

ANNUAL REPORT

For Calendar Year 2007

NEW ENGLAND TRANSPORTATION CONSORTIUM

NETCR70

February 2008

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.

The contents of this report reflect the views of the author(s) who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Departments of Transportation or the Land Grant Universities of the six New England States, or the U.S. Department of Transportation's Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

NEW ENGLAND TRANSPORTATION CONSORTIUM

POLICY COMMITTEE

Ralph J. Carpenter, Commissioner, Connecticut Department of Transportation
Bernard Cohen, Secretary, Massachusetts Executive Office of Transportation
David A. Cole, Commissioner, Maine Department of Transportation
Bradley Keazer, Division Administrator, FHWA, CT Division
Neale Lunderville, Secretary of Transportation, Vermont Agency of Transportation
Charles P. O'Leary Jr., Commissioner, New Hampshire Department of Transportation
Jerome F. Williams, Director of Transportation, Rhode Island Department of Transportation

ADVISORY COMMITTEE

Transportation Agencies

William Ahearn, Materials & Testing Engineer, Vermont Agency of Transportation
Barbara Breslin, Community Planner, FHWA, CT Division
Colin Franco, Managing Engineer, Research & Technology Development, Rhode Island Department of Transportation
Dale Peabody, Director of Transportation Research, Maine Department of Transportation
Stephen Pepin, Manager of Research, Massachusetts Executive Office of Transportation, Office of Transportation Planning
Glenn Roberts, Chief of Research, New Hampshire Department of Transportation
James Sime, Manager of Research, Connecticut Department of Transportation

Universities

John Ivan, Associate Professor, University of Connecticut
David Gress, Professor, University of New Hampshire
Wayne Lee, Professor, University of Rhode Island
Roberto Lopez-Anido, Assistant Professor, University of Maine, Orono
John Collura, Professor, University of Massachusetts, Amherst
Adel Sadek, Associate Professor, University of Vermont

LEAD STATE

James Sime, Manager of Research
Connecticut Department of Transportation

COORDINATOR

Gerald McCarthy
University of Massachusetts Dartmouth

TABLE OF CONTENTS

| | | |
|-----------|--|-----------|
| A. | INTRODUCTION | 6 |
| B. | 2007 HIGHLIGHTS | 6 |
| C. | PROGRESS OF ACTIVE PROJECTS | 10 |

| <u>Project Number</u> | <u>Title</u> | | |
|----------------------------------|---|--|----|
| 00-8: | Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region..... | | 10 |
| 02-1: | Relating Hot Mix Asphalt Pavement Density to Performance | | 11 |
| 03-1: | Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff | | 13 |
| 03-2: | Field Studies of Concrete Containing Salts of an Alkenyl Substituted Succinic Acid | | 18 |
| 03-5: | Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator | | 20 |
| 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 | | 21 |
| 03-7: | Basalt Fiber Reinforced Polymer Composites | | 23 |
| 04-1: | Recycling Asphalt Pavements Containing Modified Binders | | 25 |
| 04-2: | Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety | | 26 |
| 04-3: | Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England | | 28 |
| 04-4: | Determining the Effective PG Grade of Binder in RAP Mixes | | 31 |
| 04-5: | Network-Based Crash Prediction Using Geographic Information Systems | | 34 |
| 05-1 | Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets | | 37 |
| 05-3 | Practicable Calibration Procedures to Enhance the Accuracy of Analytical and Microsimulation Software for Modern Four-Legged Single-Lane Roundabouts | | 38 |
| 05-6 | Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension | | 41 |
| 05-7 | Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways | | 43 |
| 05-8 | Evaluation and Implementation of Traffic Simulation Models for Work Zones | | 48 |
| 06-1 | New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs | | 49 |
| 06-5 | Winter Severity Indices for New England | | 52 |

| | | |
|-----------|--|----|
| D. | FINANCIAL STATUS OF PROJECTS ACTIVE DURING 2007 | 53 |
| | D.1 Financial Status of Active Projects | 53 |
| | D.2 Fund Balance | 55 |
| E. | REPORTS, PAPERS AND PRESENTATIONS | 60 |
| | E.1 Policies and Procedures | 60 |
| | E.2 Annual Reports | 60 |
| | E.3 Reports, Papers, and Presentations (1988-1994) | 60 |
| | E.4 Reports, Papers, and Presentations (1995-2007) | 63 |

A. INTRODUCTION

The New England Transportation Consortium (NETC) is a cooperative effort of the transportation agencies of the six New England States. 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.

B. 2007 HIGHLIGHTS

1. NETC AWARDS \$300,000 TO THE UNIVERSITY OF VERMONT FOR TRANSPORTATION RESEARCH. THE AWARDS ARE AS FOLLOWS:

- \$100,000 for Dr. Adel Sadek's research on "Determining Optimum Distance for a Lane Drop Downstream from a Signalized Intersection".
- \$100,000 for Dr. Richard Watts' research on "Infrastructure Management Systems Enhancement and Integration to Support True Integrated Decision-Making".
- \$100,000 for Dr. Lisa Aultman-Hall's research on "Reliable Travel Time Estimation to Support Real-Time System Management Information".

2. NETC ALLOCATES \$512,000 FOR TRANSPORTATION RESEARCH AT NEW ENGLAND'S STATE UNIVERSITIES IN FFY 2008. THE FUNDS WILL SUPPORT RESEARCH PROJECTS ADDRESSING:

- "Sustainable Transportation Systems and Advanced Technologies for New England's Northern Communities".
- "Evacuation Modeling to Assist Hazard Management and Response in Urban and Rural Areas of New England"
- "Best Management Practices for Managing the Invasive Japanese Knotweed along New England's Transportation Corridors"
- "Sealing of Small Movement Bridge Expansion Joints"
- "Interaction Between Salinity, Soil Quality and Amendments in Roadside Plantings"
- "Strategies for Increasing the Implementation of Findings from NETC Funded Research"

- 3. NETC TO COLLABORATE WITH THE UNIVERISTY OF VERMONT'S NATIONAL UNIVERSITY TRANSPORTATION CENTER IN THE FUNDING OF RESEARCH AT NEW ENGLAND'S STATE UNIVERSITIES ADDRESSING "SUSTAINABLE TRANSPORTATION SYSTEMS AND ADVANCED TECHNOLOGIES FOR NEW ENGLAND'S NORTHERN COMMUNITIES":** The collaboration will provide increased financial resources for research to address the transportation needs of New England's communities and enhance the capability of the University of Vermont's National University Transportation Center for carrying out its research mission through the leveraging of funding and access to the administrative resources of NETC.
- 4. NETC RESEARCHERS, DR. JOHN IVAN OF THE UNIVERSITY OF CONNECTICUT AND DR. ADEL SADEK AND SARANG RANADE OF THE UNIVERSITY OF VERMONT, RECEIVED THE 'BEST 2007 PAPER' AWARD PRESENTED BY THE NATIONAL ACADEMY OF SCIENCES TRANSPORTATION RESEARCH BOARD'S COMMITTEE ON 'OPERATIONAL EFFECTS OF GEOMETRICS'. THEIR PAPER ENTITLED: "A DECISION SUPPORT SYSTEM FOR PREDICTING THE BENEFITS OF LEFT-TURN LANE INSTALLATIONS AT UNSIGNALIZED INTERSECTIONS" WAS A PRODUCT OF THEIR NETC FUNDED RESEARCH ON "WARRANTS FOR EXCLUSIVE LEFT TURN LANES AT UNSIGNALIZED INTERSECTIONS AND DRIVEWAYS".**
- 5. FINDINGS FROM THE FOLLOWING RESEARCH PROJECTS WERE DISTRIBUTED TO NEW ENGLAND'S STATE TRANSPORTATION AGENCIES AND UNIVERSITIES, THE FEDERAL HIGHWAY ADMINISTRATION, THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS' REGION 1 RESEARCH ADVISORY COMMITTEE, THE NATIONAL TECHNICAL INFORMATION SERVICE AND NATIONAL TRANSPORTATION LIBRARY:**
- NETC 03-5: "Evaluation of a Field Permeameter as a Longitudinal Joint Quality Control Indicator, Daniel, J. S., Mallick, R. B., Mogawer, W. S., April 20, 2007, NETCR64.
 - NETC 04-5: "Network-Based Crash Prediction Using Geographic Information Systems", Ivan, J. N., Garder, P. E., Bindra, S., Jonsson, B. T., Shin, H-S, Deng, Z., June 6, 2007, NETCR67.
 - NETC 00-8: "Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region", Helstrom, C. L., Humphrey, D. N., Labbe, J. M., August 2007, NETCR60
- Copies of the above reports are available from the NETC website at www.net.umassd.edu.

6. TECHNOLOGY TRANSFER:

- The NETC Coordinator's office responded to the following requests for technical assistance, information and NETC reports:
 - **Departamento de Investigacion, Madrid Spain:** request for a copy of the NETC report NETCR8 "Tire Chips As Lightweight Backfill for Retaining Walls", Humphrey, D., University of Maine, 1998.
 - **Departamento de Investigacion, Madrid, Spain:** request for technical information on the use of tire shreds for embankments for the M111 highway project in Madrid.
 - **Ohio Department of Transportation:** request for a copy of the NETC report entitled: "Network-Based Highway Crash Prediction Using Geographic Information Systems", Ivan, J.N., Garder, P.E., NETCR67.
 - **New Hampshire Department of Transportation:** request for an electronic version of: "NETC Handbook for Use by the Trucking Industry to Utilize the NETC Common Truck Permit Procedures for Certain Non-Divisionable Oversize/Overweight Vehicles Traveling on State Highways"
 - **Texas Transportation Institute, The Texas A&M University:** request for information on non-proprietary roadside safety hardware currently in use in New England.

- The Fall 2007 edition of 'Research News', the NETC newsletter, was published by the NETC Coordinator's office.

- The NETC Coordinator presented an exhibit of the Consortium's research at the 93RD Annual Meeting of the American Association of State Highway and Transportation Officials held at the Midwest Airlines Center in Milwaukee, Wisconsin in September 2007.

- The NETC Coordinator gave an illustrated presentation entitled: "Transportation Research Opportunities through the New England Transportation Program" at the '20TH Rhode Island Transportation Forum' held at the University of Rhode Island on November 2, 2007.

- The NETC Coordinator gave a briefing on the Consortium's activities for the annual visit to Connecticut of the National Academy of Sciences' Transportation Research Board representative, held at the University of Connecticut, in May 2007.

- The following papers arising from NETC sponsored research were presented at technical conferences or published in technical journals by NETC researchers:
 - "Assisting Elder Drivers' Comprehension of Dynamic Message Signs," Clark, A.T., Wang, J.H., Maier-Speredelozzi, V., Collyer, C.E., Proceedings of the 87th Annual Meeting of Transportation

Research Board, Paper No. 08-2276, p.1-16, CD-ROM, 2008.

- “A Decision Support System for Predicting the likely Benefits of Left-turn Lane Installation,” Ranade, S., Sadek, A.W. and Ivan, J., 2007, Accepted for presentation at the TRB Annual meeting, January 2007, Accepted for publication in *Transportation Research Record*.
- “Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue”, Transportation Research Record, TRR 07-2873, Transportation Research Board, Washington, DC.

C. PROGRESS OF ACTIVE PROJECTS

PROJECT NUMBER: 00-8

PROJECT TITLE: Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dana N. Humphrey, Department of Civil and Environmental Engineering, University of Maine, Orono.

STATUS: Completed

INITIAL AGREEMENT DATE: 07/01/2001

END DATE: 06/30/2005

PROJECT OBJECTIVES:

The objective of this project is to construct twelve experimental test sections to evaluate the performance and effectiveness of several alternative cold regions pavement designs. These designs involve the use of geogrids and/or drainage geocomposite as an integral member in a thin pavement section. The test sections will be constructed as part of a Federal/State, Maine Department of Transportation highway reconstruction project. Pavement sections will be evaluated for: 1) the influence of the location of a geogrid in a relatively thin pavement section on pavement performance; 2) the influence of a drainage geocomposite in a relatively thin pavement section on pavement performance; 3) the influence of a drainage geocomposite in a pavement reclamation application on pavement performance; 4) the influence of using both a geogrid and drainage geocomposite in a relatively thin pavement section on pavement performance; and 5) comparing the performance of a geogrid and/or drainage geocomposite in a relatively thin pavement section to a typical standard thick pavement section.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Final Report submitted and distributed.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“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.

“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.

PROJECT NUMBER: 02-1

PROJECT TITLE: Relating Hot Mix Asphalt Pavement Density to Performance

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Walaa S. Mogawer, PI, UMass Dartmouth; Rajib Mallick, Co-PI, Worcester Polytechnic Institute; Jo Sias Daniel, Co-PI, University of New Hampshire

STATUS: Continuing

INITIAL AGREEMENT DATE: 09/01/2003

END DATE: 7/31/2007

PROJECT OBJECTIVES: The objective of the proposed study is to determine relationship between pavement density and performance through testing of pavements at different levels of in-place density with accelerated pavement loading equipment and environmental simulation. Another objective is to use the obtained relationship to determine pay adjustments for different densities.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

1. UMass Dartmouth completed fabrication of the 12.5mm Superpave Gyratory Compactor rutting specimens at 90, 92, 95 and 97% density levels. These specimens were tested for rutting with the MMLS.
2. UMass Dartmouth constructed four 12.5mm slabs at 86, 92, 95 and 98% density to be tested for fatigue using the MMLS.
3. UMass Dartmouth completed a mix design for the 9.5mm Superpave mix. The mix met all volumetric criteria for 9.5mm Superpave. A local contractor produced this mix. This mix was utilized for fabrication of Superpave Gyratory Compactor specimens and slabs required for this project.
4. UMass Dartmouth completed fabrication of all 9.5mm Superpave Gyratory Compactor rutting specimens at 90, 93, 95 and 97% density levels. These specimens were tested for rutting with the MMLS.
5. UMass Dartmouth has constructed 9.5mm slabs to be tested for fatigue using the MMLS.
6. UMass Dartmouth constructed a steel base, which is mounted on the compaction frame for the MMLS to facilitate fatigue testing with the MMLS.
7. UMass Dartmouth completed construction on MMLS fatigue setup. Trial slabs were tested in order to validate the setup and verify the strain data

collected.

