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

RE: State Planning and Research Work Program  
July 1, 2016 to June 30, 2017  
Missouri Project SPR-PL-00 FY (017)

Dear Mr. McKenna:

In your letter dated June 17, 2016, 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) fiscal year (FY) 2017 State Planning and Research (SPR) Work Program. After prior discussion and review of draft copies, we find the FY 2017 SPR Work Program satisfactory and approve it as requested, effective July 1, 2016.

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 FY 2017 SPR work program and FY 2016 SPR Annual reporting data are presented in one planning work product. Please provide our Division Office the addendum that adds the FY 2016 actual cost to the FY 2017 SPR Work Program by August 31, 2016 and take steps to close out the SPR-PL-00 FY(16) project within 90 days of the close of the state fiscal year 2016 work program.

If you have any questions, please contact Brad McMahon at FHWA (573) 638-2609 or Jeremiah Shuler at FTA (816) 329-3940.

Mokhtee Ahmad  
Regional Administrator  
Federal Transit Administration

Sincerely,

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

cc: Mabelle Watkins, MoDOT  
Eva Voss, MoDOT  
Doug Hood, MoDOT  
Bill Stone, MoDOT  
Dave Ahlvers, MoDOT  
Sharon Monroe, MoDOT

**Missouri Department of Transportation**  
*Patrick K. McKenna, Director*

1.888.ASK MODOT (275.6636)

June 17, 2016

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:

Enclosed is the Missouri Department of Transportation's FY 2017 State Planning and Research Work Program and FY 2016 Annual Report. A draft copy was submitted to your office on May 24, 2016, for review by ONE DOT.

MoDOT is requesting overall approval of the enclosed report effective July 1, 2016.

If there are questions regarding this SPR program, please contact Eva Voss 751-3705 or me at 526-1374.

Sincerely,



for  
Machelle Watkins  
Director of Transportation Planning

Enclosure

Copy: Brad McMahon- FHWA  
Jeremiah Shuler-FTA  
Dave Ahlvers – CM-MODOT



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*Our mission is to provide a world-class transportation experience that  
delights our customers and promotes a prosperous Missouri.*

[www.modot.org](http://www.modot.org)

# State Planning and Research Program

SPR-PL-00 FY (17)  
2017 Fiscal Year  
(7/1/16 to 6/30/17)

## Work Program

And  
SPR-PL-00 FY (16)  
2016 Fiscal Year  
(7/1/15 to 6/30/16)



Missouri Department  
of Transportation

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

## Annual Report

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## 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  
 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  
 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  
 MVFC – Mississippi Valley Freight Coalition  
 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  
 ONE DOT – 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  
 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  
 SRTS – Safe Routes to School  
 STARS – Missouri Statewide Traffic Accident Records System  
 STIP – Statewide Transportation Improvement Program  
 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  
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.

**Planning (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 2017 SPR Work program is describing the proposed work activities and estimated budgets for each SFY 2017 SPR work program work element and the expenditures for each SFY 2016 SPR work program work activity and SFY 2016 accomplishments. An administrative action will be completed in August 2016 for the purpose of incorporating the actual expenditure amounts for SFY 2016 work activities into the SFY 2017 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](http://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 experience that delights our customers and promotes 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

A. Total Estimated Costs	SFY 2017	SFY 2016
Part I – Planning	\$14,586,813	\$14,282,241
Part II – Metropolitan Planning	\$8,232,873	\$7,925,453
Part III – Research, Development and Technology	<u>\$2,826,785</u>	<u>\$2,508,549</u>
<b>TOTAL ESTIMATED COST</b>	<b>\$25,646,471</b>	<b>\$24,716,243</b>
B. Available Federal Funds	SFY 2017	SFY 2016
<b>Part I - State Planning</b>		
Obligated but Not Spent [Q55/H55/L55, L55E]	\$10,938,582	\$5,376,670
Unobligated Funds [0800, L55E and M550]	\$29,600,997	\$24,938,516
Estimated SFY 2017 Annual Apportionment [L55]	<u>\$14,200,000</u>	<u>\$13,600,000</u>
<b>SUBTOTAL – STATE PLANNING</b>	<b>\$54,739,579</b>	<b>\$43,915,186</b>
<b>Part II - Metropolitan Planning</b>		
Obligated but Not Spent [PL and 5303]	\$11,612,641	\$11,896,429
Estimated FHWA PL Annual Allocation	\$5,200,000	\$4,682,757
Estimated FTA 5303 Annual Allocation	<u>\$1,672,416</u>	<u>\$1,657,604</u>
<b>SUBTOTAL – METRO PLANNING</b>	<b>\$18,485,057</b>	<b>\$18,236,790</b>
<b>Part III – Research</b>		
*Obligated but not spent [Q56/H56/L56, L56E]	\$3,228,471	\$2,602,174
Unobligated Funds [Q56/H56/L56E]	\$7,139,568	\$4,558,663
Estimated SFY 2017 Annual Apportionment	\$4,700,000	\$4,600,000
Less:	<u>(\$1,812,800)</u>	<u>(\$1,438,513)</u>
- NCHRP.....\$1,050,000 estimated		
- TRB Core.....\$165,000 estimated		
- Pooled Funds.....\$597,800		
<b>SUBTOTAL – RESEARCH</b>	<b><u>\$13,255,239</u></b>	<b><u>\$10,322,324</u></b>
<b>TOTAL FEDERAL FUNDS AVAILABLE</b>	<b>\$86,479,875</b>	<b>\$72,474,300</b>

\* The majority of “Obligated but Not Spent” funds are obligated for pooled fund projects proposed project financing for SFY 2016.

**C. Proposed Budget Estimates for SFY 2017**

<b>C. Proposed Budget Estimates for SFY 2017</b>	<b>Federal Funds</b>	<b>Percent</b>	<b>Matching Funds</b>	<b>Total</b>
State Planning	\$11,669,450	80	\$2,917,363	\$14,586,813
Metropolitan Planning (PL and 5303) (Estimated)	\$6,586,298	80	\$1,646,575	\$8,232,873
Research	\$2,261,428	80	\$565,357	\$2,826,785
<b>TOTAL SP, SR &amp; CPG</b>	<b>\$20,517,177</b>		<b>\$5,129,294</b>	<b>\$25,646,471</b>

**D. SFY 2016 SPR Budget Amounts**

<b>D. SFY 2016 SPR Budget Amounts</b>	<b>Federal Funds</b>	<b>Percent</b>	<b>Matching Funds</b>	<b>Total</b>
State Planning	\$11,425,793	80	\$2,856,448	\$14,282,241
Metropolitan Planning (PL and 5303) (Estimated)	\$6,340,362	80	\$1,585,091	\$7,925,453
Research	\$2,006,839	80	\$501,710	\$2,508,549
<b>TOTAL SP, SR &amp; CPG</b>	<b>\$19,772,994</b>		<b>\$4,943,249</b>	<b>\$24,716,243</b>

