



2019

**TRANSPORTATION
RESEARCH ASSESSMENT *of*
NORTH CAROLINA HBCUs & MSI**

Prepared by the U.S. Department of Transportation/Volpe National Transportation Systems Center on behalf of the North Carolina Department of Transportation to assess existing opportunities for accredited NC HBCU/MSIs to conduct transportation research.

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Executive Summary

First created in the mid-19th century in the aftermath of the Civil War, Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs) have a long and proud history of service as teaching universities. While that mission continues in the 21st century, research is becoming an increasingly important priority at these institutions. North Carolina schools such as NC A&T, Fayetteville State University, Elizabeth City State University and Johnson C. Smith University are now among the largest HBCU research institutions in the country.

The North Carolina Department of Transportation's (NCDOT) research program has focused on better utilizing the research strengths of the state's HBCUs and MSIs. These schools have shown untapped potential for conducting state transportation research on a wide array of topics, including aviation, next-generation Systems Applications and Products in Data Processing, public administration, automated vehicles and advanced engineering. With their strong connections to surrounding regions and experience in conducting in-depth, community-based research, North Carolina's HBCUs and MSIs are well-positioned to expand their contributions in meaningful ways to both the state's transportation research program and national research opportunities.

The North Carolina HBCUs and MSI Transportation Research Assessment summarizes each of the 10 HBCUs and one MSI in the state. The summaries describes each school's transportation-related academic programs, research efforts, curricular programs and community initiatives, and opportunities for, and barriers to, increasing transportation research capacity. Information reported in these summaries was collected during onsite interviews with faculty and staff and discussions with the Offices of Sponsored research and other administrators. After the profiles were developed, stakeholders at each school reviewed and concurred with the summaries before they were finalized.

While these institutional summaries were developed for use within NCDOT, other organizations may find them useful as well. For instance, faculty and research at peer institutions might use the summaries to find potential partners for future joint research efforts based on complementary strengths and common research interests. These summaries are not meant to be exhaustive, but rather to illuminate the strengths and resources of each institution, with a goal of fostering new connections and beginning broader conversations about transportation research opportunities within the state of North Carolina and nationally.

Transportation-Related Academic Programs at North Carolina HBCUs

		BENNETT COLLEGE	ELIZABETH CITY STATE	FAYETTEVILLE STATE	JOHNSON C. SMITH	LIVINGSTONE COLLEGE	NORTH CAROLINA A&T	NC CENTRAL	SHAW	ST. AUGUSTINES	UNC-PEMBROKE	WINSTON-SALEM STATE
Traffic & Systems Optimization	Applied Mathematics	•	•	•	•	•	•	•	•	•	•	•
	Aviation		•									
	Computer Science	•	•	•	•	•	•	•	•	•	•	•
	Entrepreneurship	•	•	•	•	•	•	•	•		•	•
	Geospatial Sciences/GIS			•				•				
	Information Sciences			•	•				•	•	•	•
	Logistics/Supply Chain						•					
Engineering & the Environment	Applied Physics			•			•	•		•	•	•
	Biology	•	•	•	•		•	•	•	•		•
	Chemistry	•	•	•	•		•	•				•
	Cyber Security										•	
	Engineering		•	•	•		•	•				
	Environmental Sciences						•	•			•	
	Sustainability											•
Planning & Business Processes	Accounting		•	•	•		•	•	•	•	•	•
	Business Administration	•	•	•	•	•	•	•	•	•	•	•
	Communications		•	•	•			•	•	•	•	•
	Emergency Management			•								
	Finance		•	•	•		•	•			•	•
	Project Management			•								
	Public Administration							•	•			
	Urban and Regional Planning							•				
Social & Community Factors	Criminal Justice		•	•		•	•	•	•	•	•	•
	Economics			•	•		•				•	•
	Law/Legal Studies							•				•
	Political Science	•		•	•	•	•	•	•	•	•	•
	Public/Community Health				•					•		•
	Public Policy							•			•	
	Social Work/Sociology	•	•	•	•	•	•	•	•	•	•	•
	Urban Studies											•



Bennett College

Greensboro, North Carolina

Institution Summary

Bennett College's research program, while small in size, is wide-ranging and diverse in its scope of topics. Faculty often collaborate with other institutions—particularly with nearby North Carolina A&T—to compete for and perform funded research. While the college currently conducts a limited amount of transportation-related research, several faculty members at Bennett have significant transportation experience from prior careers, including in transportation planning, materials research and transportation workforce development. Private and local sources provide funding for most of Bennett's research, though the institution also has some larger grants from federal sources such as the National Science Foundation. Currently, community-based health, socioeconomic, biological science, and financial literacy research comprise the bulk of the school's funded research program.



- Private college
- **534** undergraduates
- **16** undergraduate programs

Institution Research Highlights

- Each year, Bennett hosts an Interdisciplinary Research Day. At this event, students present research they have produced over the course of the year to an audience of faculty members, major funders, and community members.
- The college has built significant partnerships with other institutions (including North Carolina A&T and Virginia Tech, among others) that allow the institution to conduct more funded research.
- Funded research primarily is conducted in the areas of biological science (including a \$300,000 National Science Foundation-funded grant in bio-non-engineering), financial literacy and banking, and community health.
- Bennett has been a member of the New York University Faculty Research Network for more than 15 years. Each year, several faculty attend at least a one-week program in New York to build research skills and gain new experience.
- Bennett is a partner in the Virginia-North Carolina Louis Stokes Alliance for Minority Participation, a group dedicated to increasing diversity in the STEM workforce. Since its inception over a decade ago, the NSF-funded partnership has seen minority students graduating with STEM degrees increase 150%. The partnership hosts a conference each year for students to present their research.

