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Message from the Director

It pleases me to submit the 2013 edition of the ITRE Annual Activity Report. Like many of our sister institutions, ITRE is slowly but surely recovering from the effect of the great recession and is, as always, trying to diversify and adapt to the many changes in transportation research and education that keep coming fast and furious in our profession.

This is also a year where we have reorganized ourselves internally due to more senior departures for other opportunities. Earlier this year, Jeff Tsai the former director of our Pupil Transportation Group was offered and accepted a senior position at the Wake County Public School System, after a long career spanning 25 years at ITRE. We have missed his presence, but know he is taking on an excellent challenge, one we are sure he is more than ready to tackle. This is also the year where our new NGAT Center (hopefully in its last throes as an “in planning” designation) is beginning to make its mark on the state and the nation, from winning a coveted Golden Leaf Foundation award, to testing unmanned aerial vehicles (UAV) and receiving significant state support for its upcoming UAV focused initiatives. Here at ITRE we have very high expectations about the future of NGAT.

Financially, we continue to be on a solid footing. Our overall research expenditures, while slightly down from last year (by about 2.5%), are at levels not seen in five or more years. Our direct federal grant and contract support also continues to improve, accounting for 20% of overall expenditures. When adding indirect federal support through third party contractors, that number is close to one-third of all expenditures, a new ITRE record. These projects have contributed to an overall increase in the overhead dollars generated for NC State and ITRE to over $1.1 million this year, an increase of 7% over last year.

On the education front, our training programs still attract more than 11,000 participants annually. This includes both in-person and online training, which is now being expanded to new areas. This year we have begun exploring and negotiating overseas training opportunities in the United Arab Emirates. And we have continued our strong collaboration with our partners in two universities in Portugal in the area of sustainable transportation research.

On a personal note, I am particularly proud of ITRE-supported graduate students. This year five of our supported PhD students successfully completed their degree, all of whom are now gainfully employed in academia, in the public sector or in the private sector.

Last but not least, I want to express my sincere thanks to our administrative staff whose daily support of all our technical activities proceeds unabated. These individuals have kept our programs running, kept our clients and sponsors happy, and have kept all of us out of trouble! I am indebted to all of them and wish we could do more than just express our appreciation for their dedication.

Naguí Rouphail, PhD

This year five of our supported PhD students successfully completed their degree, all of whom are now gainfully employed in academia, in the public sector or in the private sector.
This report summarizes ITRE’s activities for the year 2013 and provides background information on the Institute’s history, mission, goals, and objectives. It also provides an overview of ITRE’s finances, personnel, and technical activities during the year. As in years past, the Institute has maintained and in some instances expanded its programmatic activities.

**Center Description**

The Institute for Transportation Research and Education (ITRE) is an Institutional Center of the University of North Carolina system. Chartered by the North Carolina General Assembly in 1978, ITRE carries out research, training, and technical support activities in surface and most recently air transportation for a host of national, state, and local clients to address the nation’s critical transportation issues. ITRE is committed to leadership in the study of transportation issues through fostering analytical thinking, integrating technology in education and research, serving as a catalyst for problem solving, and cultivating professionals and students dedicated to excellence in transportation.

Since 2012 ITRE has been reorganized into eight programmatic areas namely 1) Center for Transportation and the Environment (CTE), 2) Highway Systems, 3) Local Technical Assistance Program (LTAP) 4) Next Generation Air Transportation Center (NGAT), 5) Travel Behavior Modeling (now as a separate program outside of Highway Systems), 6) Pupil Transportation Group, 7) Geovisual Analytics and Decision Management Group (GADA) and 8) Public Transportation. A high-level organizational chart of our new structure is depicted in Exhibit I. As always our programs are guided and monitored by the ITRE Advisory Council, whose membership is shown in Exhibit II.

**Summary of ITRE Goals**

ITRE’s strategic plan, developed in 2002, has set forth five major institute-wide goals:

- Increase national visibility
- Conduct and disseminate research that impacts the transportation community
- Sustain and enhance educational opportunities to improve the knowledge and skills of transportation professionals
- Strengthen the relationship with, and gain recognition within, the University system
- Provide superior technical assistance

These goals are currently being achieved through various objectives, such as increasing national exposure through conference presentations, publishing research, outreach efforts, and increased national project awards. Additionally, the Institute continues its training efforts on a national, regional, and state level, while promoting collaboration with faculty in the department of Civil, Construction, and Environmental Engineering at North Carolina State University and at other UNC system institutions.

This report provides a glimpse of this year’s activities and accomplishments in reaching these goals and objectives. More information about ITRE’s programs and staff are available through ITRE’s website:

[http://www.itre.ncsu.edu](http://www.itre.ncsu.edu)
In the next few pages, a synthesis is provided of each program area indicated in Exhibit I.
Center for Transportation and the Environment (CTE)
James Martin, Program Director

The Center for Transportation and the Environment (CTE) was established at ITRE in 1992 through the Intermodal Surface Transportation Efficiency Act of 1991. CTE is a national University Transportation Center funded in part by the U.S. Department of Transportation Research and Innovative Technology Administration and located administratively at NCSU. CTE’s mission is to conduct research, education, and technology transfer programs focused on the effects of surface transportation on the human and natural environment. CTE helps transportation and environmental agencies and stakeholder groups collaborate on the design and implementation of solutions that improve transportation systems while protecting the nation’s critical natural resources and the vitality and livability of its communities.

CTE’s research program has focused on wetlands and water quality issues, air quality and global climate change, linking transportation planning and the National Environmental Policy Act process, Context Sensitive Solutions (CSS), and social and economic issues. CTE’s education program develops course materials, as well as experiential research and internship opportunities for undergraduate and graduate students. CTE developed and delivers the NCDOT CSS Training Program, one of the largest CSS workforce training programs in the country. The center’s technology transfer program uses webcasting technology to develop national broadcasts, Web courses, and other Web-based forums to foster the national dialogue on transportation and environmental topics. CTE also sponsors numerous conferences, workshops, and symposia.

The center serves as lead organizer for the International Conference on Ecology and Transportation and has facilitated national initiatives including an CSS Peer Exchange and the CSS National Dialog. CTE has received several awards for innovative research and public outreach.

CTE offered a three-day workshop in October on “LEGO® Robot Vehicle Lesson Plans for Secondary Education.” Participants included ten 6th and 7th grade students at Centennial Campus Magnet Middle School in Raleigh, NC.

The curriculum was developed at the University of Florida for the purpose of introducing students to transportation engineering and how transportation impacts their every-day lives. The lesson plans introduced the concept of using intelligent transportation systems to assist in the mitigation of traffic congestion.

Students programmed LEGO® Robot Vehicles to perform a variety of activities that illustrated how intelligent vehicles use sensors to perform tasks that can help mitigate traffic congestion.

The workforce development outreach efforts were funded by the Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE).

CTE has been working with the North Carolina Department of Transportation (NCDOT) and Women’s Transportation Seminar (WTS) NC Triangle on a series of workshops to offer transportation engineering as a viable career option for girls. Workshops provided experiential activities, speakers, role models, and mentoring opportunities.

“Introduce a Girl to Engineering” consisted of three four-hour workshops for junior and senior high school girls. The workshops were held in February and March in Raleigh, Winston-Salem, and Greenville, NC. This series of workshops that aims to help girls understand engineering as a potential career choice was hosted by the NCDOT with support from the WTS NC Triangle and CTE.

“Transportation YOU” offered three two-hour workshops for girls ages 13-18 that addressed a variety of transportation-related engineering topics. These after school workshops were held throughout the school-year in Raleigh and were hosted by WTS NC Triangle with support from CTE.
The Geovisual Analytics and Decision Management Group (GADA) was formed in 2012 by combining the Operations Research and Education Laboratory (OREd) and the Commercial Vehicle Enforcement Resource Lab (COVERLAB) programs under their common specialties of GIS, geospatial and traditional statistics, and mathematical modeling to support operations management decisions and guide public policy. GADA has witnessed significant growth in 2013 with 3 new team members joining the group.

In addition to these two programs, GADA supports on-site GIS training at ITRE’s GIS Lab. Through its partnership with eGIS Associates Inc., GADA continues to provide quality GIS training opportunities and has seen significant increases in class enrollments and an expanded GIS course list, including preparatory courses for GISP certification.

COVERLAB is ITRE’s flagship resource for the Motor Carrier Enforcement (MCE) assistance program of the North Carolina State Highway Patrol (NCSHP) and provides an assembly of decision support tools – web-based scorecards and dashboards, geospatial analytics, data visualization, and applied research - that inform operations enforcement planning decisions of the NCSHP.

The full scope of commercial vehicle work is available through www.coverlab.org, including the data visualization and decision support platform known as COVERLAB Analytics. COVERLAB Analytics assists MCE improve its tactical enforcement planning for reducing truck-involved fatal crashes and protecting road/bridge infrastructure from heavy truck damage. An expanded version of COVERLAB Analytics is due for release in April, 2014.

