

NC State University Center/Institute Annual Report

FY 2022

INSTITUTE FOR TRANSPORTATION RESEARCH AND EDUCATION (ITRE)

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MISSION AND VISION STATEMENT

The Institute for Transportation Research and Education (ITRE) carries out research, training and technical support activities in the areas of surface and air transportation for a host of national, state, and local clients to address the nation's critical transportation issues.

RESEARCH IMPACT

ITRE research programs — and the Institute's related training and technology transfer activities — continue to have a significant impact on the transportation practice both locally and nationally. The following are highlights from ITRE's activities in this FY.

TRB COMMITTEES AND ANNUAL MEETING PRESENTATIONS

ITRE maintains an ongoing, high-profile presence and role in the Transportation Research Board (TRB), a division of the National Academy of Sciences, Engineering, and Medicine. ITRE research staff and affiliated faculty serve as active full members of nine standing TRB committees. Much of the important business of setting national transportation research direction is done by these committees at the TRB annual meeting held each year in January. In addition to critical committee work, ITRE researchers and affiliated faculty presented 21 research papers in poster sessions and two papers in lectern sessions this year.

STRIDE CONSORTIUM

ITRE has conducted research annually since 2016 for the Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE), a University Transportation Center (UTC) funded by a grant from the U.S. Department of Transportation (USDOT). As the UTC for Region 4 (Southeast U.S.), STRIDE is a multi-university research consortium that includes NC State and is housed at the University of Florida Transportation Institute (UFTI). The UTC grant provides the consortium with up to \$14 million over five years towards developing novel strategies for reducing traffic congestion. STRIDE research efforts are addressing congestion through new in-vehicle technologies, telecommunications advances, and the rise of shared mobility and autonomous vehicles. STRIDE is also working to strengthen the regional transportation workforce and practice through educational and technology transfer activities.

In this FY ITRE's Public Transportation Group completed Phase I of a STRIDE project that combined three large datasets to identify where school and public transportation buses are impacted by congestion and how much this congestion costs. Phase II, set to begin in FY 2023, will expand on this research to develop a practitioner-ready tool that streamlines the process, enabling local governments to conduct the analysis themselves.

ITRE's Highway Systems Group completed two STRIDE projects this FY. The first project, which was completed in collaboration with UNC Highway Safety Research Center, Georgia Tech, and Auburn University, focused on innovative intersection and interchange design implementations across the southeastern U.S. The focus of ITRE's efforts was on safety evaluation techniques for new intersection forms that are currently not in place. Movement-based safety performance functions were developed based on data from similar "movements" in place across the southeastern U.S., such as left turn crossovers or u-turns. The second effort looked at the Highway Capacity Manual weaving definitions and provided recommendations for future evaluations of weaving on freeway segments that should be updated in future guidance.

The above-mentioned projects also involve researchers at other member universities in the STRIDE consortium. For more information on STRIDE visit: <https://stride.ce.ufl.edu>

INTELLIGENT TRANSPORTATION SYSTEMS / CONNECTED AUTONOMOUS VEHICLES (ITS/ CAV)

ITRE's ITS/CAV lab under the Highway Systems Group also completed a STRIDE project this FY. Titled "Utilization of Connectivity and Automation in Support of Transportation Agencies' Decision Making," the project was conducted in collaboration with the University of Florida, Georgia Institute of Technology, and Florida International University. The project assessed the existing research that enables simulation of Connected-Autonomous Vehicles (CAV), documented state agency needs regarding planning and operations of highways with CAV presence, and developed a framework and guidance for CAV modeling by stakeholders. ITRE's researchers were involved in all aspects of the project.

ITRE's researchers are also currently involved in multiple state and national projects focusing on CAVs and are leading most of them. The completion date of these projects ranges from December 2022 to December 2025.

PORT & FERRY

Investigation of Wait Time Technology for the Ferry System

The North Carolina Department of Transportation (NCDOT) Ferry Division operates vessels on seven routes along the eastern coast of North Carolina. The routes serve diverse populations, ranging from routes with substantial tourist/visitor customers to routes with primarily daily commuters. Similar to traffic signals on a road network, queuing and waiting are unavoidable at ferry terminals, and wait times and queue lengths are important considerations of customers. However, measuring and communicating wait times and queues is not simple and not currently available to NCDOT ferry customers. The NCDOT Ferry Division would like to implement technology that can reliably measure and track wait times. The objectives of this project were to 1) review and test options for measuring wait times, and 2) recommend the implementation of a system to measure and track wait times for installation at ferry terminals.

This research conducted a systematic review of the state-of-the-art technologies that can be used for measuring wait times. Summary tables were developed with information that can be used by the Ferry Division and other NCDOT staff to understand the advantages and disadvantages of various technologies. The research then tested the feasibility of applying Bluetooth and License Plate Recognition (LPR) technologies to track vehicles and estimate waiting times at ferry terminals. Based on a series of tests, this research revealed that the LPR technology achieved a match rate of 79.4 percent, which was significantly higher than the match rate of Bluetooth devices (9 percent). Thus, the LPR technology was recommended for waiting time

estimation. Based on field data collected at the busiest ferry terminal in North Carolina, this research found that travelers tended to experience long waiting times during midweek days, particularly during the mid-day period. Additionally, demand was found to be the primary factor for wait times during the midday peak period, and travelers' arrival time in terms of proximity to the scheduled ferry departure time was recognized as the key factor for waiting time during early morning and later evening non-peak periods.

RAIL

The Federal Railroad Administration in this FY funded an extension of ITRE's prior work with NCDOT looking at rail trespassing hot spots in the Southeast U.S., specifically in South Carolina and Georgia. The researchers are currently scheduling data collection efforts for 1-2 weeks per quarter for the next year to understand trespassing behavior by time-of-day, day-of-week, and seasonally. The goal of the research is two-fold: 1) provide a true understanding of the extent of trespassing events at hot spot locations, and 2) provide a method for predicting trespassing events based on data from the census.

A second ongoing effort is looking at trespassing behavior in-and-around moving trains, classified as "near miss events." Researchers are developing machine learning algorithms to detect pedestrian events from thermal and color camera systems deployed on test tracks (for calibration purposes with staged events) and actual short lines (for validation). At this time, the developed algorithms, which utilize the YOLOX and DETECTRON object detection models, are being deployed on previously collected data for validation purposes.

BICYCLE AND PEDESTRIAN PROGRAM

The Bicycle and Pedestrian Program at ITRE continues to support NCDOT with establishing and managing the North Carolina Non-Motorized Volume Data Program (NC NMVDP). The NC NMVDP began as a research project to test a bicycle and pedestrian count protocol for replication across the state. The program currently includes one of the most extensive statewide networks of continuous bicycle and pedestrian counting sensors. 71 individual loggers or 141 unique bicycle and pedestrian sensors were installed across seven NCDOT Divisions installed under Phase 1 and 2 of the program and represent 48 screenline counting locations. The program provides data management and reporting support for multiple local agency partners.

In early 2019, ITRE worked with NCDOT to integrate data from municipally-owned counters that are not currently included in the NC NMVDP. ITRE has onboarded 16 additional screenline counting locations to date under this new scope with plans to onboard dozens more counters over the next three years. This effort will allow the program to more rapidly scale while ensuring that all data are rigorously evaluated for accuracy and validity based on a standardized process and stored in a centralized, publicly-available reporting platform. New collaborators under this effort include the City of Raleigh Parks, Recreational, and Cultural Resources Department; Isothermal Planning and Development Commission; City of Greenville; and NC Department of Human and Health Services Division of Public Health (NC DHHS). ITRE is assisting NC DHHS with managing the data collected from its Pedestrian Counter Loaner Program. The loaner program was launched in late 2019 and allows communities to borrow pedestrian counters for up to 12 months to support walking in their community. Partnering with NC DHHS will enable the NC NMVDP to include rural communities more effectively while also leveraging the data to evaluate public health outcomes.

ITRE has also collaborated with the NC NMVDP's count equipment vendor to produce new research investigating count data validation methods and to engage in ongoing evaluative discussions to enhance the services that the vendor provides to local agency partners in support of the NC NMVDP. Through this

partnership, ITRE has established an annual workshop co-led by the count equipment vendor to provide the latest guidance on counter maintenance and data use for local agencies participating in the NC NMVDP. The first workshop was held in early 2020 with over 30 participants and the second workshop was held in June 2021. ITRE also partnered with the U.S. DOT Federal Highway Administration (FHWA) on a pilot project for testing non-motorized data submission to the national Travel Monitoring Analysis System (TMAS). This project resulted in a web-based tool that improves the efficiency of the NC NMVDP's established quality assurance/quality control processes and generates data reports formatted to FHWA's Traffic Monitoring Guide (TMG) standard. ITRE continues to develop this tool to gain efficiencies in programmatic data monitoring and review, as well as to produce high quality datasets for reporting to the institute's local agency partners and the public.

During the COVID-19 pandemic, the Bicycle and Pedestrian Program conducted specific analyses of the NC NMVDP network to see how bicycle and pedestrian travel changed during the pandemic. The team also worked with the UNC Highway Safety Research Center (HSRC) to examine vehicle interactions with bicyclists and pedestrians. This NCDOT sponsored research will result in guidelines to help planners across North Carolina determine what types of crosswalks and other modifications are necessary to ensure safe travel for all modes.

TRAFFIC SAFETY

The Highway Systems group was recently awarded three grants in the area of safety. The first grant, funded by NCDOT, develops movement-based safety performance functions (MBSPFs) that can calculate crash frequencies based on turning movement count data, conflict type, geometric data, and traffic control devices. This surrogate safety analysis method is based on real crash data, whereas all other surrogate methods are qualitative in nature. The method can be used to calculate expected crash rates for any intersection facility regardless of whether it has been constructed before or not.

Second, ITRE recently finished a safety evaluation of a controversial alternative intersection form known as the "continuous flow intersection" (CFI) on behalf of NCDOT. This type of intersection is known to be the most efficient intersection in existence; however, the prior safety evaluations done were not robust and found inconclusive evidence on whether they are safe for motorists. ITRE's work concluded that CFI sites can be designed safely if attention is paid to certain attributes of the site, particularly the right turn treatment.