8. Strain data from trial slabs was analyzed. Specifically, the strain data was analyzed to determine the strains correlating to the initiation of fatigue cracking in the slabs. Even after 500,000 loading cycles on a single slab, no fatigue cracking was observed.
9. Based on the initial slab testing results, the Principle Investigator proposed that the mixes be tested using the Beam fatigue apparatus (AASHTO T321) instead of the MMLS. The results obtained from this test procedure have well-documented correlation to field performance.
10. Based on a vote from the technical committee, the use of the beam fatigue test instead of MMLS was approved for evaluation of the fatigue characteristics of the each mix in this study.
11. UMass Dartmouth began preparation of beams for beam fatigue testing.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 03-1

PROJECT TITLE: Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Allison MacKay, University of Connecticut

STATUS: Continuing

INITIAL AGREEMENT DATE: 08/23/2003

END DATE: 05/31/2006

PROJECT OBJECTIVES: The objective of this research is to identify the key parameters that affect the efficacy of wood fibers for removing typical heavy metal contaminants from roadway runoff. Woody materials constitute a cheap, abundant material with the potential to attenuate the diverse suite of contaminants associated with roadway runoff. Laboratory column studies will be conducted to assess the effects of wood type and particle size, flow rate, wet-dry cycles, salt concentration and wood-aging effects on contaminant retention. Results of this research will be used to evaluate the heavy metal-attenuation effectiveness of current stormwater flow management techniques that incorporate woody materials, such as mulches used in slop stabilization and berm construction, and will be used to design remedial structures incorporating woody materials to be used for stormwater management in future roadway projects.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Heavy metals in roadway runoff may be present in either dissolved or particle-associated forms. Factors controlling the removal of a single heavy metal, copper, with wood chips was evaluated first in 2005, followed by particle-associated heavy metal removal evaluation in 2005. During 2007, the effect of competition between heavy metals was examined and a field evaluation was undertaken to evaluate dissolved and particle-associated heavy metal removal by wood chips using roadway runoff generated during local storm events.

Removal of dissolved copper by wood chips was as reduced in the presence of other dissolved heavy metals compared to when copper was present as the sole constituent in roadway runoff (Fig. 1). Copper removal by wood chips was first evaluated as the sole roadway runoff constituent in laboratory studies so that other factors (flowrate, salt content, etc.) could be evaluated without the additional complexity of competition effects. Additional evaluations were thus conducted to assess competition effects among copper and other heavy metals commonly observed in roadway runoff. Synthetic roadway runoff was prepared to contain copper, lead, zinc, nickel and cadmium at levels typical of those reported in literature studies of roadway runoff water quality. This synthetic runoff was introduced to a column containing wood chips that had been aged for 9 months, as they had been determined to be the most effective sorbent for

copper removal when present as the sole heavy metal. Column outlet concentrations of the dissolved copper in the presence of other heavy metals reached a maximum value of about 20% of the inlet concentration (Fig. 1, open circles), whereas the outlet concentrations of the copper were only about 3% of the inlet concentrations when present as the sole heavy metal (Fig. 1, closed circles).

Dissolved lead was effectively removed from the synthetic roadway runoff containing the other heavy metals, zinc, copper, nickel and cadmium. Dissolved lead, but not copper or zinc, removal by wood chips was consistent with the magnitude of solid-phase interactions with 9-month aged wood chips. Batch experiments to measure independently distributions of copper, lead, zinc, nickel or cadmium between 9-month aged wood chips and water yielded the following order of decreasing interaction: lead >> copper > zinc ~ cadmium > nickel. Note that measures of heavy metal concentrations in roadway runoff collected in Connecticut gave lead concentrations that were at, or below the method detection limit, 100 times less than reported in the literature for other sites. If the CT roadway runoff analyses are characteristic of other semi-rural areas in New England, copper would be expected to be heavy metal with the strongest interaction with wood chips.

Field evaluation of the ability of wood chips to remove heavy metals from roadway runoff was undertaken on the primary access road for the University of Connecticut to validate findings from the laboratory experiments. Ultimately, direct comparisons of the field and laboratory studies were limited because of differences in flow configurations between the two studies. The laboratory evaluation of dissolved and particle-associated heavy metals was designed to emulate sheetflow conditions. That is, all of the runoff generated from a one-lane-plus-shoulder (12 ft) strip of roadway equal to the width of the treatment device (6-in diameter column) would be intercepted. Field evaluation for such a flow configuration would require construction of interceptor trenches that were outside of the project budget. Therefore, wood chip treatment of roadway runoff was undertaken in a channel flow configuration located on Rt-195 in Mansfield, CT. At this location, roadway runoff is directed from the roadway surface through a curb cut and down an asphalt gully. A mesh bag containing 60 pounds of wood chips was anchored in the asphalt gully. Water samples were collected from two locations in the gully: (1) before the flow entered the wood chip treatment (untreated runoff), and (2) after exiting the wood chip treatment (treated runoff).

Field results from two rainfall events indicated that removal of dissolved and particle-associated heavy metals from roadway runoff may only be effective for treatment in sheetflow configurations. First, suspended solids concentrations in the runoff were reduced by wood chip treatment in the first storm event (Fig. 2a, closed circles versus open circles); however, retained solids may have been a source of suspended solids in the subsequent storm event (Fig. 2b). Release of retained solids in subsequent flushing events was not observed during the laboratory assessment (sheetflow). Second, total and dissolved copper and zinc concentrations were little changed by wood chip treatment (Fig. 3). Note that runoff concentrations of lead, nickel and cadmium were below detection levels in untreated runoff.

The outcomes of this study suggest some guidelines for utilizing wood chips as a remedial treatment for attenuating heavy metals in roadway runoff. Deployments for treatment in sheetflow configurations may reduce suspended solids, and hence particle-

associated heavy metals, in roadway runoff. Dissolved metal concentrations in sheetflow configurations may be reduced during summer conditions (low runoff salt content) after wood chips have aged in the environment for at least 3 months. Chip aging appears to only have an effect on dissolved heavy metal associations when wood chips are stored in shallow (several inches) piles, as opposed to the large stockpile that served as the source of wood chips to this study. Alternate deployments of wood chips to treat large volumetric flows would not result in removal of heavy metals from roadway runoff. Note that wood chips are also a source of organic matter to the treated runoff (i.e., yellowish coloration to effluent samples) and the impacts of added organic matter in runoff would need to be considered in field deployments.

Manuscript in preparation to summarize these findings for publication in *Journal of Environmental Engineering*.

Figures.

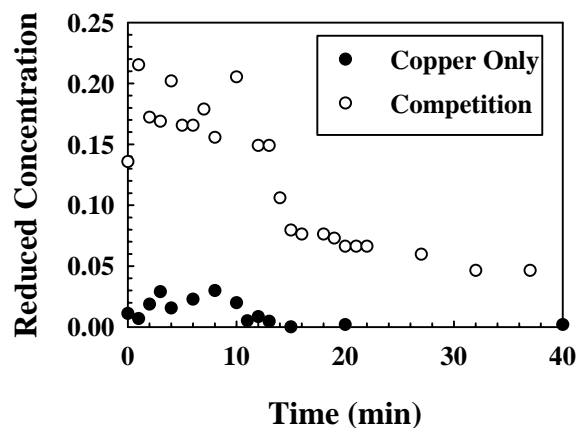


Figure 1. Effluent concentration of copper from wood chip columns flushed with synthetic roadway runoff containing copper only (solid circles) and copper with lead, zinc, nickel and cadmium (open circles). Effluent concentrations are plotted as reduced concentration (normalized to inlet concentration) to account for small differences in inlet concentrations between the two experiments.

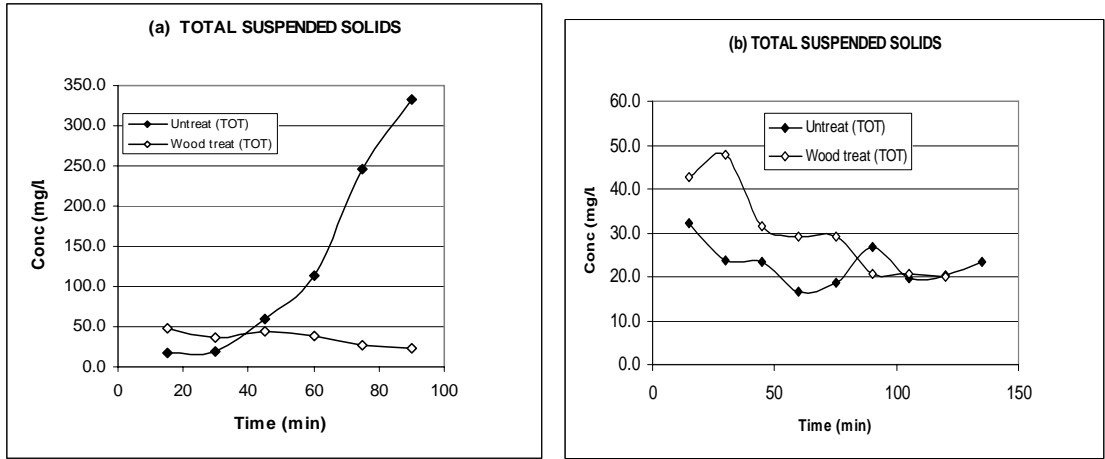


Figure 2. Suspended solids removal by wood chips in a field deployment during two storm events. Solid symbols are samples of untreated roadway runoff collected prior to wood chip treatment. Closed symbols are samples of wood chip-treated runoff.

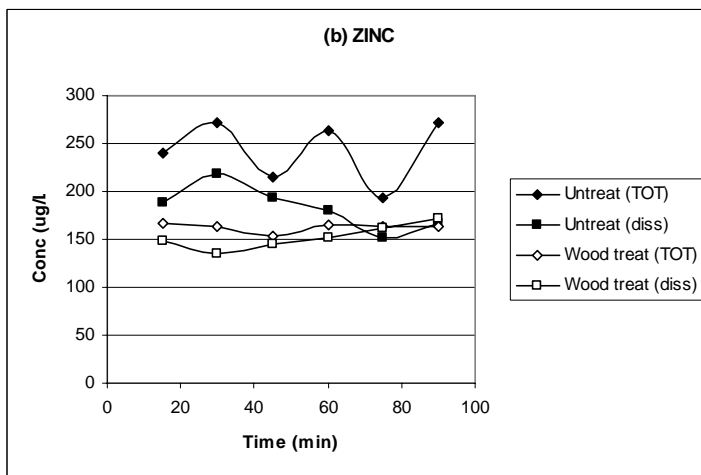
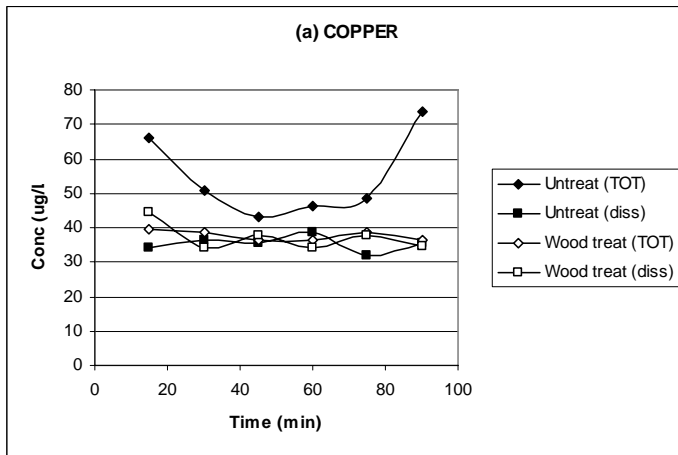


Figure 3. Comparison of dissolved and particle-associated copper (a) and zinc (a) in untreated and wood chip-treated roadway runoff in a field deployment. Solid symbols are samples of untreated roadway runoff collected prior to wood chip treatment. Closed symbols are samples of wood chip-treated runoff.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 03-2

PROJECT TITLE: Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Succinic Acid

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Scott Civjan, University of Massachusetts, Amherst

STATUS: Continuing

INITIAL AGREEMENT DATE: 09/01/2004

END DATE: 08/31/2007; Agreement Pending

PROJECT OBJECTIVES:

The overall objective of this project is to determine the field applicability of using DSS in concrete for transportation structures. Specifically, the study will develop mixing and placing procedures for concretes containing DSS and will study how well DSS added to concrete in highway and bridge structures protects against reinforcement corrosion and freeze-thaw damage. Field placements using DSS will be made in various New England states. Procedures for long term monitoring will be implemented. In addition, recommendations for laboratory and field testing to address any concerns with long term performance will be developed.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Task 1a - Literature Review

N/A

Task 1b - Determine Potential Sites for Field Implementation

Following meetings at Massachusetts and Maine offices as well as phone conversations with New York State, three new projects have been selected. These were subsequently approved by the oversight committee. These will supplement the project in VT

Maine: Rockland Ferry Terminal is under construction and will utilize a combination of Hycrete and typical High Performance Concretes in different locations for comparison. Monitoring plan has been completed and implemented in the project.