COVERLAB is also assisting the NCSHP in the migration of mapping and analytic capabilities originally developed for MCE to the traditional enforcement duties of NCSHP. COVERLAB has also received funding from North Carolina Governor’s Highway Safety Program (NCGHSP) to develop an online analytic platform to track the NCSHP’s traditional enforcement performance for improved effectiveness through integrated analytics. Troop supervisors will be able to track their status, view trends and drill down to answer questions about crash causation and more effectively identify potential countermeasures. The project began in October 2013 with the first phase of completion in October 2014.

OREd provides school districts in North Carolina, South Carolina and Virginia decision management tools based on Land Use-based membership forecasts, GIS analysis, and operations research techniques. By integrating school and community planning data, OREd can assist school districts in developing data-driven and policy-based facility and assignment plans.

In 2013 OREd completed the second full Update of its Long-Range Building Plan for the Wake County Public School System (WCPSS). Serving over 150,000 students in 170 schools, WCPSS is the largest district in North Carolina and is growing by more than 3,000 students per year. OREd developed the Student Potential Distribution Model in 2005, using Land Use data collected from county and municipal planners to predict growth in student population in the county. This forecast drives OREd’s optimization model, locating future school sites that minimize student travel distance in response to existing development and anticipated growth. Optimal school sites generated by OREd supported an $810M bond initiative, with $534M for 16 new schools. Wake County voters passed the referendum in fall 2013.

In fall 2013, OREd launched OREd Outcomes, a web-based portal for OREd products. By accessing a district-specific site, district and community leaders can examine membership forecasts, Land Use Study findings, and a host of other OREd deliverables. In addition, ore-outcomes.itre.ncsu.edu is a dissemination point for information on school planning practices and methodologies from a variety of sources over a spectrum of topics – from technical to political.

OREd worked with nearly twenty public school districts in 2013 and continues to pioneer innovative technologies that can assist school leaders make the best decisions for the communities they serve.
The **Highway Systems Group** was formed in the early 1980s to assist the North Carolina Department of Transportation (NCDOT) with pressing surface infrastructure challenges. Many research and development projects conducted for maintenance, construction, and central office staff have helped provide implementable solutions to pressing needs. Group staff are also engaged in many national research projects under FHWA, ITE, NCHRP, NCFRP, and SHRP2 research programs, and the group is involved in teaching and professional development for the National Highway Institute (NHI).

The following list comprises eight key research focus areas of the Highway Systems group, which highlight the diverse expertise and involvement of our staff in local, state, and national level research.

1) Blind Pedestrian Access to Complex Intersections
2) Unconventional Intersection Analysis
3) Identification and Evaluation of Roadway Assets
4) Video-Based Detection and Assessment of Traffic Patterns
5) Work Zone Evaluation and Safety Training
6) Economic and Financial Assessment
7) Freeway Performance Assessment, Modeling, and Monitoring
8) Education and Training

Staff also provides job-specific training and education for transportation professionals at every level along with supplementary reference materials. For more information on these key themes, please visit http://www.itre.ncsu.edu/HWY/research.html

**Major Accomplishments in 2013**

- Growth of the group through two new permanent staff, two new post-doc-positions, and several student hires.
- Successful lead agency for new NCHRP research on roundabout accessibility (3-78b), and participation on teams for other NCHRP projects (3-107: Work Zone Capacity, 3-115: HCM2010 Update, and 7-22: HCM Planning Guide).
- New research thrust on alternative intersections with several new state and federal projects, especially for the Diverging Diamond Interchange.
- Completion of the largest mesoscopic simulation model in the country to assist NCDOT in the evaluation of the I-40 “Fortify” work zone project.
- Completion of several research projects on Ped/Bike accommodations at Superstreets, the NCLOS tool, and NCDOT work zone evaluation.
- Completion of national-level reliability research through the development of the freeway reliability HCM method in SHRP2-L08.
- Participation in several national task order contracts for FHWA and NHI.
- Growth in training with delivery of customized courses outside of North Carolina.
- Development of new online curriculum FE and PE Review courses.
- Improved collaboration with other groups within ITRE.
- Full-semester instruction of 3 semester-long courses in Civil Engineering.
- Official staff membership in TRB committees on Highway Capacity, Roundabouts, Operational Effects of Geometrics, Work Zone, and History.

**Our Vision for the Future**

- Increase course offerings and training in other states and increased online and web-based training focus.
- Continue to grow group with two additional full-time staff position.
- Increase participation in (high-speed) rail projects on a state and national level.
- Continue to diversify research portfolio across state and federal sponsors.
- Enable junior staff to take leadership roles in teaching and research.
- Collaboration with other ITRE groups and leveraging joint expertise.
The North Carolina Local Technical Assistance Program (NC LTAP) is one of 59 LTAP centers nationwide, funded by the Federal Highway Administration. The NC LTAP center was established at ITRE in 1986. The center plays a leading role in helping state and local government agencies assess and apply new transportation technologies through training, technical materials, technical information services, and a quarterly newsletter. More than 80 training workshops are conducted annually for approximately 1,500 transportation personnel. Topics range from asphalt pavement maintenance to work zone traffic control.

The center also contributes to the professional development of the state’s local transportation personnel through the Roads Scholar Program. This certificate program provides a curriculum of training to enable transportation workers to study, among other topics, road fundamentals, safety, drainage, snow and ice removal, and training management. The courses help participants develop professionalism and advance their careers.

An Advanced Roads Scholar Program is also available for local agency staff who seek to develop further their technical and managerial skills.

The Roads Scholar and Advanced Roads Scholar programs provide special training administered by North Carolina’s Local Technical Assistance Program (NC LTAP) at ITRE that allow local government agencies access to high quality training for their employees at a reasonable cost. The Roads Scholar Program consists of 14 different one- or two-day training sessions regularly offered each year. To become a Roads Scholar, seven of the 14 training sessions must be completed.
The NGAT Center was started in 2008 to support North Carolina efforts in preparing for a modern aviation transportation environment in the state. NGAT’s mission is to discover, evaluate, implement, and disseminate advanced air transportation technologies at the regional, national, and international level to improve the capacity, safety, and environment surrounding air transportation.

In 2012 the NGAT Center was relaunched with the stated mission, but focusing on the development of a UAS ecosystem in the state as the primary objective. Most of the year was spent developing infrastructure, establishing work flow paths, and communicating the objectives of the Center.

In 2013 NGAT began performing UAS operations and building on the foundation previously established:

♦ March 21, 2013- The NGAT Team with BOSH Global Services conducted the first UAS flight under an FAA approved research Certificate of Authorization (COA) in North Carolina. Jaryd Tehini supported NGAT airworthiness inspection activities in the fall of 2012 before graduating NCSU with a double major in Mechanical and Aerospace Engineering. In February BOSH hired him as the lead Systems Integration Engineer for the BOSH Technologies team.

♦ By the end of the year, 5 COAs were granted to NGAT for research and testing at 3 locations in the state.

♦ Much of the spring was spent developing the UAS Test Site proposal. With statewide support, including an endorsement letter from Governor McCrory, the 291 page proposal was submitted May 6 offering approximately 30,000 acres of farmland and the airspace above it to the FAA and industry for UAS integration research and testing.

♦ UAS for agriculture research began with calibration testing and equipment configuration in the summer and fall of 2013. A complete research agenda for agriculture applications is under development in collaboration with NCSU crop and soil sciences research teams in preparation for the 2014 growing season.

NGAT 2013 Highlights
♦ January- award of Golden Leaf Foundation grant, Operation: Fly Gull Rock. This funding allowed NGAT to purchase the UTC Aerospace Systems Vireo Small UAS Package and the equipment needed for field operations to test UAS for agriculture applications.

♦ March- First Flight of Super Swiper UAS with BOSH at Hyde County Airport.

♦ May- Submission of Gull Rock Test Site proposal to FAA for consideration as one of the 6 national UAS Test Sites. Decision to be announced in December.

♦ July- annual NGAT Summer UAS Workshop hosted at NCSU.

♦ July- announcement of $2.5M from NCDOT-Aviation Division for UAS Program/Test Site development.

♦ July- first flight of Vireo UAS at Hyde County Airport.

♦ August- attended 2013 AUVSI Unmanned Systems North America conference, 8,500+ attendees from around the world.

♦ October- Added Tom Zajkowski to team to lead field operations and COA activities.

♦ November- first flight of Vireo UAS at Caratoke COA site in Moyock, NC.

♦ Ongoing collaboration with NC CIO’s Office in development of statewide UAS Governance and Implementation plan to be delivered in spring of 2014.

NGAT 2014 Objectives
♦ Official start to Membership Program to formalize industry partnerships and provide access to COA flight locations and NGAT testing resources.

