ONE DOT
WORKING BETTER TOGETHER
U.S. Department of Transportation

Federal Transit Administration
901 Locust Street, Room 404
Kansas City, MO 64106
816-329-3920
816-329-3921 (fax)

Federal Highway Administration
3220 W. Edgewood, Suite H
Jefferson City, MO 65109
573-636-7104
573-636-9283 (fax)

June 25, 2019

Mr. Patrick McKenna, Director
Missouri Department of Transportation
Jefferson City, Missouri 65102

RE: SFY 2020 State Planning and Research Work Program Missouri Project SPR-PL-00 FY (020) and SFY FY2019 Annual Report Missouri Project SPR-PL-00 FY (19)

Dear Mr. McKenna:

In your letter dated June 20, 2019, we received your request for the Federal Highway Administration's (FHWA) and the Federal Transit Administration (FTA) review and approval of the final version of Missouri Department of Transportation's (MoDOT) state fiscal year (SFY) 2020 State Planning and Research (SPR) Work Program and SFY 2019 Annual Report. After prior discussion and review of draft copies, we find the SFY 2020 SPR Work Program satisfactory and approve it as requested, effective July 1, 2019. The MoDOT SFY 2020 SPR Work Program year begins on July 1, 2019 and ends on June 30, 2020.

This approval includes the estimated funding amounts for the Unified Planning Work Programs (UPWPs) for Missouri's eight metropolitan planning areas. However, the UPWPs for each of the Metropolitan Planning Organizations (MPOs) continue to be subject to ONE DOT's individual review and written approval.

The SFY 2020 SPR Work Program and SFY 2019 SPR Annual Reporting data are presented in one planning work product. Please provide our Division Office the addendum that adds the actual cost to the SFY 2019 SPR Work Program by August 31, 2019 and take steps to close out the SPR-PL-00 FY (19) project within 90 days of the close of the state fiscal year 2019 work program.

If you have any questions, please contact Brad McMahon at FHWA (573) 638-2609 or Daniel Nguyen at FTA (816) 329-3928.

Sincerely,

Mokhtee Ahmad
Regional Administrator
Federal Transit Administration

For: Kevin W. Ward
Division Administrator, P.E.
Federal Highway Administration

cc: Machelle Watkins, MoDOT
Paige Kempker, MoDOT
Doug Hood, MoDOT
Bill Stone, MoDOT
Dave Ahlvers, MoDOT
Sharon Monroe, MoDOT

MoDOT

105 West Capitol Avenue
P.O. Box 270
Jefferson City, Missouri 65102

Missouri Department of Transportation
Patrick K. McKenna, Director

1.888.ASK MODOT (275.6636)

June 20, 2019

Mr. Kevin Ward
Division Administrator
Federal Highway Administration
3220 West Edgewood, Suite H
Jefferson City, MO 65109

Mr. Mokhtee Ahmad
Regional Administrator
Federal Transit Administration
901 Locust Street, Suite 404
Kansas City, MO 64106

Dear Messrs. Ward and Ahmad:

Attached is the Missouri Department of Transportation's FY 2020 State Planning and Research Work Program. A draft copy was submitted to your office on May 30, 2019, for review by ONE DOT.

MoDOT is requesting overall approval effective July 1, 2019 of Part I-Planning and Part III-Research, Development and Technology. Part II-Metropolitan Planning is for informational purposes. The Federal funds will be obligated based on the MPO's UPWP.

If there are questions regarding this SPR program, please contact Paige Kempker 526-4142 or me at 526-1374.

Sincerely,

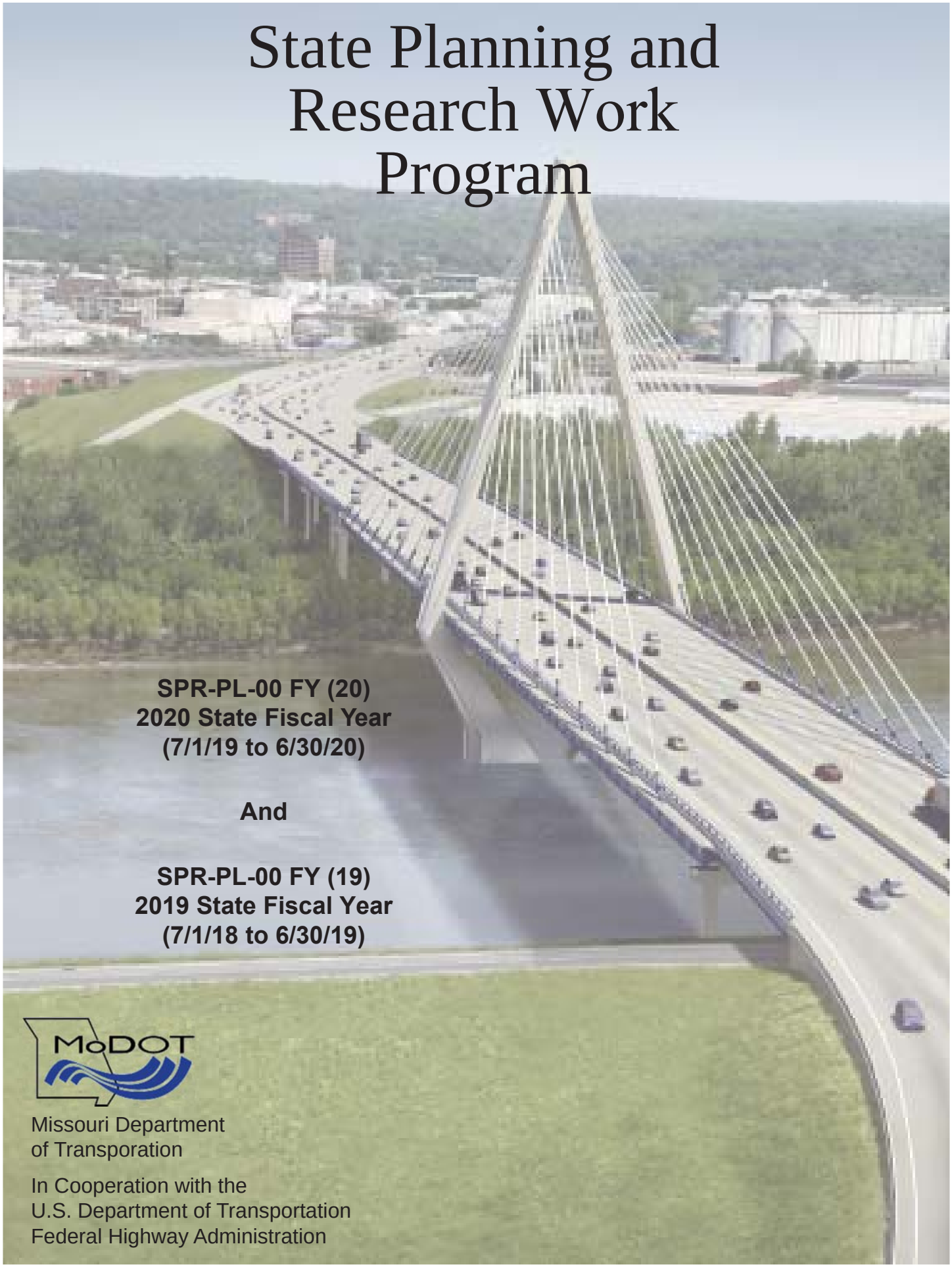
Machelle Watkins

Machelle Watkins
Director of Transportation Planning

Enclosure

Copy: Brad McMahon- FHWA
Daniel Nguyen-FTA
Jennifer Harper – CM-MODOT

State Planning and Research Work Program



SPR-PL-00 FY (20)
2020 State Fiscal Year
(7/1/19 to 6/30/20)

And

SPR-PL-00 FY (19)
2019 State Fiscal Year
(7/1/18 to 6/30/19)

Missouri Department
of Transporation

In Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

Table of Contents

List of Abbreviations

AASHTO – American Association of State Highway and Transportation Officials
AEP – Annual Exceedance Probabilities
APA – American Planning Association
ARAN – Automatic Road Analyzer
ARI – Average Recurrence Intervals
ASTM – American Society for Testing and Materials
ATR – Automatic Traffic Recorder
BEAP – Bridge Engineering Assistance Program
CAP – Compliance Assessment Program
CFR – Code of Federal Regulations
CMF – Cash Modification Factor
CMS – Content Management System
CP – Cathodic Protection
CPG – Consolidated Planning Grants
DOT – Department of Transportation
EERC – Earthworks Engineering Research Center
EMTSP – Equipment Management Technical Services Program
EPG – Engineering Policy Guide
EWG – East-West Gateway Council of Governments
FARS – Fatality Analysis Reporting System
FAST Act – Fixing America's Surface Transportation Act
FEMA – Federal Emergency Management System
FFY – Federal Fiscal Year
FHWA – Federal Highway Administration
FRP – Fiber Reinforced Polymer
FTA – Federal Transit Administration
FTZ – Foreign Trade Zone
GIS – Geographic information system
GPR – Ground-Penetrating Radar
GPS – Global Positioning System
HAL – Highway Accident Location
HMA – Hot-Mix Asphalt
HPMS – Highway Performance Monitoring System
HSM – Highway Safety Manual
HS-SCC – High Strength Self-Consolidating Concrete
HVFA – High Volume Fly Ash
IMISS – Implementing Maintenance Innovations from State to State
ITE – Institute of Transportation Engineers
ITS – Intelligent Transportation System
LED – Light Emitting Diode
LETS – Law Enforcement Technology System
LIDAR – Light Detection and Ranging
LKD – Lime Kiln Dust
LPA – Local Public Agencies
LRFD – Load and Resistance Factor Design

LRS – Linear Referencing System Network
LRTP – Long-Range Transportation Plan
LTAP – Local Technical Assistance Program
MACOG – Missouri Association of Councils of Government
MACTO – Missouri Association of County Transportation Officials
MAFC – Mid-America Freight Coalition
MAP-21 – Moving Ahead for Progress in the 21st Century
MARC – Mid-America Regional Council
MATC – Mid-America Transportation Center
MDA – Mixture Design and Analysis
MERIC – Missouri Economic Research and Information Center
MHTC – Missouri Highway Transportation Commission
MLS – Master of Library Science
MoDOT – Missouri Department of Transportation
MPO – Metropolitan Planning Organization
MUTCD – Manual on Uniform Traffic Control Devices
NCAT – National Center for Asphalt Technology
NCHRP – National Cooperative Highway Research Program
NCSC – North Central Super pave Center
NDT – Non-destructive Testing
NHI – National Highway Institute
NTKN – National Transportation Knowledge Network
NTPEP – National Transportation Product Evaluation Program
ONEDOT – Federal Highway Administration and Federal Transit Administration
OTO – Ozarks Transportation Organization
PCC – Portland Cement Concrete
PI – Principal Investigator
PIERS – Port Import Export Reporting Service
PL – Metropolitan Planning
PPG – Planning and Policy Group
QA – Quality Assurance
QC – Quality Control
RAS – Recycled Asphalt Shingles
RCA – Recycled Concrete Aggregate
RPC – Regional Planning Commission
RTAP – Rural Technical Assistance Program
RTS – Right Transportation Solutions
SASW – Spectral Analysis of Surface Waves
SCC – Self-Consolidating Concrete
SDE – Service Desk Express
SEMA – State Emergency Management System
SFY – State Fiscal Year
SHAL – Safety Handbook for Locals
SICOP – Snow and Ice Pooled Fund Cooperative Program
SPF – Safety Performance Functions
SPR – State Planning and Research
SPT – Standard Penetration Test
STARS – Missouri Statewide Traffic Accident Records System
STIP – Statewide Transportation Improvement Program
STSFA –Transportation Systems Funding Alternative

TAC – Technical Advisory Committee
TCD – Traffic Control Device
TCOAP – Thin-White Topping Concrete Overlays of existing Asphalt Pavement
TE – Transportation Enhancement
TEAP – Traffic Engineering Assistance Program
TIG – Technology Implementation Group
TKN – Transportation Knowledge Networks
TMC – Transportation Management Center
TMS – Transportation Management Systems
TRB – Transportation Research Board
TP – Transportation Planning
TPF – Transportation Pooled Funds
TSP2 – Transportation Pavement Preservation Program
TTAP –Technology Transfer Assistance Program
TTC – Temporary Traffic Control
TTCC – Technology Transfer Concrete Consortium
TTIC – Technology Transfer Intelligent Compaction
TWLT – Two-Way Left Turn
UAB – Urban Area Boundary
UPWP – Unified Planning Work Program
USGS – United States Geological Survey
UTCOAP – Ultra-Thin White Topping Concrete Overlays of existing Asphalt Pavement
VMT – Vehicle Miles of Travel
WIM – Weigh-in-motion

Preface

This SPR Work Program is prepared as an overview of the MoDOT activities that relate to Section 505, State Planning and Research, of Title 23, United States Code.

This report focuses on three parts. Part I (Planning) describes the state planning activities. Part II (Urban – Metropolitan planning organizations, MPO – CPG) describes the planning activities of the MPO. Part III (Research-SR) describes the technology transfer, development and research activities.

State Planning (SP) funds identify and develop methods to evaluate, prioritize and finance transportation needs.

Consolidated Planning Grant (CPG) funds are distributed to the nine metropolitan areas for their use in urban planning. The combined state and local urban planning work is coordinated into the Unified Work Program for each of the urbanized areas.

Research, Development and Technology Transfer (SR) funds are used for research, and for development and technology transfer activities necessary in connection with the planning, design, construction and maintenance of highway, public transportation and intermodal transportation systems.

The SFY 2020 SPR work program describes the proposed work activities and estimated budgets for each SFY 2020 SPR work program work element and the accomplishments for each SFY 2019 SPR work program work element. An administrative action will be completed in September 2019 for the purpose of incorporating the actual expenditure amounts for SFY 2019 work activities into the SFY 2020 SPR work program. This administrative action will be in the form of an addendum and provided to FHWA for informational purposes. It will be available for viewing on www.modot.org.

Introduction

Planning in general involves a method for accomplishing a desired objective – deciding in advance planning activities for the upcoming year. It is a continuous process aimed at maintaining the entire transportation system. Planning is the orderly and continuing assembly of information – including the history of development, the extent, dimensions, condition, use, economic and social effects, costs and future needs. It includes the analysis of this information for use by the administrators for the development and management of the transportation system in an efficient and cost-effective manner.

MoDOT's Mission:

Our mission is to provide a world-class transportation system that is safe, innovative, reliable and dedicated to a prosperous Missouri.

MoDOT's Tangible Results:

- Keep Customers and Ourselves Safe
- Keep Roads and Bridges in Good Condition
- Provide Outstanding Customer Service
- Deliver Transportation Solutions of Great Value
- Operate a Reliable and Convenient Transportation System
- Use Resources Wisely
- Advance Economic Development

MoDOT's Value Statements:

- Be Safe,
- Be Accountable,
- Be Respectful,
- Be Inclusive,
- Be Bold,
- Be Better and
- Be One Team

  So we can be a great organization

Financial Summary Sheet

As of April 30, 2019

A. Total Estimated Costs	SFY 2020	SFY 2019
Part I – Planning	$19,859,636	$19,857,390
Part II – Metropolitan Planning	$10,973,154	$11,161,408
*Part III – Research, Development and Technology	$3,591,691	$2,610,811
TOTAL ESTIMATED COST	**$34,424,481**	**$33,629,608**
B. Available Federal Funds	**SFY 2020**	**SFY 2019**
Part I - State Planning		
Obligated but Not Spent	$5,822,208	$6,604,694
Unobligated Funds	$29,174,012	$31,754,178
Estimated Annual Apportionment	$15,164,000	$14,800,000
Less:	($39,800)	NA
- Pooled Funds…….$39,800 estimated		
SUBTOTAL – STATE PLANNING	**$50,120,420**	**$53,158,872**
Part II - Metropolitan Planning		
Obligated but Not Spent	$7,190,835	$10,114,318
Unobligated Funds	$13,652,770	$12,051,824
Estimated FHWA PL Annual Allocation	$5,500,000	$5,400,000
Estimated FTA 5303 Annual Allocation	$1,818,340	$1,780,592
SUBTOTAL – METRO PLANNING	**$28,161,945**	**$29,346,734**
Part III – Research		
**Obligated but not spent	$1,859,311	$2,833,015
Unobligated Funds	$9,474,535	$8,699,672
Estimated Annual Apportionment	$5,055,000	$4,800,000
Less:	($2,062,685)	($1,839,146)
- NCHRP……..….$1,112,000 estimated		
- TRB Core……..….$180,685 estimated		
- Pooled Funds…..….$770,000 estimated		
SUBTOTAL – RESEARCH	**$14,326,161**	**$14,493,541**
TOTAL FEDERAL FUNDS AVAILABLE	**$92,608,526**	**$96,999,147**

* This does not include NCHRP, TRB Core and Pooled Funds.

**The majority of "Obligated but Not Spent" funds are obligated for pooled fund projects proposed project financing for SFY 2019.

C. Proposed Budget Estimates for SFY 2020

C. Proposed Budget Estimates for SFY 2020	Federal Funds	Percent	Matching Funds	Total
State Planning	$15,887,709	80%	$3,971,927	$19,859,636
Metropolitan Planning (PL and 5303) (Estimated)	$8,778,523	80%	$2,194,631	$10,973,154
* Research	$2,999,557	Varies	$592,134	$3,591,691
TOTAL SP, SR & CPG	**$27,665,789**		**$6,758,692**	**$34,424,481**

* This does not include NCHRP, TRB Core and Pooled Funds.

D. SFY 2019 SPR Budget Amounts

D. Proposed Budget Estimates for SFY 2019	Federal Funds	Percent	Matching Funds	Total
State Planning	$15,885,912	80%	$3,971,478	$19,857,390
Metropolitan Planning (PL and 5303) (Estimated)	$8,929,126	80%	$2,232,282	$11,161,408
* Research	$2,088,649	80%	$522,162	$2,610,811
TOTAL SP, SR & CPG	**$26,903,687**		**$6,725,921**	**$33,629,608**

* This does not include NCHRP, TRB Core and Pooled Funds.

Itemized Cost Budget Estimates and Actual Expenditures

Part I – Planning

Transportation Planning Activities	SFY 2020 Budget	SFY 2019 Budget
• Administration	$2,048,395	$797,033
• Planning and Performance Group		
o Planning and Policy Group	$612,673	$519,824
o Strategic Planning Group	$255,527	$374,197
• Statewide Programming	$720,941	$709,564
• Transportation Systems Management	$3,537,225	$3,396,348
o Administration	*$133,713*	*$132,083*
o Mapping and Customer Service	*$646,945*	*$643,272*
o Pavement Analysis and Application Dev.	*$681,291*	*$693,131*
o Traffic Collection	*$654,557*	*$655,978*
▪ Field Acquisition	*$852,971*	*$744,210*
o Data	*$567,748*	*$527,674*
SUBTOTAL	**$7,174,761**	**$5,796,966**
District Transportation Planning		
• CD	$1,568,211	$1,345,496
• KC	$1,731,695	$1,409,313
• NE	$930,691	$910,458
• NW	$533,201	$608,687
• SE	$658,421	$941,902
• SL	$887,311	$1,029,489
• SW	$853,831	$946,588
SUBTOTAL	**$7,163,361**	**$7,191,933**
Other Activities		
• Information Systems	$2,428,251	$3,421,641
• Regional Planning Commission	$1,375,000	$1,375,000
• Financial Planning & Reporting	$1,144,480	$1,118,523
• Bridge Division	$182,380	$177,853
• Design Division	$201,057	$546,874
• Innovative Partnerships and Alternative Funding	$185,346	$228,600
• Communications	$5,000	NA
SUBTOTAL	**$5,521,514**	**$6,868,491**
TOTAL PART I	**$19,859,636**	**$19,857,390**

Note: SFY 2019 Actuals will be submitted to FHWA as an addendum September 2019.

