The University of North Carolina

INSTITUTE FOR TRANSPORTATION
RESEARCH AND EDUCATION

1989 ANNUAL REPORT
ITRE Background

In its eleventh year, The Institute for Transportation Research and Education (ITRE) serves as a catalyst for transportation research in the state, region, and nation. Equally important is the technical assistance ITRE provides to state and local governments through individual projects.

It was in 1977 that the North Carolina General Assembly recognized the need for an institute to provide leadership for North Carolina’s transportation research and education programs. The following year ITRE was established in the office of the president of the University of North Carolina. As a unit of the UNC General Administration, ITRE draws on the resources of all 16 campuses of the UNC system and Duke University in a true interdisciplinary program. In 1988, ITRE was elected to represent a number of universities in the southeast as the lead institution for the Southeastern Consortium of University Transportation Centers.

Through this unique relationship, ITRE staff members and affiliated campus faculty join together in transportation research, training, and technology transfer programs.

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Kathryn P. Roe, Copy Editor
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ITRE, Photography

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3,600 copies of this public document were printed at a cost of $1,790.00 or $.50 per copy.
"It was only 80 years from the railway age to the motor age, 40 years from the motor age to the age of commercial flight, and 20 years from the air age to the first travels in space." This quote from Wilfred Owen demonstrates the rapid rate of change that continues to face our nation's transportation research and education community.

The rate of growth in the present era is better understood when we consider the technology that is being rapidly incorporated into our motor vehicles. It was just a few years ago that fuel injection systems were introduced. Today, some cars feature animated computer graphics, solar cells for cooling systems, and vocal advisory systems. Within a few years, we will have sonar obstruction/detection devices, collision avoidance systems, and voice-activated controls.

Even in the highway maintenance field, an area typically considered "low-tech," a proliferation of technology is currently inundating the market. Such technologies as electromagnetic conductivity, nuclear magnetic resonance, and infrared thermography are being explored for further development, testing, and application.

Technology for traffic control and distribution systems as well as air, rail, and maritime systems is being developed at the same rapid pace. This demonstrates that the transportation professional of the future will need a knowledge base that is far different from those that developed our interstate highway system. Therefore one of the most important issues that faces our transportation community is the preparation of transportation professionals for the 21st century.

This annual report reflects the past year's accomplishments of both ITRE and SECUTC. SECUTC, the Southeastern Consortium of University Transportation Centers, led by The University of North Carolina system, serves the Southeast as a regional transportation center. ITRE continues to deliver timely research results, technical and management training programs, and technology transfer products.

In January 1990, I will join the faculty at Arizona State University in Tempe, and will begin my tenure as Director of the Center for Advanced Research in Transportation at that institution. While I look forward to approaching transportation issues from a Southwestern perspective, I want to thank my friends and colleagues in North Carolina and the Southeast for their support as we have developed our university transportation programs over the past decade. I look forward to continuing those working relationships in various ways.

Edwin W. Hauser
P.E., Ph.D.
Director

TOTAL BUDGET FOR ITRE PROGRAMS (In Millions of Dollars)

FUNDING SOURCES FOR ITRE PROGRAMS (Fiscal Year 1989)
Letter from the Acting Director

As noted on this page, many faculty and students are involved in work in collaboration with ITRE. In like manner, as director of the University of North Carolina Highway Safety Research Center, I have enjoyed such collaboration as well.

I am honored to be able to continue and even expand that association in my role as acting director of ITRE during the search for a permanent director. I look forward to the challenge of this role within an organization that is important to transportation in North Carolina and in the nation.

B. J. Campbell, Ph.D.

Number of Faculty and Professional Staff Supported by ITRE

Number of Graduate and Undergraduate Students Supported by ITRE
Southeastern Consortium of University Transportation Centers (SECUTC)

In 1978, as ITRE was in its first year, a number of leading universities from throughout the nation established the Council of University Transportation Centers (CUTC). The purpose of ITRE’s involvement as the representative of the UNC system was to help spotlight the contributions and needs of university transportation research and educational programs. One of the direct results of that effort, which was a joint effort of CUTC, the US Congress, the USDOT, and other constituents and participants in our transportation programs, was the establishment of a Regional University Transportation Center in each of the ten federal regions.