## Itemized Cost Budget Estimates and Actual Expenditures

### Part I – Planning

Transportation Planning Activities	SFY 2017 Budget	SFY 2016 Budget
• Administration	\$492,284	\$494,769
• Planning and Performance Group		
o Planning and Policy Group	\$521,555	\$415,252
o Strategic Planning Group	\$380,624	\$480,801
• Statewide Programming	\$663,274	\$641,384
• Transportation Systems Management	\$4,586,066	\$4,788,890
o Administration	\$129,987	\$133,201
o Mapping and Customer Service	\$800,426	\$1,152,687
o Pavement Analysis and Application Dev.	\$657,038	\$653,423
o Traffic/Collection	\$1,458,940	\$1,458,598
▪ Field Acquisition	\$939,630	\$891,506
o Data	<u>\$600,045</u>	<u>\$499,476</u>
<b>SUBTOTAL</b>	<b>\$6,643,802</b>	<b>\$6,821,096</b>
<i>District Transportation Planning</i>		
• CD	\$318,174	\$306,080
• KC	\$811,735	\$711,890
• NE	\$639,792	\$186,176
• NW	\$368,617	\$95,100
• SE	\$261,458	\$249,386
• SL	\$315,626	\$300,155
• SW	<u>\$444,482</u>	<u>\$431,560</u>
<b>SUBTOTAL</b>	<b>\$3,159,884</b>	<b>\$2,280,347</b>
<i>Other Activities</i>		
• Information Systems	\$2,209,690	\$2,861,640
• Regional Planning Commission	\$1,375,000	\$1,250,000
• Financial Planning & Reporting	<u>\$1,198,437</u>	<u>\$1,069,158</u>
<b>SUBTOTAL</b>	<b>\$4,783,127</b>	<b>\$5,180,798</b>
<b>TOTAL PART I</b>	<b>\$14,586,813</b>	<b>\$14,282,241</b>

\*SFY 2016 Actuals will be submitted to FHWA as an addendum August 2016.

**Part II – Urban (MPO)**

	Estimated FFY 2017 PL Allocation	Estimated FFY 17 5303 Allocation	Estimated FFY 2017 Local Match	Estimated Total FFY 2017 CPG Funds with Match	Actual Total FFY 2016 CPG Funds with Match
<b>Metropolitan Areas</b>					
NW Arkansas	\$5,000	\$0	\$1,250	\$6,250	\$6,000
Kansas City	\$1,354,421	\$464,229	\$454,663	\$2,273,313	\$2,182,380
St. Louis	\$2,381,048	\$877,067	\$814,529	\$4,072,644	\$3,909,738
Springfield	\$435,809	\$135,039	\$142,712	\$713,560	\$685,018
Columbia	\$203,043	\$61,543	\$66,147	\$330,733	\$317,503
Jefferson City	\$121,809	\$28,877	\$37,672	\$188,358	\$180,823
Joplin	\$151,550	\$40,836	\$48,097	\$240,483	\$230,863
St. Joseph	\$146,683	\$38,879	\$46,391	\$231,953	\$222,674
Cape Girardeau	\$114,520	\$25,945	\$35,116	\$175,581	\$168,558
<b>TOTAL PART II</b>	<b>\$4,913,883</b>	<b>\$1,672,415</b>	<b>\$1,646,575</b>	<b>\$8,232,873</b>	<b>\$7,903,558</b>

Note: The total of MPO contracts (CPG agreements) in place for the SFY 2017 SPR work program is \$7,168,781.

**Part III – Research – SPR**

Activity	SFY 2017 Budget	SFY 2016 Budget
• Administration (SPR17ADS)	\$252,836	\$322,074
• Research (SPR17RDS)	\$2,001,908	\$1,673,908
• Development (SPR17DVS)	\$82,041	\$19,567
• Technology Transfer (SPR17TTS)	\$490,000	\$493,000
<b>TOTAL PART III</b>	<b>\$2,826,785</b>	<b>\$2,508,549</b>

\*SFY 2016 Actuals will be submitted to FHWA as an addendum August 2016.

**TOTAL MoDOT SPR WORK PROGRAM**

	SFY 2017 Budget	SFY 2016 Budget
• Part I – Planning	\$14,586,813	\$14,282,241
• Part II – Metropolitan Planning	\$8,232,873	\$7,925,453
• Part III – Research	\$2,826,785	\$2,508,549
<b>TOTAL MoDOT SPR WORK PROGRAM</b>	<b>\$25,646,471</b>	<b>\$24,716,243</b>

\*SFY 2016 Actuals will be submitted to FHWA as an addendum August 2016.

## WORK PLANS

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### Core and Mandated Activities

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#### 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 such items 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 economic studies.

##### SFY 2017 Proposed Activities:

- Continue providing for the management of Transportation Planning's core functions including trainings and office supplies, equipment and travel expenses
- Host a statewide planning partner meeting early 2017 to share transportation information and best practices
- Continue participating in the Midwest Rail Initiative
- Coordinate the freight data update
- Attend conferences, peer exchanges, AASHTO meetings and training courses
- Conduct an economic impact analysis for the SFY 2017-2021

##### SFY 2016 Accomplishments:

- Hosted one planning partner meeting, February 18, 2016, 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
- Conduct an economic impact analysis for the SFY 2016-2020

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$ 492,284	SPR1740S
Budget Amount SFY 2016	\$ 494,769	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

## 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:** PPG 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 focuses 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 the 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 2017 Proposed Activities:

#### Planning and Policy Group:

- Attend MPOs board and technical committee meetings
- Engage the public in discussions about additional transportation investments and needs
- Participate in the ONE DOT process review of the transportation planning process in the Columbia and St. Joseph metropolitan planning areas
- 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
- Develop analytical tools for use in transportation planning
- 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 developing performance measures and targets
- Continue development of the Asset Management Plan
- Administered Tracker surveys: Customer Service Survey (Call Center)
- Bid and manage Report Card Survey (customer satisfaction survey of Missourians)

**Strategic Planning Group:**

- Provide team facilitation for process improvement and business planning teams
- Continue to support and develop the Tracker performance management system
- 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
- Coordinate strategic issue sessions for senior manager meetings
- Continue to coordinate and develop the Innovations Challenge program
- Develop online tools for process improvement, business planning and performance measurement
- TP internal and external customer satisfaction surveys

**SFY 2016 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
- Continued collaborating with RPCs and 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
- Collaborated with local communities to assist with transportation air-quality issues and policy development
- 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
- Assist MPOs in developing performance measures
- Initiated the development of the Asset Management Plan
- Administered Tracker surveys: Customer Service Survey (Call Center) and Right Transportation Solutions Survey
- Conducted and managed Report Card Survey (customer satisfaction survey of Missourians)
- Participated in the ONE DOT Follow Up Review of the JASTO 2015 Planning Process Review (Feb. 2015).

**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
- Streamlined the production process for the Tracker publication
- Deployed action plans for all Focal Point sessions
- Facilitated development of MoDOT's Maintenance Management System, an electronic signature system and an electronic projects SharePoint site.
- Coordinated strategic issue sessions for senior manager meetings
- Developed online best practices pages for internal and external audiences
- Coordinated and further developed the Innovations Challenge program
- During the past year, the Innovations Challenge program identified 46 best practices, which have been shared for statewide implementation

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
<u>Planning and Policy Group</u>		
Projected Budget SFY 2017	\$521,555	SPR1740S
Budget Amount SFY 2016	\$415,252	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S
 <u>Strategic Planning Group</u>		
Projected Budget SFY 2017	\$380,624	SPR1790S
Budget Amount SFY 2016	\$480,801	SPR1690S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1690S

## 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 2017 Proposed Activities:

- Produce and maintain the 2017-2021 STIP in accordance with the guidelines of the Planning Framework, and state and federal regulations
- Produce reports on STIP programs and projects
- Develop portions of the Accountability Report

### SFY 2016 Accomplishments:

- Updated and completed the 2016-2020 STIP
- Incorporated STIP revisions as needed
- Developed STIP reports as needed
- Completed portions of the annual accountability report