Massachusetts: Local Interstate 91 overpass columns and bents will take place under a maintenance contract. PI was contacted by one party bidding on the job to determine how to implement the Hycrete and discuss an instrumentation plan. However, this project has been indefinitely postponed by MassHighway.

New York: A large concrete culvert being used in a highway project. Mike Kistner (Kistner Concrete) was to determine an ideal project for use with Hycrete and control comparisons and request NYDOT approval. No project has been selected to date.

Task 2 – *Large-Scale Mixing*

Trial batches were completed by Sunrise Materials for Maine implementation project.

Task 3 - *Field Placement*

Construction ongoing for the Maine Rockland Ferry Terminal project.

Task 4 - *Standardized Testing*

N/A

Task 5 - *Develop Specifications*

N/A

Task 6 - *Develop Monitoring Plan*

Monitoring plan was prepared and implemented at the Maine field implementation site..

Task 7 - *Prepare Final Report*

Final Report for Phase 1 is approved. Publication is pending signing of contract extension (funds are currently frozen on the accounts). Draft report for Phase 2 has been initiated. Final Phase II report will include VT project, ME project progress through report submittal, CT previous barrier implementation (prior to NETC03-2), and description of potential projects approved but not initiated in NY and MA.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“Hycrete – DSS An Innovative Admixture for Concrete: An Update on NETC 03-2,” Presentation: 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, Presentation made to the 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.

PROJECT NUMBER: 03-5

PROJECT TITLE: Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator

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

STATUS: Completed

INITIAL AGREEMENT DATE: 09/01/2003

END DATE: 02/28/2006

PROJECT OBJECTIVES: The main objective of this research is to evaluate a field permeameter as a tool to evaluate the quality of longitudinal joints. This will be accomplished by performing field permeability testing using a permeameter developed as part of the study. Permeability and core density testing will be performed at various construction projects around New England and the performance of the longitudinal joints will be evaluated over the length of this project.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:
Final Report submitted and distributed.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“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.

“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.

PROJECT NUMBER: 03-6

PROJECT TITLE: 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

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Walaa S. Mogawer, PI, UMass Dartmouth; Jo Sias Daniel, Co-PI, University of New Hampshire

STATUS: Continuing

INITIAL AGREEMENT DATE: 04/01/2006

END DATE: 3/31/2008; Agreement Pending

PROJECT OBJECTIVES:

- Define and compare thin lift overlay maintenance mixes and surface treatments currently used in the New England States.
- Evaluate the thin lift overlay maintenance mixes and surface treatments currently used in the New England States and compare to those currently used worldwide.
- Determine the current New England DOT procedures for picking rehabilitation methodologies.
- Perform and evaluate non-destructive testing to better determine the optimum time to apply surface treatments or thin lift overlay mixes to the existing pavements in order to properly prioritize rehabilitation projects.
- Evaluate the benefits and drawbacks of using PMA thin lift mixes versus surface treatments with lab testing.
- Evaluate the cost comparisons between PMA thin lift mixes and surface treatments.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

UMass Dartmouth continued work on the literature review.

UMass Dartmouth created a survey in an attempt to evaluate the current state of practice with regards to thin lift overlay maintenance mixes and surface treatments. This survey attempted to address the current methodologies employed by industry professionals to determine the optimum time to rehabilitate a particular pavement and the process for choosing a rehabilitation method. The survey was sent to over 100 experts from federal, state, and local agencies.

UMass Dartmouth compiled and analyzed the results of the survey.

NETC 03-6 Technical Committee decided that the PMA will incorporate rubber as the modifier. For this project both Chemically Modified Crumb Rubber (CMCR) and Asphalt Rubber (AR) processes will be examined.

UMass Dartmouth received the AR binder necessary to complete the mix designs and performance testing from All States Asphalt, Inc. The base grade of the binder is a PG 58-28.

UMass Dartmouth received aggregate for the PMA thin lift mixes from JH Lynch & Sons Inc. The four stockpiles received consisted of 1/2" aggregate, 3/8" aggregate, washed sand, and unwashed sand.

UMass Dartmouth began testing on the aggregate stockpiles.

UMass Dartmouth began developing blend gradations to meet the proposed specifications from Mass Highway Department. The blend gradations originally came from Rhode Island Department of Transportation and California Department of Transportation (CalTrans).

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 03-7

PROJECT TITLE: Basalt Fiber Reinforced Polymer Composites

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Richard Parnas, PI and Montgomery Shaw, Co-PI, University of Connecticut

STAUTS: Completed

INITIAL AGREEMENT DATE: 11/16/03

END DATE: 11/15/05

PROJECT OBJECTIVES: We propose to investigate the usage of basalt fibers in low cost composites for civil infrastructure applications requiring excellent mechanical properties and long lifetimes. Basalt fibers have great potential as reinforcement in both polymer materials and in concrete. However, this proposed research will focus on the use of basalt fiber reinforced polymer composites.

A range of basic mechanical tests will evaluate polymer composites reinforced with basalt fibers. A limited number of companion tests will also be done with glass-reinforced composites using the same polymer as the basalt specimens to permit direct comparison between the two reinforcing materials. Subsequent tests will examine effects of environmental exposure on the composite material behavior.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Final Report submitted and distributed.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“Preliminary Investigation of Basalt Fiber Composite Properties for Applications in Transportation,” Q. Liu, M.T. Shaw, R.S. Parnas, A. McDonnell, Transportation Research Board Annual Meeting, January, 2005, Washington, DC, 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 (*in press*).

“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.

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

PROJECT NUMBER: 04-1

PROJECT TITLE: Recycling Asphalt Pavements Containing Modified Binders

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): James Mahoney,
Connecticut Transportation Institute, University of Connecticut

STATUS: Continuing

INITIAL AGREEMENT DATE: 08/23/2005

END DATE: 08/22/2007; MOU Pending

PROJECT OBJECTIVES:

Phase 1

The first objective of this Phase of the research is to provide a universally accepted definition of what constitutes a modified asphalt binder. The second objective of this Phase is to determine what types of modified asphalt binders are currently being used in the region. This will include contacting State Transportation Agencies as well as asphalt binder suppliers.

Phase 2

The objectives of the second Phase of this project will attempt to address incompatibilities that may arise when RAP is used in a new HMA pavement that contains a virgin modified asphalt binder. This Phase of the project will also provide guidance as to the proper amount of RAP that can be added to the HMA without causing problems. In addition, the interaction of polyphosphoric acid modified virgin asphalts and the aggregates in the RAP will also be tested to determine if there is a negative impact on the HMA mixes performance.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

The Phase 1 report was accepted by the technical committee and work on the second phase of this project was authorized. The collection of RAP samples for this project did not get underway until the start of the 2007 construction season. RAP samples were secured from Maine DOT, Vermont AOT and Connecticut DOT. Some of the modified asphalt binder samples required for this project were also collected. Work on this project was halted unexpectedly as the original contract was allowed to expire and is being replaced with a Memorandum of Understanding between ConnDOT and UConn. The location of the final set of RAP samples that is required for this project has been identified but not yet collected. That will be done in the Spring 2008.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 04-2

PROJECT TITLE: Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Donald L. Fisher, PI, and Mike Knodler, Co-PI, University of Massachusetts, Amherst

STATUS: Continuing

INITIAL AGREEMENT DATE: 03/01/2005

END DATE: 01/31/2007

PROJECT OBJECTIVES:

1. Determine how driver eye movements vary with different work zone designs
2. Develop recommendation for more effective use of existing work zone traffic control devices.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Proofs of the Transportation Research Record paper were corrected for publication. Eye tracking data and vehicle data from the 2nd simulator study were downloaded and analyzed for two subjects.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“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 Situational Awareness during Hands-Free Communication Tasks,” Muttart, J.W., Research paper submitted to the Transportation Research Board and accepted as a presentation to be given 1/21/07 in Washington, DC.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue”, Transportation Research Record, TRR 07-2873, Transportation Research Board, Washington, DC.

PROJECT NUMBER: 04-3

PROJECT TITLE: Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Jennifer Jacobs, PI, Thomas Ballestero, Co-PI, University of New Hampshire and Richard Vogel, Co-PI, Tufts University

STATUS: Continuing

INITIAL AGREEMENT DATE: 10/01/2004

END DATE: 03/31/2007; Agreement Pending

PROJECT OBJECTIVES: The main objective of this research is to develop a set of regional regression relationships to predict flood flows for steep slope watersheds from basin characteristics. The regression relationships will be developed using standard USGS regional hydrologic methods. We propose to identify target watersheds in the New England region and to develop a database of physical basin parameters and historical streamflow necessary for the statistical analysis. Regression analyses will be conducted to identify explanatory variables and to develop regression relationships for average daily flow and 2-, 10-, 25-, 50-, and 100-year peak flow recurrence interval events. As appropriate, the New England states will be divided into subregions.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

The Literature Review was presented to the committee and feedback was provided. The watershed selection was completed. A database of 204 watersheds was selected for this study (Figure 1). The main channel slope for these 204 watersheds ranges from 50 – 625 ft/mile (Figure 2). All historical streamflow statistics and basin characteristics were developed for each watershed. A database of supporting values was developed. The regression analyses were conducted using the finalized flow and watershed characteristics. A preliminary set of equations was identified. The regression analysis will continue in the next year. The majority of the progress was accomplished prior to 2007 with the project being in hiatus for much of 2007 due to personnel changes.

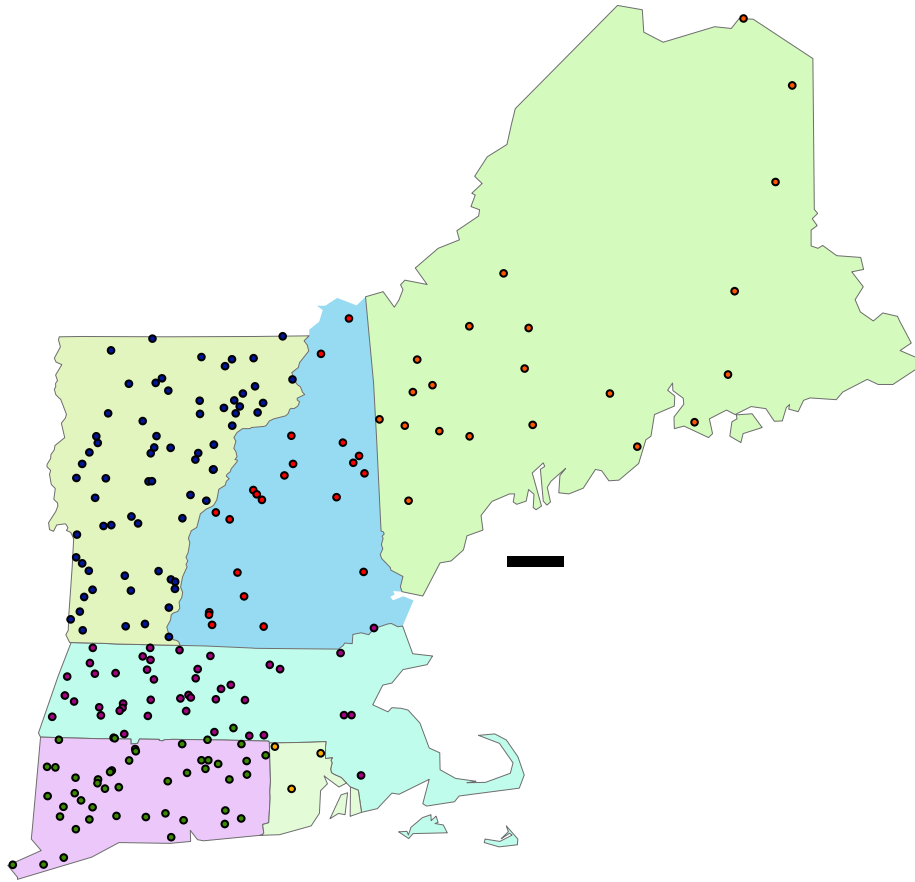


Figure 1. Distribution of watersheds throughout New England.