Part II – Urban (MPO)

Metropolitan Areas	Current CPG Contract Amount	Estimated FFY 2020 Local Match	Estimated Total FFY 2020 CPG Funds with Match	FFY 2019 CPG Funds with Match
NW Arkansas	$5,000	$1,250	$6,250	$6,250
Kansas City	$2,754,756	$688,689	$3,443,445	$3,443,445
St. Louis	$3,818,249	$954,562	$4,772,811	$4,653,158
Springfield	$558,554	$139,639	$698,193	$1,023,094
Columbia	$361,131	$90,283	$451,414	$451,414
Jefferson City	$163,886	$40,972	$204,858	$204,858
Joplin	$650,312	$162,578	$812,890	$812,890
St. Joseph	$230,978	$57,745	$288,723	$288,723
Cape Girardeau	$235,657	$58,914	$294,571	$277,578
TOTAL PART II	**$8,778,523**	**$2,194,631**	**$10,973,154**	**$11,161,408**

Note: - The estimated total of MPO contracts (CPG agreements) in place for the SFY 2020 SPR work program is $8,778,523

- The estimated PL amount is before post-apportionment set-asides; before penalties; before sequestration.
- For SFY 2020 SPR, estimated total apportioned PL Funds = $5,499,762 and Obligation limitation applied at 98%.

Part III – Research – SPR

Activity	SFY 2020 Budget	SFY 2019 Budget
• Administration (SPR20ADS)	$244,869	$256,313
• Research (SPR20RDS)	$2,753,908	$1,763,908
• Development (SPR20DVS)	$95,414	$93,090
• Technology Transfer (SPR20TTS)	$497,500	$497,500
***TOTAL PART III**	**$3,591,691**	**$2,610,811**

* This does not include NCHRP, TRB Core and Pooled Funds.

Note: SFY 2019 Actuals will be submitted to FHWA as an addendum September 2019.

Total MoDOT SPR Work Program

	SFY 2020 Budget	SFY 2019 Budget
• Part I – Planning	$19,859,636	$19,857,390
• Part II – Metropolitan Planning	$10,973,154	$11,161,408
• *Part III – Research	$3,591,691	$2,610,811
TOTAL MoDOT SPR WORK PROGRAM	**$34,424,481**	**$33,629,608**

* This does not include NCHRP, TRB Core and Pooled Funds.

Note: SFY 2019 Actuals will be submitted to FHWA as an addendum September 2019.

CFR 420.107(c) Summary

FY 2019 FHWA Research Apportionment (25%)	$5,054,631
FY 2020 Research Budget	$5,062,242
Pooled Funds	*$770,000*
NCHRP	*$1,112,000*
TRB Core	*$180,685*
Part III Research (Federal Portion Only)	*$2,999,557*

WORK PLANS

Core and Mandated Activities

Part I – Planning

TRANSPORTATION PLANNING ACTIVITIES

ADMINISTRATION

Purpose and Scope: Administration provides for the management of Transportation Planning's core functions. Included are items such as training, for example: NHI courses, supervisory/management training, APA training and other various training courses. Also included are items such as office supplies, equipment and travel expenses. The budget amount includes personal services and fringe benefits for employees in this unit.

This unit also includes MoDOT's participation in the Midwest Rail Initiative that involves sharing of information regarding freight and passenger movements on rail and freight data update coordination and planning/economic studies.

SFY 2020 Proposed Activities:

- Continue providing for the management of Transportation Planning's core functions including trainings, office supplies, equipment and travel expenses
- Host a statewide planning partner meeting early 2020 to share transportation information and best practices
- Continue participating in the Midwest Rail Initiative
- Attend conferences, peer exchanges, AASHTO meetings and training courses
- Conduct an economic impact analysis for the SFY 2020-2024 STIP
- Begin development of State Freight and Rail Plans

SFY 2019 Accomplishments:

- Hosted one planning partner meeting, February 8, 2019, and shared information regarding transportation funding, planning for the next Statewide Transportation Improvement Program and asset management planning by regional group
- Attended conferences, peer exchanges, AASHTO meetings and training courses
- Conducted an economic impact analysis for the SFY 2019-2023 STIP

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$ 2,048,395**	SPR2040S
Projected Budget Amount SFY 2019	**$** 797,033	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

PLANNING AND PERFORMANCE GROUP

Purpose and Scope: Planning and Performance Group (PPG) includes both the Planning and Policy and Strategic Planning Groups. These two groups have been consolidated into one unit and will continue working on current goals and accomplishments assigned to each group. The budgets and actuals will be tracked separately for each group. The budget amounts include personal services and fringe benefits for employees in these units.

Planning and Policy: Planning and Performance Group maintains the 20-year long-range transportation plan. This plan analyzes needs for all modes of transportation and provides policy and goal direction for MoDOT as it develops the Statewide Transportation Improvement Program. This unit also covers a wide variety of activities and ensures MoDOT's program delivery moves as seamless as possible.

Strategic Planning Group: MoDOT aligns the strategic planning process with its mission, values and tangible results. The tangible results focus on outcomes that MoDOT's customers expect the department to accomplish. MoDOT uses strategic management to ensure this is an ongoing process rather than an annual event. By linking performance measures to its tangible results, related strategies and objectives are identified, and action plans for the priority items are created. These action plans are continuously reviewed and modified, as necessary, throughout the year. Quarterly management review of the performance management system, known as Tracker, ensures accountability at all levels.

Annual leadership focus meetings establish high-level department direction and initiatives that help drive performance in key areas. The budget amount includes personal services and fringe benefits for employees coordinating and facilitating these efforts.

SFY 2020 Proposed Activities:
Planning and Policy Group:

- Attend MPOs board and technical committee meetings
- Engage the public in discussions about additional transportation investments and needs
- Continue assisting RPCs in:
  - developing and maintaining work programs and regional transportation plans
  - providing local consultation with rural local officials
- Continue assisting MPOs in developing and maintaining the following work products
  - unified planning work programs
  - transportation improvement programs
  - long-range transportation plans
  - air quality conformity determinations
  - public involvement plans
- Work with local communities to assist with transportation air-quality issues and policy development
- Coordinate and support MoDOT's national involvement in FAST Act/MAP-21 performance measure development and implementation
- Continue monthly FAST Act/MAP-21 implementation calls with MPOs, RPCs, ONE DOT, Arkansas, Illinois and Kansas DOT, FHWA and FTA staff to collaborate on performance management requirements and share best practices
- Assist MPOs in Performance Based Planning and Programming
- Continue to improve the Transportation Asset Management Plan that is federally required
- Continue to update the district Asset Management Plans
- Update the FY 2020 State Planning and Research Work Program

SFY 2020 Proposed Activities:
Strategic Planning Group:

- Provide team facilitation for process improvement and business planning teams
- Continue to support and develop the Tracker performance management system
- Continue to refine MoDOT's performance scorecard
- Provide guidance and reviews of performance measures to MoDOT management
- Produce the quarterly Tracker publications and coordinate quarterly Tracker Review meetings
- Coordinate "deep-dive" sessions and Focal Point publications for the MoDOT FOCUS
- Coordinate strategic issue sessions for senior manager meetings
- Continue to coordinate and develop the Innovations Challenge program
- Conduct Transportation Planning Division's internal and external customer satisfaction surveys
- Modernize MoDOT Tracker by implementing a full online/website version of Tracker
- Serve on the Governor's Dashboard Team and glean best practices to implement
- Update Transportation Planning's Strategic Business Plan

SFY 2019 Accomplishments:
Planning and Policy Group:

- Assisted the RPCs with:
  - developing and maintaining work programs and regional transportation plans and
  - providing local consultation with rural local officials
- Attended MPOs board and technical committee meetings
- Engaged in public discussion about additional transportation investment needs
- Continued collaborating with RPCs , MPOs and MoDOT district offices on a variety of planning issues targeted at improving federal required work products and to further enhance transportation planning efforts
- Coordinated and supported MoDOT's national involvement in FAST Act/MAP-21 performance measure development and implementation
- Initiated monthly FAST Act/MAP-21 implementation calls with MPOs, RPCs, ONE DOT, Arkansas, Illinois, and Kansas DOT, FHWA and FTA staff to collaborate on performance management requirements and share best practices
- Assisted MPOs in developing performance measures and targets
- Developed the Transportation Asset Management Plan that is federally required
- Administered Tracker surveys: Customer Service Survey (Call Center)
- Worked with districts on Transportation Asset Management Plan
- Updated and submitted FY 2019 State Planning and Research Work Program
- Revised the public involvement elements of the Engineering Policy Guide

SFY 2019 Accomplishments:
Strategic Planning Group:

- Supported and developed the Tracker performance management system including the production of the quarterly Tracker publications and coordination of the quarterly Tracker Review meetings
- Provided guidance and reviews of performance measures to MoDOT management
- Deployed MoDOT's first FOCUS initiatives
- Coordinated and further developed the Innovations Challenge program
- Provided guidance to other DOTs interested in starting their own innovations programs
- Identified 49 best practices in the Innovations Challenge program, which have been shared for statewide implementation

Financials	Amount	Work ID Code
Planning and Policy Group		
Projected Budget SFY 2020	**$612,673**	SPR2040S
Projected Budget Amount SFY 2019	$519,824	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S
Strategic Planning Group		
Projected Budget SFY 2020	**$255,527**	SPR2040S
Projected Budget Amount SFY 2019	$374,197	SPR1990S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1990S

STATEWIDE PROGRAMMING

Purpose and Scope: The Statewide Programming unit develops the STIP and STIP-related products. This includes efforts by MoDOT Central Office personnel only. Personal services and fringe benefits for all employees within this work unit are also included in the budget amount.

SFY 2020 Proposed Activities:

- Produce and maintain the 2020-2024 STIP in accordance with the guidelines of the Planning Framework and state and federal regulations
- Produce various reports on STIP programs and projects as needed

SFY 2019 Accomplishments:

- Updated and completed the 2019-2023 STIP
- Incorporated STIP revisions as needed
- Developed STIP reports as needed
- Posted Program vs. Award and Advanced Construction conversion reports on the STIP web site

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$ 720,941**	SPR2040S
Projected Budget Amount SFY 2019	$709,564	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

TRANSPORTATION SYSTEM ANALYSIS

ADMINISTRATION

Purpose and Scope: Transportation Planning's administration manages and administers field acquisition, asset data, traffic data, travel way data, analysis of asset/travel way, data query and traffic operations. The budget amount also includes personal services and fringe benefits for all employees within this work unit.

SFY 2020 Proposed Activities:

- Administer and continue to improve the HPMS program
- Analyze transportation data and provide timely and accurate information to MoDOT's customers
- Continue to provide data for the development of the MoDOT Asset Management Plan
- Administer and continue the Data Zone project

SFY 2019 Accomplishments:

- Administered HPMS program
- Analyzed and provided transportation data to customers and transportation decision makers
- Coordinated the Data Zone project
- Provided data for the development of the MoDOT Asset Management Plan

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$133,713**	SPR2040S
Projected Budget Amount SFY 2019	$132,083	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

MAPPING and CUSTOMER SERVICE

Purpose and Scope: The Mapping and Customer Service unit is responsible for the following. The budget amount includes personal services and fringe benefits for all employees within this work unit.

- Provide analysis, custom queries and reports using TMS data
- Provide training and documentation for TMS and customer support through our TMS Help Desk
- Test TMS software for monthly updates
- Maintain and publish the official Missouri State Highway Map
- Maintain statewide functional classification maps
- Maintain and update state, county and city maps and develop specialty maps as requested
- Provide GIS data and support as requested
- Provide official state system and county road mileages
- Respond to custom mileage requests
- Work with all Missouri counties to update their county road mileages in TMS
- Provide outstanding customer service both inside and outside the department
- Work with Information Systems to gather business requirements for TMS design

SFY 2020 Proposed Activities:

- Continue updating, printing and providing distribution support of the official Missouri State Highway Map
- Provide GIS data and mapping support to SEMA/FEMA during declared disasters in Missouri
- Provide custom GIS data and specialty maps to internal and external customers and planning partners
- Create maps for STIP, maintenance operations, internal and external customers and updates for Governmental Relations.
- Create annual ACPA van trip map booklet, annual bridge and culvert inspection maps, monthly letting maps and weekly work zone maps
- Update functional classification maps as required
- Provide MoDOT representation on Missouri GIS Advisory Council, Missouri Board on Geographic Names, AASHTO's GIS for Transportation, MidAmerica GIS Consortium, Missouri Geographic Alliance, Missouri Mappers Association, USGS National Map Corps, and the Statewide Incident Response Plan Team
- Provide GIS representation on the NCHRP Roadside Monarch Habitat Project
- Provide continued oversight to the Missouri statewide high-resolution imagery program (Ortho-Imagery Program) with the Missouri Office of Administration
- Conduct monthly TMS application update testing, provide support and TMS data restoration as required by our route update process
- Create and submit annual mileage of county roads by surface type report to the Missouri Department of Revenue and annual certified mileage report to the Governor and FHWA for approval
- Create annual official state system mileage report and various TMS mileage reports for internal and external customers
- Create county map books and work with the districts and county commissioners to update their official mileage that determines CART funding
- Research TMS crash location inquiries submitted by law enforcement
- Identify construction projects that opened to traffic
- Conduct annual statewide TMS/GIS workshop for RPC and MPO partners
- Test TMS Modernization, create manuals and provide training
- Test new and existing Data Zone applications and create/update manuals and videos as needed
- Create videos for TMS training
- Continue updating TMS Metadata in SharePoint for tables, views and code tables
- Provide ArcGIS software support for ArcMap 10.6.1/Oracle 12c
- Provide ongoing GIS data exchange with Missouri's surrounding states
- Participate in GIS Day through education outreach at elementary schools
- Participate in Information System software test group
- Provide ongoing legislative support regarding transportation funding
- Provide outstanding internal and external customer service

SFY 2019 Accomplishments:

- Participated in Information System software test group
- Provided ArcGIS software testing support for ArcMap 10.6.1/Oracle 12c upgrade
- Completed Windows 10 testing
- Tested reports and correspondence for Crystal and Cognos upgrades
- Tested TMS Modernization rewrite and updates
- Tested new Data Zone applications and created manuals and videos
- Created and updated training documentation for TMS

- Provided training on TMS/GIS applications via video conference and classroom atmosphere
- Provided training for Chief Counsel's Office on the Crash Browser, ARAN and Crash Statistics Map
- Conducted monthly TMS application update testing, provided support and TMS data restoration
- Provided ongoing GIS data exchange with Missouri's surrounding states
- Provided custom GIS data and specialty maps to internal and external customers and planning partners
- Created county map books, annual STIP maps, ACPA van trip map booklet, bridge and culvert inspection maps, monthly letting maps and weekly work zone maps
- Updated functional classification maps
- Continued distribution support of the official 2017-2018 Missouri State Highway Map and created the new edition of the 2019-2020 state map
- Provided representation at the ESRI Midwest User Conference
- Provided MoDOT representation on MOGISCON 2019 Conference Committee, Missouri GIS Advisory Council, Missouri Board on Geographic Names, AASHTO's GIS for Transportation, MidAmerica GIS Consortium, Missouri Geographic Alliance, Missouri Mappers Association, USGS National Map Corps, Statewide Incident Response Plan Team, and Missouri Geographic Bee 2019
- Provided GIS representation on the NCHRP Roadside Monarch Habitat Project
- Provided representation to the Missouri statewide high-resolution imagery program (Ortho-Imagery Program) with the Missouri Office of Administration
- Provided representation on the state Innovations Challenge Team and the Statewide Incident Response Team
- Submitted annual mileage of county roads by surface type report to the Missouri Department of Revenue and annual certified mileage report to the Governor and FWHA for approval
- Created annual official state system mileage report and various TMS mileage reports for internal and external customers
- Worked with the districts and county commissioners to update their official county road mileage that determines CART funding
- Researched TMS location inquiries submitted by law enforcement
- Identified construction projects that opened to traffic

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$646,945**	SPR2040S
Amended Budget Amount SFY 2019	$643,272	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

PAVEMENT ANALYSIS AND APPLICATION DEVELOPMENT

Purpose and Scope: The Pavement Analysis and Application Development unit provides analysis of pavement data used in project selection and prioritization process as well as track conditions for strategic and long-range plans, and compiling and submitting all HPMS data as required by FHWA. This also includes personal services and fringe benefits for all employees within this work unit. This group is also responsible for building and maintaining GIS data for use in TMS including the Location Referencing System (LRS), boundaries and general data sets. As part of this function the group works closely with other business units to ensure the data integrity of their inventory as the route network changes, assets and data such as bridges, functional class and crashes is not lost and properly located. Additionally this group

develops, creates and assists with custom application development and TMS building asset inventories, mapping tools and custom data applications for managing and reporting asset information.

SFY 2020 Proposed Activities:

- Evaluate pavement data and prepare for HPMS submittal
- Provide pavement data, analysis and projections for transportation decision-making
- Enhance, refine and automate more pavement management and reporting
- Verify, maintain and update and MoDOT's linear referencing system for all public roads
- Support development of new Maintenance Management System (MMS) helping create scripts and datasets to aid with planning and reporting of activities associated with maintaining assets
- Support Motor Carrier Services automatic superload routing network, maintain and update restrictions and turns
- Prepare and redesign GIS/LRS applications for upgraded GIS software platform
- Monitor pavement data to evaluate current and past best practices in pavement management
- Assist and prepare for GIS software upgrade, updating tools, enhancing mapping and spatial analysis tools to take advantage of new software updates

SFY 2019 Accomplishments:

- Completed pavement data analysis and preparation for dual carriage routes for HPMS submittal
- Continued development of data zone applications
- Provided analysis and input for MoDOT's asset management plan
- Maintained MoDOT's linear referencing system and continually worked with counties to verify local roads
- Created new scripts to update bridge locations/clearances nightly for use in automatically routing OSOW vehicles.
- Created data/processes for new data zone crash prediction map tool for analyzing systematic safety improvement cost/benefit.
- Created new LRS data type for 'inventories' that are not located on roadways
- Assisted with new Media inventory data type and application in TMS which allows storage of media files in TMS, images, documents, video etc.
- Continued working with law enforcement agencies to ensure proper location of crash data on MoDOT's LRS
- Added new quality control checks to pavement data ensuring data integrity
- Added new asset inventories into the modernized LRS

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$681,291**	SPR2040S
Projected Budget Amount SFY 2019	$693,131	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

TRAFFIC/COLLECTION

Purpose and Scope: The Traffic/Collection unit provides current traffic data, design traffic projections, road-user costs analysis, VMT and annual reports. This unit provides the department and external customers with traffic trends, VMT and current and historical traffic information. The unit provides MPOs and other local entities off-system traffic information and VMT for MoDOT and

HPMS use. The budget amount also includes personal services and fringe benefits for all employees within this work unit.

SFY 2020 Proposed Activities:

- Provide traffic and pavement data for planning and design activities
- Calculate and provide 2019 statewide travel data

SFY 2019 Accomplishments:

- Processed portable and permanent counts in accordance with the traffic monitoring guide for HPMS submittal
- Calculated and provided 2018 statewide travel data and reports
- Collected pavement data on 36,577 miles of Missouri's roadways

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$654,557**	SPR2040S
Projected Budget Amount SFY 2019	$655,978	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

Field Acquisition

Purpose and Scope: The Field Acquisition unit is responsible for the following. This includes personal services and fringe benefits.

- Collecting condition and operational data for the state highway system
- Processing and verifying physical roadway data
- Analyzing and reporting information on pavements
- Traffic data (permanent count locations and special requests) and portable traffic counts, including vehicle classification and speed data
- Manual turning movement counts
- WIM data
- HPMS data collection
- Pavement condition data collection, processing and rating - ARAN van
- Condition reports for pavements
- ARAN video

SFY 2020 Proposed Activities:

- Complete collection of approximately 5,657 portable counts and classification counts as requested with at least 30 percent of those counts being classification counts
- Install and repair ATR sites as needed due to new pavement or faulty sensors in the pavement
- Maintain our ATR sites with at least 98 percent cellular modem connection
- Collect HPMS data as requested
- Collect approximately 35,000 miles of pavement data

SFY 2019 Accomplishments:

- Collected 6,051 portable counts and class counts with 59 percent of those being classification counts
- Installed and repaired existing ATR sites
- Continued maintaining cellular modem communications to our ATR sites, currently at 98 percent switchover

- Collected all HPMS data as requested
- Collected all pavement data as requested

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$852,971**	SPR2040S
Projected Budget Amount SFY 2019	$744,210	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

DATA

Purpose and Scope: The Data section maintains the system data associated with the state highway network. The budget amount also includes personal services and fringe benefits for all employees within this work unit.