Transportation-related Majors

- Computer science
- Entrepreneurship
- Mathematics
- Political science
- Sociology

Research Funders

- AHA
- NASA
- NSF



Bennett College

Greensboro, North Carolina

OPPORTUNITIES

- Bennett has several faculty members with highly-specialized transportation skillsets and knowledge that have yet to be tapped by NCDOT. For example:
 - Professor Carly McLucas is a former City of Los Angeles transportation planner who has specialized knowledge in GIS. She has made it a goal to expand the GIS skills of Bennett College students.
 - Dean of Faculty Annette Wilson has experience in policy analysis and workforce development in transportation programs.
 - Professor Michael Cotton has been studying access to healthcare and food systems for more than 20 years, including how people use transportation systems to access these resources.
 - Professor Mary Cook Murdock has prior experience operating a ready-mix concrete plant and has performed research on concrete materials.
 - Professor Tammy McNeil has over 20 years of corporate experience working in logistics and operations with Wachovia, Bank of America, and PepsiCo.

BARRIERS

- Bennett College is the smallest HBCU in the state, and its resources (time and money) are similarly scaled.
- The institution is located in a neighborhood within the City of Greensboro that has limited access to public transit compared to other parts of the city. Students and faculty cannot always find reliable transportation to meetings, events, and opportunities around town.

RECOMMENDATIONS

- Consider the “faculty swaps” that Florida A&M developed to build relationships with faculty at HBCUs as a potential model for building closer relationships between HBCU faculty and NCDOT.
- Provide information to faculty on how NCDOT student interns performed in their roles. Bennett has sent interns to NCDOT and would like to receive their students’ final reports and work products, as well as feedback on how their students performed.
- Recognize that one of the largest impediments to expanding its research capabilities is a lack of laboratory equipment and other capital investments. Funding for these investments, according to Bennett representatives, would be one of the biggest contributors toward expanding research capacity.
- Consider having NCDOT play a unique role as a convener of universities within the state. By bringing together these institutions, NCDOT could create a forum to identify and plan responses to emerging transportation issues and research needs, which would be helpful in expanding faculty’s research interests.

Institution Summary

Elizabeth City State University’s transportation research primarily supports its majors in aviation science, engineering technology, mathematics, computer science (including artificial intelligence and machine learning), and unmanned aircraft systems. ECSU receives grants from a number of government agencies for these programs and has formed research partnerships with several academic institutions in North Carolina and nationwide. In responding to NCDOT research needs, ECSU carefully matches faculty technical capabilities to the projects. ECSU facilitates school-to-work pipeline opportunities through year-round and summer programs at no cost to high school students, including a drone exploration academy. ECSU’s flight training program and Coast Guard pre-commissioning program prepare its students for careers in aviation, and could provide valuable expertise to NCDOT. ECSU students have received NCDOT internships and scholarships in the past. While ECSU is a relatively smaller school, it has advanced research capacity and strong faculty interest in further expanding their research areas and capabilities.



- Public university
- **1,637** undergraduates
- **28** undergraduate programs
- **41** graduate students
- **5** graduate programs

Institution Research Highlights

- Has faculty research expertise in a broad range of topics related to transportation, including driver psychology and emotion, human factors, noise impacts of commercial drones, physics and materials science, operations optimization, flight simulation, GIS remote sensing, renewable energy research, investigations of health disparities, and emergency management.
- Actively develops research skills applicable to projects on virtual reality and autonomous drones.
- Conducts transportation-related research in its NASA-funded Aerospace Education Laboratory, Unmanned Aerial Systems Laboratory and Center for Remote Sensing Education and Research.
- Partners with the U.S. Department of Defense to conduct a significant amount of transportation-related research.
- Highlights four undergraduate students who were awarded Transportation Research Board fellowships in January 2019.
- Hosts an undergraduate research week annually in April.
- Has hosted a National Summer Transportation Institute for the past 20 years to introduce high school students to potential transportation career opportunities. The program is an FHWA initiative.

Transportation Related Majors

- Business administration
- Economics
- Engineering
- Environ./sustainability
- IT & computer science
- Law
- Public health
- Public policy/government
- Psychology & sociology
- Transportation
- Urban & regional planning

Research Funders

- | | |
|-------|-----------|
| FHWA | NSF |
| NASA | USDOD |
| NCDOT | USDOE |
| NIH | USDOJ/NIJ |

OPPORTUNITIES

- Participates as a member of several research consortiums and partnerships and actively works to develop additional connections by networking with faculty from other institutions and private companies. Some examples include the NC Space Grant Consortium and Institute for Transportation Research and Education, both led by NC State, and MOUs for collaboration on joint UAS exercises.
- Owns extensive equipment and research labs to support transportation research, including air traffic simulators and high-fidelity UAS simulation and flight simulators. Access to these resources could be provided to other HBCUs through a consortium.
- Has a strong relationship with the surrounding community, which supports transportation research through funding and materials specifically for drone research. ECSU also has a strong relationship with the regional airport authority, which is its second-largest customer.
- Is recognized for its research programs by state elected officials and other government leaders.
- Recently established the materials research laboratory, which focuses on research related to energy efficient batteries. This research area could be leveraged for transportation-related research.

BARRIERS

- Faculty are not fully aware of the breadth of NCDOT research interests.
- Staff and faculty often do not have the resources or time to gather preliminary data to support strong proposals.
- The school’s geographic location in the far northeast part of the state makes building partnerships with other schools and gaining visibility more difficult.
- Forming research clusters across departments is difficult because of limited staff numbers.
- The university does not have large graduate programs to support faculty.
- ECSU does not have a large presence in STEM fields and does not have formal engineering programs.

RECOMMENDATIONS

- Schedule additional in-person visits to ECSU for research briefings and meetings with researchers – faculty and staff are interested in expanding relationships with NCDOT.
- Provide periodic briefings to faculty on NCDOT’s research needs, in terms of both current and future research topics.
- Create and widely distribute additional communications materials for the Call for Ideas. Directly send these to faculty as well as to the administration.
- Attach “key words” to research ideas to help faculty understand categories of work.
- Recommend relevant departments/fields of study in all RFPs. This will help the university’s research office ensure it is distributed to the most relevant researchers.
- Create opportunities for research faculty serve as fellows at NCDOT to gain more practical experience that may, in turn, create stronger RFP responses in future cycles.
- Establish connections through a faculty exchange, such as those hosted by other agencies (NASA, DOJ, DOE, U.S. Navy).
- Consider expanded support for non-traditional research formats, such as piloting promising technologies.

