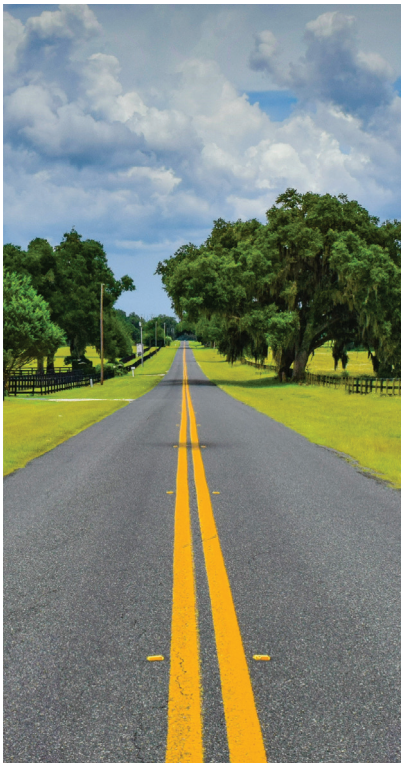


NCHRP

National Cooperative Highway Research Program

ANNUAL REPORT 2018



The National Academies of
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NCHRP

National Cooperative Highway Research Program

ANNUAL REPORT 2018

Research sponsored by the American Association of State Highway and Transportation Officials
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TRANSPORTATION RESEARCH BOARD

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed, and implementable research is the most effective way to solve many problems facing state departments of transportation (DOTs) administrators and engineers. Often, highway problems are of local interest and can best be studied by state DOTs individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation results in increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

Recognizing this need, the leadership of the American Association of State Highway and Transportation Officials (AASHTO) in 1962 initiated an objective national highway research program using modern scientific techniques—the National Cooperative Highway Research Program (NCHRP). NCHRP is supported on a continuing basis by funds from participating member states of AASHTO and receives the full cooperation and support of the Federal Highway Administration (FHWA), United States Department of Transportation.

The Transportation Research Board (TRB), part of the National Academies of Sciences, Engineering, and Medicine, was requested by AASHTO to administer the research program because of TRB's recognized objectivity and understanding of modern research practices. TRB is uniquely suited for this purpose for many reasons: TRB maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; TRB possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; TRB's relationship to the National Academies is an insurance of objectivity; and TRB maintains a full-time staff of specialists in highway transportation matters to bring the findings of research directly to those in a position to use them.

The program is developed on the basis of research needs identified by chief administrators and other staff of the highway and transportation departments, by committees of AASHTO, and by FHWA. Topics of the highest merit are selected by the AASHTO Special Committee on Research and Innovation (R&I), and each year R&I's recommendations are proposed to the AASHTO Board of Directors and the National Academies. Research projects to address these topics are defined by NCHRP, and qualified research agencies are selected from submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Academies and TRB.

The needs for highway research are many, and NCHRP can make significant contributions to solving highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement, rather than to substitute for or duplicate, other highway research programs.

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The National Academies of
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The National Academy of Sciences was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, non-governmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The National Academy of Engineering was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. C. D. Mote, Jr., is president.

The National Academy of Medicine (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at **www.national-academies.org**.



The **Transportation Research Board** is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to increase the benefits that transportation contributes to society by providing leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at **www.trb.org**.

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PHOTOGRAPH CREDITS

Page 9: Top photograph courtesy of Texas A&M Transportation Institute; bottom photograph courtesy of Dan Burden, pedbikeimages. Page 19: Photograph courtesy of Virginia DOT: I-64/U.S. 15 Diverging Diamond Interchange, Louisa County, Virginia (Photo by Jack Beilhart, Virginia DOT).

Finding information on the TRB/NCHRP websites

There are many points of entry to the TRB and NCHRP websites, depending on the kind of information you're looking for. For a general search of all TRB activities on a given topic, enter keywords related to that topic in the search box on the home page of the TRB website at www.trb.org.

To find specific projects, use the "Find a Project" option in the left-hand navigation bar at www.trb.org/NCHRP. You can restrict your search to NCHRP research by selecting NCHRP in the "Program" dropdown menu, or select "All" to include projects from our transit, aviation, freight, hazardous materials, rail, and strategic highway research programs. Enter keywords from the title, a project number, or the staff officer's name in the appropriate box. The "Research Area" dropdown menu lets you view all projects in any of 25 subject areas. If you select "All Projects" in the left-hand menu bar, you will see NCHRP projects categorized by subject area dating back to 1988 when our systems were first digitized. A summary of NCHRP projects from 1962 through 1988 is available online as NCHRP Web Document 7 and can be accessed through a link on the NCHRP home page or by going to <http://tinyurl.com/NCHRPWebDoc7>.

If you are interested in publications in a specific series, such as NCHRP Reports or Syntheses of Practice, direct links are provided on the right-hand side of the NCHRP home page. The home page also includes links to our quick-response series of projects supporting AASHTO committees.

To search all TRB publications, you can visit the TRB Online Bookstore at www.mytrb.org/store.

Finally, the most comprehensive source of information on transportation research globally is the TRID database, available at trid.trb.org.

TRID is the world's largest bibliographic transportation database, which combines the records of TRB's Transportation Research Information Services (TRIS) and the Organization for Economic Cooperation and Development's Joint Transport Research Centre's International Transport Research Documentation. The Research in Progress (RiP) database allows a person to check the research in progress.

NCHRP

Transportation research that works

- Objective national highway research since 1962
- Managed by the Transportation Research Board
- Funded cooperatively by AASHTO member departments
- Project topics determined by state DOTs
- Competitive selection of investigators
- Oversight by technical specialists
- Wide dissemination of findings
- Focus on practical results that impact practice

NCHRP

National Cooperative Highway Research Program

ANNUAL REPORT 2018

The National Cooperative Highway Research Program—NCHRP—has provided research-based solutions to challenges faced by state transportation agencies since 1962. The Board of Directors of the American Association of State Highway and Transportation Officials (AASHTO) sets the direction and focus of research conducted by NCHRP. The Transportation Research Board (TRB) and the U.S. Federal Highway Administration (FHWA) partner with the state departments of transportation (DOTs) to deliver research results in the form of new or improved specifications, standards, practices, and processes that states use every day.

During 2018, NCHRP completed 150 research projects, published 68 research products, and approved 58 new and continuation projects. This *Annual Report* provides a concise list of research published in 2018 (Table 1) and a list of all active projects, projects completed in 2018, and projects that were approved in 2018 but are not yet under contract (Table 2). The *Annual Report* also presents detailed information about how NCHRP operates with oversight by the AASHTO Special Committee on Research and Innovation (R&I).

The *NCHRP Annual Report* supersedes the *Summary of Progress*, which was published in hard copy for the last time in 2014. The *Summary of Progress* documented all NCHRP projects since the inception of the program in 1962. While it provided a useful reference, this information is now readily available on the TRB and NCHRP websites. Therefore, the new annual report series focuses on activities conducted in the current year. See the search tips (on page vi) for information on how best to locate NCHRP research and publications online.



THE STATES' HIGHWAY RESEARCH PROGRAM

The Critical Role of State DOTs

The state DOTs created NCHRP in 1962 to find answers to common problems in highway planning, design, construction, operation, and maintenance. The state DOTs, through AASHTO, are the sole sponsors of NCHRP. The program is operated in cooperation with FHWA and is administered by TRB, part of the National Academies of Sciences, Engineering, and Medicine.

Fifty-six years after the program's creation, state DOTs continue to be the driving force behind NCHRP research. The members of AASHTO—the DOTs of the 50 states and the District of Columbia—come together every year to fund, select, and oversee NCHRP research projects aimed at providing research-based solutions that address the states' most critical challenges.

States provide the funding for NCHRP

Each year, state DOTs voluntarily commit to NCHRP research 5.5 percent of the State Planning and Research (SPR) portion of their Federal-Aid-Highway funds. FHWA requests and pools these state contributions and, under a cooperative agreement, makes them available for research contracts and for administration of the program by TRB.

Available funds for NCHRP have remained strong during the past 21 years, rising along with increases in the Federal-Aid-Highway funds provided by Congress and the corresponding growth of SPR funds. The Intermodal Surface Transportation Efficiency Act (ISTEA) resulted in a funding level of approximately \$17 million for NCHRP for fiscal years 1992 through 1997. This was increased by more than 50 percent on average in fiscal years 1998 through 2003 by the Transportation Equity Act for the 21st Century (TEA-21), which Congress extended, resulting in \$35.4 million for FY 2004.

The last two federal highway acts—the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and the Moving Ahead for Progress in the 21st Century Act (MAP-21)—resulted in an average of \$42 million being programmed for fiscal years 2014 through 2018. A slight increase was experienced as a result of the Fixing America's Surface Transportation (FAST) Act, signed into law on December 4, 2015.

“For writing or evaluating performance-based specifications, I have borrowed some of the methods and findings from *NCHRP Report 720: Estimating the Effects of Pavement Condition on Vehicle Operating Costs* when estimating the road user cost impact of surface quality.”

— James Selwyn Gillespie, Virginia DOT

States select NCHRP research projects

A thorough process of consultation and review by subject matter experts from the state DOTs, AASHTO, FHWA, and TRB ensures that each proposed research project is vetted prior to being considered for funding. The process is led by AASHTO R&I, which provides oversight to NCHRP. R&I membership includes 16 state DOT members (four from each of the four AASHTO regions) plus ex officio members from FHWA and other federal agencies. In addition, the R&I chair must be the CEO of one of the state DOTs, and the vice-chair is the chair of the AASHTO Research Advisory Committee (RAC), composed of research directors from all AASHTO member departments.

In July of every year, R&I invites the submission of research problem statements from three authorized sources: (1) AASHTO member transportation departments, (2) the chairs of AASHTO's committees and councils, and (3) FHWA.

Problem statements are due November 1 each year and should explain why the research represents an immediate need and is of interest to the majority of states. The proposed research should have a high probability of success and should not duplicate other research that is under way or completed. Submitters are asked to search the relevant literature in TRID and the Research in Progress (RiP) database to determine if similar efforts are already under way or if satisfactory answers are already available.

In December, NCHRP prepares a report that contains proposed new problem statements and continuation projects. This report is sent to members of R&I and RAC to rate each of the candidates according to need, value, and appropriateness. The results are used to establish a preliminary ranking to help structure the discussion of candidates by R&I at its March meeting.



At its spring meeting, R&I allocates funds (based on expected funding for the next fiscal year) for new and continuation projects. Once the program is developed, R&I sends a report to the AASHTO Board of Directors (CEOs of each of the member departments) requesting final approval. A favorable vote of at least two-thirds of the member departments for each proposed research project is required. In addition, each year's program must be approved by FHWA and accepted by the National Academies.

An average of 120 problem statements and 20 requests for continuation are received each year. Continuation projects include research carried out under NCHRP subprograms, such as the Synthesis series, the IDEA program, and the Domestic Scan Program, and projects from previous years that request additional funds. In recent years, R&I has funded approximately 100 new projects each year, and approximately half of these are tasks under NCHRP subprograms.

A cumulative total of 1,842 research contracts have resulted from all NCHRP yearly programs through 2017. The FY 2019 program will add another 42 new contracts and 22 continuations.

The annual number of new continuation projects since 2015 is shown in Exhibit 1.

Exhibit 1. Number of Research Projects Selected by R&I, FY 2015 to FY 2019

Project	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Continuation projects	12	16	16	22	11
New projects	46	45	37	42	47
Total projects	58	61	53	64	58
Total project funds	\$28,630,000	\$30,840,000	\$32,275,000	\$35,317,000	\$34,429,000

Funding for the FY 2019 program is expected in early 2019 permitting execution of contracts and initiation of research. R&I will formulate the FY 2020 program in April 2019 based on research problem statements that were submitted by November 1, 2018, the beginning of another cycle of NCHRP research.

States help guide NCHRP research projects

Each research project is assigned to a panel of subject experts who are knowledgeable in the project area and who will provide technical guidance and counsel throughout the research and reporting phases. A broad search is made for these individuals, and TRB usually receives about four to five times as many nominees as are needed.

Panel members do not act as consultants or advisors to project investigators; they may not submit proposals for research. All members serve without compensation, and their total yearly contribution to the program adds up to thousands of staff-days. The panel members are drawn from all walks of professional life, with heavy dependence on practitioners from AASHTO member departments. See Exhibit 2.

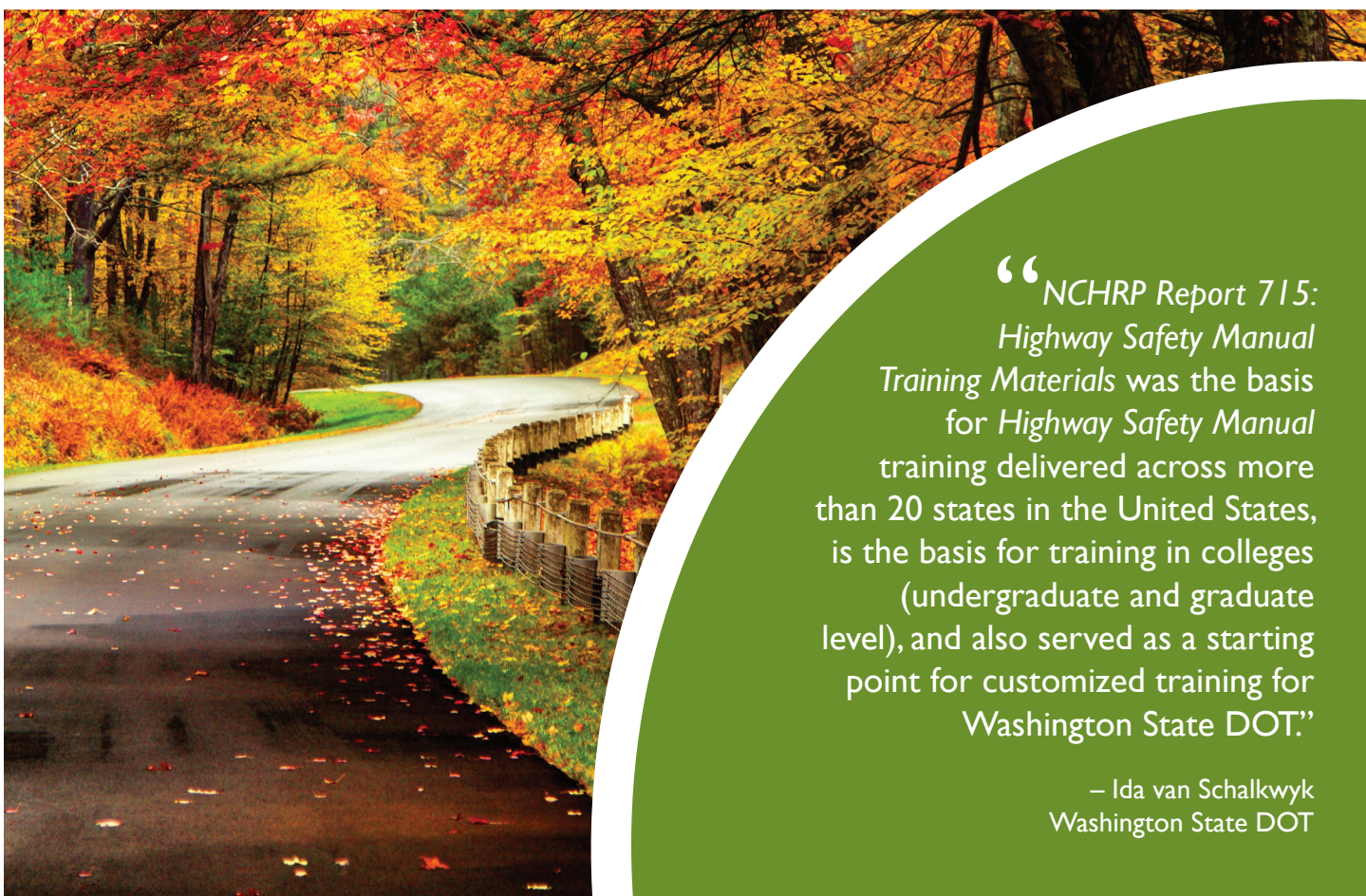
Exhibit 2. Affiliations of Panel Members on Active Projects
(Current number of active projects = 433)

Affiliation	Panel Members*	
	Number	Percentage
State agencies	1,644	61
Federal agencies	41	2
Local, transit agencies, MPOs	135	5
Educational institutions	295	11
Industry, consultants, associations	556	21
Other	19	1
All	2,710	100**

*Does not include liaison representatives.