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$663,274	SPR1740S
Budget Amount SFY 2016	\$641,384	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

## 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 2017 Proposed Activities:**

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

#### **SFY 2016 Accomplishments:**

- Administered HPMS program
- Analyzed and provided transportation data to customers and transportation decision makers

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	<b>\$129,987</b>	SPR1740S
Budget Amount SFY 2016	\$133,201	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

### 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 TMS customer support through our TMS Help Desk
- Test TMS software for monthly updates
- Maintain and publish MoDOT's 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 data support as requested, official state system and county road mileages as well as 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 IS to gather business requirements for TMS Design

#### **SFY 2017 Proposed Activities:**

- Continue distribution support of the 2013-2014 Missouri State Highway Map and create the 2017-2019 Missouri State Highway Map
- Provide customer requested maps and GIS data help to internal and external customers

- Create 2017-2021 STIP maps and 2014 and 2015 traffic volume maps and update functional classification maps as required
- Provide MoDOT representation on Missouri's GIS Advisory Council, Missouri's Board on Geographic Names, FHWA's GIS for Transportation, MidAmerica GIS Consortium, Missouri Geospatial Alliance, Missouri Mappers Association and the National Map Corps
- Conduct TMS data restoration as required by our route update process
- Submit annual mileage of county roads by surface type report to the Department of Revenue and annual certified mileage report to the Governor for approval
- Create annual official state system mileage report and various TMS mileage reports for internal and external customers
- Create county map books used by county commissioners to approve their official mileage
- Research TMS crash location inquiries submitted by the Missouri State Highway Patrol
- Identify construction projects that opened to traffic
- Provide outstanding customer service both inside and outside the department
- Develop Mapping and Customer Service SharePoint page and continue conversion of TMS documentation into SharePoint
- Create manuals and provide training for TMS Modernization
- Continue testing TMS Modernization rewrite
- Provide representation on the state Innovations Challenge Team
- Create videos for TMS training
- Create county maps for internal and external customers
- Provide representation on the State Maintenance Team
- Provide GIS data and support to SEMA/FEMA during declared disasters in Missouri
- Provide continued representation/oversight to Missouri state agency LiDAR data server sharing project
- Provide continued oversight to Missouri statewide high-resolution imagery program with the Missouri Office of Administration

#### **SFY 2016 Accomplishments:**

- Updated functional classification maps and will continue into the 2017 work program year
- Continued testing TMS Modernization rewrite
- Created training documentation for TMS, Signal, Flasher, Lighting, Traffic Hourly Segment Volume, Highway Capacity System, Adopt-A-Highway, Outdoor Advertising, Emergency Operations, Fuzzy Search, and Data Entry Map web applications
- Tested applications and created manuals for the development of new TMS applications
- Provided training on TMS applications via video conference and classroom atmosphere
- Conducted and provided monthly TMS application update testing, support and TMS data restoration
- Provided custom GIS data and specialty maps to internal/external customers and planning partners
- Provided ongoing GIS data exchange with Missouri's surrounding states
- Provided MoDOT representation on Missouri's GIS Advisory Council, Missouri's Board on Geographic Names, FHWA's GIS for Transportation, MidAmerica GIS Consortium, Missouri Geospatial Alliance, Missouri Mappers Association and the National Map Corps
- Created annual fiscal year STIP maps, traffic volume maps, county map books, and functional classification map updates as requested
- Submitted annual mileage of county roads by surface type report to the Department of Revenue and annual certified mileage report to the Governor for approval
- Created annual official state system mileage report and various TMS mileage reports for internal and external customers

- Researched TMS location inquiries submitted by the Missouri State Highway Patrol
- Identified construction projects that opened to traffic
- Provided outstanding customer service both inside and outside the department
- Provided representation to Missouri state agency LiDAR data server sharing project
- Contributed to the creation of new Missouri statewide high-resolution imagery program (Ortho-Imagery Program) with the Missouri Office of Administration
- Completed testing for the new updates for Flasher, Adobe and Internet Explorer
- Continued with the definition portion of the TMS User Doc in SharePoint
- Migrated Cognos reports to Crystal reports for Outdoor Advertising
- Provided representation on the state Innovations Challenge Team and submitted a winning (statewide) best practice in the competition
- Continued distribution support of the 2013-2014 Missouri State Highway Map and began planning for new 2017-2019 state map
- Provided ongoing legislative support regarding road support funding
- Provided data and map support regarding 325 System and Tough Choices
- Participated in GIS Day through education outreach at elementary schools
- Provided ArcGIS software testing support for the 10.4 upgrade
- Coordinate and participated at the 2016 Multi-State GIS conference (MAGIC 2016)
- Provided representation on the Statewide Maintenance Team, Total Compensation Team, and the Missouri Geographic Bee 2016

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$ 800,426	SPR1740S
Budget Amount SFY 2016	\$1,152,687	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

**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.

**SFY 2017 Proposed Activities:**

- Evaluate pavement data and prepare for HPMS submittal
- Provide pavement data, analysis and projections for transportation decision-making
- Update pavement management system and reporting for new FAST Act/MAP-21 pavement reporting requirements
- Maintain, update and refine MoDOT’s linear referencing system for all public roads
- Update and modernize GIS applications that support asset data management and linear referenced inventories
- Research and develop efficient technologies for building and updating linear referenced GIS networks linked to asset management system
- Prepare and build new processes/systems for new pavement data collection equipment
- Monitor pavement data to evaluate current and past best practices in pavement management

**SFY 2016 Accomplishments:**

- Completed pavement data analysis and preparation for dual carriage routes for HPMS submittal
- Provided pavement data analysis, modeling and forecasting continuing with MoDOT’s Long Range Plan
- Provided analysis and input for MoDOT’s asset management plan
- Updated pavement management system in preparation for new FAST Act/MAP-21 pavement reporting requirements
- Maintained MoDOT’s linear referencing system and continually worked with counties to verify local roads
- Set up error reporting process with State Highway Patrol and local law enforcement agencies to correct naming or new alignment issues with our LRS
- Added additional quality control checks to pavement data ensuring data integrity
- Added new asset inventories into the modernized LRS

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$657,038	SPR1740S
Budget Amount SFY 2016	\$653,423	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

**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 current and historical traffic information, traffic trends and VMT, and cooperates with the MPOs and other local entities in providing 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 2017 Proposed Activities:**

- Provide traffic and pavement data for planning and design activities
- Calculate and provide 2016 statewide travel data
- Purchase a new ARAN van for collecting data on Missouri’s roads

**SFY 2016 Accomplishments:**

- Processed portable and permanent counts in accordance with the traffic monitoring guide for HPMS submittal
- Calculated and provided 2015 statewide travel data and reports
- Collected pavement data on 35,977 miles of Missouri’s roadways

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$1,458,940	SPR1740S
Budget Amount SFY 2016	\$1,458,598	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

### Field Acquisition

**Purpose and Scope:** The Field Acquisition unit is responsible for collecting condition and operational data for the state highway system, processing and verifying physical roadway data and analyzing and reporting information on pavements. This includes personal services and fringe benefits.