- Change in route status
- Functional classification
- HPMS data
- Rural and urban area functional classification maps
- Bridge vertical clearance data
- State system classification
- National Highway System (NHS)
- Physical inventory of lane data (project location and length, number of lanes, pavement type, widths, thickness)
- Inventory of various data types (i.e., striping, truck routes, auto issue routes)

SFY 2020 Proposed Activities:

- Maintain all HPMS sample and universe segments
- Verify HPMS data accuracy and meet target submittal date to FHWA
- Develop and submit the Pavement Report Card
- Maintain roadway data and its attributes
- Update bridge vertical clearances
- Maintain various TMS data types and update data as required by Transportation Planning's route update process
- Process functional classification requests and changes
- Improve data accuracy by querying data to locate inconsistencies
- Respond to requests for relocating bridges and other customer service requests
- Supply data to create various maps
- Provide data for automated Motor Carrier routing
- Assist with maintenance of Motor Carrier application that supports safe, efficient and timely movement of freight through Missouri
- Continue improving the Change in Route Status Reports filing process and the process to expedite data retrieval
- Maintain an inventory of Federal Aid Primary as of 1991 for various legal purposes related to the management of Outdoor Advertising
- Maintain striping data and its attributes and continue with statewide inventory review
- Review county map books for ownership and accuracy
- Collaborate with FHWA with transportation data regarding urban boundaries

- Work with FHWA to achieve approval of new urban boundaries
- Update bridge vertical clearance reporting system to assist with verifying all vertical clearance changes
- Collect, manage, and report data on all public roads in an effort to support the strategic and performance-based goals in the SHSP and HSIP

SFY 2019 Accomplishments:

- Maintained all HPMS sample and universe segments and submitted the data to FHWA
- Maintained an inventory of roadway lane data and its attributes
- Developed and submitted the Pavement Report Card
- Entered approximately 300 roadway projects into TMS
- Began statewide review of striping inventory data
- Updated bridge vertical clearances and answered bridge and clearance related questions
- Tested improvements to Outdoor Advertising applications and maps
- Maintained various TMS data types and updated data as required by Transportation Planning's route update process
- Processed standard functional classification requests and changes
- Researched and answered inquiries submitted by internal customers (i.e., ownership)
- Provided GIS section with modifications to MoDOT's route network
- Updated MoDOT performance measures to provide management with information on roadway projects
- Served as a liaison between Motor Carrier Services and Transportation Planning's concerning routing and junction issues
- Assisted with testing TMS application changes and software upgrades for associatives
- Updated NHS data upon approval from FHWA and completed NHS changes
- Processed Change in Route Status Reports
- Assisted with implementation of new Motor Carrier application that supports safe, efficient and timely movement of freight through Missouri
- Researched and determined road sections utilizing plans, deeds and history maps
- Provided technical assistance with database issues pertaining to bridge inventory
- Conducted a statewide review of ownership data
- Reviewed county map books and assigned ownership
- Combined data records as requested using a data rollup program
- Collaborated with FHWA with transportation data regarding urban boundaries

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$567,748**	SPR2040S
Projected Budget Amount SFY 2019	$527,674	SPR1940S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1940S

DISTRICT TRANSPORTATION PLANNING

This program supports the department's district planning staff in efforts to provide comprehensive, cooperative and continuing transportation planning assistance and direction to the district staff, MPOs and RPCs. It includes the district staff efforts and activities with the MPOs, RPCs, local government officials and federal transportation agencies that support the long-range planning process and programming of transportation needs and pre-scoping activities.

District Transportation Planning	*SFY 2020 Budget*	*SFY 2019 Budget*
• CD	$1,568,211	$1,345,496
• KC	$1,731,695	$1,409,313
• NE	$930,691	$910,458
• NW	$533,201	$608,687
• SE	$658,421	$941,902
• SL	$887,311	$1,029,489
• SW	$853,831	$946,588
SUBTOTAL	**$7,163,361**	**$7,191,933**

Note: SFY 2019 Actuals will be submitted in the September 2019 Addendum.

OTHER ACTIVITIES

INFORMATION SYSTEMS

Purpose and Scope: MoDOT is directing a portion of the SPR funds for support, maintenance and modernization of the Transportation Management System.

SFY 2020 Proposed Activities:

- Maintain and modernize the Transportation Management System

SFY 2019 Accomplishments:

- TMS Core Maintenance Support, including repair, maintenance, and fix of current system, including the following key areas of TMS that provide critical support to MoDOT users and customers: Bridge, Adopt A Highway, Outdoor Advertising, Statewide Transportation Improvement Program, Traffic & Congestion, Pavement Tools, Intelligent Transportation System and Safety System.

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2020	**$2,428,251**	SPR20ISS
Projected Budget Amount SFY 2019	$3,421,641	SPR19ISS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19ISS

REGIONAL PLANNING COMMISSIONS

Purpose and Scope: MoDOT is directing a portion of the SPR funds to regional planning agencies for transportation planning activities. These funds provide sources of funding for the Missouri RPC to carry out comprehensive and continuing transportation planning processes in cooperation with state and local planning partners. State Planning and Research funds that are allocated to RPCs assist with producing regional transportation plans, work programs involving transportation planning activities, citizen involvement processes, and other rural transportation planning efforts. Seventeen RPCs will receive federal SPR funding at approximately $65,000 each. Budget and actual amounts exclude local match.

SFY 2020 Proposed Activities:

- Cooperate and collaborate with MoDOT on transportation planning processes
- Attend MACOG meetings held monthly in Jefferson City to discuss various issues with RPCs
- Participate in RPCs' transportation advisory committee meetings held in the respective regions throughout the state
- RPCs work with MoDOT and districts with developing work programs involving transportation planning activities
- Attend MoDOT District meetings
- Participate in Blueprint for Safety
- Participate in FAST Act/ MAP-21 conference calls

SFY 2019 Accomplishments:

- Attended MACOG meetings held monthly in Jefferson City to discuss various issues with RPCs
- Participated in RPCs technical committee meetings held in the respective regions throughout the state
- Worked with RPCs and districts with developing work programs involving transportation planning activities
- Attended MoDOT District meetings
- Participated in Blueprint for Safety
- Attended Statewide Planning Partner meetings hosted by MoDOT, February 8, 2019

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$1,375,000**	SPR2027S
Budget Amount SFY 2019	$1,375,000	SPR1927S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1927S

FINANCIAL SERVICES

Purpose and Scope: These activities support MoDOT's budget, finance, funds management and infrastructure bank activities. In addition, funds will be managed to achieve a balanced budget and provide coordination of STIP and federal-aid projects. Financial models are prepared to support department long-term plans and short-term cash needs. In addition, the Financial Service staff will continue to provide information on innovative sources of funding for the department's transportation projects. The budget amount also includes personal services and fringe benefits for employees within this work unit.

SFY 2020 Proposed Activities:

- Provide support for MoDOT's budget, finance, funds management and infrastructure bank

SFY 2019 Accomplishments:

- Provided activities to support MoDOT's budget, finance, funds management and infrastructure bank activities

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$1,144,480**	SPR2093S
Projected Budget Amount SFY 2019	$1,118,523	SPR1993S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1993S

BRIDGE DIVISION

Purpose and Scope: MoDOT is directing a portion of the SPR funds for Bridge Division staff spending all or a portion of their time working on projects prior to them being included in the STIP.

SFY 2020 Proposed Activities:

- Prepare projects to be included in the STIP

SFY 2019 Accomplishments:

- Prepared projects to be included in the STIP

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$182,380**	SPR20BRS
Amended Budget Amount SFY 2019	$177,853	SPR19BRS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19BRS

DESIGN DIVISION

Purpose and Scope: MoDOT is directing a portion of the SPR funds for Design Division staff spending all or a portion of their time working on projects prior to them being included in the STIP. In addition, the Design staff spends time on federal grant applications, safety benefit cost ratio and Facebook Survey-Right Transportation Solutions.

SFY 2020 Proposed Activities;

- Prepare projects to be included in the STIP
- Conduct and review Facebook Survey-Right Transportation Solutions
- Assist consultant with federal grant applications and safety benefit cost ratio

SFY 2019 Accomplishments:

- Prepared projects to be included in the STIP

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$201,057**	SPR2095S
Amended Budget Amount SFY 2019	$546,874	SPR1995S
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR1995S

INNOVATIVE PARTNERSHIPS AND ALTERNATIVE FUNDING

Purpose and Scope: The Division will develop programs as an adjunct arm of the Director's Office on issues and projects. Programs are largely focused upon alternative revenue strategies and technological innovation in the vehicle communication technology and autonomous vehicles sectors.

SFY 2020 Proposed Activities:

- FOCUS: Strategic Initiatives for Continuous Improvement
  - Safety – Service - Stability
- Deployment of various experimental vehicle communication technologies
- Assessment of various FHWA and USDOT credit assistance tools for initiation in Missouri
- Development of policy initiatives for the Director's office for review by state government stakeholders
- Advising on preparation of various discretionary grant applications to USDOT and FHWA
- Research activities in support of MoDOT Director initiatives
- Administration of Surface Transportation Systems Funding Alternative (STSFA) Program

SFY 2019 Accomplishments:

- Filed enabling legislation to change vehicle registration from taxable horse power to MPG
- Benefit Cost Analysis of FOCUS Initiatives
- Submitted INFRA Grant for 251 Bridges
- Administered the Surface Transportation Systems Funding Alternative (STSFA) Program

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$185,346**	SPR20IPS
Projected Budget Amount SFY 2019	$228,600	SPR19IPS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19IPS

COMMUNICATIONS

Purpose and Scope: The Division will direct the Customer Satisfaction Survey. This study evaluates MoDOT customer satisfaction through use of a customer survey.

SFY 2020 Proposed Activities:

- Administer MoDOT Customer Satisfaction Survey

Financials	Amount	Work ID Code
Projected Budget SFY 2020	$5,000	SPR20CRS
Projected Budget Amount SFY 2019	NA	NA
Actual Cost SFY 2019	NA	NA

Part II – Urban Transportation Planning

TRANSPORTATION PLANNING IN METROPOLITAN AREAS – CONSOLIDATED PLANNING GRANT (CPG)

The U.S Department of Transportation's Consolidated Planning Grant Program (CPG) allows the States and Metropolitan Planning Organizations (MPOs) to merge FTA metropolitan or statewide planning funds with FHWA Planning (PL) funds to provide States support for both highway and transit planning activities to single consolidated grants. This CPG program fosters a cooperative effort between the Federal agencies and the participating States to streamline the delivery of their planning programs providing the flexibility in the use of planning funds. Beginning July 1, 2003, MoDOT elected to have FHWA PL Funds and FTA Section 5303 Metropolitan Transportation Planning Funds consolidated. As of June 2016, the designated lead agency for administering the CPG funds was changed from FTA to FHWA.

CPG funds provide the principal source of funding for Missouri MPOs to carry out a comprehensive and continuing transportation planning process in cooperation with local, state and federal transportation agencies. This process is a prerequisite for receiving federal-aid funding for transportation improvements in metropolitan areas. FAST Act reaffirmed the leading role of the MPOs in the transportation improvement decision-making process, particularly in the large urbanized areas of more than 200,000 populations.

CPG funds, which are all allocated to MPOs, assist MPOs with producing long-range multimodal transportation plans, transportation improvement programs, planning work programs, studies, citizen involvement processes and other urban transportation planning requirements and goals

Under CPG, the FTA and FHWA continue to distribute metropolitan planning and Statewide planning funds according to each agency's statutory formulas that the MoDOT distributes to MPOs by formulas that meet the legislative factors for each category of funds in 23 U.S.C. 104(f)(4) and 49 U.S.C. 5305(d)(2). MoDOT's distribution formula has been developed in consultation with the MPOs, and approved by FTA and FHWA for their respective programs.

The following chart shows the estimated amount of CPG funds (FHWA PL and FTA Section 5303) available for Missouri's MPOs to carry out the metropolitan transportation planning work activities to be budgeted for in each MPO's annual Unified Planning Work Program (UPWP). The MPOs will include the below listed CPG amounts or similar amounts in their UPWPs to complete activities necessary to carry out metropolitan transportation planning. Each MPO's UPWP is approved by the MPO's Policy Board and the FHWA/FTA (ONEDOT). Planning grant agreements based on approved UPWPs are executed between the MPOs and MoDOT to allow the pass through of Federal planning funds and 5303 Transit funds to the MPOs. SFY 2020 5303 allocation amount used 2010 census urbanized area populations.

Table 1: Total CPG Funds Available to MPOs for SFY 2020 UPWP Work Activities

Metropolitan Areas (Fiscal Year)	MPO Balances as of May 2019 (with FY 2019 allocation)	Estimated FFY20 PL Allocation	Estimated FFY20 5303 Allocation Amounts	Estimated Total CPG Funds	Current CPG Contract Amount
NW Arkansas 07/01 -06/30	$1,000	$5,000	$0	$6,000	$5,000
Kansas City 01/01 - 12/31	$3,464,022	$1,486,518	$504,734	$5,455,274	$2,754,756
St. Louis 07/01 - 06/30	$10,526,040	$2,630,616	$953,594	$14,110,250	$3,818,249
Springfield 07/01 - 06/30	$942,708	$474,234	$146,822	$1,563,765	$558,554
Columbia 10/01 - 09/30	$722,190	$220,555	$66,913	$1,009,658	$361,131
Jefferson City 11/01 - 10/31	$502,094	$130,026	$31,396	$663,516	$163,886
Joplin 11/01 - 10/31	$1,095,831	$163,170	$44,399	$1,303,400	$650,312
St. Joseph 01/01 - 12/31	$704,598	$157,746	$42,272	$904,616	$230,978
Cape Girardeau 07/01 - 6/30	$674,421	$121,902	$28,209	$824,532	$235,657
TOTAL PART II	**$18,632,904**	**$5,389,767**	**$1,818,339**	**$25,841,010**	**$8,778,523**

* The MPOs balance is adjusted to include the actual SFY 2019 CPG allocation and equals the unobligated prior year (SFY 2019 and older) CPG allocated amounts. The MPOs balance column updates with payments of invoices and the allocation of CPG funds. The balance reported is a snapshot for the SPR work program update. The estimated total of MPOs' contracts (CPG agreements) that will be in place for the SFY 2020 SPR work program is $8,778,523.

MPOs annually program consolidated federal planning fund amounts in approved UPWPs to complete activities necessary to implement the metropolitan transportation planning process. MPO's UPWPs identify the available amounts of FHWA PL and FTA Section 5303 funds separately as funding sources but are not requested to identify SFY the separate amounts on each work activity or in the financial summary. Each MPO's UPWP is approved by the MPO's Policy Board and the FHWA/FTA (ONE DOT). CPG agreements, based on approved UPWPs, are executed between the MPOs and MoDOT to allow the pass through of Federal planning funds to the MPOs. MPOs have up to five years to spend CPG balances.

MoDOT allows MARC, OTO and EWG (Kansas City, Springfield and St. Louis, respectively) to use the value of MoDOT's state-funded only metropolitan planning activities to leverage the CPG funds (FHWA PL and FTA Section 5303). These MoDOT District planning activities include data collection, data analysis and data sharing that supports and enhances the overall planning process within each metropolitan planning area. Activities include such work items as traffic counts, signal timing, analysis of planning and/or traffic studies and analysis of traffic volumes and safety concerns. These work items support a more informed, better decision-making process for the MPOs and can be demonstrated to be directly attributable to the MPOs planning work elements. MPOs are able to utilize

80 percent of the value of MoDOT eligible metropolitan planning work as a credit to help provide the MPOs required 20 percent match for the Federal planning funds.

The estimated values of the MoDOT state-funded metropolitan planning work activities based on the most current completed fiscal year are as follows:

Kansas City MPO	$273,266
St. Louis MPO	$257,048
Springfield MPO	$150,000

Part III – Research

ADMINISTRATION

Purpose and Scope: Provide general administration funds for the development and monitoring of research programs that benefit the Missouri Department of Transportation. This includes distributing available information concerning past, current and proposed research work related to highways and transportation to supporting agencies; evaluation and development of proposed research studies; and, implementation and dissemination of research results.

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$244,869**	SPR20ADS
Amended Budget Amount SFY 2019	$256,313	SPR19ADS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19ADS

RESEARCH

Purpose and Scope: Research at MoDOT primarily expands and advances our knowledge in all areas of transportation, so we may provide the best, total-transportation system for Missourians. The research program responds to our customer needs, provides information and technology for management policy decisions and undertakes research and development issues that have high possibilities of being implemented. It also includes contingency funds for contract research studies approved after the start of the fiscal year.

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$2,753,908**	SPR20RDS
Amended Budget Amount SFY 2019	$1,763,908	SPR19RDS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19RDS

DEVELOPMENT

Purpose and Scope: Development studies find and implement products that have the most positive effect on MoDOT's operations. Development takes a product, process or method produced as a result of research and evaluates it for eventual implementation. Implementation applies the research, best practices and new product results within the department. The development and implementation process provides cost savings in material or time, safety issues or improved life-cycle costs.

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$95,414**	SPR20DVS
Amended Budget Amount SFY 2019	$93,090	SPR19DVS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19DVS

TECHNOLOGY TRANSFER

Purpose and Scope: Technology transfer provides mechanisms to coordinate the transfer of research results and information with MoDOT divisions and districts as well as with outside organizations. The Local Technical Assistance Program provides transportation information and training opportunities to local transportation agencies. Funding is provided to match other funds to support the BEAP and the TEAP. These programs offer assistance to local entities for bridge design and traffic studies. In addition, technology transfer provides direction and support to department personnel to maintain an understanding of new methodologies and technologies.