Third, the ITRE Highway Systems group was recently funded under the National Cooperative Highway Research Program (NCHRP) project 07-108 to evaluate several alternative intersection forms using crash and surrogate data. ITRE will act as a subcontractor to the UNC Highway Safety Research Center, and will primarily be responsible for surrogate analysis methods building off of work on MBSPFs in prior projects mentioned above.

TRANSIT PROGRAM

The Public Transportation Group continues to provide technical assistance and data analysis to NCDOT and the transit systems across the state. During the COVID-19 pandemic, the team has further expanded its roles to include assisting with developing funding formulas and programs for Federal emergency funding designed to enhance essential mobility and provide access to healthcare, including vaccines.

The team completed its first USDOT/STRIDE project with partners at the University of Florida that located where and when school and public transportation buses experience congestion. The research found that

GoDurham transit in Durham County, NC, incurs at least an additional \$1.8 million in operating expenses due to recurring delays. Durham Public Schools (DPS) incur at least \$1.5 million in annual expenses related to recurring delay. In addition, DPS buses — many of which have dozens of riders on them — experience 113 hours of delay per day or 871 total days of delay during a school year. Learn more about this research at: https://transitportal.org/cost_of_congestion.html

Another notable project for the transit team is the First Mile to Health study, which is associated with one of NC State's NCDOT Transportation Centers for Excellence. This multi-year project involves researching the impacts of COVID-19, Medicaid Transformation, and the availability of same-day public transportation in rural North Carolina. The team has been working closely with the primary study site to acquire and implement new technology and plan for a new service delivery model. Meanwhile, the team has been gathering current data and establishing the analytical processes.

The final project of note is a microtransit research project funded by NCDOT where the team is partnering with NC State Civil Engineering's Dr. Eleni Bardaka. As microtransit gains popularity, it is important to understand related operating and policy goals and measure progress toward those goals. Through interviews and data collection, the team is developing profiles of the existing and planned microtransit projects across the state. The findings from Phase I will help inform policy changes at the state level and guide implementations at the local level. Phase II will take a deeper look at specific origins and destinations being served to determine the effects of microtransit on access, equity, and mobility.

ITRE Public Transportation director Kai Monast serves in national leadership roles for transit research. He is an active full member of the Transportation Research Board (TRB) Standing Committee on Rural, Intercity Bus, and Specialized Transportation and is chair of its Intercity Bus Subcommittee.

AVIATION

NC State, with ITRE as the lead, is a core university partner of the Alliance for System Safety of UAS through Research Excellence (ASSURE), the FAA's Center of Excellence for Uncrewed Aircraft Systems (UAS) Research. Since ASSURE's inception in 2015, ITRE aviation researchers have been part of seven funded research projects totaling over \$1 million in awards. This Center of Excellence is aimed at continuing and enhancing the safe, successful integration of drones into the public airspace, and NC State's contributions include advanced use cases such as Shielded Operations and Disaster Preparedness and Response, as well as Economic and Market Impact analyses for various UAS related sectors.

Partnerships and collaborations are mainstays for ITRE and NC State. The institute and university have worked with the NC Department of Transportation, nonprofits, industry partners, the United States Army, and businesses to facilitate outreach and engagement in the community. Many of NC State's technology initiatives focus on youth development, in particular around science, technology, engineering and math (STEM) educational topics. Last year NC State launched a one-week STEM camp with a focus on drones for rising 10th grade students in partnership with NAF (formerly the National Academy Foundation) and the university's TRIO Pre-College program. Through corporate support from Lenovo, a grant was awarded to purchase Tello EDU drones to help ignite students' passion for learning about and flying drones.

North Carolina's Research Triangle region has been selected for a \$24 million National Science Foundation (NSF) grant to build an advanced wireless communication testbed centered around programmable Uncrewed Aerial Vehicles (UAVs) and programmable radios called Aerial Experimentation Research Platform for Advanced Wireless, or AERPAW. On today's 4G networks, fixed cellular base stations

communicate with mobile phones. On the AERPAW platform, the base stations can also be mobile, with the ability to transmit and receive radio waves from user devices while moving on-demand. For example, in the aftermath of a natural disaster such as a hurricane, existing cellular networks may be damaged. As a result, aerial base stations can position themselves to provide the best wireless coverage to victims and first responders who would otherwise have no cellular connectivity. The platform also has the potential to help pilots fly drones beyond line of sight, allowing for improved air traffic control under Federal Aviation Administration (FAA) regulations. NC State is leading the AERPAW research with ITRE staff as a co-principal investigator on the project.

NC State was selected by the FAA in the first group of universities and colleges to be recognized as a member of the UAS Collegiate Training Initiative (CTI). The FAA's UAS-CTI program recognizes institutions that prepare students for careers in unmanned aircraft systems. In order to qualify for the initiative, schools must offer a bachelors or associates degree in UAS or a degree with a minor, concentration, or certificate in UAS. Schools must provide curriculum covering various aspects of UAS training, including hands-on flight practice, maintenance, uses, applications, privacy concerns, safety, and federal policies concerning UAS.

NC State's Trusted Operator Program (TOP) developed by the Association for Uncrewed Vehicle Systems International (AUVSI) provides a certification process for pilots beyond their FAA part 107. TOP fills the gap between these minimally prescriptive operating regulations and a higher level of demonstrated knowledge, flight proficiency, safety and risk management practices that is expected to be valued by employers and customers of commercial UAS operators. TOP is a professional uncrewed systems community initiative aimed at supporting industry accepted remote pilot standards and protocols, which will result in the safe and sustainable advancement of the industry. NC State is one of only four institutions of higher education in the US that is accredited to deliver all AUVSI TOP levels of certifications for pilots. As a training provider the university is able to support student pilots and assist its community partners.

ECONOMIC AND POLICY ASSESSMENT GROUP

North Carolina Airports Dashboards and Mapping Tools

This group continues to provide data and analytics support for the NCDOT Division of Aviation on a variety of topics related to aviation and aerospace through an interactive dashboard. View the dashboard at: <https://go.ncsu.edu/airports>

Economic Impacts of Mobility Investments in Mecklenburg County and the Benefits to the Charlotte Region: Synthesis of Information from Key Stakeholders, Economic Modeling, and Mobility Projects

The Charlotte Regional Business Alliance (CLT Alliance) sponsored research about the impact of a proposed Transformational Mobility Network (TMN) in Mecklenburg County and the benefits to the Charlotte Region. The research evaluated: 1) what's the economic cost of doing nothing, 2) the economic impacts that would result from new investments in each mode, 3) quality-of-life benefits and costs that commuters and individuals living in the region face under the existing transportation system, and how that surplus changes under new investment paradigms, and 4) interviews with over 100 key stakeholders.

The study was conducted and presented by ITRE in partnership with UNC Charlotte's Urban Institute. The Economic Impact Study examined all modes of transportation for TMN and the economic analysis showed benefits for the region. The CLT Alliance will utilize the study findings in the coming months to support

ongoing efforts among several public and private partners to launch the TMN, as the region aims to avoid some of the challenges that could result from doing nothing: a potential loss of up to 126,100 unrealized jobs, \$10.1 billion in lost wages, \$28.0 billion in economic outputs and \$3.0 billion in tax revenue by 2050. Talent could also choose to relocate from the area if congestion and other mobility issues are neglected.

Overall, the study results position this first-of-its kind TMN as a solution to preserve and improve the quality of life of community residents and visitors by expanding access to parks, trails, employment centers, schools and universities, and the many other destinations in the region, while also generating billions of dollars in economic impact. The TMN would help alleviate driver stress by making roads safer and less congested, enhance equity outcomes through greater public transportation access, offer opportunities for better physical health with well-connected networks for walking and cycling, and advance the region's economic pull for businesses seeking to locate in well-planned hubs of innovation.

SYSTEMS PLANNING AND ANALYSIS

Triangle Regional Model (TRM)

TRM continued in a new direction this FY with new staff members, a brand new model, significant model applications, enhanced reporting tools, interesting data analytics, data collection, modeling community interaction and training. The TRM Team welcomed two new full-time staff members early in the FY including a Team Lead and Lead Modeler, both with significant experience working with travel demand models.

Other TRM highlights include:

- **New Generation Model:** After almost two decades and within less than 1.5 years, a consultant team built the second generation TRM (TRMG2). TRMG2 is a state-of-the-art trip based model and includes several components that better reflect travel decisions and travel behavior.
- **Reporting Tools:** Making model output data more consumable and usable for model users is important. This year, all reporting tools from the previous model were converted for use with the new model. Also, new tools are in development phases.
- **Data Analytics:** Analyzing data collected for the model or model outputs can provide insights to influence regional planning decisions. Three years of data from the recurring Triangle Household Travel Survey (2016, 2018 and 2021) were analyzed during this FY. A slidedoc covering all three years was created along with a factsheet focusing on changes in travel behavior during the COVID pandemic. Also, a fact sheet was created that analyzed transit travel trends from on-board surveys that were recently conducted. All are available on the TRM page of the ITRE website. In addition, some of these analyses were presented at a state-wide conference for transportation planning professionals.
- **Data Collection:** Efforts for the fourth wave of the recurring Household Travel Survey have started. Data will be collected in Fall 2022 and delivered by Spring 2023 after being processed, cleaned, weighted and expanded.
- **User Forum:** Two meetings of the TRM User Forum were conducted where model users (consultants and agency staff) shared ideas and views related to the TRM. Both meetings were held virtually, had themes related to different model elements and had strong attendance from around the region.
- **Training:** Exposing local transportation and land use planners to the new TRMG2 model is essential to optimizing its usefulness and application throughout the region. A Planners Guidebook was developed that clearly explains each model component and how model output

could enhance local planning analyses. Training for planners, using this Guidebook as the curriculum, was provided in Summer 2022.

Interim Guidance on How to Incorporate Connected and Autonomous Vehicles (CAVs) into Traffic Forecasts

A technical assistance project for NCDOT titled “Interim Guidance on How to Incorporate CAVs into Traffic Forecasts” was completed in March 2022. This project applied a simplified approach to scenario testing in order to evaluate the impact of various levels of CAV penetration on year 2045 traffic forecasts. The work resulted in detailed adjustment factors that traffic forecasters can use to adjust traffic forecasts under a variety of situations.