**Rounded down by 1.

Panel members assume a number of key responsibilities for helping ensure the quality of NCHRP research. Project panels analyze the initial problem statement, develop a final project scope and objectives, and prepare a formal request for proposals from qualified research agencies. The panels review the research proposals, recommend contract awards, and provide counsel to the NCHRP staff responsible for management of the research contracts. Finally, the panels review final reports for acceptability and for accomplishment of the approved research plan.



“NCHRP Report 715: Highway Safety Manual Training Materials was the basis for Highway Safety Manual training delivered across more than 20 states in the United States, is the basis for training in colleges (undergraduate and graduate level), and also served as a starting point for customized training for Washington State DOT.”

— Ida van Schalkwyk
Washington State DOT


WHY NCHRP WORKS

A Model for Cooperative Research

The model developed for NCHRP has functioned effectively for more than 50 years and has also served as the foundation for other successful applied research programs managed by TRB. TRB manages or has managed national cooperative research programs in the fields of highways, transit, airports, hazardous materials, freight, rail transportation, and behavioral traffic safety. Many of the research programs in state departments of transportation use procedures modeled on NCHRP. From other units of the National Academies to industry associations in a variety of fields, experts approach NCHRP for advice on how best to manage cooperative research.

Stakeholders drive success

What makes this model so effective? Why has NCHRP been supported by voluntary contributions for more than 50 years? One of the key success factors is stakeholder involvement. Those who will ultimately benefit from the research are involved from beginning to end, starting with the identification of research ideas that might address



“[NCHRP Synthesis 424: Use of the U.S. Census Bureau’s Public Use Microdata Sample (PUMS) by State DOTs and MPOs] was used to inform the CTPP Oversight Board on the use of PUMS...I also use the report in a course I teach to MPO and state planners.”

– Ed J. Christopher, Independent Consultant

their day-to-day problems. Once these ideas are identified, stakeholders review them and select and prioritize projects that will provide the greatest benefit. When projects are selected, stakeholders help to craft requests for proposals, and then provide technical guidance throughout the project to ensure that the research results will be practical, beneficial, and implementable.

An objective eye

Another key element in the NCHRP model is objectivity. As a part of the nonprofit National Academies, NCHRP does not own roads, make laws, or set policy. Instead, it provides a neutral forum for objective research without bias or prejudice. NCHRP conducts evidence-based research that adheres to the highest standards of integrity. NCHRP panels bring diverse stakeholder groups together with a common interest for a common objective.

Investing wisely in research

The program is not intended to be “all things to all people.” NCHRP research is effective because each project is directly targeted at a current problem.

Further, by working on shared, national problems and issues, the NCHRP model is designed to seek solutions effectively and efficiently. A comprehensive research program coordinated and funded by all the states allows every state to leverage its budget and receive far more value for the research dollars they spend. By joining forces to solve common problems, state DOTs are able to produce solutions to important problems that might otherwise be beyond the ability of any single state. By eliminating duplication of effort, the reach of every state’s research budget is significantly increased.

The NCHRP process is designed to maximize efficiency while producing the highest quality research results—results that will help state DOTs to effectively plan, design, construct, operate, and maintain the surface transportation network while keeping workers and the traveling public safe, providing or improving mobility, and contributing to the economic vitality of communities and the nation.

Competitive investigator selection

The competitive process used by NCHRP to select research contractors is another aspect of the program that contributes to its success. Each project panel develops a request for proposals that is publicly advertised. Successful proposers are selected based on the qualifications of their team members and the merit of their research approach.

NCHRP RESEARCH AREAS

Topics Across the Spectrum of Highway Concerns

The subject matter of NCHRP projects extends across the full spectrum of concerns within the highway industry and demonstrates AASHTO's interest in acquiring answers to the many acute problems facing DOT administrators and engineers. Problems submitted as candidates for funding each year are given a unique identification number based on the NCHRP Classification System for problem areas.

- 1 Pavements
- 2 Economics
- 3 Operations and Control
- 4 General Materials
- 5 Illumination and Visibility
- 6 Snow and Ice Control
- 7 Traffic Planning
- 8 Forecasting
- 9 Bituminous Materials
- 10 Specifications, Procedures and Practices
- 11 Law
- 12 Bridges
- 13 Equipment
- 14 Maintenance of Way and Structures
- 15 General Design
- 16 Roadside Development
- 17 Safety
- 18 Concrete Materials
- 19 Finance
- 20 Special Projects
- 21 Testing and Instrumentation
- 22 Vehicle Barrier Systems
- 23 Properties
- 24 Mechanics and Foundations
- 25 Impact Analysis (Social, Environmental, Economic, Energy)

This identification number, corresponding to the specific problem area addressed, is part of the number that identifies a research project throughout its life cycle, until the project is given an NCHRP publication number when the final deliverable is published. For example, NCHRP Project 03-117 identifies a project in Area 3 (Operations and Control). NCHRP Project 17-73 identifies a project in Area 17 (Safety). Once research was completed, final reports for these projects were published, respectively, as *NCHRP Research Report 881: Traffic Control Devices and Measures for Deterring Wrong-Way Movements*, and *NCHRP Research Report 893: Systemic Pedestrian Safety Analysis*.

Table 2 of the *Annual Report* uses this project numbering system to present information about active, completed, and pending NCHRP projects in 2018. The projects are grouped sequentially from Area 1: Pavements through Area 25: Impact Analysis.



NCHRP Project 03-117 analyzed factors associated with wrong-way movements on unsignalized divided highways and freeways. The divided highway analysis focused on design, signage, and roadway markings, while the freeway analysis emphasized the effectiveness of signage with flashing lights. The research results are discussed in *NCHRP Research Report 881: Traffic Control Devices and Measures for Deterring Wrong-Way Movements*.



NCHRP Project 17-73 advanced a systemic approach, as opposed to a "hot-spot" approach, that enables transportation agencies to identify, prioritize, and select appropriate countermeasures for locations with a high risk of pedestrian-related crashes, even when crash occurrence data are sparse. The research results are presented in *NCHRP Research Report 893: Systemic Pedestrian Safety Analysis*.

SELECTING THE BEST INVESTIGATORS

A Rigorous, Competitive Process

NCHRP does not award grants for research. Rather, the program invites competing proposals from prospective investigators who can demonstrate relevant capability and experience in the problem area to be researched. Eligible organizations include private-sector organizations as well as academic institutions and nonprofit entities. Throughout its history, NCHRP has awarded research contracts to entities headquartered in a majority of the 50 states, as well as the District of Columbia, Canada, and England. Contractors selected to conduct NCHRP research principally fall into two categories—private sector and university/research institute. Of the 94 signed contracts using FY 2017 funds, 53 were with the private sector and 41 were with universities/research institutes.

Requests for proposals are posted on TRB's website, announced through the weekly TRB E-Newsletter, and distributed to a self-subscription listserv. Proposals must comply with the format outlined in the publication *Information and Instructions for Preparing Proposals for the Transportation Research Board's Cooperative Research Programs*.

The proposed budget total is established in advance and therefore not a factor in selecting an investigator. Because the funds available for research are announced in the project statement, proposers instead provide a research plan that is achievable with the available funds. If the proposed cost exceeds the funds available, the proposal will be rejected.

The project panels select investigating agencies after careful evaluation of all proposals and discussion of proposers' past performance on other research projects conducted by NCHRP or others. The successful proposals are retained by panel members for use in monitoring the research. Proposals, panel deliberations, and meeting notes are considered to be privileged information for use by the project panel and are not released.

NCHRP will provide a debriefing, if requested, to unsuccessful proposers to discuss the areas in which their proposals were judged to have weaknesses or deficiencies that were factors in not being selected.

Selection of an agency is made by the responsible project panel considering the following factors*:

- The proposer's demonstrated understanding of the problem;
- The merit of the proposed research approach and methodology;
- Experience, qualifications, and objectivity of the research team in the same or closely related problem area;
- The plan for ensuring application of results;
- The proposer's plan for participation by Disadvantaged Business Enterprises—small firms owned and controlled by minorities or women; and
- The adequacy of the facilities and equipment.

** From Information and Instructions for Preparing Proposals for the Transportation Research Board's Cooperative Research Programs*



MANAGING THE PROGRAM

The Central Role of NCHRP Professionals

Once research starts, administrative and technical oversight of progress is performed by NCHRP staff. In-depth oversight by project managers with wide-ranging expertise is an important factor contributing to project success.

In addition to reviewing monthly progress schedules and quarterly progress reports, the project managers maintain frequent contact with the research contractors. They monitor the conduct of the research to ensure it is consistent with the approved research plan, and they consult with project panels for technical feedback on the contractor's work. Project managers provide guidance to the research contractor's principal investigator in all technical and administrative matters.

The principal investigator is responsible for managing the project budget consistent with the approved work plan, and in no case can the costs exceed the available budget. Any major changes to account for promising new research leads or unproductive lines of study must be approved in advance by NCHRP and the project panel and are authorized through a contract amendment. Contractor invoices are checked by the staff. Finally, the NCHRP project manager and panel evaluate the final research results to determine their acceptability and suitability for publication.

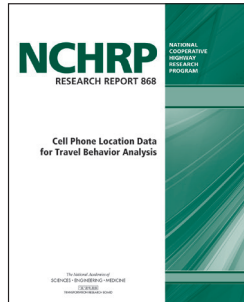


Members of the panel for NCHRP Project 20-05/Topic 50-05, "Incorporating Access Management into Local Ordinances." Left photograph, from the left: Gina Bonyani, Joseph F. Segale, Grant G. Schultz, Valerie J. Southern, and Senior Program Officer Jo Allen Gause. Right photograph, from the right: Tameka Macon, Marc S. Birnbaum, and Wayne W. Kober. Nelda A. Buckley is not shown.

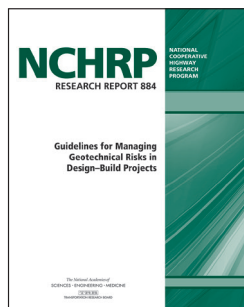
RESEARCH PRODUCTS

Disseminating Research and Documenting Success

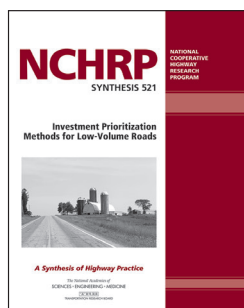
Dissemination of research findings to practitioners is a primary objective of the entire NCHRP research process. Publication of the final report or other deliverables is a key means of dissemination. NCHRP research findings are published in a number of series, which are listed in Table 1 of this *Annual Report*. Quantities for these series published over the past five years are shown in Exhibit 3. Some NCHRP publications produced this year are:



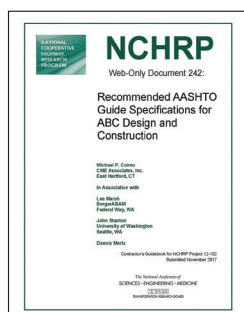
NCHRP Research Report 868: Cell Phone Location Data for Travel Behavior Analysis presents guidelines for transportation planners and travel modelers for evaluating the extent to which cell phone location data and associated products accurately depict travel. The report identifies whether and how these extensive data resources can be used to improve understanding of travel characteristics and the ability to model travel patterns and behavior more effectively. The report also supports the evaluation of the strengths and weaknesses of anonymized call detail record locations from cell phone data. (Project 08-95)



NCHRP Research Report 884: Guidelines for Managing Geotechnical Risks in Design-Build Projects provides guidelines for the implementation of geotechnical risk management measures for design-build project delivery. The guidelines offer five strategies for aligning a transportation agency and its design-builder's perception of geotechnical risk, as well as 25 geotechnical risk management tools that can be used to implement the strategies on typical design-build projects. This report helps to identify and evaluate opportunities to measurably reduce the levels of geotechnical uncertainty before contract award. (Project 24-44)



NCHRP Synthesis 521: Investment Prioritization Methods for Low-Volume Roads documents current practices used by transportation agencies to make investment decisions about low-volume roads. This publication also addresses the challenges that decision makers may face to communicate the value of such investments to stakeholders in an era of limited funds and constantly changing demands on the transportation system. (Project 20-05/Topic 48-07)



NCHRP Web-Only Document 242: Recommended AASHTO Guide Specifications for ABC Design and Construction documents the results of a synthesis of past research regarding accelerated bridge construction (ABC), leading to the development of guide specifications for ABC. Part 1 of the report includes design specifications for ABC. Part 2 of the report includes construction specifications. All current ABC technologies are covered in the specifications, and the outline of the specifications lends itself to the addition of future technologies. (Project 12-102)

Exhibit 3. Number of NCHRP Publications, 2014 to 2018

Publication Series	2014	2015	2016	2017	2018 (est.)
NCHRP Reports	39	20	19	28	33
NCHRP Syntheses of Highway Practice	14	17	17	15	15
NCHRP Research Results Digests	5	7	3	1	0
NCHRP Legal Research Digests	2	5	4	3	0
Web-Only Documents	9	8	7	13	18
CD-ROMs	9	5	2	0	0
Total	78	62	52	60	66

Publications are distributed widely by TRB, with print runs for reports ranging from 600 to 1,000 copies. Print copies are mailed to the CEOs of state DOTs, AASHTO staff, panel members, the contractor, and the following individuals and organizations:

- TRB members who have chosen to receive publications in the particular subject area of the report
- About 100 libraries
- TRB representatives in the state DOTs
- Numerous educational institutions
- Liaison representatives from industry and transportation organizations in other countries
- Relevant TRB panels and committees

The number of printed reports has been declining, with more people accessing reports online.