♦ Increase research activity at all COA locations through industry partnerships and NCSU-led projects from multiple departments across campus.

♦ More proposals.

♦ Expand support to broader NextGen aviation initiatives.

♦ Survey NextGen/UAS education landscape to determine ability for NC aerospace/aviation resources to meet the opportunities.
ITRE’s Public Transportation Group conducts research, training, and technical assistance involving transit, bicycle and pedestrian, and pupil transportation.

- The Transit Program assists North Carolina transit systems through contracts with the North Carolina Department of Transportation’s Public Transportation Division (PTD) and through direct contracts with transit systems and local governments. The program’s primary focus is in providing technical assistance to the 18 urban and 82 rural public transportation systems, and for the state’s intercity bus program. Transit Program staff provide online and on-site training as well as direct support to NCDOT/PTD for research, policy papers and recommendations, and policies and procedures manuals.

- The Bicycle and Pedestrian Program focuses on improving non-motorized transportation through planning assistance, training, and research. Program activities are primarily conducted through contracts with the NCDOT’s Division of Bicycle and Pedestrian Transportation (DBPT), local government agencies, and private non-profit sponsors. Bicycle and Pedestrian Program staff has developed policies and procedures manuals, safety education materials and curricula; administered planning and Safe Routes to School grants; and offered training on planning, design, and accessibility. Currently, staff is creating the new Pedestrian and Bicycle Infrastructure Network – a GIS database of all existing and planned bicycle and pedestrian facilities within North Carolina. Recent research topics include bicycle and pedestrian accommodations through alternative intersections, rumble strips and bicycling, and pedestrian accessibility.

- The Pupil Transportation Program addresses school travel safety and operations activities. In addition to conducting school transportation research, the program provides technical assistance to, and is responsible for supporting the Transportation Information Management System (TIMS) software for school systems across North Carolina. TIMS is a GIS-based school bus routing and scheduling software with optimization algorithms that assist school systems create efficient bus routes while adhering to safety concerns and operating policies. In addition to the traditional computer lab training, the support staff also conducts distance learning training using NCSU’s distance learning tools.

The Pupil Transportation program offers both classroom and customized training on the Transportation Information Management System (TIMS) software for school systems across North Carolina. TIMS is a GIS-based school bus routing and scheduling software with optimization algorithms that assist school systems create efficient bus routes while adhering to safety concerns and operating policies. In addition to the traditional computer lab training, the support staff also conducts distance learning training using NCSU’s distance learning tools.

The Bicycle and Pedestrian Program produced Let’s Go NC! a curriculum to teach elementary aged children safe walking and bicycling skills. The curriculum is endorsed by the NC Department of Public Instruction and meets Common Core standards. Let’s Go NC! includes lesson plans, instructor and lesson videos, an instructor’s guide, and an online interface (shown here) to download all the materials.
The Travel Behavior Modeling Group performs research on travel behavior and travel demand forecasting topics.

Research work includes:
- An investigation of land use models for application in small communities in North Carolina
- The effect of alternative development strategies on travel behavior in small communities and rural areas
- Surveys of travel behavior by university students in North Carolina at six university campuses

The Travel Behavior Modeling Group includes the Triangle Regional Model Service Bureau which develops the travel forecasting models for the Triangle region of North Carolina. The Service Bureau is developing a new Version 6 of the Triangle Regional Model which will add new commercial vehicle and university student models along with an improved parking capacity and constraint model.

Version 5 of the Triangle Regional Model was used by the Capital Area Metropolitan Planning Organization and the Durham Chapel Hill Carrboro Metropolitan Planning Organization for preparing forecasts and air quality analysis for the 2040 Metropolitan Transportation Plan. This version of the Triangle Regional Model added improvements including a bicycle and pedestrian model, an airport passenger model, and a parking cost and capacity constraint model.
Summary of ITRE’s Finances

Exhibit III shows expenditures for the most recent Fiscal Year, July 1, 2012 through June 30, 2013. Those are broken down by the funding source.

- Overall, about 6% of all 2013 ITRE expenditures represent State Appropriated Funds related to administration, with additional operations support of 4% derived from Indirect Cost Return. The overall percentage of support from State Appropriations is unchanged from FY 11/12.

- State of North Carolina and Federal Contracts total 70% of all activity. Those figures have decreased by about 4% compared to 74% for FY 11/12, although there has been a slight increase in the federal share from 19 to 20%. The Institute no longer has Pass-through projects to other departments at NCSU and other UNC universities. NCDOT now has master agreements with all NC universities individually.

- Sales and Service activity (8%) is derived mainly from registration fees for workshops. Other Contracts accounting for 12% are primarily federal projects awarded to ITRE through a subcontract from the private sector or university lead contractor.

Exhibit IV shows how ITRE’s FY 12/13 expenditures are expended by program area. As has been the norm in the past few years, the Highway Systems program is ITRE’s largest generator of expenditures, accounting for nearly 20% of all ITRE expenditures. This last figure is down from last year, but it should be noted that because of reorganization, both the Travel Behavior group and the NGAT center, that previously reported with Highways Systems now have their own reporting group.

Highways is followed closely by CTE (at 15%) and Public Transportation (at 14%) groups. Other groups and administration contribute at various rates. The “Institute” expenditures include state appropriations, facilities and administrative receipts, professional development and other accounts managed by the Institute as a whole.
Exhibit V shows the distribution of expenditure sources by program area. This chart serves to highlight where each group expends its primary funds. Funds are categorized as State, Federal, and Other. This last category includes expenditures from contracts ITRE has with other states, not-for-profit organizations, the private sector, and course registrations. Many of these contracts have their primary source as federal funds. The chart also highlights the fact that ITRE is still predominantly funded from the state of North Carolina and local sources, although there are some variations across program areas.

Exhibit VI tracks ITRE’s total annual expenditures over the past five years. As can be seen, ITRE’s total expenditures have slightly decreased in FY12/13 compared to the previous cycle, by less than $200,000 (or by about 2.5%). Nevertheless the past two years represent the two highest levels of expenditures by ITRE since 2008.
Exhibit VII summarizes ITRE’s productivity trends over the past five years. The top line represents the ratio of total annual expenditures divided by ITRE’s state appropriated funds. Total annual expenditures are utilized when calculating the ratio; basically reflecting the value of our research activities. The ratio continues to be well above the indicated 4.0 minimum threshold cited in the UNC Office of the President Report (lower line). In 2013, the 2.7 value represents the average leverage ratio of all NC State University Centers and Institutes, as reported by the Office of the Vice Chancellor for Research, Innovation and Economic Development. ITRE again is showing it is a valuable and cost effective asset to the state of North Carolina, with 14.4 dollars generated for every dollar expended by the state.

Finally, Exhibit VIII shows that ITRE continues to generate Facilities and Administrative (F&A) funds for its operations, as well as for the University. In the last fiscal year we generated about $1,100,000 in F&A dollars from our local, state, and federal projects, an increase of 7% over the previous FY. This is the second year in a row that we broke the million dollar mark in overhead generation. This increase has occurred despite the fact that overall expenditures decreased, an indication that ITRE is now winning more full overhead grants and contracts. In past years between 33-35% of the F&A funds were returned to operate the Institute and provide incentives for improving ITRE’s national visibility, but now about 26.63% is being returned due to a newer allocation formula.
Summary of Project Activities

The following list summarizes ITRE’s research and education projects at the national, state and local levels for FY 12/13.

National Research and Development

National research efforts at ITRE continue to be quite significant in terms of magnitude and funding levels.

**Blind Pedestrians’ Access to Complex Intersections, 2007-2013**
Sponsor: Western Michigan University and National Eye Institute (N. Rouphail)

**Center for Transportation and the Environment Tier II University Transportation Center, 2005-2013**
Sponsor: US Department of Transportation (J. Martin)

**Community Transportation Camera Implementation, 2012-2013**
Sponsor: Federally funded through NCDOT (D. Collins)

**Complete Streets Guidelines and Training, 2010-2012**
Sponsor: PB Americas, Inc. (J. Martin)

**Establishing Monitoring Programs for Travel Time Reliability, 2009-2013**
Sponsor: National Academy of Sciences (G. List)

**Facilitation and Documentation Services for Department of Motor Vehicles Licensing Demonstration Grant, 2009-2012**
Sponsor: Federally funded through NCDOT (A. Hartell)

**Federal Highway Administration Co-Sponsorship for the 2013 International Conference on Ecology and Transportation Conference, 2013**
Sponsor: US Department of Transportation / Federal Highway Administration (J. Martin)

**Field Evaluation of Double Crossover Diamond Interchanges, 2010-2014**
Sponsor: US Department of Transportation (N. Rouphail)

**Framework for Mobile Source Emission Inventories, 2010-2014**
Sponsor: Environmental Protection Agency (N. Rouphail)

Sponsor: US Department of Agriculture, Forest Service (J. Martin/E. Murray)

**Livability and Economic Analysis Study, 2012-2013**
Sponsor: Louis Berger Group, Inc. (L. Lane)

**Local Technical Assistance Program, 2011-2013**
Sponsor: Federally funded through NCDOT (J. Martin)

**Maintenance Leadership Academy Pilot Presentations, 2012-2013**
Sponsor: Applied Pavement Technology (T. Baughman)

**Methods for Gauging Livability Improvements, 2011-2013**
Sponsor: Louis Berger Group, Inc. (L. Lane)

**Migration of NC State Highway Patrol Geographic Information Systems Decision Support from Motor Carrier Enforcement to Traditional Enforcement - The First Step, 2011-2012**
Sponsor: Federally funded through NCDOT (G. Ferrara)

Sponsor: Kittelson & Associates, Inc. (G. List)

**Novel Approaches to Improving Air Pollution Emissions Information, 2010-2013**
Sponsor: Environmental Protection Agency (N. Rouphail)

CTE produces ICOET, the foremost multi-disciplinary, inter-agency supported conference addressing the **broad range of ecological issues related to transportation systems**. Experts in transportation development, related scientific study, policy issues, and administrative processes gather at ICOET to share the most current research information, quality applications, and best practices that can enhance both the project development process and the ecological sustainability of transportation systems.

