Research & Development Operations Manual

North Carolina Department of Transportation

Research & Development Unit

Revised September 2025

RESEARCH & DEVELOPMENT

Table of Contents

1.0 Introduction

Transportation improvements are crucial to the success of the economy, educational system, recreational endeavors, environmental initiatives, and general quality of life. Effectively managed transportation research programs help to identify transportation improvements and are a valuable national, state, and local resource. The North Carolina Department of Transportation (NCDOT and/or the Department) conducts vital transportation research as part of its ongoing effort to improve transportation engineering, technologies, and operations. The research helps to develop solutions to improve mobility; build better, safer, and longer-lasting multimodal facilities; lessen the Department's environmental impacts; provide safer conditions for drivers and pedestrians; and increase the service life of bridges and pavements.

Long-term outcomes from the NCDOT Research and Development (R&D) program include:

Figure 1

A robust research program assists the Department, our customers, and business partners in understanding and maximizing the safety, access, reliability, state of good repair, and customer satisfaction of the overall transportation program. NCDOT seeks to conduct practical and implementable research that will serve the Department and the public for many years.

1.1 Document Purpose

This document describes the functions of NCDOT's Research and Development Unit and presents an R&D management process designed to incorporate the department's needs and goals into a cohesive program. It includes discussion of program development, project administration and management, training, implementation, external program support, and federal funding requirements.

This Research & Development Manual fulfills the U.S. Department of Transportation requirements to assure the applicability of NCDOT's research in meeting national research goals as referenced in 23 CFR Part 420.209(7)(b).

1.2 Basic Structure

NCDOT develops its research program using a three-tiered structure. At the top of the organizational structure is the Research Executive Committee (REC), which is composed of NCDOT Executives. Six topical Research Technical Subcommittees provide recommendations and input to the REC. Finally, each research project is assigned a Steering & Implementation Committee (StIC) that provides technical feedback to the researcher as well as to Departmental personnel. Internal customers and NCDOT Management are pivotal in setting the strategic direction for research through their solicitation of research idea submittals and project approvals.

To investigate defined research needs, the Department contracts with various universities, transportation research centers, and consultants throughout the state and nation. Primarily, research is conducted with university programs in North Carolina, but specialized expertise may be needed from out-of-state universities. As research projects involve graduate students, an additional benefit to solving real-world problems is the development and recruitment of the next generation of transportation professionals who will work with NCDOT and its partners in the private sector and academia.

In addition to contract research, this manual discusses the R&D Unit's role in providing support and coordination for national-level research activities through the Transportation Research Board (TRB), American Association of State Highway and Transportation Officials (AASHTO), National Cooperative Highway Research

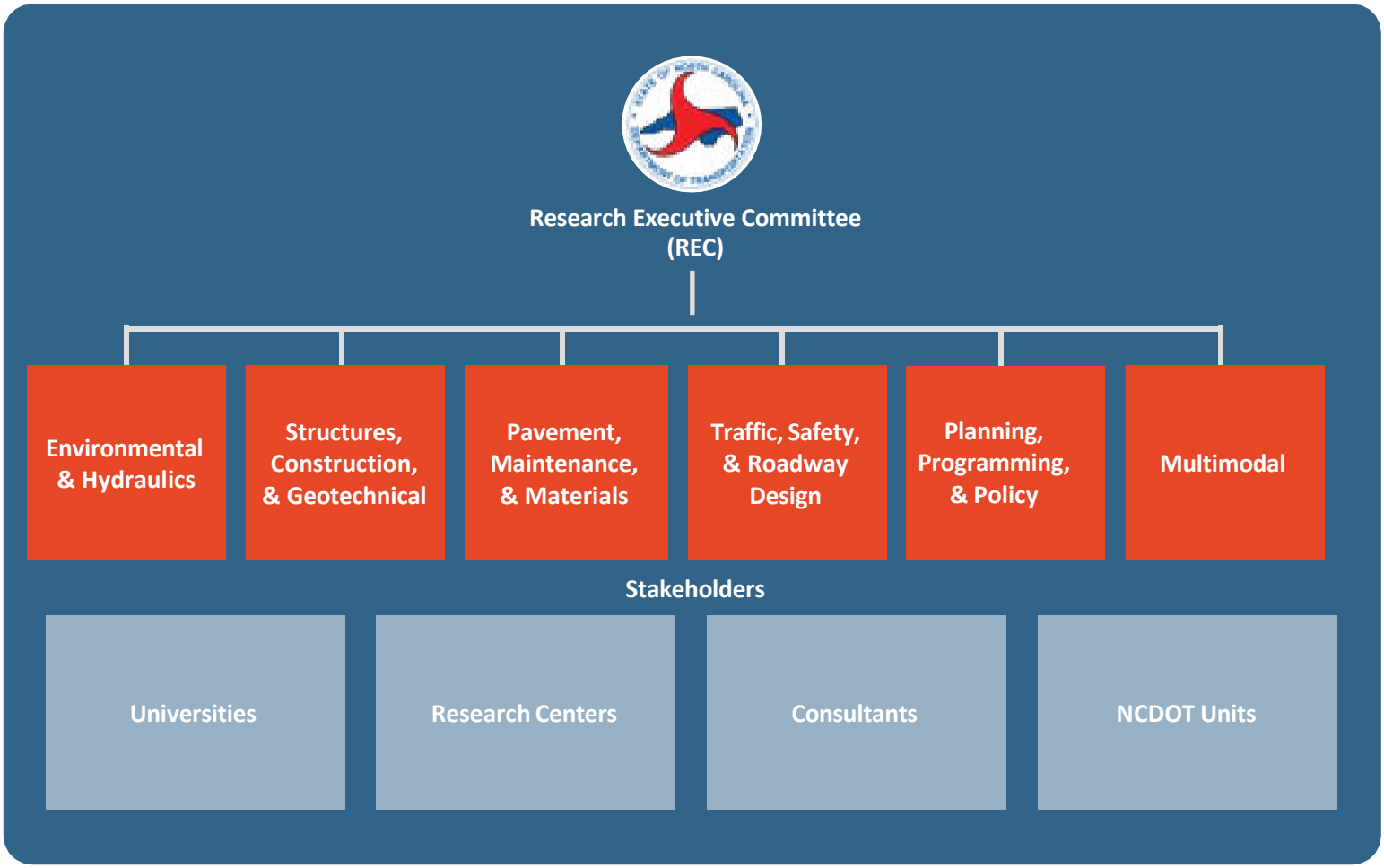


Figure 2

Program (NCHRP), Strategic Highway Research Program (SHRP), and Pooled Funds. In addition, the R&D Unit provides contract review and project management services to NCDOT business units conducting research with universities using alternative funding sources.

2.0 Background Research Program Information

1921: The Federal Highway Act of 1921
authorized the first sustained fiscal support for highway research

1959: NCDOT became involved in highway research

1962: Federal-Aid Highway Act of 1962
mandated funds for planning and research purposes only

1967: The first permanent research staff member was a Highway Research Coordinator

1981: The first permanent research staff member was a Highway Research Coordinator

1991: Research and Development Agreement was executed with the Institute for Transportation Research and Education

1997: ISTEA expired

1998: Transportation Equity Act for the 21st Century

2005: Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

2012: Moving Ahead for Progress in the 21st Century Act

Further federal funding was authorized

2021: America's Transportation Infrastructure Act

Current house bill may provide an additional 5 years funding

Figure 3

2.1 Federal Funding History

Funding for transportation research began with the Federal Highway Act of 1921, which authorized the first sustained fiscal support for highway research. Support for highway research was reaffirmed in the Federal-Aid Highway Act of 1962, which mandated funds for planning and research purposes only. Transportation research funding was expanded with the Intermodal Surface Transportation Efficiency Act of 1991 (Public Law 102-240; ISTEA, pronounced Ice-Tea). As a result, NCDOT broadened its approach to highway research and development. ISTEA included a provision assigning 2% of each state's federal allocation to State Planning and Research (Subpart B) funds. Within this Subpart B program, 25% of the funds were designated for research activities. ISTEA expired in 1997 and was followed by the Transportation Equity Act for the 21st Century (TEA-21) in 1998 and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005. Further federal funding was authorized in 2012 with the Moving Ahead for Progress in the 21st Century Act, followed by the Fixing America's Surface Transportation Act in 2015. In 2021, the Infrastructure and Jobs Act funded infrastructure and provided further research funding.

2.2 NCDOT Research Program History

The North Carolina Department of Transportation – known at the time as the North Carolina State Highway Commission – became involved in highway research in January 1959 with the establishment of cooperatively funded studies at North Carolina State University. The first permanent research staff member was a Highway Research Coordinator who was employed in 1967 and assigned to a newly created Planning & Research Branch. Under the provisions of annually renewable cooperative agreements and the oversight of a Research Steering Committee, the Planning & Research Branch continued to contract with the North Carolina State University Engineering Research Services Division through 1981.

In 1981, a Research and Development Agreement was executed with the Institute for Transportation Research and Education (ITRE), which provided the Department an avenue to undertake contractual research with state-supported universities in North Carolina. This agreement with ITRE was superseded by a Master Agreement for Services for Research and Development and Training Projects in 1988.

The R&D Unit was formed in 1990 and assigned to the Statewide Planning Branch and later to the Program Development Branch. In 2009, the R&D Unit was reassigned to the Technical Services Division and shortly thereafter, established Master Agreements with individual universities. In recent years, the R&D Unit was designated to Transportation Programs Management under the Technical Services

Division. Currently, the R&D Unit is assigned to the Office of Strategic Initiatives & Program Support (OSIPS).

2.3 Benefits of the Research Program

This document provides a framework for the administration of NCDOT's Research & Development Program and sets forth procedures that comply with the State Planning and Research Program Administration issued by the Federal Highway Administration (FHWA).

The programs, projects, and products generated by the R&D Unit provide benefits to the Department's employees and other transportation agencies and users. The program is primarily made up of contractual research with local state-supported universities. R&D also supports research opportunities that are external to the Department, such as through the Transportation Pooled Fund, AASHTO, and NCHRP.

Research project effectiveness is measured by criteria that include the following:

- Research need / Urgency
- Level of implementation
- Impact on the business
- Quality of interaction between research staff, the Department's operating units, and research teams

To ensure the effectiveness of the research management process and the research program, implementation is tracked by surveys documenting:

- Increased safety,
- Enhanced performance,
- Knowledge gained
- Cost reduction.

Furthermore, the ongoing effort of the R&D Unit will encourage other NCDOT Business Units to be lead participants in bringing innovative practices to transportation. The Unit has prioritized implementation measures as a high priority. The R&D Implementation Manager focuses on capturing and communicating project implementation. This is done through interpreting data and results to aid the Unit in ensuring the research projects are used to the fullest extent by NCDOT and its individual units.

The R&D Unit develops and maintains positive relationships with knowledgeable researchers and makes continuous efforts to accommodate new faculty. In addition, the Office fosters the recruitment and development of new transportation research professionals through graduate student funding. This helps to attract new faculty and university students to work on NCDOT research projects and equips students for careers in transportation research or to work directly with the Department and supporting industries. The program develops technologies, enhances knowledge, improves processes, and streamlines project delivery to assist the State in meeting transportation needs created by growth and changing technology.

2.4 Authority

The authority for a state transportation research organization to use federal funds is found in Title 23 of United States Code 505. The authority for the state organization to administer the Subpart B funds in its program is found in Title 23 of the Code of Federal Regulations Part 420.105. State funding authority for highway and transportation research procurement in North Carolina is permitted under General Statute 136. N.C. Statute 136-28.1 exempts the research procurements with universities and non-profits from competitive requirements if the procurement is less than $1,000,000 ($1 million).

2.5 Administrative Terms and Definitions

The following administrative terms and provisions will apply to this document:

Strategic Research & Development Plan	A guiding plan that identifies major goals and strategies for transportation research. This plan is developed by the R&D Unit with the concurrence of the Strategic Working Group and the confirmation of the Research Executive Committee. The plan considers the mission and goals of the Department, the state's transportation system, the economic environment of North Carolina, and the major challenges that the state transportation system faces.
American Association of State Highway and Transportation Officials (AASHTO)	AASHTO is a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. It represents all five transportation modes: air, highways, public transportation, rail, and water. Its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system.
Research & Development Work Program	A narrative and tabulation of all activities to be undertaken by the R&D Unit for each fiscal year. The tabulation shall be separated into federal aid State Planning and Research funded components and one hundred percent state-funded components. It will also include obligations to organizations such as TRB, AASHTO, Pooled Fund Participation, etc.
Applied Research	This type of research means the study of phenomena and observable facts, without specific applications towards processes or products in mind. The primary purpose of this kind of research is to increase knowledge.
Basic Research	Research driven purely by curiosity and a desire to expand knowledge. This type of research tends not to be directly applicable to the real world in a direct way but enhances our understanding of the world around us. This type of research is largely conducted at the national level in transportation topics.
Budget Authorization	The portion of the Project Authorization (PA) detailing the total funds required for work accomplishment over the entire study duration. The Budget Authorization is subdivided into line items which depict both direct costs and indirect costs and are subdivided by fiscal years.
Catalog of Federal Domestic Assistance (CFDA)	The Catalog of Federal Domestic Assistance (CFDA) provides a full listing of Federal programs available to state and local governments (including the District of Columbia); federally recognized Indian tribal governments; Territories (and possessions) of the United States; domestic public, quasi-public, and private profit and nonprofit organizations and institutions; specialized groups; and individuals. NCDOT's CFDA is 20.205. Available at: https://www.cfda.gov/.
Transportation Centers of Excellence	Transportation Centers of Excellence was created in the Summer of 2019. These university-based consortium efforts are focused on Advanced Technology (i.e., Connected and Automated Vehicles or CAVs) and novel solutions to mobility and congestion issues. After review by the NC Transportation Innovation Committee (NC-TIC) Executive Committee, it was determined that the three (3) top-rated submissions would be funded.
Demonstration Project	A formal research project which is conceived to apply specific research results to an actual highway construction project, maintenance operation, or operating procedure. This type of project is intended to demonstrate the value and applicability of specific research results. Demonstration projects may include experimental evaluation projects, applied demonstrations, implementation projects, and operational tests. It is identified by a formal work plan and scope of work. It may also include a provision for the allocation of special federal funds through a project-specific cooperative agreement work order.

Development	The systematic use of the knowledge or understanding gained from research, directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes.
Direct Costs	Elements of the Budget Authorization which include salaries, wages, fringe benefits, supplies, materials, travel, printing, binding, expendable equipment, non-expendable equipment, equipment rental, laboratory use fees, and data processing expenditures.
Federal Fiscal Year	The twelve-month period beginning on October 1 of one year and ending on September 30 of the following year.
Final Report	A report documenting a completed R&D study or activity.
Formal Intramural Research Investigation	A formal type of study undertaken by the R&D Unit staff, usually at the request of and in coordination with other Departmental elements. This type of investigation will differ from a routine staff investigative assignment in that a formal work plan and scope of work are necessary. The duration of the formal intramural research investigation will generally be longer, usually in terms of months, and there may be repetitive nature to some of the work plan tasks. A formal intramural research investigation may be similar in scope to a demonstration project, yet it will generally require more synthesis of information. It may also require the application of mathematical and scientific principles and theories to data collection, data analysis, and reporting. A formal intramural research investigation will involve a similar level of commitment as a demonstration project and will require the designation of a Project Monitor and other key affiliated staff within the Department.
Grants Management System	A state-wide, web-based Grants Management System to administer the financial aspects of research projects.
Implementation Manager	The R&D Unit's Implementation Manager is responsible for working with the Project Engineers, Principal Investigators, Steering & Implementation Committee Chairs and Members, and the Research Manager to qualify, quantify, and promote implementation measures and technology transfer for completed research projects.
Indirect Costs	Elements of the Budget Authorization which cover clerical, accounting, bookkeeping, procurement, and other administrative services for which no charge is identified or allowable elsewhere in the Project Authorization. Indirect Costs are also referred to as Overhead. Indirect costs are based on twenty-six percent of eligible modified total direct costs (MTDC). The MTDC includes all allowable cost items except capital equipment and tuition. Subcontract costs are also eligible direct costs, but the rate for such costs is limited to twenty-six percent of the first $25,000 of eligible MTDC covered under each annual subcontract. NCDOT will negotiate overhead in accordance with the FHWA Memo: State Planning and Research Funds Overhead/Indirect Cost Rate Guidance dated July 19, 2017.
Intermodal RD&T	Research, development, and technology transfer activities involving more than one mode of transportation, including transfer facilities between modes.
Master Agreements	Contractual agreements entered into by the Department and Universities. These agreements provide the overall framework and contract details and are typically multi-year. Project Authorizations for individual projects are executed under the terms of the Master Agreement.
National Cooperative Highway Research Program (NCHRP)	A pooled funds research program directed toward problems of national significance. This research program is sponsored by the State Departments of Transportation and the Federal Highway Administration. The program is administered through the National Academy of Sciences' Transportation Research Board (TRB). Funds are provided to support the program through an annual agreement allocation devised by

	the American Association of State Highway & Transportation Officials (AASHTO) and the Federal Highway Administration. The annual agreement currently requires that each State Department of Transportation contribute five and one-half percent of its total federal Subpart B appointment. The AASHTO Board of Directors has the prerogative to set or adjust this apportionment rate.
Patents	The Department and its subrecipients are subject to the provisions of 37 CFR part 401 governing patents and inventions and must include or cite the standard patent rights clause at 37 CFR 401.14, except for §401.14(g), in all subgrants or contracts. In addition, NCDOT and their subrecipients must include the following clause, suitably modified to identify the parties, in all subgrants or contracts, regardless of tier, for experimental, developmental or research work: "The subgrantee or contractor will retain all rights provided for the State in this clause, and the State will not, as part of the consideration for awarding the subgrant or contract, obtain rights in the subgrantee's or contractor's subject inventions."
Peer Exchange	A periodic review of a State DOT's RD&T program or portion thereof, by representatives of other State DOTs, for the purpose of exchange of information or best practices. The State DOT may also invite the participation of FHWA and other Federal, State, regional, or local transportation agencies; the Transportation Research Board (TRB); and academic institutions, foundations, or private firms that support transportation research development or technology transfer activities. Peer Exchanges should be held every 4-5 years, and NCDOT will actively participate in those held by other states
Period of Performance	2 CFR 200.309 Period of performance. Requires a beginning and end date to be included in agreements and a non-Federal entity may charge to the Federal award only allowable costs incurred during the period of performance.
Procurement	Procedures for the procurement of property and services with FHWA planning and research funds by the State DOTs must be in accordance with 49 CFR 18.36(a) and (i) and, if applicable, 18.36(t). Local government subrecipients of State DOT funding must follow the procedures specified by the State DOT. Universities, hospitals, and other non-profit organizations must follow the procedures in 49 CFR 19.40 through 19.48. The State DOTs and their subrecipients must not use FHWA funds for procurements from persons (as defined in 49 CFR 29.105) who have been debarred or suspended in accordance with the provisions of 49 CFR part 29, Subparts A through F.
Principal Investigator	The research professional responsible for the oversight of a research project.
Project	An undertaking by a State highway department for highway construction, including preliminary engineering, acquisition of rights-of-way and actual construction, or for highway planning and research, or for any other work or activity to carry out the provisions of the Federal laws for the administration of Federal aid for highways. Completed NCDOT research projects can be accessed via the link on the R&D Unit's webpage: NCDOT Research Projects
Project Authorization	A formal contract of specific study objectives and arranged by specific work tasks, methods, and procedures. The Project Authorization duration will vary based on the complexity and time constraints of the research project under consideration. The Project Authorization will include a Budget Authorization for each fiscal year of activity. The Project Authorization may be supported with state-appropriated funds, or an eighty (80) / twenty (20) percent Federal/State combination
Research Engineer	The R&D Unit Engineer responsible for the oversight of a specific research project investigation. The Project Engineer works with the Chairperson of the Research

