

**Part III:  
RESEARCH AND INTERNATIONAL WORK  
PROGRAM**

# **Part III – RESEARCH AND INTERNATIONAL WORK PROGRAM**

## **Chapter 1: International Program**

PART III – Research and International Program

Chapter 1 International Program

**Objective:** The International Program provides bi-national coordination with the Republic of Mexico to enhance the mobility and safety of commercial and passenger vehicle traffic along state and federal roadways serving New Mexico’s international border crossings.

**Methodology**

The International Planner develops and manages the activities of the Border Technology Exchange Program (BTEP), participates on the Bi-national Joint Working Committee (JWC), the Bi-national Bridges and Border Crossings Group, and the Border Crossings Worktable of the Border Governors’ Conference. The Planner also serves as liaison between the Department and other local, state and federal agencies interested in providing a safe and efficient transportation system serving the US/Mexico international border. Administrative activities include the continued In-house development of an informational database showing industrial and commercial development along New Mexico/Mexico border corridor for planning purposes.

**Products and Costs:**

	International Program Administrative Costs				
<b>3.1.1</b>	<p>Project Description: Personnel Services and Employee Benefits included in Part I, Chapter 1</p> <p><b>Project Number:</b> CNP917010</p> <p><b>Project Number:</b> CNP918010</p> <p>Project Manager: Asset Management &amp; Planning Division Director</p> <table><thead><tr><th>Number of Positions</th><th>Position Title</th></tr></thead><tbody><tr><td>1</td><td>Urban &amp; Regional Planner – Advanced included in the list in Part 1, Chapter 1</td></tr></tbody></table>	Number of Positions	Position Title	1	Urban & Regional Planner – Advanced included in the list in Part 1, Chapter 1
Number of Positions	Position Title				
1	Urban & Regional Planner – Advanced included in the list in Part 1, Chapter 1				
<b>3.1.2</b>	<p>Project Description: International Programs Operational Expenses covered in the Research Operational Project</p> <p><b>Project Number:</b> CN R917020</p> <p><b>Project Number:</b> CN P918020</p> <p>Project Manager: Research and International Programs Division Director</p> <p>Programs and Events Participation</p> <p><u>Project Summary</u></p> <ul style="list-style-type: none"><li>• Border Governor’s Conference, locations vary, typically held in the</li></ul>				

	<p>Fall. Intent is to send upper level management and staff: estimate \$10,000</p> <ul style="list-style-type: none"> <li>• FHWA Joint Working Committee (JWC) Binational Transportation meetings (bi-annual), Mexico meeting (Spring), U.S.-side meeting (September). Locations are TBA. Intent is to send upper level management to events along with staff: estimate \$2,500.</li> <li>• FHWA Joint Working Committee (JWC) Binational Transportation meetings (bi-annual), Mexico meeting (Spring), U.S.-side meeting (September). Locations are TBA. Intent is to send upper level management and staff to events: estimate \$2,500.</li> <li>• New Mexico – Chihuahua Commission, December. Intent is to send upper level management and staff to events: estimate \$5,000 if travel to Ciudad Chihuahua required.</li> <li>• Binational Bridges and Border Crossings Group (BBBXG), New Mexico/Texas Regional meeting (Spring/Fall). Location TBA. Intent is to send upper level management and staff to events: estimate \$2,500.</li> <li>• NMDOT’s International Transportation BTEP Partners attendance at NMDOT Engineering Conference: estimate attendance and registration for six (6) guests \$3,500</li> <li>• International Rail and Freight Planning Meetings and Conferences: estimate travel and registration for 3 NMDOT staff to attend: \$9,000</li> </ul>
<p><b>3.1.3</b></p>	<p>Project Description: Continuation of Contracted Work  FHWA FY 2014 TIGER Planning Grant No. 11  Santa Teresa Border Area Transportation Needs Assessment and Strategic Plan  <b>Project Number:</b> CN P915350  <b>Project Amount FY16:</b> \$500,000  Project Manager: Research and International Programs Division Director</p> <p><u>Project Summary</u>  The Santa Teresa Border Area Transportation Needs Assessment and Strategic Plan will identify the most beneficial planning, maintenance, and capital improvement transportation projects in the Santa Teresa border area, keeping in mind economic development considerations.</p> <p>FY15-16 Work</p>