The ICOET program includes presentations for all transportation modes and topics of interest to attendees – researchers, biologists, engineers, planners, project managers, administrators, and policy makers representing government, Tribal, academic, non-governmental, and private industry organizations. More than 500 professionals from all 50 United States and over 20 other countries attend ICOET.

ICOET 2013 was co-hosted by the Arizona Department of Transportation (ADOT) and supported by ADOT partner organizations including the Arizona Game & Fish Department. Arizona is a national leader in successfully addressing many challenges concerning transportation and the environment.

Field trips organized by ADOT and its partners showcased award-winning projects and on-going research addressing sustainable transportation solutions for wildlife, habitat, and ecosystems. The remarkable variety of landscapes and species found in the “Grand Canyon State” also provided a unique location and learning experience for ICOET participants.
Every time the light changes on Hillsborough Street next to NC State, the sound of electronic chirps mingles with the noises of foot and car traffic. For the blind, those chirps are more than an auditory novelty; they're signals indicating when it's safe to cross the street. Experienced blind pedestrians can also use the sounds of dependable traffic patterns to help them cross safely.

The roundabouts near campus, however, are a different matter. Because they lack traffic lights, there's no way to audibly indicate when it's safe to cross. In addition, the movement of vehicles through a roundabout is essentially random, making it impossible for the blind to rely on their experience with normal traffic patterns.

Researchers weren't necessarily thinking of those problems when they took their first tour of the new Hunt Library. But a 3-D printer in the Hunt Library's Makerspace inspired them to come up with a solution: a tactile map of a real-world roundabout, modeled to represent landscaping, crossings and the boundaries between street and sidewalk.

"It was a creative, spur-of-the-moment idea," says Bastian Schroeder, assistant director of highway programs at ITRE.

Tactile maps are common tools for transportation planners. But the companies that create tactile maps usually make them in bulk, so custom-designed maps are rare. The Hunt Library's 3-D printers offered Schroeder and ITRE research assistant Jeffrey Chang a chance to turn their own custom design (a map of the busy roundabout at Pullen Road and Stinson Drive) into a scale-model reality in a matter of days. "The tactile map has a range of possible applications," Schroeder said. "Most obviously, it's a useful tool for teaching the blind to identify and navigate existing or planned traffic circles. It can also provide a design model for engineers building roundabouts."

"Being able to present a tactile map that says 'this is what your experience is going to be like' is really powerful," Schroeder says.

For more information, email Bastian Schroeder at bastian_schroeder@ncsu.edu. Read the complete article online at http://www.ncsu.edu/huntlibrary/create/

Southeastern Transportation Research Innovation, Development and Education (STRIDE), 2012-2014
Sponsor: University of Florida (D. Brill)

Support for NC Department of Motor Vehicles Participation in Fiscal Year 2010 Secure Driver License Grant Program, 2012-2013
Sponsor: Federally funded through NCDOT (J. Martin)

Triangle Regional Model Service Bureau at ITRE, 2011-2013
Sponsor: Federally funded through Triangle Transit (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, Capital Area Metropolitan Planning Organization, 2010-2014
Sponsor: Federally funded through the City of Raleigh (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, 2010-2015
Sponsor: Federally funded through the City of Durham, Chapel Hill, and Carrboro Metropolitan Planning Organization (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, NC Department of Transportation, 2012-2013
Sponsor: Federally funded through NCDOT (J. Huegy)

Web-Based Tool to Locate Data on Community Preference Characteristics, 2012-2013
Sponsor: Louis Berger Group, Inc. (L. Lane)

2011 Eisenhower Graduate Fellowship for Zachary Bugg, 2011-2012
Sponsor: Federal Highway Administration (N. Rouphail)

Other Projects Funded From Federal Sources

Sponsor: Virginia Polytechnic Institute (B. Schroeder)

Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Dissemination of Airport Cooperative Research Program Research Results: Value and Utility Assessment, Scoping and Pilot-Testing (Previously Airport Cooperative Research Program 11-05, Task 2 - Value and Utility Assessment), 2011-2013
Sponsor: National Academy of Sciences (J. Martin)

Sponsor: Project Performance Corporation (J. Martin)

Guidelines for the Application of Crossing Solutions at Roundabouts and Channelized Turn Lanes to Assist Pedestrians with Vision Impairments, 2013-2015
Sponsor: National Academy of Sciences (B. Schroeder)

Incorporation of Travel Time Reliability into the Highway Capacity Manual, 2011-2013
Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Sponsor: Kittelson & Associates, Inc. (B. Schroeder)

Pedestrian Counting System Evaluation, 2012-2014
Sponsor: Migma Systems, Inc. (N. Rouphail)
Sponsor: Cambridge Systematics, Inc. (N. Rouphail)

Surveys to Generate Data for Updated Passenger Rail Ridership Estimates, 2012
Sponsor: AECOM Technology Corporation (T. Cook)

Sponsor: Kittelson & Associates, Inc. (B. Schroeder)

State of North Carolina and Local Research and Development
ITRE administered ongoing, statewide projects mostly in conjunction with the NC Department of Transportation (NCDOT) and local municipalities. See the pages that follow for additional project categories.

Aerospace Industry Development in North Carolina, 2013
Sponsor: NC Department of Transportation (D. Findley)

Americans with Disabilities Act Training, 2012-2013
Sponsor: NC Department of Transportation (D. Collins)

Analysis of Truck Load Weight Distribution in North Carolina, 2011-2012
Sponsor: NC Department of Transportation (R. Hughes)

Bicycle and Pedestrian Geo-Spatial Data Update and Management, 2012-2013
Sponsor: NC Department of Transportation (S. O’Brien)

Bicycle and Pedestrian Technical Assistance, 2012-2013
Sponsor: NC Department of Transportation (S. O’Brien)

Comparison of Data Collection Vehicles to Human Collection Methods, 2010-2012
Sponsor: NC Department of Transportation (C. Cunningham/J. Hummer)

Delay and User Cost Estimation for Work Zones on Urban Arterials, 2012-2014
Sponsor: NC Department of Transportation (B. Schroeder)

Defining North Carolina’s Transportation Disadvantaged Populations, 2012-2013
Sponsor: NC Department of Transportation (L. Lane)

Development and Packaging of Statewide Curriculum Materials for the Safe Routes to School Program, 2012
Sponsor: NC Department of Transportation (S. O’Brien)

Development of Near Real Time Performance Measurements for Closed-Loop Signal Systems Using Historical Traffic Data from Existing Loop Detectors, 2011-2014
Sponsor: NC Department of Transportation (N. Rouphail)

Economic Performance Measurements, 2013-2014
Sponsor: NC Department of Transportation (L. Lane)

Ecosystem Enhancement Program, 2008-2013
Sponsor: NC Department of Environment and Natural Resources (J. Martin)

Facilitation and Documentation of Fiscal Year 2009 Driver’s License Security Grant, 2011-2012
Sponsor: NC Department of Transportation (A. Hartell)
Dr. Nagui Rouphail, ITRE director was an invited keynote speaker at the 16th Euro Working Group on Transportation held in Porto, Portugal on September 4-6, 2013. His presentation topic was on "Reliability as a Means for Integrating Mobility and Safety Considerations in Strategy Selection."

**Blind Pedestrians Access to Roundabouts and Other Complex Intersections**

ITRE is centrally involved in research addressing questions and concerns of pedestrian accessibility to roundabouts and complex intersections.