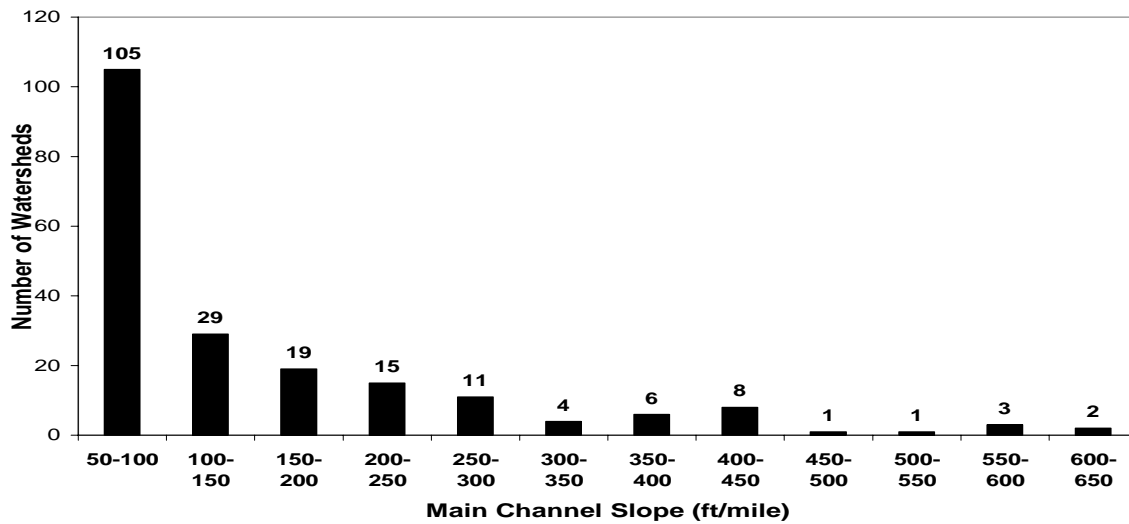


Figure 2. Range of Main Channel Slopes of Selected Watersheds

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO
THIS PROJECT FROM THE START OF THE PROJECT THROUGH
DECEMBER 31, 2007:**

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

PROJECT NUMBER: 04-4

PROJECT TITLE: Determining the Effective PG Grade of Binder in RAP Mixes

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): PI: Jo Daniel, University of New Hampshire; Co-PI: Walaa Mogawer, UMass Dartmouth

STATUS: Continuing

INITIAL AGREEMENT DATE: 10/01/2004

END DATE: 03/31/2008; Agreement Pending

PROJECT OBJECTIVES: The main objective of this research is to develop a method to determine or estimate the binder grade in mixtures designed with RAP from the properties of the mixture itself.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

During the previous year specimen fabrication of all samples for the fundamental approach were completed. At least two replicates were made for each RAP content level. Volumetric data was collected for all samples prior to testing and is summarized in Table 1.

Table 1. Summary of Volumetric Data for Specimens

| Specimen | AC % | RAP % | Gsb | Gmm | Va | VMA | VFA |
|-----------------|-------------|--------------|------------|------------|-----------|------------|------------|
| 6000I | 6.0 | 0 | 2.521 | 2.632 | 4.2 | 17.6 | 76.0 |
| 6000J | 6.0 | 0 | 2.536 | 2.632 | 3.6 | 17.1 | 78.6 |
| 6000K | 6.0 | 0 | 2.517 | 2.632 | 4.4 | 17.7 | 75.3 |
| 5710E | 5.7 | 10 | 2.545 | 2.643 | 3.7 | 16.5 | 77.6 |
| 5710F | 5.7 | 10 | 2.531 | 2.643 | 4.2 | 17.0 | 75.0 |
| 5325F | 5.3 | 25 | 2.539 | 2.634 | 3.6 | 16.0 | 77.4 |
| 5325G | 5.3 | 25 | 2.529 | 2.634 | 4.0 | 16.3 | 75.6 |
| 5325I | 5.3 | 25 | 2.53 | 2.634 | 3.9 | 16.3 | 75.8 |
| 5240F | 5.2 | 40 | 2.541 | 2.637 | 3.6 | 15.9 | 77.1 |
| 5240H | 5.2 | 40 | 2.526 | 2.637 | 4.2 | 16.4 | 74.3 |
| 5240I | 5.2 | 40 | 2.529 | 2.637 | 4.1 | 16.3 | 74.9 |

Dynamic modulus testing was also completed on all specimens during the previous year. Analysis was performed on all data using an Excel based solver, but the data is being reevaluated using a more precise Matlab based solver. This should help refine the master curves to fit more smoothly. The average curves are shown below in Figure 1.

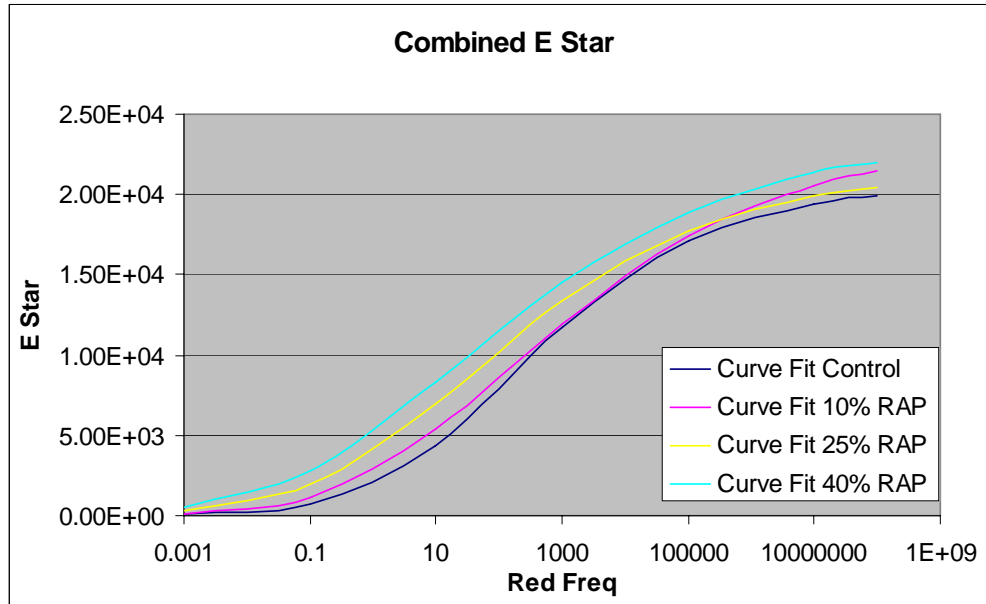


Figure 1: Dynamic Modulus Master Curves for RAP Mixtures

A large variance in the 40% RAP samples has been noted and it is believed that this is due to adding the RAP in bulk, as opposed to adding it by sieve sizes. Research has shown that fractionating the RAP at the #4 sieve helps to reduce variance in the samples, and testing of several samples prepared using this procedure is planned. Additionally, some variance is believed to be caused by the IDT method itself. To help further reduce the variance the fractionated RAP samples will be tested using the compressive testing method.

Strength testing on all the samples was also completed during the previous year. The results are summarized in table 2.

Table 2. IDT Strengths

| Sample ID | Max Load (kN) | Strength (kPa) |
|-----------|---------------|----------------|
| 6000I | 36.65 | 3894 |
| 6000J | 29.77 | 3288 |
| 6000K | 30.14 | 3655 |
| 5710E | 30.97 | 3496 |
| 5710F | 31.86 | 3512 |
| 5325G | 34.21 | 4176 |
| 5325I | 39.25 | 4791 |
| 5240F | 31.17 | 3515 |
| 5240G | 42.52 | 4958 |
| 5240H | 35.77 | 3918 |
| 5240I | 35.13 | 3951 |
| FC 3 | 38.48 | 4507.77 |
| FC 5 | 31.36 | 3118.12 |

Research for the upcoming quarter will focus on analyzing the data and working towards finding a method to determine the $G^*/\sin \delta$ value. Additionally, refinement and analysis

of the empirical method will be completed. The draft final report will be started as well.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 04-5

PROJECT TITLE: Network-Based Highway Crash Prediction Using Geographic Information Systems

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): John N. Ivan, PI, University of Connecticut and Per Gårder, Co-PI, University of Maine, Orono

STATUS: Completed

INITIAL AGREEMENT DATE: 08/23/2004

END DATE: 03/31/2007

PROJECT OBJECTIVES: The objectives of this project are to estimate network-based crash prediction models that will predict the expected crash experience in any given geographic area as a function of the highway link, intersection and land use features observed in the area. The result will be a system of GIS programs that permit a polygon to be drawn on a map, or a set of links and intersections to be selected, and then predict the number of crashes expected to occur on the selected traffic facilities. These expected values can then be compared with observed values to identify locations that are particularly dangerous and require attention for improving safety. Alternatively, this tool could be used to estimate the safety impacts of proposed changes in highway facilities or in different land development scenarios. Another project objective is to demonstrate the value of the resulting system in helping planners and engineers to consider road safety when conducting transportation and land use planning and design and policy-making. This will be done by presenting and demonstrating the resulting model system at a workshop given to each of the New England State DOT's.

The particular novelty with the approach is that land use data by zone is used for accident prediction models for roads on a link level. The land use is used for enhancing the estimates of exposure to accidents by taking into account the amount of traffic that can be expected in and out of areas, exiting and entering the state routes for which the models are developed.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Literature survey

A literature survey with a special focus on the use of GIS and land use data in accident modeling has been compiled. New references are added continuously for the duration of the project.

Data acquisitions and compilation

Data for the region around Hartford, Connecticut has been compiled, including:

- land use data (number of residents, retail-employees and non-retail employees by Traffic Analysis Zone (TAZ), obtained from CRCOG¹)

¹ Capitol Region Council Of Governments, the planning authority of the Hartford region, CT

- land cover data (maps detailing land development developed by CLEAR² from aerial photos)
- traffic flow data on state routes for 1996-2004 (obtained from ConnDOT)
- accident data for state routes for 1996-2003 (obtained from ConnDOT, 2004 data will be added when available)
- road characteristics (obtained from CRCOG and ConnDOT)

Similar data, but excluding land cover maps, has been acquired from MaineDOT for the Maine state route network and TAZs.

Procedure for allocating zonal data to links

As part of the project a procedure has been developed for allocating zonal data. The full procedure consists of three sub-procedures: 1) The splitting of links into shorter segments that either are fully located within one zone or act as a border between the same two zones for their entire length, 2) Identification of all link segments either adjacent to or interior to each zone, and 3) Allocation of the zone attributes (population and employment) to the links associated with each zone, according to attributes of the zones and the links, as well as other information describing the area. Step 2 has been necessitated by the situation that the link layers and TAZs don't line up. This, in its turn, is due to that they originally were coded on different occasions.

Estimation of Accident Prediction Models

Accident prediction models have been estimated for the following contexts:

1. Major intersections (between state roads with AADT and accident data available)
2. Segments between major intersections
 - a. Two-lane rural roads
 - b. Two-lane urban/suburban roads
 - c. Four-lane undivided roads
 - d. Four-lane divided roads
3. Minor intersections on segments between major intersections
 - a. Two-lane rural roads
 - b. Two-lane urban/suburban roads
 - c. Four-lane undivided roads
 - d. Four-lane divided roads

There were not enough major intersections in the dataset to subdivide them by type of road. The descriptor variables used, in addition to the population and employment variables, include road width and speed limit for the segment and minor intersection models and number of lanes for the major intersection models. For the minor intersection models, trip generation (estimated from the population and employment values using ITE rates) proved to result in the best model fit.

Models were estimated using data from both Connecticut and Maine. The resulting models were compared, both with respect to their coefficients and their ability to predict on the other data set. The conclusion is that the models are different enough that they cannot be used for the opposite context. Therefore, the user must decide if the

² Center for Land use Education And Research at University of Connecticut, www.clear.uconn.edu

application context is more like Connecticut or Maine when deciding which set of models to use.

GIS-Based Accident Model User Interface (AMUI)

As part of the scope of work, the project team created an AMUI based in ARCGIS. This interface consists of macros to present and compare accident model results in a GIS environment so they can be viewed graphically. The project team demonstrated use of the AMUI at three workshops held at the Connecticut and Maine Departments of Transportation and Massachusetts Highway Department.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“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 32nd Annual Traffic Records Forum, Palm
Desert CA, Aug. 3, 2006.

“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.

PROJECT NUMBER: 05-1

PROJECT TITLE: Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Thomas C. Sanford,
University of Maine

STATUS: Continuing

INITIAL AGREEMENT DATE: 1/1/2006

END DATE: 12/31/2007; Agreement Pending

PROJECT OBJECTIVES: The objective of this study is to produce a drilled shaft design method for evaluating the now unused side shear or end bearing to supplement the AASHTO allowable load. The magnitude of unused side shear or end bearing corresponding to the AASHTO allowable load will be the magnitude that occurs at the same shaft movement as the allowable load. This method should reflect different rock socket geometry and different rock properties typical of New England. The method should be based on past load tests and be robust and easy-to-use.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Received load test data from Connecticut DOT. Total number of tests received from the Connecticut, Massachusetts, and Maine DOT's was 14. Analysis of the data was started. Records of 460 Osterberg load tests conducted for public agencies by LOADTEST were obtained from Dr. Dan Brown of Auburn University. The information has been screened down to 40 tests occurring in hard rock, including the 14 tests indicated above. The geotechnical information on the tests, excluding the 14 tests, is incomplete. We are in the process of tracking down supplemental information from public agencies principally in Pennsylvania, Virginia, and New Jersey. Requirements for special field load tests have been developed and written.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 05-3

PROJECT TITLE: Practicable Calibration Procedures to Enhance the Accuracy of Analytical and Microsimulation Software for Modern Four-Legged Single-Lane Roundabouts

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Adel E. Sadek, University of Vermont, Mark Smith, University of Vermont, Per Garder, University of Maine and Lisa Aultman-Hall, University of Connecticut

STATUS: New

INITIAL AGREEMENT DATE: Agreement Pending

END DATE: Agreement Pending

PROJECT OBJECTIVES:

To ensure the effective implementation and operation of roundabouts, however, the transportation community is in need of accurate modeling tools to aid in planning, design and analysis of roundabouts. Transportation professionals charged with the task of the operational analysis of existing and future roundabouts have a wide range of available models and software, which vary in their modeling approach, capabilities and graphical representation. These tools, however, can be broadly divided into two groups: (1) analytical models such as aaSIDRA and RODEL; and (2) microscopic simulation models, such as PARAMICS and VISSIM.