	<ol style="list-style-type: none"> <li>1. Coordination of stakeholder/public outreach which includes establishing a comprehensive list of regional stakeholders by developing an efficient communication protocol that includes private and public employers and employee, workforce development, the Public, and roadway/transit users.</li> <li>2. Development of a database of current and planned transportation projects. This will include obtaining full understanding of current and planned transportation projects including planned projects, maintenance projects, and capital improvement projects. A database will be built to store this information which may be accessed by all stakeholders and decision-makers.</li> <li>3. Complete needs assessment on existing transportation network by compiling existing data and collecting new data through the following activities: <ul style="list-style-type: none"> <li>o Travel demand modeling</li> <li>o Transit survey</li> <li>o Pavement evaluations</li> <li>o Traffic monitoring</li> <li>o Safety study</li> </ul> </li> <li>4. Evaluation of employment opportunities, employee locations, and transportation options (options may include opportunities for public/private partnerships in transportation of employees).</li> <li>5. Creation of transportation infrastructure decision-making criteria and a data sharing framework for project prioritization. This will include: <ul style="list-style-type: none"> <li>o Developing a regional communication framework for project prioritization;</li> <li>o Focusing transportation decisions on economic development, international trade, and employment mobility;</li> <li>o Using a GIS-based data-sharing process amongst Binational agencies;</li> <li>o Providing data that allows further Binational transportation coordination with Mexico; and</li> <li>o Creating data for infrastructure maintenance prioritization.</li> </ul> </li> <li>6. Preparing a draft report on major tasks 1-5</li> <li>7. Preparing a final report on major tasks 1-5, recommendations, and the STBAT Strategic Plan for implementation. The STBAT will include an implementation component that includes short- and mid-term project recommendation for incorporation in the Statewide Transportation Improvement Program in response to the immediate transportation needs in the border area.</li> </ol> <p>FY17-18 Work</p> <ul style="list-style-type: none"> <li>• Planned Final Project Report – March 1, 2017</li> <li>• Planned Project Completion – June 30, 2017</li> </ul>
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	<ul style="list-style-type: none"> <li>Planned Project Closeout – December 31, 2017</li> </ul>
<p><b>3.1.4</b></p>	<p>Project Description: Border Crossing and Wait Times Analysis for the Santa Teresa International Land Port of Entry  <b>Project Number:</b> CN P916320  Project Amount FY16: \$375,000 of FHWA Allocated funds using program code M445.  Project Manager: International Programs Planner</p> <p><u>Project Summary</u>  Establish a border crossing measuring system for commercial vehicles at the Santa Teresa / San Jeronimo land port of entry. The border crossing measuring system will include the installation of Radio Frequency Identification equipment at the port of entry as well as the development and implementation of a data collection and dissemination tool.</p> <p>Major Milestones:</p> <ul style="list-style-type: none"> <li>Submit project funding proposal to the Federal Highway Administration, November 2015</li> <li>Prepare and commence Request for Proposal process for selection of consultant, May 2016</li> <li>Award consultant, July 2016</li> <li>Commence wait time analysis, September 2016</li> </ul>
<p><b>3.1.5</b></p>	<p>Project Description: Programs and Events Participation  <b>Project Number:</b> CN P916300  <b>Project Amount FY16:</b> \$15,000 funded with BTEP  Project Manager: International Programs Planner</p> <p><u>Project Summary</u></p> <ul style="list-style-type: none"> <li>Border Technology Exchange Program (BTEP) Event, Cd. Chihuahua, Mexico, Fall 2016. Intent is for NMDOT representatives to travel to Cd. Chihuahua to exchange transportation information and data with BTEP counterparts in Chihuahua: estimate \$5,000</li> <li>Third Annual Binational GIS Workshop, Albuquerque, Fall 2016: estimate \$10,000 (includes translation services)</li> </ul>

# **Part III – RESEARCH AND INTERNATIONAL PROGRAMS**

## **Chapter 2: Research Program**

## PART III – Research and International Program

### Chapter 2 Research Program

**Objective:** The Research Bureau administers a program of high quality applied transportation research that provides innovative, relevant, timely and cost-effective solutions to the increasingly complex problems confronting our customers in New Mexico Department of Transportation (NMDOT), the people of the State of New Mexico, our Nation and the international community. The Bureau seeks to accomplish this mission through close coordination with our partners and customers, consistent with the strategic goals and key principles established by the Department.

The NMDOT transportation research program is funded as an allotment of the State Planning and Research (SP&R) apportionment, 80% federal, with 20% state match. Under CFR 23 Part 420, Subpart A, Sec. 420.107, and Subpart B, Sec 420.207 a minimum of 25% of SP&R funding must relate to research on the planning, design, construction and maintenance of highways, public transportation, and multimodal transportation systems.

#### **Methodology**

##### **Program Prioritization, Policies and Procedures and Performance Measures**

###### *Program Prioritization*

The first priority of this two-year Work Program is to identify relevant, high-value research projects that can be quickly implemented to address transportation problem areas. A second priority is a comprehensive review and refinement of Bureau policies and procedures, consistent with the requirements of the FAST Act and recommendations from the Federal Highway Administration (FHWA) and Department staff concerning research relevance. A third priority is the improvement of the Research Bureau website to provide NMDOT Districts and Divisions with immediate access to international, national and State research results critical to their mission.