NCHRP subprograms

Several “subprograms” are carried out within NCHRP. Results may be published in hard copy, delivered in the form of internal reports and presentations, published on the TRB website, or made available upon request.

Synthesis of Information Related to Highway Problems (*Project 20-05*)

Administrators, practicing engineers, and researchers continually face problems on which much information already exists, either in documented form or in terms of undocumented experience and practice. Unfortunately, this information is often fragmented and scattered, and therefore overlooked. The NCHRP Synthesis series aims to remedy this lack of awareness of existing solutions by assembling and organizing relevant information, practices, and research for particular highway problems.



Legal Problems Arising out of Highway Programs (Project 20-06)

State DOTs have an interest in evaluating the operating practices, administrative procedures, and legal issues associated with planning, design, and construction of transportation projects. Individual state legal experiences need to be compared and made available for possible wider application. This research identifies and evaluates legal options for DOTs, which facilitates the handling of both immediate and long-range needs.

Research for AASHTO and State DOT Leadership (Project 20-24)

NCHRP conducts focused research that addresses and responds to the evolving challenges facing state DOT decision makers. Reports from this project deliver timely information on topics including asset management, innovative financing and contracting, performance measures, and e-business, as well as emerging topics such as connected automated vehicles and workforce development.

NCHRP IDEA Program (Project 20-30)

The Innovations Deserving Exploratory Analysis (IDEA) program funds research into promising but unproven innovations for highway design and construction, materials, operations, maintenance, and other areas of highway systems. A progress report that describes current and completed projects is published annually. Of the 182 projects completed to date, 33 projects have been successfully implemented. That results in 18 percent of products funded by the IDEA program successfully implemented.

International Highway Research and Technology (Project 20-36)

The NCHRP International Highway Research and Technology program provides a coordinated approach to international information sharing and technology exchange. The program helps to fund U.S. participation in international activities that identify innovative technology and successful policies and practices from around the globe.

Domestic Scan Program (Project 20-68)

The NCHRP Domestic Scan Program identifies innovative practices of high-performing transportation agencies that could be beneficially adopted by other interested agencies. The purpose of each scan and of the program as a whole is to facilitate information sharing and technology exchange among the states and other transportation agencies and to identify actionable items of common interest.

“In the [Dallas–Fort Worth] region we use the principles outlined in *NCHRP Report 694: Evaluation and Performance Management of Congestion Pricing Projects* as reference for all ongoing managed lane activities.”

– Daniel Lamers, North Central Texas Council of Governments

ENABLING IMPACTS

The Final Deliverable

As an applied research program, NCHRP expects final research deliverables to be presented in language understandable to both administrators and practitioners and in a format that permits easy assimilation and application. The detailed research techniques and analyses in which a researcher would be interested are generally presented in report appendices. NCHRP specifies the style and organization of all research reports to guide the researchers.

The NCHRP project manager writes a foreword for each published report that (1) identifies the fields of specialty of those likely to be most interested in the results and (2) suggests how the results fit into present knowledge and practice. All published reports are offered for sale through TRB's Business Office. Published reports are also available electronically on TRB's website.

Promoting useful results before publication

NCHRP undertakes a number of activities before formal publication of the final deliverables to increase the probability that results will be applied:

- Initial research proposals are required to state how the anticipated results can be used to improve practice.
- Panel members who are experts in the particular problem area and have a good understanding of practitioner needs define the research problem and its objectives and keep the focus of the research on producing implementable results.
- Investigators are selected because of the likelihood that the research results will be usable and readily implementable.
- NCHRP staff and panel members engage with the contractor throughout the research to ensure it is conducted according to the approved research plan.

NCHRP comprehensive communications plan

In late 2018, NCHRP initiated development of a comprehensive communications plan to guide presentation and dissemination of research results. The plan will help NCHRP to more effectively and efficiently inform interested stakeholders and other audiences about program activities and research results. The plan will also provide guidance on developing relevant communications products to meet the specific needs of those stakeholders and audiences.

Implementing research results

Implementation is the last step in the research process—the benefits of research cannot be realized unless put to use. To ensure that the research products are implementable, NCHRP considers implementation throughout the course of a project from the development of the problem to the awarding of the research contract and beyond to the completion of the research.

The selection of implementation strategies depends on the research product and the needs of state DOTs. Each research product requires a tailored approach to dissemination and, if appropriate, to supporting activities designed to help state DOTs and other agencies put the results into practice.

Since 2010, NCHRP has published short summaries of how state DOTs have implemented specific NCHRP research products. These *Ready Results* briefs—targeted at practitioners—outline the problem to be addressed by research, provide an overview of the research results, and, most importantly, offer guidance on immediate next steps for putting the results into practice. Recent titles include

- *Choosing Safe, Cost-Effective Intersection Designs*
- *Extending Bridge Life by Maintaining Expansion Joints*
- *Measuring Modulus for Better-Performing Pavements*
- *Modern Inspection Practices for Culverts & Storm Drain Systems*
- *New Guidelines for Lighting Overhead Signs*
- *New Tool Supports Watershed-Based Stormwater Management*
- *Updating Fuel Factors for Today's Construction Projects*

NCHRP's *Research Topic Highlights* publication series features NCHRP research products for a single subject area in each issue. Three *Highlights* publications have been produced: practice-ready solutions in the areas of warm-mix asphalt, bank erosion and bridge scour, and roadway tunnels.

Roadway Tunnels: NCHRP Shines a Light on Underground Assets

Roadway tunnels are complex structures whose design, construction, operation, and maintenance are enhanced by the same kinds of research commonly applied to other transportation assets. However, due to their relative scarcity and limited geographical distribution, tunnels have not always received the same level of attention in research nationally.

In the early 2000s, the Transportation Research Board's (TRB's) National Cooperative Highway Research Program (NCHRP) ramped up its roadway tunnel research in response to two events.



The first of these was the 2001 terrorist attacks on the United States, which brought into stark light the vulnerability of domestic transportation assets. Significant research since then has helped frame both the problem and the mitigation approaches related to security and safety, and tunnel research continues to evolve.

The second of these was a scan of international best practices that the Federal Highway Administration (FHWA) conducted in 2006 with support from NCHRP. This close-up examination of advanced tunnel technology in Europe was eye-opening for state and national agencies in the United States, and it spurred new research in tunnel design, fire safety, and other areas.

The research projects described in this publication show the maturation of knowledge and practice for tunnels between 2001 and 2017. These projects also highlight the ongoing cooperation among state and national entities in the United States to coordinate the research and keep it on track.

“NCHRP does a great job of working with AASHTO's Committee on Bridges and Structures, both to learn what the states see as critical tunnel research needs and to keep us informed about results coming from NCHRP tunnel research.”


—Louis Rizzo, Pennsylvania Department of Transportation
Chair, AASHTO Committee on Bridges and Structures (CBOS)
Technical Committee T-20, Tunnels

WHY RESEARCH ROADWAY TUNNELS?

Research has advanced different aspects of roadway tunnels thanks to NCHRP and national partners. Since 2001, NCHRP has administered research that:

- Investigated best practices for tunnel rehabilitation and preservation, including tunnel inspection, quality assurance and quality control (QA/QC), common structural problems and rehabilitation techniques, and evidence-based decision making for asset management.
- Developed design guidance for tunnels for the American Association of State Highway and Transportation Officials (AASHTO) to complement Load and Resistance Factor Design (LRFD) for other structures.
- Advanced the state of knowledge for tunnel safety and security, providing strategies to assess, prevent, and respond to hazards of all kinds.
- Worked in tandem with national partners to accelerate best practices, including national and international scanning tours that helped bring such practices to the fore.



Cutterhead of the tunnel boring machine for Washington State DOT's Alaskan Way Viaduct replacement project in Seattle

NCHRP implementation support program

To facilitate the implementation of NCHRP research products by state DOTs and others, R&I has made consultant support available through the NCHRP Implementation Support Program (*NCHRP Project 20-44*).

State DOTs, AASHTO committees and councils, and NCHRP project panels can apply for funding for consultant support in delivering a range of implementation products and activities, including pilot/demonstration projects, workshops, peer exchanges, training, and briefing materials. If approved, NCHRP will procure consultant services.

In FY 2018, the program approved 14 implementation projects, totaling \$1,221,309. Exhibit 4 provides a summary.

Exhibit 4. Implementation Projects Funded in FY 2018

Source	Implementation Project Name	Amount
NCHRP Report 750 and NCHRP Report 845	Consultant Support for Massachusetts DOT's Commission on the Future of Transportation in the Commonwealth	\$100,000
NCHRP Project 03-113	Guidance for Traffic Signals at Diverging Diamond Interchanges and Adjacent Intersections	\$99,934
NCHRP Project 03-121	Incorporating Freight, Transit, and Incident Response Stakeholders into Integrated Corridor Management (ICM): Processes and Strategies for Implementation	\$149,743
NCHRP Project 03-127	Cybersecurity of Traffic Management Systems	\$32,200
NCHRP Research Report 893	Conducting Systemic Pedestrian Safety Analyses	\$154,000
NCHRP Project 10-86A	Implementing Single-User Software for Bidding Alternative Drainage Pipe Systems	\$50,530
NCHRP Research Report 887	Underwater Installation of Filter Systems for Scour and Other Erosion Control Countermeasures	\$50,000
NCHRP Report 750 and NCHRP Report 845	Phase 2: Consultant Support for Massachusetts DOT's Commission on the Future of Transportation in the Commonwealth	\$145,570
NCHRP Report 748	Guidelines for the Use of Mobile LIDAR in Transportation Applications	\$6,000
NCHRP Report 706 and NCHRP Report 754	Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies and Improving Management of Transportation Information	\$80,000
NCHRP Research Report 853	Design Hydrology for Stream Restoration and Channel Stability at Stream Crossings	\$99,988
NCHRP Report 814	Implementing a Transportation Agency Data Self-Assessment	\$220,000
NCHRP Project 20-44R	Loaned Internal Staff for Impact Analysis	\$28,344
NCHRP Project 20-44TS	Travel Support for Implementation Activities	\$5,000
		\$1,221,309

For more information on the NCHRP Implementation Support Program, visit the TRB website (www.trb.org/NCHRP/NCHRPImplementationSupportProgram.aspx).

Documenting success

For the past several years, NCHRP has addressed the challenge of documenting or showcasing successful research products. Several approaches are being used, and NCHRP will continue to explore new and better ways to meet this challenge.

Every four years, NCHRP surveys panel members from completed projects to identify known applications of research results. Feedback from these surveys enables NCHRP to confirm high usage and application of research results, to improve the implementation of future research results, and to identify successful applications of research.

These successful applications of NCHRP research are showcased in a series of case studies, “Impacts on Practice,” based on interviews with DOT practitioners. More than 35 of these case studies are posted on the TRB website. In addition, the interviews with DOT practitioners have identified the various ways that states implement NCHRP research results. NCHRP documents some of these implementation efforts and methods in the “Paths to Practice” series.



In 2018, NCHRP produced its first Impact Report. This report highlights where and how NCHRP research is used by state DOTs. Containing several anecdotal accounts on the benefits and impacts of NCHRP research in different states, this report will be updated on a regular basis and made available through the NCHRP website.



“ I have presented the information in *NCHRP Report 731: Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections* to our regional staff. We are working to update our policy to match the outcomes of this study.”