(Project Manager)	Project Steering & Implementation Committee to assure project deliverables are met. The Project Engineer is responsible for the project from its approval date to the completion of all formal reporting, financial activities, implementation, and technology transfer activities.
Research & Development Quarterly Newsletter	The R&D Manager compiles and distributes a quarterly newsletter for NCDOT employees and associated universities. The newsletter includes updated events and initiatives as well as highlights recently completed research projects. In addition, the newsletter contains a library section for updates on the R&D Library
Record Retention	Recordkeeping and retention requirements must be in accordance with 49 CFR 18.42 or 49 CFR 19.53.
Research	A systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research can be basic or applied. Sponsored agreements have substantial NCDOT involvement with a significant emphasis placed on the delivery of results, product, or performance. Payment is based on deliverables and milestones, and there is a high level of Departmental responsibility for the conduct of the project and production of results.
Research Innovation Summit	The Research and Innovation Summit is an NCDOT research summit held in conjunction with various universities around the state. This event allows NCDOT personnel, private entities, and university partners to discuss innovative transportation technologies and research. The summit includes information and poster sessions.
Sponsored Agreement	A contract between a university and the Department for the purposes of conducting research at the university. Sponsored agreements have substantial NCDOT involvement with a significant emphasis placed on the delivery of results, product, or performance. Payment is based on deliverables and milestones, and there is a high level of Departmental responsibility for the conduct of the project and production of results.
State Fiscal Year	The twelve-month period beginning on July 1 of one year and ending on June 30 of the following year.
Research Executive Committee	The Executive Committee consists of senior management and executive staff and provides research policy and oversight. The REC reviews and approves Research and Development Work Programs.
Research Technical Subcommittees	Six research technical Subcommittees comprised of representatives throughout the Department. These representatives will have authority and expertise in each of the six designated research program technical areas. These areas will include (1) Pavement, Maintenance & Materials; (2) Traffic, Safety & Roadway Design; (3) Planning, Policy & Programming; (4) Multi-Modal; (5) Structures, Construction & Geotechnical; and (6) Hydraulics and Environment. The advisory subcommittee structure is reevaluated annually to meet the Department's needs. Committees are typically made up of permanent central and design unit members and rotating field (Division) members. **1. *Pavement, Maintenance, & Materials Research Program Technical Area*** The Pavement, Maintenance, and Materials research program technical area encompasses but is not limited to the following subjects: liquid asphalt concrete and cement pavement mixture additives and admixtures, pavement mix and structural design, soils, aggregates, petroleum products, rubbers, latexes, epoxies, polymers, plastics, fibers, geotextiles, and recyclables. This committee also covers roadway asset management and fleet management.

	2. Traffic, Safety, & Roadway Design Research Program Technical Area The Traffic, Safety, & Roadway Design research program technical area encompasses but is not limited to the following subjects: highway inventory management, roadway design, photogrammetry, engineering surveys, highway engineering services, Traffic and Safety engineering automation, Traffic and Safety engineering applications development, traffic engineering, traffic safety, intelligent transportation systems, and field and district Traffic and Safety operations. ***3. Planning, Policy, & Programming Research Program Technical Area*** The Planning, Policy, & Programming research program technical area encompasses but is not limited to the following subjects: highway planning, environmental planning, economics, and finance. This technical area may include information technologies. ***4. Multi-Modal Research Program Technical Area*** The Multi-Modal research program technical area encompasses but is not limited to transit, rail, ferries, aviation, pedestrian, bicycle, and intermodal facilities. ***5. Structures, Construction, & Geotechnical Research Program Technical Area*** The Structures, Construction, & Geotechnical technical area includes, but is not limited to the following subjects: structural steel, bridge design, bridge construction, portland cement concrete construction, bridge maintenance, bridge management, large overhead sign structures, seismology and seismic design, culverts and major drainage structures, hydraulics, drilled foundations, tunnels, innovative structural materials and geotechnical and foundation engineering. ***6. Hydraulics and Environment Technical Area*** The Hydraulics and Environment technical area encompasses but is not limited to the following subjects: NCDOT's highway storm water program, sediment and erosion control, vegetation management, natural and human environment, waste management, environmental analysis, historic architecture, archaeology, biological surveys, environmental mitigation, soil, and water engineering and environmental operations.
Research Database	Internal tracking database designed to assist the Unit in tracking program development and managing active projects.
Supplies	Acquisition and disposition of supplies acquired by the State DOTs and their subrecipients with FHWA planning and research funds must be in accordance with 2 CFR 200.
Technical Assistance	The Technical Assistance Program provides NCDOT staff with technical support on matters requiring additional expertise or specialized laboratory testing.
Technology Transfer (T2)	Those activities that lead to the adoption of a new technique or product by users and involve dissemination, demonstration, training, and other activities that lead to eventual innovation. This activity includes library services and dissemination of national training and research opportunities to NCDOT staff. Currently, the R&D Unit has a formal T2 program administered by the R&D Implementation Manager.
Transit Cooperative Research Program (TCRP)	A national transit research program authorized in July 1992 and administered under the cooperative agreement by the National Academy of Sciences' Transportation Research Board, the Federal Transit Administration, and the Transit Development Corporation Incorporated. This program is funded by the Federal Transit Administration.

Transportation Pooled Fund (TPF)	The Transportation Pooled Fund (TPF) Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies.
Transportation Research Board (TRB)	TRB is one of six major divisions of the National Research Council (NRC), which is a private, nonprofit institution that is the principal operating agency of the National Academies in providing services to the government, the public, and the scientific and engineering communities. TRB is responsible for providing a forum for information exchange, managing research programs, developing policy analysis based on objective data and research and disseminating transportation research results.
Transportation Research Board – Transport Research Documentation Database (TRID)	The TRID database contains more than 1.25 million records of references to books, technical reports, conference proceedings, and journal articles in the field of transportation research.
United States Code of Federal Regulations (CFR)	The codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government.
University Transportation Center (UTC)	The UTCs conduct research that directly supports the priorities of the U.S. Department of Transportation (DOT) to promote the safe, efficient, and environmentally sound movement of goods and people. UTCs work with regional, state, local, and tribal transportation agencies to help find solutions to challenges that directly impact their communities and affect the efficiency of the nation's transportation system.

3.0 Organization of the Research Program

Research at NCDOT is a cooperative effort led by the Research and Development Unit staff. The primary components include the R&D Unit, Research Executive Committee (REC), Technical Subcommittees, and Steering and Implementation Committees (StIC). The R&D Unit solicits, selects, and monitors all State Planning and Research-funded research projects, which are conducted primarily by state colleges and universities.

Team Organization

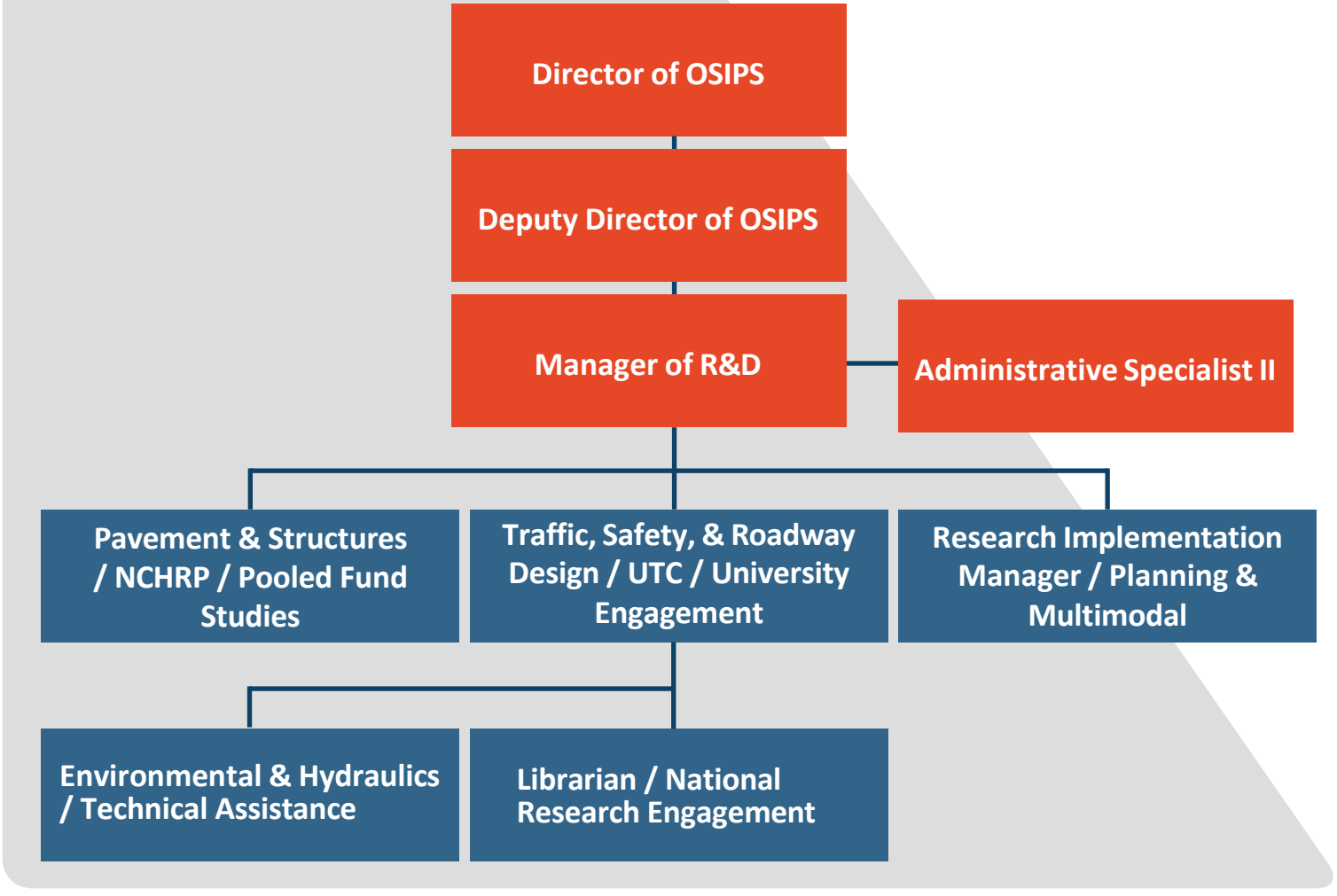


Figure 4

3.1 Research & Development Unit

The day-to-day administration of the R&D Program is the responsibility of the R&D Unit. The Unit works to ensure that the Work Program complies with 23 CFR Part 420.209(b). The Unit directs all formal staff research activities conducted within the Department; manages federally funded and state-funded contract research projects sponsored by the Department; coordinates Department research interests with those of other external research programs; and promotes research implementation and technology transfer.

The R&D Unit is led by the State Research and Development Manager. This position reports to the Deputy Director of the Office of Strategic Initiatives and Program Support. This person is also the signatory on Project Authorization documents. The R&D Manager is assisted by Administrative Specialists, Librarians and Research Engineers specializing in the previously listed topical areas of research and a Research Implementation Manager focusing on implementation of research results and technology transfer (See the APPENDIX A for Organizational Chart of the Department and the R&D Unit.)

External research programs of interest to the Department include the United States Department of Transportation and its various modal administrations, including the Federal Highway Administration, the Transportation Research Board (TRB), the American Association of State Highway & Transportation Officials (AASHTO), the various state highway and transportation agencies, foreign countries and transportation research institutes, and transportation research societies such as the American Society of Civil Engineers, the Intelligent Transportation Society of America, and the Institute for Transportation Engineers.

The expenditure of federal aid Subpart B funds per 49 CFR Part 420.209(d) is subject to evaluation. The use of these funds is obligated to add value to and improve efficiencies and/or effectiveness of Department operations. After selecting research ideas and developing the Research and Development Work Programs, the Research Work Program follows clearly defined procedures to ensure meaningful results.

One measure of success for the research program is the R&D Unit staffs' ability to develop and maintain strong and lasting interactive relationships inside and outside of the Department. These relationships assist the R&D Unit with program development, project management, consensus building, implementation assistance, technology transfer, and outreach.

3.2 The North Carolina Department of Transportation Library

The NCDOT Library was originally created to house meeting agendas and minutes for the State Highway Commission, now the NC Board of Transportation. Over time, the library expanded to become a repository of transportation-related documents.

The Collection Includes:

- Books on transportation and engineering related topics
- Research and government reports (NCDOT research reports, TRB publications, and AASHTO publications)
- Transportation-related periodicals and pamphlets
- Engineering and construction manuals
- Maps
- Historical newsletters and documents dating to the 1920s (Currently available only in print)

The collection is searchable through the State Library of North Carolina's Government and Heritage Library Online Catalog and currently consists of approximately 1,500 items and resources available to researchers and engineers.

Library outreach activities produce greater awareness for identifying basic needs and enhancements for technical reference services. This includes the development and maintenance of an Internet Homepage for the Unit, the introduction of prospective new technologies, and connection to other informational services, as well as other transportation librarian/ transportation research professionals, such as the Library Pooled Fund.

The R&D Unit employs a full-time librarian to maintain both the physical portion of the NCDOT Research Library and the online catalog in conjunction with the State Library of North Carolina. The NCDOT Research Library has executed a Memorandum of Understanding with the State Library of North Carolina that sets forth the responsibilities and relationship between the libraries in an effort to promote access to information through cooperative networks and library services.

The Research Librarian stays abreast of the most current methods of collecting and disseminating information on transportation subjects to keep the Department and the professional community informed of the latest advances in the field. The librarian is also responsible for assembling the Research and Development Newsletter on a quarterly basis. The NCDOT Research Library and Librarian are key

to knowledge management for the R&D Unit and the Department.

Research technical reference services and other related informational transfer activities performed by the R&D Unit Library are outlined in the annual Subpart B Work Program. Line items may be established to fund printing and binding services, journal subscriptions, subscription services, document acquisitions, newsletters, website development, SharePoint, Microsoft Teams, and other related services.

The R&D Unit continues to enhance and update its internet homepage to provide vital and timely informational services.

3.3 Research Committees and Subcommittees

The Research Executive Committee (REC) provides formal review and approval of the R&D Work Program and oversight of the research process.

Research Subcommittees are established for specific technical areas. The subcommittees hold primary responsibility for review and approval submitted research ideas research proposals and for recommending project funding to the REC. Through these committees, the R&D Unit staff maintains direct contact with the operating units of the Department and with outside institutions.

Steering and Implementation Committees (StIC) work with the R&D Unit to oversee and provide technical support and oversight for individual research projects. These documents are maintained by the R&D Unit (See APPENDIX B).

3.3.1 Research Executive Committee

Responsibilities

The NCDOT Research Executive Committee (REC) is the governing board for the NCDOT State Research Program and is responsible for actively participating in and supporting NCDOT's state and federal research programs. The committee is composed of NCDOT management as voting members and non-voting members, including FHWA representation. The REC is supported by the NCDOT R&D staff. The REC meets once a year to review and makes the final recommendation for funding research proposals.

The REC responsibilities include the following:

- Approving the research and development Work Programs, Project Authorization budgets, and major related activities and decisions
- Reviewing and approving of the Strategic Research & Development Plan
- Approving major determinations for research implementation and technology transfer
- Reviewing formal external master agreements
- Approving special funding requests by AASHTO, TRB, and/or other national organizations
- Participating in the periodic Peer Exchange event hosted by the R&D Unit

Executive Committee Membership

The Research Executive Committee membership will consist of the following permanent membership or appointed designees, except as noted:

- Chair* (*Chair of REC can be the Chief Engineer or the Deputy Chief Engineer unless otherwise officially noted*.)
- Vice Chair*
- Chief Engineer
- Deputy Chief Engineer
- Administrator – Technical Services Division
- Deputy Secretary – Multi-modal Transportation
- Director of Highway Operations
- Director – Transportation Planning*
- Manager – Hydraulics or Designee*
- State Materials Engineer
- Director – Civil Rights Division
- State Structures Engineer*
- State Traffic Engineer*
- HBCU Director
- FHWA – Division Administrator (Ex officio)
- FHWA – Division Research Liaison (Ex officio)
- Manager – Research and Development (Ex officio)

*These positions also act as chairs of technical subcommittees.

3.3.2 Research Subcommittees

Six Research Subcommittees have been established according to specified technical areas. The designated Research Subcommittee responsibilities include the following:

- Reviewing, prioritizing, championing, and evaluating formal research ideas and proposals
- Supporting specific research implementation and technology transfer activities
- Reviewing and evaluating external research program activities such as NCHRP problem statements, NCHRP Work Program ballots, FHWA and regional pooled fund projects, and other national-level transportation research initiatives

Environment and Hydraulics Subcommittee

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- State Hydraulics Engineer or Designee (Chair)
- Manager - Environmental Analysis Unit (Vice Chair)
- Environmental Policy Unit Head
- State Roadside Environmental Engineer
- State Geotechnical Engineer or Designee
- Field Division Representative (Three Year Appointed Term)
- Field Division Representative (Three Year Appointed Term)
- FHWA Division – Environment
- Other appointed representative(s)

* The Environment and Hydraulics Research Engineer serves in a special ex officio capacity as the Subcommittee's Secretary.

Pavements, Maintenance & Material Subcommittee Membership

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- State Materials Engineer (Chair)
- State Maintenance Engineer (Vice Chair)
- Operations Program Manager
- State Pavement Design Engineer
- State Laboratory Operations Manager
- State Roadside Environmental Engineer
- State Construction Engineer
- State Pavement Construction Engineer
- Division Maintenance Engineer (Three Year Appointed Term)
- Division Maintenance Engineer (Three Year Appointed Term)
- FHWA Division – Pavement and Materials

* The Pavement, Maintenance and Materials Research Engineer serves in a special ex officio capacity as the Subcommittee's Secretary.

Planning, Programming & Policy Subcommittee Membership

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- Director - Transportation Planning (Chair)
- Unit Head – STIP Central Region (Vice Chair)
- Commissioner - DMV
- Director of Strategic Planning and Logistics
- Director – Civil Rights Division
- State Traffic Engineer
- Division Planning Engineer
- Division Program Development Engineer
- FHWA Division – Planning

* The Planning, Programming & Policy Research Engineer serves in a special ex officio capacity as the Subcommittee's Secretary.

Traffic, Safety and Roadway Design Subcommittee Membership

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- State Traffic Engineer (Chair)
- State Roadway Design Engineer (Vice Chair)
- State Traffic Systems Operations Engineer
- State ITS and Signals Engineer
- State Traffic Safety Engineer or designee
- State Traffic Management Engineer
- Transportation Planning Division designee
- Director – Safety & Risk Management
- Division Traffic or Other Engineer (Three Year Appointed Term)
- Division Traffic or Other Engineer (Three Year Appointed Term)
- FHWA Division – Traffic Operations and Safety

* The Traffic, Safety and Roadway Design Research Engineer serves in a special ex officio capacity as the Subcommittee's Secretary.

Multimodal Subcommittee Membership

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- Director – Integrated Mobility Division
- Director – Rail Division
- Director – Ferry Division
- Director – Division of Aviation
- Traffic, Safety & Roadway Design Rep.
- Planning, Programming & Policy Division Rep.
- Structures, Construction & Geotech Division Rep.
- FHWA Rep.