Transportation professionals attempting to analyze and design roundabouts are confronted with a number of questions that remain unanswered. These questions include: (1) which software is best suited to analyze a given existing or future roundabout; (2) how accurate the software outputs are compared to field data; and (3) how the accuracy of these models can be improved within reasonable budget and time constraints. The current project is designed to help transportation professionals answer these questions.

Specifically, for the analytical models, the research will: (1) assess the accuracy of the two most widely used analytical models for roundabouts analysis (i.e. aaSIDRA and RODEL) by comparing their estimates of queue lengths and delay against field measurements (this comparison will be conducted for a wide range of traffic characteristics and for two different geometric configurations); (2) investigate how to enhance the accuracy of the two models' estimates by calibrating the models using location-specific parameters; and (3) formulate a step-by-step procedure for calibrating the models. This procedure will include a detailed description of the relevant data required for calibration, as well as an estimate of the effort needed.

For microscopic simulation models, the research will first select the most appropriate microscopic simulation model for modeling roundabouts, and then do the following: (1) assess the accuracy of the model against field observations; (2) determine

those model parameters that have the most significant impact on the results, and should therefore be the focus of the calibration process; and (3) develop a detailed procedure for the calibration of microscopic parameters to roundabouts operations. The scope of the project is limited to four-legged, single lanes roundabouts.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

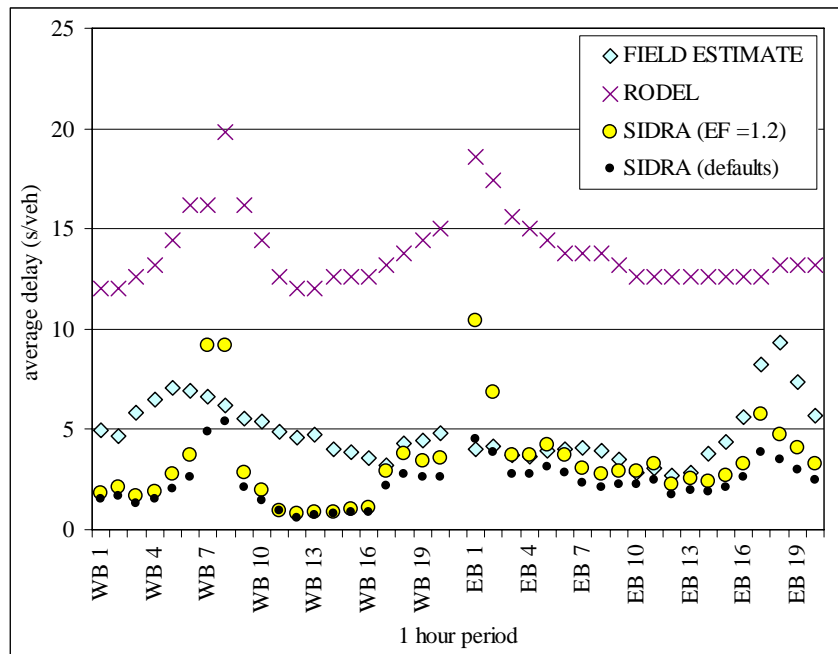
- 1) A comprehensive inventory of New England roundabouts has been compiled. The inventory contained information regarding the location of the roundabout, its geometric configuration, the number of legs and number of lanes, the year the roundabout was built, and the traffic volumes at the roundabout. From the inventory, it was determined that the Nashua, NH roundabout seemed to be the best candidate for the project, and was thus selected as our first study roundabout.



The Nashua Roundabout

- 2) A video-conference was held on June 8 between the project's principal investigators and the project's technical committee to review the project's progress and to get the project technical committee's approval on the selected roundabout.
- 3) The Nashua roundabout was videotaped for a total of twelve hours worth of data. The data were recorded in two six hour sessions (6-12 am and 12-6 pm). From the videotapes, the research team extracted volume, stopped delay, and queue lengths information from the video-tapes. Data extraction and reduction proved to be a very labor intensive process, especially given the fact that we had to deal with four videotapes from the four cameras for each time period, and had to ensure that the four cameras are synchronized. To accomplish the task in a timely manner, we had to employ a total of four students for the task, which still almost took the whole summer to complete.
- 4) The field measured delay was then compared to output from corresponding periods using aaSIDRA and RODEL. The results are shown in the Figure below. As can be seen, aaSIDRA estimates seem to be close to the field measurements, but the accuracy varies by approach. On the other hand, RODEL seems to overestimate the delay. Specifically, the average error was 1.4 seconds for SIDRA, and about 9 seconds for RODEL. A TUKEY's paired t-test was performed on the data, revealing that the average error for aaSIDRA is significantly lower than that for RODEL at the 0.05 level.

Average Delay Comparison: aaSIDRA and RODEL vs. Field Estimate



An attempt to calibrate the aaSIDRA results was made using the available “environmental factor” (EF). This parameter varies gap acceptance values used in the model. After some trial and error, an EF of 1.2 gave even closer values to the field measurements; however some spiking of the results occurred for a few data points (see above). Varying the Entry/Circulating Flow Adjustment values in the aaSIDRA configuration window had insignificant effect on the results.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“Assessing the Accuracy of Roundabouts Analysis Procedures against Field Observations: Preliminary Results from a Case Study in Northern New England,” Smith, M.C., Sadek, A.W., Johnson I., Aultman-Hall L., and Garder P., 2007, Proceedings of the *Annual Transportation Research Board Meeting*, TRB, National Research Council, Washington, D.C.

PROJECT NUMBER: 05-6

PROJECT TITLE: Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): J. H. Wang, University of Rhode Island

STATUS: Continuing

INITIAL AGREEMENT DATE: 1/1/2006

END DATE: 4/30/2008

PROJECT OBJECTIVES:

- Review and evaluate existing research and literature related to the use of graphic-aided DMSs and the effects of such uses on elder drivers.
- Examine the feasibility of employing graphics in DMS messaging to assist drivers' comprehension of the message with a particular focus on elder drivers.
- Compile and or develop a library of graphic-aided text messages if such use were determined to be both feasible and beneficial.
- Make recommendations to identify, re-design, or create elderly friendly dynamic message signs that are effective for the driving population as a whole.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

- A computer-based questionnaire to collect drivers' opinions and preferences and a driving simulation experiment to collect drivers' response times regarding the use of graphics in DMS was successfully developed and tested. Both the survey and simulation were successfully conducted in May and June with 480 people completed the survey and 170 people completed the simulation. The major part of the survey and simulation were conducted in Warwick Mall, RI.
- 35 additional elder drivers between the ages of 60 and 94 were recruited to complete the computer-based questionnaire and the driving simulation experiment to provide a better contrast between young and older drivers. Members of the research team visited local elderly housing communities to recruit subjects and drove them to the URI lab to participate in the research project. The resulting opinions and preferences collected from the survey, and response times from the driving simulation were analyzed across the five age groups.
- The PI has made a presentation about the interim progress and result of this project at the ConnDOT. The presentation was videotaped and was made available for public viewing through the web.
- A paper written based on some findings of this project was submitted to the annual TRB meeting in August, 2007. The paper was accepted in October 2007 and was presented in the meeting in January 2008. Aaron Clark, the graduate student who worked in the project, successfully defended his thesis in November 2007.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

A presentation was given to the Rhode Island DOT on November 16, 2006.

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

PROJECT NUMBER: 05-7

PROJECT TITLE: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): John N. Ivan, University of Connecticut and Adel E. Sadek, University of Vermont

STATUS: Continuing

INITIAL AGREEMENT DATE: 5/23/2006

END DATE: 11/22/2007; MOU Pending

PROJECT OBJECTIVES:

The primary objective of this project is to consider accident and operational experience to develop a set of warrants prescribing conditions under which it is and is not appropriate to install exclusive left turn lanes at unsignalized intersections and driveways. The resulting warrants will balance both safety and operational considerations. Empirical Bayes analysis and negative binomial modeling will be used to compare the accident experience at unsignalized intersections with and without exclusive left turn lanes, especially noting the contributions of other conditions (e.g., volume level, land use, driveway density, and roadway geometry). Traffic simulation will be used to estimate delay to through and left-turning vehicles at these same intersections, again noting the contributions of these other conditions. The resulting warrants will then consider not only traffic volumes, but also observed safety experience and other pertinent characteristics of the intersection or driveway.

A secondary objective is to examine the safety experience at unsignalized intersections and driveways with existing exclusive left turn lanes to see what can be learned about how to design them to be safer. This will involve observing all of the geometric characteristics of the sites studied, along with the precise application of traffic control devices used, including pavement markings and signage, as well as lane and pavement width. Then, in addition to the warrants developed, we will also prepare guidelines for how to physically design and control exclusive left turn lanes to maximize safety for all road users.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

Current practice survey

A survey was designed and distributed to gather input about current practice regarding adding left turn lanes at unsignalized intersections. We have only received 14 surveys to date, three reported to be from New England highway agencies, but four did not give contact information, so they may or may not be from New England.

Safety warrants

Data collection and analysis in Connecticut focus on the safety aspects associated with developing the left-turn lane warrants. A list of 60 intersections has been prepared

so as to include equal numbers of intersections in each of the subcategories, namely: with/without left turn lanes, 3 or 4 approach legs, rural versus non-rural settings, and number of through lanes. Six intersections have been videotaped for a period of four hours consisting of two peak hours and two off-peak hours. Half of the intersections are with a left-turn lane and the other half without. The videos are prepared for use in calibrating the operational analysis done in Vermont.

Accident records for the 60 intersections selected in Connecticut for safety analysis were collected for years 1999 through 2004. For each intersection, the ConnDOT photolog was consulted to confirm that the design during the 6-year period was unchanged with respect to the presence or absence of a left turn lane. Preliminary analysis has also been completed to identify for 12 intersections which accidents are likely to be related to the left turn lane in the study intersection as opposed to nearby intersections or driveways.

Three different crash data sets were prepared: (1) involved person data, (2) involved vehicle data, and (3) crash data. The crash data were summarized by collision type for both intersections with and w/o left-turn lane, by number of lanes on the major road (two or four), by the number of legs in the intersection (three v. four) and by urban or rural location. Collisions were classified into three categories, same direction, intersecting direction and segment-related collisions, in order to identify the types of collisions associated with the presence or absence of left turn lanes. We compiled a database of 50 unsignalized intersections on state roads in Connecticut without left turn lanes on the state road in each of six different types of intersections: rural two-lane T-intersections, rural two-lane four-way intersections, urban two-lane T-intersections, urban four-lane T-intersections, urban two-lane four-way intersections and urban four-lane four-way intersections, except for the last category, in which only 33 intersections could be found. This database includes accidents by collision type and AADT on the state road for the ten years from 1995 to 2004, the years for which accident data are available. This database is our control group. The same data were gathered for samples of intersections with left turn lanes in each category. Intersections with left turn lanes are not as plentiful, so we cannot have as many of these in the database. There are at least 5 intersections with left turn lanes in each category.

Accident prediction models are being estimated for all six intersection types for each of the three collision types. This work is still in progress.

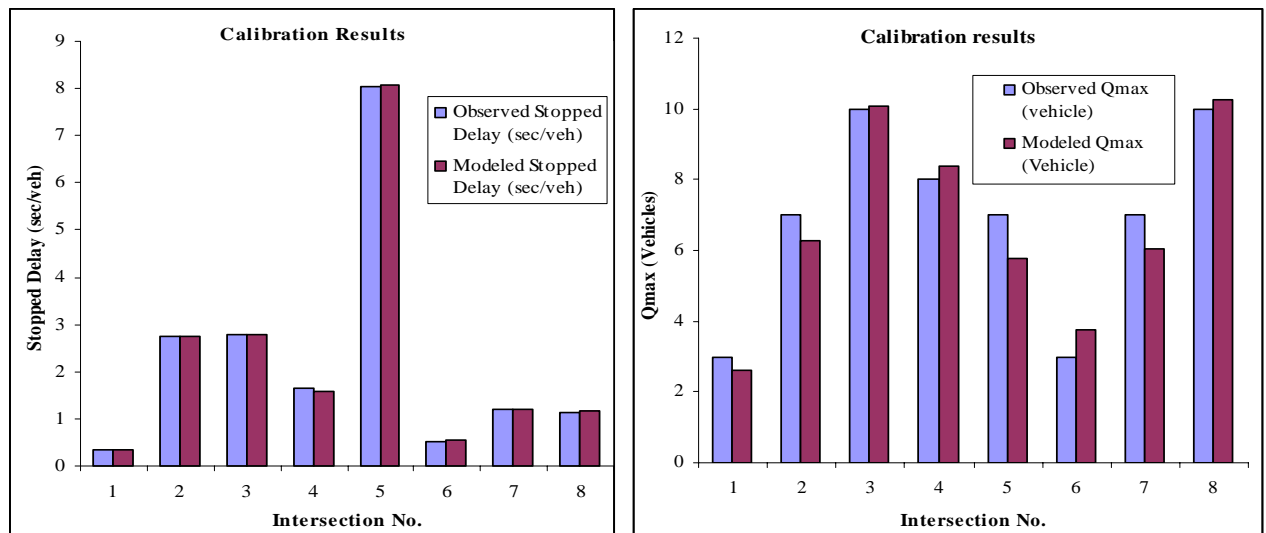
Operational warrants

In Vermont, the data collection and analysis focus on the operational aspects associated with the development of left-turn lane warrants for unsignalized intersections. As was mentioned in the previous progress report, data collection and reduction were completed at a total of 10 unsignalized intersections distributed throughout Chittenden County, Vermont, and representative of various configurations (i.e. two-lane vs. multi-lane roads) as well as various driving environments (i.e. urban vs. sub-urban vs. rural). For each intersection, the following data were extracted: (1) Advancing, opposing and left turning volumes; (2) Basic geometric information (number of lanes, lane channelization and operating speed); (3) the discharge headway from a queue; (4) Average and maximum queue length during the one hour of observation; (5) Stopped delay at the subject link; and (6) Gap acceptance behavior.