Institution Summary

Fayetteville State University is a medium-sized university with a high capacity for research in transportation. FSU has a strong research focus in business and economics, materials, and operations optimization. Their new state of the art SAP Next-Gen lab is unique in the Southeast, and represents a significant opportunity for partnership with NCDOT to solve SAP data analysis needs, provide business optimization research and services, as well as provide highly qualified future employees. Past efforts with NCDOT included support for minority and veterans entrepreneurship capacity building. FSU is a member of multiple consortiums focused on advanced technology and has experience performing research for a wide array of governmental agencies. FSU has an active Office of College Access and Student Success Program, through which they send students yearly to the NCDOT internship program and recruit math and science students at an early age.



- Public university
- **5,473** undergraduates
- **43** undergraduate programs
- **845** graduate students
- **19** graduate programs

Institution Research Highlights

- Opened SAP Next-Gen Lab in 2019 with enhanced research and operations capabilities. This could provide value to an HBCU research consortium to allow data access for other universities
- Serves as a member of the Center for Self-Aware Machining and Metrology (C-SAM). Faculty working on this effort have extensive experience with computing and data analytics.
- Leads the Cape Fear Health research consortium, which also includes Fort Bragg & USDOD.
- Conducts transportation geospatial research on behalf of the cities of Greensboro and Fayetteville related to crash analysis, impacts of road network development patterns, GIS, safety, and accessibility.
- Produced a recent project on the optimization of ambulance locations for a local government partner.
- Is a partner in the Virginia-North Carolina Louis Stokes Alliance for Minority Participation, a group dedicated to increasing diversity in the STEM workforce. Since its inception over a decade ago, the NSF-funded partnership has seen minority students graduating with STEM degrees increase 150%. The partnership hosts a conference each year for students to present their research.
- Has extensive experience working with NCDOT to offer technical assistance for minority and veteran entrepreneurs and would be interested in re-engaging on this work.
- Secured funding through the Department of Commerce for its Center for Economic Development.
- Hosts a series of workforce pipeline programs (Upward Bound, TRIO, and others) via the U.S. Department of Education. The school's College Access and Success office receives ~\$1.5 M per year.

Transportation Related Majors

- | | |
|-------------------------------|----------------------------------|
| • Business and economics | • Civil engineering |
| • Computer science | • Management information systems |
| • Criminal justice | • Political science |
| • Geospatial sciences, GEOINT | • Professional studies |
| • Emergency management | |

Research Funders

- NSF
- USDA
- USDOC
- USDOD
- USDOE

OPPORTUNITIES

- Provides other institutions with access to the school’s SAP Next-Gen Lab, which could present significant opportunities to build transportation research capacity across North Carolina HBCUs.
- Conducts a significant amount of research on transportation optimization, innovative materials, business, and economic issues.
- Performs capacity building work to help veteran and disadvantaged business owners improve their enterprises. NCDOT could support this work and encourage growth in transportation enterprises.
- Has faculty with disaster preparedness backgrounds, particularly in fire response, which could be leveraged for transportation research (such as developing hurricane evacuation plans).
- Has expertise in the application of geospatial sciences and technologies (e.g., remote sensing, GIS, GEOINT) in land cover/use changes, urbanization impacts, and human-environment interactions.
- Has faculty interested in human-centered design and local transportation issues. The school’s relationship with the surrounding Fayetteville community is often leveraged to conduct outreach and data collection on behalf local governments. NCDOT could leverage similar processes to conduct its own local outreach during state road reconstruction or other activities.
- Has a computer science research program that is comparatively advanced and could be further leveraged by NCDOT to conduct more in-depth, data-related projects.
- Has a high school student recruitment program that could serve as a model to promote transportation career paths.
- Requires its students to take a capstone course requiring them to apply all the knowledge they have gained in their program of study to a real-world project. This could serve as a model for a transportation program capstone as part of a workforce pipeline program.
- Is developing for NCDOT a GIS-based data mining and optimization model to allow decision makers to determine if additional DMV locations are needed to improve operational efficiency.

BARRIERS

- Faculty would like to gain more understanding of NCDOT research needs and priorities.
- Faculty noted that they would benefit from a structured feedback process when proposals were not selected for NCDOT research grants.
- Distance from Raleigh is a perceived barrier to participation in events at NCDOT headquarters.

RECOMMENDATIONS

- Expand outreach activities to leverage FSU’s capabilities. They have been very actively engaged in pursuing NCDOT research grants and building relationships with NCDOT research participants.
- Decentralize data, local traffic and engineering analysis to provide a strategic advantage for leveraging more research expertise across schools. FSU has significant expertise in these areas.
- Provide additional context for RFPs, including an outline of NCDOT research interests, methods, and current topic areas.
- Consider that a potential HBCU transportation research consortium would need a strong champion. FSU has experience in this role and would be interested in serving as a champion.



Institution Summary

Johnson C. Smith University is an undergraduate-focused institution with a strong emphasis on student experiences in research and internships. JCSU conducts research on a variety of topics, including robotics, air space management, cybersecurity, disaster preparation, policy, and social work (economic mobility, business development). JCSU faculty have a strong understanding of how transportation relates to their existing research, and would like to collaborate with NCDOT to help faculty in better communicating these connections to students. The school receives grants from a number of government agencies, and has several research partnerships with universities within and outside of North Carolina. These partnerships focus on fields with potential transportation applications, such as coastal resilience and homeland security. JCSU facilitates school-to-work pipeline opportunities through its internship program and the Summer Transportation Institute. Students from the school have received NCDOT internships and scholarships in the past.