Structures, Construction and Geotechnical Subcommittee Membership

Committee membership is comprised of the following permanent assignments or appointed designees, except as noted:

- State Structures Engineer (Chair)
- State Construction Engineer (Vice Chair)
- Regional Bridge Construction Engineer
- Assistant State Structures Engineer – PEF, Program Management, Ops
- Assistant State Structures Engineer – Inspections, Policy, etc.
- State Laboratory Operations Manager
- State Geotechnical Engineer
- State Materials Engineer
- State Hydraulics Engineer
- Division Construction or Bridge Program Engineer (Three Year Appointed Term)
- Division Construction or Bridge Program Engineer (Three Year Appointed Term)
- FHWA Division - Structural

* The Structures, Construction and Geotechnical Research Engineer serves in a special ex officio capacity as the Subcommittee's Secretary.

3.2.3 Research Project Steering and Implementation Committees

Definition and Responsibilities

A Research Project Steering and Implementation Committee (StIC) is selected for each research project. Responsibilities of the StIC include the following:

- Establishing initial project expectations and implementation actions
- Providing technical and project logistics and materials support
- Evaluating overall progress on specific projects
- Reviewing progress reports, interim reports, draft final reports, and other official project-related documents
- Participating in project kick-off, progress, and close-out meetings
- Advancing technical aspects of projects and investigations, including technology transfer and implementation activities

Research StIC meetings are scheduled by the R&D Unit staff in conjunction with the StIC Chairperson at appropriate intervals to ensure an understanding of the project's goals, objectives, and methodology. The StIC Committee Chairperson is responsible, in cooperation with the Research Manager, for approval of budget adjustments, project scope, personnel modifications and extensions of contract periods.

The StIC provides technical guidance to the researchers and works closely with the assigned research Project Manager (PM) to keep research efforts focused, on schedule, and within the defined scope of work (See APPENDIX B). Successful projects depend on quality work by researchers, active project management, and timely and critical feedback from the StIC chair and members.

Membership

Each StIC Committee Chairperson is appointed by the R&D Manager in conjunction with NCDOT management and the R&D Unit staff. The generator of a specific Research Idea or a Request For Proposal (RFP) is commonly, but not always, the chairperson of the project StIC. StIC members are made up of subject matter experts (SMEs) who will oversee each research project. The NC Division of FHWA also participates as StIC members.

StIC Chairpersons are typically the primary technical and policy experts for the subject area being investigated. The remaining members of the Research StIC are recommended by the participating Departmental Unit, the appointed StIC chairperson, and R&D Unit staff. Membership in the StIC is not limited to Departmental personnel. Stakeholders from the FHWA, state and federal regulatory agencies, local governments, and the general public are encouraged to participate. Each StIC member is selected to provide additional or specific expertise in a specific technical area. It is important for the right people to provide good quality and specific feedback. All funded research projects that involve Information Technology (IT) will have a Department IT representative on the StIC. Additional IT policies and cybersecurity information will be included in this manual as the policies are created and may be added to Project Authorizations as addenda.

4.0 Research Engagement, Partners, Customers & Transportation Research Centers

The R&D Unit continually strives for enhanced engagement with research customers and partners through forums, departmental functions, transportation research centers, the annual R&D Innovation Summit, rapid technical assistance, and the R&D Library.

4.1 Customer Support

The programs, projects, and products of research are intended to benefit Departmental employees and contractors, users of the transportation network, and other transportation agencies. The support of participating customers is integral and can be achieved by involving them in the development of the program and the generation of the products. This proactive involvement will ensure that customer needs and satisfaction are adequately considered.

4.2 Research Partners

Research partners come from within the Department as well as from the following:

- North Carolina and out of state universities
- Companies affiliated with transportation (e.g., vendors and contractors)
- Private engineering firms
- Other State DOT's
- Local governments
- Legislative personnel
- Local and national government regulatory agencies
- FHWA
- AASHTO
- NCHRP
- Traveling public

The level of involvement of these various partners will vary throughout the research and development process. The success of implementation depends on the successful engagement of all research partners. Gaining and maintaining the support of beneficial research partners is crucial to the R&D Program and requires continuous effort.

4.2.1 Forums for Partner Inclusion

The R&D Unit continuously interacts with partners to drive the content of the research program. Meetings, consultations, electronic contacts, the R&D Innovation Summit / Symposium, and other opportunities are scheduled to get input on critical and emerging transportation research issues. These interactions are solicited during predetermined cycles and periodically throughout the year. The R&D Unit also participates in staff meetings with each division and unit to educate and solicit feedback on the direction and goals of the research program, gather research ideas, and identify potential project champions.

Institutional discussions with the universities and other governmental representatives are conducted for both educational purposes and to aid researchers in submitting high-quality proposals.

Input for the development of the Work Program is obtained from public/private meetings, institutional discussions, and formal research idea solicitation processes. Any formal seminars or other formal events are scheduled with the approval of the Director of Field Support and/or the REC as needed.

4.3 Participation in Departmental Functions and Support of Research Centers

If requested, the R&D Unit staff will participate as regular members in important Departmental functions, task forces, and committees. Departmental inquiries are assigned to the R&D Unit as the need arises. The inquiries may include up-to-date literature searches and/ or current state-of-the-art practices on Departmental, legislative, fiscal, and policy issues. The Unit responds to assignments directed by the REC in addition to assisting with requests directly from NCDOT staff.

The R&D Unit is involved with and supports the activities performed by transportation research centers in North Carolina. These research centers include but are not limited to the University of North Carolina Highway Safety Research Center (HSRC), the Institute for Transportation Research and Education (ITRE) at NC State University, and the Transportation Institute at North Carolina A&T University.

The HSRC provides a prominent role for contract research with the Governor's Highway Safety Program and the National Highway Traffic Safety Administration. The R&D Unit works with NCDOT customers to engage the HSRC in Subpart B funded contract research or in research and training activities using other funding sources. The R&D Unit acts in concert with the Governor's Highway Safety Program to ensure maximum attention to research projects directly related to enhancing the safety of the traveling public.

In addition to being a source of research and training, ITRE provides an important technology transfer role as the manager of the Federal Local Technical Assistance Program (LTAP) for North Carolina and conducts significant amounts of training for NCDOT staff.

The Transportation Institute at North Carolina A&T University is housed in the College of Business & Economics and is an interdisciplinary research, training, and technology transfer unit that draws faculty, staff, and students from various departments. The mission of the Transportation Institute is to serve as a national, regional, and local clearinghouse for transportation education, research, and outreach.

4.4 NCDOT Research & Development Innovation Summit / Symposium

In the Spring of 2019, the R&D Unit sponsored the first annual Research Innovation Summit. This annual event provides an opportunity for both researchers/students and NCDOT personnel to showcase innovative research results, technologies, and practices obtained through the R&D program. The event includes poster sessions, workshops and training, research presentations, interactive sessions, and laboratory/research facility tours. A sponsor university hosts the summit/symposium.

4.5 University Engagement

NCDOT started supporting University research initiatives located in North Carolina in 2025. The focus of this initiative is to collaborate with Universities on basic/experimental research. More specifically, NCDOT will focus on disruptive technologies and methodologies that will eventually impact NCDOT's business practices and services. This will allow NCDOT to leverage the expertise of our University research partners and to provide insight to the potential outcomes of the research.

This program will provide matching funds to potential University-led research projects. The funding match will be based on negotiations between NCDOT and the University and the availability of funds from NCDOT.

NCDOT personnel must be engaged in the research to provide strategic direction for UTC and review the research proposal. The intent of the engagement is not to steer the direction of the research project or deliverable; rather, it is for NCDOT to provide insight and perspective to the research in order to identify potential opportunities for implementation or further research that would benefit NCDOT business practices.

5.0 Research Program Types

The R&D Unit facilitates/manages three different research project types based on the duration of the project: Long-Term, Medium-Term, and Short-Term.

5.1 Long-Term Research (Work Program)

Long-term research projects are defined as projects with more than nine months of duration and are facilitated by the Work Program. Section 6.0 details the procedure of the Work Program.

5.2 Medium-Term Research

The R&D Unit solicits proposals for medium-term research projects. Medium-term research projects are defined as research projects that take more than three months and less than nine months.

5.3 Short-Term Research (Technical Assistance Program)

The Technical Assistance Program provides Department staff with technical support on matters requiring additional expertise or specialized laboratory testing. The referrals are limited to 480 hours of consultation between a department official and a designated faculty member for a particular subject. A standard Technical Assistance Request form is used to document and contract with individual researchers or consultants (See APPENDIX C).

6.0 Research Program Development

The R&D Unit works with NCDOT customers and external partners to produce a Work Program. This program consists of contracted research with universities and non-profits and commitments of funds to Federal and national programs. The program is initially approved by the Research Executive Committee and later by the FHWA NC Division Office.

6.1 Work Program Cycle

The Research & Development Work Program is initiated on a fiscal and academic year basis. The Department's fiscal year begins on July 1 and ends on June 30. The Work Program is supported by federal aid Subpart B funds, state matching funds, special federal aid grants, and one hundred percent state funds. Certain activities, such as pooled fund participation, may be eligible for 100% Subpart B funding.

The NCDOT Transportation Planning Branch produces a Work Program for planning funds (Subpart A), while the research component (Subpart B) is prepared by the R&D Unit as required by 23 CFR Part 420.207(a). Elements of the research program include but are not limited to staff research administration, contract research Project Authorizations, formal research investigations, FHWA and regional pooled fund projects, demonstration projects, federal aid experimental evaluation studies, and other special studies.

Contract research Project Authorizations and formal intramural research investigations are developed for each project's total period of performance. Contract research projects must comply with the provisions, terms, and conditions set forth in the Master Agreement signed by each participating university. Budget authorizations are prepared for the total period of performance of each project and are structured by fiscal year. Budget authorizations shall reflect the maximum permissible costs per fiscal year. Line-item adjustments are allowed with proper documentation and justification and written approval by the appropriate NCDOT representative.

Contract research Project Authorizations are the products of a formal process. This process includes the scope of work, budget, schedule, deliverables, as well as additional contractual information.

The goal of the prioritization and selection process is to produce the best collection of projects for the Department's Work Program.

The following are the basic elements for Work Program development:

- Research Idea solicitation from NCDOT Employees and external partners
- Advertisement to University Researchers
- Evaluation of Proposals and compiling of recommendations for REC evaluation
- Submission of draft Work Program for REC approval
- Requesting of final proposal and Project Authorization documents for selected projects
- Submission of Work Program for federal approval
- Obtain approval signatures and return Project Authorization documents
- Initiation of projects
- Project Kick-Off Meetings and Implementation Plans

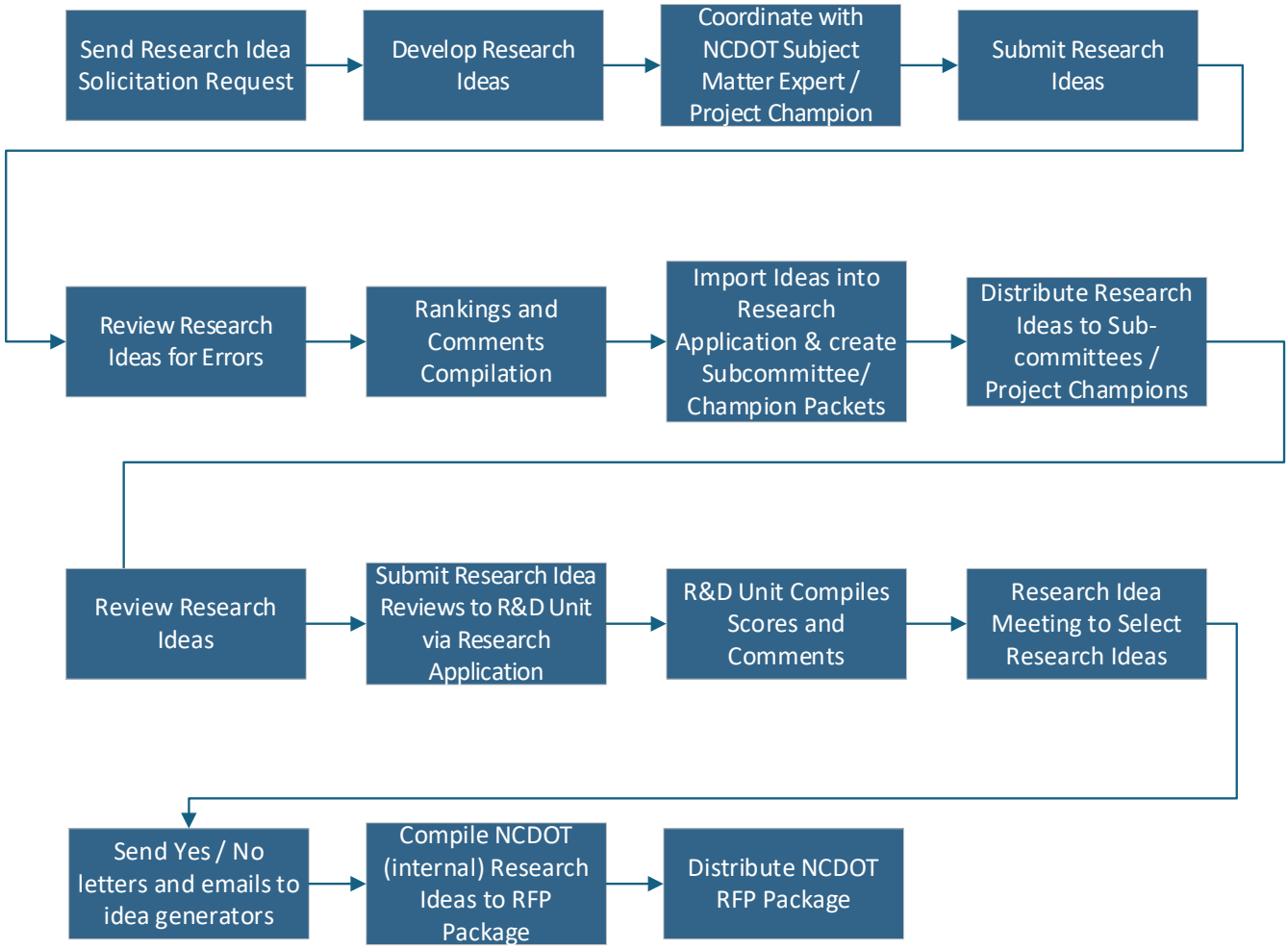
6.2 Research Solicitation Process

A request for specific research ideas is posted for NCDOT staff and external partners on the R&D Connect Site. Nearly all aspects of NCDOT business operations are eligible for research funding. Focus is placed on aiding the department in achieving its strategic and business goals.

Research partners and interest groups can also provide input for general research needs. The prospective Principal Investigators may submit potential research ideas within their specific fields of expertise and with NCDOT support.

FHWA's State Planning and Research Guide and Planning and Research Program Administration Guidance (revised October 16, 2018) provide additional assistance for implementing NCDOT's research program and eligible activities for funding.

Research Idea Phase



RESEARCH & DEVELOPMENT

Figure 5

6.2.1 Research Idea Solicitation Process

Annual Cycle

The Research Idea solicitation process is executed on an annual basis. Official solicitation requests are posted on the R&D Connect Site and distributed to Department branches, units, field divisions, and external partners during March, April, and May. The solicitation website is provided electronically via NCDOT News Distribution, Research and Development Newsletters, and direct emails to key internal and external personnel.

In addition, research ideas are accepted at any time throughout the calendar year but will be considered during the next upcoming fiscal year's Work Program. For example, if a research idea is submitted in December, it will be considered for development in the following August, nine months later.

If the research idea is urgent, a Request for Proposals (RFP) may be developed and considered for contingency or other funding on an out-of-cycle basis.

All NCDOT staff members and external partners in conjunction with NCDOT sponsors are encouraged to submit research ideas.

Research Idea Submittals

Research idea submittals and associated instructions will accompany all solicitations and is posted on the R&D Connect Site. New external users require a business North Carolina Identification (NCID) to sign in and access NCDOT Connect websites. Once the business NCID has been created, new external users will need to request access to the R&D Research Idea and Proposal Submission site.

The final deadline for the submittal of research ideas will generally be in the summer of each year. Upon receipt of the research ideas, the R&D Unit staff performs initial reviews of submissions along with individual NCDOT Technical Subcommittee reviews prior to distribution to potential researchers. Research Ideas submitted by external partners will be held in confidentiality.

6.2.2 Criteria for a Successful Research Idea

Successful Research Ideas are created with the following criteria in mind:

- **Novelty and Knowledge Contribution** - whether the proposed research is already being significantly studied, and if it has the potential to add new fundamental understanding to the subject matter
- **Potential Impact and Benefits** - the practical outcomes and advantages of the research, considering its potential to yield positive results, improve safety or environmental conditions, and aid in regulatory processes
- **Policy and Legislative Relevance** - the research's connection to governmental policies and laws at both the state and national levels, including whether it responds to or could influence future legislation
- **Technological Advancement and Departmental Mission** - the research's relationship with technology, considering if it addresses technological changes or could lead to advancements that support the Department's objectives
- **Clarity and Research Viability** - the clarity of the research concept and whether it presents a feasible idea that the Department could potentially support as a research project
- **Personnel and Implementation** - the practical aspects of carrying out the research, including identifying potential principal investigators (if the concept originated internally) and ensuring commitment from Department personnel for project oversight and implementation

The R&D Unit staff may discuss individual ideas with each submitter as needed. This discussion examines the conditions and circumstances under which a specific need or problem exists. If helpful, the R&D Unit staff involves the management of other units that may be affected by the research ideas statement to expand or clarify the problem. Discussions may be held to determine if the ideas statement topic improves the operation of these units.