Several universities in the Southeast are members of SECUTC, a consortium that is open to other institutions in the Southeast that are interested in developing collaborative programs. Dr. Charles Wallace of the University of Florida was recently selected to succeed Dr. Edd Hauser as executive director of SECUTC. At the same time, Dr. B. J. Campbell of The University of North Carolina has succeeded Dr. Hauser as director of the Regional Transportation Center grant from the USDOT. Both of these outstanding professionals will serve the regional center well.

An important activity of SECUTC has been the establishment of the Southeast Transportation Roundtable, an association of industry, government, and academia that is aimed at forging workable solutions to the region’s current and future transportation problems. The Roundtable met in Nashville, TN, last year. The outcome of that session on the development of the research theme of the Southeastern transportation research center: “Mobility 21: Managing Mobility in a High Growth Region in the 21st Century.” The Roundtable will convene again in Atlanta, GA, in March 1990 to explore issues that affect the preparation of engineers and other professionals for their future roles.

SECUTC’s challenge for the next two years is to demonstrate that it can address the “theme” of managing mobility with a meaningful research agenda and innovative educational programs. SECUTC will also need to work closely with other members of CUTC, which is under the able leadership this year of Mr. Calvin Grayson of the University of Kentucky, to further strengthen programs with the USDOT and the various state and local highway and transportation agencies in order to satisfy Congress that universities can, in fact, DELIVER. A golden opportunity will disappear if we do not do so.

Current Projects of SECUTC

- Intercity Travel Analysis
  Dr. Eric I. Pas, Duke University

- Duo-Mode Bus Analysis
  Dr. John R. Stone, North Carolina State University

- Highway Accessibility & Economic Development
  Dr. Alfred W. Stuart and Dr. Wayne Walcott, The University of North Carolina at Charlotte

- Industrial Trends in Rural North Carolina and Their Relation to Transportation Investments
  Dr. Alfred W. Stuart, The University of North Carolina at Charlotte

- Apprenticeship and Internship Program in North Carolina
  Dr. John E. Tidwell, ITRE

- Apprenticeship Programs in Urban and Rural Transit Properties
  Dr. L. Milton Glisson, North Carolina A&T State University

- Geographic Information Systems in Transportation Planning and Management
  Dr. Woodrow W. Nichols, North Carolina Central University

- Transportation Information Management System
  Mr. Derek Graham, ITRE
- Structural Behavior of a Post Tensioned Segmental, I-Beam Bridge That Incorporates New Innovative Design Features
  Mr. Theodore Hopwood, II, University of Kentucky
- Freeze-Thaw Evaluation of Concrete Aggregates for Development of D-Cracking and Durability Data Banks
  Mr. D. G. Hunsucker, University of Kentucky
- Performance of New Type Stabilization Using Hydrated Lime and Cement
  Mr. Clark Graves, University of Kentucky
- Monitor and Evaluate the Performance of New Type of Edge Drains
  Mr. David L. Allen, University of Kentucky