The research in this area was supported by an ongoing Bioengineering Research Partnership by the National Eye Institute of the National Institutes of Health, and National Cooperative Research Program project NCHRP 3-78a. More recently, ITRE has been asked to assist the Road Commission of Oakland County, Michigan with the evaluation of several treatments to assist blind pedestrians to cross at two busy multi-lane roundabouts.

ITRE is currently leading another NCHRP project (3-78b) which is tasked with developing guidelines for the application of crossing solutions at roundabouts and channelled turn lanes to assist pedestrians with vision disabilities.

Facilitation of NC Department of Transportation Technical Assistance Program, 2012-2013
Sponsor: NC Department of Transportation (L. Lancaster)
High Speed Rail Technical Assistance, 2010-2013
Sponsor: NC Department of Transportation (J. Martin)

Infrastructure Investment Protection with High Density Surveys, 2011-2012
Sponsor: NC Department of Transportation (D. Collins)

Intercity Bus Routes, 2012-2013
Sponsor: NC Department of Transportation (B. Williams)

Land Use Forecasting Models for Small Areas in North Carolina, 2011-2012
Sponsor: NC Department of Transportation (J. Huey)

Mobility and Reliability Performance Measurement, 2010-2013
Sponsor: NC Department of Transportation (N. Rouphail / B. Williams)

Motor Carrier Safety Assistance Program Technical Support, 2011-2013
Sponsor: NC Department of Crime and Control and Public Safety (G. Ferrara)

Sponsor: University of North Carolina, Chapel Hill (J. Huey)

NC Department of Transportation Maintenance Technical Assistance Program, 2011-2013
Sponsor: NC Department of Transportation (T. Baughman)

NextGen Air Transportation Center Implementation Project, 2013-2014
Sponsor: NC Department of Transportation (K. Snyder)

NextGen Air Transportation Center Technical Assistance to the NC Department of Transportation Division of Aviation, 2011-2012
Sponsor: NC Department of Transportation (R. Foyle)

North Carolina Level of Service Program 2010 Update, 2011-2012
Sponsor: NC Department of Transportation (R. Foyle)

Pedestrian and Bicycle Accommodations on Superstreets, 2011-2013
Sponsor: NC Department of Transportation (N. Rouphail)

Performance Improvement from Deep Layers of Subgrade Stabilization, 2008-2012
Sponsor: NC Department of Transportation (L. Lancaster)

Professional Enhancement Program, 2011-2013
Sponsor: NC Department of Transportation (D. Findley)

Public Transportation Division Transit Operations Group/Urban Transit Technical Assistance Program, Technology Implementation and Research, 2012-2013
Sponsor: NC Department of Transportation (D. Collins)

Rail Intern Program, 2010-2012
Sponsor: NC Department of Transportation (T. Cook)

Research Administration Facilitation in Transition and Technical Assistance, 2011-2012
Sponsor: NC Department of Transportation (R. Foyle)

Skill Building Workshops, 2012-2013
Sponsor: NC Department of Transportation (D. Collins)

Smartlink Baseline for Measurement of Benefits, 2012-2014
Sponsor: NC Department of Transportation (N. Rouphail)

TDM Program, 2012-2013
Sponsor: NC Department of Transportation (D. Collins)
Teach Fundamental Engineering Principles Program, 2011-2013  
Sponsor: NC Department of Transportation (C. Cunningham)

Technical Assistance: Developing and Implementing NC Department of Transportation’s Sustainability Blueprint, 2010-2013  
Sponsor: NC Department of Transportation (J. Martin)

Technical Assistance to the NC Department of Public Instruction in the Implementation of the Transportation Information Management System, 2011-2013  
Sponsor: NC Department of Transportation (T. Cook)

Technical Support for the Safe Routes to School Program, 2011-2013  
Sponsor: NC Department of Transportation (T. Cook)

Technical Support of NC State Highway Patrol Motor Carrier Enforcement Size and Weight Enforcement Program, 2011-2013  
Sponsor: NC Department of Crime and Control and Public Safety (G. Ferrara)

Technical Support Services for the NC Department of Transportation Division of Bicycle and Pedestrian Transportation, 2011-2012  
Sponsor: NC Department of Transportation (T. Cook)

Trip Making Patterns of North Carolina’s University Students, 2012-2014  
Sponsor: NC Department of Transportation (J. Huegy)

Unmanned Aircraft Systems Development Initiative, 2012-2013  
Sponsor: NC Department of Transportation (K. Snyder)

Updating Crash Map Content for NC State Highway Patrol Traditional Operational Enforcement Planning, 2013  
Sponsor: NC State Highway Patrol (G. Ferrara)

Work Zone Traffic Analysis & Impact Assessment, 2012-2013  
Sponsor: NC Department of Transportation (B. Schroeder)

Additional Projects

ACRP Tasks, 2011-2013  
Sponsor: Project Performance Corporation (J. Martin)

Assessing the Utility of a Ubiquitous Transportation Network Using Computer Simulation  
Sponsor: Seoul National University (N. Rouphail)

Highway Safety and Capacity Workshops for Minnesota Department of Transportation, 2013  
Sponsor: University of Minnesota (B. Schroeder)

Operations Research and Education Lab (OREd) Program  
Sponsor: Various counties and school districts (M. Miller)

Researchers at ITRE, led by Dr. Bastian Schroeder of ITRE’s Highway Systems Group, recently completed a project predicting the impacts of NCDOT TIP Project I-532/I-5338 – referred to initially as the “Crawleigh” project, and more recently as “Fortify” (http://ncdot.gov/fortifync/). The ITRE team used computer models and extensive data collection to predict the extent of congestion and diversion rates once the DOT starts closing lanes on a facility carrying more than 110,000 vehicles per day.

The study developed and calibrated a network-wide simulation model of the entire Triangle region, including over 20,000 evaluation links. The four-hour AM and PM peak analysis periods included total traffic demands of 1.1 and 2.1 million vehicles, respectively, making this one of the largest simulation models in the country.

The final report for the project is currently under review at NCDOT and follow-up work on monitoring the actual work zone project has just gotten underway.
Staff Honors and Recognitions in 2013

State and National Committee and Panel Participation

TRB Committees

ABG20: Transportation Education and Training (D. Findley, friend)
ABG50: History (D. Findley, member)
ABG50: History Communication Coordinator (D. Findley)
ABJ40: Travel Survey Methods (J. Huegy, friend)
ADB40: Transportation Demand Forecasting (J. Huegy, friend)
ADC10: Environmental Analysis in Transportation (D. Brill, member)
ADC30: Ecology and Transportation (J. Martin, member, D. Brill, friend)
ADC00: Section-Social, Economic, and Cultural Issues (L. Lane, chair)
AFB10: Geometric Design (D. Findley, friend)
AFB20: Roadside Safety Design (D. Findley, friend)
AFB30: Low-Volume Roads (D. Findley, friend)
ADB50: Transportation Planning Applications (J. Huegy, member)
ADC30: Ecology and Transportation (J. Martin, member)
AHB25: Signal Systems (C. Cunningham, friend)
AHB30: Vehicle-Highway Automation Committee (C. Vaughan, friend)
AHB40: Highway Capacity and Quality of Service (B. Schroeder, member)
AHB50: Traffic Control Devices (T. Baughman, friend)
AHB55: Work Zone Traffic Control (T. Baughman, chair, A. Hajbabaie, friends)
AHB65: Operational Effects of Geometrics (A. Holzem, D. Findley, C. Cunningham, friends)
AHB70: Access Management (C. Cunningham, member)
AHD15: Maintenance Operation Personnel (J. Martin, member)
ANB40: Traffic Law Enforcement (C. Cunningham, member)
ANB75: Roundabout (B. Schroeder, member)
ANF10: Pedestrian (S. O'Brien, friend)
ANF20: Bicycle Transportation (S. O'Brien, member)
APO55: Rural Public and Intercity Bus Transportation (T. Cook, member)
APO60: Paratransit (K. Monast, member, T. Cook, friend)
APO85: Ferry (T. Cook, friend)

ITRE Director Dr. Rouphail was invited as a private consultant to teach a short course in Traffic Engineering Concepts for the Abu Dhabi Municipality (ADM) in May 2013. Subsequent to teaching a second course on Arterial Management in August 2013, ITRE was approached by ADM to manage the delivery of a series of short courses ranging from work zone traffic control, to road maintenance to sustainability. Negotiations are currently underway to craft an agreement between ADM and ITRE on this activity.

ITRE taught workzone safety training to more than 4,4000 participants in 2013. The training included classroom and in-the-field safety issues.