- Private university
- **1,480** undergraduates
- **23** undergraduate programs
- **85** graduate students
- **1** graduate programs

Institution Research Highlights

- Awarded FHWA and NCDOT funding to host a National Summer Transportation Institute.
- Conducts research at its STEM Innovation Center, which hosts the Centers for Renewable Energy, Medical Informatics, Analytics, and Bioinformatics. It includes shared instrumentation and other labs.
- Conducts research on the management of highway networks in the event of disasters through the university's Center of Excellence in Homeland Security.
- Holds a grant from the National Science Foundation to increase the diversity of researchers in engineering. The grant allows students to research emergency preparedness and responsiveness.
- Serves as a partner in the Virginia-North Carolina Louis Stokes Alliance for Minority Participation, a group dedicated to increasing diversity in the STEM workforce. Since its inception over a decade ago, the NSF-funded partnership institutions' minority students graduating with STEM degrees increased 150%. The partnership hosts a conference each year for students to present their research.
- Requires all students to complete a senior investigative research paper centered on their major and discipline.

Transportation Related Majors

- | | |
|--------------------------------|----------------------------------|
| • Community health | • Mathematics |
| • Computer engineering | • Political science |
| • Computer information systems | • Social work |
| • Economics | • Urban studies & sustainability |

Research Funders

- NASA
- NIH
- NSF
- USDHS
- USDOD



OPPORTUNITIES

- Faculty and students are both involved in summer programs and research with private and public entities, such as Google, Forest Products Lab, and NASA, which could provide industry research connections for NCDOT.
- JCSU has a review panel board for its grant proposals to support funded research. Faculty think this model is highly successful.
- Recently launched its first graduate program in social work, and has noted an uptick in research activity as a result, which could present opportunities for NCDOT partnerships.
- Faculty and administration have expressed an interest in developing a transportation concentration. NCDOT could assist in shaping this concentration.
- JCSU provides funding for faculty-mentored research projects and course-based research experiences. NCDOT could leverage this as an opportunity to advance its research needs.

BARRIERS

- Faculty stressed that production expectations must be different for schools that are not Tier 1 research institutions. There are fewer faculty and graduate students available to devote time to research at HBCUs, and especially at JCSU with just one graduate program.
- JCSU's institutional capacity to continue projects can be strained if lead researchers leave the university. There are challenges with institutionalizing research beyond a specific faculty member or funding source.
- JCSU has a proven record of successfully developing research through networking; however, the institution lacks funding for faculty to consistently attend conferences, workshops, and other events, placing some limitations networking opportunities.
- JCSU faculty list time as a significant barrier, as they teach heavy course loads and there are challenges finding adjuncts to cover teaching responsibilities.
- Faculty perceive NCDOT projects to be primarily technical in nature. Expanding awareness of research variety at NCDOT may increase success at JCSU.

RECOMMENDATIONS

- Adjust timing of and develop RFPs with smaller scopes so that work can be conducted in the summer when faculty have more time to carry out research.
- Provide additional information via webinars and written resources for faculty to communicate to students how their disciplines connect with transportation research and careers, as well as internships and job opportunities.
- Use internships and other opportunities with NCDOT to create direct pathways to applying for and receiving jobs. Consider developing an apprenticeship model or fellowship program.
- Consider supporting student tuition in exchange for work commitments from students.
- Participate in JCSU's career fair held in September each year. On-campus visits are an effective method of generating partnerships.
- Allow faculty to serve as ambassadors to NCDOT through on-site work.
- Consider geographical location of HBCUs in North Carolina when asking for travel to meetings.
- Provide more than 7 weeks to put together a quality proposal. Three or more months would be preferable for faculty.

Institution Summary

Livingstone College currently does not conduct a high volume of funded research, and does not have any ongoing transportation-related research. However, the college does have the capability to offer transportation-focused courses in economics and computer information systems/optimization. The college is actively considering developing a transportation certificate program so that students from a variety of disciplines across the college can become better equipped with the necessary skills to earn transportation jobs upon graduation.



- Private college
- **1,148** undergraduates
- **23** undergraduate programs

Institution Research Highlights

- The school's research is generally focused on STEM, business, entrepreneurship, and economics.
- The college has received several grants including related to HIV/STI research (DHHS grant), Upward Bound Classic and STEM (US Department of Energy grant), a \$500,000 preservation grant (National Park Service), and a \$1.2million grant(National Science Foundation) to build and expand undergraduate research experience on campus.
- Livingstone has multiple faculty members who are conducting non-sponsored research, especially in the biological sciences department.

Transportation Related Majors

- Business administration
- Computer information systems
- Entrepreneurship
- Mathematics
- Political science
- Sociology

Research Funders

- Cannon Foundation
- EPA
- NPS
- NSF
- Stanback Family Foundation
- USDOE
- USDHHS



OPPORTUNITIES

- The college requires all students to complete either undergraduate research or an internship. NCDOT could serve as a partner in supporting this requirement.
- The college has launched efforts to strengthen its emphasis on research in the student curriculum and experience. For instance, there has been an increased focus on faculty encouraging students to attend research symposia and conferences across the state.
- Dr. Nisha Singh is working to build a transportation-focused certificate program at the college. This will start by combining some existing courses, such as transportation economics, but faculty are actively investigating other courses to add to the program. NCDOT could help shape the certificate program by providing input on what types of courses should be added.
- Livingstone College has strong ties to its surrounding communities, and faculty are very interested in exploring additional community-based projects and research.

BARRIERS

- The school is not a large institution, and its research activity is comparatively smaller in scope than other institutions. Though faculty have proven they are capable in conducting research, as evidenced by other research grants being awarded, there is relatively less institutional experience carrying out grant-funded research.
- Livingstone, like many HBCUs, sees itself primarily as a teaching institution. Though research is becoming more prevalent on campus, faculty's main focus is on preparing students to succeed in the workplace.