The study then proceeded to develop and calibrate microscopic traffic simulation models for each intersection in CORSIM. Thirty different runs with different seed numbers were performed using the CORSIM Script tool, and the results from these runs were averaged to get a more accurate picture of the CORSIM's reported performance measures. For calibration, the gap acceptance distribution, the discharge headway and the vehicle entry distribution for each intersection were adjusted based on the values obtained from the videotapes. For each intersection, the model's output (i.e. the average of 30 runs) was then compared against several field measurements. Excellent calibration results were obtained as evidenced by Figure 1, which compares the average stopped delay and maximum queue length (as determined from the 30 CORSIM runs) to the values measured from the field. As can be seen, the values are almost identical for all eight sites.

To develop the warrants, we focused first on one road category (namely the 2-lane urban case) and generated a set of 150 random operational scenarios, each representing a certain combination of advancing volume, opposing volume, left-turn percentage and speed. In generating these scenarios, advancing and opposing volumes were randomly varied between 100 and 800 vehicles/hr/lane, left-turn percentage was varied between 3% and 30%, and speed was varied between 40 and 60 mph. For each scenario, two cases were simulated once without a left-turn lane and another with a left-turn installed. As before, each case was run for 30 times, each time with a different seed numbers and the results were averaged over the 30 runs. The output from all these runs was a dataset which for each operational scenario gave the estimated values for the following performance measures: control delay (sec/veh), percent stops, fuel consumption (mpg), Carbon monoxide (CO), Nitrogen oxide (NO) and Hydrocarbon (HC) emissions (gram/mile) for two cases, without a left-turn lane and with a left-turn lane. Initial efforts were also made toward developing Neural Network models to generalize the results obtained. These NNs would form the basis for developing the warrants, as well as developing a Decision Support System for estimating the benefits of installing exclusive left turn lanes at unsignalized intersections.

Figure 1 - Results of the Calibration Procedure



Subsequently, we generated the different operational scenarios for the different road categories (2-lane urban, 4-lane urban and 2-lane rural). For each road category, 150 random operational scenarios, each representing a certain combination of advancing volume, opposing volume, left-turn percentage and speed were generated. In generating these scenarios, advancing and opposing volumes were randomly varied between 100 and 800 vehicles/hr/lane, left-turn percentage was varied between 3% and 30%, and speed was varied between 40 and 60 mph. For each scenario, two cases were simulated once without a left-turn lane and another with a left-turn installed. As before, each case was run for 30 times, each time with a different seed numbers and the results were averaged over the 30 runs. The output from all these runs was a dataset which for each operational scenario gave the estimated values for the following performance measures: control delay (sec/veh), percent stops, fuel consumption (mpg), Carbon monoxide (CO), Nitrogen oxide (NO) and Hydrocarbon (HC) emissions (gram/mile) for two cases, without a left-turn lane and with a left-turn lane.

Following this, Neural Network (NN) models were developed to generalize the results obtained. These NNs form the basis for developing the warrants, as well as developing a Decision Support System (DSS) for estimating the benefits of installing exclusive left turn lanes at unsignalized intersections. The DSS is designed to predict the likely benefits of left-turn lane installations in terms of reductions in control delay, stops, fuel consumption and emissions. A paper summarizing the work done to develop the NN DSS was presented at the Transportation Research Board (TRB) meeting in January.

Subsequently, *operational* left turn lane warrants were developed based on the output from the Neural Network (NN) model. For developing the warrants, we used the NNs trained for the “without left turn lane” scenarios. Because our results indicated that the emissions model in CORSIM is not that sensitive to changes in operational conditions (i.e. speed, stops, etc), we decided to base our warrants on: (1) the control delay (sec/hour); and (2) the number of stops per hour on the subject link (in other words, warrants based on fuel consumption or emissions levels were not developed).

In developing the warrants for the left turn lane based on control delay and the number of stops per hour, the first step was to setup the thresholds for the both of the warrant criteria. While setting up the thresholds for the control delay and number of stops per hour, the following points were considered. First, it was necessary to look at the rate of change in the delay and number of stops with respect to the opposing, advancing, left turning volumes and operating speed. For that, total delay and the total number of stops on the subject link were plotted against the various combinations of advancing, opposing, left turning volumes and different operating speed.

The thresholds selected were kept constant regardless of the volumes and category (e.g. urban two lane and rural two lane categories had same thresholds), but varied with the operating speeds. For example, volume combinations for 30 mph speed are higher than the volume combinations for 40 mph speed as the thresholds are higher for the former. This same logic was followed by Harmelink (1967), Kikuchi and Chakraborty (1991) and Lakkundi et al., (2004). Finally, the thresholds were selected such that the warrants developed herein would be, generally speaking, somewhat comparable to other existing warrants presented by Harmelink (1967), Kikuchi and Chakraborty (1991) and Lakkundi et al., (2004).

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

“A Decision Support System for Predicting the likely Benefits of Left-turn Lane Installation,” Ranade, S., Sadek, A.W. and Ivan, J., 2007, Accepted for presentation at the TRB Annual meeting, January 2007, Accepted for publication in *Transportation Research Record*.

PROJECT NUMBER: 05-8

PROJECT TITLE: Evaluation and Implementation of Traffic Simulation Models for Work Zones

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): John Collura, University of Massachusetts Amherst

STATUS: Continuing

INITIAL AGREEMENT DATE: 1/1/2006

END DATE: 12/31/2007; Agreement Pending

PROJECT OBJECTIVES:

1) assess the strengths and limitations of readily available computer based simulation models designed to evaluate the impacts of alternative work zone strategies; 2) make recommendations for the use of such simulation models on roadway reconstruction and rehabilitation projects in New England and New York State; and 3) conduct the necessary technology transfer activities in order to ensure that the results of this project are disseminated and provided directly to potential simulation model users, including transportation engineers and planners in New England and New York State.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

During 2007 the Literature Review (Task 1) focused on the identification of PC based simulation models to assist State DOTs in the evaluation of alternative work zone strategies (QuickZone, QUEWZ and CA4PRS). In addition, the data requirements of these models were identified (Task 2) and incorporated into the assessment of the strengths and weaknesses of these models and their potential use by State DOTs (Task 3). The Simulation Software was used to assess the impacts of work zone strategies along segments of interstates in Connecticut, Maine and New Hampshire.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007:

Prepared paper to be presented at the TRB Annual Meeting in January 2008: "Using Simulation Models to Assess the Impacts of Highway Work Zone Strategies: Case Studies Along Interstate Highways in Massachusetts and Rhode Island".

PROJECT NUMBER: 06-1

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

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Jo Sias Daniel, PI, University of New Hampshire; Ghassan R. Chehab, Co-PI, Pennsylvania State University

STATUS: New

INITIAL AGREEMENT DATE: 8/1/06

END DATE: 7/31/08

PROJECT OBJECTIVES:

The main goal of this research is to offer the New England and New York state highway agencies guidelines for the implementation of the MEPDG, with focus on flexible pavements and AC overlays. The research team will address some of the issues and concerns that arise in the transition from current AASHTO design practices to the new mechanistic-empirical design methodologies incorporated in the MEPDG. Within the scope of this project, the proposal team would try to answer some questions that highway agencies have with regard to the MEPDG implementation, as shown in Figure 1.

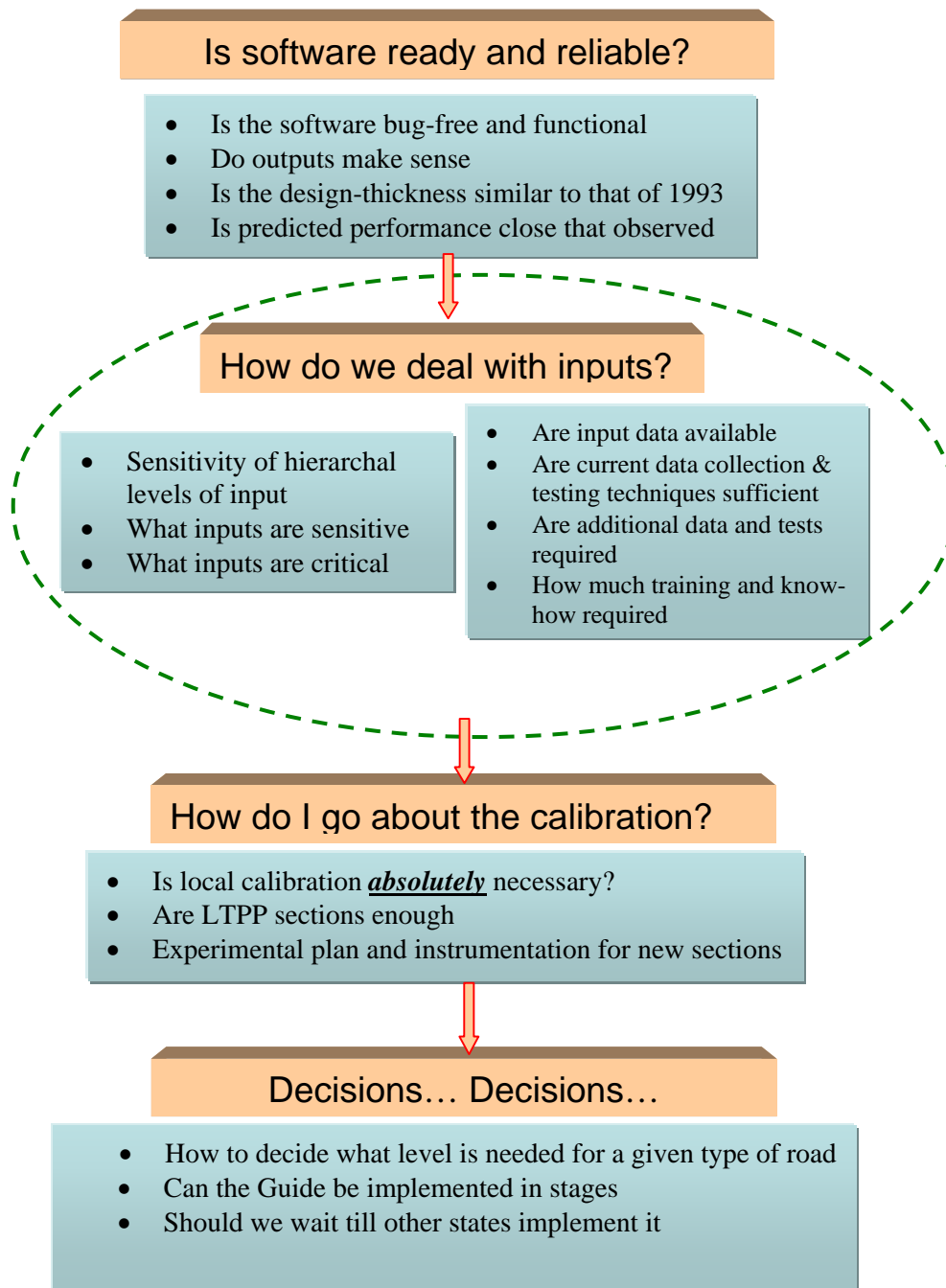


Figure 1. Possible Concerns Regarding the MEPDG Implementation

Specifically, the objectives of this research project are as follows:

- Determine the design and data collection methods, material tests, and testing equipment currently in use by each state.
- Identify the Level 2 and Level 3 design guide inputs for which regional or local values are required.
- Provide state specific recommendations on implementation of the MEPDG

including changes in data collection & measurement, equipment needs, training, and anticipated benefits.