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<td>Microcomputer Based Traffic Control System Monitoring and Enhancement</td>
<td>Development of Generic Rural and State Transit Microcomputer Information System</td>
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<td>Dr. Kenneth G. Courage, University of Florida</td>
<td>Dr. Fred J. Wegmann, University of Tennessee</td>
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<td>Feeder Bus Service for Downtown People Mover</td>
<td>Dr. Robert E. Stammer, Jr., Vanderbilt University</td>
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<td>Dr. Fasli T. Najafi, University of Florida</td>
<td>Guidelines for Selecting Roadway Cross-Sections in Developing Urban/Suburban Areas</td>
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<td>Mr. Stephen H. Richards, University of Tennessee</td>
<td>Investigation of Lead Paint Removal Procedures for Highway Bridges</td>
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<td>Dr. James H. Deatherage, University of Tennessee</td>
<td>Optimization of Crash Cushion Design</td>
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<td>Dr. John F. Carney, III, Vanderbilt University</td>
<td>Development Length and Lateral Spacing Requirements of Prestressing Strand for Prestressed Concrete Bridges</td>
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<td>Dr. James H. Deatherage, University of Tennessee</td>
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<td>Improved Transportation Noise Analysis and Control Techniques</td>
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<td>Dr. William Bowly, Vanderbilt University</td>
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<td>Expert System for Warranting Roadside Safety Hardware</td>
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<td>Dr. Malcolm H. Ray, Vanderbilt University</td>
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<td>Expert System for Spill Control from Transportation Systems</td>
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<td>Dr. Roger L. Wayson, Vanderbilt University</td>
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A SECUTC meeting was held following the Southeastern Transportation Roundtable in Nashville, TN. Some of those present were (left to right) Charles Wallace, University of Florida; Bill Bowly, Vanderbilt University; Stephen Richards, University of Tennessee; Eric Pas, Duke University; and Edwin Hauser, ITRE.
For eleven years, ITRE has been providing and administering transportation related research and training activities for the North Carolina Department of Transportation. The program has continually grown and currently approaches $1.5 million per year. This support from NCDOT points out the continued commitment of ITRE, NCSU, UNCC, and Duke researchers to perform high quality, useful research for the department.

This past year, ITRE staff worked on 12 projects for the NCDOT. The major subject areas for this work included geographic information systems, pavement and maintenance management, various topics in civil engineering, pavement marking materials, and upper management training. The GIS project is particularly noteworthy because NCDOT is one of the first states nationwide to implement GIS technology into the Highway Department. The potential uses and savings in data management, analysis, and information reporting makes GIS a very exciting area to be working in right now.

Another project that was unique this year was video-based management training for emerging NCDOH managers. This type of training is fast becoming one of the most effective tools to use when training and evaluating people in management principles. A total of 50 NCDOH employees were trained using this technique.

Professors at North Carolina State University continue to provide a high degree of research support for the NCDOT. Eleven projects were conducted on the campus of NCSU involving seven professors and numerous research assistants. General subject areas included asphalt materials and flexible pavements, soil stabilization and shear strength, bridge management, roadside vegetation management, and alternatives for repair and protection of coastal highways. One of these projects is a study of the performance of different designs for flexible pavements. This is the second year of this ten-year project to investigate the long-term performance of materials used in flexible pavement construction. The results of this project will allow new equations and strength coefficients to be generated for pavements in North Carolina. This will provide better long-term performance from the pavements in their ability to carry the traffic loads.

Both Duke University and UNC-Charlotte carried out a project this year. At Duke, a study is under way to evaluate portland cement concrete made with marine limestone coarse aggregate. The other project was just completed at UNCC and evaluated various pavement markings to determine the best material for wet night conditions.

ITRE continues its research in several different areas involving pavement marking materials, including wet night conditions pavement markings and pre-mixed and plain traffic paint.
Current Research Projects