RECOMMENDATIONS

- Provide more lead time in notifications of funding and other opportunities. HBCU faculty are busier than most, and it is common that they miss the first communication. Following up on these communications is key to success.
- Increase NCDOT presence on campus. NCDOT can provide students with opportunities that help shape professional interests and marketability.
- Consider the large network of vendors and consultants that NCDOT uses and how they can be leveraged into a school-to-work pipeline program. Rather than only exposing students to the specific careers of the NCDOT workforce, NCDOT could also expose students to private-sector roles which are vital to the overall transportation industry.
- Assume that any type of research consortium or other formalized group needs to have a dedicated staff person from NCDOT in order to ensure success.
- Consider a rotational position in the agency for HBCU faculty to fill on a term basis, similar to a fellowship program.
- Invest resources in HBCU faculty to strengthen their abilities to pursue large Federal and private grants. That would allow schools to leverage faculty buy-out time and faculty to become more productive as researchers.



North Carolina A&T

Greensboro, North Carolina

Institution Summary

North Carolina A&T is a Tier 1 research institution with a broad range of transportation-related research. Key topic areas include geomatics, remote sensing, UAVs, construction work zone monitoring, safety operations, robotics, automation, contaminant treatment, LiDAR, augmented reality, artificial intelligence, smart cities, optimization, emergency management, cybersecurity, and many others. N.C. A&T researchers have submitted several NCDOT proposals. The institution has some ongoing relationships and contracts with NCDOT, but there is a desire for additional engagement from researchers who have not yet secured grants. N.C. A&T has numerous partnerships with other institutions, including patents with private companies. N.C. A&T also leads and participates in several consortiums. It also supports school-to-work pipeline opportunities for students through undergraduate senior exam projects with local companies, as well as summer and job opportunities through a cybersecurity workforce pipeline.



- Public university
- **10,629** undergraduates
- **54** undergraduate programs
- **1,513** graduate students
- **38** graduate programs

Institution Research Highlights

- Received \$64.26 million in contracts and grants for 2017-18, most of which were from Federal sources.
- Has several existing projects with NCDOT which focus on pedestrian detection by autonomous fleets, using drones for infrastructure inspection, and aerial mapping.
- Hosts the Center for Advanced Transportation and Mobility with Virginia Tech. Recent projects at the Center have focused on emergency response and evacuation.
- Received \$1.4 million in grant funding for its Summer Transportation Institute, which is in its 27th year, making it the longest-serving in the nation.
- Is home to several research centers, including the NSF CREST Center for Bioenergy, Testing, Evaluation, and Control of Heterogeneous Large Scale Autonomous Vehicles (TECHLAV), Center for Autonomous Control and Information Technology, Center for Energy Research and Technology, NOAA Interdisciplinary Scientific Environmental Technology Cooperative Science Center, and Flood Mapping and Management.
- Several students have received Eisenhower Fellowships for transportation research in recent years.

Transportation Related Majors

- Business education
- Civil engineering
- Computational science and engineering
- Political science
- Mechanical engineering
- Natural resources and environmental design
- Systems engineering

Research Funders

NASA	USDOE
NCDOT	USDOD
NOAA	USDOT
NSF	



North Carolina A&T

Greensboro, North Carolina

OPPORTUNITIES

- N.C. A&T has numerous existing transportation research projects and courses in transportation engineering, which could be leveraged to conduct high-quality research for NCDOT.
- Has experience leading consortiums and partnerships for research, including one with the Department of Energy. Under this agreement, N.C. A&T disseminates funding and manages proposals with eight other HBCUs. NC A&T was also the first HBCU to lead a research partnership among various labs for the National Science Foundation, focused on biomaterials.
- The school's strong connections to industry expose students to research, careers, and conferences and strengthen the school's knowledge base. There are similar benefits and opportunities for a strengthened partnership between NCDOT and NC A&T.
- N.C. A&T has hosted NCDOT several times to present research and build relationships.
- There are opportunities to integrate faculty research projects into master's and PhD coursework. Undergraduates could also support research through special topics courses.
- N.C. A&T has begun building a relationship with the City of Greensboro to support research and provide opportunities for students to engage with real-world problems.
- The institution is working to develop a certificate in transportation for students.

BARRIERS

- The pressure to bring in research dollars to gain tenure can discourage collaborative projects across departments. A culture shift is needed to bring in interdisciplinary projects/funding. NCDOT could shape its research opportunities to help address this need.
- Faculty estimate it takes 6-12 months to write a quality proposal. Professors have limited time to write quality proposals and can only be released from teaching loads once grants are received.
- The geographical distance from NCDOT headquarters may discourage faculty from interacting with NCDOT as often as they would like to.
- Successful proposals have required long-term communication and a champion within NCDOT prior to submitting (e.g., initial discussion for about two years before funding). Not all researchers are able to do this or have been successful at maintaining communication with NCDOT.

RECOMMENDATIONS

- More clearly define NCDOT's highest priorities in RFPs, while still allowing institutions to customize proposals and adapt projects to their specific areas of expertise.
- Contact universities earlier to review ideas and develop proposals.
- Leverage on-campus connections and knowledge of NCDOT hires from HBCUs to act as ambassadors or liaisons between NCDOT and their alma maters.
- More clearly state in RFPs that equipment rentals and leases are allowable expenses included in project budgets.
- Improve NCDOT research website for easier navigation to help facilitate connections to research topics.
- Develop a capability matrix from institutions based on mission and goals to support consortium building.
- Consider providing workshops for idea reviews, and provide feedback regardless of the outcome.
- Consider allowing 1-2 page "pre-proposals" to allow for feedback before spending significant time on developing a full proposal.

Institution Summary

North Carolina Central is a larger university with a strong and established set of research programs, primarily focused on biomedical/bioengineering fields. They are actively engaged in growing their general research capacity and specifically in pharmaceutical science and biotechnology, including through a partnership with Duke. NC Central has also provided guidance to Bennett College and would be interested in further partnership opportunities to enhance research capacity. NC Central has existing research contracts with NCDOT in GIS and particulate matter atmospheric research. They also conduct research on the health impacts of transportation through a partnership with NC State for the NSF. NC Central is an ideal candidate for growing NCDOT’s research portfolio with HBCUs given their high-level research capabilities, strong existing relationship with NCDOT, and subject matter alignment with critical topics in transportation research.