###### *Policies and Procedures*

The NMDOT research program is customer-driven and product-oriented, enlisting project Sponsors, Advocates and Technical Panels to ensure research projects are identified and completed on time and within budget. To facilitate project implementation, the Research Bureau now has two Research Implementation Engineers who review technical details from project selection to project completion. Databases will track implementation results and present these results to NMDOT executive management on an annual basis.

The Research Work Program is organized into twelve research subject areas consistent with FHWA initiatives and NMDOT strategic priorities. The research subject areas are as follows: Administration, Construction, Design, Environment, Maintenance, Materials Science, Multimodal, Planning, Safety, Structures, Special Projects and Technology Transfer.

Projects are internally identified by the code NMYRSUB-XX, in which “NM” is New Mexico; “YR” is the year the project began, “SUB” is subject area; and “XX” is the project index number. Each research



project listed in the Work Program is presented on the Research Bureau website. Project activities and progress are updated quarterly.

Other current Research Bureau policies and procedures include:

- *Project-Specific Contract Model* – Research Bureau contracts are administered through this contracting method with the exception of a limited number of strategic initiatives and short term projects managed through on-call contracts.
- *Broadened Participation among State Universities and the Public Sector* – The Research Bureau issues *Invitations to Propose* (ITPs) to all of the major Institutions of Higher Education in the State of New Mexico, and *Requests for Proposals* (RFPs) to interested private and public sector service providers as administered through the Procurement Services Bureau. With few exceptions, award of contracts is competitive with contractors selected by an independent Selection Committee.
- *Research Project Solicitation* (RPS) - The RPS focuses on continuous outreach by Research Bureau personnel to stakeholders in our transportation system to identify innovative and implementable research projects as required by 23 CFR 420.209.
- *Project Management Database* – Research Bureau staff continues to evaluate needs and identify effective and efficient commercial project management software and training.
- *Improved Checks and Balances* – The Research Bureau uses a system of checks and balances to ensure the integrity and efficiency of research activities. A *Research Oversight Committee* (ROC) provides guidance in policies and procedures and the selection of transportation research projects to be submitted to FHWA for approval; FHWA reviews and approves the Annual Work Program; independent ad-hoc Selection Committees evaluate proposals for research projects from consultants; project sponsors and advocates certify the need for proposed research and materially participate in the conduct of research; Technical Panels guide each research project from conception through implementation, and Research Bureau staff administer the program.
- *Focus on Applied Research* – The Research Bureau emphasizes applied versus pure research projects, focusing on transportation problems that have the potential to be implemented immediately through the identification of effective and efficient research solutions. To ensure research results in tangible benefits, each contract is required to include an Implementation Plan that guides the Department in implementing research results.
- *Improved Library Services* – The Research Bureau maintains an expansive transportation library, many publications of which were cataloged in prior program years; and the Bureau uses a web-based application to access these resources online.

#### Documentation of Policies and Procedures

Federal regulations require that state sub-recipients of federal SP&R funds maintain a well-documented set of operating procedures and policies. The first publication of the Research Bureau's Information and Instructions manual served to satisfy this requirement and was published in FY07, concurrent with implementation of new program procedures. As policies and procedures were refined to better meet Agency needs, this manual was revised, and the last update was published in FY09. In FY15-16, the Research Bureau documented and published new program procedures that have been implemented since the last publication of the manual, consistent with the recommendations resulting from the most recent Research Peer Exchange and a Process Review jointly conducted by state and federal

representatives. With each new revision, procedures and policies are thoroughly reviewed by legal staff, agency management and FHWA to ensure that these are effective and consistent with governing regulations.

#### Revised Process Review

A comprehensive revision of the Research Bureau's *Information and Instructions Manual*, which has served as the source of documented Bureau policies and procedures, was completed and given to FHWA for their review and comment in April 2016. This revision came as a recommendation from the Research Peer Exchange that was conducted in FY13.

#### Research Results

Research projects, processes and products are reported quarterly and are available to Department managers, FHWA and all interested parties. Each research project details the research activities, deliverables, budget and schedule.

Research deliverables are products. Research Bureau products vary from reports to innovative technologies. Whether a technical report, a software application, or an object used in the field, research products are designed to solve transportation problems and improve transportation practices. Research necessarily involves experimentation and, thus, the potential for success and failure in research results. Some research results actually identify projects and procedures the Department should not implement. Knowing what does not work is often a critical step toward understanding what does work.