TRB Subcommittees

ABJ40(1): Household Travel Surveys (J. Huegy, member)
ABJ40(2): Freight Surveys (J. Huegy, member)
ABJ40(3): Stated Response Surveys (J. Huegy, member)
ABJ40(4): New Technologies (J. Huegy, member)
Joint ADD30 and ADB40: Integrated Transportation and Land Use Modeling (J. Huegy, member)
ADD20 and ADA60: Community Impact Assessment Subcommittee (L. Lane)

AHB40: Research (B. Schroeder, secretary)
AHB40: Traffic Simulation Applications (B. Schroeder, member)
AHB40: Freeway and Multilane Highways (B. Schroeder, N. Rouphail, members)
AHB40: Signalized Intersections (N. Rouphail, member)
AHB70(2): Access Management Research (C. Cunningham)
ANB10(6): School Transportation (S. O’Brien, friend)
ANF20(6): Joint Subcommittee on Pedestrian and Bicycle University Education (S. O’Brien, friend)
ADD50-01: Health and Transportation Joint Subcommittee (S. O’Brien, L. Lane, friends)
ANF10: Pedestrian Research (S. O’Brien, friend)

TRB Task Forces and Panel Participation

Special Awards

AFB50T: Context Sensitive Solutions Task Force (L. Lane)
Communication Coordinator Council (D. Findley)
NCHRP 01-17: Pedestrian and Bicycle Transpiration Along Existing Roads (S. O’Brien, panel member)
NCHRP 15-49: Geometric Design Guidelines for Managed Lanes (C. Cunningham)
NCHRP 17-65: Improved Analysis of Two-Lane Highway Capacity and Operational Performance (B. Schroeder, panel member)

Best Paper Award, TRB Committee AHB40: Highway Capacity and Quality of Service, “Methodology for Developing an HCM-Based Oversaturated Speed Flow Model”, Yilun Xu, Billy Williams, Nagui Rouphail and Thomas Chase


Other Organizations

American Planning Association (J. Huegy, K. Monast, members)
American Society of Civil Engineers, Engineers Without Borders, Institute of Transportation Engineers (A. Holzem, member)
Association for Unmanned Vehicle Systems International, (ITRE@NCSU corporate membership)
American Institute for Aeronautics and Astronautics (K. Snyder, member)
American Society of Civil Engineers (N. Rouphail, member)
Association of Pedestrian and Bicycle Professionals (S. O’Brien, member)
Future City Mentor, Centennial Campus Magnet Middle School, team was 4th in the State in 2012 (D. Findley)
Future City Mentor, Wake Forest-Rolesville Middle School  (C. Cunningham)
Institute for Transportation Engineers  (D. Collins, member)
National Committee on Uniform Traffic Control Devices (T. Baughman, member)
National LTAP Association 2012 (J. Martin, past president)
NCAPWA President-Elect (J. Martin)
NCDOT Statewide Regionalization Study as requested in Section Law 2011-145, Section 28.21 (D. Collins, member)
NCSITE (D. Collins, member)
NCSITE Traffic Engineering Council (B. Schroeder, C. Cunningham, members)
NCSITE Traffic Planning Council  (C. Cunningham, member)
NCSITE Transportation Planning Council (J. Huegy, member)
NCSITE Simulation and Capacity Models Users Group  (B. Schroeder, chair, C. Cunningham, friend)
NCSITE Traffic Analysis Tools Task Force (B. Schroeder, chair)
NCSITE Signal Systems User Group (C. Cunningham, chair)
NCSU TRB Representative (N. Rouphail, member)
NCSU Transportation Founder’s Fund Executive Committee Member (N. Rouphail, member)
NCSU Solar Center Review Committee (N. Rouphail, chair)
NCSU Reappointment, Promotion and Tenure Committee (N. Rouphail)
North Carolina Chapter/American Planning Association (J. Huegy, member)
Paper Reviewer for Advances in Automobile Engineering (D. Findley)
Watch for ME NC Core Group (K. Jackson, member)

Bing Mei, senior research associate at ITRE, presented Development of a New Commercial Vehicle Model for the Triangle Region at the 14th TRB National Transportation Planning Applications Conference in Columbus, OH in May. The presentation described the new commercial vehicle model developed for the Triangle Regional Model (Raleigh, Durham, and Chapel Hill, North Carolina) using survey data collected in 2010. The model is stratified by trip purposes of delivering goods or delivering service. The model uses a logic-based destination choice model structure, which allows for explicit inclusion of non-impedance variables, such as socio-economic, geographic, and political-boundary variables. For more information contact Bing at bmei@ncsu.edu.

Dr. Chao Wang, senior research associate at ITRE, presented Determining the Free Flow Speeds in a Regional Travel Demand Model based on the Highway Capacity Manual (HCM). This presented an approach to determining the free-flow speeds in the Triangle Regional Model using the formulas and procedures described in the HCM to calculate free-flow speeds. The free-flow speeds were compared to speeds collected in a floating car survey conducted in 2011, and showed the HCM is able to yield reasonable free-flow speeds. For more information please contact Chao at cwang11@ncsu.edu
2014 Annual Transportation Research Board Meeting Participation

Based on research conducted in 2013, ITRE staff will present and contribute to various meetings of the Transportation Research Board (TRB) at the Annual Meeting in January 2014. Many of these papers will also be considered for publication in upcoming issues of the Transportation Research Record.

A Highway Capacity Planning Application and Development of Default Values in North Carolina, Daniel Findley/Jeff Chang/Chris Vaughan/Bastian Schroeder/Bob Foyle/David Alford

A method for Scenario Selection and Probability Adjustment for Reliability and Active Traffic Management (ATM) analysis in a Highway Capacity Manual (HCM) Context, Behzad Aghdashi/Bastian Schroeder/Nagui Rouphail


Calibration and Field Validation of Four Double-Crossover Diamond Interchanges in VISSIM Microsimulation, Bastian Schroeder/Katy Salamati

Considerations for Effective LiDAR Deployment by Transportation Agencies, Jeff Chang/Daniel Findley/Chris Cunningham/Mary Tsai

Determining the Free-Flow Speeds in a Regional Travel Demand Model Based on the Highway Capacity Manual, Chao Wang/Joe Huey

Dynamic Bandwidth Analysis and Optimization for Coordinated Arterial Streets, Sangkey Kim/Ali Hajabaie/Nagui Rouphail/Billy Williams


Lane Utilization at Two-lane Arterial Approaches to Double Crossover Diamond (DCD) Interchanges, Chunho Yeom/Bastian Schroeder/Chris Cunningham/Chris Vaughan/Nagui Rouphail/Joe Hummer

Modeling Impact of Subject and Opponent Vehicle on Crash Severity in Two-Vehicle Collisions, Guillermina Torrao/Margarida Coelho/Nagui Rouphail

Pedestrian and Bicycle Accommodation on Superstreets, Anne Holzem/Joe Hummer/Nagui Rouphail/Chris Cunningham/Sarah O’Brien/Bastian Schroeder/Katy Salamati/Bob Foyle

Traffic Stream Model Evaluation Under Inclement Weather Condition Through a Fused Database Approach, Soheil Sajjadi/Bastian Schroeder/Nagui Rouphail

Synergistic Traffic Signal Optimization and System Optimal Traffic Assignment, Ali Hajabaie


The Potential for Metering to Help Roundabouts Manage Peak Period Demands, in the US, Joe Hummer/Katy Salamati/Bastian Schroeder/Joe Milazzo

PANEL DISCUSSION: Simulation: Looking Back and Looking Ahead, George List

WORKSHOP: Preparing for the Near Future of Aviation with Integrated NextGen and Unmanned Aerial Systems, Kyle Snyder
Conference and Workshop Attendance, Participation and Exhibits in 2013

Center for Transportation and the Environment (CTE)
- Context Sensitive Solutions National Dialog 2 Workshop, Raleigh, NC, February, 2013 (J. Martin, N. Bailey, E. Murray)
- Context Sensitive Solutions National Dialog 2 Workshop, Sacramento, CA, April, 2013 (J. Martin, N. Bailey, E. Murray)
- 2013 International Conference on Ecology and Transportation (ICOET), Scottsdale, AZ, June, 2013 (J. Martin, N. Bailey, E. Murray)
- Context Sensitive Solutions National Dialog 2 Workshop, Olympia, WA, August, 2013 (J. Martin, N. Bailey, E. Murray)
- Context Sensitive Solutions National Dialog 2 Workshop, Santa Fe, NM, December, 2013 (J. Martin, N. Bailey, E. Murray)

Geovisual Analytics and Decision Management Group (GADA)
- North Carolina GIS Conference, Raleigh, NC, February, 2013 (A. Belcher, attended)
- Troop-Level Data Visualization for Operational Enforcement Planning, CVSA Intelligent Transportation Systems Technology Forum - Denver, CO - September, 2013 (G. Ferrara, presented)
- A Performance-Based Visual Analytics Platform for Improving Motor Carrier Enforcement Operational Effectiveness, TRB Visualization Symposium, Irvine, CA, October, 2013 (G. Ferrara, presented)
- Traffic Records Forum, St Paul, MN, October, 2013 (A. Belcher, presented)