- Provide specific recommendations for regional and local calibration of the MEPDG by identifying appropriate field test & monitoring sites, data to be collected, and perform local calibrations if appropriate field data is available.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007:

- A. The Preliminary literature review was completed. This will be continuously updated as new published material becomes available over the course of the project. The research team contacted several states about their implementation activities, designed and completed a survey to determine the design and data collection methods, material tests, and testing equipment currently in use by each state. A website is under development. Sensitivity analysis with version 1.0 of the software is underway.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: None

PROJECT NUMBER: 06-5

PROJECT TITLE: Winter Severity Indices for New England

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Samuel Miller, PI, Plymouth State University; Brendon Hoch, Co-PI, Plymouth State University

STATUS: New

INITIAL AGREEMENT DATE: 7/24/06

END DATE: 7/31/08

PROJECT OBJECTIVES: RESEARCH OBJECTIVE: The objective of this study is to develop winter severity indices for the New England region. Anticipated tasks include identifying appropriate and manageable number of weather regions within New England, developing winter severity indices using statistical concepts, developing standard methods to utilize the indices and provide recommendations on maintaining and improving indices.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2007: N/A

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2007: N/A

D. FINANCIAL STATUS OF PROJECTS ACTIVE DURING 2007

D.1 FINANCIAL STATUS OF ACTIVE PROJECTS:
Table 1: Financial Status of Projects Active During 2007
(As of December 18, 2007)

| NO. | PROJECT TITLE, PI, UNIVERSITY | APPROVED BUDGET | INVOICES APPROVED FOR PAYMENT | PROJECT BALANCE |
|-----------------|---|-----------------|-------------------------------|-----------------|
| 00-8 | Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage in a Cold Region, <i>D.Humphrey, University of Maine, Orono</i> | \$150,000.00 | \$150,000 | \$0 |
| 02-1 | Relating Hot Mix Asphalt Pavement Density to Performance, <i>W. Mogawer, University of Massachusetts, Dartmouth, R. Mallick, Worcester Polytechnic Institute, J. Daniels, University of New Hampshire</i> | \$103,524.00 | \$90,721.69 | \$12,802.31 |
| 03-1 | Ability of Wood Fiber Materials to Attenuate Heavy Metals, <i>A. MacKay, University of Connecticut</i> | \$72,000.00 | \$57,079.86 | \$14,920.14 |
| 03-2 | Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Acid, <i>S. Civjan, University of Massachusetts Amherst</i> | \$140,000.00 | \$81,749.35 | \$58,250.65 |
| 03-5 | Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator, <i>J. Daniel, University of New Hampshire</i> | \$77,646.00 | \$77,318.43 | \$327.57 |
| 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 | \$99,927.00 | \$48,720.34 | \$51,206.66 |
| 03-7 | Basalt Fiber Reinforced Composites, <i>R. Parnas, M. Shaw, University of Connecticut</i> | \$65,791.00 | \$64,092.29 | \$1,698.71 |
| 04-1 | Recycling Asphalt Pavements Containing Modified Binders, <i>J. Mahoney, University of Connecticut</i> | \$109,918.00 | \$15,316.34 | \$97,154.38 |
| 04-2 | Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety, <i>D. Fisher, University of Massachusetts Amherst</i> | \$74,491.00 | \$70,387.66 | \$4,103.34 |
| 04-3 | Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England, <i>J. Jacobs , T. Ballestero, University of New Hampshire, R. Vogel, Tufts University</i> | \$120,000.00 | \$98,025.49 | \$21,974.51 |
| 04-4 | Determining the Effective PG Grade of Binder in RAP Mixes, <i>J. Daniel, University of New Hampshire, W. Mogawer, University of Massachusetts Dartmouth</i> | \$130,876.00 | \$115,495.75 | \$15,380.25 |
| 04-5 Phase 1 | Network-Based Highway Crash Prediction Using Geographic Information Systems, <i>J. Ivan, University of Connecticut, P. Garder, University of Maine Orono</i> | \$130,000.00 | \$126,658.38 | \$3,341.62 |
| 04-5 Phase 2 | Network-Based Highway Crash Prediction Using Geographic Information Systems, <i>J. Ivan, University of Connecticut, P. Garder, University of Maine Orono</i> | \$3,341.00 | \$0.00 | \$3,341.00 |

D.1 FINANCIAL STATUS OF ACTIVE PROJECTS:
Table 1: Financial Status of Projects Active During 2007
(As of December 18, 2007)

| NO. | PROJECT TITLE, PI, UNIVERSITY | APPROVED BUDGET | INVOICES APPROVED FOR PAYMENT | PROJECT BALANCE |
|------------|--|------------------------|--------------------------------------|------------------------|
| 05-1 | Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets, <i>T. Sandford, University of Maine</i> | \$99,910.00 | \$33,675.94 | \$66,234.06 |
| 05-3 | Practicable Calibration Procedures to Enhance the Accuracy of Analytical and Microsimulation Software for Modern Four-Legged Single-Lane Roundabouts, <i>A. Sadek, University of Vermont, P. Garder, University of Maine, L. Aultman-Hall, University of Connecticut</i> | \$75,000.00 | \$0.00 | \$75,000.00 |
| 05-6 | Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension, <i>J. H. Wang, University of Rhode Island</i> | \$59,991.00 | \$44,836.51 | \$15,154.49 |
| 05-7 | Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways, <i>J. Ivan, University of Connecticut, A. Sadek, University of Vermont</i> | \$100,000.00 | \$0.00 | \$100,000.00 |
| 05-8 | Evaluation and Implementation of Traffic Simulation Models for Work Zones, <i>J. Collura, University of Massachusetts</i> | \$100,000.00 | \$78,673.04 | \$21,326.96 |
| 06-1 | New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs, <i>J. Daniel, University of New Hampshire</i> | \$150,295.00 | \$5,286.11 | \$145,008.89 |
| 06-5 | The New England Winter Severity Index, <i>S. Miller, Plymouth State University</i> | \$100,000.00 | \$0.00 | \$100,000.00 |

Note: Retainage is not included in "INVOICES APPROVED FOR PAYMENT"

| D. 2 FUND BALANCE: | | | | |
|--|-------------------|----------------------------|----------------|-------------------------|
| NETC FUND BALANCE | | | | |
| As of December 31, 2007 | | | | |
| ITEM | OBLIGATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
| Unexpended Balance of NETC funds from AASHTO as of 6/5/95 (Per AASHTO memo 12/4/95) | | | | 132,777.07 |
| Member Obligations 1994 = 6 X \$75,000 | 450,000.00 | | | 582,777.07 |
| Coord./Admin. of NETC: Calendar Year 1995 Bdgt. = \$73,042 | | 58,761.32 | FINAL | 524,015.75 |
| Continued Projects: | | | | |
| - Construction Costs of New England Bridges-Phase II | | 39,500.00 | FINAL/CLOSED | 484,515.75 |
| - Tire Chips as Lightweight Backfill-Phase II: Full-Scale Testing (Supplemental Funding) | | 16,000.00 | FINAL/CLOSED | 468,515.75 |
| - Bridge Rail Crash Test - Phase II: Sidewalk-Mounted Rail | | 134,127.00 | FINAL/CLOSED | 334,388.75 |
| - New England Vehicle Classification and Truck Weight Program | | 6,752.57 | FINAL/CLOSED | 327,636.18 |
| Member Obligations 1995 = 7 X \$75,000 | 525,000.00 | | | 852,636.18 |
| "95" Project Series: | | | | |
| 95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads | | 75,000.00 | FINAL/CLOSED | 777,636.18 |
| 95-2: Suitability of Non-Hydric Soils for Wetland Mitigation | | 39,867.70 | FINAL/CLOSED | 737,768.48 |
| 95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes | | 120,812.12 | FINAL/CLOSED | 616,956.36 |
| 95-5: Buried Joints in Short Span Bridges | | 61,705.61 | FINAL/TERM. | 555,250.75 |
| 95-6: Guidelines for Ride Quality Acceptance of Pavements | | 106,124.00 | FINAL/CLOSED | 449,126.75 |
| "94" Project Series: | | | | |
| 94-1: Structural Analysis of New England Subbase Materials and Structures | | 110,057.38 | FINAL/CLOSED | 339,069.37 |
| 94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques | | 224,901.80 | FINAL/CLOSED | 114,167.57 |
| Member Obligations 1996 = 6 X \$75,000 | 450,000.00 | | | 564,167.57 |
| Coord./Admin. of NETC: Calendar Year 1996; Bdgt. = \$75,000 | | 69,123.85 | FINAL | 495,043.72 |
| Member Allocations 1997 = 6 X \$75,000 | 450,000.00 | | | 945,043.72 |
| Coord./Admin. of NETC: Calendar Year 1997; Bdgt. = \$82,494 | | 77,244.35 | FINAL | 867,799.37 |
| "94" Project Series: | | | | |
| 94-3: Procedures for The Evaluation of Sheet Membrane Waterproofing <i>Note: Project administered by VAOT under TPF Project No. SPR-3</i> | | | FINAL/CLOSED | 800,797.37 |
| 94-4: Durability of Concrete Crack Repair Systems | | 72,036.04 | FINAL/TERM. | 728,761.33 |
| "96" Project Series: | | | | |
| 96-1: SUPERPAVE Implementation | | 60,139.25 | FINAL/CLOSED | 668,622.08 |
| 96-2: Optimizing GPS Use in Transportation Projects | | 27,008.81 | FINAL/TERM. | 641,613.27 |
| 96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge Elements, etc. | | 135,000.00 | FINAL/CLOSED | 506,613.27 |
| T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = \$10,000 | | 9,551.06 | FINAL | 497,062.21 |
| Coord./Admin. of NETC: Calendar Year 1998; Bdgt = \$73,021 | | 80,422.65 | FINAL | 416,639.56 |
| Refund Check (No. 15-663337), for CY '98 Management of NETC, from UConn OSP; Ref. 7/19/00 letter to J. Sime from J. Devereux, UConn OSP | 336.00 | | | 416,975.56 |

| D. 2 FUND BALANCE: | | | | |
|---|-------------------|----------------------------|----------------|-------------------------|
| NETC FUND BALANCE | | | | |
| As of December 31, 2007 | | | | |
| ITEM | OBLIGATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
| Member Obligations 1998 = 6 X \$75,000 | 450,000.00 | | | 866,975.56 |
| "97" Project Series: | | | | |
| 97-1: A Portable Method for Determining Chloride Concentration on Roadway Pavements | Phase 1 | 96,669.50 | FINAL/CLOSED | 770,306.06 |
| | Phase 2 | 90,667.79 | FINAL/CLOSED | 679,638.27 |
| 97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, etc. | | 108,318.73 | FINAL/CLOSED | 571,319.54 |
| 97-3: Determining Properties, Standards & Performance of Wood Waste Compost, etc.: | Phase 1 | 27,779.64 | FINAL/CLOSED | 543,539.90 |
| | Phase 2 | 16,074.30 | FINAL/CLOSED | 527,465.60 |
| Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot) | | 10,700.00 | | 516,765.60 |
| 97-4: Early Distress of Open-Graded Friction Course | | 57,495.71 | FINAL/CLOSED | 459,269.89 |
| Travel Tech. Comm. (Aug. 98 tel. poll) for 1998 = \$5,000 | | 0.00 | | 459,269.89 |
| | | | | |
| Member Obligations 1999 = 6 X \$75,000 | 450,000.00 | | | 909,269.89 |
| Coord./Admin. of NETC: Calendar Year 1999: | | | | 909,269.89 |
| - Administration = \$77,666 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| - Travel = \$20,400 | | | | |
| - Total = \$98,066 | | 79,101.20 | FINAL | 830,168.69 |
| "99" Project Series: | | | | |
| 99-1: Bridge Rail Transitions | | 240,000.00 | FINAL/CLOSED | 590,168.69 |
| 99-2: Evaluation of Asphaltic Expansion Joints | | 62,234.76 | FINAL/CLOSED | 527,933.93 |
| 99-3: Bridge Scour Monitoring Systems | | 78,523.32 | FINAL/CLOSED | 449,410.61 |
| 99-4: Quantifying Roadside Rest Area Usage | | 44,857.00 | FINAL/CLOSED | 404,553.61 |
| 99-6: The Effects of Concrete Removal Operations on Adjacent That Is to Remain | | 96,008.36 | FINAL/CLOSED | 308,545.25 |
| | | | | |
| Member Obligations 2000 = 6 X \$100,000 | 600,000.00 | | | 908,545.25 |
| Coord./Admin. of NETC: Calendar Year 2000: | | 91,899.37 | FINAL | 816,645.88 |
| - Administration = \$ 85,788 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| - Travel = \$ 16,800 | | | | |
| - Total = \$102,588 | | | | |
| "00" Project Series: | | | | 816,645.88 |
| 00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England - A Synthesis of Practice | | 31,251.92 | FINAL/CLOSED | 785,393.96 |
| 00-2: Evaluation of Permeability of Superpave Mixes | | 95,499.16 | FINAL/CLOSED | 689,894.80 |
| 00-3: Composite Reinforced Timber Guard Rail - Phase I: Design, Fabrication and Testing | | 81,989.38 | FINAL/CLOSED | 607,905.42 |
| 00-4: Falling Weight Deflectometer Study | | 100,000.00 | FINAL/CLOSED | 507,905.42 |
| 00-5: Guard Rail Testing - Modified eccentric Loading Terminal at NCHRP 350 TL2 | | 61,287.00 | FINAL/CLOSED | 446,618.42 |
| 00-6: Implementation of Visualization Technologies to Create Simplified Presentations Within Highway agencies to be Used at Public Hearings | | 74,914.49 | FINAL/CLOSED | 371,703.93 |
| 00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn't | | 45,369.45 | FINAL/CLOSED | 326,334.48 |
| 00-8: Performance and Effectiveness of A Thin Pavement Section Using Geogrids and Drainage geocomposites in A Cold Region | | 150,000.00 | FINAL | 176,334.48 |