Financials	Amount	Work ID Code
Projected Budget SFY 2020	**$497,500**	SPR20TTS
Budget Amount SFY 2019	$497,500	SPR19TTS
Actual Cost SFY 2019	(See Addendum Sept. 2019)	SPR19TTS

Certification Statement

I, Jennifer Harper, Research Administrative Engineer, of the State of Missouri, do hereby certify that the State is in compliance with all requirements of 23 U.S. Code 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

Jennifer Harper
Research Administrative Engineer

6-20-19
Date

Part III Research Summary

Project No.	Project Name	SFY2020 Budget
TA196601	Research Administration	$244,869
TR19CONT	Research Contingencies	$881,812
TR201313	Secretary of State Library MOU	$5,344
TR201522	MoDOT Customer Satisfaction Tracking Survey	$13,087
TR201609	MEPDG Local Calibration	$46,976
TR201610	AASHTO Technical Service Program	$155,000
TR201720	Rejuvenating Asphalt Products	$25,610
TR201724	MoDOT Report Card Survey	$32,155
TR201806	Performance-Based Specifications of Fiber-Reinforced Concrete to Enhance Performance and Reduce Steel-Reinforcement in Structural Members	$4,796
TR201807	Understanding and Improving Heterogeneous, Modern Recycled Asphalt Mixes	$164,691
TR201809	Assessment and Repair of Corroded Steel H-Piles	$100,000
TR201811	Support for Balanced Asphalt Mixture Design Specification Development in Missouri	$24,476
TR201813	Leader-Follower TMA System	$357,449
TR201814	Leader-Follower TMA System Misc. Expenses	$16,664
TR201901	Work Zone Inspection Training using Enhanced Visualization Technology	$38,172
TR201902	Intelligent Compaction/Paver Mounted Thermal Profile-Consultant Contract-The Transtec Group	$112,182
TR201904	Compacted Concrete Pavement-SE District	$82,365
TR201905	Wicking Fabric (H2Ri) to Mitigate Pumping in Concrete Pavement Shoulder	$37,403
TR201908	Highway Safety Manual Training	$46,729
TR201910	Developing Implementation Strategies for Risk Based Inspection (RBI)	$32,757
TR201911	Inlaid Pavement Marking Evaluation	$109,739
TR201912	Predictive Deep Learning for Flood Evacuation Planning and Routing	$36,501
TR201917	Protection and Repair of P/S Girders Damaged due to Over-Height Vehicles	$80,000
TR201919	Field Implementation of Compacted Concrete Pavement - Mexico, MO	$30,000
TR202001	Library Support Contract (2020-2021)	$100,000
TR202002	Snow and Ice Treatment Products Evaluation	$60,000
TR202003	Evaluating Performance of Concrete Overlays	$60,000
TR202004	Traffic Disruption-free Bridge Inspection Initiative with Robotic Systems	$100,000
TD170701	New Product Evaluation	$95,414
TTAPT001	Local Technical Transfer Assistance Program (LTAP)	$300,000
TT200701	National Highway Institute (NHI)	$40,000
TTAPT001	BEAP and TEAP	$157,500
	Total	$3,591,691

Pooled Funds

TPF-5(255)	Highway Safety Manual	$20,000
TPF-5(305)	ME Design	$10,000
TPF-5(316)	Traffic Control Device (TCD) Consortium	$25,000
TPF-5(317)	Evaluation of Low Cost Safety Improvements	$5,000
TPF-5(319)	Transportation Management Center Pooled Fund Study	$25,000
TPF-5(334)	Enhancement to the Intelligent Construction Data Management (Veta) and Implementation	$25,000
TPF-5(341)	National Road Research Alliance (NRRA)	$150,000
TPF-5(343)	Roadside Safety Research for MASH Implementation	$50,000
TPF-5(353)	Clear Roads Phase II	$25,000
TPF-5(357)	Connecting the DOTs: Implementing ShakeCast Across Multiple State Departments of Transportation for Rapid Post-Earthquake Response	$15,000
TPF-5(396)	Mid-America Freight Coalition (MAFC) Phase 3	$37,000
Solicitation 1473	Development of Accelerated Weathering and Corrosion Tests to Identify High-Performance Coatings for Structural Steels	$25,000
Solicitation 1489	Midwest Roadside Safety Pooled Fund Program	$65,000
Solicitation 1492	Technology Transfer Concrete Consortium (FY20-FY24)	$8,000
Solicitation 1493	Smart WZ (FY20-FY24)	$50,000
Solicitation 1496	Aurora Program (FY20-FY24)	$25,000
Solicitation 1499	Determining the in-place strength of concrete using piezoelectric based sensors	$25,000
Solicitation 1501	Continuous Asphalt Mixture Compaction Assessment using Density Profiling System (DPS)	$25,000
Solicitation 1503	Solicitation 1503- Transportation Research and Connectivity (librarian toolkit / knowledge networking / information condition / analysis of resources / digitization efforts / ADA support)	$25,000
Solicitation 1504	No Boundaries Transportation Maintenance Innovations	$10,000
	Pooled Fund Contingency	$125,000
	Total Pooled Funds	$770,000
	TRB Core Subscription estimate	$180,685
	NCHRP FY2020 estimate	$1,112,000
	Total	$2,062,685

Administration – SPR20ADS

Estimated Cost - $244,869

TAyy6601 - Research Administration

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $244,869
Contract Period: 7/1/1966 to 6/30/2020
Funding: SPR 80%, State 20%

Project Description and Objectives:
Research administration is a funding source for the administration of research activities. This includes office support such as phone, supplies, and office equipment. The type of project is "contract other" because project work will include contract management. The purpose of this item is to provide funds for the development and monitoring of a program designed to meet the research needs of the Missouri Department of Transportation.

Proposed Activities for SFY 2019:
The salary and expenses of the Research Administrator and Research Engineer will be charged against this item.

SFY 2018 Accomplishments:
The Research Section had 37 active contract research projects and a total of 5 projects were completed at the end of the third quarter. The research Section also published 8 reports as of May 17, 2018.

Financials	Amount
Projected Budget SFY 2020	$244,869
Budget Amount SFY 2019	$256,313
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	N/A

Research – SPR20RDS

Estimated Cost - $2,753,908

TRyyCONT - Research Contingencies

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $881,812
Contract Period: 7/1/2018 to 6/30/2020
Contract Investigator: N/A
Funding: SPR 80%, State 20%

Project Description and Objectives:
Research and development contingencies are funds for unanticipated costs on current or new activities. These funds are for proposed research projects that are in the initiation stage and for unanticipated projects during the year. The type of project is "Contract Other" because project funded work will include contract management and contract expenditures.

Proposed Activities for SFY 2020:
In addition to funds for unanticipated costs on current or ongoing activities, funds have been included for studies that may be initiated during State Fiscal Year 2020. These include administrative and other eligible costs.

SFY 2019 Accomplishments:
9 new projects were approved for funding in Fiscal Year 2019.
TR201901 Work Zone Inspection Training using Enhanced Visualization Technology
TR201902 Intelligent Compaction/Paver Mounted Thermal Profile-Consultant Contract-The Transtec Group
TR201904 Compacted Concrete Pavement-SE District
TR201905 Wicking Fabric (H2Ri) to Mitigate Pumping in Concrete Pavement Shoulder
TR201908 Highway Safety Manual Training
TR201911 Inlaid Pavement Marking Evaluation
TR201912 Predictive Deep Learning for Flood Evacuation Planning and Routing
TR201918 Flood Inundation Maps to Support Flood Warning for Dardenne Creek
TR201919 Field Implementation of Compacted Concrete Pavement - Mexico, MO

Financials	Amount
Projected Budget SFY 2020	$881,812
Budget Amount SFY 2019	$591,035
Adjusted Budget Amount SFY 2019	$0
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	N/A

TR201313 - Secretary of State Library MOU

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: N/A
Contract Period: 7/1/2013 to 6/30/2020
Contract Investigator: Waheedah Bilal
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT has established a library to serve employees, researchers and industry partners. This library contains materials (hardcopy and electronic) that are catalogued according to current national bibliographic standards. MoDOT and the Secretary of State Library have executed a Memorandum of Understanding that outlines the responsibilities of each organization. MoDOT and the Secretary of State Library agree to maintain the MoDOT library collection at the Missouri State Library. The library holdings will be included in the state library's integrated online library catalog. The bibliographic records in the MoDOT library collection will be included in the statewide MOBIUS catalog to facilitate resource sharing.

Proposed Activities for SFY 2020:
It is expected that the 2020 invoice will be received and sent for payment during first quarter.

SFY 2019 Accomplishments:
The 2019 MOU was executed by MoDOT on November 1, 2018. The invoice for the amount of $5,103.46 was processed on November 19, 2018.

Financials	Amount
Projected Budget SFY 2020	$5,344
Budget Amount SFY 2019	$5,103
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	N/A

TR201518 - Roller Compacted Concrete-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $90,000
Contract Period: 12/1/2014 to 7/31/2019
Contract Investigator: Dr. Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
Increasing interest in decreasing the time and cost in pavement construction, research was recently been undertaken at Missouri S&T in collaboration with the NUTC and MoDOT to investigate the in-situ properties of RCC mixtures in pavement applications. The proposed project will investigate cost-effective, rapid pavement construction techniques that can reduce construction cost and duration. The roller roller-compacted concrete (RCC) with or without an asphalt topping will be investigated. The study will aim at the development of mixture optimization methodology to design novel materials that can be used in rapid pavement construction through detailed laboratory testing and field implementation. The

mixture proportions will be developed to achieve the mixture with satisfactory workability and mechanical and durability properties.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019

SFY 2019 Accomplishments:
A contract extension was executed on July 25, 2018 extending the project into July of 2019; however, the Mexico project was delayed. It was decided to write a report on the work to date and then once the Mexico, Missouri project is let a new task order for the instrumentation and monitoring of that project would be generated. The final report was received on February 13, 2019 and has been posted in the Innovation Library. This project is completed.

Financials	**Amount**
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$7,040
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$82,960

TR201522 - MoDOT Customer Satisfaction Tracking Survey

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $152,948
Contract Period: 3/4/2015 to 1/31/2020
Contract Investigator: Lance Gentry
Funding: SPR 80%, State 20%

Project Description and Objectives:
This study evaluates MoDOT customer satisfaction through use of a customer survey. This survey will be conducted quarterly to evaluate MoDOT's overall satisfaction. The Right Transportation Survey (RTS) will be conducted once under this contract.

Proposed Activities for SFY 2020:
During each month of the quarter, approximately 200 people who contacted MoDOT the previous month will be surveyed by phone about their experience along with online surveys being distributed to those who provided an email address. A summary report will be provided to MoDOT each month. The contract end date for the project is January 31, 2020. All activities for the Right Transportation Solution surveying were previously completed in Fiscal Year 2016.

SFY 2019 Accomplishments:
During each month of the quarter, approximately 200 people who contacted MoDOT the previous month were surveyed by phone about their experience along with online surveys being distributed to those who provided an email address. A summary report was provided to MoDOT each month. The annual report for calendar year 2018 was also created and provided in January 2019. The second extension for the project was approved and was executed on February 26, 2019 and has a completion date of January 31, 2020.

Financials	Amount
Projected Budget SFY 2020	$13,087
Budget Amount SFY 2019	$12,947
Adjusted Budget Amount SFY 2019	$22,252
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$117,609

TR201609 - MEPDG Local Calibration

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $254,950
Contract Period: 3/2/2016 to 3/30/2019
Contract Investigator: Chetana Rao
Funding: SPR 80%, State 20%

Project Description and Objectives:
The Missouri Department of Transportation (MoDOT) has always relied on sound engineering for designing new and rehabilitated pavements. The current design approach is the Mechanistic-Empirical Pavement Design Guide (MEPDG), developed under a series of National Cooperative Highway Research Projects (NCHRP). The MEPDG utilizes existing state-of-the-practice mechanistic-based pavement analysis and distress prediction algorithms.

Enough time has elapsed to perform a second local calibration cycle. During this interim period, more performance data has been collected from the original field test sections. In addition, newer models have been introduced to the AASHTO Pavements ME Design Guide software that requires a first local calibration. Greater emphasis will be placed on the rehabilitation models.

Objectives:

• Perform a second local calibration of distress prediction models for existing field test sections.

• Supplement existing test sections with additional rehabilitation pavement sections.

• Perform a first local calibration of newer prediction models in the AASHTO Pavement ME Design Program

• Update the materials database library with contemporary pavement materials properties, including reclaimed materials.

• Fully document the local calibration work, including clear guidance for changing calibration coefficients. Update the user manual. Provide recommendations and precise details of any suggested /incorporated changes.

Proposed Activities for SFY 2020:
At the time of this report it is unclear if this project will be completed in State Fiscal Year 2019 or will extend into State Fiscal Year 2020.

SFY 2019 Accomplishments:
Final calibration is taking longer than anticipated. The PI requested that the project be extended a few extra months to finish the calibration work and complete the final deliverables. A task order extension

was executed on November 27, 2018. Several of the models have been received but not all of them. The draft report has not been submitted. As of the date of this report the PI has been contacted multiple times but has not given a final date they can produce all the deliverables.

Financials	**Amount**
Projected Budget SFY 2020	$46,976
Budget Amount SFY 2019	$73,690
Adjusted Budget Amount SFY 2019	$41,282
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$166,692

TR201610 - AASHTO Technical Service Program

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $310,000
Contract Period: 7/1/2014 to 06/30/2020
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
Each year, the Standing Committee on Highways and the board of directors of American Association of State Highway and Transportation Official's (AASHTO) approves the listing of Technical Service Programs. The type of project is "Contract Other" because the project is to participate in the Technical Service Programs. The purpose of this item is to support continued participation in various AASHTO Technical Service Programs.

Proposed Activities for SFY 2020:
MoDOT's Construction and Materials Division is expected to participate in the following AASHTO Technical Service Programs for Fiscal Year 2020:
• National Transportation Product Evaluation Program (NTPEP), $20,000.
• AASHTO Innovation Initiative (AII), formerly Technology Implementation Group (TIG), $6,000.
• Transportation Curriculum Coordination Council (TC3), $20,000
• Technical Service Program to Develop AASHTO Materials Standards (DAMS), $10,000.
The total amount for SFY2020 for Construction and Materials is $57,000. Other MoDOT Divisions are participating in various Technical Service Programs.

SFY 2019 Accomplishments:
The Construction Materials Division approved the funding of four AASHTO Technical Services Programs. These are the NTPEP program ($20,000), AASHTO Innovation Initiative ($6,000), Transportation Curriculum Coordination Council ($20,000) and Technical Service Program to Develop AASHTO Materials Standards (DAMS), $10,000. The total of $56,000 was processed. It was determined to use SPR Part B funds for the Technical Service Programs that the other Divisions participate in; the total amount for the other divisions is $99,000.

Financials	Amount
Projected Budget SFY 2020	$155,000
Budget Amount SFY 2019	$140,000
Adjusted Budget Amount SFY 2019	$155,000
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	N/A

TR201614 - Zero Cement Concrete-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $100,000
Contract Period: 1/3/2017 to 2/28/2019
Contract Investigator: Dr. Mohamad ElGawady
Funding: SPR 80%, State 20%

Project Description and Objectives:
Conventional concrete mixes use ordinary Portland cement (OPC) or OPC and fly ash as the main binding material. Conventional concrete involves slow process of hydration of the OPC/fly ash. Zero-cement (ZC) concrete is a relatively new class of concrete that does not include any Portland cement. The overarching objective of this research is to develop zero-cement concrete mixtures that can be used by MODOT contractors for bridge deck and girders using locally available material. The feasibility of using ZC concrete for partial depth deck and prestressed girder repair works will be explored as well.

Proposed Activities for SFY 2020:
The project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
MoDOT sent comments on the draft report to the researcher at the end of July. A task order extension was sent to the University in September and a time extension was executed on November 19, 2018 with a new completion date of February 19, 2019. The final report was accepted at the end of November. The research librarian worked with the PI on accessibility of the report and it was published on December 17, 2018. The final invoice was paid on February 11, 2019. This project is completed.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$1,378
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$98,622

TR201702 - High Volume Recycled Materials Phase II-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $69,687
Contract Period: 7/1/2016 to 5/31/2019
Contract Investigator: Dr. Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
The presented research plan proposes a field-oriented study as a follow-up of the Project Number TR201502 entitled "High-Volume Recycled Materials for Sustainable Pavement Construction". The main goal of this project is to validate findings of the previous research project in the field implementation and to develop guidelines for the selection and use of recycled concrete aggregate (RCA) for sustainable pavement construction. The scope of the proposed research plan includes the construction of full-scale pavement sections and implementation in the actual construction projects in collaboration with Missouri Department of Transportation (MoDOT). The project team will assist in planning, field implementation, and monitoring of pilot projects in the state of Missouri.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
The final report was submitted in March and was posted in the Innovation Library. The final invoice was paid in March and the project has officially been closed.

Financials	**Amount**
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$4,543
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$65,144

TR201703 - Economical and Crack Free High Performance Concrete Phase II-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $69,687
Contract Period: 7/1/2016 to 7/31/2018
Contract Investigator: Dr. Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
The research plan that is proposed here is a follow up of the two-year project and aims to investigate and validate the performance of Eco-HPC mixtures under actual field conditions. The main goal of this follow-up project is to validate findings of the previous research project in the field implementation and to develop guidelines for the use of Eco-HPC for sustainable pavement and transportation infrastructure construction. The project will employ two classes of Eco-HPCs for the following field demonstrations: Eco-Pave-Crete for pavement construction and Eco-Bridge-Crete for transportation infrastructure

construction. The project will establish guidelines for material selection, mix design, casting, and performance of such sustainable infrastructure materials through the validation of field implementation.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
The final report was submitted in March and was posted in the Innovation Library. The final invoice was paid in March and the project has officially been closed.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 20199	$1,707
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$67,980

TR201705 - Implementation of FR SCC and FR SWC Phase II-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $64,828
Contract Period: 7/1/2016 to 7/31/2018
Contract Investigator: Dr. Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
The proposed study seeks to investigate key engineering and structural properties of FR-SCC and fiber-reinforced super workable concrete (FR-SWC) for infrastructure repair and construction. FR-SCC is targeted for repair of sub-structure elements, while the FR-SWC is targeted for construction operations. The expected result from this study will be guidelines and performance-based specifications for the evaluation, selection, and specification of FR-SCC for infrastructure repair of bridge substructures and FR-SWC for the construction of bridge substructure and superstructure elements.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
The final report was received and accepted on December 19, 2019. The final report was published in January 2019.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$13,221
Adjusted Budget Amount SFY 2019	$10,080
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$54,748

TR201712 - Performance Characteristics of Recycled Asphalt-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $200,000
Contract Period: 10/14/2016 to 11/30/2018
Contract Investigator: Bill Buttlar
Funding: SPR 80%, State 20%

Project Description and Objectives:
Evaluating performance characteristics of ground tire rubber, recycled roofing shingles and rejuvenators in recycled asphalt pavements in the Midwest climate.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
A time extension was executed on September 6, 2018 extending the project through the end of November. The final report was received on December 13, 2018; however the researcher included new content in the final report from the work that was done with the University Transportation Center. The final report was received in January, 2019 and was published in the Innovation Library. The final invoice posted February 14, 2019. This project has been closed.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$5,217
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$194,783

TR201720 - Rejuvenating Asphalt Products

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $244,752
Contract Period: 8/11/17 to 1/31/2020
Contract Investigator: Jay Bledsoe
Funding: SPR 80%, State 20%

Project Description and Objectives:
The objective of this investigation is to provide recommendations for creating a performance based specification for rejuvenating and surface sealing products that extend asphalt pavement life. The product evaluation will consider the effectiveness of softening the existing asphalt binder, improving the existing rheological properties (less brittle), and decreasing the permeability of the pavement. The product comparisons will outline the pros and cons to include, but not limited to: the testing results, cure time necessary before opening roadway to traffic, daily production rate, material cost, material location, other economical limitations, application rate utilized and blotting materials utilized, if applicable. A field application study will be performed and evaluated by a third party researcher to provide a report of each product's performance.

Proposed Activities for SFY 2020:
One final field evaluation will take place in early State Fiscal Year 2020. Deliverables and the final invoice are anticipated to be received during the second quarter.

SFY 2019 Accomplishments:
Following friction testing on Route N during the first quarter, MoDOT made the decision that two of the products had reduced the friction to an unsafe level and that a chip seal would be applied. A miscommunication between MoDOT staff resulted in all sections in the westbound lane being covered. The result is that only 4 test sections remained viable in the eastbound lane. The Route 30 joint location was inadvertently restriped in its entirety, so no retro-reflectivity testing will be done in the future at this location. One year testing on the Route 30 sections in Jefferson County along with 6 month testing of the Route N sections in St. Charles County (mainline) and the Route 52 sections in Morgan County were completed during October of 2018. Weather issues caused another change in the original scope. After discussion with MoDOT staff, it was agreed that no permeability testing would be performed on Route 30 to avoid an additional field trip for testing. It was believed that because the permeability was essentially zero for all previous tests (prior to construction, 30-day and 6 month), testing at the 1-year time frame would give no significant data.

Financials	**Amount**
Projected Budget SFY 2020	$25,610
Budget Amount SFY 2019	$36,792
Adjusted Budget Amount SFY 2919	$61,588
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$157,554

TR201724 – MoDOT Report Card Survey

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $142,010
Contract Period: 4/20/2017 to 12/31/2021
Contract Investigator: Lance Gentry
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project is a statewide evaluation of satisfaction from a general population survey of Missouri adults. Results are reported to MHTC and the Missouri Department of Transportation (MoDOT). Provide a statewide evaluation of satisfaction levels with MoDOT performance from a general population telephone survey of Missouri adults. The survey will be conducted every other year in May in years 2017, 2019, and 2021. MoDOT expects this review to result in reports summarizing the data received by using specified methodology. The results are reported in the July MoDOT Tracker.