EQUITY ANALYSIS AND PRACTICES

Enhancing the Strategic Prioritization Process with Socioeconomic Geospatial Analysis

This research project, which began in January 2021 and will close in December 2022, will help NCDOT evaluate socio-economic measures when prioritizing projects for funding. Currently, the NCDOT project prioritization process does not include empirically-based tools needed to identify projects that will provide significant quality of life benefits to North Carolinians. This study is designed to equip NCDOT with the geospatial analysis methods and guidance needed to incorporate data related to socio-economic measures, which is key to considering the equity of transportation investments. Study results have been presented at the national TRB Conference on Advancing Transportation Equity, the NCDOT Research & Innovation Summit, and the NC State Equity Symposium. The FHWA also invited the research team to present results as part of a workshop at the AASHTO GIS-T: Elevating Equity through Spatial Analysis and Visualization conference in April 2022.

Including Equity in Benefit-Cost Analysis

Research on this project, focused on developing two cross-modal measures that can be included in NCDOT’s prioritization process, started in August 2021. The measures can be used to estimate the benefits and costs that accrue from various transportation investments in the state. Research this year focused on reviewing relevant literature and data. A workshop was also conducted to develop a definition of equity to inform this project as well as transportation planning efforts. The research team is currently analyzing the data and refining the methodology that will be applied to several case studies. The research is scheduled to conclude in July 2023.

Assessing Metrics and Indicators for the Office of Civil Rights

This project, which began in May 2022 and will close in March 2023, is focused on enhancing knowledge about available data and metrics that the NCDOT Office of Civil Rights (OCR) can potentially use to inform decisions and policies. The project team is conducting a review of the state of the practices related to Key Performance Indicators (KPIs) to inform how the agency collects, analyzes and leverages data. The results of this project will provide guidance and implementation considerations OCR can use to improve their internal approaches and further enhance equitable practices at NCDOT.

MODELING AND COMPUTATION

Integrated Corridor Management (ICM) Dashboard

ICM systems offer the potential to manage travel demand and network demand in normal and abnormal conditions. Through increased awareness, decision support, and institutional coordination, ICM systems can shift the traditional reactive traffic management model to a proactive approach. With ICM, system operators can take action before corridor performance degrades and, in cases where degradation has already occurred, take action to quickly restore normal conditions. The ICM project includes many tasks such as before- and-after analysis of the NCDOT's ICM pilot application, sketch-planning models for estimating North Carolina's localized impact, and guidance and outreach material to enable ICM stakeholders to effectively implement ICM principles. As part of this project, ITRE developed a dashboard that automatically collects incident, travel time, and ICM strategies along multiple primary and alternative routes along the I-85 in Charlotte, NC. This dashboard helps ICM stakeholders visually investigate incidents occurring along the corridor and assess the effectiveness of newly-developed strategies as part of the project.

GEOVISUAL ANALYTICS AND DECISION MANAGEMENT GROUP (GADA)

GADA continues to partner with the NC Governor's Highway Safety Program (GHSP) and the NC State Highway Patrol (NCSHP) to support the shared mission of reducing traffic crashes and fatalities on North Carolina roads. The GADA team at ITRE provides technical and program support for the Commercial Vehicle Enforcement (CVE) section of the NCSHP, as well as North Carolina's NC Vision Zero (NCVZ) program.

COMMERCIAL VEHICLE ENFORCEMENT RESOURCE LAB (COVERLAB)

COVERLAB staff continue to support the Commercial Vehicle Enforcement (CVE) section of the NC State Highway Patrol (NCSHP) by providing technical and program assistance for the Federal Motor Carrier Safety Administration's (FMCSA) Motor Carrier Safety Assistance Program (MCSAP) and FHWA's Truck Size and Weight program. COVERLAB staff provide decision management services to help improve commercial vehicle enforcement effectiveness. This working partnership provides CVE with online performance measurement analytics, data-informed enforcement planning, on-demand requests, personnel allocation model development, performance optimization, grant writing assistance, special operations field support, and field research services. Learn more at: <https://coverlab.org>

NC VISION ZERO

NC Vision Zero (<https://ncvisionzero.org>) is North Carolina's collaborative initiative to eliminate roadway deaths and injuries in North Carolina. The goal of the NC Vision Zero initiative is to unify all safety stakeholders to reduce traffic fatalities. ITRE works collaboratively with North Carolina's GHSP, the UNC Highway Safety Research Center (HSRC), and UNC's Injury Prevention Research Center (IPRC), to host and maintain the NC Vision Zero website and related tools. This provides access to program content data visualization tools that service both the general public as well as traffic safety partners.

Among the online tools developed and maintained by ITRE for this initiative are:

- NC Vision Zero Analytics: A suite of data visualization tools for helping traffic safety partners and the general public measure and understand traffic fatality trends, locations, contributing circumstances, demographics, and more. These data visualization tools include

login-based performance measurement tools to assist the NCSHP, GHSP, and other traffic safety stakeholders across North Carolina in tracking crash reduction performance goals, visualizing data for in-depth analysis, and streamlining reporting requirements.

- NC Vision Zero Target Tracking Dashboard: A gated online data analytics system for safety stakeholders to track traffic safety goals and identify effective data-informed strategies for reducing traffic fatalities in North Carolina. The state's crash reduction goals are visually presented to (and co-tracked by) both the North Carolina State Highway Patrol and NC GHSP staff. Users can see how well they are performing with "views" specific to their geographic location. This provides a common "ground truth" and the capability to more effectively prioritize safety countermeasure activities for reducing traffic crashes and fatalities.
- NC Vision Zero Public Dashboards: A series of public-facing data analytics tools for helping the general public answer questions about crash data, identify problem areas by geographic area, and enable insights for understanding crash data trends.

ITRE staff also organize and host traffic safety training events in partnership with NC GHSP including an annual webinar series, the biennial NC Traffic Safety Conference (<http://nctrfficsafetyconference.org>) and other safety-focused workshops. In this FY ITRE produced eight webinars on various traffic safety topics and, in August 2021, ITRE hosted two "Road Safety Training for Law Enforcement and First Responders" training classes in Hickory and Raleigh. See Appendix B of this report for more details on these webinars and classes.

SCHOOL TRANSPORTATION SAFETY

ITRE staff continue to serve as leaders in school transportation safety with participation in National Highway Traffic Safety Administration (NHTSA) research and as key members of TRB committees and subcommittees supporting national research ideas. This FY, ITRE researcher Joy Davis was also appointed chair of the TRB Subcommittee on School Transportation (ACS10(3)).

ITRE is currently in the second phase of research for NCDOT observing queue lengths and loading procedures for carpoolers at North Carolina public, private and charter schools. The purpose of this project is to improve and validate the Municipal School Transportation Assistance calculator, which is used to support transportation planning for new North Carolina schools. The first phase of this research observed queues and loading procedures at over 70 North Carolina schools, most often using static traffic cameras strategically placed around each school's queuing area. For the second phase, ITRE is observing queues and loading procedures of 40+ schools using a combination of static cameras and drones, which provide a better vantage point to capture all or most of the queue in one recording. The ultimate goal for NCDOT is to better estimate the extent of a queue at a school based on its location, student population, grades served and other factors.

OPERATIONS RESEARCH AND EDUCATION LAB (OREd)

OREd assists public school systems with complex student enrollment forecasting, attendance zone analysis and facility optimization decision support. In this FY, OREd assisted an increasingly diverse mix of growing and shrinking school systems across North Carolina. For growing districts, this includes interviewing land developers and planners and identifying optimal areas to consider for new school construction. For shrinking districts, this includes evaluating which schools may have the least impact on the community and operations if closed. OREd serves districts and communities across North Carolina by promoting transparency, equity, and inclusion in the school facility planning process.

PUPIL TRANSPORTATION INFORMATION MANAGEMENT

The Pupil Transportation Information Management System (TIMS) at ITRE is an ongoing statewide project focused on maintaining and improving efficiency in school bus transportation at the district level. In this FY, TIMS staff provided technical assistance and training to school district personnel for operating computer-assisted school bus routing and scheduling software. This routing system allows school districts to create effective bus routes and maintain student, transportation and street network data at the local level, which provides district personnel with access to the most accurate and current information related to pupil transportation. To support these efforts, TIMS staff provide dozens of training classes per year as well as daily software and technical support to TIMS routing managers from school districts across the state. See Appendix B of this report for a listing of TIMS training classes delivered in this FY.

After the sudden closure of schools in March 2020 in response to the COVID-19 pandemic, the TIMS program was called into action to assist school districts. TIMS staff developed methodologies to manage irregular cohort assignments and bus routes for the 2020-2021 School Year. To help combat educational setbacks related to COVID, TIMS project leaders were also heavily involved with assisting the entire state with managing student assignments and bus routes for the largest summer school programs in North Carolina history. TIMS staff also provided significant bus route planning assistance to school transportation departments as they prepared for a more normal return to school in August 2021.

As part of the long-term relationship with the North Carolina Department of Public Instruction (NCDPI), TIMS project leaders at ITRE were identified as key stakeholders and included as primary members of the evaluation team related to NC House Bill 256, “THE SMART SCHOOL BUS SAFETY PILOT PROGRAM” (<https://www.ncleg.gov/Sessions/2021/Bills/House/PDF/H256v1.pdf>). TIMS Project Leaders continue to be involved in the evaluation of school bus routing software from developers not currently approved for use in North Carolina.

HIGHWAY SYSTEMS TRAINING

In addition to highway systems research described earlier in this report, ITRE delivers a wide range of training workshops, courses and webinars in the areas of highway engineering, operations, geometrics and safety. Training is designed for engineers, technicians, maintenance and operations staff, and related professionals across the United States working in transportation and traffic safety. Some ongoing courses are tailored specifically to NCDOT personnel. ITRE’s Maintenance Operations and Safety Program is an established leader throughout the southeastern U.S. for training transportation department employees on work zone safety, flagging operations, and related safety and maintenance topics. Highway Systems staff at ITRE trained 2189 practitioners through 34 courses and activities offered this year. See Appendix B of this report for a listing of the Highway Systems training activities in this FY.