- 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
- Friction testing
- ARAN video

#### **SFY 2017 Proposed Activities:**

- Collect approximately 5,100 portable counts and class counts with at least 30 percent of those being classification counts
- Install and repair existing ATR sites, upgrade two site locations to Wavetronix units
- Continue updating our landline modem communications to cellular modem communication for our ATR sites, currently close to 50 percent switchover
- Collect all HPMS data as requested
- Collect all ARAN miles as requested

#### **SFY 2016 Accomplishments:**

- Completed collection of approximately 4,925 portable counts and classification counts as requested with 46.5 percent of those counts being classification counts
- Installed and repaired ATR sites as needed due to new pavement or faulty sensors in the pavement.
- Collected HPMS data as requested
- Collected 35,000 miles of ARAN data including HPMS and NHS

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$939,630	SPR1741S
Budget Amount SFY 2016	\$891,506	SPR1641S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1641S

**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., outdoor advertising controlled routes, truck routes, auto issue routes)

**SFY 2017 Proposed Activities:**

- Maintain all HPMS sample and universe segments
- VeriSFY HPMS data accuracy and meet target submittal date to FHWA
- Maintain roadway data and its attributes
- Update bridge vertical clearances
- Maintain various TMS data types and update data as required by TP's route update process
- Prepare monthly publications to share transportation data
- 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
- Improve the Change in Route Status Reports filing process and the process to expedite data retrieval
- Prepare and maintain an inventory of Federal Aid Primary as of 1991 for various legal purposes related to the management of Outdoor Advertising
- 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

**SFY 2016 Accomplishments:**

- Maintained all HPMS sample and universe segments and submitted the data to FHWA
- Maintained an inventory of roadway lane data and its attributes
- Entered over 300 roadway projects into TMS
- Updated bridge vertical clearances and answered bridge and clearance related questions
- Maintained various TMS data types and updated data as required by TP's route update process
- Prepared weekly and monthly crash-related publications
- Began processing all not-on-system property damage only crashes as well as all on-system crashes
- Processed standard functional classification requests and changes

- Researched and answered inquiries submitted by internal customers (i.e., crash locations)
- Provided GIS section with modifications to MoDOT’s route network
- Updated MoDOT performance measures to provide management with information on roadway projects and number of crashes to review
- Served as a liaison between Motor Carrier Services and TP concerning routing and junction issues
- Provided Motor Carrier Services with weekly progress reports on SDE tickets and other issues
- Assisted with testing the TMS Modernization applications for associatives and lane data
- Coordinated the FAST Act/MAP-21 enhanced NHS/Principal Arterial route review with districts
- Updated NHS data upon approval from FHWA and completed NHS changes as a result of the NE, NW and SE district NHS/Principal Arterial reviews
- Processed Change in Route Status Reports
- 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 roadway detail and speed limit data
- Provided Billboard and Junkyard maps to customers as requested
- 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
- Worked with FHWA to achieve approval of new urban boundaries

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	<b>\$600,045</b>	SPR1740S
Budget Amount SFY 2016	\$499,476	SPR1640S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1640S

**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 transportation planning 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.

<i>District Transportation Planning</i>	<i>SFY 2017 Budget</i>	<i>SFY 2016 Budget</i>
• CD	\$318,174	\$306,080
• KC	\$811,735	\$711,890
• NE	\$639,792	\$186,176
• NW	\$368,617	\$95,100
• SE	\$261,458	\$249,386
• SL	\$315,626	\$300,155
• SW	<u>\$444,482</u>	<u>\$431,560</u>
<b>SUBTOTAL</b>	<b>\$3,159,884</b>	<b>\$2,280,347</b>

**\*SFY 2016 Actuals will be submitted in the August 2016 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 2017 Proposed Activities:

- Maintain and modernize the Transportation Management System

#### SFY 2016 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.

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$2,209,690	SPR17ISS
Budget Amount SFY 2016	\$2,861,640	SPR16ISS
Actual Cost SFY 2016	(See Addendum Aug. 2016)	

### 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 RPC's 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 \$60,000 each. Budget and actual amounts exclude local match.

#### SFY 2017 Proposed Activities:

- Cooperate and collaborate with MoDOT on transportation planning processes
- Attend MACOG meetings held monthly in Jefferson City to discuss various issues with RPC's
- Participate in RPCs' technical committee meetings held in the respective regions throughout the state
- RPC's work with MoDOT and districts with developing work programs involving transportation planning activities

#### SFY 2016 Accomplishments:

- Attended MACOG meetings held monthly in Jefferson City to discuss various issues with RPC's
- Participated in RPCs' technical committee meetings held in the respective regions throughout the state
- Worked with RPC's and districts with developing work programs involving transportation planning activities
- Attended Statewide Planning Partner meetings hosted by MoDOT, February 18, 2016

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$1,375,000	SPR1727S
Budget Amount SFY 2016	\$1,250,000	SPR1627S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1627S

### Financial Planning and Reporting

**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 2017 Proposed Activities:

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

#### SFY 2016 Accomplishments:

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

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$1,198,437	SPR1793S
Budget Amount SFY 2016	\$1,069,158	SPR1693S
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR1693S

## Part II – Urban Transportation Planning

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

The U.S Department of Transportation’s Consolidate 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.

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 MPO 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 MPOs 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 UPWP is approved by the MPO 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 2017 5303 allocation amount used 2010 census urbanized area populations.

**Table 1: Total CPG Funds Available to MPOs for SFY 2017 UPWP Work Activities**

Metropolitan Areas (Fiscal Year)	MPO Balances as of May 2016 (without FY 2016 allocation)*	Estimated FFY17 PL Allocation	Estimated FFY17 5303 Allocation Amounts	FFY16 PL Allocation	FFY16 5303 Allocation Amounts	Estimated Total CPG Funds
NW Arkansas 07/01 - 06/30	(\$3,000)	\$5,000	\$0	\$5,000	\$0	\$7,000
Kansas City 01/01 - 12/31	\$1,791,029	\$1,354,421	\$464,229	\$1,354,421	\$464,229	\$5,428,329
St. Louis 07/01 - 06/30	\$6,711,479	\$2,381,048	\$877,067	\$2,381,048	\$877,067	\$13,227,709
Springfield 07/01 - 06/30	\$732,806	\$435,809	\$135,039	\$435,809	\$135,039	\$1,874,502
Columbia 10/01 - 09/30	\$532,134	\$203,043	\$61,543	\$203,043	\$61,543	\$1,061,306
Jefferson City 11/01 - 10/31	\$187,540	\$121,809	\$28,877	\$121,809	\$28,877	\$488,912
Joplin 11/01 - 10/31	\$878,916	\$151,550	\$40,836	\$151,550	\$40,836	\$1,263,688
St. Joseph 01/01 - 12/31	\$441,135	\$146,683	\$38,879	\$146,683	\$38,879	\$812,259
Cape Girardeau 07/01 - 06/30	\$340,603	\$114,520	\$25,945	\$114,520	\$25,945	\$621,533
<b>TOTAL</b>	<b>\$11,612,641</b>	<b>\$4,913,883</b>	<b>\$1,672,415</b>	<b>\$4,913,883</b>	<b>\$1,672,415</b>	<b>\$24,785,237</b>

\* The MPO balance is adjusted to include the actual SFY 2015 CPG allocation and equals the unobligated prior year (SFY2015 and older) CPG allocated amounts. The MPO 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 total of MPO contracts (CPG agreements) in place for the SFY 2017 SPR work program is \$7,168,781.

MPOs annually program consolidated federal planning fund amounts in approved UPWPs to complete activities necessary to implement the metropolitan transportation planning process. MPO 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 UPWP is approved by the MPO 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 MPO and can be demonstrated to be directly attributable to the MPO's 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 MPO's 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	\$256,730
St. Louis MPO	\$257,686
Springfield MPO	\$89,500

## 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. In fiscal year 2017, a majority of the salary for the Research Analyst position was moved from SPR17ADS to SPR17DVS. This is reflected in the decrease of the SPR17ADS and an increase in the SPR17DVS amounts.