#### Performance Measures

The following performance measures will continue to be used to assess the effectiveness of the Research Program and may be refined on an annual basis to better measure performance:

- 1) Percent of available budget expended.
- 2) Percent of projects in work plan actually contracted.
- 3) Percent of projects completed on-time
- 4) Percent of projects completed on-budget

#### Technology Transfer

Technology Transfer (T2) is defined as activities and expenditures, where need has been substantiated that lead to the introduction, promotion, adoption, and communication of new ideas, techniques, applications or products by users. Activities include education, dissemination, demonstration, field applications, technical support and other activities that lead to eventual innovation. Innovation is defined as any technology transfer activity that creates new solutions for a specific user. T2 funds can be used to anticipate and address transportation concerns before they become critical problems (23 CFR §420.203: 23 CFR §420.205). Technology transfer projects are identified by NMDOT employees or other stakeholders. Proposals for expenditure of T2 funds are evaluated and prioritized by the Research Oversight Committee.

#### University Transportation Centers

In FY16 the NMDOT through the Research Bureau provided letters of support to three New Mexico universities for their application to the Office of the Assistant Secretary for Research and Technology,

USDOT, to be considered for establishment of University Transportation Centers (UTCs). Results of the competition for UTC applications will be announced in December 2016. The Research Bureau, pending funding availability, will support projects that support the interests of NMDOT.

### **Other Key Research Bureau Activities**

#### **Research Peer Exchanges**

The Research Bureau is committed to participation in the FHWA Peer Exchange process to identify and integrate best practices into its policies and procedures. Research Bureau staff participated in a Peer Exchange in February 2016 in Vermont and will likely participate in another peer exchange in September 2016 in Utah. It is anticipated that the Research Bureau will host a Peer Exchange no later than September 2018.

#### **Participation in National Activities**

The Research Bureau strives to be an active participant in the Transportation Research Board (TRB), the National Research Council of the National Academy of Sciences and in the National Cooperative Highway Research Program (NCHRP). The annual membership costs for participation in the TRB, as well as annual membership for NCHRP, are paid from the distribution of SPR funds. In addition, the Research Bureau participates in the American Association of State Highway and Transportation Officials (AASHTO) activities including the Research Advisory Committee. These activities permit review of applicability of research results with other transportation research organizations, and to ensure the program in New Mexico is directly involved in National research to support State Transportation Agencies.

Research Bureau staff have contributed numerous technical papers for presentation and publication by TRB in recent years. During FY17-18 the Research Bureau plans to produce more abstracts for technical papers and to submit these for consideration for presentation at various national and international conferences as appropriate.

#### **TRB/AASHTO RAC Annual Meetings**

Each year the TRB and the AASHTO Research Advisory Committee sponsor an annual meeting among state representatives to discuss mutual needs, to learn of new products and services available to industry practitioners, and to plan activities that address those identified needs. The Research and International Programs Division Director, in absence of the Research Bureau Chief, is responsible for serving as the agency's liaison to the Transportation Research Board and the AASHTO Research Advisory Committee (RAC). This position is actively involved with research initiatives at the national level and serves as the agency's representative at the annual TRB conference conducted in January of each year in Washington D.C. and the annual AASHTO RAC/TRB Summer Meeting conducted in the home state of a hosting State DOT. The Research Bureau plans to send the Division Director/Bureau Chief or designee to each of these conferences during the FY17-18 Work Program, and to other worthwhile events as appropriate.

#### **TRB Site Visit**

The Research Bureau hosted a staff member for a site visit from the TRB in February 2016 and anticipates hosting a site visit in FY18.

Stewardship and Oversight Agreement

The Research Bureau plans to continue coordinating these activities during the FY17-18 Work Program.

Library

As part of the T2 plan for FY17-18, a major goal of the Work Program is to continue efforts to establish a greater awareness of the Research library, its mission, its resources and its services for Department staff and the external stakeholder community through extensive outreach. The Research Bureau is currently working on establishing a strong presence on the Department website that provides NMDOT staff with access to external databases, publications, videos and other state DOT websites, all designed to improve the transfer of innovative research results and effective technology alternatives to the State for immediate implementation. The Library staff will also continue to improve the library collection and databases consistent with the mission and goals of the Research Bureau, the Department, and the FHWA.

**FY 17-18 Research Program:**

<b>3.2.1</b>	Project Description: Personnel Services and Employee Benefits <b>FY17 Project Number:</b> CN R917010 <b>FY17 Project Amount:</b> \$717,000  <b>FY18 Project Number:</b> CN R918010 <b>FY18 Project Amount:</b> \$717,000 Project Manager: Research and International Programs Division Director Number of Positions      Position Title 1                              Administrative Operations Manager II 1                              Staff Manager 1                              Civil Engineer - Advanced 1                              Engineer Coordinator Specialist – NL- Advanced 1                              Management Analyst Supervisor 1                              Management Analyst – Advanced 1                              Librarian – Advanced 1                              IT Applications Developer I 1                              Business Operations Specialist – Advanced 1                              Financial Specialist – Basic
<b>3.2.2</b>	Project Description: Research Operational Expenses <b>FY17 Project Number:</b> CN R917020 <b>FY17 Project Amount :</b> \$306,200  <b>FY18 Project Number:</b> CN R918020 <b>FY18 Project Amount:</b> \$306,200 Project Manager: Research and International Programs Division Director