— Joanna L. Bush
Wisconsin DOT

Table 1. Publications of the National Cooperative Highway Research Program 2018

Research Reports		
No.	Proj. No.	Title, Pages
855	15-52	An Expanded Functional Classification System for Highways and Streets (& WOD 230), 84 p.
858	14-33	Quantifying the Effects of Preservation Treatments on Pavement Performance, 112 p.
860	08-100	Assessing the Environmental Justice Effects of Toll Implementation or Rate Changes: Guidebook and Toolbox (& WOD 237), 424 p.
865	20-103	Guidance for Development and Management of Sustainable Enterprise Information Portals (& WOD 241), 132 p.
866	20-100	Return on Investment in Transportation Asset Management Systems and Practices, 180 p.
868	08-95	Cell Phone Location Data for Travel Behavior Analysis, 152 p.
869	17-61	Estimating the Safety Effects of Work Zone Characteristics and Countermeasures: A Guidebook (& WOD 240), 76 p.
870	04-39	Field Performance of Corrugated Pipe Manufactured with Recycled Polyethylene Content, 164 p.
871	09-54	Long-Term Aging of Asphalt Mixtures for Performance Testing and Prediction, 120 p.
872	12-93	Contribution of Steel Casing to Single Shaft Foundation Structural Resistance, 176 p.
873	19-13	Guidebook to Funding Transportation Through Land Value Return and Recycling, 152 p.
874	20-109	The Transportation Research Thesaurus: Capabilities and Enhancements, 112 p.
875	17-59	Guidance for Evaluating the Safety Impacts of Intersection Sight Distance (& WOD 228), 44 p.
877	01-55	Performance-Based Mix Design of Porous Friction Courses, 146 p.
878	09-40A	Validation of the Louisiana Interlay Shear Strength Test for Tack Coat, 72 p.
879	13-04	Optimal Replacement Cycles of Highway Operations Equipment, 120 p.
880	15-48	Design Guide for Low-Speed Multimodal Roadways, 279 p.
881	03-117	Traffic Control Devices and Measures for Deterring Wrong-Way Movements, 106 p.
882	25-52	How Weather Affects the Noise You Hear from Highways, 322 p.
883	12-87A	Fracture-Critical System Analysis for Steel Bridges, 58 p.
884	24-44	Guidelines for Managing Geotechnical Risks in Design-Build Projects (& WOD 247), 84 p.
885	20-108	Guide to Creating and Sustaining a Culture of Innovation for Departments of Transportation (& WOD 248), 68 p.
886	25-44	Field Evaluation of Reflected Noise from a Single Noise Barrier, 432 p.
887	24-42	Guidance for Underwater Installation of Filter Systems (& WOD 254 Vol. 1; & WOD 254 Vol. 2), 112 p.
888	17-70	Development of Roundabout Crash Prediction Models and Methods, 186 p.
890	09-55	Using Recycled Asphalt Shingles with Warm Mix Asphalt Technologies, 208 p.
891	20-102(08)	Dedicating Lanes for Priority or Exclusive Use by Connected and Automated Vehicles, 152 p.
892	12-90	Guidelines for Shielding Bridge Piers, 106 p.
893	17-73	Systemic Pedestrian Safety Analysis, 110 p.
895	12-96	Simplified Full-Depth Precast Concrete Deck Panel Systems, 156 p.
896	20-102(09)	Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles, Vol. 1: Executive Summary, 30 p.
896	20-102(09)	Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles, Vol. 2: Guidance, 96 p.
897	08-106	Tools to Facilitate Implementation of Effective Metropolitan Freight Transportation Strategies, 116 p.
900	03-120	Guide for the Analysis of Multimodal Corridor Access Management (& WOD 256), 126 p.
Syntheses of Highway Practice (Project 20-05)		
No.	Topic No.	Title, Pages
515	48-01	Practices for Preventing Roadway Departures, 58 p.
516	48-02	Tack Coat Specifications, Materials, and Construction Practices, 128 p.
517	48-03	Corrosion Protection for Extending Steel Bridge Service Life, 84 p.
518	48-04	Staffing for Alternative Contracting Methods, 122 p.
519	48-05	The Renewal of Stormwater Systems Using Trenchless Technologies, 56 p.
520	48-06	Integrated Transportation and Land Use Models, 90 p.
521	48-07	Investment Prioritization Methods for Low-Volume Roads, 76 p.
523	48-09	Integration of Roadway Safety Data from State and Local Sources, 92 p.
524	48-10	Aggregate Quality Requirements for Pavements, 100 p.
525	48-11	Practices in One-Lane Traffic Control on a Two-Lane Rural Highway, 152 p.
526	48-12	Inertial Profiler Certification for Evaluation of International Roughness Index, 108 p.
527	48-13	Resilience in Transportation Planning, Engineering, Management, Policy, and Administration, 86 p.
528	48-14	Analyzing Data for Measuring Transportation Performance by State DOTs and MPOs, 62 p.

529	48-15	How Transportation Agencies Assess the Value of Added Capacity Highway Projects versus Other Modal Projects and Strategies, 70 p.
530	48-16	Construction and Rehabilitation of Concrete Pavements Under Traffic, 92 p.

Web-Only Documents

No.	Proj. No.	Title, Pages
228	17-59	Safety Impacts of Intersection Sight Distance (& Rep. 875), 119 p.
230	15-52	Developing an Expanded Functional Classification System for More Flexibility in Geometric Design (& Rep. 855), 230 p.
240	17-61	Analysis of Work Zone Crash Characteristics and Countermeasures (& Rep. 869), 74 p.
241	20-103	Development and Management of Sustainable Information Portals (& Rep. 865), 248 p.
242	12-102	Recommended AASHTO Guide Specifications for ABC Design and Construction, 193 p.
243	12-98	Recommended Guidelines for Prefabricated Bridge Elements and Systems Tolerances and Recommended Guidelines for Dynamic Effects for Bridge Systems, 177 p.
245	12-103	Bridge Superstructure Tolerance to Total and Differential Foundation Movements, 825 p.
246	25-48	Transportation Air Quality System, Vol. 1: TRAQS User Guide, 153 p.
246	25-48	Transportation Air Quality System, Vol. 2: Combined Interface for Project-Level Air Quality Analysis, 60 p.
247	24-44	Managing Geotechnical Risks in Design-Build Projects (& Rep. 884), 279 p.
248	20-108	Research on Creating and Sustaining a Culture of Innovation for Departments of Transportation (& Rep. 885), 95 p.
249	24-37	Combining Individual Scour Components to Determine Total Scour, 289 p.
250	10-77	Use of Automated Machine Guidance (AMG) Within the Transportation Industry, 538 p.
251	14-30	Spot Painting to Extend Highway Bridge Coating Life, Vol. 1: Guidance, 94 p.
251	14-30	Spot Painting to Extend Highway Bridge Coating Life, Vol. 2: Research Overview, 73 p.
252	17-69	A Strategic Approach to Transforming Traffic Safety Culture to Reduce Deaths and Injuries, 164 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 1: Legal Landscape, 131 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 2: State Legal and Regulatory Audit, 206 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 3: Legal Modification Prioritization and Harmonization Analysis, 95 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 4: Autonomous Vehicle Action Plan, 65 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 5: Developing the Autonomous Vehicle Action Plan, 95 p.
253	20-102(07)	Implications of Connected and Automated Driving Systems, Vol. 6: Implementation Plan, 12 p.
254	24-42	Underwater Installation of Filter Systems for Scour and Erosion Countermeasures, Vol. 1: Research Report (& Rep. 887), 206 p.
254	24-42	Underwater Installation of Filter Systems for Scour and Erosion Countermeasures, Vol. 2: Training Manual (& Rep. 887), 142 p.
255	17-65	Improved Analysis of Two-Lane Highway Capacity and Operational Performance, 679 p.
257	01-52	A Mechanistic–Empirical Model for Top-Down Cracking of Asphalt Pavements Layers (& RRD 403), 214 p.

Notes:

Publications in parentheses with an ampersand (&) are companion publications.

See Table 2 for project titles. See inside back cover of this document for ordering information.

TABLE 2
STATUS (AS OF 12/31/2018) OF PROJECTS ACTIVE OR PENDING DURING 2018

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
AREA ONE : PAVEMENTS						
01-52	A Mechanistic-Empirical Model for Top-Down Cracking of Asphalt Pavement Layers	Texas A&M Transportation Institute	499,356	3/4/2013	3/30/2018	Completed---Agency report to be available as NCHRP Web-Only Document 257
01-53	Proposed Enhancements to Pavement ME Design: Improved Consideration of the Influence of Subgrade and Unbound Layers on Pavement Performance	Texas A&M Transportation Institute	400,000	1/1/2014	12/31/2018	Completed---Publication decision pending
01-54	Guidelines for Limiting Damage to Flexible and Composite Pavements Due to the Presence of Water	Applied Pavement Technology	349,881	8/1/2014	12/31/2018	Completed---Publication decision pending
01-57A	Developing Standard Definitions for Comparable Pavement Cracking Data	Oklahoma State University	249,592	10/13/2017	7/13/2019	Research in progress
01-58	Quantifying the Effects of Implements of Husbandry on Pavements	University of Pittsburgh	400,000	9/1/2017	2/28/2020	Research in progress
01-59	Proposed Enhancements to Pavement ME Design: Improved Consideration of the Influence of Subgrade Soils Susceptible to Shrink/Swell and/or Frost Heave on Pavement Performance	Arizona State University	500,000	8/15/2018	5/14/2021	Research in progress
01-60	Measuring the Characteristics of Pavement Surface Images and Developing Standard Practices for Calibration, Certification, and Verification of Imaging Systems	Georgia Tech Research Corporation	593,633	9/10/2018	12/9/2021	Research in progress
01-61	Evaluation of Bonded Concrete Overlays on Asphalt Pavements	Nichols Consulting Engineers	570,000	2/26/2018	2/26/2020	Research in progress
AREA TWO : ADMINISTRATION--ECONOMICS						
02-25	Attracting, Retaining, and Developing the Transportation Workforce: Design, Construction and Maintenances	-----	700,000			In development
02-26	Implementation of Programmatic Life-Cycle Cost Analysis in a Transportation Asset Management Framework	-----	500,000			In development
02-27	Making Targets Matter: Managing Performance to Enhance Decision-Making	-----	650,000			In development
AREA THREE : TRAFFIC--OPERATIONS AND CONTROL						
03-62	Guidelines for Accessible Pedestrian Signals (APS)	University of North Carolina - Chapel Hill	1,070,000	10/4/2001	1/31/2018	Completed---Interim materials summarized in NCHRP Research Results Digest 278. Final publication decision pending.

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
03-78C	Training and Technology Transfer for Accessibility Guidelines for Roundabouts and Channelized Turn Lanes	Kittelson & Associates	250,000	1/4/2017	1/3/2019	Research in progress--- Contractor's final report under review
03-99A	Linking the TRB Access Management Manual and the Access Management Application Guidelines	Kittelson & Associates	25,960	11/13/2017	2/13/2018	Completed---Published by TRB as "Access Management Manual and Application Guidelines--Linked"
03-111	Effectiveness of Work Zone Transportation Management Plan Strategies	KLS Engineering LLC	749,961	6/24/2014	7/24/2019	Research in progress---Interim report pending
03-113	Guidance for Traffic Signals at Diverging Diamond Interchanges and Adjacent Intersections	North Carolina State University	1,099,875	6/13/2014	9/12/2018	Research in progress
03-117	Traffic Control Devices and Measures for Detering Wrong-Way Movements	Texas A&M Transportation Institute	298,697	5/11/2015	1/15/2018	Completed---Published as NCHRP Research Report 881
03-118	Decision-Making Guide for Traffic Signal Phasing	Vanasse Hangen Brustlin, Inc.	600,000	8/13/2015	8/12/2019	Research in progress
03-119	Application of MASH Test Criteria to Breakaway Sign and Luminaire Supports and Crashworthy Work Zone Traffic Control Devices	George Mason University	599,134	9/28/2015	11/30/2019	Research in progress
03-120	Assessing Interactions Between Access Management Treatments and Multimodal Users	Kittelson & Associates	800,000	8/11/2015	7/31/2018	Completed---Published as NCHRP Research Report 900
03-121	Incorporating Freight, Transit, and Incident Response Stakeholders into Integrated Corridor Management (ICM): Processes and Strategies for Implementation	Cambridge Systematics	549,301	7/5/2016	9/1/2019	Completed---To be published as NCHRP Research Report 899
03-122	Performance-Based Management of Traffic Signals	Kittelson & Associates	600,000	4/14/2016	7/13/2018	Completed---Publication decision pending
03-123	Proposed Practices for the Application of Dynamic Lane Use Control	Texas A&M Transportation Institute	350,000	7/1/2016	6/30/2019	Research in progress
03-124	Principles and Guidance for Presenting Drivers with Dynamic Information on Active Traffic Management	Battelle Memorial Institute	749,939	11/3/2016	5/2/2019	Research in progress
03-125	Evaluation of Change and Clearance Intervals Prior to the Flashing Yellow Arrow Permissive Left-Turn Indication	University of Wisconsin - Madison	300,000	9/21/2016	9/20/2019	Research in progress
03-126	Operational Standards for Highway Infrastructure	-----	500,000			In development
03-127	Cybersecurity of Traffic Management Systems	Southwest Research Institute	750,000	8/16/2017	8/15/2019	Research in progress
03-128	Business Intelligence Techniques for Transportation Agency Decision Making	Applied Engineering Management Corporation	359,942	6/20/2018	9/19/2019	Research in progress
03-129	Essential Communications: A Guide to Land Mobile Radio (LMR)	CommDEX Consulting LLC	536,433	8/1/2018	7/31/2020	Research in progress---Interim report pending

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
03-130	Guide for Roundabouts	Kittelson & Associates	750,000	6/1/2018	11/30/2020	Research in progress
03-131	Guidance for Planning and Implementing Multimodal, Integrated Corridor Management	Kapsch TrafficCom USA Inc.	499,306	5/7/2018	11/7/2019	Research in progress
03-132	Guidance for Safe and Effective Temporary Traffic Control for Mobile Operations on Two-Lane Two-Way Roadways	Texas A&M Transportation Institute	300,000	5/14/2018	11/13/2019	Research in progress
03-133	Signal Timing Strategies for Non-Motorized Users	Kittelson & Associates	500,000	4/25/2018	4/24/2020	Research in progress
03-134	Determination of Encroachment Conditions in Work Zones	-----	500,000			In development
03-135	Wrong-Way Driving Prevention Solutions, Policy, and Guidance	-----	600,000			In development
03-136	Evaluating the Performance of Right-Turn-On-Red Operation at Signalized Intersections (with single and dual right-turn lanes)	-----	300,000			In development
03-137	Algorithms to Convert Basic Safety Messages into Traffic Measures	-----	400,000			In development
AREA FOUR : MATERIALS AND CONSTRUCTION--GENERAL MATERIALS						
04-40	Reliability-Based Geotechnical Resistance Factors for Axially-Loaded Micropiles	University of Missouri	249,998	9/1/2017	8/31/2019	Research in progress
04-41	Deterioration Rates and Unit Costs for Geotechnical Assets	-----	400,000			Terminated
AREA FIVE : TRAFFIC--ILLUMINATION AND VISIBILITY						
05-21	Safety and Performance Criteria for Retroreflective Pavement Markers	Texas A&M Transportation Institute	675,000	9/1/2015	6/30/2018	Completed---To be published as an NCHRP Research Report
05-22	Guidelines for Solid-State Roadway Lighting	WSP USA Inc.	399,993	6/1/2017	3/31/2019	Research in progress
05-23	Effects of LED Roadway Lighting on Driver Sleep Health and Alertness	Virginia Polytechnic Institute	399,775	7/1/2018	6/30/2020	Research in progress
05-24	Guidelines for Vehicle and Equipment Color, Marking, and Lighting	Texas A&M Transportation Institute	600,000	6/1/2018	11/30/2020	Research in progress
AREA SIX : MAINTENANCE--SNOW AND ICE CONTROL						
06-18	Guide for Snow and Ice Control Operations	-----	300,000			In development
AREA SEVEN : TRAFFIC--TRAFFIC PLANNING						
07-22	Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual	Kittelson & Associates	566,000	6/4/2013	1/30/2018	Completed---Published as NCHRP Report 825

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
07-23	Access Management in the Vicinity of Interchanges	Texas A&M Transportation Institute	900,000	6/20/2013	2/28/2019	Research in progress
07-24	Estimating the Value of Truck Travel-Time Reliability	WSP USA Inc.	299,920	1/26/2017	12/31/2018	Completed---To be published as an NCHRP Research Report
07-25	Guide for Pedestrian and Bicycle Safety at Alternative Intersections and Interchanges (AII)	Kittelson & Associates	400,000	4/12/2017	2/12/2019	Research in progress
07-26	Highway Capacity Manual Methodologies for Analyzing Freeway Merging and Diverging Bottlenecks Considering Different Geometric Characteristics and Mitigation Strategies	-----	500,000			In development
07-27	An Update of the Green Book Design Vehicles and Minimum Turning Paths	-----	400,000			In development
07-28	Assessing the Impacts of Turn Lanes in Different Contexts and Modal Considerations to Increase Safety Performance	-----	650,000			In development