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$252,836	SPR17ADS
Budget Amount SFY 2016	\$322,074	SPR16ADS
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR16ADS

### 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. It was determined that \$325,000 from the fiscal year 2016 budget would be set aside for Road to Tomorrow activities that would be spent in fiscal year 2017. This is reflected in the increase in SPR17RDS and the SPR16RDS expenditures will be reduced by that amount.

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$2,001,908	SPR17RDS
Budget Amount SFY 2016	\$1,673,908	SPR16RDS
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR16RDS

### 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.

<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	\$82,041	SPR17DVS
Budget Amount SFY 2016	\$19,567	SPR16DVS
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR16DVS

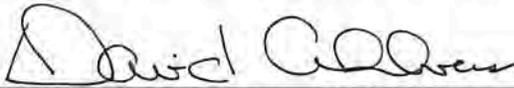
**TECHNOLOGY TRANSFER**

**Purpose and Scope:** Technology transfer provides mechanisms to coordinate the transfer of research results and information with MoDOT functional units and districts as well as with outside organizations. The Local Technical Assistance Program provides transportation information and training opportunities to local transportation agencies. The Transportation Assistance Program provides urban and rural areas access to highway technology and collaborates to provide assistance in the department’s technology transfer effort. 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.

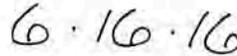
<u>Financials</u>	<u>Amount</u>	<u>Work ID Code</u>
Projected Budget SFY 2017	<b>\$490,000</b>	SPR17TTS
Budget Amount SFY 2016	\$493,000	SPR16TTS
Actual Cost SFY 2016	(See Addendum Aug. 2016)	SPR16TTS

**Certification Statement**

I, Dave Ahlvers, State Construction and Materials 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.



\_\_\_\_\_  
State Construction and Materials Engineer



\_\_\_\_\_  
Date

### Part III Research Summary

Project No.	Project Name	SFY2017 Budget
TA176601	Research Administration	\$252,836
TR17CONT	Research Contingencies	\$872,285
TR201228	Statewide Report Card Survey--Completed	\$0
TR201236	SCC Implementation Project--Completed	\$0
TR201313	Secretary of State Library MOU	\$4,504
TR201401	Library Support Contract (2013-2015)--Completed	\$0
TR201405	Highway Safety Manual-Freeways--Completed	\$0
TR201417	GRS Rustic Road Bridge	\$1,412
TR201501	Improving Striping Operations through System Optimization--Completed	\$0
TR201502	High Volume Recycled Materials	\$550
TR201503	Economical and Crack Free High Performance Concrete	\$11,085
TR201504	Crash Landing Correction for Freeways--Completed	\$0
TR201505	Fiber Reinforced Concrete	\$10,472
TR201506	Evaluation of Finger Plate and Flat Plate Connection--Completed	\$0
TR201509	Evaluation of Erosion Control Blankets	\$6,302
TR201510	System-wide Safety Improvements and Design Guidance--Completed	\$0
TR201512	Alternative Merge Sign Simulation	\$948
TR201513	Evaluation of Aviation Specifications--Completed	\$0
TR201514	No Passing Zone Guidance	\$14,639
TR201515	Investigation of J-Turn Design Factors using the ZouSimulator	\$14,037
TR201516	FRP Deck Panels	\$0
TR201518	Roller Compacted Concrete	\$14,782
TR201522	MoDOT Customer Satisfaction Tracking Survey	\$21,930
TR201601	Library Support Contract (2016-2017)	\$83,218
TR201602	Poplar Street Approach-Phase II	\$13,313
TR201603	Accelerated Bridge Column Construction-Phase II --Completed	\$0
TR201605	Monitoring Vibrations on the JC Truss Bridge --Completed	\$0
TR201606	Long Term Pavement Performance, Project 5P3131, Central District	\$42,000
TR201607	Striping Optimization Enhancements	\$15,295
TR201608	Transportation Infrastructure Conference--Completed	\$0
TR201609	MEPDG Local Calibration	\$148,500
TR201610	AASHTO Technical Service Program	\$43,000
TR201611	St. Louis In-Laid Pavement Markers Survey	\$84,626
TR201612	Work Zone Simulator Analysis: Alternate Lane Configurations	\$59,411
TR201613	Work Zone Split Traffic Symbol Sign	\$75,000
TR201615	Transportation Research Methods Training	\$91,136

TR201616	Missouri Highway Safety Manual Recalibration	\$91,463
TR201621	Solar Roadways Evaluation	\$102,000
TR201701	Internal Curing	\$40,000
TR201702	High Volume Recycled Materials-Phase II	\$35,000
TR201703	Economical and Crack Free High Performance Concrete-Phase II	\$35,000
TR201704	Design of Ultra High Performance Concrete for Thin Overlays	\$35,000
TR201705	Implementation of FR Self-Consolidating Concrete for Repair of Bridge Sub-Structures and FR Super-Workable Concrete for Infrastructure Construction-Phase II	\$35,000
TR201127	Library Connectivity and Development TPF-5(237)--Completed	\$0
TR201131	Innovative Maintenance TPF-5(239)--Completed	\$0
TR201144	Thermography Technologies Phase II TPF-5(247)--Completed	\$0
TD170701	New Product Evaluation	\$82,041
TTAPT001	Local Technical Transfer Assistance Program (LTAP)	\$300,000
TTAPT001	BEAP and TEAP	\$150,000
TT200701	National Highway Institute (NHI)	\$40,000
	Total	\$2,826,785

## Administration - SPR17ADS

### Estimated Cost - \$252,836

#### TAyy6601 - Research Administration

**Project Type:** Contracts Other

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$248,469

**Contract Period:** 7/1/1966 to 6/30/2017

**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 2017:

The salary and expenses of the Research Administrator, Research Engineer and Research Analyst will be charged against this item.

#### SFY 2016 Accomplishments:

The Research Section had 39 active contract research projects and a total of 15 projects were completed. The Research Section also published 24 reports as of June 17th, 2016.

**Financials**

Projected Budget SFY 2017  
 Budget Amount SFY 2016  
 Actual Cost SFY 2016  
 Prior to SFY 2016 Actual Cost

**Amount**  
 \$252,836  
 \$322,074  
 (See Addendum Aug. 2016)  
 N/A

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## Research – SPR17RDS

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### Estimated Cost - \$2,001,908

#### TRyyCONT - Research Contingencies

**Project Type:** Contracts Other  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$872,285  
**Contract Period:** 7/1/2016 to 6/30/2017  
**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 2017:

In addition to funds for unanticipated costs on current or ongoing activities, funds have been included for studies that may be initiated during Fiscal Year 2017. These include administrative and other eligible costs.