| D. 2 FUND BALANCE: | | | | |
|---|-------------------|----------------------------|----------------------------|-------------------------|
| NETC FUND BALANCE | | | | |
| As of December 31, 2007 | | | | |
| ITEM | OBLIGATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
| Member Obligations 2001 = 6 X \$100,000 | 600,000.00 | | | 776,334.48 |
| Coord./Admin. of NETC: Calendar Year 2001: | | 104,385.35 | FINAL | 671,949.13 |
| - Administration = \$89,448 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| - Travel = \$16,800 | | | | |
| - Total = \$106,248 | | | | |
| "01" Project Series: | | | | |
| 01-1: Advanced Composite Materials for New England's Transportation Infrastructure | | 47,559.27 | FINAL/CLOSED | 624,389.86 |
| 01-1: Advanced Composite Materials for New England's Transportation Infrastructure - Technology Transfer Phase | | 25,000.00 | | 599,389.86 |
| 01-2: Development of A Testing Protocol for Quality Control/Quality Assurance of Hot Mix Asphalt | | 80,000.00 | FINAL/CLOSED | 519,389.86 |
| 01-3: Design of Superpave HMA for Low Volume Roads | | 120,324.15 | FINAL/CLOSED | 399,065.71 |
| 01-6: Field Evaluation of A New Compaction Device | | 49,944.50 | FINAL/CLOSED | 349,121.21 |
| Member Obligations 2002 = 6 X \$100,000 | 600,000.00 | | | 949,121.21 |
| NY DOT Obligation = \$52,500 | 52,500.00 | | | 1,001,621.21 |
| Coord./Admin. Of NETC: Calendar Year 2002 | | 109,207.12 | FINAL | 892,414.09 |
| "02" Project Series: | | | | |
| 02-1: Relating Hot Mix Asphalt Pavement Density to Performance | | 103,524.00 | | 788,890.09 |
| 02-2: Formulate Approach for 511 Implementation in New England Phase 1 | | 48,158.19 | FINAL/CLOSED | 740,731.90 |
| 02-2: Formulate Approach for 511 Implementation in New England Phase 2 | | 32,813.16 | FINAL/CLOSED | 707,918.74 |
| 02-3: Establish Subgrade Support Values (M _s) for Typical Soils in New England | | 79,936.86 | FINAL/CLOSED | 627,981.88 |
| 02-5: Determination of Moisture Content of De-Icing Salt at Point of Delivery | | 19,679.99 | FINAL ² /CLOSED | 608,301.89 |
| 02-6 : Sealing of Expansion Joints - Phase 1 | | 74,982.81 | FINAL/CLOSED | 533,319.08 |
| 02-7: Calibrating Traffic Simulation Models to Inclement Weather Conditions with Applications to Arterial Coordinated Signal Systems | | 74,037.57 | FINAL/CLOSED | 459,281.51 |
| 02-8: Intelligent Transportation Systems Applications to Ski Resorts in New England | | 54,724.71 | FINAL/CLOSED | 404,556.80 |
| Member Obligations 2003 = 6 X \$100,000 | 600,000.00 | | | 1,004,556.80 |
| NY DOT Obligation = \$40,000 | 40,000.00 | | | 1,044,556.80 |
| Coord./Admin. Of NETC Calendar Year 2003 = \$124,258 | | 118,855.19 | FINAL | 925,701.61 |
| "03" Project Series: | | | | |
| 03-1: Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff | | 72,000.00 | | 853,701.61 |
| 03-2: Field Studies of Concrete Containing Salts of An Alkenyl-Substituted Succinic Acid | | 140,000.00 | | 713,701.61 |
| 03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England | | 20,682.70 | FINAL/CLOSED | 693,018.91 |
| 03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England Phase 2 | | 13,135.80 | FINAL/CLOSED | 679,883.11 |
| 03-4: Measuring Pollutant Removal Efficiencies of Storm Water Treatment Units | | 80,000.00 | FINAL/CLOSED | 599,883.11 |
| 03-5: Evaluation of Field Permeameter As A Longitudinal Joint Quality Control Indicator | | 77,318.43 | FINAL/CLOSED | 522,564.68 |
| 03-6: Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines for the Use of Polymer Modified Thin Lift HMA vs. Surface Treatments | | 99,927.00 | | 422,637.68 |
| 03-7 (Alt.): Basalt Fiber Reinforced Polymer Composites | | 64,092.29 | FINAL/CLOSED | 358,545.39 |

| D. 2 FUND BALANCE: | | | | |
|--|------------|--------------------|---------|-----------------|
| NETC FUND BALANCE | | | | |
| As of December 31, 2007 | | | | |
| ITEM | OBLIGATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
| Member Obligations 2004 = 6 X \$100,000 | 600,000.00 | | | 958,545.39 |
| NY DOT Obligation = \$52,000 | 52,000.00 | | | 1,010,545.39 |
| Coord./Admin. Of NETC Calendar Year 2004 = \$126,559 | | 113,012.87 | FINAL | 897,532.52 |
| "04" Project Series: | | | | |
| 04-1: Recycling Asphalt Pavements Containing Modified Binders | | 109,918.00 | | 787,614.52 |
| 04-2: Driver-Eye-Movement-Based Investigation for Improving Work Zone Safety | | 74,491.00 | | 713,123.52 |
| 04-3: Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New England | | 120,000.00 | | 593,123.52 |
| 04-4: Determining the Effective PG Grade of Binder in RAP Mixes | | 130,876.00 | | 462,247.52 |
| 04-5: Network-Based Highway Crash Prediction Using Geographic Information Systems | | 130,000.00 | | 332,247.52 |
| | | | | |
| Member Obligations 2005 = 6 x \$100,000 | 600,000.00 | | | 932,247.52 |
| NY DOT Obligation = \$50,000 | 50,000.00 | | | 982,247.52 |
| Coord./Admin. Of NETC Calendar Year 2005 = \$130,528 | | 128,934.25 | FINAL | 853,313.27 |
| "05" Project Series: | | | | |
| 05-1: Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft Rock Sockets | | 100,000.00 | | 753,313.27 |
| 05-2: Safety of Reflective Median Barriers Phase 1 | | 48,000.00 | | 705,313.27 |
| 05-2: Safety of Reflective Median Barriers Phase 2 | | 72,000.00 | | 633,313.27 |
| 05-3: Analysis of Roundabout Operational Characteristics Utilizing Microscopic Simulation Modeling | | 75,000.00 | | 558,313.27 |
| 05-5: Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel | | 125,000.00 | | 433,313.27 |
| 05-6: Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension | | 60,000.00 | | 373,313.27 |
| 05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways | | 70,000.00 | | 303,313.27 |
| 05-8: Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis of Traffic Impacts of Highway Construction, Reconstruction and Rehabilitation | | 100,000.00 | | 203,313.27 |
| | | | | |
| Member Obligations 2006 = 5 x \$100,000 (no ME DOT allocation) | 500,000.00 | | | 703,313.27 |
| Note: Maine 2006 Obligation as of 11/06/06 per Peabody 11/30/06 email | 100,000.00 | | | 803,313.27 |
| Coord./Admin. Of NETC Calendar Year 2006 = 131,814 | | 100,718.92 | FINAL | 702,594.35 |
| "06" Project Series: | | | | |
| 06-1: New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide With Level 2 & 3 Input | | 150,295.00 | | 552,299.35 |
| 06-2: Infrastructure Management Systems Enhancement and Integration to Support True Integrated Management Decision-Making | | 100,000.00 | | 452,299.35 |
| 06-3: Establish Default Dynamic Modulus Values for New England | | 110,000.00 | | 342,299.35 |
| 06-4: Preventative Maintenance and Timing of Applications | | 200,000.00 | | 142,299.35 |
| 06-5: Winter Severity Indices for New England | | 100,000.00 | | 42,299.35 |

| D. 2 FUND BALANCE: | | | | |
|--|-------------------|----------------------------|----------------|-------------------------|
| NETC FUND BALANCE | | | | |
| As of December 31, 2007 | | | | |
| ITEM | OBLIGATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
| Member Obligations 2007 = 600,000 | 600,000.00 | | | 642,299.35 |
| Coord./Admin. Of NETC Calendar Year 2007 | | 136,061.00 | | 506,238.35 |
| "07" Project Series: | | | | |
| 07-1: In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations | | 150,000.00 | | 356,238.35 |
| 07-2: Exploring the Potential of Intelligent Intersections Deployment in New England | | 100,000.00 | | 256,238.35 |
| 07-3: Determining Optimum Distance for a Lane Drop Downstream from a Signalized Intersection | | 100,000.00 | | 156,238.35 |
| 07-4: Estimating and Predicting Traffic Conditions for Traveler Information and Emergency Response | | 100,000.00 | | 56,238.35 |
| NETC Research Needs Conference | | 7,500.00 | | 48,738.35 |
| | | | | |
| Member Obligations 2008 = 600,000 | 600,000.00 | | | 648,738.35 |
| NY DOT Obligation (72,000+8,000) | 80,000.00 | | | 728,738.35 |
| Coord./Admin. Of NETC Calendar Year 2008 | | 134,998.00 | | 593,740.35 |
| 08-2: Evacuation Modeling to Assist Hazard Management and Response in Urban and Rural Areas of New England | | 160,000.00 | | 433,740.35 |
| 08-3: Best Management Practices for the Invasive Polygonum Cuspidatum (Japanese Knotweed) Along Transportation Corridors | | 140,000.00 | | 293,740.35 |
| 08-4: NETC Research Implementation Survey & Synthesis | | 35,000.00 | | 258,740.35 |
| 08-5: NETC/UVM-UTC Transportation Research Challenge | | 50,000.00 | | 208,740.35 |
| 02-6: Phase II Sealing of Small Movement Bridge Expansion Joints – Field Installation & Monitoring | | 75,000.00 | | 133,740.35 |
| 08-6: (Alt.) Interaction Between Salinity, Soil Quality and Amendments in Roadside Plantings | | 75,000.00 | | 58,740.35 |
| | | | | |
| Member Obligations 2009 = 600,000 | 600,000.00 | | | 658,740.35 |
| Coord./Admin. Of NETC Calendar Year 2009 (Estimated) | | 140,398.00 | | 518,342.35 |
| 08-1: Applying the Highway Safety Manual in New England | | 120,000.00 | | 398,342.35 |
| | | | | |
| | | | | |
| 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 | | | | |

E. REPORTS, PAPERS AND PRESENTATIONS

E.1 POLICIES AND PROCEDURES:

- “Policies and Procedures, New England Transportation Consortium,” July 1995.
- “Policies and Procedures, New England Transportation Consortium,” April 2002.

E.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

E.3 REPORTS, PAPERS, AND PRESENTATIONS 1988-1994:

- “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.

E.3 NETC REPORTS, PAPERS, AND PRESENTATIONS 1988-1994 (cont'd):

“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.

E.3 NETC REPORTS, PAPERS, AND PRESENTATIONS 1988-1994 (cont'd):

“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.

E.4 REPORTS, PAPERS AND PRESENTATIONS 1995-2007:

Project No. Title

N/A Construction Costs Of New England Bridges

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 Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing

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 18th 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.

“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.

Papers and Presentations: None

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

94-1

Structural Analysis Of New England Subbase Materials And Structure

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 5th 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.

94-2 **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.

“Ground Penetrating Radar for Nondestructive Evaluation of Concrete Bridge Decks,” Adam, C., M.S. Thesis, Department of Mechanical Engineering University of Vermont, September 1997.

“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.

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.

“Wireless Inspection of Structures Aided by Robots,” Huston D.R., Pelczarski N., Esser B., Gaida G., Arms S. and Townsend C. SPIE Symposium on NDE for Health Monitoring and Diagnostics, 4337-24, Newport Beach CA, March 2001.

“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.

“Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques,” Huston, D., Fuhr, P., Maser, K. and Weedon, W., July 1, 2002, NETCR19.

- 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.

96-3

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 (in print).

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 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.

“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.

97-2 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 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.

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:

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

“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, December 2005, NETCR 53.

- 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

“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.

Papers and Presentations: None
- 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 Anwendungen der Informatik in Architectur 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,” Luo, J., MS Thesis, University of Connecticut, August 2002.

“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: None
- 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 7th 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
- 01-2 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 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 82nd 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 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 2003, NETCR 42.
- Papers and Presentations: None

- 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, an 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 Determiration of Moisture Content of Deicing Salt at Point of
Delivery**
Reports:
“Determiration of Moisture Content of Deicing Salt at Point of Delivery,”
Long, R., Demars, K., March 2004, NETCR 45.
- Papers and Presentations: None

02-6**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.

02-7

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.

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

Reports: None.

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 Phase 1 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.

03-7

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* (*in press*).

“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.

04-2

Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety

Reports: None

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.

04-2 Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety (cont'd):

Papers and Presentations (cont'd):

“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 Situational Awareness during Hands-Free Communication Tasks,” Muttart, J.W., Research paper submitted to the Transportation Research Board and accepted as a presentation to be given 1/21/07 in Washington, DC.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue”, Transportation Research Record, TRR 07-2873, Transportation Research Board, Washington, DC.

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 32nd Annual Traffic Records Forum, Palm Desert CA, Aug. 3, 2006.

- 05-3 Practicable Calibration Procedures to Enhance the Accuracy of Analytical and Microsimulation Software for Modern Four-Legged Single-Lane Roundabouts**
Reports: None
- Papers and Presentations:
“Assessing the Accuracy of Roundabouts Analysis Procedures against Field Observations: Preliminary Results from a Case Study in Northern New England,” Smith, M.C., Sadek, A.W., Johnson I., Aultman-Hall L., and Garder P., 2007, Proceedings of the *Annual Transportation Research Board Meeting*, TRB, National Research Council, Washington, D.C.
- 05-6 Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers’ Message Comprehension**
Reports: None
- Papers and Presentations:
“Assisting Elder Drivers’ Comprehension of Dynamic Message Signs,” Clark, A.T., Wang, J.H., Maier-Sperdelozzi, V., Collyer, C.E., Proceedings of the 87th Annual Meeting of Transportation Research Board, Paper No. 08-2276, p.1-16, CD-ROM, 2008.
- 05-7 Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways**
Reports: None
- 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, Accepted for presentation at the TRB Annual meeting, January 2007, Accepted for publication in *Transportation Research Record*.