Proposed Activities for SFY 2020:
The analysis of the survey results will take place in the first quarter of the state fiscal year. The report is due in September. Once this round of the survey is complete it will be taken over by Transportation Planning.

SFY 2019 Accomplishments:
Initial discussions were held about the 2019 schedule and survey. Suggestions for the 2019 survey instrument were made in collaboration with MoDOT and the survey was conducted in May.

Financials	Amount
Projected Budget SFY 2020	$32,155
Budget Amount SFY 2019	$0
Adjusted Budget Amount SFY 2019	$39,525
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$70,330

TR201801 - Library Support Contract (2018-2019) - Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $196,428
Contract Period: 7/1/2017 to 6/30/2019
Contract Investigator: Henry Brown
Funding: SPR 80%, State 20%

Project Description and Objectives:
The demand for information services has increased as more MoDOT users are realizing the timely, diverse and high quality information they receive using the services of the current librarian. The major objective of this project is to provide library, research and reference support services for MoDOT. University of Missouri-Columbia will provide the services of a Master of Library Science (MLS) librarian who will work 40 hours per week and will be located at the Secretary of State's State Library and MoDOT in Jefferson City.

Proposed Activities for SFY 2020:
This project was completed in SFY19. The next round of Library Services was contracted and is project TR202001.

SFY 2019 Accomplishments:
For 2019 Q1-Q3, the librarian answered a total of 40 requests, 32 short reference questions and 8 literature searches. A total of 9,452 print and electronic library items were circulated or accessed. 138 new items were added to the library collection. Eight Contract Research Reports were posted to the Innovation Library. Continue to serve as ombudsman for state DOT libraries regarding AASTHO e-publications issues; co-lead for AASHTO RAC CCTF TKN Working Group; member of National Transportation Knowledge Network (NTKN) Coordinating Council; working on numerous collaborative projects with Midwest Transportation Knowledge Network (MTKN) members; and developed Right Transportation Solutions site in SharePoint to assist Design Division with tracking invoices and survey results.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$100,000
Adjusted Budget Amount SFY 2019	$103,494
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$92,934

TR201804 - Field Implementation of Rubberized Chip Seal -Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $54,167
Contract Period: 9/15/2017 to 12/31/2018
Contract Investigator: Mohamed ElGawady
Funding: SPR 80%, State 20%

Project Description and Objectives:
The Central District Maintenance Division was interested in placement of a rubberized chip seal to evaluate its performance. The Missouri University of Science and Technology (Missouri S&T) had received a grant from Missouri Department of Natural Resources to study the product. This MoDOT research project will monitor the performance of an experimental section constructed out of rubberized chip seal. The site selected was Route CC in Phelps County just south of Rolla.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
The final report was received and published in the Innovation Library. The final invoice was received in February and posted on February 14, 2019. This project is closed.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$16,967
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$37,200

TR201806 - Performance-Based Specifications of Fiber-Reinforced Concrete to Enhance Performance and Reduce Steel-Reinforcement in Structural Members

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $89,999
Contract Period: 12/1/2017 to 1/31/2020
Contract Investigator: Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
The project aims at evaluating the combined effect of calcium oxide-based EA (CaO-based), LWA, and fiber content under different moist-curing regimes on restrained shrinkage, mechanical properties, frost durability, transport properties, and corrosion resistance of Eco high-performance concrete (Eco-HPC) targeted for bridge applications (Eco-Bridge-Crete). It has also been recognized that the FR-SWC can be produced using EA and various types of fibers. Proper use of fibers was shown to increase flexural strength and flexural toughness in monolith beams cast using FRC vs. those cast using regular concrete. As such, the **i**ncorporation of fibers can replace a portion of the steel reinforcement bars and obtaining same flexural strength, and even associated improve in toughness and crack resistance for the enhancement of resilience.

Proposed Activities for SFY 2020:
Based on the results obtained from the testing in State Fiscal Year 2019, the optimized mixtures of Super Workable Concrete (SWC) and Eco-Bridge-Crete with high shrinkage resistance will be determined. Statistical models will be developed for predicting the shrinkage and mechanical performance of concrete mixtures based on contents of expansive agent (EA), lightweight sand (LWS), fiber reinforcement (FR) and moist curing duration. The final report is due December, 2019.

SFY 2019 Accomplishments:
The work in progress includes optimization of Super Workable Concrete (SWC) and Eco-Bridge-Crete mixtures for shrinkage crack resistance. Drying shrinkage, restrained expansion, compressive strength and flexural strength tests are being conducted to obtain the optimum contents for EA, LWS, and FR as well as moist curing conditions for SWC and Eco-Bridge-Crete mixtures using a factorial design approach.

Financials	**Amount**
Projected Budget SFY 2020	$4,796
Budget Amount SFY 2019	$44,793
Adjusted Budget Amount SFY 2019	$85,203
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201807 - Understanding and Improving Heterogeneous, Modern Recycled Asphalt Mixes

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $543,534
Contract Period: 3/1/2018 to 4/30/2020
Contract Investigator: Bill Butler
Funding: SPR 80%, State 20%

Project Description and Objectives:
The research goal will be to focus on high-type mixes (MoDOT Sec. 403 mixes), although findings will provide useful insight for all asphalt mixes used in Missouri. A comprehensive suite of binder and mixture tests will be carried out in order to link mix designs and materials to eventual field performance (rutting, cracking, and moisture damage predictions). This project will allow us to evaluate the potential performance of modern crumb rubber mixes, RAP and RAS mixtures, and rejuvenators in Missouri.

Proposed Activities for SFY 2020:
The project is scheduled to be completed in State Fiscal Year 2020. Additional field samples will be collected during the first quarter so that laborarory work can wrap up during the esecond quarter. The dreaft final report is due January 31, 2020 and the final report March 31, 2020.

SFY 2019 Accomplishments:
The first phase of this project was centered on the testing and evaluation of recycled materials sampled on a recently concluded MoDOT-MTC project led by the University of Missouri-Columbia. Two research coordination meetings were held in the previous quarter, one at Missouri S&T and one at Mizzou, which has led to the development of a detailed, collaborative experimental plan to be carried out in the spring of 2019. Testing continued on mixtures from the US54 and US63 projects. Extraction and recovery of binder from cores at Missouri S&T was completed. On March 27th, 2019, the research team retrieved samples from a demonstration project carried out by NB West in Bourbon, MO. The team sampled fibers, RAP, RAS and the aggregate. The fiber is a coated, Kevlar-type fiber which is designed to enhance mix strength and crack resistance.

Financials	**Amount**
Projected Budget SFY 2020	$164,691
Budget Amount SFY 2019	$242,000
Adjusted Budget Amount SFY 2019	$280,272
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$98,571

TR201809 – Assessment and Repair of Corroded Steel H-Piles

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $227,498
Contract Period: 12/1/2017 to 7/1/2020
Contract Investigator: Mohamed ElGawady
Funding: SPR 80%, State 20%

Project Description and Objectives:
The overarching objective of this research is to develop efficient, accelerated, and sustainable techniques for repairing H-piles to restore their initial axial capacities. The corrosion will be simulated by milling the flanges and/or webs of the H-piles. For a severely corroded pile, the reduced section dimensions will be accompanied by a void in the web and/or cuts in the flanges. The piles will be repaired using pultruded fiber reinforced polymer (FRP) sections, ultra-high performance concrete (UHPC) sections, and FRP wrapping.

Proposed Activities for SFY 2020:
Further testing of the piles will continue through State Fiscal Year 2020. The research team will also continue refining the finite element models so that prediction of damage and repair can be done without full scale testing. This draft final report is due April 1, 2020 and the final report June 1, 2020. Depending on invoicing the project may or may not continue into State Fiscal Year 2021.

SFY 2019 Accomplishments:
Testing of three full-scale piles using FRP repair were carried out. The piles were first tested to complete collapse; then, the piles were straightened, repaired, and retested. The piles developed 90% of the axial capacity of the uncorroded pile. Finite element models for the repaired piles were developed. The FE models were able to accurately predict the strength of the repaired piles; however, more refinement is still required for the model.

Financials	Amount
Projected Budget SFY 2021	$29,569
Projected Budget SFY 2020	$100,000
Budget Amount SFY 2019	$83,211
Adjusted Budget Amount SFY 2019	$54,352
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$43,577

TR201811 - Support for Balanced Asphalt Mixture Design Specification Development in Missouri

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $283,609
Contract Period: 5/18/2017 to 6/30/2020
Contract Investigator: Bill Butler
Funding: SPR 80%, State 20%

Project Description and Objectives:
The project is being developed to mix performance tests to supplement volumetric mix design and the PG binder specification, and there is currently a national movement to rectify that shortcoming. Advances in fundamental and torture-type asphalt mixture tests, particularly those related to crack control, have become more prevalent in the past decade. However, states are just now beginning to implement these new tests into specifications for asphalt mixture design, control, and acceptance. The first step in this path usually involves the introduction of tests for the mixture design stage.

Proposed Activities for SFY 2020:
Field sampling will take place for projects constructed during the 2019 summer season and testing will be completed by early winter. The draft final report for the project is due March 31, 2020 and the final report May 31,2020. Depending on invoicing the project may or may not continue into State Fiscal Year 2021.

SFY 2019 Accomplishments:
Mixture rutting and fracture tests were completed for plant mix, lab compacted samples from Missouri at standard temperatures and loading conditions. Hamburg rut tests and Disk-Shaped Compacted (DC (T)) fracture testing was performed. A detailed summary of results was provided to MoDOT in a comprehensive Appendix. An extensive analysis of estimated pavement temperatures reached in Missouri during the record cooling event in late January 2019 was performed (to gauge potential thermal stress), and a meeting was held at MoDOT on February 28, 2019 to review project data and discuss field sampling for 2019.

Financials	Amount
Projected Budget SFY 2020	$24,476
Budget Amount SFY 2019	$135,917
Adjusted Budget Amount SFY 2019	$259,133
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201813 - Leader-Follower TMA System

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $549,921
Contract Period: 3/5/2018 to 3/16/2020
Contract Investigator: Jay Rhoades
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT's mobile and slow moving operations, such as striping, sweeping, bridge flushing and pothole patching, are critical for efficient and safe operation of the highway transportation system. MoDOT's slow moving operations have been crashed into over 80 times since 2013 resulting in many injuries to MoDOT employees. The objective of this RFP is to provide a NCHRP 350 Level 3 compliant Leader-Follower TMA System capable of operating a driverless rear advanced warning truck in mobile highway operations as described in Traffic Application TA-35a. The system shall consist of a Lead Truck (LT) and a Rear Advanced Warning Truck called the Follow Truck (FT). The goal is to avoid operator injury by eliminating the need for a human operator in the FT.

Proposed Activities for SFY 2020:
A majority of the 250 hour testing in a live mobile work zone will take place in State Fiscal Year 2020. The Leader-Follower TMAs will be part of a mobile striping operation in the Kansas City District. Missouri S&T will provide on-site support while Kratos will be available remotely for trouble shooting.

SFY 2019 Accomplishments:
A meeting was held with the AIPV NextGen System team to review end-item hardware assembly mounting and bracketry design. The review also included a conceptual layout where hardware will be installed on the AIPV NextGen System vehicles (International Trucks). The review provided value added feedback that will increase reliability, reduce maintainability, and extend availability of the system. A project meeting between the research team and MoDOT determined that the antenna's mounted on the trucks need to be removable so they are not damaged during other operations. Also the in-cab system will need to be enclosed so that it is protected from salt and snow debris tracked into the truck during snow events. A conference call took place on Friday December 21, 2018 to talk about the current progress and to set up dates for the trucks to be delivered and the training to occur. Testing at the contractor's site was conducted February through March. The testing was delayed due to some unforeseen circumstances at the location for testing as well as some mechanical issues. Final testing on the trucks and preparing training material for training MoDOT maintenance personnel was conducted and the trucks were shipped in late March. The training began early-April in Sedalia, MO. Initially there were some hardware and software issues during the closed course 32 hour test but those were quickly resolved and the 32 hour test was passed.

Financials	Amount
Projected Budget SFY 2020	$357,449
Budget Amount SFY 2019	$192,472
Actual Cost SFY 2019	$0
Prior to SFY 2019 Actual Cost	(See Addendum Sept. 2019) $0

TR201814 - Leader-Follower TMA System Misc. Expenses

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $50,000
Contract Period: 3/5/2018 to 3/16/2020
Contract Investigator: N/A
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project is set up for the miscellaneous expenses for the Leader-Follower truck project that are not part of the contract. Items such as shipping of the trucks to the contractor would fall under this project number.

Proposed Activities for SFY 2020:
It is unclear if additional miscellanous expenses will be required for State Fiscal Year 2020.

SFY 2019 Accomplishments:
The trucks were shipped to Florida in August of 2018 and then back to Kansas City, MO in late March 2019. This project covered the shipping expenses and the travel expenses for the training.

Financials	Amount
Projected Budget SFY 2020	$16,664
Budget Amount SFY 2019	$16,100
Adjusted Budget Amount SFY 2019	$33,336
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201815 - TITAN - An Interactive Web-based Platform for Transportation Data InTegration and Analytics-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $24,992
Contract Period: 6/1/2018 to 5/31/2019
Contract Investigator: Carlos Sun
Funding: SPR 80%, State 20%

Project Description and Objectives:
The rate of transportation data collection is poised to increase exponentially with mobile computing, community-based sensing and vehicle-to-vehicle and vehicle-to-infrastructure communications. The research team will design a prototype interactive, web-based platform that will assist decision makers at MoDOT to seamlessly integrate and analyze transportation datasets. The developed system will take advantage of recent advances in big data analytics and user-centered data visualization to improve the speed of the platform and facilitate the storage and integration of very large, structure and unstructured data across different private and public databases. TITAN will also provide for users quick access to the integrated datasets via a non-programmatic, interactive web interface.

Proposed Activities for SFY 2020:
This project was completed in State Fiscal Year 2019.

SFY 2019 Accomplishments:
An initial version of the prototype was completed using one year of historical data from St. Louis. Several data visualization methods were implemented. The prototype was deployed on the web and was improved by incorporating additional data sources. During the first quarter of Fiscal Year 2019 the PIs met with Springfield TMC staff, both MoDOT (Marc Lewis) and City (Tom Dancey) to explore adding traffic, probe, and signal data from the region. The PIs are also exploring the addition of freight data. The prototype was migrated to Microsoft's Azure cloud. A methodology for automatically integrating crash and probe data was developed and deployed. A data access portal has also been integrated on the platform. A real time video analytic feature for assisting with incident management was developed. New modules for predictive analytics are being developed for TITAN. These modules will be used for crash risk prediction, automated CCTV surveillance, and traffic anomaly detection. The prototype of TITAN was launched and is available at www.mizzou-titan.com. A non-programmatic interface for querying crash, probe and detector data from TITAN was integrated and user-friendliness was greatly improved.

Financials	**Amount**
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$24,992
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201901 – Work Zone Inspection Training using Enhanced Visualization Technology

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $106,265
Contract Period: 9/1/2018 to 10/31/19
Contract Investigator: Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT engineers inspect all work zones in one or more districts each year. This annual exercise is demanding as each work zone is inspected and rated based on several factors. A rating value is assigned for each factor based on discrepancies and deficiencies. The inspection team, typically consisting of 4 to 5 personnel, compiles the ratings for all work zones operational in the district, prepares a summary, and presents the findings to the district management. Personnel on the inspection team need to be familiar

with the inspection worksheet and the different evaluation categories. They need to also be familiar with the typical applications (TA) for different facilities and work activities. This project will develop a work zone inspection training module for MoDOT engineers. The module will consist of two steps. The first step is a learning routine which will be founded on the historical knowledge gained by MoDOT staff from inspections dating back at least 10 years. The second step is an immersive routine that will place the personnel in a virtual work zone and observe their performance and provide feedback.

Proposed Activities for SFY 2020:
This upcoming fiscal year the training modules will be completed both for the initial scenarios as well as the flagger scenario that was requested by MoDOT staff to be added to the project. The draft final report is due August 1, 2019. It is anticipated the final report will be published in the second quarter of State Fiscal Year 2020 and the project will be closed out.

SFY 2019 Accomplishments:
The contract was executed August 27, 2018 with a start date of September 1, 2018. The researchers attended the October Work Zone Quality Circle meeting to present the project and begin developing the technical advisory panel. The initial training and learning modules were developed. Each training module includes a set of slides that provide background on signage and temporary traffic control in a work zone. The learning module uses virtual reality headsets to simulate inspection scenarios. The research team worked on drafting training materials and simulation scenarios for virtual reality experiments. The scenarios were demonstrated to MoDOT work zone traffic engineers in two meetings. The two scenarios developed in virtual reality were tested by the project's technical review panel. The scenarios and training module questionnaires were revised based on the panel feedback. A group of participants were then asked to participate in a study and provide feedback on the revised immersive module. MoDOT staff also requested that a flagging module be developed. The work plan was developed and a supplemental agreement was executed on March 26, 2019 to include the new work.

Financials	**Amount**
Projected Budget SFY 2020	$38,172
Budget Amount SFY 2019	$68,093
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201902 – IC-IR Consultant Contract-Phase 3

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $199,852
Contract Period: 7/1/2018 to 1/31/2020
Contract Investigator: George Chang
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project provides consultant support for approximately 25 MoDOT projects for the 2019 construction season. The consultant has developed and lead contractor Intelligent Compaction (IC) and Infrared (IR) training for MoDOT projects in previous years. This current research project will provide training, data and field support for each of the IC-IR MoDOT Asphalt Projects constructed in 2019.

Proposed Activities for SFY 2020:
Most of the projects that will be supported under the contract will take place during State Fiscal Year 2020. The project budget allows for 6 onsite support efforts, 12 projects where the researchers assist with the data analysis and another 12 projects where they help with the data analysis notes. An additional workshop will take place early next fiscal year to train the contractors and inspectors that may not have been identified by the February training.

SFY 2019 Accomplishments:
In October the research team provided field support for the Route 130 project in Putnam County that was paved by Norris Asphalt. The research staff also provided remote support for an I-35 project in Harrison County by Herzog from October to November 2018, a Route 61 project in Cape Girardeau County by Chester Bross from September to November 2018, and a Route 54 project in Callaway County by Capital Paving from October to November 2018. The second IC-PMTP workshop was held at the MoDOT Central District Office on February 26, 2019. It was attended by more than 60 participants including MoDOT staff and paving contractors. Two planning meetings were conducted on February 26th and 27th.

Financials	**Amount**
Projected Budget SFY 2020	$112,182
Budget Amount SFY 2019	$87,670
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201903 - Facebook Surveys—RTS Fiscal Year 2019-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $11,370
Contract Period: 7/1/2018 to 6/30/19
Contract Investigator: Facebook
Funding: SPR 80%, State 20%

Project Description and Objectives:
For several years MoDOT has been conducting a project which a contract was negotiated with a professional survey company to conduct a survey entitled “Right Transportation Solutions”. It conducted a public survey regarding multiple projects across the state to gauge the public’s reaction to those projects. With this project MoDOT is looking to conduct a similar survey, however use Facebook as the survey mechanism. A pilot project was conducted in 2017 and was successful so starting in fiscal year 2018 all district surveys have been conducted through Facebook.

Proposed Activities for SFY 2020:
Responsibility and payment of this survey will be taken over by Design starting in State Fiscal Year 2020.

SFY 2019 Accomplishments:
Six of the districts utilized Facebook to conduct the Right Transportation Survey this past year. Invoices were received and processed. The number of surveys taken by district was: Northwest (536), Kansas City (1,474), Central (306), St. Louis (2,765), Southwest (1,886), and Southeast (52). With over 475,000

Facebook users reached, there were more than 2,950 comments received and in excess of 15,000 reactions and shares were documented. This project is closed.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$11,370
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201904 – Compacted Concrete Pavement-SE District

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $125,000
Contract Period: 9/28/2018 to 12/31/2021
Contract Investigator: Kamal Khayat
Funding: SPR 80%, State 20%

Project Description and Objectives:
In order to assess the construction issues and characterize the long-term performance of Compacted Concrete Pavement (CCP), three CCP test sections made with and without fiber will be part of a larger project constructed in Scott County, Missouri. The test section pavement will be designed and tested. The project objective is to determine the performance of designed CCP mixtures given special design features and durability of surface texture through field implementation and detailed laboratory testing. The primary performance characteristics include mechanical properties, drying shrinkage, durability, optimum joint spacing, and enhancement of joint load transfer gained from fiber-reinforcement of the pavement.