Highway Systems
- Geospatial Transportation Mapping Association. 1st Annual Meeting and Transportation Data Expo. Infrastructure Investment Protection with LiDAR. March, 2013. Hyatt Regency, Crystal City, VA. (B. Schroeder presented, D. Findley, C. Cunningham attended)
- Freeway Reliability in the Highway Capacity Manual, STRIDE Regional Conference. Orlando, FL. April, 2013. (B. Schroeder presented)
- Empirically-Based Performance Assessment and Simulation of Pedestrian Behavior at Unsignalized Crossings, ITE Technical Conference, San Diego, CA. March, 2013. (B. Schroeder presented)
- TRB Highway Capacity Committee Midyear Meeting. New York City, NY. July, 2013. (B. Schroeder presented)
- NCSITE SimCap Users Group Meeting. Calibration and Analysis Guidance of four DCD Interchanges in VISSIM. Raleigh, NC. September, 2013. (B. Schroeder presented)
- NCSITE SimCap Users Group Meeting. Treatments for Pedestrian and Bicycle Accommodations at Superstreets Analyzed in VISSIM. Raleigh, NC. September, 2013. (A. Holzem presented)
- PTV America Users Group Meeting. Evaluating Innovative Treatments for Pedestrians and Bicycles at Superstreet Intersections in VISSIM. Portland, OR. October, 2013. (B. Schroeder presented)
- A Hybrid Method for Scenario Generation in the Freeway Travel Time Reliability Analysis'. INFORMS conference, Minneapolis, MN, October, 2013 (B. Aghdashi presented)


National Orientation and Mobility Conference. *Twelve Years of Research about Crossing Streets at Complex Intersections: What We’ve Learned from the National Eye Institute Research Program and Where We Go From Here.* New Orleans, LA. December, 2013 (B. Schroeder presented)

**ITRE Director**


Invited Presenter, “SHRP 2 L08: Incorporation of Travel Time Reliability into the HCM,” for the Strategic Highway Research Program 2, Transportation Research Board, Portland, Oregon, April, 2013


Presenter, NCFRP41 Panel Meeting, ITRE, July, 2013

Attended, Midyear Meeting of the HCQS Committee, Brooklyn, NY, July, 2013


Keynote Speaker, “Reliability as a Means for Integrating Mobility and Safety Considerations in Strategy Selection,” 16th Annual EURO Working Group on Transportation, Porto, Portugal, September, 2013

Invited Presenter, “ITRE and its Research Capabilities,” University of Tennessee, Knoxville, TN, November, 2013

Presenter, Travel Time Reliability for Transportation Facilities, University of Tennessee, Knoxville, TN, November, 2013

Invited PhD Opponent, Jorge Bandeira, University of Aveiro, Portugal, December, 2013

**NC Local Technical Assistant Program (NC LTAP)**

LTAP Region 4 Annual Conference, Louisville, KY, May 2013 (J. Martin, L. Collier, attended)

APWA-NC State Chapter Annual Conference and Exposition, Wilmington, NC, June 2013 (J. Martin, L. Collier, B. Woods, facilitated and exhibited)


APWA-NC Combined Equipment Services and Streets Division Conference, New Bern, September 2013 (J. Martin, L. Collier, B. Woods, facilitated and exhibited)

APWA-NC Meet and Greet and Leadership Training, December 201, (J. Martin, L. Collier, N. Bailey facilitated)

Participated in monthly board meeting for APWA-NC Streets Division, Greensboro, NC, (L. Collier)

Participated in APWA-NC State Chapter Board Meetings, Greensboro, NC (L. Collier)

**NextGen Air Transportation (NGAT) Center**

NC Emergency Management Forum, January, 2013 (K. Snyder, presented)

AAAE Airport Planning Conference, February, 2013 (K. Snyder, presented)

NC Northeast State of the Region, March, 2013 (K. Snyder, presented)

NC Airports Association Conference, April, 2013 (K. Snyder, presented)

NCSU AIAA Student Chapter, April, 2013 (K. Snyder, presented)

Transportation You, April, 2013 (K. Snyder, presented)

Ohio UAS Conference, April, 2013 (K. Snyder, presented)

NGAT UAS Summer Workshop, July, 2013 (K. Snyder, hosted)

NC Military Foundation Luncheon with NC Delegation (DC), July, 2013 (K. Snyder, hosted)
Airport Consultants Council 2013 Summer Workshop, July, 2013 (K. Snyder, presented)
NC Aerospace Suppliers Conference, August, 2013 (K. Snyder, presented)
AUVSI Unmanned Systems North America, August, 2013 (K. Snyder, attended)
AvWeek’s NextGen Ahead Conference, September, 2013 (K. Snyder, attended)
NGAT UAS Local Reception, November, 2013 (K. Snyder, hosted)

Public Transportation


APC User Group, Fayetteville, NC, February, 2013 (D. Collins presented)

NCPT Conference, Wilmington, NC, April 2013 (D. Collins, K. Monast presented, J. Scott attended)

Americans With Disabilities Workshops, Hickory, Greensboro, Raleigh, April, 2013 (D. Collins, J. Scott attended)


NCDOT PTD Staff on Technology workshop, Raleigh, NC, June, 2013 (D. Collins, K. Monast, J. Scott presented)

Skillbuilding Workshop: Building Relationships with Public Officials at Every Level, Raleigh, NC June, 2013, (J. Scott attended)

Skillbuilding Workshop: Budgeting as a Planning Tool for Additional Funding, Raleigh, NC, June ,2013 (K. Monast presented)

ITE Technical Advisory Group Meetings: Transit ITS Standards Module Development, June, 2013 to present (D. Collins, attended)

NCPTA conference workshops held at SEA TRAIL RESORT, Sunset Beach, NC , July 2013 (M. Perez, attended)

Watch for Me - NC Tactical Training Workshop, August, 2013 (S. O’Brien, attended)

NCDOT PTD workshop on Prioritization, Raleigh, NC, August, 2013 (D. Collins, attended)

Quarterly NCMPO Meeting, High Point, NC, September, 2013 (D. Collins, presented)


*Taking the “B” Train*, North Carolina Bicycle Summit, October, 2013 (K. Jackson, presented)

*NCDOT’s Let’s Go NC! Curriculum*, North Carolina Bicycle Summit, October, 2013 (S. O’Brien, presented)

CITE Consortium Course (NHI): Introduction to System Engineering, Fall, 2013 (D. Collins, attended)

TCRP Project G-13: A Transit Manager’s Guide to Using ITS Data to Work Smarter and Cheaper; Developing Content for the APTA Tech Portal (D. Collins, panel member)

CITE Consortium Course: Managing High Technology Projects in Transportation, Fall, 2013 (D. Collins, attended)

Transportation Leadership Development - Clemmons and Salisbury, Fall, 2013 (D. Collins, presented, J. Scott, attended)

Cite Consortium Course (NHI): Introduction to Systems Engineering, Fall, 2013 (D. Collins, attended)

Travel Behavior Modeling Group

*Development of a New Commercial Vehicle Travel Model for Triangle Region*, 14th TRB Transportation Planning Applications Conference, Columbus, Ohio, May 2013, (B. Mei, J. Huegy presented)
**Refereed Journal Papers**


Other Publications and Reports


NGAT Center at ITRE Conducts

*First FAA Approved Unmanned Aircraft System Flight in NC*

We all remember what happened December 17, 1903 in Kitty Hawk, NC. One hundred and ten years later we are breaking more barriers. On March 21, 2013 the NGAT Center at ITRE conducted the first flight of an unmanned aircraft system (UAS) in North Carolina under an approved Certificate of Authorization from the FAA. In the summer of 2013, the NGAT Center began regular research flights of UAS for capturing agriculture imagery at the Hyde County Airport in northeastern North Carolina. Under a Golden Leaf Foundation grant, the NGAT Center is working with multiple departments on campus to support the flight operations and image analysis of the agriculture data captured during these research flights. The flight data is also shared with the FAA to support research into safe integration of UAS into the National Airspace System. In August the NGAT Center received a waiver from the state CIO to continue UAS research to support development of a governance structure and policies for statewide integration. NGAT agriculture research will continue in the spring of 2014 with both the BOSH Super Swiper UAS and the UTC Aerospace Systems Vireo small UAS aircraft returning to flight. For more information on this program, email Kyle Snyder (kyle_snyder@ncsu.edu).
Student and Scholar Activities

Support for Scholars and Students

ITRE research and technical assistance projects continue to engage and support a large number of students from various disciplines and universities. The adjoining tables summarize our record of accomplishments in providing student support, indicating increased graduate student participation in ITRE research. In 2013, we had the highest number of supported research graduate students in our history (36). More importantly, much of the graduate student support has come from federal research dollars from agencies such as the National Science Foundation, the National Cooperative Highway Research Program (NCHRP), the Strategic Highway Research Program (SHRP-2), the Federal Highway Administration and the Environmental Protection Agency. Many of the graduate students at ITRE have received full Research Assistantship support. We also provided meaningful research experiences for our undergraduate students, primarily in the areas of transportation systems, rail operations and a variety of other fields. ITRE also recruited two high school students, Chris Carnes, from the Academy of Information Technology (AOIT) program, Apex High School, Apex, NC. and Edward Foyle from the North Carolina School of Science and Mathematics, Durham, NC.