- Public university
- **6,434** undergraduates
- **31** undergraduate programs
- **1,773** graduate students
- **32** graduate programs

Institution Research Highlights

- Member of the [MSI STEM R&D consortium \(through USDOD\)](#).
- Hosted a National Summer Transportation Institute for high school students in 2019.
- Developing an innovative project to create mobile public health and chronic disease management care in rural areas and needs a strong transportation agency partner.
- Has experience working on transportation planning projects with local governments.
- Has contracted with Transport Canada to investigate head injuries in crashes.
- Has prior experience working to research disaster management and emergency preparedness.
- Houses the Julius L. Chambers Biomedical/Biotech Research Institute and the Golden Leaf Foundation Bio-manufacturing Research Institute and Technology Enterprise.
- Provides students with an introduction to public health research through summer educational experiences placement and would be an ideal partner for transportation public health research.
- Has developed several pipeline programs to increase the number of minority students pursuing careers in science, math, and technology.
- Has a large cohort of alumni working at NCDOT.

Transportation Related Majors

- Biomedical engineering
- Environmental and geographic science (GIS)
- Materials science
- Mathematics
- Planning/public administration
- Political science
- Public and behavioral health

Research Funders

City of Durham	USDOD
NASA	USDOE
NIH	USDA
NSF	UNC Resource
Transport Canada	Opportunity Initiative

OPPORTUNITIES

- NC Central has several faculty who are interested in nano-materials/particulate matter research and the environmental impacts of transportation, possible areas of collaboration with NCDOT.
- The university has strong interest and ability to complete public health/behavioral science and transportation research.
- The university has identified opportunities to expand existing relationships with GIS researchers, currently funded through NCDOT.
- NC Central's public administration program planning concentration teaches a multi-modal transportation course. Each student in the program completes a 300-hour service learning project with a partner organization, providing an opportunity to expose students to NCDOT.
- The university is an experienced participant in consortiums and partnerships, and values this model for expanding research capabilities and opportunities.
- NC Central and Duke University have discussed operating jointly on resilience work with NCDOT.
- Key NC Central staff had meetings between their programs and several units at NCDOT. They are poised to continue building relationships.
- The university is seeking a champion to identify innovative transportation alternatives for vulnerable populations' healthcare needs. Research suggests that providing a mobile unit could help solve chronic health conditions and increase equity. This could be harnessed for rural road condition data collection and outreach.

BARRIERS

- There are a limited number of departments with NCDOT research experience.
- Faculty are not all aware of NCDOT's research needs.
- NC Central's primary research focus is on biomedical sciences.

RECOMMENDATIONS

- Advertise research needs statements more broadly, and provide more communications materials.
- Provide potential PIs a point of contact within NCDOT's research department for particular research topics.
- Consider research partnerships across the State of North Carolina agencies (e.g., transportation and public health) to enable cross-disciplinary innovations.
- Leverage the unique capacity of universities to do public engagement and local transportation planning.
- Consider providing funds for faculty research development in transportation.



Saint Augustine's University

Raleigh, North Carolina

Institution Summary

Saint Augustine's University is a small university with a strong commitment to further develop its STEM research program. Faculty at St. Augustine's currently work in many transportation-related fields. Their expertise lies not only in technical fields relevant to NCDOT's research, but also in leading research capacity building efforts for HBCUs and MSIs. St. Augustine's research specializations include public health, molecular biology, behavioral health, business and entrepreneurship development, and criminal justice research. Their faculty are deeply involved in these research areas, as well as multiple community-based outreach projects. Saint Augustine's career development department is very active in finding potential placements for student internships and developing relationships with potential employers. The school has expressed interest in receiving communications materials for transportation careers.



- Private university
- **767** undergraduates
- **20** undergraduate programs

Institution Research Highlights

- Saint Augustine's most significant funding source is the National Science Foundation, which has sponsored ongoing and expanding research in molecular biology and environmental science involving multiple faculty researchers and many undergraduate students.
- The school is a partner in the Virginia-North Carolina Louis Stokes Alliance for Minority Participation, a group dedicated to increasing diversity in the STEM workforce. Since its inception over a decade ago, the NSF-funded partnership has seen minority students graduating with STEM degrees increase 150%. The partnership hosts a conference each year for students to present their research.
- The university recently established the Laboratory of Molecular Genetics for genetics research.
- Is a member of a partnership with Morehouse College, focused on building research capacity and grant-writing expertise for HBCU faculty. Dr. Mark Melton is a major figure in the project and hosts a monthly webinar series providing technical assistance on grant writing and research procurement. He and other partners are tracking application and acceptance rates for their participants.
- The university is working in partnership with the UNC system on behavioral research related to the spread of HIV/AIDS on college campuses in North Carolina.
- A recent valedictorian of St. Augustine's worked as an intern at NCDOT and had a very positive experience, energizing St. Augustine's student body interest in the program and allowing them to significantly boost the annual number of student applications to the program.

Transportation Related Majors

- Business administration
- Behavioral health
- Biology
- Computer science
- Criminal justice
- Political science
- Public health
- Sociology

Research Funders

- | | |
|-------|------------|
| NSF | NPS |
| USDA | UNC Center |
| USHUD | for AIDS |
| USDOJ | Research |



OPPORTUNITIES

- Dr. Mark Melton, Dean of Sciences, Mathematics, and Public Health, is a strong champion for HBCU research capacity building. Working with him and partners at other institutions on including NCDOT research procurement strategies may help cultivate increased applications from HBCU faculty, as well as higher quality applications.
- The business department is focused on expanding opportunity and certifications to minority entrepreneurs and would be an excellent partner for NCDOT's Minority Business Enterprise office.
- St. Augustine's public policy and planning department is conducting community engagement on transportation issues in their local community and is interested in a partnership with NCDOT for any public engagement purposes.

BARRIERS

- Faculty and staff noted that students do not have detailed awareness of transportation careers and perceive jobs at NCDOT as primarily road crew work.
- Faculty described the difficulty of finding time to apply for research grants on top of heavy course loads and existing responsibilities.
- Department chairs described the challenge of pursuing single projects (dedicating an FTE to a project which will soon end) as opposed to pursuing ongoing and stable funding.