#### SFY 2016 Accomplishments:

Thirteen new projects were approved for funding in Fiscal Year 2016.  
 TR201602 Poplar Street Approach-Phase II  
 TR201603 Accelerated Bridge Column Construction-Phase II  
 TR201605 Monitoring Vibrations on the JC Truss Bridge  
 TR201607 Striping Optimization Enhancements  
 TR201608 Transportation Infrastructure Conference  
 TR201609 MEPDG Local Calibration  
 TR201610 AASHTO Technical Service Program  
 TR201611 St. Louis Inlaid Pavement Markings  
 TR201612 Work Zone Simulator Analysis: Alternate Lane Configurations  
 TR201613 Work Zone Split Traffic Symbol Sign  
 TR201615 Transportation Research Methods Training

TR201616 Missouri Highway Safety Manual Recalibration  
 TR201621 Solar Roadways Evaluation

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$872,285
Budget Amount SFY 2016	\$590,400
Adjusted Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	N/A

**TR201228 - Statewide Report Card Survey**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$175,062  
**Contract Period:** 2/1/2012 to 9/1/2015  
**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 is conducted each year in May, for the years 2012 through 2015. MoDOT expects this review to result in annual reports summarizing the data received by using specified methodology. The results are reported in the July MoDOT Tracker.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The final report was received on August 4, 2015 and was published in the Innovation Library. The final invoice was processed on August 5, 2015. This project is closed.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$15,616
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$159,446

**TR201236 - SCC Implementation Project**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$197,943  
**Contract Period:** 10/10/2012 to 3/31/2016  
**Contract Investigator:** Dr. John Myers  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

Self-Consolidating Concrete (SCC) can be beneficial due to the highly fluid nature of the concrete prior to hardening. Previous research on SCC has indicated that the materials used can have a significant effect on the finished product. MoDOT recently worked with Missouri S&T to test SCC mixes using Missouri aggregates prior to allowing wide-scale use on infrastructure elements such as prestressed bridge girders, drilled shafts, columns, retaining walls, congested steel areas, etc. MoDOT is piloting a bridge using self-consolidating concrete on bridge girders. The objective of this project is to evaluate and monitor a bridge that has self-consolidating concrete for some of the precast/prestressed girders and an intermediate bent with 50% fly ash replacement. The bridge project will have both traditional and innovative beams and intermediate bents which allows the researchers to do direct comparisons. At the conclusion of the project, it will be determined if MoDOT should allow SCC and 50% fly ash replacement as options on MoDOT projects.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

Compressive strength, modulus of elasticity, and creep/shrinkage readings of the girders were completed during fiscal year 2016. The analysis of the static and dynamic load test results was also completed. The final report consisted of a summary report and four technical reports. The reports were received in March and were sent to the technical contacts. Comments and questions were sent back to the research team on April 28, 2016. The final reports were received May 30, 2016. The final invoice was received and paid.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$72,801
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$125,142

**TR201313 - Secretary of State Library MOU**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$18,429

**Contract Period:** 7/1/2013 to 6/30/2017

**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 2017:**

The draft of the 2017 Secretary of State MOU was updated. The amount of the SFY 2017 invoice is anticipated to be \$4,504.38.

**SFY 2016 Accomplishments:**

The invoice for the MOBIUS Subscription was received in the amount of \$4,582.39 and was processed in August 2015. This is a one-time annual invoice. The draft of the 2017 Secretary of State MOU is being developed third quarter of SFY2016. The amount of the SFY 2017 invoice is anticipated to be \$4,504.38.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2017	\$4,504
Budget Amount SFY 2016	\$4,582
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$9,343

**TR201401 - Library Support Contract (2013-2015)**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$152,936  
**Contract Period:** 7/1/2013 to 6/30/2015  
**Contract Investigator:** Charles Nemmers  
**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. Technical services will be provided for operation and development of the MoDOT Transportation Library including: cataloging, collection development, and maintenance for the physical and electronic materials of the transportation library collection. Library research and reference services will be provided to end-users particularly "Information Scouting" where the Librarian responds to requests for technical information and assistance. The PI will provide continued library services with the Librarian position through the university system.

**Proposed Activities for SFY 2017:**

This project was finished and all billing was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The final invoice was received in August and paid on August 27, 2015. This project is completed.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$24,889
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$128,047

**TR201405 - Highway Safety Manual-Freeways**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$60,154  
**Contract Period:** 8/7/2013 to 3/31/16  
**Contract Investigator:** Dr. Carlos Sun  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The new Highway Safety Manual (HSM) provides methods and tools to assist in the quantitative evaluation of safety. The HSM will be revised to include modeling of freeways including segments, speed-change lanes and interchanges. These new models will need to be calibrated in order to reflect local driver populations, conditions and environments. This project involves the systematic calibration of HSM freeway models to account for such conditions in Missouri. This project will develop models for facilities that are unique to the MATC states. Two examples of innovative geometrics designs that reduce severe crash types are the diverging diamond (or double-crossover) and the J-turn. Local crash, signalization and geometric data will be used to develop Safety Performance Functions.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The Draft report was submitted to MoDOT in early March for comment. Traffic and Research staff submitted their comments to the PI on March 24, 2016. The final report was submitted in late March 2016, however the project size was a challenge to electronically receive. Therefore a different delivery method was needed and the final report was received in early April and was accepted. The report was posted to the Innovation Library on June 13, 2016.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$12,805
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$47,349

**TR201417 - GRS Rustic Road Bridge**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$84,999  
**Contract Period:** 2/11/2014 to 12/1/16  
**Contract Investigator:** Andy Boeckmann  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The city of Columbia, MO and Boone County received an Innovative Bridge Research and Deployment (IBRD) grant to deploy a Geosynthetic Reinforced Soil (GRS) abutment bridge. GRS bridges can be an economical and quick method for constructing some types of bridges. This project will evaluate the

horizontal and vertical displacements of the abutments and bridge. Pore pressures and earth pressures will also be monitored. After completion of the bridge, the research team will continue to monitor the sensors for two years.

**Proposed Activities for SFY 2017:**

During the first two quarters of fiscal year 2017 the project team will continue monitoring the bridge. Construction of the bridge ended up being later than originally planned so a full two years of monitoring is not possible during the contract period. The researchers and MoDOT will determine if the contract should be extended. If the project is not extended, the draft final report will be due September 30, 2016 with the final report being due on November 1, 2016.

**SFY 2016 Accomplishments:**

During fiscal year 2016 the research team continued to monitor the bridge for pore water and earth pressure and movement. The pore pressure and earth pressure data are reasonable and indicate the instruments are operational and responsive to changes in water level. The City of Columbia continued to do surveys quarterly. On November 7, 2015 the research team submitted a memo "Rustic Road GRS-IBS Instrumentation/Monitoring Update." All instrumentation appears to be working correctly and readings indicate very little movement of the bridge.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$1,412
Budget SFY 2016	\$8,468
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$75,119

**TR201501 - Improving Striping Operations through System Optimization**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$60,000

**Contract Period:** 6/23/14 to 10/31/15

**Contract Investigator:** Dr. Ron McGarvey

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

Striping operations generate a significant workload for MoDOT's maintenance operations. The requirement for each striping crew to replenish its stock of paint and other consumable items from a bulk storage facility, and the necessity to make several passes on most of the routes to stripe all the lines on that road, introduces the potential for inefficiencies in the form of "deadhead miles" that striping crew vehicles must travel while not actively applying pavement markings. The objective of this study is to develop decision support tools that utilize optimization models to increase the efficiency of striping operations, defined in terms of the assets required for striping and the total miles traveled in support of striping. The research team will apply these models to the set of striping requirements in MoDOT's Central District, and provide recommendations to that district in a timeline that supports planning for 2015 striping operations.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The extension for the project was finalized and the new end date was pushed back to October 31, 2015. The draft report was received on September 8th. The MoDOT technical advisory panel reviewed the report and sent back comments to the research team. The final report was received on October 9, 2015. The final invoice was paid on October 2, 2015. This project is closed; however the technical advisory group determined they would like the program output to be in an easier to read format. So a second phase of the project has been developed for some model enhancements.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$23,077
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Cost	\$36,923

**TR201502 - High Volume Recycled Materials**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$80,000

**Contract Period:** 6/15/2014 to 5/31/2016

**Contract Investigator:** Dr. Kamal Khayat

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

It has become essential to effectively reuse demolition waste in order to conserve non-renewable natural resources. Decreasing natural resources, as well as increasing problems with waste management, ecological hazards, landfill limitations and increasing distances between the natural resources and consumption markets, support the idea of recycled wastes to be used for new concrete production. The proposed study aims at developing sustainable concrete materials for infrastructure applications. The main objective of the proposed research project is to maximize the content of recycled materials (at least 50% of the mass of solids) in concrete pavement in an effort to reduce the overall material cost of pavement construction as well as enhancing the sustainability aspects of these operations.