Proposed Activities for SFY 2020:
State Fiscal Year 2020 will be devoted to continuing testing of the samples and monitoring readings from the test site. Little other activity will take place. Reporting of the data and final deliverable will not take place until State Fiscal Year 2021.

SFY 2019 Accomplishments:
The final work plan was received on September 10, 2018 and the task order was developed. Laboratory tests on saw-cut and cored samples as well as samples prepared during paving was conducted. Tests include compressive strength of cylinders and flexural strength of prisms. Others tests include freeze-thaw durability, de-icing salt scaling, hardened air-void system, 56-day rapid chloride ion permeability, and drying shrinkage. The saw-cutting operation was carried out later than initially expected, and was completed on December 19th, 2018. Cutting and coring was successfully performed by Emery Sapp and Missouri S&T with the support of MoDOT. Further testing included compressive and flexural strength tests carried out at 120 and 180 days, along with additional analysis of freeze-thaw durability, de-icing salt scaling resistance, and drying shrinkage.

Financials	Amount
Projected Budget SFY 2021	$25,000
Projected Budget SFY 2020	$82,365
Budget Amount SFY 2019	$17,635
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201905 – Use of H2Ri to Mitigate Pumping in Concrete Pavement Shoulder

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $37,403
Contract Period: 9/28/2018 to 1/31/2020
Contract Investigator: Xiong Zhang
Funding: SPR 80%, State 20%

Project Description and Objectives:
Pumping is one of the major factors contributing toward concrete pavement slab failures. It is believed that drainage issues are the major cause of severe pumping and failure of PCC slabs because water and fine materials are observed to be ejected out through the joints. In recent years, a new type of wicking fabric (H2Ri) was developed by TenCate Geosynthetics to remove the excess water in the pavement structure and potentially maintain good pavement performance and longevity. By installing a layer of wicking fabric horizontally beneath the road shoulder, the excess water in the pavement structure can be absorbed from the soils, transported along the wicking fabric to the slope, and vaporized to the surrounding atmosphere which has much higher suction. A full depth shoulder replacement project at Milepost 115.9 on I-44 will be used as a field test section to test the effectiveness of the H2Ri wicking fabric in mitigating pumping of concrete shoulders. Three test sections will be constructed and instrumented. Laboratory testing will also be conducted as part of the project.

Proposed Activities for SFY 2020:
The research team will continue taking readings in early State Fiscal Year 2020. A draft final report is due October 31, 2019 and the final report December 31, 2019. The project should be closed out in the third quarter.

SFY 2019 Accomplishments:
The work plan and budget were submitted to MoDOT in late September. Construction of the field test section was completed. All the sensors were installed and are transmitting data. The research team did a site visit on December 11, 2018 and retrieved soil samples and downloaded data for analysis. During on one of the follow up site visits it was discovered the contractor had covered up the exit location of the wicking fabric so the researchers had to expose the fabric again. Some preliminary laboratory tests were conducted in order to characterize soil properties. Small scale lab testing is being completed to test for some different types of conditions.

Financials	Amount
Projected Budget SFY 2020	$37,403
Budget Amount SFY 2019	$6,305
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201908 – Highway Safety Manual Training

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $100,000
Contract Period: 1/1/2019 to 12/31/2019
Contract Investigator: Carlos Sun
Funding: SPR 80%, State 20%

Project Description and Objectives:
Missouri has been one of the 12 lead states in improving transportation safety analysis nationwide and promoting the use of the national Highway Safety Manual (HSM). The research team previously completed multiple research projects with MoDOT to develop calibration factors specific to Missouri. The goal of this project is to produce a training framework so that HSM training can be provided to a wide range of users on a regular basis. This framework involves two main components: 1) practitioner-friendly material that is relevant to Missouri and 2) a system to train trainers. This project seeks to produce training materials that can used with a wide variety of delivery methods such as in person workshops, remotely delivered workshops, and online modules. Missouri examples will be used in all training modules. The data will be obtained from MoDOT Transportation Management Systems (TMS), MoDOT districts, and aerial photographs.

Proposed Activities for SFY 2020:
The training modules will be completed in the first quarter of State Fiscal Year 2020. The research team will do a "train the trainer" session so that MoDOT staff can go out and train employees. The draft final report is due on October 31, 2019 and the final report on December 15, 2019.

SFY 2019 Accomplishments:
The contract was executed on December 27, 2018 with a start date of January 1, 2019. The training material structure includes the scope of the training, case studies/illustrative examples, and delivery methods. Learning technology tools such as Camtasia, Kaltura, and Zoom have been explored. The PIs collected data related to various MoDOT facilities to be used as training examples.

Financials	**Amount**
Projected Budget SFY 2020	$46,729
Budget Amount SFY 2019	$53,271
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201911 – Inlaid Pavement Marking Evaluation

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $120,000
Contract Period: 3/15/2019 to 12/15/2019
Contract Investigator: Xiong Zhang
Funding: SPR 80%, State 20%

Project Description and Objectives:
Over the past three decades, MoDOT has tried multiple strategies to provide and improve wet nighttime guidance on its major routes, culminating in the current use of ASTM Type III glass beads on all lines on MoDOT's major roadways. Before the implementation of the Type III bead system, MoDOT's St. Louis District began experimenting with inlaid pavement markers (IPMs); however, to date, a complete evaluation of their effectiveness and life cycle cost has not been performed. Before moving forward with further implementation plans for IPMs, the performance and effectiveness of these devices needs to be determined in order to establish a statewide direction for the use of these devices. The objective of this study is to determine the benefits of IPMs on Missouri roadways considering our current wet reflective pavement marking system. It is believed IPMs will provide added benefit in certain locations; however, there is a question regarding the accuracy of national crash modification factors (CMFs) as they apply to Missouri's roadways. It is assumed these CMFs were established based on IPM applications with standard pavement markings.

Proposed Activities for SFY 2020:
Once all the existing background data has been collected the research team can begin working on which locations will require site visits and which locations have been down long enough for a before/after safety evaluation. An initial safety analysis will be conducted and a memo written to MoDOT so that a decision can be made if a more detailed safety analysis and development of CMFs would be beneficial. The final report is due in mid-November.

SFY 2019 Accomplishments:
The contract was executed on March 15, 2019. A kick-off meeting took place on April 4, 2019. The research team began collecting background data on all of the locations that have the inlaid pavement markings.

Financials	**Amount**
Projected Budget SFY 2020	$109,739
Budget Amount SFY 2019	$ 10,261
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201912 – Predictive Deep Learning for Flood Evacuation Planning and Routing

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $86,548
Contract Period: 2/8/2019 to 12/31/2019
Contract Investigator: Suzi Long
Funding: SPR 80%, State 20%

Project Description and Objectives:
Although Departments of Transportation have detailed safety and disaster planning response documents in place, these plans have limited effectiveness for flash flood scenarios resulting from higher than average rainfalls or other unexpected conditions impacting roadways and roadway infrastructure along river basins. The lack of real-time rate of water rise information can prevent effective evacuation or detour routing before rising flood waters overtop impacted routes. This proposed research uses deep learning methods, along with geospatial data from the USGS National Map and other public geospatial data sources, to develop forecasting tools capable of assessing water level rate of change in high risk

flood areas. These tools build on existing models developed by the USGS, FEMA, and others and are used to determine evacuation routing and detours to mitigate the potential for loss of life during flash floods. The project scope includes analysis of publically available flood data along a river basin as part of a pilot project in Missouri.

Proposed Activities for SFY 2020:
A majority of the programming will begin in early State Fiscal Year 2020. The deep learning algorithms will continue being developed and historical data collected. The routing algorithm will also be developed to determine the available routes during a flood and an estimate of when each route will become impassible. The last task is developing the flood routing protocols and writing the final report. The draft final report is due October 31, 2019.

SFY 2019 Accomplishments: The contract was executed on February 7, 2019. A kick-off meeting took place on Friday February 22nd. On Tuesday May 28, 2019 a meeting took place in Springfield, Missouri between MoDOT, Missouri S&T, and USGS. The purpose of the meeting was to revisit the low water crossing rankings and cataloging that the research team is developing. USGS gave a demonstration of the FLASH and National Water Model web applications.

Financials	**Amount**
Projected Budget SFY 2020	$36,501
Budget Amount SFY 2019	$50,047
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201917 – Protection and Repair of P/S Girders Damaged due to Over-Height Vehicles

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: estimated $80,000
Contract Period: TBD
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Unfortunately overpass bridges occasionally get hit by oversized vehicles. Repair of steel girders is mostly straightforward. If the damage is not extensive then the girder is heated and straightened. For prestressed concrete girders repairs are more complicated. If pre-stressing strands are broken often times it requires partial removal of the deck and replacement of the girder. This project is looking at ways to determine the remaining capacity of the damaged girder along with repair techniques.

Proposed Activities for SFY 2020:
In early State Fiscal Year 2020 the research team will be selected and most of the work should be completed. Depending on the submitted work plan the project may or may not continue into the following fiscal year.

SFY 2019 Accomplishments:
The RFP has not been issued at the time of this report. It is anticipated it will go out at the end of the state fiscal year.

Financials	Amount
Projected Budget SFY 2020	$80,000
Budget Amount SFY 2019	$0
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201918 – Flood Inundation Maps to Support Flood Warning for Dardenne Creek

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $20,000
Contract Period: 5/1/2019 to 5/31/2020
Contract Investigator: USGS
Funding: SPR 80%, State 20%

Project Description and Objectives:
The proposed work will address the lack of flood warning information along Dardenne Creek in St. Charles County, Missouri. Existing USGS stream gage locations at Highway K near O'Fallon, Missouri, and Main Street at Old Town St. Peters, Missouri, can serve as NWS forecast points and developed flood-inundation maps could provide corresponding information on the areas of inundation at various water levels that can be used in providing flood warning, flood prevention and future mitigation, and rescue efforts. The flood-inundation maps will be tied to real-time data from the USGS stream flow gages, flood forecast information, and delivered to the public via the Internet. The maps will be created by the USGS and will depict the approximate area that would be inundated at selected water levels in increments of 1 to 2 feet referenced to both Dardenne Creek stream gages, ranging from the NWS defined "Action Stage" near the top of the bank to the maximum observed water level at the estimated annual exceedance probability of 0.2 percent (e.g. 500-year flood).

Proposed Activities for SFY 2020:
In the upcoming state fiscal year the hydraulic model will be developed for all river stages from NWS defined "Action Stage" to an annual exceedance probability of 0.2 percent (500-year) at 1 to 2-foot increments. Stream flows and their associated stream stages will be compiled and linked to an established NWS flood forecast data that will be available on the internet in real time. The planned product includes an internet application for Dardenne Creek in St. Charles County, Missouri, that displays a flood inundation map for any flood forecast. The applicable map as well as all other maps will be available to emergency management personnel and the public for safety and planning purposes. In addition, a USGS Scientific Investigations Report (SIR) outlining the methodology used to develop this product will be published.

SFY 2019 Accomplishments:
The contract was executed on April 23, 2019 with a notice to proceed date of May 1, 2019. This is a cost share between multiple entities. Based on the agreement and the available funding, MoDOT's portion was billed first. The research team spent the first few months collecting data from the existing stream gauges in the area of interest.

Financials	Amount
Projected Budget SFY 2020	$0
Budget Amount SFY 2019	$20,000
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR201919 – Field Implementation of Compacted Concrete Pavement - Mexico, MO

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $30,000
Contract Period: 6/1/2019 to 5/30/2020
Contract Investigator: Missouri S&T
Funding: SPR 80%, State 20%

Project Description and Objectives:
The city of Mexico, Missouri received an Accelerated Innovation Deployment grant from FHWA to use Compacted Concrete Pavement on a city street. Part of the grant proposal was to evaluate some of the concrete properties in order to compare them with traditional pavement methods. This work was initially going to be part of a field implementation project with Dr. Kamal Khayat but due to delays in the letting of the Mexico, MO project the initial implementation project was closed out.

Proposed Activities for SFY 2020:
A majority of the work will be done in State Fiscal Year 2020. Both fresh and hardened properties of concrete will be tested. A majority of the testing will be completed in the first 3 months with the exception of drying shrinkage measurements where the samples will be monitored for 6 months.

SFY 2019 Accomplishments:
The only work taking place in State Fiscal Year 2019 was development of the testing plan and contracting.

Financials	Amount
Projected Budget SFY 2020	$30,000
Budget Amount SFY 2019	$0
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR202001 - Library Support Contract (2020-2021)

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $225,640
Contract Period: 7/1/2019 to 6/30/2021
Contract Investigator: Henry Brown
Funding: SPR 80%, State 20%

Project Description and Objectives:
The demand for information services has increased as more MoDOT users are realizing the timely, diverse and high quality information they receive using the services of the current librarian. The major objective of this project is to provide library, research and reference support services for MoDOT. University of Missouri-Columbia will provide the services of a Master of Library Science (MLS) librarian who will work 40 hours per week and will be located at the Secretary of State's State Library and MoDOT in Jefferson City.

Proposed Activities for SFY 2020:
The librarian will continue to provide reference and research support services to MoDOT employees. Other services include circulation, cataloging, collection management (which includes digital repositories) & maintenance, marketing & outreach in addition to website content creation. Ongoing activities include coordinating and collaborating with the Missouri State Library.

SFY 2019 Accomplishments:
The task order was executed on March 28, 2019. This project will not start until the beginning of State Fiscal Year 2020.

Financials	**Amount**
Projected Budget SFY 2022	$5,640
Projected Budget SFY 2021	$120,000
Projected Budget SFY 2020	$100,000
Budget Amount SFY 2019	$0
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR202002 – Snow and Ice Treatment Products Evaluation

Project Type: Contract Research
MoDOT Contact: Ryan Martin
Total Contract Amount: est. $100,000
Contract Period: TBD
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
The Missouri Department of Transportation (MoDOT) Maintenance Division employs various tools to reduce the impact of snow and ice on State travelways. Rock salt (sodium chloride) has been used for decades as the primary snow and ice treatment solution, as both a spread solid and sprayed brine solution, to treat the pavement before and during inclement weather. In addition, abrasives such as sand or cinders are sometimes utilized in an attempt to provide a level of skid resistance in situations when temperatures render chloride treatment less effective. Both treatments have been deployed on state routes for many a winter, and are considered the standard. MoDOT would like an evaluation of chemical treatments, including those being chloride-based and agriculture-based, in addition to viable alternatives on the market. The evaluation will address the cost effectiveness of the treatments, the impacts to varied pavement structures and the overall performance of the treatments.

Proposed Activities for SFY 2020:
The selection committee will meet in July to select the research team and the contract should be signed in the first quarter of State Fiscal Year 2020. One of the first tasks will be for the research team to do a literature search to document what other studies have been done and other possible products that should be considered in the study.

SFY 2019 Accomplishments:
The RFP was posted on May 20, 2019. Proposals are due back on June 28, 2019.

Financials	**Amount**
Projected Budget SFY 2021	$40,000
Projected Budget SFY 2020	$60,000
Budget Amount SFY 2019	$0
Actual Cost SFY 2019	$0
Prior to SFY 2019 Actual Cost	(See Addendum Sept. 2019)

TR202003 – Evaluating Performance of Concrete Overlays

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: est. $100,000
Contract Period: TBD
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Concrete overlays are used to maintain or rehabilitate, increase the structural capacity and re-establish a smooth profile for existing roadways consisting of concrete, asphalt, or composite pavement structures. MoDOT currently uses bonded and unbonded concrete overlays to maintain or rehabilitate existing pavements. The objective of this study is to review and evaluate the performance of unbonded and bonded overlays that have been constructed in Missouri during the past 20 years. Existing data consisting of design and construction information, smoothness data, and video media will be compiled and analyzed to provide a thorough synthesis of concrete overlays used for Missouri's infrastructure.

Proposed Activities for SFY 2020:
The technical advisory team will meet in July to select the winning proposal. It is anticipated the contract will be issued in August. A majority of the project will take place in State Fiscal Year 2020 including data collection and analysis. The draft final report is due on June 30, 2020.

SFY 2019 Accomplishments:
The RFP was issued on May 13, 2019. Proposals are due on July 1, 2019.

Financials	**Amount**
Projected Budget SFY 2021	$40,000
Projected Budget SFY 2020	$60,000
Budget Amount SFY 2019	$0
Actual Cost SFY 2019	$0
Prior to SFY 2019 Actual Cost	(See Addendum Sept. 2019)

MoDOT Lead Pooled Fund Studies

TR201910 / TPF-5(388) – Developing Implementation Strategies for Risk Based Inspection (RBI)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $100,000/$400,000
Contract Period: 11/1/2018 to 12/31/2021
Contract Investigator: Glenn Washer – University of Missouri-Columbia
Funding: SPR 100%

Project Description and Objectives:
The research envisions developing a handbook for implementation of RBI practices that will provide a resource to participating states, presenting examples and case studies that define suitable attributes and characteristic for RBI. Workshops and training will be provided to participating states to assist with implementation of RBI, and tools will be developed to assist with future implementation of the RBI technology. Analysis of the bridge inventory to evaluate risk-based strategies will provide data for better asset management.

Proposed Activities for SFY 2020:
The research team will travel to each state in the first two quarters of State Fiscal Year 2020. Analysis of existing bridge data will continue along with collection of additional data. Each state will be asked to target a few bridge types to be the primary focus.

SFY 2019 Accomplishments:
The contract was awarded on November 1, 2018. NBI data for the period of 1992-2017 for the participating DOT's in the research project were downloaded from the Federal Highway Administration (FHWA) database. The research team is working to develop a time in condition rating (TICR) for the bridges. A kickoff meeting took place on January 10, 2019. The research team worked with each state to set up dates to travel to each DOT and meet with staff to do Reliability Assessment Planning (RAP).

Financials	Amount
Projected Budget SFY 2020	$32,757
Budget Amount SFY 2019	$50,000
Adjusted Budget Amount SFY 2019	$67,243
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

TR202004 / TPF-5(395) – Traffic Disruption-free Bridge Inspection Initiative with Robotic Systems

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $125,000/$575,000
Contract Period: 8/01/2019 to 7/31/2024
Contract Investigator: Dr. Genda Chen – Missouri University of Science and Technology
Funding: SPR 100%

Project Description and Objectives:
The INSPIRE University Transportation Center (https://inspire-utc.mst.edu) at Missouri University of Science and Technology was awarded in December of 2016 by the U.S. Department of Transportation. The center is focused on the development of advanced technologies to aid in bridge inspection and maintenance. Specifically, structural crawlers and unmanned aerial vehicles (UAVs) will provide a mobile platform for in-depth inspection of elevated bridges. Microwave and hyperspectral images will be developed to qualitatively or quantitatively assess concrete delamination and steel corrosion of reinforced concrete (RC) bridges.

The goals of this pooled-fund initiative are to engage closely with several state departments of transportation (DOTs) in the early stage of technology development at the INSPIRE University Transportation Center, and leverage the center resources to develop case studies, protocols, and guidelines that can be adopted by state DOTs for bridge inspection without adversely impacting traffic. The initiative involves the integration, field demonstration and documentation of a robotic system of structural crawlers, UAVs, NDE devices, sensors, and data analytics. Depending on the interest of participating DOTs, the objectives of this initiative include, but are not limited to:

- Development of inspection protocols for various types of bridges with the robotic system integrated into current practice.
- Comparison and correlation of bridge deck inspections from above and underneath decks to understand the reliability of traffic disruption-free bridge inspection from underneath.
- Design and technical guidelines of measurement devices on a robotic platform for the detection of surface and internal damage/deterioration in structural members, and for the change in lateral support of foundations.
- Data fusion and analytics of measurements taken from various imaging and sensing systems for consistency and reliability.