From these discussions and from a literature review, the R&D Unit may decide, along with the associated Departmental unit, to defer taking further action on any specific idea statements due to recently completed or other current related research. In addition, the R&D Unit may defer further action because the affected operating unit(s) cannot alter current practices. A written disclosure

Annual Cycle

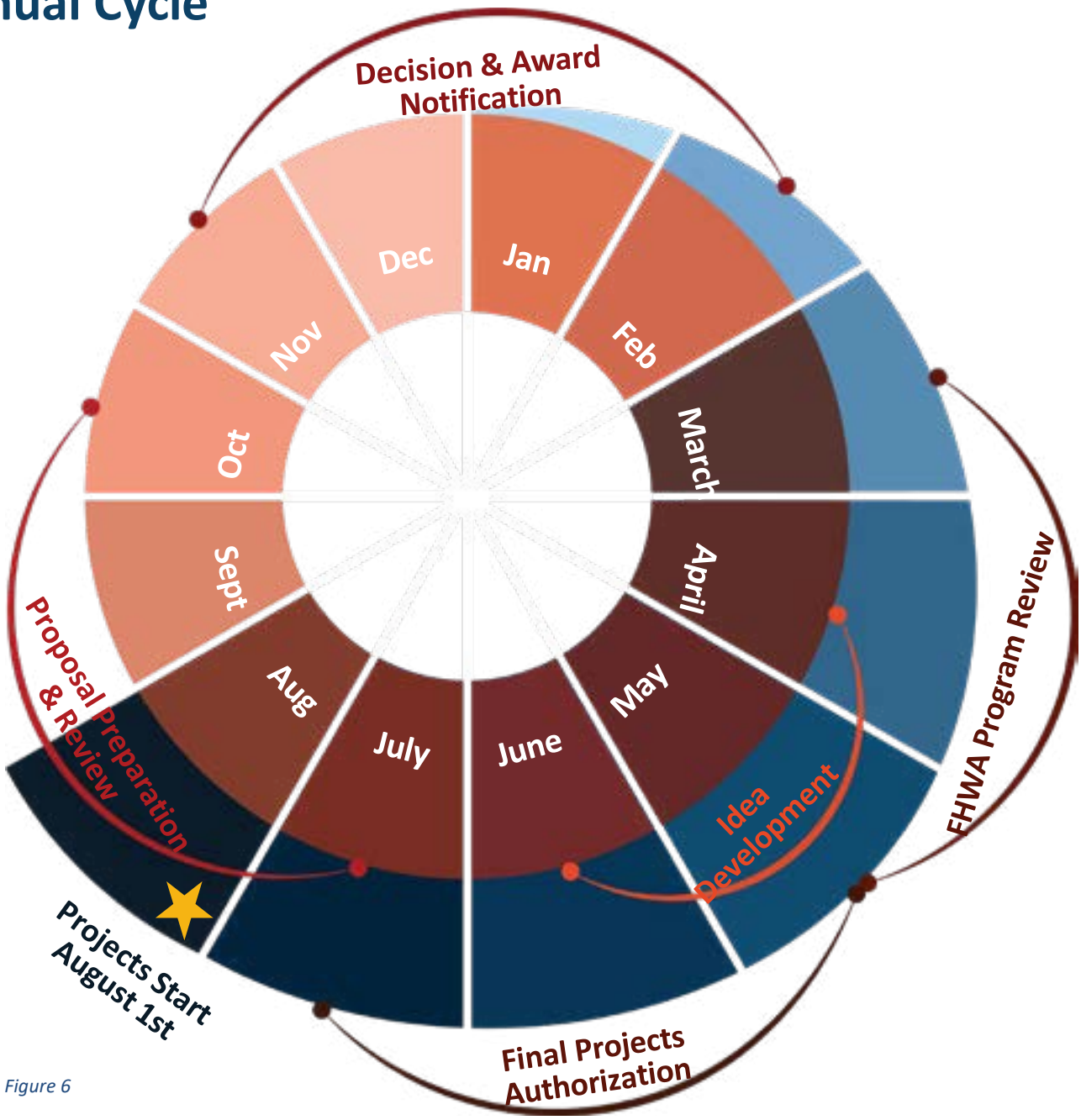


Figure 6

will come from the NCDOT staff member such as the Research Manager, topic NCDOT management, and/or Research Engineer as the external partner idea must have an NCDOT sponsor / champion prior to submittal. The NCDOT R&D Unit supports the external partner in making connections with the appropriate staff member for review, comment, and sponsorship interest when needed.

Research Idea submissions are accepted from outside the Department, and affected Departmental units are asked to assess the study's potential benefits and implementation potential. The R&D Unit staff may conduct a TRID literature search on any suggested topic to look for duplicate research efforts and explore the current state of the art. This information aids in avoiding unnecessary duplication of ongoing or completed research and enhances the scope of the specific problem statement.

Research Idea Evaluation

Research Ideas are evaluated by each of the technical subcommittees. The subcommittees evaluate the research ideas based on the following criteria:

- Urgency/Importance
- Probability of Implementation Likelihood of Tangible Benefits
- Feasibility of Accomplishing Project Objectives

In addition, evaluators are asked to consider the following:

- Is the anticipated result or product of the proposed idea needed by the Department?
- Is the concept or proposed idea needed now (urgency)?
- Based on an assessment of its probability of implementation, how would you rate the likelihood of this project/initiative delivering tangible benefits?
- If a full proposal is developed what are the chances of moving forward with a research project and accomplishing project objectives?

Once the research ideas have been selected, the R&D Unit compiles the selected ideas, and distributes the ideas to interested researchers and university personnel. The distribution of research ideas is done via emails and a general announcement to the research community.

Subcommittees can recommend solicitation of a full proposal or recommend for national project development. The R&D Unit prepares the subcommittee meeting minutes and distributes to the appropriate parties.

Research Idea Distribution to Researchers

The distribution of selected NCDOT internal research ideas is made available at the R&D Connect Site. In the case of researcher-submitted ideas, researchers will be notified directly if selected. Potential researchers should contact the appropriate Departmental unit and idea submitter for feedback and to have questions answered as they prepare proposals.

6.3 Research Proposals

Universities and researchers are encouraged to submit proposals to address specific research ideas. Proposal template and guidelines are distributed to interested research and provided on the NCDOT R&D Website regarding required content, page limitations, and criteria evaluated. Proposals are submitted electronically via the NCDOT R&D website. Proposals are required to, at a minimum, provide a current literature review using the TRB-TRID database.

The R&D Unit compiles and distributes the research proposals into an electronic PDF document, which is distributed to each of the technical subcommittees for evaluation. The research subcommittees use identified criteria to judge the technical merits of the research proposals using a standard review form with associated instructions.

6.3.1 Proposal Format

Proposal research documents are developed in the Project Authorization format. The proposal format is updated periodically by the R&D Unit, and NCDOT maintains current guidelines and proposal requirements on the R&D Connect site. The principal elements of a proposal are as follows (See APPENDIX D for additional details):

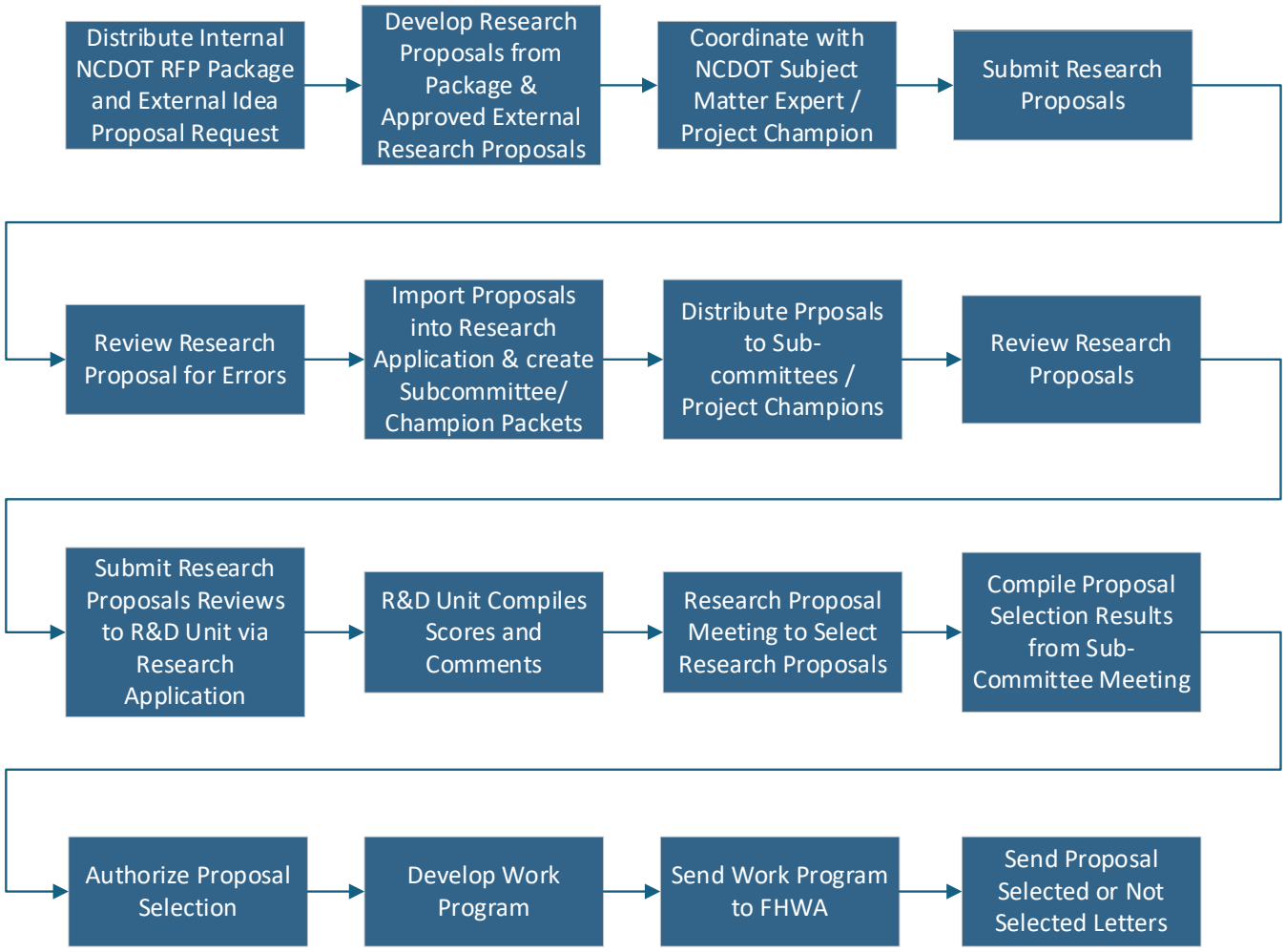
- Cover Page
- Executive Summary Page
- Table of Contents
- Formal Statement of Work
- Budget Authorization Page
- Justification of Budget Line Items
- Breakdown of Effort
- Federal Assurance Documents (if required)

6.3.2 Proposal Evaluation Criteria

By the fall, the Research Subcommittee members evaluate the respective documents using a standard evaluation guidance document and scoring form maintained on the R&D Connect site. Proposals are evaluated to identify those that each Research Technical Subcommittee recommends for funding as well as a prioritization of the selected projects. Currently, subcommittee members are provided a link to the R&D application along with associated instructions (See APPENDIX E). Subcommittee members are encouraged to provide suggestions to amend proposals to better capture department needs and/or clarify the proposed research.

The Research Subcommittee members may recommend a proposal for consideration at the national level if it is determined to be better suited for NCHRP, NCHRP Synthesis, or national pooled fund studies. If a proposal is not recommended for funding, appropriate feedback to the researcher will be provided.

Research Proposal Phase



RESEARCH & DEVELOPMENT

Figure 7

The R&D staff compiles and distributes electronic copies of the proposals to the members of the respective Research Subcommittees. Other key Departmental staff with a direct interest, for example, the research idea generator and/or unit head, are also requested to participate in the evaluation process. See evaluation criteria in APPENDIX E.

6.3.3 Proposal Recommendations

The Research Subcommittee members rank their respective proposals based on urgency, need, and priority. Technical Subcommittee meetings are held to discuss the compiled rankings and comments. Often, top projects will receive a clear priority and high ranking. For those projects for which the members' evaluation responses do not reveal a consensus, discussion during committee meetings is used to evaluate the relative merits of the proposals. If major deficiencies are identified, the proposal is returned to the submitters for revision. Efforts are made at this time to identify persons in the Department who may provide an important role as the StIC Committee Chairperson for the individual candidate research projects.

The R&D Unit staff is responsible for compiling the information from the proposal reviews. Sometime between November - January, a ranked list of all proposals in each technical program area is prepared for submission to the Research Executive Committee. The R&D Unit distributes the compiled information to the REC and schedules the REC meeting.

6.3.4 REC Research Program Review

The REC typically meets between December - March to approve, deny, or modify the recommendations.

The REC receives details of the contract research project development process and reviews the goals and strategies of the Research & Development Work Program, the budget projections, and the recommendations of the Research Subcommittees. The REC uses this information to recommend a final prioritized list of projects within budget constraints. This robust selection and prioritization process is designed to produce the best collection of research projects that the Department can develop for each Work Program.

6.4 Project Selection

After REC approval, the R&D Unit notifies prospective Principal Investigators in writing, usually by email, of proposal selection status. The R&D Unit will provide appropriate feedback to submitters whose proposals were not selected. For selected proposals, researchers must address any provided comments.

6.5 Project Authorization Contract Documents

For projects approved by the REC, researchers submit formal Project Authorizations to the R&D Unit. The formal Project Authorization, per the terms of the Master Agreement with each University, serves as the contract for the research project. The Project Authorization consists of the proposal, amendments that address provided comments, and a formal signature cover page (See APPENDIX F). When the university or other external partner does not have a Master Agreement established, the R&D Unit will establish a Master Agreement with the university prior to proceeding with the Project Authorization or create a stand-alone agreement for that Project Authorization.

The R&D Unit Staff reviews the Project Authorizations for proper adherence to content, formatting, and budgetary guidelines, and that all documents are complete and accurate. The Project Authorizations are provided to the NCDOT-approved signatory via DocuSign for signature and formal execution of the contract.

Approval from the FHWA Division Office is obtained prior to NCDOT signature and execution.

6.5.1 Project Authorization Contract and Budget Revisions

Revisions to Project Authorizations are managed on a project-by-project basis. On occasion, additional time may be needed for the project. In this case, the PI will submit a revised Project Authorization cover page along with justification for extending the project to the assigned Research Engineer. The Research Engineer will review the document and obtain approval from the StIC Chairperson. Formal approval signatures are required from PI, the associated university, and the Department. A signed, revised Project Authorization is required for changes in total cost, project scope of work, Principal Investigator, or project duration. Line-item budget adjustments without time extensions or other changes can be electronically approved by the R&D Unit without signatures.

6.5.2 Title VI Responsibility

The R&D Unit will comply with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C 2000d-42 and all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-Assisted Programs of the Department of Transportation-Effectuation of Title VI of the Civil Rights Act of 1964 and other pertinent directives (See APPENDIX G). The R&D Unit assigns a liaison to the NCDOT Office of Civil Rights (OCR) and the liaison reports annually on associated activities. The liaison works with OCR to update policies on an annual basis. The liaison also receives guidance regarding compliance, education, monitoring, and reporting efforts within their respective units.

6.6 Work Program Submittal for FHWA Approval

The R&D Unit submits the Work Program to the NC FHWA Division Office. The Work Program outlines the expected expenditure of resources in the upcoming fiscal year on a technical and financial basis. At a minimum, the Work Program will include:

- A summary of Work Program costs
- A list and executive summaries of each new project
- A list and percentage of work completed of continuing research projects
- A list of expected pooled fund participation and costs
- A break-down of in-house research costs, including but not limited to
    A. Staff Research
    B. Library services
    C. Technology Transfer and Training
    D. National Program Support (NCHRP/TRB/SHRP Etc.)
- A list of non-Subpart B funded projects is also provided to as stated in 23 CFR Part 420.207(b)

Work Program requirements are contained in Title 23 Code of Federal Regulations (CFR) Subchapter E Part 420. The R&D Unit will comply with all federal requirements listed in the above-referenced CFR. In addition, the R&D Unit will provide FHWA with annual reporting on project completion rates and associated costs.

6.7 Proposals for National External Consideration

The R&D staff may assist NCDOT business units in preparing NCHRP and other CRP problem statements, NCHRP synthesis of practice submissions, and FHWA pooled funds study submissions. Processes and procedures for these submittals are posted on appropriate websites.

6.8 Internal and Demonstration Research

The research staff may conduct investigations and inquiries into specific subjects as directed. These specific elements may be developed into formal internal research investigations or demonstration projects, as necessary. Formal intramural research investigation work plans are prepared by the R&D Unit staff and the appropriate NCDOT business unit. These work plans apply to experimental evaluation projects and to demonstration projects as well.

6.9 National Pooled Fund Participation

NCDOT employees may contact the R&D Manager to request participation in National Pooled Fund studies (http://pooledfund.org). Participation will be contingent upon management support and the availability of Subpart B funds. The R&D Unit maintains a request for participation form on its main home page. Requests should be completed with all details and submitted to the R&D Manager for review. Approval is required by a unit head or director-level position and the R&D Manager. If funds are available, the R&D Unit will make a commitment on the Pooled Fund website and complete annual transfers as appropriate.

All Pooled Fund participation is recorded in the Work Program.

NCDOT Research and Development also provides management services for employees/business units wishing to act as the Lead State in a study. The R&D Unit will work with the business unit in developing a statement of work and soliciting national interest.

7.0 Program Management and Reporting

Management of the research focuses on results and customer benefits, with an emphasis on implementation. As a project progresses, information must also be captured to monitor the status of the project and to provide supporting documentation to process invoices.

Proper reporting on each project is critical for the evaluation of the entire research program. The following process applies to formal contract research projects and, as appropriate, to intramural research investigations. All Subpart B research projects are entered into the TRB – Research in Progress database (RIP), the R&D Unit internal database, and the NCDOT Research Connect site. Each project is given its own webpage, which contains the executive summary and project contact information.

7.1 Project Kick-Off Meetings

Each formal research project will begin with a Kick-Off Meeting scheduled by the assigned PM. The meeting will be held within seventy-five (75) calendar days of the project start date. The purpose of the Kick-Off Meeting is to introduce the researcher to the StIC, the PM, and other interested parties. The researcher presents the project's proposed methodologies, tasks, and timelines. Title VI adherence will also be communicated.

It is critical in the Kick-Off Meeting that both the researchers and the StIC reach a mutual understanding of how the project will proceed, action items, items to be furnished by the Department, and implementation measures.

7.2 Project Progress Meetings

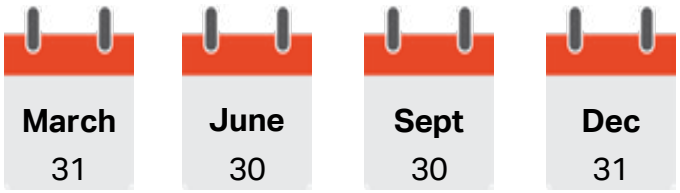
There will be a minimum of one progress meeting every six (6) months. These are to ensure the Department is receiving quality deliverables and that the project is staying within the agreed upon scope of work. Research Project Engineers will coordinate and schedule meetings to discuss progress as needed and/or at the request of the project StIC chair or Principal Investigator.

7.3 Quarterly Progress Reports

The quarterly progress report (QPR) provides a succinct summary of the work performed over the quarter for the research committee members. The implementation process is aided by the exchange of information, beginning with clear, concise, and thorough quarterly progress reports. These reports detail the research project's accomplishments and the status of deliverables. They also detail the upcoming quarter's work, identify any problems and deviations, and provide a record of expenditures used to validate and process invoices.

7.3.1 Requirement for Quarterly Progress Reports (QPR)

As specified in each Master Agreement or Research Contract, quarterly progress reports are submitted by email to the assigned NCDOT Project Manager within ten (10) days following the end of each quarter (March 31, June 30, September 30, and December 31) using a standard format maintained by the R&D Unit (See APPENDIX H). The assigned PM will review and distribute the reports to the individual StICs. Invoices will not be paid without an approved QPR that includes a completed Budget Summary that matches the invoice totals. QPRs assist in the R&D Unit's compliance with 23 CFR Part 420.209(a)(3).