- Maintenance Management Program
  James B. Martin, ITRE
- Career Development Program
  Robert S. Foyle, ITRE
- A Comparative Study of Performance of Different Designs for Flexible Pavement
  Dr. N. Paul Khosla, North Carolina State University
- Role of Modified Asphalt Binders
  Dr. N. Paul Khosla, North Carolina State University
- Structural Application of High Strength Concrete
  Dr. Paul Zia, North Carolina State University
- Pavement Marking Materials Program
  Robert W. Attaway, ITRE
- Soil Stabilization in Pavement Structures
  Dr. Philip C. Lambe, North Carolina State University
- Optimizing System Level Bridge Management Decisions
  Dr. David W. Johnston, North Carolina State University
- Determination of Shear Strength for Design of Cut Slopes
  Dr. Philip C. Lambe, North Carolina State University
- Evaluation of Pavement Marking in Wet Night Conditions
  Dr. L. Ellis King, The University of North Carolina at Charlotte
- Roadside Mowing and Spraying Efficiency
  Dr. Joseph M. DiPaola, North Carolina State University
- CTES and Technical Services
  Dr. N. Paul Khosla, North Carolina State University
- Training Needs Analysis and Pilot Workshop
  Robert S. Foyle, ITRE
- Maintenance Organization Study
  James B. Martin, ITRE
- Repair and Protection Alternatives for Coastal Highways Vulnerable to Storm Damage, Shoreline Erosion, and Sea Level Rise
  Dr. John R. Stone, North Carolina State University
- Geographical Information Systems Development
  Larry W. Minor, ITRE
- HCM Workshop for Roadway Design Unit
  Robert S. Foyle, ITRE
- Team Building Seminar
  Dr. Edwin W. Hauser, ITRE
- Management Training Program
  Robert S. Foyle, ITRE
  Dr. Steve A. Martin, ITRE
- In-Service Testing of Pre-Mixed and Plain Traffic Paints
  Robert W. Attaway, ITRE
- Evaluation of Chemical and Structural Properties of Portland Cement Concrete Made with Marine Limestone Coarse Aggregates
  Dr. Mrinmoy Biswas, Duke University
- Curriculum Guide for a Standard Program for Bicycle Safety Education for 4th-6th Grade Students
  Robert S. Foyle, ITRE
- Career Development Program
  Robert S. Foyle, ITRE
  Dr. Steve A. Martin, ITRE
- Large Sized Aggregate Asphaltic Mixtures - A Design Approach and Performance Evaluation
  Dr. N. Paul Khosla, North Carolina State University
- Weed Control Management Plan for Wildflower Plant Beds
  Dr. W. A. Skroch, North Carolina State University
- Workshop on Stormwater Management Systems
  Dr. H. Rooney Malcom, North Carolina State University

1989 ITRE Annual Report
ITRE serves as the Technology Transfer Center for transportation issues in North Carolina. Since it was established in 1986, ITRE's Technology Transfer program has been committed to the challenge of narrowing the gap between North Carolina's transportation researchers and practicing professionals. ITRE's services and programs are carefully patterned after the agricultural extension concept. As a result, ITRE is available through the universities in North Carolina and maintains a complete cadre of transportation expertise in pavements, traffic control, structures, public transit, and other transportation specialties.

The Technology Transfer program at ITRE is the medium by which this expertise can be channeled to state and local governments. Through technical training, special technical assistance, newsletters, and the dissemination of technical materials, the Technology Transfer program has helped state and local governments learn how to put current research and technology to practical use in their daily transportation operations.

ITRE is also engaged in technology transfer at the national level. Four training courses and other resource materials are being developed under contract to the Federal Highway Administration (FHWA).

North Carolina's Technology Transfer program at ITRE is one of 45 nationwide, funded by the FHWA, National Highway Institute (NHI), through the Rural Technical Assistance Program (RTAP).

James B. Martin (left), ITRE, prepares to inspect the condition of a catch basin in Medoc Mountain State Park. ITRE has developed a roadway maintenance management system for the North Carolina state parks.

Francis B. Francois (far left), executive director of the American Association of State Highway and Transportation Officials (AASHTO), led the panel discussion on "Dealing with the Public and the Media" at the 1989 NC Street and Highway Management Conference. Panel members included (left to right) Senator William Goldston, Raleigh Mayor Avery Upchurch, WPTF Anchorman Terry Thill, Charlotte Director of Public Information Bill Guerrant, Greensboro Public Works Director James M. Dawkins, and NCDOT Program and Policy Branch Manager Dr. Larry R. Goode.
Current Technology Transfer Projects

• Technology Transfer to Local Transportation Agencies
  Pamela C. White, ITRE
  Dr. John E. Tidwell, ITRE

• Traffic Operations Training Courses for Rural and Small Urban Areas (RTAP 54)
  Dr. H. Douglas Robertson, The University of North Carolina at Charlotte

• Pavement Structural Repair Techniques (RTAP 46A)
  James B. Martin, ITRE

• Bridge Posting and Evaluation Handbook (RTAP 809)
  Dr. David W. Johnston, North Carolina State University