Proposed Activities for SFY 2020:
The initial kickoff meeting will take place at the International Conference on Structural Health Monitoring of Intelligent Infrastructure in St. Louis, Missouri August 5-7, 2019. Work will begin on the field test facility for the Bridge Inspection Field Deployment (BIRD). The researcher will also work with the states to develop a list of bridges for the field tests such that they are good candidates for UAV inspection as well as manual inspection.

SFY 2019 Accomplishments:
Work during the fiscal year consisted of marketing the pooled fund to other state DOTs and developing the work plan. The contract was finalized with a start date of August 1, 2019.

Financials	**Amount**
Projected Budget SFY 2021	$25,000
Projected Budget SFY 2020	$100,000

Budget Amount SFY 2019	$25,000
Adjusted Budget Amount SFY 2019	$0
Actual Cost SFY 2019	(See Addendum Sept. 2019)
Prior to SFY 2019 Actual Cost	$0

Pooled Fund Studies

(Pooled Fund Project contributions are not taken out of the RDS funding category)

TPF-5(193)/solicitation 1489-Midwest States Pooled Fund Crash Test Program

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $705,000
MoDOT Commitment new solicitation: $65,000
Contract Period: 11/19/2008 to 6/30/2019
Contract Investigator: Nebraska DOT
Funding: SPR 100%

Project Description and Objectives:
This project is continuation of work done under project SPR-3(017), in which MoDOT has been a participant since 1991. The study has proved to be successful to this point and will remain active under the new project number. The purpose of the project is to crash test highway roadside appurtenances to assure they meet criteria established nationally. For more information, please refer to the Midwest Roadside Safety website: www.mwrsf.unl.edu

Financials	Amount
Committed Funds SFY 2020	$65,000
Committed Funds SFY 2019	$65,000
Transferred Funds SFY 2019	$65,000

TPF-5(255)-Highway Safety Manual

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $200,000
Contract Period: 1/19/2012 to 12/31/2020
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The Highway Safety Manual (HSM), 1st Edition, was published by AASHTO in 2010. The HSM provides the best factual information and tools in a useful form to facilitate roadway planning, design, operations, and maintenance decisions based on precise consideration of their safety consequences. The AASHTO Standing Committee on Highway Traffic Safety has established a goal to institutionalize the

AASHTO Highway Safety Manual (HSM) and its associated analytical tools to make data-driven decisions, advance the science of safety, and to ultimately reduce fatalities and serious injuries. The objectives of the study are to advance ongoing efforts by lead states to implement the HSM, and to expand implementation to all states.

Financials	Amount
Committed Funds SFY 2020	$20,000
Committed Funds SFY 2019	$20,000
Transferred Funds SFY 2019	$20,000

TPF-5(295)/Solicitation/1493-Smart Work Zone Deployment Initiatives (SWZDI)-FY20-FY24

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $300,000
MoDOT Commitment new solicitation: $50,000
Contract Period: 10/1/2019 to 9/30/2024
Contract Investigator: Iowa DOT
Funding: SPR 100%

Project Description and Objectives:
The Midwest Smart Work Zone Deployment Initiative (MwSWZDI) was initiated in 1999 as a Pooled Fund Study intended to coordinate and promote research related to safety and mobility in highway work zones. The Iowa DOT has been the lead state since 2004. The program is an ongoing cooperative effort between State Departments of Transportation, universities, and industry. Commercial products are provided by private vendors for evaluation, although this is not the only focus of contracted projects. State DOTs provide funds, prioritize products with respect to the anticipated benefits to their construction and maintenance activities, and cooperate with researchers to identify test sites and conduct the evaluations.

Financials	Amount
Committed Funds SFY 2020	$50,000
Committed Funds SFY 2019	$50,000
Transferred Funds SFY 2019	$50,000

TPF-5(301)-Support Services for Peer Exchanges

Project Type: Pooled Funds
MoDOT Contact: Bill Stone
MoDOT Total Commitment: $21,504
Contract Period: 10/1/14 to 6/30/19
Contract Investigator: Oregon
Funding: SPR 100%

Project Description and Objectives:
The Peer exchange has been a requirement for state RD&T programs since 1998 and it has proven to be a useful and effective tool for improving research program management. However, for many states the most difficult aspect of hosting a peer exchange is logistics and procurement. This Peer Exchange Project

is intended to provide Research Programs with the option to procure services to help with the logistical and administrative aspects of organizing and holding an RD&T Peer Exchange, as described under 23 CFR 420.203. Doing so will allow Research Programs to focus on the content of their peer exchange. Each state makes a contribution amount of around $7,000 but an actual transfer amount is determined after the logistics are finalized and actual costs are determined. MoDOT has not participated in this pooled fund in past years; Fiscal Year 2018 was the first year of participation.

Financials	Amount
Committed Funds SFY 2020	$0
Committed Funds SFY 2019	$21,504
Transferred Funds SFY 2019	$21,504

TPF-5(305)-Regional and National Implementation and Coordination of ME Design

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $60,000
Contract Period: 1/1/15 to 12/30/19
Contract Investigator: Iowa DOT
Funding: SPR 100%

Project Description and Objectives:
The focus of this pooled fund project will be to provide peer exchanges and the AASHTO National Users Group meeting. The meetings are to support State DOT and Canadian province implementation of ME Design procedures by (1) sharing information between, (2) identifying issues at the local/regional level with regard to implementation, (3) identifying needs or areas that still need to be researched relative to the MEPDG, and (4) organizing implementation efforts on a regional and National basis. The four peer exchanges will be limited to participation by governmental agencies, while the AASHTO Users group meeting will be open to industry representatives, academics, consultants, and others interested in ME Design.

Financials	Amount
Committed Funds SFY 2020	$10,000
Committed Funds SFY 2019	$10,000
Transferred Funds SFY 2019	$10,000

TPF-5(313)/Solicitation 1492 -Technology Transfer Concrete Consortium (TTCC)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $40,000
MoDOT Commitment new solicitation: $8,000
Contract Period: 2/5/2015 to 8/31/2020
Contract Investigator: Iowa State
Funding: SPR 100%

Project Description and Objectives:
Increasingly, state DOTs are challenged to design and build longer life concrete pavements that result in higher levels of user satisfaction. In order to foster new technologies and practices, experts from state DOTs, FHWA, academia and industry must collaborate to identify and examine new concrete pavement research initiatives. The Technology Transfer Concrete Consortium (TTCC) is to establish a pooled fund for state representatives to continue collaborative efforts begun in TPF-5(066) Materials and Construction Optimization. TTCC will provide new developments in concrete paving leading to implementation of new technologies and longer life pavements through the use of innovative testing, technology transfer, and construction optimization technologies and practices.

Financials	Amount
Committed Funds SFY 2020	$8,000
Committed Funds SFY 2019	$8,000
Transferred Funds SFY 2019	$8,000

TPF-5(316)-Traffic Control Device (TCD) Consortium (Traffic)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 1/14/2015 to 1/14/2021
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The Traffic Control Device Consortium will focus on systematic evaluation of novel TCDs, employing a consistent process that addresses human factors and operations issues for each TCD idea and by providing local and state agencies a quicker response to new technologies with the right assessment skills and tools that will enable consistent TCD idea identification and evaluation. TCD Consortium efforts will address TCD issues identified by local and state jurisdictions, industry, and organizations and will aid in the compliance to the MUTCD rule-making process and incorporation of novel TCDs into the MUTCD. This project is a continuation of TPF-5(065).

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$25,000
Transferred Funds SFY 2019	$25,000

TPF-5(317)-Low Cost Safety Improvements

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $25,000
Contract Period: 2/10/2015 to 2/9/2021
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The Evaluation of Low Cost Safety Improvements Pooled Fund Study will encompass safety-effectiveness evaluations of priority strategies from the NCHRP Report 500 Guidebooks, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan. A target of 24 strategies totaling $6M over three years is planned, but this will vary depending on the level of support. The data for the study will be gathered from those states that implement the strategies throughout the US. The data will be collected, and evaluation studies performed. This project is a continuation of TPF-5(099).

Financials	Amount
Committed Funds SFY 2020	$5,000
Committed Funds SFY 2019	$5,000
Transferred Funds SFY 2019	$5,000

TPF-5(319)-Transportation Management Center Pooled Fund Study

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 4/17/2015 to 4/16/2021
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The Transportation Management Center (TMC) Pooled Fund Study (PFS) serves as a forum to identify and address issues that are common among agencies that manage and operate TMCs and provides an opportunity for agencies to collectively take on those key issues and challenges. The goal of the TMC PFS is to assemble regional, state, and local transportation management agencies and the Federal Highway Administration (FHWA) to (1) identify human-centered and operational issues; (2) suggest approaches to addressing identified issues; (3) initiate and monitor projects intended to address identified issues; (4) provide guidance and recommendations and disseminate results; (5) provide leadership and coordinate with others with TMC interests; and (6) promote and facilitate technology transfer related to TMC issues nationally. This project is a continuation of TPF-2(207).

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$25,000
Transferred Funds SFY 2019	$25,000

TPF-5(330) / Solicitation 1504-No Boundaries Roadway Maintenance Practices

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $60,000
Contract Period: 9/1/2015 to 6/30/2019
Contract Investigator: Ohio DOT
Funding: SPR 100%

Project Description and Objectives:
Through this pooled fund project, the Ohio Department of Transportation will work with other State Departments of Transportation (DOTs) to facilitate the implementation of promising non-snow and ice maintenance innovations and technologies. This project provides a forum for State DOTs to share their maintenance innovations with each other, support technology transfer activities and develop marketing and deployment plans for the implementation of selected innovations. Resources will be provided for implementing the innovations that includes travel, training and other technology transfer activities. This project is a continuation of the previous project initiated and led by the Missouri DOT TPF-5(239). It is anticipated that this consortium will become the national forum for state involvement in the technical exchange needed for collaboration and new initiatives, and be a forum for advancing the application and benefit of research technologies. Workshops will continue to be provided for the states participating in the pooled fund project.

Financials	**Amount**
Committed Funds SFY 2020	$10,000
Committed Funds SFY 2019	$10,000
Transferred Funds SFY 2019	$10,000

TPF-5(334) - Enhancement to the Intelligent Construction Data Management System (Veda) and Implementation

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 1/19/2016 to 6/30/2020
Contract Investigator: Minnesota DOT
Funding: SPR 100%

Project Description and Objectives:
MnDOT, in collaboration with local contractors and suppliers, is moving forward with full implementation of geo-spatial technologies such as intelligent compaction and thermal profiling (infrared imaging) as quality control tools on grading, reclamation, and asphalt paving projects. Currently, only 10 to 15 percent of the MnDOT 2014 bituminous paving contracts will utilize these technologies due to lack of needed enhancements to the ICDM-Veda for use in contract administration. The pooled fund offers participating states to be a part of development of a software interface that will provide intelligent construction data collection systems (i.e., geospatial systems such as intelligent compaction, paver-mounted thermal profiling [infrared radar technology], ground penetrating radar (GPR), and pavement smoothness/profile, etc.) gather large quantities of data each day of production activities.

Financials	**Amount**
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$25,000
Transferred Funds SFY 2019	$25,000

TPF-5(341)-National Road Research Alliance

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $750,000
Contract Period: 4/19/2016 to 6/30/2020
Contract Investigator: Minnesota
Funding: SPR 100%

Project Description and Objectives:
The need for the National Road Research Alliance (NRRA) has grown over the last several years. It is based on a number of successful efforts the Minnesota Department of Transportation (MnDOT) has achieved utilizing the MnROAD research facility. These efforts include a number of local and national research studies, pool fund research projects, local-national-international partnerships, academic and industry involvement, Transportation Engineering and Road Research Alliance (TERRA) pooled fund, and MnROAD's 2014 Peer exchange.

Primary objectives of the National Road Research Alliance (NRRA) are:

- Conduct structured construction, field testing and evaluation using the MnROAD cold weather facility;
- Evaluate pavement materials, equipment and methods under real-world conditions;
- Establish industry standards and develop performance measure for improving pavement performance;
- Develop and/or revise specifications and recommendations;
- Studying and promoting innovative techniques and technologies that will save agencies money, improve safety and increase efficiency;
- Supporting technology transfer by developing practical field guides, best practices, and training curriculum to promote the results of research projects

Financials	**Amount**
Committed Funds SFY 2020	$150,000
Committed Funds SFY 2019	$150,000
Transferred Funds SFY 2019	$150,000

TPF-5(343)-Roadside Safety Research for MASH Implementation

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $150,000
Contract Period: 1/1/2016 to 12/31/2020
Contract Investigator: Washington
Funding: SPR 100%

Project Description and Objectives:
The Roadside Safety Research for MASH Implementation program is designed to conduct research on roadside safety priorities for research projects aligned with the MASH implementation completion schedule. The compliance dates for MASH roadside safety hardware are:

- December 31, 2017: W-beam barriers and cast-in-place concrete barriers;
- June 30, 2018: W-beam terminals;

• December 31, 2018: Cable barriers, cable barrier terminals, crash cushions;
• December 31, 2019: Bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and other breakaway hardware;
• Also, temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2015 edition of MASH.

Financials	Amount
Committed Funds SFY 2020	$50,000
Committed Funds SFY 2019	$50,000
Transferred Funds SFY 2019	$50,000

TPF-5(353)-Clear Roads Phase II

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $100,000
Contract Period: 1/1/2017 to 12/30/2021
Contract Investigator: Minnesota DOT
Funding: SPR 100%

Project Description and Objectives:
The Clear Roads pooled fund project will maintain its focus on advancing winter highway operations nationally but will include a more pronounced emphasis on state agency needs, technology transfer and implementation. State departments of transportation are aggressively pursuing new technologies, practices, tools, and programs to improve winter highway operations and safety while maintaining fiscal responsibility. This pooled fund is needed to evaluate these new tools and practices in both lab and field settings, to develop industry standards and performance measures, to provide technology transfer and cost benefit analysis, and to support winter highway safety.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$25,000
Transferred Funds SFY 2019	$25,000

TPF-5(357)-Connecting the DOTs: Implementing ShakeCast Across Multiple State Departments of Transportation for Rapid Post-Earthquake Response

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $60,000
Contract Period: 1/1/2017 to 6/30/2020
Contract Investigator: California DOT
Funding: SPR 100%

Project Description and Objectives:
When an earthquake occurs, the U. S. Geological Survey (USGS) ShakeMap portrays the extent of potentially damaging shaking. In turn, the ShakeCast system, a freely-available, post-earthquake situational awareness application, automatically retrieves earthquake shaking data from USGS

ShakeMap, analyzes shaking intensity data against users' facilities (e.g., bridges, buildings, roads), sends notifications of potential impacts, and generates maps and other web-based products for emergency managers and responders. ShakeCast is particularly suitable for earthquake planning and response purposes by Departments of Transportation (DOTs), in part since it can utilize State's existing NBI databases to implement shaking-based inspection priority and impact assessments. This collaborative effort will bring participating DOTs into full ShakeCast operation for post-earthquake assessment of state and local bridge inventories. The project will provide a mechanism to actively engage representatives from state DOTs with the common interests in implementing and expanding the application of ShakeCast technologies to improve emergency response capabilities.

Financials	**Amount**
Committed Funds SFY 2020	$15,000
Committed Funds SFY 2019	$15,000
Transferred Funds SFY 2019	$15,000

TPF-5(375) - MnROAD/NCATJoint Study – Phase II

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $150,000
Contract Period: 6/1/2012 to 9/30/2020
Contract Investigator: Minnesota DOT
Funding: SPR 100%

Project Description and Objectives:
MnROAD and NCAT are seeking organizations to join the partnership for the second phase of research efforts. Main objectives include:

1. Determining the life cycle cost of various pavement preservation alternatives in a highly controlled experiment that will provide state Departments of Transportation (DOTs) with the financial foundation to begin to build a decision tree for their own maintenance program

2. Develop quality assurance QA field testing protocols to correlate construction practices with long term performance of pavement preservation techniques.

3. Technology transfer - Answering practical questions posed by research sponsors through formal (i.e., reports & technical papers) & informal (e.g., one-on-one responses to sponsor inquiries) technology transfer on how these life extending benefits can be best utilized in each state.

Financials	**Amount**
Committed Funds SFY 2020	$0
Committed Funds SFY 2019	$150,000
Transferred Funds SFY 2019	$150,000

TPF-5(396)-Mid-America Freight Coalition-III

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $74,000
Contract Period:
Contract Investigator: Wisconsin DOT
Funding: SPR 100%

Project Description and Objectives:
The industries and farms of the Mississippi Valley region can compete in the marketplace only if their products can move reliably, safely and at reasonable cost to market. Growing congestion threatens the sustainability of this freight movement. The people of the region are dependent upon farms and industries for their livelihoods and their economic quality of life depends on the flow of goods to our markets. The Mississippi Valley Freight Coalition (MVFC) was created to protect and support the economic wellbeing of the industries, farms and people of the region by keeping the products of those industries, farms and people flowing to markets reliably, safely, and efficiently. This project is a continuation of Pooled Fund TPF-5(156).

Financials	Amount
Committed Funds SFY 2020	$37,000
Committed Funds SFY 2019	$37,000
Transferred Funds SFY 2019	$37,000

TPF-5(397)-TRB Research Subscription FY 2019 & FY 2020

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $357,222
Contract Period: 7/1/2017 to 9/30/2020
Contract Investigator: TRB
Funding: SPR 100%

Project Description and Objectives:
This is a subscription for support of core technical activities with the Transportation Research Board (TRB). The subscription is an agreement between MoDOT and the Transportation Research Board for the Research Correlation Service. The Research Correlation Service comprises a bundle of core services whose aim is to promote innovation through the coordination of research and dissemination of research results. The type of project is "Contract Other" because MoDOT purchases the services. The activities supported by this subscription include the collection of available information concerning past, current, and proposed research related to transportation. Sources including federal, state, and other governmental agencies, colleges and universities, research and planning organizations, transport operators and industry, as well as the TRB Annual Meeting and conference programs.

Financials	Amount
Committed Funds SFY 2020 (estimated)	$180,685
Committed Funds SFY 2019	$176,537
Transferred Funds SFY 2019	$176,537

TPF-5(419)-National Cooperative Highway Research Program (NCHRP) FY 2019 & TPF-5(420)-National Cooperative Highway Research Program (NCHRP) FY 2020

Project Type: Pooled Funds
MoDOT Contact: Bill Stone
MoDOT Total Commitment: $2,224,019
Contract Period: 7/1/2015 to 6/30/2016
Contract Investigator: NCHRP
Funding: SPR 100%

Project Description and Objectives:
FHWA has a longstanding association with the American Association of State Highway and Transportation Officials (AASHTO) and the National Academy of Sciences for conducting the National Cooperative Highway Research Program (NCHRP) under the Transportation Research Board (TRB). Each year contributions to the NCHRP are requested from the states. The NCHRP meets the criteria for use of federal-aid funds and is authorized to use 100% State Planning and Research Funds for the contribution.