7.3.2 QPR Technical Status

Project tasks outlined in the Project Authorization document are identified in the work progress summary, and each major research task results in a milestone. Steps taken to reach the milestones may include the following:

- Laboratory investigation phase
- Design of the installation or a prototype
- Installation or prototype completion
- Data collection completion
- Specification
- Summary report
- Software development
- Model development

The QPR must discuss the significance of the accomplishment with respect to overall project completion and implementation. The planned start and completion dates are provided for each of the tasks as well as the

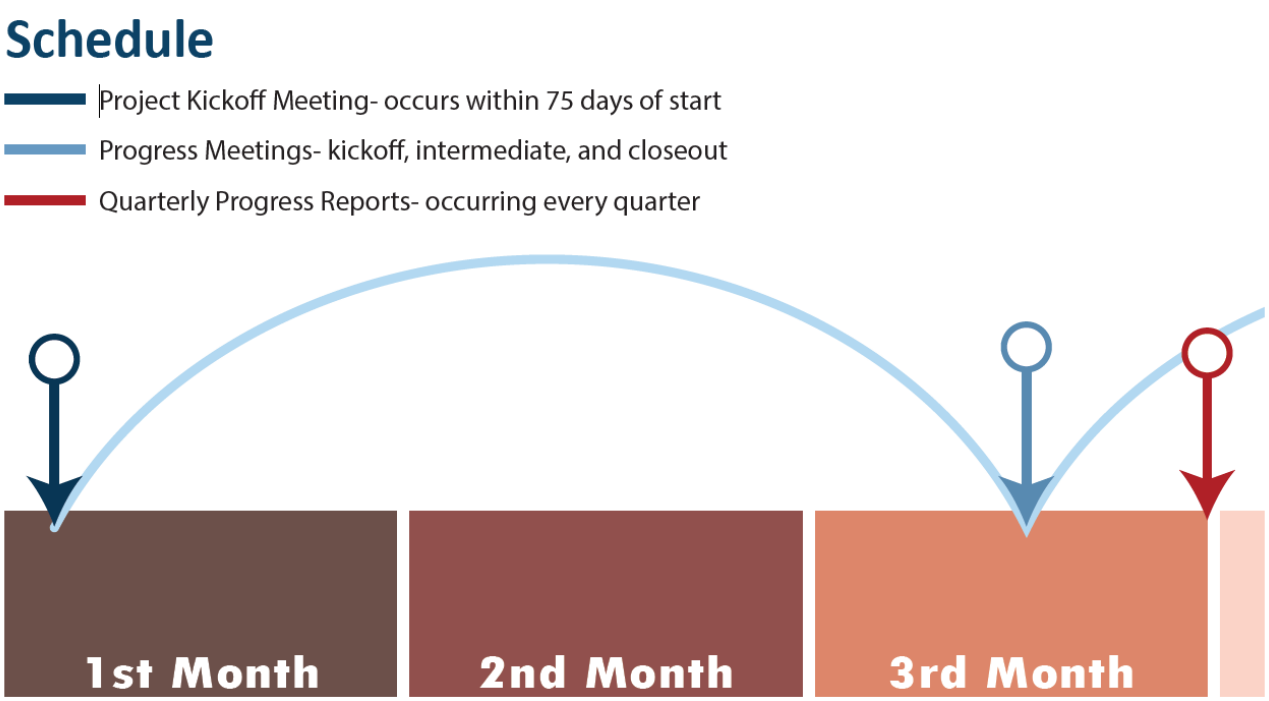


Figure 8

percent of completion. Financial, staff, equipment, and technical problems are discussed as they affect the individual tasks. Their resolutions, or attempts at resolution, must also be included in the report. The QPR must also include work scheduled for the next quarter.

7.3.3 QPR Financial Status

The summary table describes the budget authorization line items and quarterly expenditures. Researchers must submit cumulative fiscal year expenditures and quarterly expenditures by listing each line item shown in the Project Authorization document and providing a best estimate of cumulative expenditure to date. Printouts from university fiscal offices are not accepted.

7.3.4 Final Progress Report Submittal

A Final Progress Report (FPR) submittal is required before the end of the project. The template for the FPR is slightly modified to capture the final deliverables and financials. FPR should be submitted only after the Final Report is complete. A template for the FPR can be found in APPENDIX I.

7.4 Project Close-Out Meetings

As laid out in Master Agreements, Draft Final Reports are due to the Research Engineer no later than the date specified in the Project Authorization. The R&D Unit requires the Draft Final Report to be submitted no later than the project end date and preferably thirty (30) days prior to the end date. Closeout Meetings are held within forty-five (45) days following the PI delivering the draft final report. Closeout Meetings are held for each research project with a focus on the accomplishments of the project and moving forward into an implementation phase. Researchers and employees may be assigned tasks and responsibilities to facilitate implementation as needed. Attendees at Closeout Meetings include members of the Research Project StIC, R&D Unit staff, members of the applicable university research team, other external parties, interested parties, and other key Department personnel. The Closeout Meeting may afford the research project StIC with opportunities to present their implementation plans to the Department's management.

7.5 Project Final Reports

The Project StIC Chairperson and committee members for a contract research project are informed of the project findings prior to the issuance of the final technical report. The final technical report is due thirty (30) days following the Project Closeout Meeting. The final technical report is required as part of 23 CFR Part 420.209(a)(6) and is expected to be a complete, formal document representing the methodology and findings of the research study. The R&D Unit sends notifications to the FHWA Division Office and publishes final technical reports. **Invoices beyond 90% project complete will not be paid until the Final Report is completed.**

7.5.1 Final Close-Out Procedure

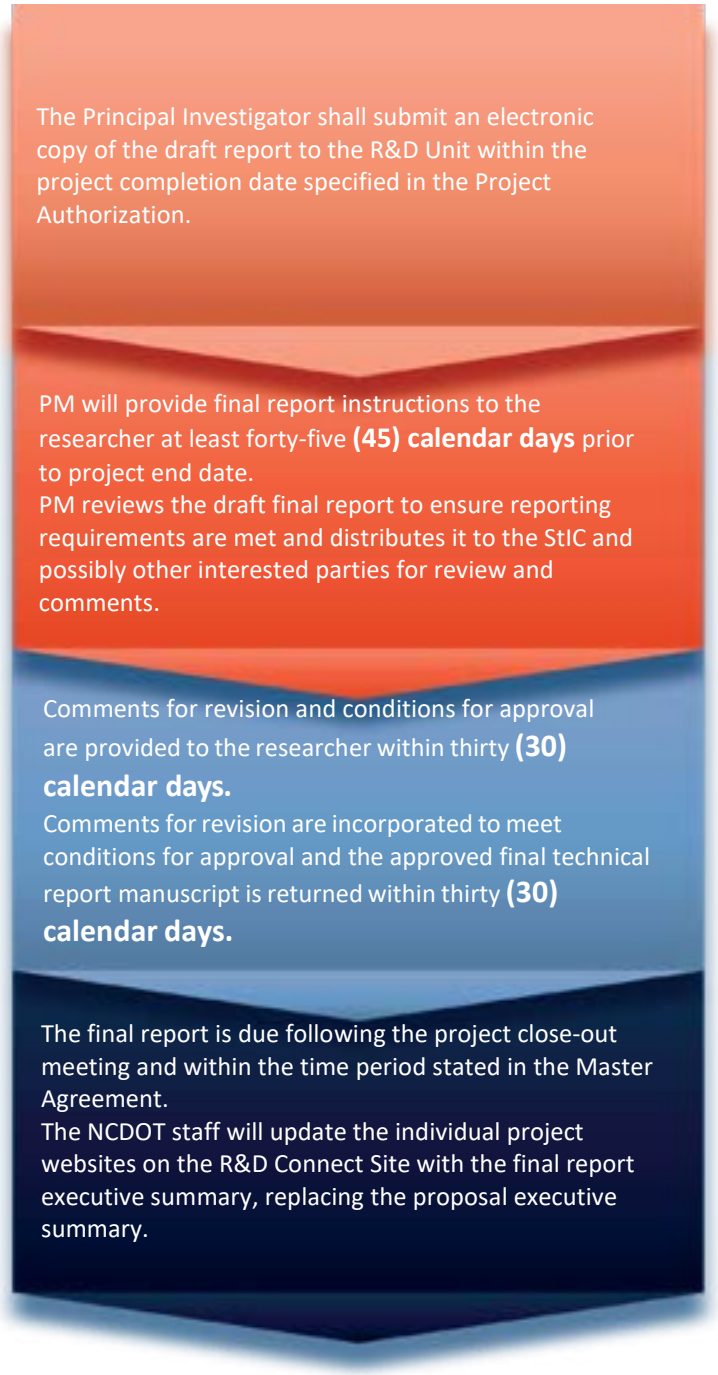
As required in the Master Agreement, the Principal Investigator shall submit an electronic copy of the draft report to the R&D Unit within the project completion date specified in the Project Authorization. Upon written approval of PM, the PI could be allowed an additional thirty (30) days to complete this work. The assigned PM will provide final report instructions to the researcher at least forty-five (45) calendar days prior to the project end date.

The assigned PM will review the draft final report to ensure reporting requirements are met and distribute it to the StIC and possibly other interested parties for review and comments. After the StIC has provided comments and conditions for approval, the assigned PM will submit these to the project researcher.

Comments for revision and conditions for approval are provided to the researcher within thirty (30) calendar days. The Principal Investigator is required to incorporate the relevant comments for revision and meet conditions for approval and return the approved final technical report manuscript within a period of thirty (30) calendar days.

The final report is due following the project close-out meeting and within the time period stated in the Master Agreement. Each researcher should review the university master agreement to ensure deadlines for deliverables are met. The R&D Unit staff facilitates the electronic and multimedia distribution of the final reports.

The NCDOT staff will update the individual project websites on the R&D Connect Site with the final report executive summary, replacing the proposal executive summary. The R&D Unit staff will prepare a notification letter to the FHWA office that a final report has been completed and distributed. The notification letter includes a short summary of the project along with implementable results and conclusions. In addition, the notification letter contains an internet link to the final report. The TRB – Research in Progress database is also updated and will use the same internet link to the final report.



For any equipment purchased during the project period of performance with a current fair market value of $5,000 or more that is no longer needed for the project, the Principal Investigator must request disposition instructions from the R&D Unit.

7.5.2 Final Technical Report Format

The body of the final technical report is prepared according to a general format. The final technical report may be assembled in more than one volume. The final report format and instructions are maintained by the R&D Unit. The minimum contents can be found in APPENDIX J.

Unless previously discussed and approved by the StIC Chair, the main body of the report should be no more than 60 pages with key data, charts, and tables included in addition to analysis and recommendations. Raw data and other detailed information should be included in the appendices of the report or in a separate volume. PDFs should not have lock or password protection as they cannot be shared with the State Library Clearinghouse. Appendices or data volumes are not limited in length but should be well-organized and provide a clear benefit to the document.

7.5.3 Standard Disclaimer

The standard disclaimer statement used in a federally-funded project report is as follows: *"The contents of this report reflect the views of the author who is responsible for the facts and the accuracy of the data presented herein. The contents of the report do not reflect the official views or policies of the North Carolina Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification or regulation."* A similar disclaimer, but without reference to the FHWA, is included in state-funded project final technical reports.

7.6 Retention Requirements for Records

Retention requirements (2 CFR 200.333) are for financial records, supporting documents, statistical records, and all other non-Federal entity records pertinent to the Federal award. These records must be retained for three years after the project receives the final voucher in FHWA's FMIS system.

7.7 Annual Reporting to FHWA

In addition to providing new project and continuing project information on the Work Program, annual reporting includes expenditures on all internal and contract projects, completion status, and information on any extensions or project changes. Formats are defined by agreement between the FHWA Division Office and NCDOT Research. Note that 23 CFR 420.117 includes basic reporting requirements such as:

i. Comparison of actual performance with established goals;
ii. Progress in meeting schedules;
iii. Status of expenditures in a format compatible with the Work Program, including a comparison of budgeted (approved) amounts and actual costs incurred;
iv. Cost overruns or underruns;
v. Approved Work Program revisions; and
vi. Other pertinent supporting data

More detailed information can be found in the Quarterly Progress Reports for each funded project. The annual report is due within six (6) months of the end of the NCDOT fiscal year.

8.0 Fiscal Procedures

For contract research projects, the prompt handling of fiscal matters is an important daily operation of the R&D Unit. Clear fiscal procedures permit the orderly flow of information between the R&D Unit and other agencies involved with the Research and Development Work Program. Good communication and detailed expectations expedite the handling of accounts payable and the orderly processing of research expenditures and federal aid grant vouchers. This section provides general guidance. Further details are included in individual Master Agreements and Project Authorizations. The R&D Unit will ensure that NCDOT and all funding recipients comply with 2 CFR 220.

8.1 Review of Fiscal Documents

The R&D Unit reviews fiscal documents with attention to detail and informs, at the earliest convenience, affected parties when changes and/updates are warranted.

8.1.1 Review of Project Authorization Documents

The R&D Unit reviews each submitted Project Authorization document to ensure the estimated budgets meet the requirements set forth in each master agreement. Line-item reviews include Personnel and Benefits and Total Other Direct costs. In addition, the Unit reviews the calculated Facilities & Administrative Costs to make sure the costs conform to the Master Agreements. Any proposed equipment cost over $5,000 is addressed as needed to meet Federal requirements in 2 CFR Part 200.

8.1.2 Review and Approval of Research Project Line Item Budget Adjustment Requests

During the life cycle of contract research projects, estimated budgets require line-item adjustments due to changes in personnel, travel, supplies, etc. All project line-item budget adjustments must be submitted to the R&D Unit for review. The assigned PM notifies the StIC chairperson, if not already aware, of the request and obtains the chairperson's approval.

For all budget revisions, the University requests approval from the Department electronically or in writing, including the proposed budget line-item revisions and corresponding justifications. If the total budget of the project is changed, the duration extended or other major change, such as a substantial scope modification, a Project Authorization revision is submitted and signed by both parties. Budget revisions require an updated budget spreadsheet and a written budget adjustment justification.

For projects authorized under post-2019 Master Agreements, line-item changes may be approved electronically by the R&D Unit if there is no change in overall budgets or project end dates. Project Authorizations made under the pre-2019 Master Agreements are subject to the following: project budget adjustments of less than three thousand dollars ($3,000) and can be approved by the R&D Unit. Project budget adjustments that are more than three thousand dollars ($3,000) require an updated budget spreadsheet and a written budget adjustment justification. R&D Unit will notify the researcher that the budget adjustment has been approved.

8.1.3 Review of QPR Expenditures and Payment of Invoices

Quarterly Progress Reports include budget summaries for each fiscal year. In the QPR budget table, under the "Current" column, researchers show estimated cumulative fiscal year expenditures. The R&D Unit reviews the estimated cumulative expenditures to date and compares the expenditures to the original or modified estimated budgets.

The universities that enter into specific contract research studies with the Department are required to submit quarterly invoices. When possible, NCDOT will use the Grants Management System (GMS) to review and approve invoices.

The deadline dates for receipt of these quarterly invoices is specified in the Master Agreements with each university, typically 45 days after the end of each quarter.

To ensure compliance with 23 CFR Part 420.113, invoices are reviewed by the appropriate research engineer. The review includes a line-item comparison of the university invoice with the most current estimated budget. The research engineer ensures all project deliverables have been met for the period of the invoice. If the invoice is acceptable, the research engineer approves the invoice via the GMS along with attaching a copy of the corresponding QPR for that quarter. The research engineer will review the invoice line items and compare them with the corresponding QPR to make sure the budget expenditures match.

The Research Engineer reviews and approves the project invoices. After verification, the research engineer will forward the invoice to the Research Manager for approval to be paid in the current business system. To be approved, invoices must be dated within thirty (30) days of approval and match the corresponding Quarterly Progress Report. After invoices have been paid, the assigned research engineer retains a PDF copy of the invoice in the appropriate project location and updates the current project management and invoice tracker.

8.1.4 Close-Out Final Progress Report

Final Progress Reports, similar to Quarterly Progress Reports, must be submitted with final invoices (See APPENDIX I). All projects are to be completed within a 42-month time frame. Invoices received for work performed after the end date will not be eligible for reimbursement. Universities are required to submit final invoices prior to the FHWA end date of the Work Program. Typically, project end dates will be several months prior to the FHWA end dates to ensure all eligible expenses qualify for reimbursement. If a project warrants an amended end date, the request must be submitted before the Period of Performance end date.

8.1.5 Final Fiscal Close-Out Procedure

University partners submit final invoices to the R&D Unit, which are reviewed and approved by the Research Engineer and the Research Manager. Once the invoices are processed through the current fiscal procedures, the funding source is closed by the R&D Unit.

8.2 Non-Expendable Research Equipment Procedures

Equipment means tangible personal property (including information technology systems) having a useful life of more than one year and a per-unit acquisition cost which equals or exceeds the lesser of the capitalization level established by the non-Federal entity for financial statement purposes, or $5,000.

The use of non-expendable capital equipment is often necessary for contract research studies and formal intramural research investigations. Procedures are followed in compliance with 2 CFR 200.313 provisions that address the use of capital equipment in federally funded programs. These procedures are a guide to the acquisition of non-expendable research equipment with state and federal funds.

8.2.1 Eligible Equipment Expenditures

Non-expendable equipment required for use on a contract research Project Authorization or formal intramural research investigation is considered an eligible expenditure under the following conditions:

- Use of the equipment for the authorized purposes of the project during the period of performance, or until the property is no longer needed for the purposes of the project
- Equipment is not of a nature normally used in the regular administrative or engineering operations of the University or the Department
- Equipment item is required for and is used primarily on work incidental to the contract research project or intramural research investigation
- Cost of the equipment item is reasonable as to quoted market value

Non-expendable equipment will be defined solely on its basis of initial acquisition cost of $5,000 or more. Non-expendable equipment designation will not apply to readily consumable items and to items which have less than a $5,000 per-item value. The R&D Unit requires contracted researchers who submit equipment line items to prepare a separate justification describing compliance measures in accordance with 200.313 (2)(3)(b)(c). Under the individual Master Agreements, the universities with budgeted equipment items using Subpart B funds must comply with 200.313 (2)(d)(e), subject to brief audits by the R&D Unit.

8.2.2 Equipment Acquisition

Non-expendable equipment acquisition is handled in either of two ways:

1. Equipment is rented or leased by the contracting university or the supporting element within the Department from a supplier. The lower of the rent or the lease option will be used. The equipment rental rate must be approved by the R&D Unit.

2. Non-expendable equipment purchases when identified in an annual project budget authorization. The Principal Investigator must request written approval from the Research Manager at least thirty (30) days prior to the actual purchase of the equipment. The Principal Investigator is required to obtain multiple quotes for purchased equipment that meets the technical requirements. The Principal Investigator is required to acknowledge satisfactory receipt of non-expendable equipment in the Quarterly Progress Report. This accounting will include equipment description and model number by manufacturer, serial number, date purchased, cost and constituent components for assembled equipment. Non-expendable equipment purchases will not be reimbursed if unaccounted for in the annual project budget authorization.

There may be instances where non-expendable equipment is assembled by the contracting university or the supporting element within the Department. University/ Departmental assembled equipment covers the major alteration of an existing piece of equipment within the Department to make it usable. This non-expendable equipment purchase must be accounted for in the annual project budget authorization. Written approval from the Research Manager will be required for all component parts exceeding $5,000. Assembled non-expendable equipment and partly assembled non-expendable equipment will become the property of NCDOT upon conclusion of any contract research Project Authorization. The contracting university may elect to dispose of such equipment and credit the money as reimbursed funds to the Department and/or FHWA, less a standard percentage.

It is the responsibility of the contracting university or the supporting element within the Department to ensure the safekeeping, integrity, and proper use of the non-expendable equipment. Any non-expendable equipment purchased by a contracting university will become the property of the Department upon completion of the project, unless otherwise agreed upon by FHWA and the Department.

8.2.3 Equipment Disposition

As stated in CFR 200.313(e), upon completion of a contract research Project Authorization, or formal intramural research investigation, researchers must contact the R&D Unit for disposition instructions. If the R&D Unit does not require the return of equipment with a current per-unit fair market value of $5,000 or less, it may be retained, sold, or otherwise disposed of with no further obligation. If the fair market value of equipment exceeds $5,000, the researcher must consult the Department and FHWA to determine disposition. A complete record of the non-expendable equipment is submitted to the Research Manager with the official report manuscript. This record includes a report of the condition of the non-expendable equipment. The Department is required to recover this equipment within sixty (60) days or to advise the contracting University of the final disposition of the equipment, unless otherwise stipulated in the Project Authorization.