NORTH CAROLINA LOCAL TECHNICAL ASSISTANCE PROGRAM (NC LTAP)

NC LTAP is one of the 51 Local Technical Assistance Program (LTAP) centers nationwide. There is an LTAP center in each state and in Puerto Rico. LTAP was established by the U.S. DOT Federal Highway Administration in 1982, and North Carolina’s center at ITRE was one of the first organized in 1986. LTAP’s mission is to help local agencies tap into new technology, information, and training so they can operate more efficiently and safely. LTAP centers provide access to training and information that may not have otherwise been accessible. Centers provide local road departments with workforce development

services, resources to enhance safety and security, solutions to environmental, congestion, capacity and other issues, technical publications, and training videos and materials. In this FY, NC LTAP trained 1668 practitioners statewide through 41 course offerings. See Appendix B of this report for a listing of NC LTAP training activities in this FY.

NORTH CAROLINA AIRPORT TECHNICAL ASSISTANCE PROGRAM (NC AIRTAP)

NC AirTAP is a joint effort of ITRE and the NCDOT Division of Aviation, with support from the NC Airports Association, to provide educational offerings, information resources and related assistance to the state's public- and private-sector airport professionals. NC AirTAP helps North Carolina airports improve the safety, quality and efficiency of their operations and increase the use of new aviation materials and technology. The program also helps airport staff build a community network for exchanging best practices.

NC AirTAP in this FY concluded its inaugural work on the NC Airport Leadership and Management Program (ALMP), a 12-part training course series designed for the state's airport officials, managers and operations staff. The final two ALMP courses were developed and delivered by November 2021:

- Course 11, Future Airport Opportunities: Offers strategies for managing the technological paradigm shifts facing airports today and in the near future.
- Course 12, The Airport Consultant: Examines the role of the airport consultant in North Carolina and the relationships between the Airport Sponsor, the Consultant, and the NCDOT Airport Project Manager.

The ALMP series was relaunched in March 2022 with updated course content and new instructors added. Three updated courses — two in-person and one online/on-demand — were offered through the end of this FY. A second on-demand online course is in development. The remaining eight courses are planned for in-person instruction and will be offered approximately every other month. Participants who complete nine or more ALMP courses earn their “North Carolina Airport Professional” (NCAP) certification. Nine participants were awarded NCAP certificates this FY and 36 total have earned the designation. Over 240 professionals have participated in ALMP courses to date.

NC AirTAP staff in this FY also supported the NCDOT Division of Aviation with these activities:

- Hosting quarterly statewide virtual meetings of the NC Airport Community including sponsors and administrators of the state's 72 public airports and their engineering/planning consultants.
- Presentations and technical assistance at the annual NC Airports Association conference.
- Hosting a 1.5-day hybrid meeting of FAA State Block Grant Program administrators from Georgia, Illinois, Michigan, Missouri, New Hampshire, North Carolina, Pennsylvania, Tennessee, Texas, and Wisconsin.
- Hosting a statewide virtual briefing on the biennial “N.C. State of Aviation Economic Impact Study” for the state's public airport sponsors and administrators.

See Appendix B of this report for a listing of NC AirTAP training activities in this FY.

PERSONNEL

Number of NC State faculty members currently affiliated with the Center/Institute — 37

Number of staff members currently affiliated with the Center/Institute — 45

PUBLICATIONS

Total number of annual Publications — 32 (see Appendix A for a complete listing)

Noteworthy publications:

- *Economic Impacts of Mobility Investments in Mecklenburg County and the Benefits to the Charlotte Region: Synthesis of Information from Key Stakeholders, Economic Modeling, and Mobility Projections*
 Authors: Bert, S., Nicholas, C., Dudley, T., Callister, L., Walden, M., Huntsinger, L., Findley, D., Xiong, K., Thomas, L., and Anderson, B.
 Conducted for the Charlotte Regional Business Alliance, this research evaluated: 1) what's the economic cost of doing nothing, 2) the economic impacts that would result from new investments in each mode, 3) quality-of-life benefits and costs that commuters and individuals living in the region face under the existing transportation system, and how that surplus changes under new investment paradigms, and 4) interviews with over 100 key stakeholders.
- *Examination of Temporal, Classification, and Population Impacts of Flight Operations at Airports in the United States During the COVID-19 Pandemic*
 Authors: Findley, D.J., Bert, S., Lippert, C., Walston, B., and Conner, A.
 This paper, published in the *ASCE Journal of Transportation Engineering, Part A: Systems*, found that for commercial service and general aviation airports, the airports with the quickest and most substantial recoveries related to the COVID-19 pandemic were in areas with populations of under 100,000 people [within 48.2 km (30 mi) of the airport]. Airports with higher and lower populations within 48.2 km experienced sharper declines in flights and slower recoveries.
- *Movement-Based Intersection Crash Frequency Modeling*
 Authors: Lee, T.; Cunningham, C.M.; and N. Roupail
 Published in the *Journal of Transportation Safety and Security*, this safety analysis method predicts crash frequency for any intersection form using surrogate data such as conflict point type, traffic volume by approach, etc. Ongoing ITRE research will update these models using other features such as geometric design elements, signal type, number of lanes, etc. No other method exist that uses actual crashes and other surrogate data to predict crash frequency. This is especially important for judging the safety of novel intersection forms yet to be designed.
- *Spatial Distribution and the Facility Evaluation of the Service and Rest Areas in the Toll Motorway Network of the European Union*
 Authors: Pérez-Acebo, H., Romo-Martín, A., and Findley, D.J.
 Published in *Applied Spatial Analysis and Policy*, the analysis presented in this paper of the average and maximum distances between areas and the facilities provided showed a great variability due to different distribution policies. Few regulations exist that establish maximum distances between areas. Standardization of the spatial distribution of these facilities, on both free and tolled roadways, in the EU would benefit drivers, especially on long journeys, creating a consistent and predictable network of areas and services.

ACTIVITIES SUPPORTED BY THE CENTER/INSTITUTE

In this FY, ITRE conducted 118 training courses and related educational activities. See Appendix B of this report for a listing and descriptions of the activities.

EDUCATIONAL IMPACT

Numbers of students and professionals engaged in ITRE research, training and related educational activities.

NC State Undergraduate students:	51
NC State Master's students:	17
NC State PhD students:	9
Non-NC State Undergraduate students:	10
Non-NC State Master's students:	3
Other (Postdocs, industry professionals, etc.):	6180

FINANCIAL REPORT

Funds Received and Expended	Academic Affairs	Agricultural Research	Agency Funds	Auxiliary Sales and Services	Contracts and Grants	Endowments	F and A Receipts	Foundations	Gift and Loan Funds	FYTD Activity Total
Total Revenues	\$0	\$0	\$10,191	(\$902,191)	(\$7,482,355)	\$0	\$0	(\$16,570)	\$0	(\$8,390,925)
Personnel Expenditures	\$501,694	\$0	\$0	\$454,034	\$4,277,768	\$0	\$180,725	\$0	\$0	\$5,414,220
Operating Expenditures	\$0	\$0	\$2,276	\$314,303	\$1,187,013	\$0	\$123,940	\$0	\$2,111	\$1,629,643
Student Aid	\$0	\$0	\$0	\$0	\$33,507	\$0	\$0	\$0	\$0	\$33,507
Stipend Student	\$0	\$0	\$0	\$0	\$15,000	\$0	\$0	\$0	\$0	\$15,000
Stipend Non-Student	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Subcontracts	\$0	\$0	\$0	\$0	\$460,909	\$0	\$0	\$0	\$0	\$460,909
Transfers & Reserves	\$0	\$0	\$0	\$0	\$1,508,157	\$0	\$0	\$0	\$0	\$1,508,157
Total FYTD Expenditures	\$501,694	\$0	\$2,276	\$768,337	\$7,482,355	\$0	\$304,665	\$0	\$2,111	\$9,061,437

APPENDIX A – ANNUAL PUBLICATIONS

Title of Journal Paper, Report or other Publication	Author(s)	Name of Journal, Publisher or Client	Date Published
A Case Study of Rural Freight Transport – Two Regions in North Carolina	Findley, D.J., Bert, S., List, G., Coclanis, P., and Magliola, D.	Springer Sustainable Civil Infrastructures (SUCI)	2022
A Review on Volume-Delay-Functions: Connecting Theoretical Fundamental, Practical Deployment and Emerging Applications	Pan, Y., Y. Chen, J. Guo, M. Abbasi, G. List, and X. Zhou	SSRN (Elsevier)	Jun 2022
A Simplified Skid Resistance Predicting Model for a Freeway Network to be Used in a Pavement Management System	Pérez-Acebo, H. Montes-Redondo, M. Appelt, A., and Findley, D.J.	International Journal of Pavement Engineering (GPAV)	In Press
Acoustical Standard for Noise Walls	McCaleb, E., Coble, D., Vaughan, C., Davis, J., and Findley, D.	NC Department of Transportation	Sep 2021
Age Differences in Driver Visual Behavior and Vehicle Control When Driving with In-Vehicle and On-Road Deliveries of Service Logo Signs.	Feng, J.; Deng, Y.; Lau, M.; Cauffman, S.; Johnson, E.; Cunningham, C.M.; and D. Kaber	International Journal of Industrial Ergonomics	In Press
Capitalizing on Drone Videos to Calibrate Simulation Models for Signalized Intersections and Roundabouts	Samandar, M. S., Chun, G., Yang, G., Chase, T., Roupail, N. M., & List, G. F.	Transportation Research Record	Jun 2022
Characterizing Lane Changing Behavior and Identifying Extreme Lane Changing Traits	Ishtiaq Ahmed, Alan F Karr, Nagui M Roupail, R Thomas Chase, Shams Tanvir	Transportation Letters	Apr 2022
Collision Mitigation at Signalized Intersection Using Connected Vehicles Data and Technologies	Tajalli, M., G. List, and A. Hajbabaie,	Journal of the Transportation Research Board	May 2022
Critical Constructability Review Indicators for Construction of Transportation Infrastructure	Bonilla, M., Rasdorf, W., Akhnouk, A., Norboge, N., Findley, D., and Fullerton, C.	American Society of Civil Engineers	2022
Development of Safety Benefit Factors for New Location and Widening Projects for Use in the STI Scoring Process	Davis, J., Findley, D., Norboge, N., Saleem, T., and Srinivasan, R.	NC Department of Transportation	Feb 2022
‘Did I Just Miss My Exit?’ Research and Design Considerations for the Presentation of Non-Safety Related Information on In-Vehicle Displays During Automated Driving	Cauffman, S.; Lau, M.; Deng, Y.; Cunningham, C.M.; Kaber, D.; and J. Feng	Human Factors in Transportation Systems: Mechanical Engineering.	In Press