	<p>Purchase of:</p> <ul style="list-style-type: none"> <li>• Project specific supplies/equipment</li> <li>• Technology Transfer innovations</li> <li>• Eligible travel reimbursements</li> <li>• Eligible conferences/workshops</li> <li>• Library needs</li> <li>• Peer Exchange</li> </ul>
<b>3.2.3</b>	<p>Project Description: Continuation of Contracted Research  NM11MSC-03 Materials Response in Hot Mix Asphalt (Phase 2)  Advocate/Sponsor: Asset Management &amp; Planning Division</p> <p>Project Number: CN R915047  <b>FY17 Project Amount:</b> \$50,000  <b>FY18 Project Amount:</b> \$50,000  Project Manager: Management Analyst Supervisor</p>
<b>3.2.4</b>	<p>Project Description: Continuation of Contracted Research  NM13MSC-04 Field and Laboratory Evaluation of Warm Mix Asphalt (Phase 2)  Advocate/Sponsor: State Materials Bureau</p> <p>Project Number: CN R915048  <b>FY17 Project Amount:</b> \$110,000  <b>FY18 Project Amount:</b> \$110,000  Project Manager: Management Analyst Supervisor</p>
<b>3.2.5</b>	<p>Project Description: Continuation of Contracted Research  NM14MSC-01 Evaluation of Plus Graded Performance Asphalt (Phase 2)  Advocate/Sponsor: State Materials Bureau</p> <p>Project Number: CN R915049  <b>FY17 Project Amount:</b> \$125,000  Project Manager: Civil Engineer – Advanced</p>
<b>3.2.6</b>	<p>Project Description: Continuation of Contracted Research  NM16SAF-01 Law Enforcement Agency Crash Data Linkage  Advocate/Sponsor: Traffic Safety Division  Project Number: CN R916030  <b>FY17 Project Amount:</b> \$74,000  Project Manager: Staff Manager</p>
<b>3.2.7</b>	<p>Project Description: Research to be Contracted Out (48 Mo. Contract)  NM09MSC-01 Feasibility Analysis of Ultra High Performance Concrete for  Prestressed Concrete Bridge Applications (Phase 4)</p>

Advocate/Sponsor: State Materials Bureau, State Bridge Bureau

Project Number: CN R917030

**FY17 Project Amount:** \$100,000

**FY18 Project Amount:** \$100,000

Project Manager: Management Analyst Supervisor

Project Summary

Following the construction of Bridge 9706, designed with ultra-high performance concrete (UHPC) using materials local to New Mexico, the bridge will be monitored to identify the advantages of UHPC in bridge superstructure design. Key parameters will be investigated to improve the design, construction, economy, and applications of UHPC. Continued monitoring of this bridge will provide advanced knowledge of the long term bridge performance of a bridge utilizing innovative materials.

Following the successful completion of Phases I-III and the construction of the first UHPC bridge in New Mexico, a symposium will be held to disseminate the results to engineers, designers, fabricators, and the public to highlight the results and research findings.

Mixture proportions developed in Phase II of the project will continue to introduce new technologies (e.g., admixtures) to improve the strength characteristics, durability, economy, and casting and curing methods. Furthermore, new potential applications will be identified and investigated.

Investigations on the field implementation of UHPC will be conducted. Laboratory and field studies will be conducted to study the cast-in-place behavior of UHPC. These studies will provide new tools and applications for the UHPC (e.g., field joints).

Justification

Not conducting the research will lose the momentum of the first three successful phases of research including the opportunity to monitor the first ultra-high performance concrete (UHPC) bridge in New Mexico, and potentially the first non-proprietary UHPC bridge in the U.S. Making use of the instrumentation installed during Phase III, the bridge will be evaluated for performance, durability, maintenance, and cost. This unique opportunity provides the direct comparison of two different types of materials to be directly studied to improve bridge design practices.