AREA EIGHT : TRANSPORTATION PLANNING--FORECASTING

08-36/Task 116	Development of Transportation Asset Management Plan Templates	RAND Corporation	234,718	6/12/2013	7/15/2018	Completed---Final report sent to AASHTO
08-36/Task 125A	Transportation Asset Management Knowledge Portal (Continuation)	RAND Corporation	70,000	1/10/2017	4/15/2018	Completed---Final report sent to AASHTO
08-36/Task 127	Employment Data for Planning: Do You Know What You're Getting, Who's Your Supplier, and How Good are the Goods?	Cambridge Systematics	99,975	6/18/2015	2/28/2018	Completed---Final report sent to AASHTO
08-36/Task 135A	Addressing Margins of Error in Small Areas of Data Delivered through the American FactFinder or the Census Transportation Planning Products Program	RAND Corporation	29,956	8/23/2017	8/22/2018	Completed---Final report sent to AASHTO
08-36/Task 137	Assessing the Utility and Costs of Statewide Travel Demand Models	RAND Corporation	124,697	6/21/2016	4/30/2018	Completed---Final report sent to AASHTO
08-36/Task 139	Planning Research Digest	RAND Corporation	124,401	6/21/2016	6/29/2018	Completed---Final report sent to AASHTO
08-36/Task 140	Assessing Actual Transportation Impacts of the 2005 BRAC Decisions	WSP USA Inc.	124,995	7/20/2016	4/30/2018	Completed---Final report sent to AASHTO
08-36/Task 141	Evaluation of Walk and Bicycle Demand Modeling Practice	RAND Corporation	99,996	5/30/2017	1/31/2019	Research in progress
08-36/Task 142	Advancing Sustainability through Multi-Agency Collaborations	RAND Corporation	145,000	6/5/2017	5/30/2019	Research in progress
08-36/Task 143	Evolving Transportation Planning Research Needs for the 21st Century	WSP USA Inc.	124,980	6/5/2017	1/15/2019	Research in progress
08-36/Task 144	Transportation Asset Management and Effective Organizational Models for Program Implementation	Cambridge Systematics	125,000	6/5/2017	11/30/2018	Completed---Final report sent to AASHTO

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
08-36/Task 145	Scenario Planning Lite	Cambridge Systematics	75,000	4/6/2018	1/5/2019	Research in progress
08-36/Task 146	Economic Resilience and Long-Term Highway/Transportation Infrastructure Investment	RAND Corporation	150,000	5/3/2018	5/9/2019	Research in progress
08-36/Task 147	Strategic Mobility Research: Enhancing Mobility, Stimulating Economic Activity, Saving Lives	WSP USA Inc.	150,000	5/3/2018	5/2/2019	Research in progress
08-101	Enhanced Truck Data Collection and Analysis for Emissions Modeling	Cambridge Systematics	500,000	6/22/2015	6/30/2018	Completed---Publication decision pending
08-102	Bicyclist Facility Preferences and Effects on Increasing Bicycle Trips	Georgia Tech Research Corporation	350,000	6/24/2015	8/30/2019	Research in progress---Interim report pending
08-103	Implementing NCHRP Report 806: Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance	Spy Pond Partners	398,300	6/1/2016	9/22/2018	Completed---To be published as an NCHRP Research Report
08-104	A Guidebook for Post-Award Contract Administration for Highway Projects Delivered Using Alternative Contracting Methods	University of Colorado - Boulder	500,000	9/16/2016	3/31/2019	Research in progress---Contractor's draft report under review
08-105	Measuring the Effectiveness of Public Involvement in Transportation Planning and Project Delivery	PRR Inc.	350,000	6/6/2016	11/20/2018	Completed---Publication decision pending
08-106	Metropolitan Freight Transportation: Implementing Effective Strategies	Texas A&M Transportation Institute	375,000	5/25/2016	5/25/2018	Completed---Published as NCHRP Research Report 897
08-107	A Guidebook for Emergency Contracting Procedures for Administration of a Regional Emergency	AECOM Consulting Transportation Group	249,997	12/15/2016	6/30/2019	Research in progress---Interim report under review
08-108	Developing National Performance Management Data Strategies to Address Data Gaps, Standards, and Quality	Spy Pond Partners	299,956	3/9/2017	3/29/2019	Research in progress
08-109	Updating the AASHTO Transportation Asset Management Guide—A Focus on Implementation	Spy Pond Partners	100,000	3/10/2017	7/9/2018	Completed---Work continuing under NCHRP Project 08-109(01)
08-109(01)	Updating the AASHTO Transportation Asset Management Guide—A Focus on Implementation, Phase 2	Spy Pond Partners	700,000	6/4/2018	1/3/2020	Research in progress
08-110	Traffic Forecasting Accuracy Assessment Research	University of Kentucky Research Foundation	349,932	2/14/2017	2/28/2019	Research in progress
08-111	Effective Decision-Making Methods for Freight-Efficient Land Use	Rensselaer Polytechnic Institute	500,000	3/20/2017	3/20/2019	Research in progress
08-112	Guidebook for Implementing Alternative Technical Concepts into All Types of Highway Project Delivery Methods	Gransberg & Associates Inc.	450,000	6/1/2017	3/1/2019	Research in progress--Interim report under review
08-113	Integrating Effective Transportation Performance, Risk, and Asset Management Practices	CH2M Hill	520,617	3/15/2018	9/14/2020	Research in progress

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
08-114	Systematic Approach for Determining Construction Contract Time: A Guidebook	Iowa State University	0	3/20/2018	11/19/2019	See NCHRP Project 08-114A
08-114A	Systematic Approach for Determining Construction Contract Time: A Guidebook	Texas A&M University	500,000	7/27/2018	3/27/2020	Research in progress
08-115	Guidebook for Data and Information Systems for TAM	Spy Pond Partners	400,000	8/1/2018	10/31/2019	Research in progress
08-116	Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making	Applied Engineering Management Corporation	399,973	5/8/2018	11/7/2019	Research in progress
08-117	Impact of Transformational Technologies on Land Use and Transportation	Kittelson & Associates	200,000	5/1/2018	7/31/2019	Research in progress
08-118	Risk Assessment Techniques for Transportation Asset Management	-----	600,000			In development
08-119	Developing Data Standards and Guidance for Transportation Planning and Traffic Operations - Phase 1	-----	1,100,000			In development
08-120	Initiating the Systems Engineering Process for Rural Connected Vehicle Corridors	-----	350,000			In development
08-121	Operationalizing Accessibility Metrics to Support Transportation Planning and Performance Management	-----	500,000			In development
08-122	Metropolitan Planning Organizations: Transportation Partnerships for the 21st Century	-----	400,000			In development
08-123	Census Transportation Data Use and Application Field Guide	-----	375,000			In development
08-124	Quantifying the Impacts of Corridor Management	-----	450,000			In development
08-125	A Comprehensive Study of Future Competencies for Transportation Planners	-----	300,000			In development
AREA NINE : MATERIALS AND CONSTRUCTION--BITUMINOUS MATERIALS						
09-52A	Short-Term Laboratory Conditioning of Asphalt Mixtures: Field Verification	Texas A&M Transportation Institute	162,000	10/18/2016	12/31/2018	Completed---Publication decision pending
09-54	Long-Term Aging of Asphalt Mixtures for Performance Testing and Prediction	North Carolina State University	950,000	5/21/2013	4/30/2019	Research in progress
09-55	Recycled Asphalt Shingles in Asphalt Mixtures with Warm Mix Asphalt Technologies	Auburn University	600,000	6/10/2013	2/28/2018	Completed---Published as NCHRP Research Report 890
09-56A	Identifying Influences on and Minimizing the Variability of Ignition Furnace Correction Factors - Phase II	Auburn University	250,000	5/12/2017	3/31/2019	Research in progress---Contractor's draft report pending

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
09-57A	Ruggedness of Laboratory Tests to Assess Cracking Resistance of Asphalt Mixtures	Texas A&M Transportation Institute	1,000,000	6/15/2018	10/14/2020	Research in progress---Interim report under review
09-58	The Effects of Recycling Agents on Asphalt Mixtures with High RAS and RAP Binder Ratios	Texas A&M Transportation Institute	1,500,000	5/2/2014	3/31/2019	Research in progress---Contractor's draft report under review
09-59	Relating Asphalt Binder Fatigue Properties to Asphalt Mixture Fatigue Performance	Advanced Asphalt Technologies, LLC	1,000,000	4/20/2015	2/28/2019	Research in progress---Contractor's draft final report under review
09-60	Addressing Impacts of Changes in Asphalt Binder Formulation and Manufacture on Pavement Performance through Changes in Asphalt Binder Specifications	Western Research Institute	1,000,000	7/6/2016	6/30/2019	Research in progress
09-61	Short- and Long-Term Binder Aging Methods to Accurately Reflect Aging in Asphalt Mixtures	Advanced Asphalt Technologies, LLC	749,976	3/2/2017	9/1/2019	Research in progress
09-62	Rapid Tests and Specifications for Construction of Asphalt-Treated Cold Recycled Pavements	Virginia Department of Transportation	999,751	6/1/2017	6/1/2020	Research in progress
09-63	Development of a National Performance-Related Specification for Emulsified Asphalt Binder	-----	500,000			In development

AREA TEN : MATERIALS AND CONSTRUCTION--SPECIFICATIONS, PROCEDURES, AND PRACTICES

10-91A	Sustainable Highway Construction Practices	University of Washington	300,000	10/10/2016	12/31/2018	Completed---Publication decision pending
10-93	Measuring, Characterizing, and Reporting Pavement Roughness of Low-Speed and Urban Roads	University of Michigan	450,000	10/1/2013	8/31/2018	Completed---Publication decision pending
10-94	Mitigation of Weldment Cracking of Highway Steel Structures due to the Galvanizing Process	University of Kansas	499,975	7/1/2014	5/31/2019	Research in progress
10-95A	Toughness Requirements for Heat-Affected Zones of Welded Structural Steels for Highway Bridges	University of Kansas	425,000	9/19/2016	12/31/2019	Research in progress
10-97	Detection and Remediation of Soluble Salt Contamination Prior to Coating Steel Highway Structures	Elzly Technology Corporation	500,000	9/15/2015	11/30/2018	Completed---Publication decision pending
10-98	Protocols for Network-Level Macrotexture Measurement	Virginia Polytechnic Institute	500,000	9/6/2016	9/5/2019	Research in progress
10-99	Guidebook for Implementing Constructability Across the Entire Project Development Process: NEPA to Final Design	University of Florida	450,000	5/24/2018	5/23/2020	Research in progress
10-100	Procedures and Guidelines for Validating Contractor Test Data	University of Nevada - Reno	300,000	8/1/2017	7/31/2019	Research in progress

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
10-101	Improving Mid-Term, Intermediate, and Long-Range Cost Forecasting: Guidance for State Departments of Transportation	Auburn University	250,000	5/1/2018	4/30/2020	Research in progress---Interim report pending
10-102	A Guidebook for Risk-Based Construction Inspection	-----	600,000			In development
10-103	Benchmarking Accelerated Laboratory Tests for ASR to Field Performance: Consideration of Cement and Alkali Contents and Influence of SCMs	-----	650,000			In development
10-104	Evaluating Use of Unconventional Fly Ash Sources in Highway Concrete	-----	600,000			In development
AREA ELEVEN : ADMINISTRATION--LAW						
11-08	Assessing Practices for Right-of-Way Acquisition and Reimbursement in Utility Relocations	-----	450,000			In development
AREA TWELVE : DESIGN--BRIDGES						
12-90	Guidelines for Shielding Bridge Piers	Roadsafe LLC	450,000	11/20/2012	4/16/2018	Completed---Published as NCHRP Research Report 892
12-94	LRFD Minimum Flexural Reinforcement Requirements	Iowa State University	550,000	9/30/2013	9/30/2018	Completed---To be published as an NCHRP Research Report
12-95A	Proposed AASHTO Guidelines for Adjacent Precast Concrete Box Beam Bridge Systems	University of Cincinnati	399,516	7/17/2018	10/16/2021	Research in progress
12-96	Simplified Full-Depth Precast Concrete Deck Panel Systems	George Washington University	399,931	7/1/2013	6/30/2018	Completed---Published as NCHRP Research Report 895
12-97	Guide Specification for the Design of Concrete Bridge Beams Prestressed with CFRP Systems	University of Houston	500,000	8/1/2013	6/29/2018	Completed---To be published as an NCHRP Research Report
12-104	Guidelines to Improve the Quality of Element-Level Bridge Inspection Data	University of Missouri	347,961	8/11/2015	10/31/2018	Completed---To be published as an NCHRP Web-Only Document
12-105	Proposed AASHTO Seismic Specifications for ABC Column Connections	University of Nevada - Reno	450,000	9/1/2015	7/31/2019	Research in progress
12-106	Proposed Guidelines for Performance-Based Seismic Bridge Design	Modjeski & Masters	429,920	9/23/2016	3/22/2019	Research in progress
12-108	Development of Guidelines for Uniform Service Life Design for Bridges	Modjeski & Masters	279,846	9/1/2016	2/28/2019	Research in progress
12-109	Use of 0.7-in. Diameter Strands in Precast Pretensioned Girders	University of Cincinnati	550,000	11/16/2016	5/15/2020	Research in progress
12-110	Proposed New AASHTO Load Rating Provisions for Implements of Husbandry	E&T Consulting Engineers	550,000	10/21/2016	10/20/2019	Research in progress