Title of Journal Paper, Report or other Publication	Author(s)	Name of Journal, Publisher or Client	Date Published
Driver Logo Sign Detection and Hazard Responses under Partial Vehicle Automation.	Cauffman, S.; Feng, J.; Kaber, D.; Liu, Y.; Cunningham, C.M.; and Y. Deng	Human Factors and Ergonomics Society	In Press
Driver Situation Awareness and Cognitive Workload Effects of Novel Interchange Configurations and Associated Signage	Yunmei Liu, Kihyun Pyo, Christopher Cunningham, Thomas Chase, David Kaber	Applied Human Factors and Ergonomics (AHFE 2022)	Jun 2022
Driver Visual Behavior and Vehicle Control with In-Vehicle and On-Road Deliveries of Service Logo Signs	Deng, Y.; Cauffman, S.; Liu, M.; Johnson, E.; Cunningham, C.M.; Kaber, D.; and J. Feng	Transportation Research Record, Part F	In Press
Economic Impacts of Mobility Investments in Mecklenburg County and the Benefits to the Charlotte Region: Synthesis of Information from Key Stakeholders, Economic Modeling, and Mobility Projections	Bert, S., Nicholas, C., Dudley, T., Callister, L., Walden, M., Huntsinger, L., Findley, D., Xiong, K., Thomas, L., and Anderson, B.	Charlotte Regional Business Alliance	Aug 2021
Evaluating the Efficiency of Constructability Review Meetings for Highway Department Projects	Akhnoukh, A.K., Bonilla, M., Norboge, N., Findley, D., Rasdorf, R., and Fullerton, C.	Springer Sustainable Civil Infrastructures (SUCI)	2022
Examination of Temporal, Classification, and Population Impacts of Flight Operations at Airports in the United States During the COVID-19 Pandemic	Findley, D.J., Bert, S., Lippert, C., Walston, B., and Conner, A.	ASCE Journal of Transportation Engineering, Part A: Systems	Dec 2021
Identifying and Prioritizing Bridges Critical to Commerce: A Case Study of Weight-Restricted Bridges in North Carolina	Nicholas, D., Dudley, T., Head, W., Bert, S., Norboge, N., List, G., and Findley, D.	International Journal of Transportation Science and Technology	In Press
Impact of Using Drones in Emergency Medicine: What Does the Future Hold?	Johnson, A.M.; Cunningham, C.J.; Arnold, E.; Rosamond, W.D.; and Zègre-Hemsey, J.K.	Open Access Emergency Medicine	Nov 2021
Impacts of Private Autonomous and Connected Vehicles on Transportation Network Demand in the Triangle Region,	Hasnat, M., E. Bardaka, S. Samandar, N. Roupail, G. List, and B. Williams	ASCE Journal of Urban Planning and Development,	Mar 2021
Impacts of Transportation Infrastructure Investments and Options for Sustainable Funding	Findley, D.J., Bert, S., Head, W., Norboge, N., and Fuller, K.	Springer Sustainable Civil Infrastructures (SUCI)	2022
Locating and Costing Impacts of Congestion on Public and School Buses	Monast, K.; Steiner, R.; Scott, J.; Wright, J.W.	University of Florida STRIDE/USDOT	May 2022
Moral and Social Ramifications of Autonomous Vehicles: A Qualitative Study of the Perceptions of Professional Drivers	Dubljević V., S. Douglas, J. Milojevich, N. Ajmeri, W. Bauer, G. List, and M. Singh	Behaviour and Information Technology	May 2022

Title of Journal Paper, Report or other Publication	Author(s)	Name of Journal, Publisher or Client	Date Published
Movement-Based Intersection Crash Frequency Modeling.	Lee, T.; Cunningham, C.M.; and N. Roupail	Journal of Transportation Safety and Security	July 2021
NCDOT Statewide Customer Service Survey 2019-20	McCaleb, E., Davis, J., and Findley, D.	NC Department of Transportation	Aug 2021
North Carolina Highway Cost Allocation and Revenue Attribution Study	Hasnat, M., Bardaka, E., Findley, D., and Goode, L.	NC Department of Transportation	Sep 2021
Prosocial Norm Emergence in Multiagent Systems	Mashyekhi, M., N. Ajmeri, G. List, and M. Singh	ACM Transactions on Autonomous and Adaptive Systems	May 2022
School Traffic Trip Generation Calculator Evaluation and Data Collection	Kearns, B., Davis, J., Carter Geiger, B., Coble, D., Klemann, K., Rhoney, M., Baird, C., Carnes, C., Vaughan, C., McCaleb, E., Dudley, T., Searcy, S., and Findley, D.	NC Department of Transportation	Sep 2021
Spatial Distribution and the Facility Evaluation of the Service and Rest Areas in the Toll Motorway Network of the European Union	Pérez-Acebo, H., Romo-Martín, A., and Findley, D.J.	Applied Spatial Analysis and Policy	2021
The Potential of Signalized Offset T-Intersection to Accommodate New Developments	Yang, G., Warchol, S., Cunningham, C., and Hummer, J.	International Journal of Transportation Science and Technology	In Press
Toward a Rational and Ethical Sociotechnical System of Autonomous Vehicles: A Novel Application of Multi-Criteria Decision Analysis	Dubljevic, V., G. List, J. Milojevich, N. Ajmeri, W. Bauer, M. Singh, E. Bardaka, T. Birkland, C. Edwards, R. Mayer, I. Muntean, T. Powers, H. Rakha, V. Ricks, and S. Samandar	PLOS One	Aug 2021
Waiting Time Estimation at Ferry Terminals based on License Plate Recognition	Yang, G., Coble, D., Vaughan, C., Peele, C., Morsali, A., List, G., and Findley, D.	ASCE Journal of Transportation Engineering, Part A: Systems	In Press

APPENDIX B – ANNUAL ACTIVITIES

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
AVIATION					
ALMP Course 1: Airport Rules and Regulations, Minimum Standards and Legal Issues	This one-day, in-person training course introduces participants to the numerous federal, state, and local regulations that apply to airport operations in North Carolina.	Classroom	1	6.00	48
ALMP Course 3: Airport Operations and Maintenance	This one-day training course examines the broad and diverse range of activities required to operate and maintain an airport, and how airport managers and staff can efficiently keep their airport running smoothly.	Classroom	1	6.00	42
ALMP Course 7: The Fixed Based Operator (On-Demand)	This course examines the role of a FBO, its services and management options, and how to create a good customer service climate at the airport.	Online	1	6.00	6
ALMP Course 11: Future Airport Opportunities	Aviation is currently experiencing a technological paradigm shift not seen since the introduction of jet aircraft. In addition, airports will have to adapt to economic and social changes at the same time. This course looks at these changes and offers strategies on how to deal with them.	Online	1	6.00	67
ALMP Course 12: The Airport Consultant	This course discusses the role of the airport consultant in North Carolina. Real world airport projects will be referenced as examples to help participants understand the proper roles of the sponsor and consultant. Example projects will include planning, design, construction, through project completion, and closeout.	Classroom	1	6.00	47
GEOGRAPHIC INFORMATION SYSTEMS					
Learning ArcGIS Pro 2: Editing, Analysis & Automation	This intermediate course will teach student how they can use ArcGIS Pro to edit data, create 3D maps, perform GIS analysis and automate processes using ModelBuilder and Python.	Online	1	16.00	2
HIGHWAY SYSTEMS					
Basic Work Zone Installer Safety	This workshop teaches the basics of work zone traffic control. The course covers short-term operations – no longer than one work shift – and focuses on daytime activities.	Online	9	8.00	331
Flagger Certification	This workshop is designed to train participants to be effective flaggers by teaching the basics of flagging operations and procedures.	Classroom	10	4.00	326

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Flagging Instructor Training	This workshop teaches participants the basics of flagging operations and then instructs them how to teach their own personnel these concepts	Online	1	8.00	21
Flagging Instructor Training - Recertification	This workshop teaches participants the basics of flagging operations and then instructs them how to teach their own personnel these concepts	Online	1	4.00	11
Fundamentals of Engineering (FE) - Self-Paced	This is a review course for the civil engineering exam only and covers approximately 16 topics.	Online	1	130.00	4
Fundamentals of Engineering (FE) - Self-Paced - NCDOT	This is a review course for the civil engineering exam only and covers approximately 16 topics.	Online	1	130.00	27
Fundamentals of Engineering (FE) - Self-Paced - NCSU	This is a review course for the civil engineering exam only and covers approximately 16 topics.	Online	1	130.00	9
Fundamentals of Engineering (FE) - Tues/Fri	This is a review course for the civil engineering exam only and covers approximately 16 topics.	Online	1	130.00	4
Fundamentals of Engineering (FE) - Tues/Fri - NCDOT	This is a review course for the civil engineering exam only and covers approximately 16 topics.	Online	1	130.00	11
Fundamentals of Engineering Principles (FEP) Program	The FEP Program is a series of courses offering introductory engineering education for transportation technicians. FEP courses build a deeper conceptual understanding of transportation design, inspection, and field practices.	Online	2	366.00	310
Highway Engineering Concepts (HEC) Program - NCDOT	The HEC course reviews and reinforces the Fundamental Engineering Principles (FEP) course content through a project-based curriculum that applies engineering principles to real-world transportation engineering projects.	Classroom	1	130.00	22
Intermediate Work Zone Safety	This workshop builds on the information covered in the Basic Work Zone Safety course, with particular emphasis paid to multi-lane urban streets. Multi-lane intersection work zones, detours, and mobile operations are covered in detail. Basic Work Zone Safety Training is a prerequisite for this course.	Online	3	8.00	100
NCDOT Executive Education Program - Financial, Budget, and Procurement Processes (Advanced)	This comprehensive training course provides advanced training on NCDOT's various procurement procedures.	Online	2	30.00	21