Furthermore, the UHPC mixture proportions developed with local materials in Phase II will continued to be improved in Phase IV as well as new potential uses for UHPC identified (including key initiatives identified by FHWA's Every Day

	<p>Counts initiative). UHPC has been identified as an innovative material that can be used for connections for prefabricated bridge elements leading to accelerated construction and improved long term performance. This research will continue to investigate new uses of UHPC to meet and exceed FHWA Every Day Counts initiative to provide greater efficiency and economy in projects with less impact on users.</p> <p><u>Anticipated Benefits</u> The findings of this research will continue to develop more sustainable, durable, cost effective methods/materials for implementation into transportation infrastructure. Longer design life of bridges and structures will be demonstrated through the monitoring of Bridge 9706. Additionally, the data collected will provide additional information to improve life-cycle cost analysis for future projects (promoted by FHWA as an economic analysis tool). The project will also provide the additional uses of UHPC, including the use of UHPC for field cast joints, identified by FHWA as “Accelerating Innovation” through the Every Day Counts program.</p> <p><u>Deliverable</u> The project will deliver an analysis of the performance of UHPC in comparison with high performance concrete (HPC), other potential uses of UHPC, and a symposium to highlight research.</p>
<p><b>3.2.8</b></p>	<p>Project Description: Research to be Contracted Out (48 Mo. Contract)          NM17ADM-01 On-Call Research Services          Advocate/Sponsor: Research and International Programs Division          Project Manager: Engineering Coordinator and/or Staff Manager          Project Number: CN R917031          Project Amount FY17: \$117,000          Project Amount FY18: \$109,000</p> <p><u>Project Summary</u> This project establishes an on-call contract to be executed between NMDOT and one or more contractors. The contract will provide the means to leverage resources at the state’s research universities to provide literature searches for relevant information requested by Department staff, and to perform short and medium term research. This is envisioned as a long-term, 4-year project.</p> <p><u>Justification</u> A wealth of information on topics related a broad variety of transportation issues is available through several sources, including the Transportation Research Board, AASHTO, NCHRP, and individual state DOT research divisions. Oftentimes, a question or concern raised by NMDOT staff has been previously addressed through another agency, and a thorough literature search will reveal</p>

	<p>this information. This eliminates unnecessary and costly duplication of effort in finding solutions to these problems. Research Bureau staff regularly conducts literature reviews in response to requests from Department staff and subsequent to receipt of research project proposals.</p> <p><u>Anticipated Benefits</u>  An on-call contract for research services will improve the volume and quality of investigation of previously conducted research, as well as short and medium term research. Existing operational procedures require a project-specific contract to be executed for each problem statement. This is often a time consuming process, both in preparing a contract and conducting research. A common remark from Department staff is that research takes too long, and that an expedited process for addressing immediate problems would be beneficial. On-call research is authorized with a Task Order with a short timeline and a well-defined and limited scope of work.</p>
<p><b>3.2.9</b></p>	<p>Project Description: Research to be Contracted Out (12 Mo. Contract)  NM17DSN-01 Scale Model of Complex Drainage Structure  Advocate/Sponsor: Engineering Design Division  Project Manager: TBD  Project Number: CN R917033  Project Amount FY18: \$85,000</p> <p><u>Project Summary</u>  This research project will physically model the South Domingo Baca Arroyo drainage structure and answer the question: “Will the physical model of the complex structure, which runs through the Paseo del Norte and Interstate 25 interchange, match the performance results predicted by the mathematical model in the US Environmental Protection Agency’s Storm Water Management Model (SWMM)?”</p> <p>SWMM is used throughout the world for planning, analysis and design related to storm water runoff, combined and sanitary sewers, and other drainage systems in urban areas. It is used for single event or long-term (continuous) simulation of runoff quantity and quality. The runoff component operates on a collection of sub catchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators.</p> <p><u>Justification</u>  The research results will help drainage engineers adjust and identify future mathematical modeling to ensure systems meet performance criteria and requirements.</p>



	<p><u>Anticipated Benefits</u>  Research results will permit drainage design engineers to assign better loss coefficients to future mathematical models which will, in turn, result in improved analysis/design for future drainage systems. The research will also give the Drainage Bureau a predictive means of understanding the anticipated performance of an existing structure for large, infrequent storm events. It may also help in the future to increase the service life of the structure.</p>
<p><b>3.2.10</b></p>	<p>Project Description: Research to be Contracted Out (60 Mo. Contract)  NM17ENV-01 Determining the Design Effectiveness of Constructed and Planned Wildlife-Vehicle Collision Mitigation Projects  Advocate/Sponsor: Environmental Design Division  Project Manager: TBD  Project Number: CN R917034  Project Amount FY17: \$100,000  Project Amount FY18: \$100,000</p> <p><u>Project Summary</u>  This project will determine the design effectiveness of wildlife crossings by estimating wildlife passage rates with covert infrared cameras for up to 24 months at 8 built crossings (I-40/NM 333 Tijeras and Edgewood) and 6 planned crossings (I-25 Raton and US 550 Cuba). The monitoring of the planned crossings would establish pre construction baselines. These baseline rates could then be compared to post construction rates.</p> <p><u>Justification</u>  NMDOT has designed and built wildlife crossings since 2008 and two more projects are funded for construction. These future projects are located on I-25 at Raton and US 550 near Cuba, both are within wildlife-vehicle collision (WVC) hotspots. However, the Department has no good data to determine the effectiveness of any crossing. While the number of reported WVCs gives some measure of the safety hazard, researchers estimate that less than 50% of WVCs are reported to law enforcement.</p> <p>The standard practice in western states is to install battery-operated, motion-activated, covert infrared wildlife cameras at crossings. Camera images are date and time stamped and are used to determine the approach and passage rates of targeted species. From this data, crossing designs can be modified to improve passage rates and new crossings can be designed to be more effective. Over the past 10 years Arizona DOT has deployed over 500 such cameras. NMDOT has deployed none and has. As a result, the State has no data to determine design effectiveness.</p> <p><u>Anticipated Benefits</u></p>