RECOMMENDATIONS

- Visit the campus. Faculty described NCDOT's HBCU Outreach Director's visits to campus as a positive and crucial factor in developing internship interest and recommend similar engagement around research grants.
- Issue calls for internship applications earlier in the year, as many students have already applied or been accepted to other internships by the time NCDOT's program opens for applications.
- Develop communication materials advertising NCDOT jobs, internships, and research grants in more accessible and relatable ways. For example:
 - Provide a listing of all degree fields which may be relevant in job descriptions.
 - Provide an engaging set of materials on the breadth of NCDOT work (planning, research, technology, policy, etc.).
 - Provide a transportation career guide connecting the steps toward an NCDOT job and why a student would want to follow that path.
 - Provide very early engagement for students in middle or high school to learn about the transportation field.
- St. Augustine's career development office recommends creating a faculty-in-residence program at NCDOT where faculty and undergraduate research assistants can join for a summer to conduct research and become more familiar with NCDOT overall.



Institution Summary

Shaw University currently conducts a limited amount of sponsored research, mostly in STEM fields and especially in biological sciences. The institution is successful in building ties with private firms, community organizations, and other agencies to increase faculty skills and knowledge, as well as to build additional opportunities for its students.



- Private university
- 1,305 undergraduates
- 22 undergraduate programs
- 3 graduate programs

Institution Research Highlights

- Research focuses primarily on science and technology, especially the biological sciences.
- Currently there is limited ongoing transportation research at the university; however, students have participated in transportation-related internships in the past.
- Various faculty members conduct research with the NYU Faculty Research Network (FRN) program, spending a week there in the summer. The program provides intensive one-week professional development training. Additionally, one faculty member from Shaw is selected each year to participate in a longer faculty-in-residence program (one- to two-months long) each summer.
- Shaw is a member of the White House Initiative on HBCUs.
- One faculty member at the university has participated in professional development programs with private firms such as Google and Citrix.

Transportation Related Majors

- Business and public administration
- Computer and information sciences
- Mathematics
- Political science

Research Funders

- NEH
- NIH
- NSF



OPPORTUNITIES

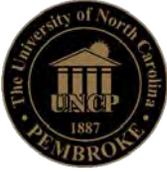
- The university is located just blocks from NCDOT headquarters, potentially making it easier for the agency to build relationships with faculty members at the institution.
- Shaw has begun to develop living-learning communities, in which students interested in similar fields of study live together and pursue opportunities related to their interests. Though a transportation community has not yet formed, it is possible that one could in the future. NCDOT could help shape a transportation-focused living-learning community by offering programming, talks, and professional development opportunities. In turn, NCDOT could have access to a stronger recruiting pipeline from the university.

BARRIERS

- Faculty teaching loads are very high. Most professors are teaching five courses each semester, meaning that the only time that they could research and write proposals to conduct funded research would be late in the evening or on weekends. Including faculty buy-outs would be a key factor in determining whether a professor would apply to any particular grant.
- Shaw has had very few faculty at the university express an interest in pursuing transportation-related research grants. However, for those who are interested, the opportunities are high.
- Students have not explicitly shown interest in transportation, and faculty noted that students also are not fully aware of the variety of career options in transportation.

RECOMMENDATIONS

- Support faculty awareness of the gaps that exist at NCDOT to help them identify how they might help fill those gaps with their existing skills.
- Consider developing faculty fellowships. These could occur over the summer and provide funding for faculty at various HBCUs to work on projects at NCDOT during the academic off-season. Faculty would benefit in that they would better understand NCDOT while the agency would benefit by developing ambassadors to the schools whose faculty participate.



UNC-Pembroke

Pembroke, North Carolina

Institution Summary

The University of North Carolina at Pembroke conducts a significant amount of research on campus, though much of it is non-sponsored. Faculty research strengths are in the fields of data analytics, including automated data analysis, optimization, and prediction models; business and management; and emerging technology applications, including some work on drones. In recent years, the university has increased investment in its research program with the goal of becoming more productive; as a result, more sponsored research has begun to occur on campus, especially in STEM fields. The institution also emphasizes undergraduate research experience and has actively developed on-campus programs to provide students more exposure to research, including those from historically underrepresented groups.



- Public university
- 6,069 undergraduates
- undergraduate programs
- 1,068 graduate students
- graduate programs

Institution Research Highlights

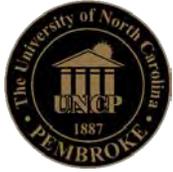
- The majority of UNC-Pembroke's current research is secondary in nature and non-sponsored.
- In recent years, the university has had increased success in attracting sponsored research, mostly from national sources.
- Recent research on campus includes work in data analytics, machine learning, predictive modeling, optimization models, and some drone work.
- Undergraduate students have several opportunities to be involved in on-campus research, including the UNC-RISE Program, which seeks to diversify the research workforce by attracting and training underrepresented undergraduate students.

Transportation Related Majors

- Applied physics
- Business administration
- Computer science
- Economics
- Environmental science
- Political science
- Sociology

Research Funders

- NIH
- NSF
- USDA
- USDHHS
- USDOD



UNC-Pembroke

Pembroke, North Carolina

OPPORTUNITIES

- UNC-Pembroke’s administration has been actively working to develop and test new programs and initiatives to increase students’ exposure to research and to support faculty capacity to produce high-quality research projects.
- The university has existing contract-based work with public agencies, such as conducting water quality testing on behalf of public agencies in areas surrounding the university. Faculty and administration suggest that developing similar transportation-focused projects would be an effective approach for smaller universities to work on more NCDOT projects.
- UNC-Pembroke’s Office of Sponsored Research is led by administrators who have significant experience in successfully building research programs at other HBCUs.
- There is a large pool of qualified faculty with significant skillsets that NCDOT has expressed interest in pursuing, including in machine learning, optimization, and drone technology.