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
NCDOT Executive Education Program - Financial, Budget, and Procurement Processes (Introduction)	This comprehensive training course provides introductory training on NCDOT's various procurement procedures. Also included is a big picture overview of NCDOT's financial processes, including the annual budget.	Online	2	10.00	154
Professional Engineering (PE) - Friday/Saturday	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Classroom	1	98.00	12
Professional Engineering (PE) - Friday/Saturday - NCDOT - Classroom	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Classroom	1	98.00	4
Professional Engineering (PE) - Friday/Saturday - NCDOT - Online	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Online	1	98.00	3
Professional Engineering (PE) - Self-Paced	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Online	1	66.00	67
Professional Engineering (PE) - Study Aid - NCDOT	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Online	1	66.00	5
Professional Engineering (PE) - Wednesday	This is a civil engineering professional engineering exam review course which covers breadth and depth topics in construction, geotechnical, transportation, and water resources and environmental. Only breadth topics are covered in the structural discipline.	Classroom	1	66.00	19

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Road Safety Training for Law Enforcement and First Responders	This two-day workshop from the Federal Highway Administration (FHWA) is for North Carolina law enforcement and first responders seeking further knowledge to make a difference in road safety. The workshop addresses basic traffic engineering principals, crash investigating skills, how to partner and communicate with transportation agencies...and much more! Echoing the official DHS National public awareness campaign, this is “See Something, Say Something” for improving road safety!	Classroom	2	14.00	57
Roadway Drainage	This workshop teaches the basics of roadway drainage	Online	3	16.00	81
Site Development & Highway Access – Introductory Level	This class is meant to be a comprehensive introduction to highway access principles discussed in the NCDOT Driveway Access Manual and associated manuals.	Online	2	8.00	32
Site Development & Highway Access – Practitioner Level	This class looks at more complex case examples with discussions on government/developer involvement/interaction. The course is intended for TIA preparers; NCDOT district and traffic engineering staff; local government planning, transportation and traffic staff; and site developers. It is recommended that you complete the Introductory Level before you enroll in the Practitioner Level.	Online	2	10.50	26
TSC Webinar—Combatting Creative Defenses Through Investigation and Expertise	GERD? Diabetes? They weren’t a problem roadside, but they suddenly crop up in court. What about drivers that start drinking AFTER a crash? Is it legitimate? Often these are more creative reasons than realistic defenses. Furthermore, an expert can reveal to the court that these defenses are not truly defenses to impaired driving.	Online	1	1.00	37
TSC Webinar—Community Engagement and Outreach on a Budget	You don’t have to have a large budget to launch an effective community outreach campaign. This presentation will cover social media advertising, building effective messages for outreach, and free communication tools.	Online	1	1.00	45
TSC Webinar—Data Tools for North Carolina Vision Zero	Data can be overwhelming, NC Vision Zero's website has many tools that are freely available to explore, each letting the user to explore the various data about NC's crashes. These tools will break down the data to a level that is not overwhelming. Staff with ITRE's Geospatial Analytics and Decision Management group will guide you through these tools in this 1-hour webinar.	Online	1	1.00	82

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
TSC Webinar—DWI Checking Stations: How to Get Them Right	This webinar reviews the best practices for setting up and conducting DWI checking stations, from statutory compliance to constitutional concerns. We will also address common issues that occur during a checking station, the evidence you need in court to prove your checking station was lawful, and an overview of the latest developments in checking station case law.	Online	1	1.50	62
TSC Webinar—NC Vision Zero Communities	Vision Zero is more than a safety campaign and will require significant community mobilization from diverse sectors and strong leadership in order to be accomplished. So, just how engaged are the community members and key stakeholders in North Carolina to come together to end serious injuries and fatalities on our roads? Using an adapted version of the Community Readiness Assessment (CRA), we interviewed stakeholders across the Vision Zero communities in the state to determine the extent to which communities: 1) understand the problem of road fatalities and serious injuries; 2) have knowledge about current road safety efforts in the community; and 3) are able to leverage the resources and leadership to do so. This webinar will present results from the assessment and propose next steps for increasing community "readiness" in North Carolina to achieve Vision Zero.	Online	1	1.00	26
TSC Webinar—Overcoming DUI/DWI Defenses	Learn how to anticipate and effectively respond to defense theories and practices in impaired driving cases. This webinar will cover multiple considerations for law enforcement and prosecutors to help create more powerful case files and ensure effective prosecutions of Driving Under the Influence (DUI/DWI) cases.	Online	1	1.00	39
TSC Webinar—The Comprehensive Cost of Rail Incidents in North Carolina	ITRE at NC State University, under the leadership of the North Carolina Rail Division, has developed a user-friendly cost tool that is capable of estimating the comprehensive set of costs that result from a rail incident. The tool evaluates costs stemming from property damage, injuries and fatalities, delay, rerouting, and supply chain events, as well as emergency responder costs. Pedestrian strikes are a key subset of the many types of rail incidents that occur on North Carolina's rail network. Crossing deaths of pedestrians (as opposed to those of motor vehicle occupants) have increased from approximately 10 percent of total crossing deaths in the late 1970s to 35 percent in the middle 2010s. As part of this webinar, safety considerations related to pedestrian strikes will be closely examined.	Online	1	1.00	17

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
TSC Webinar—The Implicit Four-Letter Word: A Scratch on the Surface	During these times of political and social unrest and division in our nation, especially in the law enforcement and prosecution, it is more important than ever that we all look inward to be cognizant of our own internal beliefs and biases. The purpose of this presentation is to recognize the intersection of personal bias, privilege and how they can affect the way that we administer justice.	Online	1	1.00	31
Work Zone Traffic Control Supervisor	This course is designed for NCDOT, larger municipalities, and highway contractors that work on all highway systems, including two-lane roads, multi-lane roadways, and high-volume, high-speed, controlled access facilities. This course covers traffic control plan reading and development, positive protection, work zone capacity, night work, and inspection. Part 6 of the MUTCD and state DOT “Roadway Standard Drawings” are used as the text for this course. Additional handouts are used to supplement these materials. All work zone durations are covered in this course. Participants will be tested at the conclusion of the workshop for NCDOT Work Zone Supervisor certification.	Online	3	17.50	113
Work Zone Traffic Control Supervisor-Recertification	This workshop is intended for people who have completed ITRE’s ‘Work Zone Traffic Control Supervisor’ course and now need recertification. This course will address updates in work zone safety, including any changes to NCDOT Roadway Standard Drawings and Part 6 of the Manual on Uniform Traffic Control Devices. All participants who successfully complete the course will be certified for another 4 years as a Work Zone Traffic Control Supervisor.	Online	2	8.00	80

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
NC LOCAL TECHNICAL ASSISTANCE PROGRAM (NC LTAP)					
ADA Self Evaluations/Elements of PROWAG	With the 25-year anniversary of the passage of ADA, it is critical that local governments recognize their obligation to upgrade streets, sidewalks and facilities for accessibility. ADA requires that public agencies perform self-evaluations and prepare transition plans. They were to have been completed by July 26, 1992 and be updated periodically. The morning portion of the workshop examines the background to, contents of and enforcement of the self-evaluation and transition plan requirements. Several landmark court cases are also highlighted. A case study is presented to illustrate these items. Participants will leave the session with a “To Do” list of next steps they need to take and a toolkit of helpful resources. The afternoon session overviews the current criteria for accessible public rights-of-way including the pedestrian access route, curb ramps and detectable warnings, accessible pedestrian signals, street furniture, on-street parking and temporary traffic control requirements for pedestrians.	Online	1	6.00	9
ADA Self Evaluations/Elements of PROWAG	With the 25-year anniversary of the passage of ADA, it is critical that local governments recognize their obligation to upgrade streets, sidewalks and facilities for accessibility. ADA requires that public agencies perform self-evaluations and prepare transition plans. They were to have been completed by July 26, 1992 and be updated periodically. The morning portion of the workshop examines the background to, contents of and enforcement of the self-evaluation and transition plan requirements. Several landmark court cases are also highlighted. A case study is presented to illustrate these items. Participants will leave the session with a “To Do” list of next steps they need to take and a toolkit of helpful resources. The afternoon session overviews the current criteria for accessible public rights-of-way including the pedestrian access route, curb ramps and detectable warnings, accessible pedestrian signals, street furniture, on-street parking and temporary traffic control requirements for pedestrians.	Classroom	2	6.00	23
Asphalt Pavement Maintenance	This workshop covers pavement evaluation, asphalt mix materials, hot plant mix production and pavement construction methods, routing pavement maintenance techniques, and pothole patching.	Classroom	2	6.00	35

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Asphalt Pavement Maintenance	This workshop covers pavement evaluation, asphalt mix materials, hot plant mix production and pavement construction methods, routing pavement maintenance techniques, and pothole patching.	Online	1	6.00	14
Basic Concepts of Supervision	The Basic Concepts of Supervision focuses on the elements that new supervisors should be aware of: tasks of a leader, being a role model, motivation techniques, communication skills, problem solving and decision making, conflict and time management, customer service and stress management. The workshop is interactive with lecture, small and large group exercises and skill practices. Participants will have opportunities to ask and answer questions related to the subjects as described.	Online	3	6.00	74
Basic Drainage/Roadway Drainage Maintenance	There are three things you need to have a good road: drainage, drainage, and drainage. This program covers drainage principles, drainage policy, ditches, pipes, and other drainage features, including installation maintenance and construction of drainage components.	Online	1	6.00	26
Basic Work Zone Installer Safety	This workshop teaches the basics of work zone traffic control. The course covers short-term operations (no longer than one work shift) and focuses on daytime activities. This course must be completed before taking Intermediate Work Zone Safety Training.	Classroom	9	8.00	204
Chain Saw Safety	Use of a chain saw requires a whole host of special personal protective equipment, including special glasses, gloves, chaps, and more. This hands-on class will cover basic chain saw operational safety awareness (e.g. proper protective wear, starting, kick back prevention, cutting do's and don'ts) as well as body position during cutting and a few advanced topics. Each attendee will don the proper PPE for a routine sawing operation of felled trees, inspect the condition of the saw, check fluid levels, crank the saw and perform a successful cutting operation.	Classroom	5	4.00	73
Communicating with the Public and Media (Online)	Effective communication with the public can prevent confusion and complications during transportation projects. This course covers strategies and guidelines for communicating important information with the public and media organizations, including strategic communication planning, message development, audience specification, press release development, social media, and interacting with news organizations.	Online	1	6.00	13