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
12-111	Evaluating the Effectiveness of Vibration-Mitigation Devices for Structural Supports of Signs, Luminaires, and Traffic Signals	University of Connecticut	400,000	4/3/2017	7/2/2019	Research in progress
12-112	Update of the AASHTO LRFD Movable Highway Bridge Design Specifications	Modjeski & Masters	449,927	7/28/2017	9/27/2020	Research in progress
12-113	Proposed Modification to AASHTO Cross-Frame Analysis and Design	University of Texas - Austin	589,670	6/1/2017	9/30/2020	Research in progress
12-115	Guidelines for Risk-Based Inspection and Strength Evaluation of Suspension Bridge Main Cable Systems	Modjeski & Masters	469,895	8/14/2018	4/13/2021	Research in progress
12-116	Design Specifications for the Static and Seismic Design of Piles for Downdrag	-----	500,000			In development
12-117	Effective Use of Duplex Coating Systems to Improve Steel Bridge Structure Durability	-----	500,000			In development
12-118	Design and Construction Specifications for Bonded and Unbonded Post-Tensioned Concrete Bridge Elements	-----	800,000			In development
AREA THIRTEEN : MAINTENANCE--EQUIPMENT						
13-05	Guide for Utilization Measurement and Management of Fleet Equipment	Washington State University	399,998	6/1/2015	12/31/2018	Completed---Publication decision pending
13-06	Guide for the Formulation of Long-Range Plans for Replacement Needs and Budget of Highway Operations Equipment	State University of New York	399,998	11/12/2018	11/11/2020	Research in progress
13-07	Guide to Calculating Ownership and Operating Costs of Department of Transportation Vehicle and Equipment Fleet	Cadmus Group, LLC	300,000	4/1/2018	8/31/2019	Research in progress
13-08	Guideline for Decision Making for Repair vs. Replacement of Highway Maintenance Equipment	-----	350,000			In development
AREA FOURTEEN : MAINTENANCE--MAINTENANCE OF WAY AND STRUCTURES						
14-26(01)	Culvert and Storm Drain Inspection Manual	Simpson Gumpertz & Heger, Inc.	17,300	8/6/2018	12/5/2018	Completed---Contractor's report available on project web page
14-27A	A Guide for the Preservation of Highway Tunnel Systems	Gannett Fleming, Inc.	75,000	3/28/2018	3/27/2019	Research in progress
14-30	Spot Painting to Extend Highway Bridge Coating Life	University of Kentucky Research Foundation	349,965	9/3/2013	1/29/2018	Completed---Agency report available as NCHRP Web-Only Document 251
14-34	Guide for Performance Measures in Snow and Ice Control Operations	ICF Incorporated	299,956	4/20/2015	1/31/2018	Completed---To be published as NCHRP Research Report 889

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
14-35	Acceptance Criteria of Complete Joint Penetration Steel Bridge Welds Evaluated Using Enhanced Ultrasonic Methods	Purdue University	538,965	4/24/2015	10/31/2018	Completed---To be published as an NCHRP Research Report
14-36	Proposed AASHTO Guide for Bridge Preservation Actions	University of Colorado - Boulder	609,887	11/13/2015	4/30/2019	Research in progress
14-37	Guide Specifications for the Construction of Chip Seals and Microsurfacing	Shuler Consultants LLC	175,000	8/15/2016	7/13/2018	Completed---Contractor's report available on project web page
14-38	Guide for Timing of Asphalt-Surfaced Pavement Preservation	AMEC Foster Wheeler Environ & Infrastructure Inc.	299,694	8/1/2016	8/31/2018	Completed---Contractor's report available on project web page
14-39	Using Vegetated Compost Blankets to Achieve Highway Runoff Volume and Pollutant Reduction	University of Maryland	499,999	4/27/2017	4/26/2021	Research in progress---Interim report pending
14-40	Comparison of Cost, Safety, and Environmental Benefits of Routine Mowing and Managed Succession of Roadside Vegetation	Texas A&M Transportation Institute	300,000	9/5/2017	9/5/2019	Research in progress
14-41	Permanent Vegetation Control Treatments for Roadsides	Texas A&M Transportation Institute	200,000	5/23/2018	5/22/2020	Research in progress---Interim report pending
14-42	Determining State DOT Maintenance Program Implications of Connected and Automated Vehicles	----	300,000			In development

AREA FIFTEEN : DESIGN--GENERAL DESIGN

15-50(01)	Implementation Assessment of 3R Design Guidelines	MRIGlobal	97,963	7/2/2018	1/1/2020	Research in progress
15-52	Developing a Context-Sensitive Functional Classification System for More Flexibility in Geometric Design	University of Kentucky Research Foundation	300,001	1/15/2015	1/31/2018	Completed---Published as NCHRP Research Report 855
15-53	Roadside Design for Conflicts in Proximity to Bridge Ends and Intersecting Roadways	KLS Engineering LLC	744,767	8/25/2014	2/29/2020	Research in progress
15-54	Proposed Modifications to AASHTO Culvert Load Rating Specifications	Michael Baker, Jr., Inc.	541,524	7/7/2015	3/31/2019	Research in progress
15-55	Guidance to Predict and Mitigate Dynamic Hydroplaning on Roadways	Virginia Polytechnic Institute	499,992	6/17/2015	4/30/2019	Research in progress
15-56	Guidelines for Selecting Ramp Design Speeds	MRIGlobal	400,000	11/10/2015	8/31/2019	Research in progress
15-57	Highway Capacity Manual Methodologies for Corridors Involving Freeways and Surface Streets	University of Florida	799,999	8/18/2016	2/17/2019	Research in progress
15-59	Horizontal Sightline Offset Design Criteria, Exceptions, and Mitigation Strategies	MRIGlobal	400,000	8/10/2015	8/31/2018	Completed---To be published as an NCHRP Research Report
15-60	Proposed Update of the AASHTO Guide for the Development of Bicycle Facilities	Toole Design Group	400,000	6/1/2015	12/31/2018	Completed---Submitted to AASHTO for balloting

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
15-61	Applying Climate Change Information to Hydrologic and Hydraulic Design of Transportation Infrastructure	Kilgore Consulting and Management	750,000	9/20/2016	12/31/2018	Completed---Publication decision pending
15-62	Design and Access Management Guidelines for Truck Routes	MRIGlobal	500,000	7/5/2016	7/31/2019	Research in progress
15-63	Guidance to Improve Pedestrian and Bicycle Safety at Intersections	University of North Carolina - Chapel Hill	500,000	7/19/2016	4/30/2019	Research in progress
15-64	Guidelines for the Design of Unsignalized Median Openings in Close Proximity to Signalized Intersections	Texas A&M Transportation Institute	325,000	8/22/2016	3/31/2019	Research in progress
15-65	Development of Safety Performance-Based Guidelines for the Roadside Design Guide (RDG)	Roadsafe LLC	300,000	9/1/2017	9/1/2019	Research in progress
15-66	Arterial Weaving on Conventional and Alternative Intersections	-----	750,000			In development
15-67	Wind Drag Coefficients for Highway Signs and Support Structures	University of Iowa	300,000			In development
15-68	Effective Low-Noise Rumble Strips	Illingworth & Rodkin, Inc.	699,828	7/25/2018	1/24/2021	Research in progress

AREA SIXTEEN : DESIGN--ROADSIDE DEVELOPMENT

16-05	Guidelines for Cost-Effective Safety Treatments of Roadside Ditches	Texas A&M Research Foundation	400,000	5/14/2010	2/28/2019	Research in progress---Contractor's draft final report pending
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AREA SEVENTEEN : TRAFFIC--SAFETY

17-11(02)	Development of Clear Recovery Area Guidelines	Texas A&M University	270,000	9/7/2008	10/31/2019	Research in progress---Contractor's draft final report pending
17-43	Long-Term Roadside Crash Data Collection Program	Virginia Polytechnic Institute	1,000,000	4/27/2010	12/31/2020	Research in progress---Contractor's draft final report pending
17-50	Lead States Initiative for Implementing the Highway Safety Manual	CH2M Hill	299,000	1/11/2011	12/31/2018	Completed---See NCHRP Project 17-83 for follow-on activity
17-54	Consideration of Roadside Features in the Highway Safety Manual	Roadsafe LLC	1,310,000	4/4/2011	12/31/2018	Completed---Publication decision pending
17-55	Guidelines for Slope Traversability	Texas A&M Research Foundation	500,000	5/2/2012	11/15/2018	Completed---Publication decision pending
17-62	Improved Prediction Models for Crash Types and Crash Severities	University of Connecticut	800,000	8/1/2013	9/30/2018	Completed---See NCHRP Project 17-71 for follow-on activity
17-64	Guidance for the Implementation of the Toward Zero Deaths National Strategy on Highway Safety	University of Minnesota	496,810	3/4/2016	3/31/2020	Research in progress

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
17-65	Improved Analysis of Two-Lane Highway Capacity and Operational Performance	University of Florida	530,949	9/22/2014	3/5/2018	Completed---Agency report available as NCHRP Web-Only Document 255
17-66	Guidance for Selection of Appropriate Countermeasures for Opposite Direction Crashes	Texas A&M Transportation Institute	350,000	8/27/2014	4/30/2019	Research in progress---Contractor's final report pending
17-68	Intersection Crash Prediction Methods for the Highway Safety Manual	MRIGlobal	750,000	9/1/2014	10/31/2019	Research in progress
17-70	Development of Roundabout Crash Prediction Models and Methods	Kittelson & Associates	710,000	7/14/2014	2/28/2018	Completed---Published as NCHRP Research Report 888
17-71	Proposed AASHTO Highway Safety Manual, Second Edition	Kittelson & Associates	1,200,000	10/12/2015	4/1/2020	Research in progress
17-72	Update of Crash Modification Factors for the Highway Safety Manual	University of North Carolina - Chapel Hill	645,000	8/31/2015	1/31/2019	Research in progress
17-73	Conducting Systemic Pedestrian Safety Analyses	University of North Carolina - Chapel Hill	300,000	7/28/2015	6/20/2018	Completed---Published as NCHRP Research Report 893
17-74	Developing Crash Modification Factors for Corridor Access Management	Vanasse Hangen Brustlin, Inc.	450,000	10/24/2016	4/24/2019	Research in progress
17-75	Leveraging Big Data to Improve Traffic Incident Management	Applied Engineering Management Corporation	275,000	8/15/2016	10/31/2018	Completed---To be published as an NCHRP Research Report
17-76	Guidance for the Setting of Speed Limits	Texas A&M Transportation Institute	500,000	10/7/2016	4/7/2019	Research in progress
17-77	Guide for Quantitative Approaches to Systemic Safety Analysis	MRIGlobal	300,000	8/5/2016	2/28/2019	Research in progress
17-78	Understanding and Communicating Reliability of Crash Prediction Models	University of North Carolina - Chapel Hill	300,000	9/20/2016	3/19/2019	Research in progress
17-79	Safety Effects of Raising Speed Limits to 75 mph and Higher	Texas A&M Transportation Institute	500,000	9/19/2016	9/18/2019	Research in progress
17-80	Expansion of Human Factors Guidelines for Road Systems, Second Edition	Battelle Memorial Institute	499,914	11/9/2016	8/9/2019	Research in progress
17-81	Proposed Macro-Level Safety Planning Analysis Chapter for the Highway Safety Manual	Vanasse Hangen Brustlin, Inc.	400,000	10/26/2017	7/26/2020	Research in progress
17-82	Proposed Guidance for Fixed Objects in the Roadside Design Guide	MRIGlobal	500,000	12/12/2017	12/12/2020	Research in progress
17-83	Briefings and Training Materials for Implementation of the Highway Safety Manual, Second Edition	University of North Carolina - Chapel Hill	500,000	12/12/2017	12/12/2020	Research in progress
17-84	Pedestrian and Bicycle Safety Performance Functions for the Highway Safety Manual	MRIGlobal	500,000	3/27/2017	3/26/2019	Research in progress
17-85	Development and Application of Crash Severity Models for the Highway Safety Manual	University of Connecticut	600,000	11/15/2018	2/15/2022	Research in progress

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
17-86	Estimating Effectiveness of Safety Treatments in the Absence of Crash Data	Vanasse Hangen Brustlin, Inc.	599,567	10/22/2018	1/22/2022	Research in progress
17-87	Enhancing Pedestrian Volume Estimation and Developing HCM Pedestrian Methodologies for Safe and Sustainable Communities	Kittelson & Associates	550,000	4/20/2018	4/20/2020	Research in progress
17-88	Roadside Encroachment Database Development and Analysis	Virginia Polytechnic Institute	675,000	6/19/2018	6/18/2022	Research in progress
17-89	Safety Performance of Part-Time Shoulder Use on Freeways	Kittelson & Associates	400,000	6/15/2018	6/14/2020	Research in progress
17-89A	HOV/HOT Freeway Crash Prediction Method for the Highway Safety Manual	Vanasse Hangen Brustlin, Inc.	299,998	7/10/2018	7/9/2020	Research in progress
17-90	Validation of Roadside Crash Injury Metrics in Real World Crashes (Correlation of Actual Injury Outcomes to Those Predicted During Crash Testing)	-----	400,000			In development
17-91	Assessing the Impacts of Connected, Automated, and Autonomous Vehicles on the Future of Transportation Safety	-----	450,000			In development
17-92	Developing Safety Performance Functions for Rural Two-Lane Highways that Incorporate Speed Measures	-----	500,000			In development
17-93	Updating Safety Performance Functions for Data-Driven Safety Analysis	-----	500,000			In development
17-94	Tactile Walking Surface Indicators to Aid Wayfinding for Visually Impaired Travelers in Multimodal Travel	-----	384,000			Contract pending
AREA EIGHTEEN : MATERIALS AND CONSTRUCTION--CONCRETE MATERIALS						
18-17	Entrained Air Void System for Durable Highway Concrete	Iowa State University	599,986	11/2/2015	5/31/2019	Research in progress
18-18	Design and Construction of Deck Bulb Tee Girder Bridges with UHPC	Ohio University	478,125	7/3/2017	10/2/2020	Research in progress
18-19	Rating Concrete Water Permeability Based on Resistivity Measurements	-----	600,000			In development
AREA NINETEEN : ADMINISTRATION--FINANCE						
19-12	Development of Financial Plans and Performance Measures for Transportation Asset Management	Spy Pond Partners	350,000	5/11/2016	5/10/2018	Completed---Publication decision pending
19-14	Right-Sizing Transportation Investments--Methods for Planning and Programming	Economic Development Research Group, Inc.	499,994	2/3/2017	2/2/2019	Research in progress