8.3 Funding External Obligations: Pooled Fund, TRB, NCHRP, AASHTO TSP, and Others

NCDOT participates in several external programs for which the R&D Unit manages funds and/or agency contacts. Estimates for these funds must be included in the Work Program.

8.3.1 Transportation Pooled Fund Program

http://www.pooledfund.org/

Managed by FHWA, this program allows states to pool research dollars to tackle larger topics that cannot typically be addressed in their individual programs. A single state or FHWA acts as the lead agency and handles contracts with researchers and travel for steering committee members.

Pooled Fund projects may be of almost any duration, with 2 to 5 years being common. Participating agencies can typically use 100% Subpart B funds via a direct transfer mechanism handled by the FHWA Division Office. Transfer request forms can be found on the website. It is imperative that funding levels be checked before creating a transfer. If in doubt, the Federal Funds Management section should be consulted.

Participation in a Pooled Fund is typically requested by an NCDOT Business Unit Manager. Funds are allocated on a first-come, first-served basis by the Research Manager. In cases where funding requirements are particularly large or the amount of Subpart B funds available is limited, the Research Executive Committee may prioritize participation. The business or technical expert on the StIC for the project may often travel once or twice a year at the expense of the Pooled Fund project. The role is similar to any research StIC.

8.3.2 Transportation Research Board Core Program

NCDOT has historically been an active member of TRB, with many employees participating in committees and research projects. The annual contribution to the core program provides NCDOT with the following benefits:

- No conference fees for the TRB Annual Meeting
- Travel Costs to the annual meeting are paid for the TRB Representative, TRB Standing Committee Chairs and up to 2 committee members per year.
- Allows participation in TRB standing committees. These committees work to coordinate research efforts on both a national and international basis and provide learning and networking opportunities for NCDOT employees.
- No-cost for individual participation in TRB Webinars. Many of these webinars provide professional development credit to engineers and planners. NCDOT employees simply must register using a valid ncdot.gov email address
- Copies of all NCHRP and TRB reports are available at no additional costs with free web-access to NCDOT employees.

Annual dues are based on the state's federal allocation and TRB budgetary needs. Payment is carried out by either check or Pooled Fund Transfer. Pooled Fund Transfer is preferred as it allows the use of 100% Subpart B funding.

8.3.3 National Cooperative Highway Research Program

NCHRP is coordinated by both AASHTO and TRB and is focused on research of national or regional importance. Much like the pooled fund process, it can often tackle projects of a larger nature and engage national research resources. An annual program, made up of statements generated by state and federal agencies, is assembled, prioritized, and voted on by all state agencies. States submit candidates to serve on panels (or steering committees) for each project.

NCHRP is typically funded through the Pooled Fund transfer process. Currently, NCDOT splits the cost 75%/25% between planning and research funds (Subpart A and Subpart B). Total cost, based on annual federal allocations, averages $1 to $1.2 million.

8.3.4 AASHTO Technical Service Program (TSP)

The R&D Unit coordinates participation and payment for several AASHTO products. These are typically paid directly by check. Participation is triggered by a request from an NCDOT business unit. Upon receipt of each annual invoice, the R&D Unit confirms continued participation with the requestor. Costs are variable; however, they typically range from $5,000 to $20,000.

8.3.5 Other Programs and Grants

NCDOT often participates in other programs such as LTPP (Long Term Pavement Performance) and LTAP (Local Technical Assistance Program). The R&D Unit assists in the applications for and administration of federal grants. These programs typically have their own funding and participation requirements and require consultation with business units and senior leadership.

9.0 National Report Distribution

The Transportation Research International Database (TRID) is currently the most comprehensive repository of literature on all subjects in the field of transportation. The TRID database provides the Department access to the technical background on transportation and highway issues under investigation on a national level and provides others outside the Department with information on the Department's research and development activities.

Technical information dissemination to Department staff is a major element of research and development support. The R&D staff perform literature searches when requested and as needed to support the development of the Work Program. An analysis of research ideas and informational requests considers the literature available in TRID as defining the subject state of the art. The R&D Unit Library maintains direct online access to TRID for the program to comply with 23 CFR Part 420.209(a)(4). The R&D Unit updates its project entries on a semi-annual basis and posts relevant deliverables at the appropriate time.

9.1 Reporting to TRID Database – Research In Progress (RIP)

Ongoing research activities are reported annually or as needed to the TRID-RIP database. The reporting includes the status of projects, project abstracts and summaries, and significant technology transfer and implementation activities. The R&D Unit provides a link to TRB for the TRID database.

9.1.1 Keywording

A search of the TRID database for information on a subject starts with the selection of the appropriate keywords. A selection of keywords is made after discussing the subject with a prospective customer. The search is structured so that the information made available to the customer or user adequately covers the subject and is current.

9.1.2 TRID-Based Literature Review

A collection of the findings is developed from the abstracts returned from an informational search. This serves as the basis for defining further investigations of a subject. If the search is made as part of the literature review process at the outset of a project, this collection serves as background material. As part of proposal, literature reviews are required from the potential researchers. Currently, Principal Investigators conduct a TRID literature search review to assure there is no duplication of research and report any relevant findings to the affected party.

9.1.3 Additional Data and Information Sources

A review of the abstracts generally leads to a greater level of technical knowledge, additional keywords, and the possibility of additional informational systems to be accessed.

The R&D Unit's Library and technical reference services include inquiries to other transportation information repositories such as the Northwestern University Transportation Library at Evanston, Illinois. The Unit's Library provides document locator service, interlibrary loans, and abstract retrieval services for Departmental personnel.

9.2 Transportation Library Distribution

The R&D Librarian distributes hard copies and electronic copies of final reports to the North Carolina Government Publications Collection and provides electronic copies to the National Transportation Library, National Technical Information Service and the Transportation Research Board's TRID Database. A spreadsheet is maintained by the NCDOT Research Librarian, a copy of which is stored on the current R&D shared site. This spreadsheet contains various library distribution entities that the R&D Unit provides electronic copies of final reports to, as well as the entities listed above (e.g., NTL, NTIS, TRID). The spreadsheet also contains a checklist of other items required for final report distribution, such as sending the file to the State Library of North Carolina using the NCDOT File Transfer System(FTS)

The following steps are taken when the project final report is provided to the NCDOT Librarian by the R&D Research Engineers:

1. Electronic distribution of the report link, as well as a brief summary, is sent via email to select transportation libraries/transportation centers from the Final Report Distribution spreadsheet.

2. A PDF is sent to the State Library of North Carolina Publications Clearinghouse using the NCDOT File Transfer System (FTS).

3. Electronic distribution via email is also sent to the National Transportation Library (NTL), Transportation Research Board (TRB), and National Technical Information Service (NTIS).

4. A print request, along with a PDF of the Final Report, is sent to the NCDOT Printshop via email by the NCDOT Librarian with a request to print 13 hard copies of the report.

5. When the 13 hard copies are received from the DOT Printshop, 10 of those hard copies are sent to the State Library of North Carolina State Government Publications Collection for distribution to libraries around the state.

6. The 3 remaining hard copies are sent to the cataloger for the State Library of North Carolina to be cataloged for the NCDOT Library Collection.

The R&D Unit also continues to enhance and update its Internet Homepage to provide vital and timely informational services.

10.0 Research Peer Exchange Process

The Peer Exchange process is one technique designed to improve the quality of the program. It examines the deliverables of the R&D Unit through the management process. A panel with knowledge of state research programs will bring expertise to the Unit, assess the research process, and advance recommendations for enhanced performance.

Peer Exchanges are designed to permit the Department to interact with other states on a formal review basis. This provides an opportunity for direct involvement with other transportation research professionals. The R&D Unit staff gains knowledge from and provides guidance to other agencies on the research process.

The R&D Unit will provide information necessary for Peer Exchanges to comply with 23 CFR 420.205 Subpart B (b). The Peer Exchange team will prepare a written report of the exchange as per 23 CFR 420.209(a)(7).

10.1 Peer Exchange Participants

The Department is responsible for selecting and organizing the Peer Exchange team. The Peer Exchange representatives are typically from the FHWA, universities, the Transportation Research Board, the private sector, and the research programs from other states. The peer exchange team is expected to spend at least two days with the staff of the R&D Unit.

The R&D Unit will provide other states with the information and documentation required to be collected and maintained under this subpart. Travel and other costs associated with the R&D Unit's Peer Exchange will be identified as a line item in the State DOT's Work Program and be eligible for 100 percent Federal funding.

When planning Peer Exchanges, the R&D Manager should investigate whether a pooled fund mechanism may be in place that allows for travel expenses to be managed independently from the Department, simplifying the travel process.

10.2 Peer Exchange Report

The Peer Exchange review team is required to prepare a closeout report for the Department, as stated in 23 CFR 420.209(a)(7). The report will summarize the discussions, itemize the findings, and reiterate the recommendations discussed with the R&D Unit. Copies of the report are filed with the Director of Field Support, the R&D Unit, the Secretary of Transportation, and the FHWA Division Office.

10.3 Meeting Frequency and Location

The R&D Unit will schedule a Peer Exchange approximately every four (4) to five (5) years. These Peer Exchange meetings are held at the Department's headquarters or a suitable alternative. Alternatives may include regional or virtual Peer Exchanges.

10.4 Analysis of Peer Exchange

The Peer Exchange is conducted for the benefit of the R&D Unit. It is designed to improve the research and development process. The recommendations of the peer review team are reviewed with the R&D Unit staff and appropriate management and presented to the Research Executive Committee. The R&D Unit makes meaningful efforts to incorporate peer review recommendations that enhance the quality of the research process.

11.0 Procedures for Intellectual Property

Unique intellectual properties may be developed as part of a contract research project. Examples could include computer software, equipment, prototypes, methods, machinery, or other properties under patent, copyright, or trademark protection. Assurances will protect the rights of the research entity or university, the Department, and FHWA in the use of intellectual properties.

11.1 Computer Software and Data

Mainframe and/or microcomputer programs developed under a contract research project are identified in the formal statement of work in a contract research Project Authorization. NCDOT retains the right to use the software. The mainframe and/or microcomputer programs will become the property of the Department upon completion of the research project and are considered public domain software.

The databases that are collected or developed during the course of a contract research project will remain the property of the contracting university and its Principal Investigator. The Department will have the option to request such data during the active period of the project and during the period of the review of the draft final report.

Mainframe and microcomputer programs and data that are provided to interests outside the Department will include the following disclaimer: “No warranty is made by the North Carolina Department of Transportation, the Federal Highway Administration or (the responsible research agency) as to the accuracy, reliability or usability of the computer program and its associated data and documentation. No responsibility is assumed by the above parties for incorrect results or damages resulting from the use of this computer program or this data.”

All IT activities shall comply with NCDIT/NCDOT Acceptable Use Policies. In addition, all research projects involving software shall comply with the North Carolina State Chief Information Office’s Statewide IT Policies and Standards found at the NC Department of Information Technology.

11.2 Other Intellectual Property Provisions

Royalty-free patent rights for the North Carolina Department of Transportation and the Federal Highway Administration are fully preserved for intellectual properties that are either directly documented in a federal aid Subpart B contract research project or directly produced during formal research activities. Federal agencies have a blanket exception based on code. NCDOT includes such language in Master Agreements with individual institutions. This royalty-free provision also applies to the Department for fully state-funded contract research projects. Intellectual properties include artwork, processes, methods, machinery, manufactures, designs or compositions of matter or useful improvements thereof, and any variety of plant which is patentable under the patent laws of the United States of America or any foreign country.

Otherwise, the research Principal Investigator and/or the contracting university may pursue the development of other intellectual properties of similar but exclusive nature to those documented in a Department or FHWA sponsored contract research project. The royalty-free patent rights for the Department and the FHWA shall not apply to these exclusive intellectual properties. For any exclusive intellectual property upon which the Principal Investigator or the contracting university elects to file a patent application, these parties may reserve a revocable paid-up license to practice the use of such property throughout the United States, its territories and possessions, and any foreign country where a patent application is filed.

Where patentable intellectual properties apply to a contract research project, the Principal Investigator is required to have written documentation to disclose the conception and the first application of the practice to the research project. The first application of practice is disclosed in the most immediate quarterly progress report and will convey to the inventor the nature, purpose, and operation of the invention. A written disclosure is provided with the final report manuscript to divulge the full application of the intellectual property to the research project. This final disclosure identifies all parties covered under the contract research project investigation who provided creative contributions to the intellectual property, except for clerical labor and manual labor.

11.3 Identification of Intellectual Property

Intellectual Property (IP) management is an intensive process. It is important to understand that levels of proactive IP management require time and commitment. The R&D Unit will identify outcome(s) that may potentially be protected as IP. This includes:

- Review of projects at the beginning of process. The R&D Unit will document possible outcomes based on the expectation of the research project.
- Review of projects periodically, such as at the midpoint or at the point of a major deliverable to assess any potential IP.
- Review projects near completion to check that any potential IP has been accounted for.
- Identify the value of a specific outcome.
- Classify the outcomes (e.g., software, test method, machine, public service announcement, video).
- Classify the potential IP protection for the outcome (e.g., patent, copyright, trademark, or trade secret).
- Identify the funding source (e.g., Bayh-Dole implications).
- Strengthen the R&D relationship with the inventors/ creators (e.g., query the creator/inventor on their suggestions on how the potential IP may be managed). This may include Departmental staff and counsel as well as researchers.

11.4 Intellectual Property Disposition

The following disposition and filing requirements are imposed for Subpart B supported contract research project investigations. With respect to each intellectual property to which the Principal Investigator or the contracting university elects to retain patent rights during the contract research project investigation, a domestic patent application shall be filed within six months of disclosure to the Department. Within two months of this filing, the Principal Investigator or the contracting university must provide the Research Manager a copy of the application, including the filing date and serial number.

The following statement is included within this application: "The United States Department of Transportation Federal Highway Administration has rights in this intellectual property pursuant to the Project Authorization agreement between (the contracting university) and the North Carolina Department of Transportation dated (date)." Within six months of this filing, the Principal Investigator or the contracting university must deliver to the Research Manager a duly approved, executed, and recorded legal instrument fully confirmatory of all rights to which the United States Department of Transportation is entitled and to provide the Federal Highway Administration with an irrevocable power to inspect and make copies of the patent application. A copy of this legal instrument is provided to the FHWA Division Office within thirty days of its receipt. If the patent approval requires longer than six months, the Principal Investigator or the contracting university will provide the Research Manager with the approved document within sixty days of the approval and issuance of the patent.

Revenue sharing from patentable intellectual properties shall be addressed in individual Project Authorization documents. The net revenue will be shared among the inventor, the Department, the university, and the State of North Carolina.

In the event the Principal Investigator or the contracting university elects to forego filing a patent application for either Project Authorization documented or subsequently disclosed intellectual property, a written disclosure of this decision will accompany the final technical report manuscript. The final technical report manuscript will include the following statement: "There was no invention or discovery first applied to practice in the course of this research Project Authorization, including any artwork, methods, processes, manufactures, designs, or compositions of matter or useful improvements thereof, or any variety of plant which may be patentable under the laws of the United States of America or any foreign country."

12.0 Implementation & Technology Transfer

The goal of the research through the R&D Unit is to have it implemented as often as possible. In order to accomplish this, it is necessary for the R&D Unit to develop mechanisms that will assist and enable the customer through the implementation. The following sections describe the mechanisms, process, and customers who participate in the research and implementation process.

12.1 Definitions

In addition to facilitating research, the R&D Unit also facilitates "Implementation," "Knowledge Transfer," and "Technology Transfer." These definitions will be consistent with the findings from the NCHRP Synthesis 355 – "Transportation Technology Transfer: Successes, Challenges, and Needs" by Barbara T. Harder and Robert Benke:

- "Implementation of research results – used in highway transportation and particularly by the research community to describe the various activities required to put an outcome of a research project into widespread use. This term is often used synonymously with technology transfer by those in research." (Benke & Harder, 2005)
- "Knowledge Transfer – diverse activities causing the flow of knowledge from one person, group, or organization to another. Such knowledge transfer can be a systematic process to identify, capture, and share tacit knowledge to enable it to become explicit knowledge." (Benke & Harder, 2005)
- "Technology Transfer – activities leading to the adoption of a new-to-the-user product or procedure by any user or group of users. New-to-the-user means any improvement over existing technologies or processes and not only a recent invention or result. Technology transfer includes research results implementation and product or process development." (Benke & Harder, 2005)

The R&D Unit participates in research consistent with the work performed by NCDOT (i.e., Highway, Public Transportation, Ferry, and Rail).

12.2 R&D List of Customers

The R&D Unit maintains a list of internal Departmental contacts, business unit contacts, university contacts, etc. In addition, a contact list including wider research community and other states, ancillary organizations, MPOs, RPOs, local governments, and the general public may be maintained as well.

12.3 R&D Implementation & Technology Transfer Activities

The traditional method of technology transfer and implementation of research is disseminating research reports. The R&D Unit also utilizes multiple programs to assist with the implementation of research. The design of these programs is to provide a formal methodology where the dissemination and tracking of research results (state and national), as well as other technologies, processes, procedures, and innovations, may be disseminated to NCDOT personnel and interested constituents. Listed below are some of the programs that the R&D Unit participates in and/or facilitates:

- **Technology Transfer Program** – The R&D Unit has developed a Technology Transfer Program that assists the Project Champion (or interested party) in the dissemination of research results. Through this program, the Project Champion may request additional resources to fund training, workshops, or presentations. This request may be made by way of a Technology Transfer Request Form.
- **Research Reels** – The R&D Unit has funded RP 2024-38 Communicating the Impacts of Research Projects in North Carolina (aka Research Reels) that highlights research results through an engaging public video series. The videos showcase different completed research projects featuring interviews with the researchers and the NCDOT Subject Matter Experts (SME).
- **Research and Innovation Symposium** – The R&D Unit has funded RP 2024-35 NCDOT Research and Innovation Summit (renamed Symposium), which provides an opportunity to share ongoing and completed research projects. The symposium will provide multiple sessions involving research presentations, posters, workshops, and/or training, and live demonstrations of innovative technologies. The event will allow people to participate both remotely and in person via a hybrid online setup.

12.4 Implementation Champion & Responsible Unit

As part of a successful research program, a designated person must oversee the implementation of the research project results. This person may be the StIC Chair, but it may also be another individual in a principally engaged unit. The responsible unit and champion should be identified early in the project development cycle.

The R&D Unit manages NCDOT's research and implementation programs, including coordinating the development of annual programs, developing and managing research and implementation program budgets, providing technical and contracting support to all research committees, tracking and supporting the implementation of research results, completing required state and federal reports, and maintaining relevant policies and procedures and reporting program status to the Research Executive Committee.

The Research Unit Manager executes all research and implementation Project Agreements for NCDOT based on project approvals discussed earlier in this chapter and working with the Technical Services Director, approves the use of research contingency funds for unforeseen research needs.

12.5 Implementation Status Reports & Actions

The R&D Unit staff compiles summary data describing research project implementation activities as stated in 23 CFR 420.209. This information is obtained from the Project Authorization (PA) document describing the proposed Implementation Plan and/or supplemental Implementation Plan forms (See APPENDIX #). There must be a continuous process for assessing and recognizing implementable results from contract research projects. The supplemental Implementation Plan forms are to be distributed to each researcher and encouraged to be discussed with the StIC Chair, depending on the status of the project.