**Proposed Activities for SFY 2017:**

The final report will be submitted to MoDOT for all work completed except for Task 3, which is dependent on other PIs from consortium universities. A supplementary report (final deliverable) will be submitted by July 31, 2016.

**SFY 2016 Accomplishments:**

Work was completed to optimize proper concrete compositions for single and two-lift concrete pavements (2LCP) made with recycled concrete aggregate (RCA). The first step of the work included producing concrete mixtures made with different RCA replacements for different applications according to the research plan. Fresh, mechanical properties and shrinkage of concrete was investigated. A no-cost extension of 60 days is needed to complete the final deliverables. This extension is due to delays caused by the coordination of Principal Investigators from multiple consortium universities.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$550

Budget Amount SFY 2016	\$47,686
Adjusted Budget Amount SFY 2016	\$47,136
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$32,314

### TR201503 - Economical and Crack Free High Performance Concrete

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$80,000  
**Contract Period:** 6/23/2014 to 6/30/2016  
**Contract Investigator:** Dr. Kamal Khayat  
**Funding:** SPR 80%, State 20%

#### Project Description and Objectives:

The project seeks to develop and validate the behavior of a new class of environmentally friendly and cost-effective high-performance concrete (HPC), which is referred to here as Eco-HPC. The proposed project will develop two classes of Eco-HPC for the following applications: HPC for pavement construction (Eco-Pave-Crete) and HPC for bridge deck and transportation infrastructure construction (Eco-Bridge-Crete). Eco-Bridge-Crete can be used in cast-in-place girders, cast-in-place piers and piles, and other bridge elements.

#### Proposed Activities for SFY 2017:

The final report will be submitted to MoDOT for all work completed except for Task 3 (Deformation and structural evaluation), which is dependent on other PIs from consortium universities. A supplementary report (final deliverable) will be submitted by August 31, 2016.

#### SFY 2016 Accomplishments:

Work is currently underway on Task 2 (Laboratory Testing) of the Research Plan. Based on the test results, the incorporation of fly ash is shown to decrease the high-range water reducer (HRWR) demand for a given slump consistency. As expected, mixtures containing fibers exhibited higher HRWR demand compared to similar mixture made without any fiber. In the subtask for key engineering properties and durability, four optimal concrete mixtures (with and without fibers) were selected for targeted applications. The flexural beams that were to be instrumented have been delayed due to the delivery of the sensors. Thus, a no-cost extension of 60 days will be needed to complete the project.

#### Financials

	<u>Amount</u>
Projected Budget SFY 2017	\$11,085
Budget Amount SFY 2016	\$44,666
Adjusted Budget Amount SFY 2016	\$33,581
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$35,334

### TR201504 - Crash Landing Correction for Freeways

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$59,996

**Contract Period:** 7/21/2014 to 3/31/2016

**Contract Investigator:** Dr. Carlos Sun

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

AASHTO is preparing to release a revision to the Highway Safety Manual (HSM) that includes models for freeway interchanges composed of segments, speed-change lanes and terminals. A high percentage of interchange crash documentation on the MoDOT TMS systems is inconsistent with data collected for the HSM model. In order to properly calibrate HSM freeway interchange models, the location of crashes need to be corrected. The crash landing correction involves the visual inspection of crash images compiled by Missouri Highway Patrol. It is estimated that 10,100 crashes will be reviewed and corrected. A second product is the documentation of crash correction procedures so that the same procedures can be used by MoDOT staff when performing HSM modeling of interchanges.

**Proposed Activities for SFY 2017:**

Project is completed. No activities anticipated for SFY 2017.

**SFY 2016 Accomplishments:**

Final review of interchange geometric information, traffic volumes, and crash data is being conducted. The calibration of interchange facilities will begin. The crash review of speed-change lanes, ramps, and mainline freeway segments is almost complete. The crash review of additional interchanges with 6-lane crossroads is also complete. The decision was made that TR201504 would have a separate report and be referenced in the other projects that the data correction has affected. The Final Report was reviewed and accepted by MoDOT in late April. Final Invoice was processed on April 21, 2016. The report was posted to the Innovation Library on June 13, 2016.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$35,786
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$24,210

**TR201505 - Fiber Reinforced Concrete**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$80,619

**Contract Period:** 7/1/2014 to 6/30/2016

**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 2017:**

A primary report will be submitted by June 30, including all the details of the whole project in exception of the results of the structural performance of 30 beams. All final deliverables will be submitted to MoDOT by August 15, 2016.

**SFY 2016 Accomplishments:**

Work has wrapped up on Tasks 2C (Mixture optimization for FR-SWC), Task 3A (Beam flexural tests for FR-SWC and FR-SCC) and Task 3B (Repaired beam flexural tests for SCC) of the Research Plan. The investigated mechanical properties of the optimized SCC and SWC mixtures included compressive strength, splitting tensile strength, flexural strength (ASTM C78), flexural toughness (ASTM C1609), crack resistance (RILEM TC-162).

An additional eight mixtures from Task 2C were prepared to evaluate drying shrinkage, restrained shrinkage, and freeze/thaw durability of the optimized mixtures. Rutgers University has established a full-scale beam testing program and has tested nine cast beams each beam has two layers of concrete. A no-cost extension of 45 days will be needed due to some issues surrounding the project. The lab has some drain problems that resulted in the loss of a month of testing. There was an issue with the storing of the multiple concrete beams along with scheduling of lab time to test the beams was also an issue.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$10,472
Budget Amount SFY 2016	\$43,747
Adjusted Budget Amount SFY 2016	\$39,625
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$30,522

**TR201506 - Evaluation of Finger Plate and Flat Plate Connection**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$297,289

**Contract Period:** 10/17/2014 to 12/31/2015

**Contract Investigator:** Dr. Sarah Orton

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

MoDOT has recently observed earlier than expected distress of its finger plate and flat plate expansion device connections on structures with high traffic volumes. Although this distress seems to be a common occurrence, there appears to be no consistent mode of failure as sometimes the damage results in an anchorage spall and other times with weld failures in the plate itself. This early life damage results in costly and difficult repairs which must be accomplished quickly to minimize impact on traffic.