	<p>Better understanding of the comparative effectiveness of wildlife crossing designs;  Improved highway safety as research results are implemented in future projects;  Reduced WVCs and carcasses on roadways; and  Increased wildlife habitat connectivity and genetic diversity.</p> <p><u>Deliverables</u></p> <ol style="list-style-type: none"> <li>1. Installation and monitoring of specialized cameras at 14 wildlife crossings.</li> <li>2. Semi-annual reports on research efforts at crossings for up to 24 months.</li> <li>3. Final report evaluating the design effectiveness and recommendations for modifications at each of 8 existing crossings; and the baseline pre-construction wildlife passage rate for 6 planned crossings.</li> <li>4. Development of a guide for designing effective wildlife crossings for big game species.</li> </ol>
<p><b>3.2.11</b></p>	<p>Project Description: Research to be Contracted Out (48 Mo. Contract)  NM17ENV-02 Dust Mitigation Monitoring Project  Advocate/Sponsor: Environmental Design Division/Cabinet Secretary  Project Manager: TBD  Project Number: CN R917035  Project Amount FY17: \$55,000  Project Amount FY18: \$45,000</p> <p><u>Project Summary</u></p> <p>This project will determine the effectiveness of land use interventions on mitigating blowing dust and the frequency of dust-related traffic crashes at three selected crash hotspots on Interstate 10 and US 180 in southwest NM. Currently available and appropriate dust monitoring equipment will be used to monitor control areas and treated areas over the project period.</p> <p><u>Justification</u></p> <p>The NMDOT has a multi-faceted approach to reducing dust storm related crashes, injuries, and fatalities. These approaches range from educational strategies to site specific land use changes to mitigate dust.</p> <p><u>Anticipated Benefits</u></p> <p>This project will allow environmental scientists to determine which land use strategies are most effective in the respective selected locations. By reducing the dust load, there may be a reduction of dust related crashes. This benefits traffic safety and saves lives. In addition, it may have a positive impact on commerce if roads are closed less often due to blowing dust.</p>
<p><b>3.2.12</b></p>	<p>Project Description: Research to be Contracted Out (15 Mo. Contract)  NM17ENV-03 Free Energy – A Feasibility Study for a No-Cost NMDOT “Solar</p>

	<p>Highway” Program  Advocate/Sponsor: Environmental Design Division  Project Manager: TBD  Project Number: CN R917036  Project Amount FY18: \$85,000</p> <p><u>Project Summary</u>  This research project would provide a solar photovoltaic power generation feasibility analysis for each of NMDOT’s six districts and the general office by answering three essential questions:</p> <ol style="list-style-type: none"> <li>1. What cost-mitigating partnership opportunities are available in each district?</li> <li>2. What costs and revenues can be expected under these available partnership scenarios?</li> <li>3. What legal/regulatory constraints, if any, exist for NMDOT to participate in cost-mitigating partnerships and agreements for solar photovoltaic energy production in the right of way?</li> </ol> <p>The project will provide each District and the General Office with a feasibility study that outlines the opportunities and obstacles to establish public-private partnerships or other contracts for free or low-cost solar-power generation on Department facilities and rights-of-way.</p> <p><u>Justification</u>  FHWA and state DOTs are increasingly recognizing highway rights-of-way as locations for generation of alternative energy. Innovative “solar highway” projects provide financial revenue, economic stimulus, positive public perception, and environmentally beneficial carbon emissions offsets. Moreover, in some cases partnerships with utilities and/or private companies can lead to revenue generating solar photovoltaic projects with little or no up-front or maintenance costs to sponsoring agencies. The FHWA has identified 38 renewable energy projects in highway rights-of-way in 14 states.</p> <p><u>Anticipated Benefits</u>  Lower energy costs, carbon offsets, and positive public perception.</p>
<p><b>3.2.13</b></p>	<p>Project Description: Research to be Contracted Out (36 Mo. Contract)  NM17MSC-01 Superpave 5: Constructing Asphalt Pavement with Road Voids Equal to Design Air Voids  Advocate/Sponsor: State Materials Bureau  Project Manager: Civil Engineer – Advanced  Project Number: CN R917037  Project Amount FY18: \$120,000</p> <p><u>Project Summary</u>  This project concerns itself with a more robust H/WMA pavement section. The concept is to design and then compact the HMA to 5% air voids, vs. the current</p>