BARRIERS

- Adjunct faculty are difficult to find due to UNC-Pembroke’s rural setting. Adjunct faculty are an important part of the sponsored research process, as they help to cover teaching responsibilities as faculty conduct the research.
- UNC-Pembroke has tried to develop a course release program for scholarship one out of every two semesters, but found that there were already not enough faculty to cover required courses.

RECOMMENDATIONS

- Clarify whether U.S. citizenship is required to be awarded research funding. For many federal and national grants, this is often the case. Several faculty members are working under visa status.
- Specify which data products are available to support certain research projects. If there are state-collected and managed datasets that would be available to carry out any particular project, researchers would benefit from knowing that up front to understand how much data collection and analysis would be required to conduct the research.
- Expand presence on campus. This would help researchers and students have a better sense of the types of work that the agency is hoping to achieve. In-person interaction could foster better communication and improve the quality and responsiveness of proposals. It would also help the university determine if faculty have the right mix of skillsets on campus to carry out the project.
- Provide additional information on how research proposals are evaluated by NCDOT. Several people suggested structuring reviews similarly to those of the National Institutes of Health, where panels of peers score proposals.

Institution Summary

Winston-Salem State University researchers have interest and expertise in transportation-related fields, including human factors, transportation solutions for people with disabilities, and economic impact studies of traffic corridors. WSSU has strong programs in the social sciences, including a research center for economic mobility and health disparities. In particular, faculty have interest and capacity to support community-based research. WSSU faculty have a strong understanding of how transportation relates to their existing research, and desire additional perspective from NCDOT on how non-engineering fields can support NCDOT priorities. WSSU strongly prioritizes supporting student research and employment opportunities as a primarily teaching institution. WSSU facilitates school-to-work pipeline opportunities through Federally-funded workforce development programs to educate at-risk youth on pathways to meaningful jobs, even without a high school diploma.



- Public university
- 4,741 undergraduates
- undergraduate programs
- 449 graduate students
- 10 graduate programs

Institution Research Highlights

- WSSU has several students who have received Eisenhower Fellowship grants for transportation research.
- The Center for the Study of Economic Mobility researches barriers to opportunity in vulnerable communities, with a specific focus on communities within Winston-Salem. The research is intended to directly support policy that improves job opportunities, business development, and property taxes. One study focuses on access to reliable transportation for Winston-Salem residents.
- The Center of Excellence on the Elimination of Health Disparities promotes health equity in health care delivery and treatment through community-engaged research with policy-oriented solutions.
- The Center for Design Innovation is a multi-campus research center shared with the UNC School of the Arts and Forsyth Technical Community College. It includes a spatial justice studio, which focuses on developing alternatives to support more equitable urban communities.

Transportation Related Majors

- | | |
|---------------------------|--------------------------|
| • Business administration | • Information technology |
| • Computer science | • Political science |
| • Economics | |

Research Funders

- NSF
- OSR
- USDOE



OPPORTUNITIES

- Faculty are knowledgeable and creative and have a strong understanding of how their existing research could connect to transportation, including a specific focus on human factors, public health, and elderly populations.
- The university has extensive knowledge of the surrounding community and capacity to support community-based research. Students are actively engaged in community service learning, which is embedded across majors.
- Three international airports are located within a 90-minute drive of campus. There are opportunities for WSSU to be a transportation hub for the country that NCDOT could leverage.
- WSSU has faculty with expertise in transportation-related areas who could participate in research clusters in partnership with other institutions. WSSU also has capacity to support course-based research with students, which NCDOT could help shape and develop for its career pipeline.
- Faculty have experience working with a wide range of community stakeholders across the Triad, including project work on the MLK Jr. Dr. Overlay Zoning District, Waughtown Strategic Plan, and Piedmont Together (a 12-county, \$1.6 million regional sustainability plan, funded by USHUD to address transportation, housing, places/spaces, jobs, and healthy communities).
- The university has an established internship program with the City of Winston-Salem's Department of Transportation. Three students have participated over the past two years.

BARRIERS

- Faculty researchers noted that some of their research might be more applicable on a national scale. More collaboration with NCDOT is required to determine connections to NCDOT priorities.
- The faculty prefer research projects submitted as grants rather than full-time contracts to ensure release time from teaching course loads. It is unlikely that faculty could devote 100% of their time to research. Short-term summer contracts may be more feasible for faculty than 9-12 month contracts.
- The university does not have a formal engineering or aviation program. The institution would primarily be able to support business, social sciences, and health research.

RECOMMENDATIONS

- Clarify process for developing areas of research interest in tandem with NCDOT.
- Harness WSSU and similar institutions' focus is on student development through NCDOT funding.
- Consider that a consortium or partnership model will require a major investment for a permanent structure.
- Develop a list of ways transportation connects to research and potential jobs across disciplines.
- Consider possible connections between faculty research and Eisenhower-funded undergraduate research.

Glossary of Terms

AEL	Aerospace Education Laboratory
AHA	American Heart Association
C-SAM	Center for Self-Aware Machining and Metrology
CSERSER	Laboratory and Center for Remote Sensing Education and Research
ECSU	Elizabeth City State University
FHWA	Federal Highway Administration
GIS	Geographic Information Systems
HBCU	Historically Black Colleges and Universities
JCSU	Johnson C. Smith University
MOU	Memorandum of Understanding
MSI	Minority-serving Institution
N.C. A&T	North Carolina A&T University
NASA	National Aeronautics and Space Administration
NCDOT	North Carolina Department of Transportation
NEH	National Endowment for the Humanities
NIH	National Institute of Health
NIJ	National Institute of Justice
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NSF	National Science Foundation
OSR	Office of the Secretary for Research
SAP	SAP is not an acronym, but rather the name of a software company
STEM	Science, Technology, Engineering, and Math
UAS	Unmanned Aerial Systems
UNC	University of North Carolina school system
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health & Human Services
USDHS	U.S. Homeland Security
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior
USDOJ	U.S. Department of Justice
USDOT	U.S. Department of Transportation
USHUD	U.S. Department of Housing and Urban Development
WSSU	Winston-Salem State University