Financials	Amount
Committed Funds SFY 2020 (estimated)	$1,112,000
Committed Funds SFY 2019	$1,112,019
Transferred Funds SFY 2019	$1,112,019

Solicitation 1473-Development of Accelerated Weathering and Corrosion Tests to Identify High-Performance Coatings for Structural Steels

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $75,000
Contract Period: TBD
Contract Investigator: Kentucky DOT
Funding: SPR 100%

Project Description and Objectives:
Currently, protective coatings applied to new steel bridges have anticipated service lives of approximately 30 years; for maintenance coatings, this figure is 20 years. With state highway agencies seeing their maintenance funding stretched thin to maintain infrastructure, it is critical to extend the service lives of coatings for as long as possible. Coatings manufacturers possess the knowledge and technologies required to produce new coatings which significantly outperform what they currently provide to public agencies, however, there isn't much of a market for those items absent empirical testing. This project will develop accelerated performance testing protocols, including evaluation methods, for high-performance coatings for structural steel. It will also develop equipment to execute the new testing protocols and undertake comparison testing of the current and new performance testing protocols.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

Solicitation 1496-Aurora Program (FY20-FY24)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $25,000
Contract Period: TBD
Contract Investigator: Iowa DOT
Funding: SPR 100%

Project Description and Objectives:
The Aurora Program is a consortium of public agencies focused on collaborative research, evaluation, and deployment of technologies for detailed road weather monitoring and forecasting. Members seek to implement advanced road weather information systems (RWIS) that fully integrate state-of-the-art roadway and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures; ultimately lessening adverse impacts of inclement weather.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

Solicitation 1499- Determining the in-place strength of concrete using piezoelectric based sensors

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $25,000
Contract Period: TBD
Contract Investigator: Indiana DOT
Funding: SPR 100%

Project Description and Objectives:
Fast-paced construction schedules often expose concrete pavement and/or structures to undergo substantial loading conditions even at its early age, which causes pre-mature failure or a significant reduction in the life span of pavement and bridges. The current methods for determining traffic opening times can be inefficient and expensive, causing construction delays and cost overruns. To address this critical need an in-situ nondestructive sensing method was developed that enables an accurate and efficient understanding of early age properties of concrete using electromechanical impedance (EMI) method coupled with piezoelectric sensors.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

Solicitation 1501- Continuous Asphalt Mixture Compaction Assessment using Density Profiling System (DPS)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $25,000
Contract Period: TBD
Contract Investigator: Minnesota DOT
Funding: SPR 100%

Project Description and Objectives:
The Aurora Program is a consortium of public agencies focused on collaborative research, evaluation, and deployment of technologies for detailed road weather monitoring and forecasting. Members seek to implement advanced road weather information systems (RWIS) that fully integrate state-of-the-art roadway and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures; ultimately lessening adverse impacts of inclement weather.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

Solicitation 1503- Transportation Research and Connectivity (librarian toolkit / knowledge networking / information condition / analysis of resources / digitization efforts / ADA support)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $25,000
Contract Period: TBD
Contract Investigator: Oklahoma DOT
Funding: anticipated SPR 100%

Project Description and Objectives:
With the number of transportation librarians shrinking nationwide and the number of complex issues facing transportation researchers only increasing, several solutions will be developed in the proposed study to remedy the aforementioned problems. To increase professionalism and standardization among non-library information managers, a toolkit will be developed that will offer guidance on best practices and be scalable to the research organization's size and abilities. Separately, a white paper on the changing nature of transportation libraries in the 21st century will be produced. This document will provide a roadmap for transportation organizations to follow with respect to current conditions of transportation information infrastructure. It will identify recurring problems, recommend solutions, and help organizations adapt to the rapid change that is occurring across the research landscape.

Financials	Amount
Committed Funds SFY 2020	$25,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

N/A- Transportation Pooled Fund Contingency

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: TBD
Contract Investigator: N/A
Funding: anticipated SPR 100%

Project Description and Objectives:
At the time of this document, state DOTs are just now working on the upcoming 2020 pooled fund solicitations. It is anticipated that Missouri DOT staff will request to enter into several other pooled fund projects in State Fiscal Year 2020. This Contingency project is to account for those requests over the next 13 months.

Financials	Amount
Committed Funds SFY 2020	$125,000
Committed Funds SFY 2019	$0
Transferred Funds SFY 2019	$0

Development – SPR20DVS

Estimated Cost - $95,414

TDyy0701 - Product testing in general

Project Type: New Products
MoDOT Contact: Brent Schulte
Contract Period: 7/1/208 to 6/30/2020
Funding: SPR 80%, State 20%

Project Description and Objectives:
Previously, sales persons have been able to contact many divisions, districts, and offices of MoDOT resulting in multiple evaluations, duplicated efforts, and potentially contradictory results. By setting a single point of contact, MoDOT can simplify applications, eliminate duplicate work, and improve evaluations of products. This project combines establishes a centralized application, a review method, and a database for all products submitted to MoDOT. Safety, cost, and minimum qualifications can be checked before resources are spent evaluating a product. If a product is selected for evaluation, then work is coordinated for better, faster, and less expensive testing. This project includes education to help personnel understand procedures and direct sales persons to the Coordinator.

Proposed Activities for SFY 2019:
This is an ongoing project to continually evaluate new products when submitted, update product information, improve centralized methods and information, share information department wide (even

nationwide), and encourage two-way communication about products. The coordinators from the specification and non-specification efforts will need to develop a work-plan to be more responsive for incoming submissions.

SFY 2018 Accomplishments:
The new products system continues to be split between specification compliant and non-compliant products.

Financials	**Amount**
Projected Budget SFY 2020	$95,414
Budget Amount SFY 2019	$93,090
Actual Cost SFY 2019	(See Addendum Sept. 2018)
Prior to SFY 2019 Actual Cost	N/A

Technology Transfer – SPR20TTS

Estimated Cost - $497,500

LTAP = $300,000
NHI = $40,000
BEAP = $120,000
TEAP = $37,500

TTAP - LTAP Program

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Contract Investigator: Missouri S&T
Funding: SPR 100%

TTAP Number	Calendar Year	SPR Work Program Timeline	Contract $
TTAP-T001(33)	2018	7/1/18 through 12/31/18	$183,351
TTAP-T001(34)	2019	1/1/19 through 12/31/19	$300,000
TTAP-T001(35)	2020	1/1/20 through 6/30/20	$100,000

Project Description and Objectives:
The Local Technical Assistance Program (LTAP) was established by the Federal Highway Administration (FHWA) in 1982 in response to a recognized need for funding and technical support to the 38,000 communities that maintain local roads and bridges. The Missouri LTAP center is located at Missouri University of Science and Technology. The center enables local counties, parishes, townships,

cities and towns to improve their roads and bridges by supplying them with a variety of training programs; new and existing technology updates; and personalized technical assistance. Through these core services, the LTAP center provides access to training and information that may not otherwise be accessible.

Accomplishments

CY 2018:

There was a joint Advisory Committee and Ambassadors meeting on November 8, 2017 to go over the 2018 work plan before issuing the next task order. The Task Order was executed by the Commission on December 22, 2017. For Calendar Year 2018 there were 94 classes with 5,781 attendees.

CY 2019:

The Task Order was executed by the Commission on December 27, 2018. There was a joint Advisory Committee and Ambassadors meeting on April 22, 2019. This meeting provides LTAP an opportunity to provide progress of the program to the committee. For the first quarter of Calendar Year 2019 there were 24 classes with 449 attendees.

Proposed Activities

CY 2019 & CY 2020:

- Will be seeking to expand our LTAP contact list by developing partnerships with various organizations. Also continue to look for partnerships through the Local Public Agency LPA efforts with MoDOT.
- Provide technology transfer materials.
- Provide increased information services - Continue to review and update the webpage to increase the services provided online and the links available.
- Conduct and arrange seminars & workshop training sessions.
- Continue offering "Show Me" Roads Scholar Program Level I courses; will be offering more Level II classes.
- Develop more Level II courses.
- Pursue additional funding sources that will allow the program to be expanded. This would allow us to further promote LTAP and our training and services.
- Continue to assist the MoDOT Local Public Agency efforts through training and other administrative opportunities.
- Evaluate program effectiveness.
- Create efficiencies in providing tech transfer materials and training by sharing resources and cost sharing with the Rural Technical Assistance Program (RTAP) on such deliverables as e-newsletters, arranging training and providing materials.

Financials	**Amount**
Projected Budget SFY 2020	$300,000
Budget Amount SFY 2019	$300,000
Actual Cost SFY 2018	(See Addendum Sept. 2018)
Actual Cost SFY 2018	$299,924

TT200701 - NHI National Highway Institute Training SFY 2019 & SFY 2020

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $80,000
Contract Period: 7/1/2018 to 6/30/2020
Contract Investigator: Sherron Motts
Funding: SPR 80%, State 20%

Project Description and Objectives:
The National Highway Institute (NHI) as part of FHWA is a source for training the transportation community. NHI provides a catalog of available courses that MODOT can purchase and host. Construction and Materials provides research funding in the amount up to $40,000. The type of project is "Contract Other" because MoDOT purchases the classes. NHI training courses provide direction and support to department personnel. Courses are scheduled and provided for department personnel to maintain an understanding of new methodologies and technologies. Training is also provided to meet employee needs and enhance their abilities to support the department's functions.

Proposed Activities for SFY 2019:
Provide opportunity for training of department personnel through NHI courses. Other training opportunities may be offered that support department functions, including on-site classes and workshops necessary to maintain our goal.

SFY 2018 Accomplishments:
There were three classes paid for in State Fiscal Year 2019 for the Bridge Division. A bridge Inspection class, a bridge inspection refresher course, and a fracture critical bridge class. The research section offered to pay over the traditional $40,000 for this fiscal year because there was room in the research budget to absorb the extra needed class whereas the Bridge Division would go over budget if required to absorb the class cost.

Financials	**Amount**
Projected Budget SFY 2020	$40,000
Budget Amount SFY 2019	$40,000
Adjusted Amount SFY 2019	$73,015
Actual Cost SFY 2018	(See Addendum Sept. 2018)
Prior to SFY 2018 Actual Cost	N/A

BEAP Program 2019 and 2020

Project Type: Contracts Other
MoDOT Contact: Bill Stone
Total Contract Amount: $240,000
Contract Period: 7/1/2018 to 6/30/2020
Funding: SPR 80%, State 20%

Problem, Background, and Significance:
The BEAP program has been in existence for a number of years. It provides an avenue for local agencies without engineering expertise to get some engineering assistance, through approved consultants, to deal with problems on their bridges. The Bridge Division administers the BEAP program. The type of project

is "Contract Other" because the project work will include contract management. The objective of this program is to provide engineering technical assistance to various local agencies to deal with operational problems on their bridges. This assistance results in reports that are provided to the local agencies providing them with options for addressing these issues. Implementation by the local agency of the recommendations from these reports will result in improvements to the functionality and safety of their bridges.

Proposed Activities for SFY 2019:
Provide opportunity for local agencies to get technical assistance for bridge engineering problems. It is estimated that the available funds will allow for around 30 BEAP projects. The total number of projects per year will vary depending on the scope and final cost of individual projects.

SFY 2018 Accomplishments:
The funding allocation for SFY2018 has allowed for 34 BEAP studies to provide technical assistance for operational problems on 37 local agency bridges. As of 5/10/18, 28 of these studies have been completed.

Financials	**Amount**
Projected Budget SFY 2020	$120,000
Budget Amount SFY 2019	$120,000
Actual Cost SFY 2018	(See Addendum Sept. 2018)
Prior to SFY 2018 Actual Cost	N/A

TEAP Programs 2019 and 2020

Project Type: Contracts Other
MoDOT Contact: Bill Stone
Total Contract Amount SPR: $60,000
Total Contract Amount Local Agency Match: $15,000
Total Contract Amount: $75,000
Contract Period: 7/1/2017 to 6/30/2019
Funding: SPR 80%, State 20%

Problem, Background, and Significance:
The TEAP program has been in existence for a number of years. It provides an avenue for local agencies without engineering expertise to get some engineering assistance, through approved consultants, to deal with problems on their roadways. The Design Division administers the TEAP program. The type of project is "Contract Other" because the project work will include contract management. The objective of this program is to provide engineering technical assistance to various local agencies to deal with operational problems on their bridges and roadways. This assistance results in reports that are provided to the local agencies providing them with options for addressing these issues. Implementation by the local agency of the recommendations from these reports will result in improvements to the functionality and safety of their roadways.

Proposed Activities for SFY 2020:
Provide opportunity for local agencies to get technical assistance for traffic engineering problems. The total number of projects per year will vary depending on the scope and final cost of individual projects. The TEAP program is managed by MoDOT’s Design Division’s LPA group.

SFY 2018 Accomplishments:
The funding allocation for SFY2019 allowed for 11 TEAP studies to provide technical assistance for local agency roadways. The eleven projects were from a combination of technical transfer funding and highway safety funding.

Financials	**Amount**
Projected Budget SFY 2020	$37,500
Budget Amount SFY 2019	$37,500
Actual Cost SFY 2019	(See Addendum Sept. 2018)
Prior to SFY 2019 Actual Cost	N/A

ADDENDUM

State Planning and Research Program

Fiscal Year 2019 Annual Report - (07/01/2018 - 06/30/2019)

PART I - PLANNING

Transportation Planning Activities	SFY 2019 Budget with Match	SFY 2019 Expenditures with Match
• Administration	$797,033	$835,260
• Planning and Performance Group		
o Planning and Policy Group	$519,824	$583,130
o Strategic Planning Group	$374,197	$265,864
• Statewide Programming	$709,564	$721,432
• Transportation Systems Management	$3,396,348	$3,421,235
o Administration	*$132,083*	*$140,865*
o Mapping and Customer Service	*$643,272*	*$688,942*
o Pavement Analysis and Application Dev.	*$693,131*	*$682,517*
o Traffic Collection	*$655,978*	*$619,258*
▪ Field Acquisition	*$744,210*	*$807,911*
o Data	*$527,674*	*$481,742*
SUBTOTAL	**$5,796,966**	**$5,826,922**
District Transportation Planning		
• CD	$1,345,496	$1,673,553
• KC	$1,409,313	$1,765,690
• NE	$910,458	$970,723
• NW	$608,687	$516,067
• SE	$941,902	$688,365
• SL	$1,029,489	$958,954
• SW	$946,588	$701,008
SUBTOTAL	**$7,191,933**	**$7,274,360**
Other Activities		
• Information Systems	$3,421,641	$3,206,064
• Regional Planning Commission	$1,375,000	$1,238,489
• Financial Services	$1,118,523	$1,170,901
• Bridge Division	$177,853	$242,655
• Design Division	$546,874	$721,481
• Innovative Partnerships and Alternative Funding	$228,600	$168,609
SUBTOTAL	**$6,868,491**	**$6,748,199**
TOTAL PART I	**$19,857,390**	**$19,849,481**

Part II – Urban (MPO) – PL

Metropolitan Areas	FY 2019 CPG Funds with Match	FY 2019 CPG Expenditures with Match*
NW Arkansas	$6,250	$6,250
Kansas City	$3,443,445	$1,560,123
St. Louis	$4,653,158	$4,259,276
Springfield	$1,023,094	$790,350
Columbia	$451,414	$155,386
Jefferson City	$204,858	$113,055
Joplin	$812,890	$14,173
St. Joseph	$288,723	$102,243
Cape Girardeau	$277,578	$122,117
TOTAL PART II	**$11,161,408**	**$7,122,974**

* Updated 9/13/2019

Part III – Research – SPR

Activity	SFY 2019 Budget with Match	SFY 2019 Expenditures with Match
• Administration (SPR19ADS)	$256,313	$225,416
• Research (SPR19RDS)	$1,763,908	$1,830,701
• Development (SPR19DVS)	$93,090	$12,234
• Technology Transfer (SPR19TTS)	$497,500	$500,155
TOTAL PART III	**$2,610,811**	**$2,568,505**

TOTAL MoDOT SPR WORK PROGRAM

	SFY 2019 Budget with Match	SFY 2019 Expenditures with Match
• Part I – Planning	$19,857,390	$19,849,481
• Part II – Metropolitan Planning	$11,161,408	$7,122,974
• Part III – Research	$2,610,811	$2,568,505
TOTAL MoDOT SPR WORK PROGRAM	**$33,629,609**	**$29,540,959**

Part III Research
Addendum September 2019
SFY2019 Budget to Actual

Project Number	Project Description	SFY 2019 Budget	SFY 2019 Actual
Administration - SPR19ADS		**$256,313.00**	**$225,415.74**
TA196601	Research Administration	$256,313.00	$225,415.74
Research - SPR19RDS	**Research**	**$1,763,908.00**	**$1,830,701.04**
Research General			
TR19CONT	Research Contingencies	$591,035.00	N/A
Research Contracts			
TR201313	Secretary of State Library MOU	$5,103	$5,103
TR201518	Roller Compacted Concrete	$7,040	$3,476
TR201522	MoDOT Customer Satisfaction Tracking Survey	$12,947	$22,252
TR201609	MEPDG Local Calibration	$73,690	$41,282
TR201610	AASHTO Technical Service Program	$140,000	$56,000
	Other Division Technical Service Programs		$224,361
TR201614	Zero Cement Concrete	$1,378	$1,321
TR201702	High Volume Recycled Materials Phase II	$4,543	$3,663
TR201703	Economical and Crack Free High Performance Concrete Phase II	$1,707	$198
TR201705	Implementation of FR SCC and FR SWC Phase II	$13,221	$9,956
TR201712	Performance Characteristics of Recycled Asphalt	$5,217	$5,217
TR201720	Rejuvenating Asphalt Products	$36,792	$61,588
TR201724	MoDOT Report Card Survey	$0	$39,525
TR201801	Library Support Contract (2018-2019)	$100,000	$109,711
TR201804	Field Implementation of Rubberized Chip Seal	$16,967	$16,967
TR201806	Perform.-Based Specs of Fiber-Reinf. Concrete to Enhance Perform. and Reduce Steel-Reinf. in Structural Members	$45,206	$85,203
TR201807	Understanding and Improving Heterogeneous, Modern Recycled Asphalt Mixes	$242,000	$280,272
TR201809	Assessment and Repair of Corroded Steel H-Piles	$83,211	$54,352
TR201811	Support for Balanced Asphalt Mixture Design Specification Development in Missouri	$135,917	$259,133
TR201812	Infrastructure Conference Invoice	$3,000	$0
TR201813	Leader-Follower TMA System	$192,472	$192,472
TR201814	Leader-Follower TMA System Misc. Expenses	$16,100	$13,787
TR201815	TITAN - An Interactive Web-based Platform for Transportation Data InTegration and ANalytics	$24,992	$24,992
TR201901	Work Zone Inspection Training using Enhanced Visualization Technology	$0	$68,093
TR201902	IC-IR Consultant Contract-Phase 3	$0	$87,670
TR201903	Facebook Surveys--RTS Fiscal Year 2019	$11,370	$6,585
TR201904	Compacted Concrete Pavement-SE District	$0	$17,635
TR201905	Wicking Fabric (H2Ri) to Mitigate Pumping in Concrete Pavement Shoulder	$0	$6,305
TR201908	Highway Safety Manual Training	$0	$53,271
TR201911	Inlaid Pavement Marking Evaluation	$0	$10,261
TR201912	Predictive Deep Learning for Flood Evacuation Planning and Routing	$0	$50,047
TR201917	Protection and Repair of P/S Girders Damaged due to Over-Height Vehicles	$0	$0
TR201918	Flood Inundation Maps to Support Flood Warning for Dardenne Creek	$0	$20,000
TR201919	Field Implementation of Compacted Concrete Pavement - Mexico, MO	$0	$0

TR202001	Library Support Contract (2020-2021)	$0	$0
TR202002	Snow and Ice Treatment Products Evaluation	$0	$0
TR202003	Evaluating Performance of Concrete Overlays	$0	$0
TR202004	Traffic Disruption-free Bridge Inspection Initiative with Robotic Systems	$0	$0
		$1,172,873	$1,830,701
Development - SPR19DVS		**93,090**	**12,234**
TD180701	New Product Evaluation	93,090	12,234
Technology Transfer - SPR19TTS		**497,500**	**500,155**
TTAPT001	Local Technical Transfer Assistance Program (LTAP)	300,000	278,664
TTAPT001	BEAP	120,000	119,068
TTAPT001	TEAP	37,500	29,408
TT200701	NHI National Highway Institute Training	40,000	73,015
Total SFY 2019 Part III Budget		**2,610,811**	**2,568,505**
MoDOT Led Pooled Fund Studies*			
TR201910	Developing Implementation Strategies for Risk Based Inspection (RBI)	$50,000	$63,031
Total SFY 2019 Part III Budget including MoDOT led Pooled Funds		**$2,660,811**	**$2,631,536**