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
19-15	Guidebook for Effective Policies and Practices for Managing Surface Transportation Debt	WSP USA Inc.	300,000	6/25/2018	12/24/2019	Research in progress
19-16	Managing the Effects of Uncertain Federal Funding	-----	400,000			In development
AREA TWENTY : SPECIAL PROJECTS						
20-24(89)C	Transportation Asset Management, Inclusive Wealth, and Ecosystem Services	-----	389,250			Funds reallocated
20-24(95)	Ensuring Essential Capability for the Future Transportation Agency	Spy Pond Partners	200,000	10/7/2016	8/7/2018	Completed---Work continuing under NCHRP Project 20-24(95)A
20-24(95)A	Ensuring Essential Capability for the Future Transportation Agency (Phases 2 and 3)	Spy Pond Partners	375,000	9/19/2018	12/18/2019	Research in progress
20-24(110)	Development of Resources to Support State DOT Communications on Safety	Cambridge Systematics	129,713	1/27/2017	10/26/2018	Completed---Contractor's final report sent to AASHTO and available on project web page
20-24(111)	State DOT CEO Leadership Forum on "Connected & Autonomous Vehicles and Transportation Infrastructure Readiness" in conjunction with 2017 ITSWC, Montreal, Canada	CAViTa LLC	173,500	1/26/2017	1/25/2018	Completed---Contractor's final report sent to AASHTO and available on project web page
20-24(112)	Connected Road Classification System (CRCS) Development	Texas A&M Transportation Institute	180,000	7/28/2017	1/31/2019	Research in progress
20-24(113)	CEO Peer Exchange 2017	WSP USA Inc.	249,978	2/23/2017	9/22/2018	Completed---Contractor's final report sent to AASHTO and available on project web page
20-24(116)	Guidance on Roles and Responsibilities in Operation of Automated Vehicles	-----	230,000			In development
20-24(118)	AASHTO reorganization strategic planning	ICF Incorporated	500,000	7/28/2017	3/27/2019	Research in progress
20-24(119)	Strategic Research in Support of the Connected and Automated Vehicle Executive Leadership Team	-----	150,000			In development
20-24(120)	Guide to Communicating Transportation System Revenue Needs	-----	300,000			In development
20-24(121)	Road Usage Charge: Applying Lessons Learned in New Zealand to the United States	Cambridge Systematics	70,000	5/1/2018	2/28/2019	Research in progress
20-24(123)	Roadmap for Supporting Specialty Personnel Recruitment, Development, and Retention in the DOT Workforce	-----	50,000			In development
20-24(124)	Performance Management Peer Exchange	Cambridge Systematics	125,000	8/15/2018	4/14/2019	Research in progress
20-36	Highway Research and Technology-- International Information Sharing	TRB Cooperative Research Programs	850,000 **	1/26/1993	9/30/2023	Research ongoing; see project writeup on NCHRP website

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
20-44	Accelerating the Application of NCHRP Research Results	Various	31,870 **	8/1/1995	9/30/2023	Support for implementation and dissemination activities
20-44(01)	Workshop on Increasing WMA Implementation by Leveraging the State-of-the-Knowledge	Myers McCarthy Consulting Engineering, LLC	101,000	1/26/2017	6/15/2018	Completed---Contractor's report available on project web page
20-44(02)	Implementation of the AASHTO Guide for Enterprise Risk Management	StarIsis Corporation	2,999,979	4/2/2018	4/1/2020	Research in progress---Interim report pending
20-44(03)	Intellectual Property Management Guide Workshops and Assessments	Applied Research Associates	115,500	7/28/2017	1/27/2019	Research in progress
20-44(05)	Dissemination of "NCHRP Domestic Scan 14-01: Leading Management Practices in Determining Funding Levels for Maintenance and Preservation"	Arora and Associates, P.C.	120,000	2/14/2018	8/13/2019	Research in progress
20-44(06)	Consultant Support for Massachusetts DOT's Commission on the Future of Transportation in the Commonwealth	Burns & McDonnell Engineering Company Inc.	395,506	2/12/2018	2/28/2019	Research in progress
20-44(07)	Implementing Single-User Software for Bidding Alternative Drainage Pipe Systems	-----	50,530			In development
20-44(08)	NCHRP Comprehensive Communications Plan	LGND, LLC	100,000	10/1/2018	7/1/2019	Research in progress
20-44(09)	Quantitative and Qualitative Methods for Capturing the Impacts and Value of NCHRP Research	-----	800,000			In development
20-44(10)	NHI 134115 Mobile LIDAR Online Learning Module Revisions	Dragonfly Communication	6,000	8/3/2018	10/2/2018	Completed---Incorporated into NCHRP Project 15-44
20-44Q	Communication Services for NCHRP	CTC & Associates LLC	644,923	5/7/2015	8/6/2018	Completed
20-50(18)	LTPP Data Analysis: Significance of As-Constructed Asphalt Pavement Air Voids to Pavement Performance	Auburn University	425,000	4/1/2018	1/1/2020	Research in progress
20-50(19)	LTPP Data Analysis: Feasibility of Using LTPP Data to Develop Relationships Between Laboratory- and Field-Derived Properties of Unbound Materials	AMEC Foster Wheeler Environ & Infrastructure Inc.	69,762	6/11/2018	4/10/2019	Research in progress
20-50(20)	LTPP Data Analysis: Develop Practical Tools and Procedures to Improve WIM Data Quality	Applied Research Associates	350,000	10/1/2018	3/31/2021	Research in progress
20-50(21)	Enhancements of Climatic Inputs and Related Models for Pavement ME Using LTPP Climate Tool (MERRA-2)	Applied Research Associates	350,000	8/24/2018	2/23/2021	Research in progress
20-50(22)	LTPP Data Analysis: Feasibility of Using LTPP Data to Improve Use of FWD and Longitudinal Profile Measurements	-----	100,000			In development
20-59(30)A	Train-the-Trainer Regional Workshops for Incident Command System (ICS) Training for Field Level Transportation Supervisors and Staff	San Jose State University	150,000	7/11/2017	4/30/2019	Research in progress---Contractor's draft report pending

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
20-59(51)A	Security 101: A Physical & Cyber Security Primer for Transportation Agencies	Countermeasures Assessment & Security Experts, LLC	100,000	2/10/2016	3/31/2018	Completed---To be published as an NCHRP Research Report
20-59(51)C	Research Support for Implementing Security, Emergency Management, and Infrastructure Protection at State Transportation Agencies	Geographic Paradigm Computing Inc.	100,000	11/18/2016	2/17/2018	Completed---Final report sent to AASHTO
20-59(53)	FloodCast: A Framework for Enhanced Flood Event Decision Making for Transportation Resilience	Dewberry Engineers Inc.	498,162	9/2/2014	3/31/2019	Research in progress---Contractor's final report pending
20-59(54)	Transportation System Resilience: Research Roadmap and White Papers	Geographic Paradigm Computing Inc.	200,000	11/18/2016	8/30/2019	Research in progress---Contractor's draft report pending
20-59(55)	Transportation System Resilience: CEO Primer & Engagement	Louis Berger & Associates	300,000	3/1/2017	2/28/2019	Research in progress---Contractor's draft report pending
20-59(56)	Support for State DOT Transportation Systems Resilience and All-Hazards Programs	WSP USA, Inc.	250,000	6/16/2017	6/15/2019	Research in progress---Interim report pending; see NCHRP Project 20-117
20-65/Task 68	Successful Mobility Management Practices for Improving Transportation Services in Small Urban and Rural Areas	Cambridge Systematics	75,000	9/20/2016	1/31/2018	Completed---Agency report available on project webpage
20-65/Task 72	Small System Alternative Fuel Strategies	ICF Incorporated	74,959	9/29/2016	1/31/2018	Completed---Agency report available on project webpage
20-65/Task 73	Best Practices and Marketing to Increase Rural Transit Ridership and Investment	ICF Incorporated	50,000	4/16/2018	12/15/2018	Completed---Publication decision pending
20-65/Task 75	Baseline Research on Allowable In-Kind and Local Match Sources	AECOM Technical Services, Inc	125,000	5/14/2018	9/13/2019	Research in progress
20-65/Task 76	Opportunities for State DOTs (and Others) to Encourage Shared Use Mobility Practices in Rural Areas	WSP USA Inc.	99,080	4/23/2018	7/22/2019	Research in progress
20-65/Task 77	Lessons Learned and Impacts to Date of State DOT Implementation of New Federal Transit Asset Management and Public Transportation Agency Safety Requirements	ICF Incorporated	100,000	4/16/2018	4/15/2019	Research in progress
20-65/Task 78	Impact of Decline in Volunteerism on Rural Transit Systems	AECOM Technical Services, Inc.	100,000	12/15/2018	12/15/2019	Research in progress
20-65/Task 79	Program Management Insights for the 5310 Program (Including Sub-Grantee Consolidation and Urban 5310)	ICF Incorporated	125,000	12/15/2018	12/15/2019	Research in progress
20-65/Task 80	Capacity Building Options for DOT Transit Staff	ICF Incorporated	100,000	12/15/2018	9/15/2019	Research in progress
20-65/Task 81	Best Practices in Rural Service Assessment	AECOM Technical Services, Inc.	75,000	12/15/2018	12/15/2019	Research in progress
20-65/Task 82	Issues Associated with Providing Customized, Client-Based Transportation Services	-----	150,000			In development

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
20-68A(02)	U.S. Domestic Scan Program	Arora and Associates, P.C.	4,510,592	12/28/2012	12/26/2019	Research in progress
20-83(03)A	Long-Range Strategic Issues Affecting Preservation, Maintenance, and Renewal of Highway Infrastructure	WSP USA Inc.	499,999	5/18/2015	9/28/2018	Completed---Publication decision pending
20-95A	Compendium of Successful Practices, Strategies, and Resources in the FHWA Disadvantaged Business Enterprise (DBE) Program	Keen Independent Research LLC	174,997	4/10/2017	12/31/2018	Completed---Publication decision pending
20-97	Improving Findability and Relevance of Transportation Information	Spy Pond Partners	899,975	4/18/2014	2/28/2019	Research in progress; Phase I report published as NCHRP Research Report 846
20-101	Guidelines to Incorporate the Costs and Benefits of Adaptation Measures in Preparation for Extreme Weather Events and Climate Change	Dewberry Engineers Inc.	299,210	9/1/2015	8/31/2018	Completed---Publication decision pending
20-102(04)	Evaluation Guidance for Automated Vehicle Pilot and Demonstration Projects	-----	75,000			Incorporated into NCHRP Project 08-116
20-102(05)	Strategic Communications Plan for NCHRP Project 20-102	-----	100,000			Incorporated into NCHRP Project 08-116
20-102(06)	Road Markings for Machine Vision	Texas A&M Transportation Institute	200,000	7/13/2016	8/12/2018	Completed---To be published as an NCHRP Web-Only Document
20-102(07)	Implications of Automation for Motor Vehicle Codes	Virginia Polytechnic Institute	350,000	11/14/2016	7/16/2018	Completed---Agency report available as NCHRP Web-Only Document 253; Volumes 1-6
20-102(08)	Dedicating Lanes for Priority or Exclusive Use by CVs and AVs	Booz-Allen & Hamilton	349,929	8/2/2016	4/15/2018	Completed---Published as NCHRP Research Report 891
20-102(09)	Providing Support to the Introduction of CV/AV Impacts into Regional Transportation Planning and Modeling Tools	Texas A&M Transportation Institute	300,000	9/1/2016	9/7/2018	Completed---Published as NCHRP Research Report 896
20-102(11)	Mobility-on-Demand and Automated Driving Systems: A Framework for Public-Sector Assessment	Booz-Allen & Hamilton	300,000	5/17/2018	11/16/2019	Research in progress; interim report pending
20-102(12)	Business Models to Facilitate Deployment of CV Infrastructure to Support AV Operations	WSP USA Inc.	400,000	7/11/2017	1/10/2019	Research in progress
20-102(13)	Planning Data Needs and Collection Techniques for CV/AV Applications	-----	250,000			Incorporated into NCHRP Project 08-119
20-102(14)	Data Management Strategies for CV/AV Applications for Operations	-----	250,000			Incorporated into NCHRP Project 08-119
20-102(15)	Impacts of Connected and Automated Vehicle Technologies on the Highway Infrastructure	Booz-Allen & Hamilton	649,966	5/24/2018	2/23/2020	Research in progress

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
20-102(16)	Preparing TIM Responders for Connected Vehicles and Automated Vehicles	-----	250,000			In development
20-102(17)	Deployment Guidance for CV Applications in the Open Source Application Development Portal	-----	450,000			In development
20-102(18)	Minimum Safety Data Needed for Automated Vehicle Operations and Crash Analysis	-----	225,000			Incorporated into NCHRP Project 17-91
20-102(19)	Update AASHTO's Connected Vehicle/Automated Vehicle Research Roadmap	Booz-Allen & Hamilton	124,904	3/13/2018	3/12/2020	Research in progress
20-105A	Development of Course Outlines for Ahead of the Curve Training Program: Mastering the Management of Transportation Research	Applied Research Associates	220,700	6/1/2016	7/1/2019	Research in progress
20-107	Effective Construction Project Staffing Strategies for Transportation Agencies	University of Kentucky Research Foundation	499,613	6/28/2016	9/30/2018	Completed---To be published as an NCHRP Research Report
20-108	Effective Practices for Creating and Maintaining an Innovation-Delivery Culture within Departments of Transportation	Burns & McDonnell Engineering Company Inc.	249,954	7/11/2016	6/30/2018	Completed---Published as NCHRP Research Report 885 and NCHRP Web-Only Document 253
20-109	Enhancement of the Transportation Research Thesaurus	Information International Associates Inc.	219,074	7/28/2016	5/16/2018	Completed---Published as NCHRP Research Report 874; a phase 2 is being developed
20-110	A Guide to Ensure Access to the Publications and Data of Federally Funded Transportation-Related Research	University of Michigan	249,960	8/5/2016	6/30/2018	Completed---Publication decision pending
20-111J	Successful Practices for State Transportation Research Office's Complying with 2 CFR 200	Applied Research Associates	100,000	5/15/2018	7/14/2019	Research in progress
20-112	A Research Roadmap for Transportation and Public Health	University of North Carolina - Chapel Hill	250,000	9/26/2017	3/25/2019	Research in progress
20-113	Research Roadmap--Transformational Technologies (other than CV/AV)	-----	130,000			In development
20-113E	Support for TRB's Forum on AVs and Shared Mobility	-----	25,000			Completed
20-114	Multimodal Freight Transportation Research Roadmap	Texas A&M Transportation Institute	250,000	5/15/2017	12/31/2018	Completed---Publication decision pending
20-116	Emergency Management in State Transportation Agencies	-----	750,000			In development
20-117	Deploying Transportation Resilience Practices in State DOTs	WSP USA Inc.	1,000,000	6/16/2017	6/15/2019	Research in progress---Interim report pending
20-118	Benchmarking for Effective Performance Management for Transportation Agencies	High Street Consulting Group	499,060	4/10/2017	9/9/2018	Completed---To be published as NCHRP Research Report 902