• Work Zone Safety for Rural Local Agencies (RTAP 812)
  Dr. John E. Tidwell, ITRE

• Municipal Pavement Management Systems
  James B. Martin, ITRE
  James E. Hester, ITRE

• NCDOT Pavement Management Program
  James B. Martin, ITRE

• NCDOT Maintenance Manual Volume II
  James B. Martin, ITRE

• NCDOT Pavement Maintenance Principles
  James B. Martin, ITRE

• NCDOT Career Development Program
  Robert S. Foyle, ITRE
  Dr. Steve A. Martin, ITRE

• PE and EIT Review for Local Governments
  Robert S. Foyle, ITRE

• Highway Capacity Manual Workshops
  Dr. Paul D. Cribbins, North Carolina State University

• Public Transportation Training Program
  Lowell K. Shaw, ITRE

• NC Street and Highway Management Conference
  Dr. Edwin W. Hauser, ITRE

• Geographic Information System for Local Governments
  Larry W. Minor, ITRE

• School Bus Scheduling and Routing
  Derek S. Graham, ITRE

• North Carolina Emergency Energy Conservation Plan
  Lowell K. Shaw, ITRE

• Vehicle Maintenance Program
  Kathryn P. Roe, ITRE

• Solid Waste Management Program
  Larry W. Minor, ITRE

• North Carolina Recycling Project
  Larry W. Minor, ITRE

• Site Impact Traffic Evaluation
  Dr. John R. Stone, North Carolina State University

• Utility Meter Reader Routing Projects
  Larry W. Minor, ITRE

• Roadway Evaluation for State Parks in North Carolina
  James B. Martin, ITRE

Innovative

1. Public agency-oriented
2. Predominately highway
The Transportation Information Management System (TIMS) is a program of the North Carolina Department of Public Instruction and is a computer-assisted tool to aid local school units in the management of their transportation program. Through a combination of maps and reports, complete information can be distributed for each bus route. The TIMS Installation Project is being performed through the Institute for Transportation Research and Education (ITRE) with funding support from the Energy Division, North Carolina Department of Economic and Community Development. Currently, 46 of the 134 school districts in the state are using TIMS and another 24 are in the process of installing the software during 1989-90.

The TIMS staff at ITRE provides data preparation, training, and "help desk" services to the participating units. It is the responsibility of this project team to ensure that each unit has the training needed to successfully install this complex program. Through the GIS portion of the TIMS program, maps are digitized at ITRE, and the geocode is thoroughly edited in this very important aspect of technical assistance.

Two major areas of TIMS which were used extensively this year were the Boundary Planning and Optimization modules. Several units used the Boundary Planning module to test alternative school district lines and to analyze student demographics. Optimizing bus routes was done in some units for only one or two schools and in some units for half or even all of the schools. With over half of the state using the program, the potential for improving the efficiency of pupil transportation in North Carolina is tremendous.

Through TIMS, optimal path routing instructions are produced for each bus. A report is provided, giving driving directions for each bus route. Corresponding maps (see illustration above) are available to show individual bus routes or all routes for each school.
This year, ITRE's Management Training program for the Division of Highways, NCDOT, has had three major components.

Senior Management: One goal has been to strengthen the team work between the field organization and the central office organization. This has been done through a series of team meetings that focused on planning and tracking performance on hard issues. Additionally, counselling to individual managers has been provided in specific skill areas such as effective speaking and leading meetings.

Middle Managers and Senior Managers: The Street and Highway Management Conference focused on privatization, dealing with the media, and a variety of technical areas. Additional training is planned in the areas of public relations and hiring skills.

High Potential Junior Managers: The purpose here is to assist in growing the next generation of leadership. This training, entitled "Managing Employee Performance," has been provided by a combination of classroom discussion and videotaped role plays in small groups.

The content of the program addresses selected topics of critical concern to managers. Participants get practical "how to" information about motivating employees, coaching performance, and delegating effectively. Other topics include setting and communicating clear expectations for employees, solving performance problems, and providing positive reinforcement.