	<p>method of designing at 4% air voids; and compacting in the field to 7%, allowing traffic to further compact the material. This is a pavement innovation that is new and will decrease pathways for permeation of both water (freeze-thaw damage) and evaporable volatiles throughout the mix, which dries out the H/WMA and makes it more vulnerable to cracking</p> <p><u>Justification</u></p> <p>NMDOT Hot and Warm Mix Asphalts are designed at 4% air voids and placed in the field at lower densities, in some cases with air voids about 8%. These mixes are expected to be compacted to 4 or 5% air voids under roadway traffic within two years of construction and thus avoid shear rutting which sometimes occurs at below 4% air voids during the design life. In fact, such designs of Superpave mixes have shown very little to no rutting. However, mixes with high air voids (before initial compaction by roadway traffic) show high permeation of water and volatiles with binders oxidizing significantly. If mixes can be designed at 5% air voids in the lab and placed at 5% air voids in the field, binder aging can be mitigated by reducing both initial and subsequent pathways for permeability due to kneading of the binder under traffic, therefore enhancing durability, including rut resistance.</p> <p>There is a need for changes in mix design parameters so as to design at 5% air in the lab and compact to 5% air in the field, and then keep the voids at that level (reduce traffic densification). Lower air voids in the field should improve durability by decreasing binder aging.</p> <p><u>Anticipated Benefits</u></p> <p>This will increase the life of the asphalt pavement through reducing permeability and increasing structural robustness at a minimal effort of increasing compaction, leading to cost savings, the magnitude thereof to be determined by this project as longevity of the product.</p> <p><u>Deliverable</u></p> <p>A complete mix design procedure considering NMDOT traffic levels, mixtures containing RAP/RAS, binder grades, aggregate types, and mix types.</p>
<p><b>3.2.14</b></p>	<p>Project Description: Research to be Contracted Out (24 Mo. Contract)  NM17SAF-01 Establishing Variable Speed Limits for Inclement Weather, Phase 1  Advocate/Sponsor: ITS Bureau/District 6 Traffic Engineer  Project Manager: TBD  Project Number: CN R917038  Project Amount FY17: \$25,000  Project Amount FY18: \$0</p> <p><u>Project Summary</u></p> <p>This research project will establish recommended variable speed limits during inclement weather. Inclement weather includes dust storms, high winds, heavy rain, fog, snow, and ice. Speed limits are established for design criteria, not</p>

	<p>weather conditions. This three-phase project will provide NMDOT with a new tool to reduce inclement weather crashes.</p> <p>Numerous states have implemented a Variable Speed Management System for inclement weather. This system consists of a complete Road Weather Information System (RWIS) and one or more linked Dynamic Message Signs (DMS). The RWIS has non-intrusive pavement weather sensors to monitor pavements wetness, temperature, traction/friction, snow and ice; air temperature, humidity, wind speed and direction, and visibility. The RWIS reading are processed through software that communicates (wirelessly) with the DMS (some distance away) and can change the message to reflect the existing weather conditions ahead. For example, Colorado DOT may use “Wet Roads Ahead” or “Icy Roads Ahead.”</p> <p><u>Justification</u> The project site is Interstate 40 at the Continental Divide in District 6. Due to elevation, this location may experience severe inclement weather and more dangerous driving conditions than locations a few miles away. Drivers are often not prepared for these sudden changes in conditions.</p> <p><u>Anticipated Benefits</u> Reduced crashes, injuries, and fatalities in the project area.</p>
<b>3.2.16</b>	<p>Unprogrammed funds</p> <ul style="list-style-type: none"> <li>• FY17 - \$727</li> <li>• FY18 - \$884</li> </ul> <p>Research Projects to be identified and CNs established.</p>
<b>3.2.a</b>	<p>NCHRP Annual Fee - 100% Federally Participating</p> <ul style="list-style-type: none"> <li>• Estimate \$240,000 – FY17</li> <li>• Estimate \$240,000 – FY18</li> </ul>
<b>3.2.b</b>	<p>TRB Annual Dues - 100% Federally Participating</p> <ul style="list-style-type: none"> <li>• Estimate \$100,000 – FY17</li> <li>• Estimate \$100,000 – FY18</li> </ul>
<b>3.2.c</b>	<p>Library Pooled Fund Study - 100% Federally Participating</p> <ul style="list-style-type: none"> <li>• Estimate \$20,000 – FY17</li> <li>• Estimate \$20,000 – FY18</li> </ul>