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Concrete: What? When? and How?	This class features the basics of concrete installation from the composition of concrete to an actual student hands on session demonstrating placing and finishing techniques. This course is geared to anyone interested in improving concrete skills and will provide students with a general knowledge of concrete. Part of this workshop will be hands-on working with concrete.	Classroom	1	7.00	21
Confined Space Entry and Lockout/Tagout	This workshop is a follow-up to the Trenching Competent Person workshop. It is a must for any field supervisor who has crews working in confined spaces, such as: manholes, catch basins, meter vaults, and excavations deeper than four feet.	Classroom	3	8.00	44
Confined Space Entry and Lockout/Tagout	This workshop is a follow-up to the Trenching Competent Person workshop. It is a must for any field supervisor who has crews working in confined spaces, such as: manholes, catch basins, meter vaults, and excavations deeper than four feet.	Online	1	6.00	14
Designing Pedestrian Facilities for Accessibility	Facilities in the public right-of-way (including walkways, ramps, curb ramps and landings, crosswalks, and pedestrian overpasses and underpasses) must be designed, constructed and maintained to serve all users. This course identifies the applicable laws, regulations, guidelines and standards pertaining to accessibility for persons with disabilities. Requirements for ensuring accessibility in existing facilities versus work in new construction and alternations will be discussed. Design elements necessary for achieving accessibility in the public right-of-way will be reviewed. Best practices will be identified.	Online	1	6.00	10
Effective Leadership Skills	Leadership involves effective communication with organizational members to build successful teams and achieve organizational goals. This course will include ideas for communicating clear goals, helping groups negotiate clear communication expectations, motivating employees, assessing team progress, and providing effective performance feedback. Furthermore, this course will provide an opportunity to prepare for a supervisory or leadership role by learning management concepts, tools, and techniques to build personal influence and succeed as a leader. Topics include ethics, organizational self-assessment, defining excellence, and team development.	Online	2	6.00	33

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Erosion Control	The seminar will focus on current methods of erosion control. The material will be targeted toward non-engineers, but include valuable information and reviews for everyone no matter their experience or skill level. The class style will include data, pictures, graphs, and, of course, what we can all learn from previous project failures.	Classroom	1	6.00	12
Erosion Control (online)	The seminar will focus on current methods of erosion control. The material will be targeted toward non-engineers, but include valuable information and reviews for everyone no matter their experience or skill level. The class style will include data, pictures, graphs, and, of course, what we can all learn from previous project failures.	Online	1	6.00	26
Ethics in Public Works	This course focuses on the importance of ethics in Public Works. Course content includes legal requirements and restrictions under North Carolina state law that apply to public officials and employees – conflicts of interest in public contracting, prohibitions on accepting gifts and favors from vendors and contractors, misuse of confidential information, and misuse of public resources (otherwise known as embezzlement).	Online	1	6.00	14
Excavation Safety	This workshop will not only teach the participants to recognize danger, but will equip them with the tools to prevent dangerous accidents.	Classroom	1	7.00	28
Fall Protection	According to the Occupational Safety and Health Administration (OSHA) Fall Protection requirements, workers in local and state government, as well as construction firms can be subject to general industry regulations while performing some duties and construction industry regulations on other occasions. In addition, federal OSHA has issued quite a number of fall protection interpretations that pertain, but are not included in the two books of OSHA regulations. This class provides an overview of these many different fall protection provisions, interpretations and grandfathered work environments.	Classroom	1	7.00	12
Flagger Safety Training	This workshop is designed to train participants to be effective flaggers by teaching the basics of flagging operations and procedures.	Classroom	18	4.00	286
Flagger Training Online	This workshop is designed to train participants to be effective flaggers by teaching the basics of flagging operations and procedures.	Online	2	4.00	27

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Fundamentals of Government	This course provides an overview of the American federal system with a focus on local government in North Carolina, particularly municipalities, including the organization and operation of municipal governments and their interactions with the community and in the intergovernmental system.	Online	1	6.00	15
Inspecting Curb Ramps	This class will introduce the ADA requirements for the pedestrian access route. Requirements for ensuring accessibility in existing facilities versus work in new construction and alternations will be discussed. The focus of the class will be curb ramps in the public right-of-way.	Classroom	1	4.00	22
Inspecting Curb Ramps Online	This class will introduce the ADA requirements for the pedestrian access route. Requirements for ensuring accessibility in existing facilities versus work in new construction and alternations will be discussed. The focus of the class will be curb ramps in the public right-of-way.	Online	1	4.00	44
Intermediate Work Zone Safety	This workshop builds on the information covered in the Basic Work Zone Installer course, with particular emphasis paid to multi-lane urban streets. Multi-lane intersection work zones, detours, and mobile operations are covered in detail. Basic Work Zone Installer Training is a prerequisite for this course.	Classroom	5	7.00	98
Maintenance and Repair of Utility Cuts	This workshop expands on the discussion of utility cut repairs presented in the Asphalt Pavement Maintenance workshop and includes an in-depth review of the use of flowable fill concrete for utility cut maintenance and repair.	Classroom	1	4.00	24
Management Techniques for Experienced Managers	The Management Techniques for Experienced Managers is for supervisors and managers with some years of experience in their positions. Subjects include: resource management, negotiation skills, ethics, delegation, coordination with other units, team building, planning, setting priorities. A variety of instructional strategies is used: lecture, large group discussions, small group exercises and skill practices. The final activity brings all of the elements discussed earlier into focus by having the small groups complete a case study.	Online	1	6.00	22
Managing Conflict with the Public and Employees	This class focuses on three primary topics: conflict styles, strategies for de-escalating conflict, and steps for negotiating a mutually beneficial resolution to conflict. Participants will have the opportunity to practice conflict management strategies in role-play situations.	Classroom	1	7.00	26

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
OSHA 10-Hour	This workshop is an important tool in meeting the Occupational Safety and Health Administration (OSHA) requirements to provide employees with an awareness of the basic hazards that exist in the field. Over a 10-hour period, this workshop covers many important basic safety requirements that field employees must know that are in OSHA's Standards for the Construction Industry. OSHA inspectors can enforce these safety rules for field employees working in the public or private sector.	Classroom	2	10.00	37
Pavement Markings Retroreflectivity	This half day workshop discusses the purpose, installation and effectiveness of Pavement Markings on Roadways.	Online	1	4.00	25
Plan Reading	Learn Blueprint reading, one of the foundational skills essential to a successful career in construction. Gain an elementary level of understanding of blueprint reading and how to apply it to construction projects.	Online	2	4.00	26
Reducing Roadway Departure Crashes	More than half of the annual fatal crashes in the U.S. relate to roadway departures, and they are the leading cause of traffic deaths in many states. This workshop provides participants with some tools for addressing roadway departure crashes. Topics covered include a discussion of engineering countermeasures as well as implementation strategies.	Classroom	1	7.00	12
Silica Standards – Strategies for Municipal Compliance	The Occupational Safety and Health Administration (OSHA) limits the permissible exposure level (PEL) for workers exposed to respirable crystalline silica to be 50 micrograms per cubic meter over an average 8-hour period. Municipalities and construction contractors are particularly impacted by this regulation because of the variety of tools that are routinely used on concrete pavement, sidewalk and curbing, asphalt pavement and other concrete related products in their day-to-day work activities. This seven-hour program helps large and small organizations plan for, implement and comply with this workplace standard.	Online	1	6.00	9
Soil Fundamentals	This workshop focuses on the important aspects of highway sub-grade preparation, including soil classifications, compaction of fills, soil compaction tests, proof rolling, and the importance of proper drainage.	Classroom	1	6.00	30

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Traffic Calming	<p>Traffic engineers, street supervisors and other public officials face a growing number of complaints about high motor vehicle speeds and volumes in residential neighborhoods. This can occur on classifications from local streets to minor arterials. The issue can also occur on state highways passing through small- and medium-size communities. This workshop will discuss typical traffic problems in neighborhoods and their causes. Geometric design features and traffic control strategies to provide safer and more livable neighborhoods will be described, including residential area traffic circles, curb extensions (bulb-outs), median islands, realigned intersections, speed humps, chokers and diverters. Impacts of these features on roadway users (pedestrians/bicyclists, emergency vehicles, transit and maintenance and related vehicles) will be reviewed along with legal and liability issues. Attention will also be given to the process of traffic calming, including public participation, identification of the problem and plan development, approval and implementation.</p>	Online	2	6.00	39
Traffic Sign Retroreflectivity/Pavement Markings	<p>Traffic signs provide an important means of communicating information to road users. They need to be visible to be effective. The nighttime environment presents many sign visibility challenges. Since drivers cannot see as many visual cues as they can during the day, this places greater reliance on signs and other traffic control devices. To provide nighttime sign visibility, most signs are made from retroreflective sheeting. Retroreflectivity is the property of a material that re-directs light back to the originating source. Since the retroreflective properties of signs deteriorate over time, road and street officials should assess their schedules for inspecting, cleaning and replacing signs to ensure that these maintenance activities meet the objectives of the Manual on Uniform Traffic Control Devices and, more importantly, the needs of drivers at night. This workshop will help practitioners gain a better understanding of sign retroreflectivity issues in order to improve the overall nighttime visibility of traffic signs.</p>	Classroom	1	6.00	38

