

Reports: “Improved Regionalization of Quality Assurance (QA) Functions.”

Dave, Eshan V.; Sias Daniel, Jo; Kotowski, Michael, March 2018, NETCR110.

Papers and Presentations: The research team will present at the 2019 TRB Annual Meeting in Washington, D.C.

**14-1      Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians**

Reports: “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers and Engineering Technicians.” Ahmadian, Chris; Knodler, Michael; Fitzpatrick, Cole; Ryan, Alyssa; Bouchard, Chelsea, December 2018, NETCR111.

Papers and Presentations: The research team will present at the 2019 TRB Annual Meeting in Washington, D.C.

**14-2      Investigation of Northern Long-Eared Bat Roosting Sites on Bridges**

Reports: “Investigation of Northern Long-Eared Bat Roosting Sites on Bridges,” Civjan, Scott; Dumont, Elizabeth; Bennett, Alyssa; Berthaume, Angela; May 2017, NETCR100

Papers and Presentations:

Paper accepted for TRB 2017 Annual Meeting in Washington D.C. Workshop 114: Bats at the Crossroads: Regulatory Compliance for Program and Project Delivery and Approaches to Conserving Imperiled Species.

Lunch and Learn and Project Summary Workshop for ME/VT/NH: Concord NH 3/13/17

Project Summary Workshop for MA/CT/RI: Westborough MA 3/24/17

Presented at 2017 International Conference on Ecology and Transportation, Salt Lake City, UT, May 2017.

**14-4      Optimizing Future Work Zones in New England for Safety and Mobility**

Reports: “Optimizing Future Work Zones in New England for Improved Safety and Mobility.” Xie, Yuanchang; Gartner, Nathan H.; Stamatiadis, Polichronis; Ren, Tianzhu; Salcedo, Gustavo, March 2018, NETCR104.

Papers and Presentations:

A paper entitled “Modelling Highway Work Zone Traffic Safety and Driver Behaviours in the United States Using a Virtual Reality Driving Simulator” has been accepted to the 2017 Road Safety & Simulation Conference to be held in The Hague, Netherland in October 2017.

A paper entitled “Cooperative Merging in Highway Work Zone Enabled by Connected and Autonomous Vehicles” has been accepted by the 2018



ASCE International Conference on Transportation & Development to be held in Pittsburgh, Pennsylvania on July 15-18, 2018.

Dr. Xie has been invited to give a talk at the 2018 TRB Annual Meeting. The title of his talk is “Cooperative Highway Work Zone Merge Control for Improved Mobility and Safety.”

**15-1      Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)**

Reports: None

Papers and Presentations: None

**15-2      Using the New SHRP2 Naturalistic Driving Study Databases to Examine Safety Concerns for Teens and Older Drivers**

Reports: None

Papers and Presentations: None

**15-3      Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England**

Reports: “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England.” Dave, Eshan V.; Sias Daniel, Jo; Mallick, Rajib B.; DeCarlo, Christopher; Veeraragavan, Ram Kumar; Kottayi, Nivedya Madankara, August 2018, NETCR109.

Papers and Presentations: The research team participated in the VTrans Research Symposium that took place on September 12, 2018. For this symposium a poster and fact sheet were prepared in coordination with NETC.

**15-4      Quick Response: Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast**

Reports: “Quick Response: Quality Assurance (QA) Processes for Asphalt Pavement Construction in the Northeast.” Sias Daniel, Jo; Dave, Eshan V.; Ogbo, Chibuike, December 2018, NETCR112.

Papers and Presentations: None

**17-1      Quick Response: New England Connected Automated Vehicles**

Reports: “Quick Response: New England Connected Automated Vehicles.” Chaffee, Chris and Murtha, Suzanne, October 2018, NETCR108.

Papers and Presentations: None

**17-2      Quick Response: Quantification of Research Benefits**

Reports: None

Papers and Presentations: None