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
20-119	Evaluating the Suitability of Roadway Corridors for Use by Monarch Butterflies	University of Minnesota	349,821	3/13/2017	9/13/2019	Research in progress
20-121	State DOT Contributions to the Study, Investigation, and Interdiction of Human Trafficking	Project Performance Corporation	299,883	5/31/2018	3/30/2020	Research in progress---Interim report pending
20-122	Rural Transportation Issues: Research Roadmap	Montana State University	200,000	10/9/2018	10/8/2019	Research in progress---Contractor's draft report pending
20-123	Support for AASHTO Committees	-----	1,500,000			In development
20-124	Deploying Transportation Security Practices in State DOTs	-----	750,000			In development
20-125	Strategies for Incorporating Resilience into Transportation Networks	-----	600,000			In development
AREA TWENTY-ONE : SOILS AND GEOLOGY--TESTING AND INSTRUMENTATION						
21-10	Manual on Subsurface Investigations--Update	GeoSyntec Consultants of North Carolina PC	299,912	6/17/2014	9/28/2018	Completed---To be available as an NCHRP Web-Only Document
21-11	Improved Test Methods and Practices for Characterizing Steel Corrosion Potential of Earthen Materials	McMahon & Mann Consulting Engineers PC	400,000	7/5/2016	6/30/2019	Research in progress
AREA TWENTY-TWO : DESIGN--VEHICLE BARRIER SYSTEMS						
22-26	Identification of Factors Related to Serious Injury and Fatal Motorcycle Crashes into Traffic Barriers	Virginia Polytechnic Institute	500,000	5/1/2009	12/31/2019	Research in progress---Contractor's draft report pending
22-29B	Evaluating the Performance of Longitudinal Barriers on Curved, Superelevated Off-Ramps	-----	250,000			In development
22-31	Recommended Guidelines for the Selection and Placement of Test Levels 2 through 5 Median Barriers	Roadsafe LLC	577,000	9/28/2015	5/31/2020	Research in progress
22-32	Development of Methods to Evaluate Side Impacts with Roadside Safety Features	Roadsafe LLC	500,000	1/2/2018	5/2/2021	Research in progress
22-33	MultiState InService Performance Evaluations of Roadside Safety Hardware	Roadsafe LLC	650,000	1/2/2018	5/2/2021	Research in progress
22-34	Determination of Zone of Intrusion Envelopes under MASH Impact Conditions for Barrier Attachments	University of Nebraska - Lincoln	400,000	6/20/2018	9/19/2021	Research in progress
22-35	Evaluation of Bridge Rail Systems to Confirm AASHTO MASH Compliance	Texas A&M Transportation Institute	500,000	6/1/2018	6/30/2021	Research in progress
22-36	Synthesis of the Performance of Portable Concrete Barrier Systems	Texas A&M Transportation Institute	50,000	7/13/2018	3/12/2019	Research in progress
22-37	Development of a Barrier Design to Accommodate Vehicles, Pedestrians, and Cyclists	-----	500,000			In development

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
22-38	Development of MASH TL-3 Deflection Reduction Guidance for 31-inch Guardrail	-----	500,000			In development
22-39	Guardrail Performance at Various Offsets from Curb for MASH TL-3 Applications	-----	600,000			In development
22-40	Update to AASHTO M180 and Associated Material Specifications	-----	300,000			In development
22-41	Improvement and Reorganization of Section 13 of the AASHTO LRFD Bridge Design Specifications to Address MASH Loading	-----	250,000			In development

AREA TWENTY-FOUR : SOILS AND GEOLOGY--MECHANICS AND FOUNDATIONS

24-41	Defining the Boundary Conditions for Composite Behavior of Geosynthetic Reinforced Soil (GRS) Structures	University of Texas - Austin	500,000	9/1/2014	10/31/2018	Completed---Publication decision pending
24-42	Underwater Installation of Filter Systems for Scour and Other Erosion Control Countermeasures	Ayres Associates	300,000	6/30/2014	3/31/2018	Completed---Published as NCHRP Research Report 887 and Web-Only Document 254
24-43	Relationship between Erodibility and Properties of Soils	Texas A&M Transportation Institute	300,000	8/11/2015	11/30/2018	Completed---Publication decision pending
24-44	Guidelines for Managing Geotechnical Risks in Design-Build Projects	Iowa State University	349,277	6/1/2015	2/28/2018	Completed---Published as NCHRP Research Report 884 and Web-Only Document 257
24-45	Evaluating Mechanical Properties of Earth Material During Intelligent Compaction	University of Texas - El Paso	500,000	7/27/2015	12/31/2019	Research in progress
24-46	Development of an Implementation Manual for Geotechnical Asset Management for Transportation Agencies	Shannon & Wilson, Inc.	499,682	7/27/2016	9/27/2018	Completed---Publication decision pending
24-47	Revised Clear-Water and Live-Bed Contraction Scour Analysis	Ayres Associates	500,000	10/6/2016	4/6/2019	Research in progress---Interim report under review

AREA TWENTY-FIVE : IMPACT ANALYSIS

25-25/Task 96	Quick Reference Guide for Traffic Modelers for Generating Traffic and Activity Data for Project-Level Air Quality Analyses	WSP USA Inc.	75,000	11/4/2015	5/31/2018	Completed---Final report sent to AASHTO
25-25/Task 98	Practical Guide for Developing Effective Scopes of Work for the Geophysical Investigation of Cemeteries	WSP USA Inc.	74,961	2/16/2016	1/26/2018	Completed---Final report sent to AASHTO
25-25/Task 102	Artificial Bat Roost Mitigation Designs and Standardized Monitoring Criteria	Louis Berger Group	125,000	11/27/2017	5/26/2019	Research in progress---Interim report pending

TABLE 2 (continued)

Project		Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
No.	Title					
25-25/Task 103	Administration of Categorical Exclusions by State Departments of Transportation (DOTs) under NEPA	WSP USA Inc.	59,897	3/5/2018	3/4/2019	Research in progress---Interim report pending
25-25/Task 104	Streamlining Carbon Monoxide Project-Level Air Quality Analyses with Programmatic Agreements	Louis Berger Group	125,000	11/27/2017	11/26/2019	Research in progress---Interim report pending
25-25/Task 105	A Guidebook for Communications between Transportation and Public Health Communities	Louis Berger U.S. Inc.	125,000	3/1/2018	2/28/2019	Research in progress---Contractor's draft report pending
25-25/Task 106	National Synthesis of Highway Noise Effects on Historic Properties and Effective Mitigation Practices	Louis Berger U.S. Inc.	100,000	3/1/2018	2/28/2019	Research in progress---Contractor's draft report pending
25-25/Task 107	Synthesis of Best Practices for the Development and Implementation of Section 106 Delegation Programmatic Agreements	Louis Berger U.S. Inc.	100,000	3/1/2018	2/28/2019	Research in progress---Contractor's draft report pending
25-25/Task 108	Creating Lookup Tables to Streamline the Determination of Emission Reductions for CMAQ Projects	Louis Berger U.S. Inc.	125,000	3/1/2018	2/28/2019	Research in progress---Interim report pending
25-25/Task 109	Successful Practices for Environmental Commitments in Public/Private Partnerships (P-3) and Design-Build (D-B) Contracts	Louis Berger U.S. Inc.	125,000	4/2/2018	4/1/2019	Research in progress---Interim report pending
25-25/Task 110	National Synthesis of Successful Strategies for Managing Post-World War II Resources in Historic Property Identification Surveys	Louis Berger U.S. Inc.	100,000	2/15/2018	2/14/2019	Research in progress---Interim report pending
25-25/Task 111	Environmental Management System Perspectives for State DOTs	Louis Berger Group	110,000	1/1/2018	2/28/2019	Research in progress---Contractor's final report under review
25-25/Task 112	Enhancing the International Stormwater BMP Database to Serve as a Highway Specific BMP Database	Transferred	0			Terminated---See NCHRP Project 25-25/Tasks 119 and 120 for follow-on activity
25-25/Task 113	Highway Passages for Small Terrestrial Wildlife - Summary and Repository of Design Examples	Louis Berger U.S. Inc.	125,000	3/20/2018	9/19/2019	Research in progress---Interim report pending
25-25/Task 114	Integrating Tribal Knowledge into Processes to Identify, Evaluate, and Record Cultural Resources	Louis Berger U.S. Inc.	125,000	11/15/2018	11/14/2019	Research in progress---Interim report pending
25-25/Task 115	Estimates of Emissions Reductions from Future Fleet Changes for Use in Air Quality Models	-----	125,000			Contract pending
25-25/Task 116	Recommendations for Additional Section 106 Program Comments or Exemptions	Louis Berger U.S. Inc.	125,000	11/15/2018	11/14/2019	Research in progress---Interim report pending
25-25/Task 117	Valuing Wildlife Crossing Enhancements for Mitigation Credits	Louis Berger U.S. Inc.	115,000	11/15/2018	11/14/2019	Research in progress---Interim report pending
25-25/Task 118	Context-Sensitive Design Options for Workhorse Bridges in Rural Historic Districts	Louis Berger U.S. Inc.	110,000	11/15/2018	11/14/2019	Research in progress---Interim report pending

TABLE 2 (continued)

Project						
No.	Title	Research Agency	Contract Amount	Starting Date	Completion Date	Project Status *
25-25/Task 119	Enhancing the International Stormwater BMP Database to Serve as a Highway Specific BMP Database	-----	80,000			Contract pending
25-25/Task 120	Use of the State Department of Transportation Portal to the International Stormwater BMP Database	GeoSyntec Consultants	24,999	8/13/2018	11/12/2019	Research in progress---Interim report pending
25-44	Field Evaluation of Reflected Noise from a Single Noise Barrier	Resource Systems Group, Inc.	549,969	9/4/2013	2/1/2018	Completed---Published as NCHRP Research Report 888
25-47	How to Measure and Communicate the Value of Access Management	University of South Florida	600,000	5/17/2018	11/16/2020	Research in progress
25-49	Development of a Highway Construction Noise Prediction Model	Gannett Fleming, Inc.	349,579	11/2/2015	3/8/2019	Research in progress---Contractor's final report pending
25-50	Prioritization Procedure for Proposed Road-Rail Grade Separation Projects along Specific Rail Corridors	Olsson Associates Inc.	349,763	9/28/2015	9/28/2018	Completed---To be published as NCHRP Research Report 901
25-51	Limitations of the Infiltration Approach to Stormwater Management in the Highway Environment	GeoSyntec Consultants	499,772	8/10/2015	1/31/2019	Research in progress
25-53	Approaches for Determining and Complying with TMDL Requirements Related to Roadway Stormwater Runoff	Michael Baker International	199,973	12/9/2016	12/9/2018	Completed---Publication decision pending
25-54	Field Testing of BMPs Using Granulated Ferric Oxide Media to Remove Dissolved Metals in Roadway Stormwater Runoff	Barr Engineering	400,000	9/16/2016	5/15/2019	Research in progress---Contractor's draft report pending
25-55	Quantifying the Contribution of Vehicle Emissions to Local Air Quality	ICF Incorporated	700,000	6/4/2018	6/3/2021	Research in progress
25-56	Methods for State DOTs to Reduce Greenhouse Gas Emissions from the Transportation Sector	Cambridge Systematics	600,000	5/1/2018	10/31/2020	Research in progress---Interim report pending
25-57	Innovative Mitigation Strategies for Highway Noise	-----	250,000			In development
25-58	Post-World War II Commercial Properties and Transportation Project Development: Historic Context and National Guidance on Evaluation of National Register of Historic Places Eligibility	-----	300,000			In development
25-59	Regional Guidebooks of Current Practices for Roadside Pollinator Conservation and Endangered Species Act Compliance	-----	500,000			In development
25-60	Watershed Approach to Mitigating Hydrologic Impacts of Highway Projects	-----	500,000			In development

* Information on all projects initiated under the NCHRP from its inception in 1962 through 1988 is included in NCHRP Web Document 7: Special Edition of Summary of Progress through 1988 located at <http://tinyurl.com/NCHRPWebDoc7>. Detailed status reports on projects initiated after 1988 for which there is any type of contractual activity can be found on the NCHRP website at www.trb.org/nchrp.

** Continuing activity. Amount shown is for latest fiscal year in which funding was provided.

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Items Available on Request

Some research agencies' final reports, manuals, videotapes, etc. that are identified in the project summaries are available upon written request to:

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Summary of Progress Through 1988—Special Edition

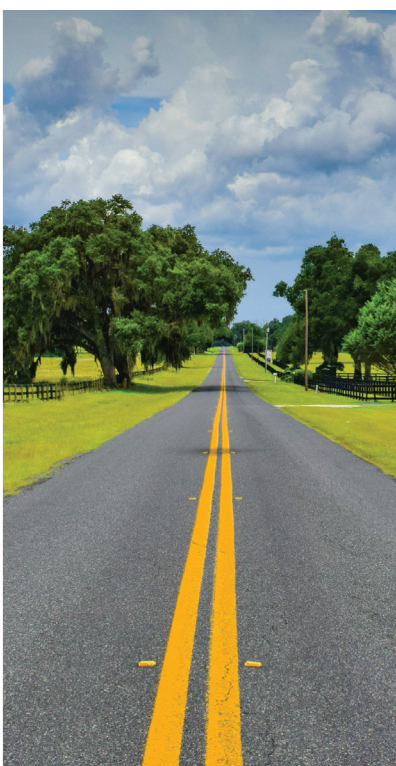
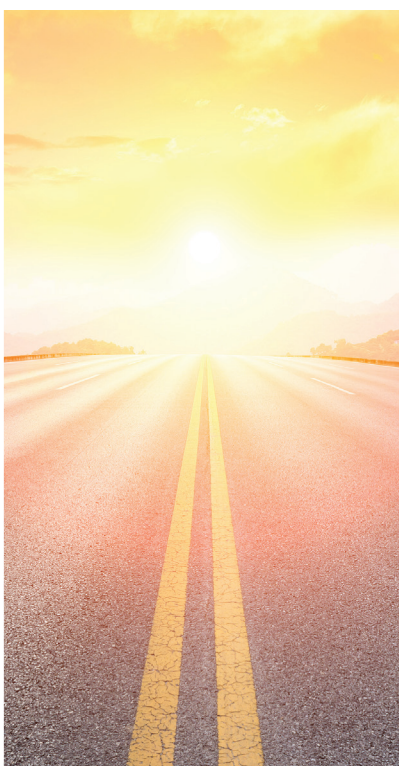
A summary of NCHRP projects from 1962 through 1988 is available online as NCHRP Web Document 7. This document can be accessed through the link on the NCHRP home page (www.trb.org/NCHRP) or by going to <http://tinyurl.com/NCHRPWebDoc7>.

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