The R&D Unit staff assists the StIC Chairpersons and other key Department staff with decisions regarding research implementation actions and technology transfer. These efforts include the following:

- Decisions relative to design or retrofit of technical features involving the use of research findings
- Decisions for the selection of further experimental or demonstration type projects to promote the progressive application of specific research findings.
- Scheduling of technical meetings, workshops, training sessions, or other implementation and technology transfer events.
- Field or office visitations related to the resolution of technical problems or to information dissemination
- Other documentation and information gathering conducted to support the utilization of specific research findings.
- Documentation of cost savings, life extension, increased capacity, improved safety, better systems, and durability.

In addition, as necessary, the R&D Unit may conduct a small focus group to assist with determining the outcomes and implementation actions for research projects and activities.

12.6 Technology Transfer Benchmarking

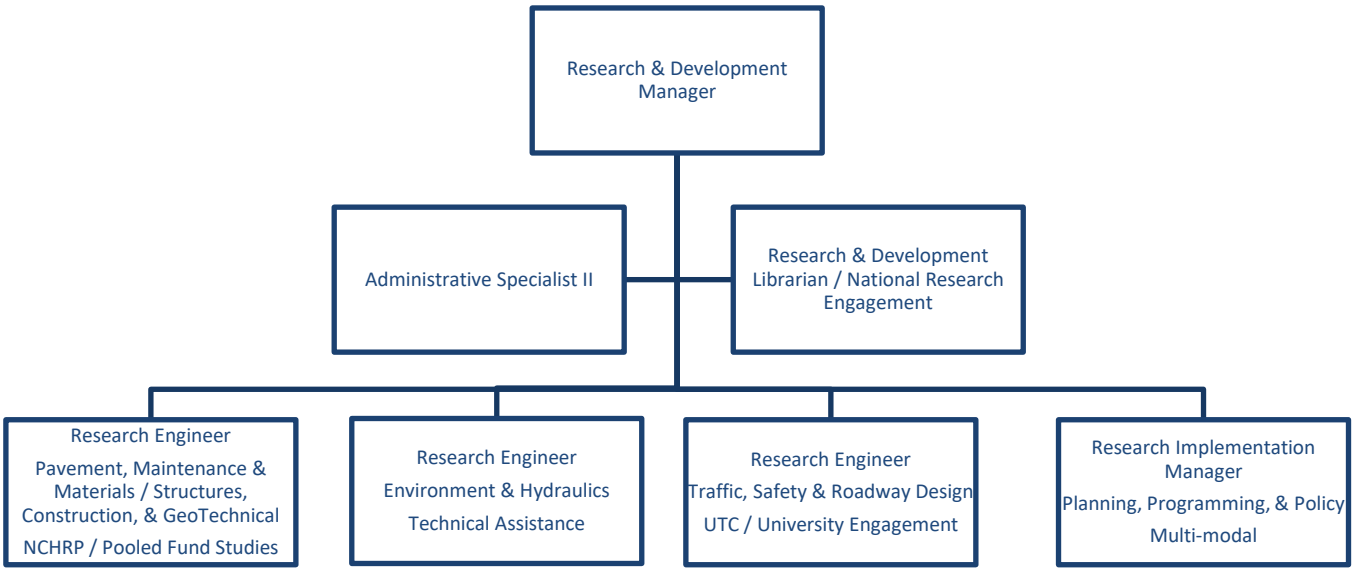
The achievements of the research and development Work Programs are reflected on a total performance basis. The quality of the program is evaluated by observing the progress toward the project milestones and other measurable parameters. Benchmarking will demonstrate progress and support quality improvement.
The R&D Unit has distributed a quarterly newsletter to the Department, highlighting milestones and quality improvement as well as informing personnel of the overall program and key dates for participation.
Factors that are benchmarked to show the performance and results of the Work Programs include:

- Programmed funds
- Intramural research investigations and demonstration projects
- Contract research projects
- Milestone achievements
- Implementation success
- Timely deliverables
- Quarterly newsletter
- Multiple surveys

List of Appendices

APPENDIX A – R&D Office Organizational Chart

RESEARCH & DEVELOPMENT



APPENDIX B – Research Committee Guidelines

Research Executive Committee Member Roles in Evaluating Proposals

The NCDOT Research Executive Committee (REC) is the governing board for the NCDOT State Research Program. The committee is composed of 14 voting members, 3 non-voting members and NCDOT R&D staff. REC committee members are responsible for actively participating in and supporting NCDOT's state and federal research programs. The REC meets once a year to review and select new research proposals. makes the final recommendation for funding research proposals. These guidelines are intended to aid NCDOT REC Chairperson and Members in understanding their roles on the committee. Ranked recommendations produced by a subcommittee are reviewed by the REC for final selection and inclusion in the annual NCDOT Research Work Program.

Research Executive Committee Chairperson

REC Chairpersons are currently or have been involved in the research process and is an executive level manager as recommended and selected by the R&D Manager along with other executive management. The REC Chair is also a technical and policy expert involved in national research efforts on behalf of the Department.

Responsibilities include:

- Review and evaluate submitted research proposals
- Work with the R&D Manager to acquire feedback from internal technical subcommittees
- Review and evaluate submitted research proposals, as a SME in his/her technical area, using forms provided by R&D
- Attend and facilitate the annual REC meeting
- In concert with the R&D Manager and staff, ensure subcommittee evaluations and rankings are completed and distributed
- Champion research results throughout the Department and externally.

Review universities Master Agreement to assure deliverables are met

REC members serve as representatives of technical and business units and are committed to carrying out NCDOT's mission and strategic initiatives. REC members are also technical or policy experts, often from cross-cutting or closely associated fields. Active members are critical in selecting the highest quality and highest impact projects that meet NCDOT needs and strategic goals.

Responsibilities include:

- Review and evaluate submitted research proposals with emphasis on proposals in assigned technical subject areas
- Attend and participate in annual REC meeting
- Review and evaluate submitted research proposals using forms provided by R&D
- Attend and participate in the research ideas and research proposals subcommittee meetings
- Assist in ranking recommended proposals for funding for presentation to the REC
- Champion research results throughout the Department and externally.

Steering & Implementation Committee (StIC) Role in NCDOT Research Projects

NCDOT forms Steering and Implementation Committees made up of subject matter experts (SMEs) to oversee every research project. The StIC provides technical guidance to the researchers and works closely with the assigned research Project Manager (PM) to keep the effort focused, on schedule and within the defined scope of work. These guidelines are intended to help StIC members understand their duties and responsibilities. Successful projects are dependent on quality work by the Principal Investigator (PI), an active Project Manager and on timely and critical feedback from the StIC chair and members.

StIC Chairperson

StIC Chairpersons are typically the primary technical and policy experts for the subject area being investigated.

Chair responsibilities include:

- Recommending StIC members
- Overall guidance and technical expertise for researchers and other committee members
- Attend and actively participate in project Kick-Off, Progress and Close-Out Meetings
- Carefully review Quarterly Progress Reports and Draft Final Report and advise if reports do not meet professional standards, address missing or deleted data, and/or do not provide the agreed upon course or scope of project
    - NOTE: University invoices will be held by the R&D Office if reports are determined to be unsatisfactory or not submitted
- Provide researchers with requested Departmental items related to project
- In concert with the PM, coordinate meetings, milestones, and accomplishments
- Review/approve any budget adjustments, project extensions, conference travel requests and/or changes in scope of work
- Champion research results throughout the Department and externally
- In addition, the StIC chair is responsible for reviewing requested project publications prior to end date to assure it conforms to language in Master Agreement. Publications prior to the completion of a project shall be limited to the objective of the research; such approval shall be requested through the Research Manager
- In concert with PI, complete project Kick-Off, Progress and Close-Out Implementation Plans provided by the R&D Office and work with R&D Implementation Manager to address any technical transfer needs

StIC Members

StIC members are also technical or policy experts and are often from cross-cutting or closely associated fields.

Member responsibilities include:

- Attend and participate in project meetings
- Carefully review and comment on Quarterly Progress Reports and the Draft Final Report and advise if reports do not meet professional standards, address missing or deleted data, and/or address the agreed upon scope of work for the project
- Provide researchers with requested NCDOT provided information, data, items, and materials related to the project
- Assist in coordination when projects require access to field and/or construction sites
- Work with the StIC chair on completion of project Kick-Off, Progress and Close Out Implementation Plans provided by the R&D Office
- Champion research results throughout the Department and to external partners

StIC friends

StIC friends are those parties who have either interest in or are affected by the outcomes of the research project.

Friend activities may include:

- Participation in project Kick-Off, Progress and Close-Out Meetings
- Will receive, but are not required, to provide feedback on project reports and deliverables.
- Assist researchers in acquiring requested NCDOT provided information, data, items, and materials related to the project
- Assist in coordination when projects require access to field and/or construction sites
- Champion research results throughout the Department and externally

APPENDIX C – Technical Assistance Request Form

NCDOT Managers and their staff are invited to consult appropriate faculty at any **UNC system university or at Duke University** for technical assistance. Discussion with the faculty member should involve defining the scope of the assistance needed and estimating the time required to complete the assignment.

To initiate the work, the NCDOT business should fill out the scope of work, consulting faculty information, and receive verbal Division/Manager approval. R&D will review and process this request form with ITRE. A technical assistance project should be limited to activities requiring **no more than 120 hours (15 workdays)** of individual consultation and may include the use of research assistants, temporary labor, travel, or laboratory equipment rentals.

Any technical assistance request that is **not completed within ninety days of the start date shown below will be canceled**. One extension can be granted upon request by the PI to the ITRE project administrator.

Payment by ITRE will be made upon completion of the work and delivery of a satisfactory summary report or other documents as required by the scope of work outlined below.

Submit this document in MS Word format to R&D. R&D will initiate the signature process through DocuSign.

Nature and Scope of Work – Be detailed and specific. Include estimated work hours required per task

Title:			
Start Date:		**Completion Date:**	

Description of Work (*box will expand as needed***):**

Faculty / Researcher Information	**Name:**	
	Affiliation:	
	Phone:	
	Email:	

NCDOT Requester Information	**Name:**	
	Division/Unit	
	Phone:	
	Email:	

Budget

Personnel	*$*
Other Direct Costs	*$*
Indirect Costs	*$*
Total Cost	*$*

NCDOT Approval (Division Official or other Manager)

Print or Type Name	*Signature*	*Date*

NCDOT Approval (Research and Development Manager)

Neil Mastin, PE		
Print or Type Name	*Signature*	*Date*

Approval (ITRE Director)

Print or Type Name	*Signature*	*Date*

Total Hours: _____ **Cost: $** _____ **Technical Assistance #: TA-** _____

_____

APPENDIX D – Instructions for Research Proposals

Instructions for Preparing and Submitting

Proposals for the NCDOT Research Program

Please use the following guide to prepare and submit proposals.
Research Proposals will be evaluated and screened by expert committees. Proposals will be recommended for funding based on quality, urgency, departmental need and available funding.

Maximum proposal length, including all supporting information, budget and cover page is 14 pages.

Proposals should be typed in a font size not less than 11 point and be submitted in a single PDF. Please use line numbering for ease of reference during the review process.

All proposal files should be named such that the Research Idea # is at the beginning of the filename.

Example: 2021-001_Research Proposal Title_Doe _Proposal (where Doe is the PI's last name)

P.I. or university signature or cover letter is **NOT** required at this stage. There should be only one "Principal Investigator". Additional Researchers, if any, may be listed as "Other Investigators."

To achieve high quality and relevant proposals, **research teams are encouraged to communicate or meet with DOT personnel to discuss the technical content and goals of the research and to address any comments and feedback from the research idea evaluation**. Contact information for research idea generators is typically the same as that listed on the original Research Idea form.

Required Information for each Full Proposal

1. **Cover Page** (*See attached format*)
2. **Executive Summary Page**
   - Research Idea (RI) ID
   - Proposal Title
   - Executive Summary
3. **Table of Contents**
4. **Formal Statement of Work**
   - Introduction - Including background information on the research need
   - Research Need Definition – Detailed description of this particular research need
   - Research Objectives
   - Literature Review and the relevance of the proposed research
     - What work has been accomplished in this general area in the past and is related to this project?
     - How will this research advance the state of the art, science, and practice?
   - Research Tasks and Methodology
   - Significance of Proposed Work – what impact will this work have
   - Anticipated Research Products

    - Do not include required deliverables, such as quarterly progress reports, draft final report, etc.
    - This might include specifications, testing procedures, workshop, policy document, design guides etc.
- Preliminary Implementation Plan that details:
    - Who at NCDOT will use the Research Product
    - How NCDOT will use the Research Product
    - The impact of the research product
    - Training and resources required for successful implementation and technology transfer
- Proposed Work Schedule
- P.I. and other investigators' information
    - Up to two pages using the attached format
    - Do NOT include copies of full resumes
    - A list of directly related publications (five max) by the proposer(s)
    - A list of directly related publications (ten max) by others

5. **Budget Authorization Page** (See attached format)
6. **Justification of Budget Line Items**
7. **Breakdown** of Effort in days by Personnel and Tasks (See attached format)

Submission of Proposals

Research Proposals are now submitted via the same website used for idea collection. The website provides the advantage of users being able to attach their proposal documents and provides notification on successful submittal. Users may also return to the site to update information or attach additional files.

External users must log into the site. An NCDOT Business NCID is required. Instructions for obtaining an NCID and registering as a user are provided at the link below.

If you previously registered for the idea site, your ID and password will work for the proposal site. Please verify that your login credentials still work.

Note that new user registration may take 2 or more days as the process is partially manual. *Do not wait until the due date to attempt site registration.*

The web form for requesting access and the link for proposal submittals can be found at the following location:

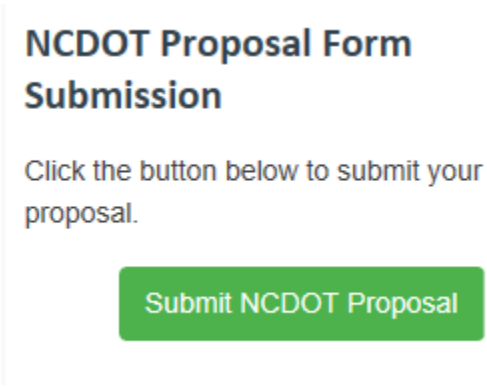
https://connect.ncdot.gov/projects/research/Pages/research-dev-ideas.aspx

Once fully registered, you will click the green button to submit a proposal. Fill out the basic contact information and attach the proposal document(s).

You may go back and review your submitted proposal at any time.

Once fully registered, you will click the green button to submit a proposal. Fill out the basic contact information and attach the proposal document(s).

You may go back and review your submitted proposal at any time.



APPENDIX E – Research Proposal Evaluation Instructions

Instructions and Guidelines for Research Proposal Review

When reviewing Research Proposals, please keep the following items in mind. If you feel the need to specifically address an issue, please do so in the comments box, particularly if revisions will be required prior to final funding decisions. The comment box will expand onto another page as you type. **You should only review projects for which you feel comfortable providing quality feedback.**

Proposal Evaluation Method

Proposals will be scored using a matrix of 9 criteria and the number of Yes votes received for funding. As you evaluate proposals, keep the following in mind in addition to the matrix criteria.

- Will the research provide a **long-term benefit**?
- Are there **consequences** of not conducting the research?
- Has the researcher identified the research **Product [s]**?
- Who will use the **Product [s]** and how?
- What **resources** will customers need to use the research product [s]?
- Have **specific implementation** protocols been identified?
- Does the researcher have a good **track record** regarding quality and timeliness?

Please evaluate the proposal using the following criteria:

1) Need and/or Urgency of the Proposed Research Project

- Is the need for the research **urgent?** Is that urgency captured in the proposal?
- If not urgent is there a significant benefit to be had by conducting this research?

2) Understanding of the Problem Statement:

Does the proposed project provide a clear understanding of the problem? Are NCDOT business practices and the traveling public needs addressed?

3) Creative/Innovative Elements of Project:

Are creative and innovative elements included in the project? Does the project provide a unique way of addressing the challenges outlined in the problem statement?

4) Quality of Literature Review:

Does the literature review directly relate to the subject matter identified? Does the literature review describe previous work accomplished in the subject matter area and how the proposed research will advance the state of the practice?

5) **Research and Analysis Methodology:**
Does the project communicate how it will address the proposed subject matter? Does the product the research team is looking to produce eliminate or reduce the problem? Does the proposal reflect sound engineering, planning or policy methodologies? Are the items to analyze defined in the proposal? Are the proposed methods to analyze data appropriate?

6) **Experience/Expertise of Research Team in the Proposed Technical Area:**
Does the experience in the resume(s)/CV(s) indicate expertise in the proposed area of research?

7) **Readability including Grammar, Spelling, Punctuation, and Organization:**
Is the proposal organized in an easily understood manner? Are there grammar, spelling or punctuation errors?

8) **Project Implementation Plans:**
Does the project communicate a potential path to implement the work product? Do the final products include potential implementation readiness?

9) **Proposal Cost vs Value/Impact to NCDOT Business Practices:**
Does the cost of the project align with its perceived value or impact to the business?

Topic Recommended for Funding:
Should this topic be funded? **If you do not feel that a topic falls into your area of expertise, do not select Yes or No (Y or N) to the funding question**. You may have someone else in your unit or group evaluate the proposal if they have directly relevant experience. Please make a note in the comments if that is the case.

Preferred Proposal if Multiple Proposals Received
No more than one proposal may be recommended for funding. Please indicate which proposal you prefer.

Likert Scale Rating Guidelines

Rating Value	Guideline
5 – Excellent	The proposal or project aligns extremely well with the objectives of the selection criteria. In other words, it can't get much better.
4 – Above Average	The proposal or project aligns well with the objectives of the selection criteria.
3 – Average	The proposal or project has limited value with respect to the objectives of the selection criteria.
2 – Adequate	The proposal or project would not promote the outcomes describe for the criterion under consideration or the proposal provides insufficient information to adequately assess.
1 - Unsatisfactory	The criteria is not addressed or shows a distinct lack of understanding.

APPENDIX F – Project Authorization Cover Page

PROJECT AUTHORIZATION NUMBER:

New PA? ☐ **Revised PA?** ☐ **Revision No.:** ☐

Authorized under Master Agreement Contract: MA-XXXX-XX
For Research and Training Services between the
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION AND
XXX UNIVERSITY

Project Title	*<< text >>*
Formal Statement of Work	See attached proposal
Period of Performance	*Month dd, 20yy - Month dd, 20yy*
Budget by Year including Total	
Property to be Furnished by the Department	*(list)*
Special Terms Applicable to this Project	*(list)*
Department & University Conducting Work	*(department, center, or institute, etc.)* *(university)*
Principal Investigator (list other investigators on following page)	*(name)* *(mailing address line 1)* *(mailing address line 2)* *(city, state, zip)* *(email address)* *(phone #)*
NCDOT Project Manager	

IN WITNESS WHEREOF, the parties hereto have executed this Project Authorization as of:

_____
Date

University	**North Carolina DOT**
_____ University Contract Officer Signature	_____ NCDOT Signature
_____ University Contract Officer Name	_____ NCDOT Name
_____ PI Signature	_____ NCDOT Title

APPENDIX G – Notice of Nondiscrimination

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

NCDOT NOTICE OF NONDISCRIMINATION AND ACCESSIBILITY RIGHTS

The North Carolina Department of Transportation (NCDOT), pursuant to its policy to comply with Title VI of the Civil Rights Act of 1964 and other pertinent nondiscrimination authorities, will not exclude from participation in, deny the benefits of, or subject to discrimination any person, based on **race, color, national origin, limited English Proficiency, income- level, sex, age, or disability (or religion, where applicable)**, under any programs or activities conducted or funded by NCDOT.