In all cases, training participants discuss the topic and then actually practice the skill. This provides the opportunity for each participant to "see himself" as well as get specific feedback from others on how to improve. Skill development practice and feedback is a proven method for helping improve skills and transfer learning back into the job setting.

Response from DOH managers has been very positive, both to the content and the methods of training. Thus far, two training sessions have been conducted. Two more are scheduled for April 1990. Upon completion, 100 DOH managers will have attended "Managing Employee Performance."

Dr. Steve A. Martin, ITRE, provides instruction to North Carolina Department of Transportation personnel at one of the Boone middle management conferences.
SECUTC Policy Board, Advisory Committee, and Technical Coordinating Committee

Policy Board

Dr. Glen F. Clanton
Vanderbilt University

Dr. Tom Collins
University of Tennessee

Dr. Jasper D. Memory, Chairman
University of North Carolina

Dean Edward A. Moses
University of North Florida

Dr. Theodore Poister
Georgia State University

Dr. Donald R. Price
University of Florida

Dr. Charles E. Putnam
Duke University

Dr. Wimberly C. Royster
University of Kentucky

Advisory Committee

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Raleigh-Durham (NC) Airport Authority

Mr. Milo D. Bryant
Commonwealth of Kentucky Transportation Cabinet

Mr. Henry Clegg
Associated General Contractors of America, Carolinas Branch

Ms. Coleen Cousineau
Southern Legislative Conference

Mr. William Cox
Thomas Heavy Hauling

Mr. Lewis Evans, P.E.
Tennessee Department of Transportation

Mr. Paul E. Forney
Saturn Corporation

Mr. D. W. (Bill) Gwynn
Orlando-Orange County Expressway Authority

Mr. Randal H. Ihara
CSX Transportation

Mr. David King
NC Department of Transportation

Mr. Leon Larson, P.E.
Federal Highway Administration

Mr. Lawrence L. Schulman
Urban Mass Transit Administration

Mr. Joel M. Volinski
Broward County (FL) Mass Transit Division

Dr. Robert Whalin
U.S. Army Waterways Experiment Station

Mr. Carl Wills, P.E.
City of High Point (NC)

Technical Coordinating Committee

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Vanderbilt University

Dr. B. J. Campbell
University of North Carolina

Mr. Calvin Grayson
University of Kentucky

Dr. George Guess
Georgia State University

Dr. Edwin W. Hauser, Chairman
University of North Carolina

Dr. Kevin Horn
University of North Florida

Dr. Eric I. Pas
Duke University

Mr. Stephen H. Richards
University of Tennessee

Dr. Charles Wallace
University of Florida
Council on Transportation Research and Education

Purpose: Recommends policies for the operation of ITRE to the president of The University.

Dr. Roy Carroll
Dr. Quiester Craig
Dr. Alvin M. Cruze
Dr. William DeMaria
Secretary James E. Harrington

Mr. L. Felix Joyner
Dr. Jasper D. Memory, Chairman
Dr. Larry Monteith
Mr. John Sanders
Dr. James H. Wernitz, Jr.

Advisory Committee

Purpose: Assists the Council on Transportation Research and Education in ensuring that ITRE's programs are responsive to user needs and that ITRE is meeting its program goals.

Carl E. Annas
C. Ronald Aycock
Kenneth H. Bellamy
Dempsey Benton
John Brantley
Henry Clegg
Carson D. Culbreth
David King
Bobby Mattocks
Howard Newlon, Jr.

Elbert L. Peters, Jr.
Will Plendl
David Reynolds
Tom Runkle
William M. Spreitzer
Jim A. Taylor
C. Edwin Vick, Jr.
George E. Wells, Chairman
Carl Wills

Technical Coordinating Committee

Purpose: Provides advice to the ITRE director and coordinates with transportation research and educational programs.