Post-Doctoral Fellows and Visiting Scholars

ITRE continues to engage both post-doctoral candidates and visiting students and scholars. This past year, we were pleased to hire Dr. Katy Salamati and Dr. Behzad Aghdashi as post-doctoral scholars. Dr. Salamati completed her doctoral work at North Carolina State University with a focus in pedestrian accessibility to complex intersections. Dr. Aghdashi also graduated from North Carolina State University with a doctoral degree in operations research. His research focuses in ramp metering on freeways.

Dr. Ali Hajbabaie, who has completed his doctoral work at the University of Illinois at Urbana-Champaign (UIUC) in the areas of traffic operations, focused on signal optimization, and safety, continues his research at ITRE at the national level including several SHRP-2 and NCHRP projects, and on an NCDOT project on arterial work zones.

PhD student Paulo Fernandes and Dr. Margarida Coelho, assistant professor from the University of Aveiro, Portugal, visited ITRE in January 2013 continuing their research collaboration on infrastructure design and operations and its impact on vehicle emissions. PhD student, Ling Ding, from the Southeast University in Nanjing, China, studied at ITRE this past spring, with Dr. Billy Williams. During her visit, she assisted in research with the NCDOT SmartLink Project.

PhD student Flavia De Simone is also studying with Dr. Billy Williams at ITRE this fall. She attends the Sapienza University of Roma, Italy and her doctoral research focuses on traffic safety.

<table>
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<tr>
<th>2013 Supported Graduate Students</th>
<th>Academic Year</th>
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<td>Sangkey Kim</td>
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<td>Isaac Kumar</td>
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<td>Edward Foyle, Chris Carnes</td>
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The Context Sensitive Solutions (CSS) National Dialog 2 builds upon FHWA’s efforts to promote an ongoing exchange of ideas, and to drive momentum for wider implementation of CSS in the transportation industry. The 2012-2013 workshop series highlights the linkages between CSS and sustainability, livability, striking a balance between needs and affordability, as well as the value of CSS for improving all phases of the transportation decision-making process, from planning, to design, construction, maintenance, performance evaluation, and into the next planning cycle.

At the Transportation Founders Fund Speaker Series, held April 18, 2013 at the Monteith Research Center on the Centennial Campus of North Carolina State University, the theme was Transportation Technologies for the 21st Century: A Peek at the Highway, Rail, and Aviation Modes. Three panelists addressed technological innovations in transportation in their individual fields.

### Exhibit IX

**Summary of Continuing Education Activities**

More than 11,000 transportation professionals - from flaggers to professional engineers - received the benefit of ITRE’s education activities during 2013. The Transportation Founders Fund also offered a well-attended seminar in April 2013 on Transportation Technologies for the 21st Century. Exhibit IX lists training areas, workshops and summary statistics, including a separate listing of ITRE’s Distance Learning training.

<table>
<thead>
<tr>
<th>Program</th>
<th>Training/Workshops in 2013</th>
<th>Instruction Hours per Session</th>
<th>Sessions Offered</th>
<th>Total Hours</th>
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<tr>
<td>CTE</td>
<td>CSS National Dialog Workshops / Webcasts - Raleigh, NC (February); Sacramento, CA (April); Olympia, WA (August); Albany, NY (October); Santa Fe, NM (December)</td>
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<td>CSS National Dialog National Webcast - “Shaping the Conversation” (July)</td>
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<td>ICOET 2013 International Conference on Ecology and Transportation (June)</td>
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<td>Introduce a Girl to Engineering Workshops - Raleigh, NC (February); Winston-Salem, NC (February); Greenville, NC (March)</td>
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<td>Transportation YOU - Raleigh, NC (February, April, November)</td>
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<td>LEGO® Robot Vehicle Lesson Plans for Secondary Education Workshop - Raleigh, NC (October)</td>
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<td>Transportation Research Board reception at Annual TRB Meeting, Washington, DC, (January)</td>
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<td><strong>Distance Learning</strong></td>
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<td>Fundamentals of Engineering (FE) Tues/Fri review course</td>
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## Pupil Transportation

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Andy Wagner was recently awarded the Mulkey/General Hugh Shelton Leadership Award for 2013. This award is given to a senior civil engineering student at NCSU who exhibits values-based leadership. Andy was honored at a scholarship recognition banquet held November 7.

In addition to majoring in civil engineering at NCSU, Andy is minorng in mathematics. He currently works part-time for the finance office at ITRE and was previously employed at ITRE doing research on the Smartlink project involving congestion mapping and data analysis. He also had an internship with Newport News Shipbuilding and a co-op with RMF Engineering.

Andy began his undergraduate experience in the University Honors Program and has maintained a high grade point average. As a member of the NC Alpha Chapter of Tau Beta Pi engineering honor society, Andy has been a member of the officer team for three years – serving as chapter president in 2012/13.

Andy plans to pursue graduate studies in transportation engineering and is interested in working in the field of Intelligent Transportation Systems.
Marketing/Public Relations

As ITRE works to position itself as a world-class transportation research center, the Institute continues to focus its efforts on increasing national visibility. Whether making presentations at conferences and seminars—both nationally and abroad, receiving awards and recognition for contributions to the field, establishing collaborations with universities in foreign countries, or working to solve transportation problems and educate transportation professionals, ITRE staff work toward the achievement of this goal.

Sharing the accomplishments and successes brought about by these efforts has been the focus of marketing and public relations for 2013. ITRE staff members provide services to support the goals and objectives of ITRE that relate to marketing and public relations.

On the ITRE Website:
- Activities, events, programs, and research were featured in ITRE Directions, a quarterly online newsletter available on the “News and Events” page.
- News items were featured on the home page.
- Current research papers and reports continue to be made available through either source links or PDF files from a searchable database in the “Research” section of the Website.
- The Transportation Founders Fund Speaker Series for 2013 was promoted through a printed brochure and on the ITRE website prior to the event. Afterwards, a video of the event, including speaker presentations, was made available from the “Transportation Founders Fund” section of the site. A photo gallery for the event was also made available on the website.
- ITRE recognized staff who presented at the TRB Annual Meeting through a listing of session papers and a photo gallery made available on the website.
- A new feature, “Courses of Interest” was added to the home page. Links to selected courses that are open for registration will rotate periodically. A link to the main “Training and Education” page is included.
- ITRE worked with its centers and program groups as well as other transportation-related organizations to maintain over 15 websites.
- ITRE continues to share items of interest on Facebook. It is accessible through the Facebook button on the home page of the website.
- Website analytics show that the total number of pages viewed on the ITRE website has increased 4.82% from the same period in 2012.

Articles in TRB Transportation Research E-Newsletter
- Announcements about ITRE Directions and Annual Reports

Items in business updates section of News & Observer (Career Moves, Tech Moves)
- Mike Miller as director, Geovisual Analytics and Decision Management Group - Tech Moves, September 9, 2013
- Joe Huegy as director, Travel Behavior Modeling Group - Career Moves, September 24, 2013

Media coverage of NGAT Center activities
- UNC TV (PBS): NC Now (12/10/12)
- WUNC NPR: “The State of Things”
- “Corn doesn’t care”- LA Times (4/8)
- “NC State steps up drone testing ahead of 2015 launch”, Raleigh News and Observer, Oct 2013
- Aviation Week Magazine, Nov 25, 2013
- Elite Magazine, December 2013
ITRE Staff Participation in Community Service

We helped at the Inter-Faith Food Shuttle Market,

we worked with Habitat for Humanity,

and we helped create a trail for the Walnut Creek Wetland Center.
Websites Hosted by ITRE

- [www.itre.ncsu.edu](http://www.itre.ncsu.edu)
- [www.itre.ncsu.edu/cte/](http://www.itre.ncsu.edu/cte/)
- [www.itre.ncsu.edu/ngat/](http://www.itre.ncsu.edu/ngat/)
- [www.icoet.net](http://www.icoet.net)
- [www.itre.ncsu.edu/ored/](http://www.itre.ncsu.edu/ored/)
- [www.cssnationaldialog.org](http://www.cssnationaldialog.org)
- [www.cte.ncsu.edu/engineering](http://www.cte.ncsu.edu/engineering)
- [http://ored-outcomes.itre.ncsu.edu/](http://ored-outcomes.itre.ncsu.edu/)
- [www.ncbussafety.org](http://www.ncbussafety.org)
- [www.nasdpts.org](http://www.nasdpts.org)
- [www.coverlab.org](http://www.coverlab.org)