Any person who believes they have been wronged by a discriminatory act (action or inaction) of NCDOT or its funding recipients, has the right to file a complaint with NCDOT. For instructions on how to file a complaint, or additional information regarding NCDOT's nondiscrimination obligations, please contact the:

NCDOT Office of Civil Rights Title VI
Nondiscrimination Program
1511 Mail Service Center
Raleigh, NC 27699
919-508-1808 or 800-522-0453

Anyone with a hearing or speech impairment may use Relay NC, a telecommunications relay service, to call the NCDOT Civil Rights Office. Relay NC can be accessed by dialing 711 or 1-877-735-8200.

ATTENTION: If you speak a language other than English, the following language assistance services are available to you, free of charge: Qualified interpreters and information written in other languages. Call 1-800-522-0453.

ATENCIÓN: Si habla un idioma distinto al inglés, los siguientes servicios de asistencia lingüística están a su disposición gratuitamente: intérpretes calificados e información escrita en otros idiomas. Llame al 1-800-522-0453.

APPENDIX H – Quarterly Progress Report Instructions & Format

Instructions and Template for Research Quarterly Progress Reports (QPRs)

Introduction

- The quarterly progress report provides a ***brief*** summary of the work performed over the quarter.
- **Use the format provided here.**
- Provide updates of work performed during the ***previous quarter***. If you have additional information to report, such as literature reviews, pictures, charts, graphs, figures, equations, data analyses, etc., ***please attach them as a separate file (appendix)***
- Per the Master Agreement, please submit a QPR within 10 business days **after the end** of each quarterly period:
  - Quarter 1: September 30th
  - Quarter 2: December 31st
  - Quarter 3: March 31st
  - Quarter 4: June 30th
- Submit the QPR via email to the following email address: The assigned NCDOT Research Project Manager and research@ncdot.gov in MS Word format.
- Invoices are required to be submitted to the assigned NCDOT Research Project Manager and research@ncdot.gov for all subcontracts within 30 days after the end of the quarter. Please include an * for each subcontract indicating that the subcontract is an estimate on the QPR if the subcontract invoice amount is unavailable at the time of QPR submittal.

Section 1. Project Work Progress Summary:

The table provides a brief overview of the current status of efforts and scheduling of all project tasks. Numerically list every task included in the project authorization. Include a brief description of each task. List the percent of effort for each task as a component of the project's total effort (please note that this column should sum to 100% and include whole numbers only). Indicate the cumulative percent complete for each individual task. Include the dates for each task as listed in the table's column headings.

Section 2. Budget Summary:

The budget table lists five columns, the first two columns (budget item and budget item total cost) should be the same as was approved in your project authorization document. The third column should list the amount of budget that has been spent for the ***current quarter only*** for each individual budget item. The fourth column should list the ***cumulative budget*** (sum total) spent for every quarter since the start of the project for each individual budget item. The last column only needs to be completed for the budget subtotals, indirect costs and final total. The cumulative percent spent is column four divided by column two, rounded to the nearest whole percent. ***If any project travel was conducted during the quarter, you must submit receipts for the travel with your QPR.*** Please attach scanned copies of the receipts at the end of the QPR.

Please do NOT substitute printouts from your fiscal office in lieu of the budget table.

Below the budget table are two drop down boxes, one for overall project schedule, and one for the overall project budget. Select from the drop-down menu whether the project is progressing on schedule as agreed upon. Select from the drop-down menu whether the project is on budget as agreed upon in the project authorization.

Sections 3 through 6:

For sections three through six, complete each section describing the research activities separately for each task. Please indicate the task number, task title, and a brief description of each task.

Section 3: Executive Summary

Section three is for the researcher(s) to provide a ***brief*** description of activities performed during the previous 90 days. The description should include activities conducted that satisfy the requirements agreed upon in the project authorization. Refrain from including literature reviews, pictures, charts, graphs, figures, equations, data analyses, etc. in this section. Supporting evidence should be included in a separate appendix document.

Section 4. Problems and Deviations Encountered this Quarter:

If any problems, issues, or deviations from the planned work activities occurred during the quarter, indicate those here. Describe the specific nature of the problem encountered, any effects on the planned work schedule and/or budget (increases/decreases), and actions that have been or will need to be taken to correct the issue. Please indicate if the research office or the committee chair can further assist with or expedite the remedying of these issues.

Section 5. Work Planned Next Quarter:

This section is for the researcher(s) to provide a ***brief*** description of upcoming research activities planned/anticipated for next quarter. Include the planned utilization of any NCDOT personnel and/or resources that will need to be made available to complete each task.

Section 6. Problems and Deviations Planned Next Quarter

If any issues, problems, or deviations are anticipated during the next quarter, please list those. Describe the specific nature of the anticipated problem, effects it is expected to have upon the projects work schedule and/or budget and actions to be taken to correct the issue. Indicate if the research office or the committee chair can assist with or mitigate the anticipated issue(s).

QUARTERLY PROGRESS REPORT

Date of Report*:* *(month, day, year)*

Calendar Quarter ending: (*month day, year)* **Research Project No.** 2YYY-NN

Contract Start Date: (*month day, year)* Contract Expiration Date *(month day, yr.)*

Project Title: (*title)*

Research Team:

Enter Name	Principal Investigator
Enter Name	Other Investigator
Enter Name	Post-Doctoral
Enter Name	Graduate Student
Enter Name	Undergraduate Student
Enter Name	Technician
Enter Name	Etc…

Steering and Implementation Committee:

Enter Name	Chair
Enter Name	Research Engineer
Enter Name	Member
Enter Name	Member
Enter Name	Member
Enter Name	Member
Enter Name	Member

Section 1. Project Work Progress Summary:

Task No.	Abbreviated Task Title	Task as a percent of Total Project Effort	Cumulative Percent of Task Completed	Scheduled Task Start Date	Actual or Planned Task Start Date	Scheduled Task Completion Date	Actual or Planned Task Completion Date
1							
2							
3							
i							
n							

Section 2. Budget Summary:

Budget Item	Total Contract Budget	Current Quarterly Expenditures	Cumulative Expenditures	Cumulative Percent Spent
1A. Personnel Salaries / Wages (itemized by individual)				
(PI first, last name)				
(Co-PI first, last name)				
(Stu 1 first, last name)				
Subtotal 1A:				
1B. Personnel Fringe Benefits (itemized by individual)				
(PI first, last name)				
(Co-PI first, last name)				
(Stu1 first, last name)				
Subtotal 1B:				
1. Subtotal: Personnel (1A + 1B)				
2. Contracted Services				
3. Supplies and Materials				
4. Domestic Travel				
5. Current Services				
6. Fixed Charges				
7. Tuition				
8. Subcontracted Services				
Subtotal (Items 1-8):				
Indirect Costs				
Totals:				

Overall Project Schedule Status: Choose an item.

Overall Project Budget Status: Choose an item.

Section 3. Executive Summary:

Task 1: *(Task Title)*
(Summary of Progress)
Task i: *(Task Title)*
(Summary of Progress)
Task n: *(Task Title)*
(Summary of Progress)

Section 4. Problems and Deviations Encountered this Quarter:

Task 1: *(Task Title)*
Issue A:
Issue B:
Task i: *(Task Title)*
Issue A:
Issue B:
Task n: *(Task Title)*
Issue A:
Issue B:

Section 5. Work Planned Next Quarter:

Task 1: *(Task Title)*
(Summary of Work Planned)
Task i: *(Task Title)*

(Summary of Work Planned)
Task n: *(Task Title)*
(Summary of Work Planned)

Section 6. Problems and Deviations Planned Next Quarter

Task 1: *(Task Title)*
Issue A:
Issue B:
Task i: *(Task Title)*
Issue A:
Issue B:
Task n: *(Task Title)*
Issue A:

APPENDIX I – Final Progress Reports

Instructions and Template for Research Final Progress Reports (FPRs)

Introduction

- The final progress report provides a ***brief*** summary of the work performed over the Final Invoice period.
- **Use the format provided here.**
- Please provide in the Executive Summary the reason for the Final Invoice charges and updated on project completion status.
- The Final Progress report **must be submitted** prior to the Final Claim being paid **if the costs are not available on the last Quarterly Progress Report (QPR) delivered**. If the last QPR contains all costs, there is no need to submit this document.
- Submit the FPR via email to the following email address: The assigned NCDOT Research Project Manager and research@ncdot.gov in MS Word format.
- Invoices are required to be submitted to the assigned NCDOT Research Project Manager and research@ncdot.gov for all subcontracts within 90 days after the period of performance.

Section 1. Project Work Progress Summary:

The table provides a brief overview of the current status of efforts and scheduling of all project tasks. Numerically list every task included in the project authorization. Include a brief description of each task. List the percent of effort for each task as a component of the project's total effort (please note that this column should sum to 100%, and include whole numbers only). Indicate the cumulative percent complete for each individual task. Include the dates for each task as listed in the table's column headings.

Section 2. Budget Summary:

The budget table lists five columns, the first two columns (budget item and budget item total cost) should be the same as was approved in your project authorization document. The third column should list the amount of budget that has been spent for the ***current quarter only*** for each individual budget item. The fourth column should list the ***cumulative budget*** (sum total) spent for every quarter since the start of the project for each individual budget item. The last column only needs to be completed for the budget subtotals, indirect costs and final total. The cumulative percent spent is column four divided by column two, rounded to the nearest whole percent. ***If any project travel was conducted during the quarter, you must submit receipts for the travel with your FPR.*** Please attach scanned copies of the receipts at the end of the FPR.

Please do NOT substitute printouts from your fiscal office in lieu of the budget table.

Section 3: Executive Summary

Section three is for the researcher(s) to provide a ***brief*** description of activities performed during the final invoice period. The description should include activities conducted that satisfy the requirements agreed upon in the project authorization. Refrain from including literature reviews, pictures, charts, graphs, figures, equations, data analyses, etc. in this section. Supporting evidence should be included in a separate appendix document. Complete each section describing the research activities separately for each task. Please indicate the task number, task title, and a brief description of each task. \

Section 4: Equipment Disposition

Equipment disposition procedures, *if applicable*, should be reported. If there is a request to retain the equipment, please indicate the reason for this. This section should include equipment description, equipment cost, who is requested/recommended to receive the equipment, date of receipt/planned date of receipt, and approver(s) of the distribution method.

NOTE: PLEASE DO NOT INCLUDE THESE INSTRUCTIONS WITH YOUR FPR SUBMITTAL!

FINAL PROGRESS REPORT

Date of Report*:* *(month, day, year)*

Calendar Quarter ending: *(month day, year)* **Research Project No.** 2YYY-NN

Contract Start Date: *(month day, year)* Contract Expiration Date *(month day, yr.)*

Project Title: *(title)*

Research Team:

Enter Name	Principal Investigator
Enter Name	Other Investigator
Enter Name	Post-Doctoral
Enter Name	Graduate Student
Enter Name	Undergraduate Student
Enter Name	Technician
Enter Name	Etc…

Steering and Implementation Committee:

Enter Name	Chair
Enter Name	Research Engineer
Enter Name	Member
Enter Name	Member
Enter Name	Member
Enter Name	Member
Enter Name	Member

Section 1. Project Work Progress Summary:

Task No.	Abbreviated Task Title	Task as a percent of Total Project Effort	Cumulative Percent of Task Completed	Scheduled Task Start Date	Actual or Planned Task Start Date	Scheduled Task Completion Date	Actual or Planned Task Completion Date
1							
2							
3							
i							
n							

Section 2. Budget Summary:

Budget Item	Total Contract Budget	Current Quarterly Expenditures	Cumulative Expenditures	Cumulative Percent Spent
1A. Personnel Salaries / Wages (itemized by individual)				
(PI first, last name)				
(Co-PI first, last name)				
(Stu 1 first, last name)				
Subtotal 1A:				
1B. Personnel Fringe Benefits (itemized by individual)				
(PI first, last name)				
(Co-PI first, last name)				
(Stu1 first, last name)				
Subtotal 1B:				
1. Subtotal: Personnel (1A + 1B)				
2. Contracted Services				
3. Supplies and Materials				
4. Domestic Travel				
5. Current Services				
6. Fixed Charges				
7. Tuition				
8. Subcontracted Services				
Subtotal (Items 1-8):				
Indirect Costs				
Totals:				

Section 3. Executive Summary:

Task 1: *(Task Title)*
(Summary of Progress)
Task i: *(Task Title)*
(Summary of Progress)
Task n: *(Task Title)*
(Summary of Progress)

Section 4: Equipment Disposition

(Retainment request/reason for request, Equipment description, equipment cost, who is requested/recommended to receive the equipment, date/planned date of receipt, approver(s) of distribution method)

APPENDIX J – Technical Report Documentation Page

TECHNICAL REPORT DOCUMENTATION PAGE

General instructions: To add text, click inside the form field below (will appear as a blue highlighted or outlined box) and begin typing. The instructions will be replaced by the new text. If no text needs to be added, remove the form field and its instructions by clicking inside the field, then pressing the Delete key twice.
Please remove this field before completing form.

<table>
<tr><td>1. Report No.
Enter the report number assigned by the sponsoring agency.</td><td>2. Government Accession No.</td><td>3. Recipient’s Catalog No.</td></tr>
<tr><td colspan="2" rowspan="2">4. Title and Subtitle
Enter title and subtitle (use mixed case with initial caps for first word in title and subtitle) with volume and part numbers, if applicable.</td><td>5. Report Date
Enter same date as is on the report cover. Enter full publication date, including month and date, if available, and full year. Example: June 5, 2014 or June 2014 or 2014</td></tr>
<tr><td>6. Performing Organization Code
Enter any/all unique numbers assigned to the performing organization, if applicable.</td></tr>
<tr><td colspan="2">7. Author(s)
Enter name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. Form of entry is first name, middle initial (if applicable), last name, and any additional qualifiers. Primary author is listed first. After each author name, enter ORCID (https://orcid.org/) URL, when available. Example: Josiah Carberry, Ph.D. https://orcid.org/0000-0002-1825-0097</td><td>8. Performing Organization Report No.
Enter any/all unique alphanumeric report numbers assigned by the performing organization, if applicable.</td></tr>
<tr><td colspan="2" rowspan="2">9. Performing Organization Name and Address
Enter the name and address of the organization(s) performing the research.</td><td>10. Work Unit No.</td></tr>
<tr><td>11. Contract or Grant No.
Enter the number of the contract, grant, and/or project number under which the report was prepared. Specify whether the number is a contract, grant, or project number. Example: Contract # 8218</td></tr>
<tr><td colspan="2" rowspan="2">12. Sponsoring Agency Name and Address
Enter name and address of the organization(s) financially responsible for the work. After each agency name, enter funding type (e.g. SPR). Example: Missouri Department of Transportation (SPR)</td><td>13. Type of Report and Period Covered
Enter the type of report (e.g. final, draft final, interim, quarterly, special, etc.) followed by the dates during which the work was performed. Example: Final Report (June 2012-June 2014)</td></tr>
<tr><td>14. Sponsoring Agency Code
If available, enter the office code or acronym if a sponsoring agency (such as FHWA or NHTSA) is named in field #12. For FHWA office codes, see https://fhwaapps.fhwa.dot.gov/foisp/hqphone.do]</td></tr>
</table>

15. Supplementary Notes Conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration. Enter information not included elsewhere, such as translation of (or by), report supersedes, old edition number, alternate title (e.g. project name), hypertext links to documents or related information in the form of URLs, PURLs (preferred over URLs - https://archive.org/services/purl/help), DOIs (https://www.doi.org/), insertion of QR codes, copyright or disclaimer statements, etc. Edit boilerplate FHWA statement above if needed.
16. Abstract Enter a brief factual summary of the most significant information, including the purpose, methods, results, and conclusions of the work. When appropriate, the abstract should include advice on how the results of the research can be used. For guidance, please see ANSI/NISO Z39.14-1997 (R2015) Guidelines for Abstracts (https://www.niso.org/publications/ansiniso-z3914-1997-r2015-guidelines-abstracts).

17. Key Words Enter words, terms, or phrases that identify important topics in the report. When possible, terms should be selected from the Transportation Research Thesaurus (TRT) (http://trt.trb.org) in addition to terms not found in the TRT.	**18. Distribution Statement** No restrictions. This document is available through the National Technical Information Service, Springfield, VA 22161. Enter any other agency mandated distribution statements. Remove NTIS statement if it does not apply.

19. Security Classif. (of this report) Enter security classification of this report (e.g. Unclassified). Reports carrying a security classification will require additional marking giving security and downgrading information as specified by the sponsoring agency.	**20. Security Classif. (of this page)** Enter the security classification of the form (e.g. Unclassified). When at all possible, this form should remain unclassified. If a classification is required, identify the classified items on the page by an appropriate symbol as per instruction from the sponsoring agency.	**21. No. of Pages** Enter the total number of pages in the report, including both sides of all pages and the front and back covers.	**22. Price** Refers to the price of the report. Leave blank unless applicable.

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Technical Report Documentation Page

1. Report No. ***Fill in number assigned by NCDOT, near end of project (e.g. FHWA/NC/2002-006)***	2. Government Accession No. … …	3. Recipient's Catalog No. … …
4. Title and Subtitle *…fill in…*		5. Report Date *…fill in…*
		6. Performing Organization Code … …
7. Author(s) *…fill in…*		8. Performing Organization Report No. … …
9. Performing Organization Name and Address *…fill in…*		10. Work Unit No. (TRAIS) … …
		11. Contract or Grant No. … …
12. Sponsoring Agency Name and Address Research and Development Unit 104 Fayetteville Street Raleigh, North Carolina 27601		13. Type of Report and Period Covered Report *…fill in contract period…*
		14. Sponsoring Agency Code *Fill in NCDOT Project # (e.g. 1999-07)*

Supplementary Notes: … …			
16. Abstract *…fill in…*			
17. Key Words *As a minimum, list a few keywords selected from Transportation Research Thesaurus available for download at:* http://www.infodesigns.com/files.html		18. Distribution Statement … …	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages *…fill in…*	22. Price … …

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

APPENDIX K – Technology Transfer Request Form

RESEARCH & DEVELOPMENT

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TECHNOLOGY TRANSFER REQUEST

Submission Date: _____ **T^2#: (R&D Use)**

Submitter Name: **Phone:**

Division / Unit: **Email:** _____

Technology Transfer Title: _____

What technology transfer effort would you like to pursue? _____. Provide an explanation.

Who will be conducting the technology transfer effort? Who is the intended audience?

Name: _____
Position: _____
Affiliation: _____

Anticipated Class Size: _____

- ☐ **State Employees**
- ☐ **Federal Employees**
- ☐ **Municipal / Town Employees**
- ☐ **Private Sector**
- ☐ **Other:** _____

Where will the technology transfer be held? _____
How often does this effort need to happen? _____
When does this effort need to happen? _____

Equipment/ Development Component: *Describe any IT, Equipment or logistical services that you may need*

Presentation	Printed Material	Web Based Access & Recording
Scribe/Note Taker	Audio/Visual Recording	Training Manual/Material Development
Training Video	Specification Development	Other: _____

Project Champion:

Unit: _____
Title: _____
Name: _____

Approval (Division Official or Unit Head)

Print Name	Signature	Title

Please email the signed document cbradley8@ncdot.gov & research@ncdot.gov;
Questions can be directed to the research via email, by phone (919-707-6664) or to the appropriate Research Engineer.