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Trenching Competent Person	The Occupational Safety and Health Administration (OSHA) safety regulations for trenching and other types of excavations require a trained “competent person” to be at the excavation whenever any employees are involved working in or near the hole. This course teaches required OSHA technique for proper hands-on classification of soils that trained competent persons must be able to perform in order to meet the requirements of OSHA for soil types A, B and C.	Classroom	7	8.00	85
Work Zone Traffic Control Supervisor	This three-day course is designed for NCDOT, larger municipalities, and highway contractors that work on all highway systems, including two-lane roads, multi-lane roadways, and high-volume, high-speed, controlled access facilities. This course covers traffic control plan reading and development, positive protection, work zone capacity, night work, and inspection. Part 6 of the MUTCD and state DOT “Roadway Standard Drawings” are used as the text for this course. Additional handouts are used to supplement these materials. All work zone durations are covered in this course. Participants will be tested at the conclusion of the workshop for NCDOT Work Zone Supervisor certification. Certification for the Basic and Intermediate Work Zone Safety Courses are both included in this course.	Classroom	2	20.00	42
Work Zone Traffic Control Supervisor RECERTIFICATION - online	This workshop is intended for people who have completed ITRE’s ‘Work Zone Traffic Control Supervisor’ course and now need recertification. With NCDOT requiring recertification every 4 years, this course will address updates in work zone safety, including any changes to NCDOT Roadway Standard Drawings and Part 6 of the Manual on Uniform Traffic Control Devices. All participants who successfully complete the course will be certified for another 4 years as a Work Zone Traffic Control Supervisor.	Online	1	6.00	18

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Work Zone Traffic Control Supervisor Safety Training Online	This three-day course is designed for NCDOT, larger municipalities, and highway contractors that work on all highway systems, including two-lane roads, multi-lane roadways, and high-volume, high-speed, controlled access facilities. This course covers traffic control plan reading and development, positive protection, work zone capacity, night work, and inspection. Part 6 of the MUTCD and state DOT "Roadway Standard Drawings" are used as the text for this course. Additional handouts are used to supplement these materials. All work zone durations are covered in this course. Participants will be tested at the conclusion of the workshop for NCDOT Work Zone Supervisor certification. Certification for the Basic and Intermediate Work Zone Safety Courses are both included in this course.	Online	1	15.00	17
Work Zone Traffic Control Supervisor-Recertification	This workshop is intended for people who have completed ITRE's 'Work Zone Traffic Control Supervisor' course and now need recertification. With NCDOT requiring recertification every 4 years, this course will address updates in work zone safety, including any changes to NCDOT Roadway Standard Drawings and Part 6 of the Manual on Uniform Traffic Control Devices. All participants who successfully complete the course will be certified for another 4 years as a Work Zone Traffic Control Supervisor.	Classroom	3	7.00	41
PUBLIC TRANSPORTATION / TRANSIT					
Demand Response Planning and Visualization	Introduction to the web-based mapping, planning and visualization capabilities of the Demand Response Planning and Visualization Tools.	Online	1	1.00	51
Enterprise Asset Management (EAM) Training	Specific training on how to use the AssetWorks EAM software for maintenance tracking.	Online	1	2.00	12
Fare Free Transit in North Carolina	Why we charge fares and their impact on our services	Blended	4	1.00	208
Fully Allocated Rate Setting Model	How to establish billing rates for all agency types	Online	4	1.00	65
Operating Statistics Reporting	How to collect and report transit operating statistics.	Online	6	1.00	46

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
Transit Skills - Building and Maintaining Effective Organizations through Good Employees	For Public Transportation Services Directors and Administrators—If you want to build your skills at attracting and retaining qualified, committed and motivated employees at all levels of your mobility services organization, this course will assist you in delving into the causes and cures for high turnover, lack of teamwork, and ineffectiveness within your operation.	Online	1	16.00	8
TRANSPORTATION INFORMATION MANAGEMENT SYSTEM (TIMS)					
Boundary Planning	TIMS Course focusing on School Boundary Edits, Updates, Tallies, Projections and Forecasts	Online	2	12.00	59
EMU & UPSTU	TIMS Course focusing on Edulog Maintenance and Student Update Processes	Online	2	4.00	79
eSQL Tips	TIMS Course focusing on eSQL Tips and Tricks	Online	2	4.00	64
eSQL Vets	eSQL Course for TIMS Staff trained on previous version	Online	4	4.00	161
MARIS 1	Part 1 of TIMS Geocode Course	Online	2	12.00	32
MARIS 2	Part 2 of TIMS Geocode Course	Online	2	8.00	26
MARIS 3	Part 3 of TIMS Geocode Course	Online	2	4.00	26
MARIS Refresher	Refresher Course for TIMS Geocode	Online	2	2.00	34
New Users	TIMS New Users Class	Online	2	12.00	60
Reports and Worklists	TIMS Reports and Worklists	Online	3	4.00	123
SS Data Management	Summer School Data Management Tips and Tricks	Online	1	2.00	104
TIMS Data Mgt	TIMS Course outlining various data management practices used by the best school systems in NC	Online	1	2.00	49
TIMS for Bus Routers	TIMS Best Practices Course for Hands-On Bus Routers	Online	1	2.00	73
TIMS for Directors	TIMS Course focusing on needs of Transportation Directors	Online	2	2.00	119
Transfers & MidDay	Best Practices for Managing Special Needs Bus Routes and Transfer Stops	Online	2	8.00	44
Webinar - Fall/Summer Planning	Statewide Webinar discussing data collection and best practices for Summer School and Fall Bus Route Preparation	Online	1	2.00	131
Webinar - Open House\Back to School Reports	Statewide Webinar focusing of helpful reports for Open House and Back to School Planning	Online	1	2.00	63
Webinar - TDTIMS - Due Friday Nov 19th	Statewide Webinar covering the 2021-22 Annual TDTIMS Submission Process.	Online	1	2.00	130

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
TIMS @ NCPTA — Batch Fill Data Tricks	Training session at 2022 NC Pupil Transportation Association Conference. This session will showcase how to import external codes into TIMS for various scenarios. Whether it's lost assignments from promotions, summer school, or some other need. Come see how to make your workflow more efficiently with the use of batch fill.	Classroom	1	1.00	34
TIMS @ NCPTA — Competition Event	Training session at 2022 NC Pupil Transportation Association Conference. Are you the best TIMS operator in North Carolina? Come put your Edulog skills to the test versus other bus routers from across the state in the second annual TIMS Bus Routing Competition. Similar to the school bus inspector competition, TIMS operators will be given a bus routing scenario to complete in Edulog and a winner will be chosen based on the final results of the bus routes created. This competition will require a full array of TIMS skills; from creating new stops, runs and routes, to shifting school bell times, reverse/copying runs, adding double loads to a bus, creating alternate stops for am/pm assignments, using/creating work lists and advanced searches, assigning students to stops, running driver reports, etc.	Classroom	1	4.00	11
TIMS @ NCPTA — Data Management Tips and Tricks	Training session at 2022 NC Pupil Transportation Association Conference. This session will discuss the variety of Data Management Tips and Tricks available within TIMS. From importing PowerSchool Ridership Codes as part of UPSTU, conceptualizing complex worklists and advanced searches, to the creation of specialized summer school stops, runs and routes. Come explore various data management practices used across the state.	Classroom	1	1.00	43
TIMS @ NCPTA — DPI Update	Information session at 2022 NC Pupil Transportation Association Conference. Updates to LEA staff on happenings in the NC Legislature and other information relevant for the school year.	Classroom	1	1.00	52
TIMS @ NCPTA — Edulog Data Analysis	Training session at 2022 NC Pupil Transportation Association Conference. Comparative Analysis and On-Time Performance through detailed GPS analysis of where buses are expected to go and what really happens on the road. Learn about reviewing GPS data in Routing (on one screen) and detecting unrecorded substitutions.	Classroom	1	1.00	31

Title of Course or Activity	Description	Instructional Format	Sessions Offered 7/1/21 to 6/30/22	Contact Hours per Session	Total Participants 7/1/21 to 6/30/22
TIMS @ NCPTA — MARIS Skills, Tips and Tricks	Training session at 2022 NC Pupil Transportation Association Conference. This session will concentrate on refreshing key MARIS skills as well as sharing new tips and tricks to make map edits easier and more efficient.	Classroom	1	1.00	15
TIMS @ NCPTA — Preview New Service Indicators	Training session at 2022 NC Pupil Transportation Association Conference. This session will showcase the new, expanded and improved Online Version of the Annual TIMS Pupil Service Indicators Report being developed by NCSU-ITRE. Come explore the new school bus data and annual student measures available for each LEA and all of North Carolina. When released, LEAs will be able to compare Bus Route Information and Student Ridership Data to previous years as well as to other LEAs.	Classroom	1	1.00	35
TIMS @ NCPTA — Reports	Training session at 2022 NC Pupil Transportation Association Conference. In this session we will concentrate on reports used for Open House, worklists for PowerSchool Backload and All Call files. We will also cover basic reports that will help you analyze your data for more efficient routing.	Classroom	1	1.00	44
TIMS @ NCPTA — TIMS eSQL Experience	Training session at 2022 NC Pupil Transportation Association Conference. TIMS ESQl includes google street maps and satellite imagery backgrounds as well as many enhanced search and assignment features to help with daily bus routing.	Classroom	1	1.00	39
TIMS @ NCPTA — TIMS for Transportation Directors and Supervisors	Training session at 2022 NC Pupil Transportation Association Conference. This session will help transportation administrators better understand the annual TDTIMS Audit, how to correctly repair the TD2 (Headcounts) and TD2R (Buses, Miles, Drivers Hours) Reports as well as better understand TIMS data and how to look for potential errors.	Classroom	1	1.00	14
TIMS @ NCPTA — Transfer Stops and Mid-Day Runs	Training session at 2022 NC Pupil Transportation Association Conference. Establishing and Managing Transfer Stops and Mid-Day Runs are among the trickiest components of maintaining Bus Routes in TIMS. This session will provide users the opportunity to better understand, create and insert transfer stops within TIMS. This course will also cover preferred methodologies for setting up and managing irregular Mid-Day Runs.	Classroom	2	1.00	26
TOTAL PARTICIPANTS FOR ALL ACTIVITIES					6180

APPENDIX C – ORGANIZATIONAL CHART