Dr. Mrinmay Biswas
Dr. Downey Brill
Dr. B. J. Campbell
Dr. Milton Glisson

Dr. Edwin W. Hauser, Chairman
Dr. John J. Manock
Mr. Robert L. Martin
Dr. Wayne Walcott
ITRE Staff and Research Affiliates

Administrative
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Robert L. Martin, M.S., P.E., AICP, Associate Director
Cynthia C. Beasley, B.S.
Jennifer J. Geer, B.S.
Rosalie P. Neville

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Robert W. Attaway, M.C.E.
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Kent Fonvielle
Robert S. Foyle, M.C.E., P.E.
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Deidre L. Lee, B.S.
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Teresa D. Messing, A.S.
Tim Nyerges, Ph.D.
Jim Stephens
Steve Walsh, Ph.D.

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Sylvia Bull, B.S.
Vida Covington, B.S.
Aurda Foree, B.S.
Kim Hauser
Apri Hinson, B.S.
Lewis Huff, IGONC
Tony Johnson, B.S.
M. Beth McDaniel, B.S.
Patricia C. Martin, B.A., B.A.
Alan Melvin, B.S.
Larry W. Minor, M.C.P.
Kathryn P. Roe, B.A., B.A.
Janice Rowe

Lowell K. Shaw, M.AE.
John Tidwell, Ph.D., P.E.
Pamela C. White, B.A.
Rebecca Withrow

Transportation Information Management System (TIMS) (Raleigh office only)
Tabitha H. Barnette, B.S.
James Bodolosky
Laura Chesser
John Fillo, B.S.
Derek S. Graham, M.S.
Bobby R. Harris, B.S.
Elizabeth Hemandon-Locus, B.S.
Robert Irene, B.S.
Amy Jacobs
Shanzi Ke, M.S.
Steven Kelly
Anne LaPierre
Shaping Liu, B.S.
Mickey Michael, B.S.
Jonathan Overton
Tuan Phan
Chris Ray
Jeff Tsal, M.S.
Mark Wimmer

North Carolina Department of Transportation (NCDOT)
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James Caldwell, B.A.
Don Cooper, B.S., P.E.
Ryan Cummings, B.A.
Barbara DuRand, B.A.

Neil Fox, B.E.D.
Ted Funderburk, B.S., P.E.
Ginger Gregory
Carol Hanchette
Clintom L. Heimbach, Ph.D., P.E.
Curtis Hinton
Ken Horton, B.S., P.E.
Jackie Kioto
Michael Marsh
Steve A. Martin, Ph.D.
Carol Parker, B.S.
William Powell, B.A.
Bobby Robinson
Paul Robinson, B.S.
Gordon Rogers
Bobby Ross
John Sandy, B.A.
Juanita Smith, B.S.
Jan Von Essen, M.S.

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Thomas Brown, Ph.D.
Paul D. Cribbins, Ph.D., P.E.
Joseph M. DiPaola, Ph.D.
Foad Farid, Ph.D.
John S. Fisher, Ph.D.
David W. Johnston, Ph.D., P.E.
N. Paul Khosla, Ph.D.
Y. R. Kim, Ph.D.
Philip C. Lambe, Ph.D., P.E.
H. Rooney Malcom, Ph.D., P.E.
Vernon Matzen, Ph.D., P.E.
Armin Moerz, M.C.E.
Dan Moore, Ph.D.

James M. Nau, Ph.D., P.E.
Margery F. Overton, Ph.D.
Robert Ramsay, Ph.D.
W. A. Skroch, Ph.D.
John R. Stone, Ph.D.
Paul Zia, Ph.D., P.E.

University of North Carolina at Charlotte
(includes Charlotte TIMS staff)
John E. Chesser, B.A.
Barbara Christenbury
James Clay, Ph.D.
Aaron Faircloth
Robert Hamby, M.S.
Dave Hartgen
Sherry Helms
Brian Hoyle
Yunhui Hu, B.S.
Mohammed Idrus, M.S.
L. Ellis King, Ph.D., P.E.
Tim Lesser
Jian Lu
Marv Mininger
Tracy Newsome, M.A.
H. Douglas Robertson, Ph.D., P.E.
Kim Schieffer
David Seniw, B.A., B.S.
Paul D. Smith, B.S.
Alfred W. Stuart, Ph.D.
Mary Beth Thurman, B.S.
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