Additionally, these repaired expansion devices often end up with similar early distress. The objective of this project is to learn the cause(s) of premature deterioration of MoDOT finger plate and flat plate expansion devices under high traffic volumes and then use that information to design a new Load and Resistance Factor Design (LRFD) finger plate and flat plate design that is intended to last 40 years or more with minimal maintenance. In addition, repair and replacement best practices and details will be developed as part of this project.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The research team met with MoDOT on July 30, 2015 to begin discussion of preliminary designs. Based on these discussions, the preliminary designs were verified with FEM analysis. MoDOT and HDR met on November 17, 2015 to discuss the draft final report and detail sheets. The final report was received January 19, 2016 and was posted in the innovation library. All details and drawings were also received. The final invoice was received on June 13, 2016 and paid.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$190,301
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$106,988

**TR201509 - Evaluation of Erosion Control Blankets**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$100,000

**Contract Period:** 1/1/2015 to 6/30/2016

**Contract Investigator:** Dr. Amanda Cox

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

Erosion Control Blankets (ECBs) are geosynthetics that provide temporary erosion protection while vegetation becomes established on a disturbed job site. The Missouri Department of Transportation (MoDOT) uses ECBs to prevent stormwater-induced erosion at many job sites. Many varieties of ECBs exist and MoDOT faces challenges with determining which ECBs are appropriate for combinations of slope, run-off, soil type, and other factors specific to Missouri construction sites. Objectives of the project are to develop recommendations for specifications for ECB properties, given Missouri job site characteristics, that can be economically evaluated at independent labs to ensure successful performance. Develop a matrix tool to guide in the selection of appropriate ECB options for MoDOT projects. Develop monitoring guidelines and protocols to evaluate the performance of ECB installations for the purpose of determining failures that warrant prohibiting their future use on MoDOT projects. Develop a short course to train MoDOT engineers and technicians.

**Proposed Activities for SFY 2017:**

A contract extension was granted resulting in the extension of projected completion date to June 30th 2016. It is anticipated the project will be completed by the end of the fiscal year.

**SFY 2016 Accomplishments:**

A research meeting was held on March 11 to discuss development of workshop materials and provide an update on the matrix tools and protocols for performance evaluations. Completion of task # 2 ECB performances on Missouri construction sites survey response analysis. Completion of task # 3 field evaluation of ECB samples and a final site visit was conducted on April 1st. Completion of task # 4 develop ECB specifications for product approval and recommended thresholds we developed for removal of products from the approved products list. Nearing completion of task # 6 development of short course material after receiving feedback from during the March 11th meeting. A contract extension was granted

resulting in the extension of projected completion date to June 30th 2016. The workshop materials were developed and provided to MoDOT on June 1, 2016. A draft report was submitted to MoDOT for review. Comments to the draft report were submitted to the Principal Investigator on June 2, 2016.

<b><u>Financials</u></b>	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$6,302
Budget Amount SFY 2016	\$78,259
Adjusted Budget Amount SFY 2016	\$67,006
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$26,692

## **TR201510 - System-wide Safety Improvements and Design Guidance**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$80,091

**Contract Period:** 9/1/2014 to 4/30/2016

**Contract Investigator:** Dr. Praveen Edara

**Funding:** SPR 80%, State 20%

### **Project Description and Objectives:**

The Missouri Department of Transportation (MoDOT) has implemented system-wide safety treatments across the state over the past decade, which resulted in significant decreases in traffic fatalities and injuries. This research project is aimed at supporting MoDOT's goal of reducing annual traffic fatalities to 700 by 2016 and the long-term goal towards zero fatalities. The first task in this project is a synthesis of system-wide safety treatments from other states and countries will be conducted. The benefits, drawbacks, and implementation guidelines will be compared. The focus will be on those treatments that have not been used in Missouri in the past. In the second task, Design guidelines for J-turns will be developed. Specifically, guidance on the spacing between the main intersection and the U-turn will be developed.

### **Proposed Activities for SFY 2017:**

It is anticipated all work will be completed in fiscal year 2016.

### **SFY 2016 Accomplishments:**

Completion of task 1 & 2, and they are as follows: Task 1: A synthesis of system-wide safety treatments from other states and countries will be conducted. The benefits, drawbacks, and implementation guidelines will be compared. The focus will be on those treatments that have not been used in Missouri in the past. This task will synthesize literature and state of practice on system-wide treatments applicable to freeways, signalized corridors, and unsignalized highway corridors, among other facilities. Both urban and rural applications will be investigated. The following characteristics will be identified for each treatment: 1) cost of installation, 2) safety effectiveness measured via crash reduction percentage or other surrogates, and 3) benefits (other than safety), limitations, concerns, based on deployments in other states. Task 2: Design guidelines for J-turns will be developed. Specifically, guidance on the spacing between the main intersection and the U-turn will be developed. The guidelines will be based on both available best practices from other states and the use of analytical equations and microscopic traffic simulation models to estimate the impact of various spacing and traffic volume scenarios. The PIs have used microscopic simulation for evaluating alternative intersection designs in the past. For example, a screenshot of the J-turn design they simulated using the VISSIM program in a previous study<sup>3</sup> is shown

to the right. Microscopic traffic simulation involves simulating individual vehicles in a road network using car-following and lane changing algorithms. It is different from a driving simulator study that focuses on studying the behavior of an individual driver in response to a specific scenario.

<u>Financials</u>	<u>Amount</u>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$40,241
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$39,850

### TR201512 - Alternative Merge Sign Simulation

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$120,237  
**Contract Period:** 10/1/2014 to 6/15/2016  
**Contract Investigator:** Dr. Suzi Long  
**Funding:** SPR 80%, State 20%

#### Project Description and Objectives:

This research project uses the Missouri S&T simulator to extend previous research results completed by Dr. Carlos Sun and Dr. Praveen Edara, UM-Columbia under TRyy1318. The previous field study evaluated an alternative merge sign configuration with the Manual on Traffic Control Devices (MUTCD) temporary traffic control (TTC) signage in a freeway work zone. As part of getting the alternative sign accepted, a simulator study must be conducted to determine if the alternative sign is understood by the traveling public. This project will develop driving scenarios using the S&T driver simulator for use in the evaluation of an alternate merge sign configuration for work zones.

#### Proposed Activities for SFY 2017:

It is anticipated that the activities for the research project including the final report will be completed by the end of the fiscal Year. Processing of the final invoice will be the only activity for fiscal year 2017.

#### SFY 2016 Accomplishments:

The Draft Final Report was received on April 7, 2016. Comments to the draft report were submitted to the Principal Investigator on June 9, 2016. The project will be completed by the end of the fiscal year.

<u>Financials</u>	<u>Amount</u>
Projected Budget SFY 2017	\$948
Budget Amount SFY 2016	\$84,769
Adjusted Budget Amount SFY 2016	\$83,821
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$35,468

### TR201513 - Evaluation of Aviation Specifications

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$39,508

**Contract Period:** 11/15/2014 to 7/31/2015

**Contract Investigator:** Dave Nauman

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

MoDOT administers federal and state funding at airports throughout Missouri. Specifications for these projects must meet Federal Aviation Administration (FAA) requirements. MoDOT uses some established FAA specifications and modifies others to be closer to the MoDOT highway specifications. By doing this, it enables contractors that work on both airports and highways in Missouri to utilize similar processes and materials in order to make bidding easier. MoDOT's aviation specifications are out-of-date with current highway specifications. This project intends to update the aviation specifications to align closer to the MoDOT highway specifications while ensuring they meet the FAA regulations. The goal of this project is to update the MoDOT aviation specifications to make projects as easy as possible for transportation contractors to bid and build.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

Draft specifications were sent to MoDOT, sent back to CMT and resubmitted several times during the first quarter of fiscal year 2016. The final specifications were sent to MoDOT on October 5, 2015. The final invoice was received and paid on November 3, 2015. This project is completed.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$4,528
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$34,980

**TR201514 - No Passing Zone Guidance**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$87,587

**Contract Period:** 1/1/2015 to 7/31/2016

**Contract Investigator:** Jessica Hutton

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

For two and three lane roadways with centerline striping, no passing zones are marked at locations where sight distance is less than what is required to safely pass a slower moving vehicle. MoDOT has historically used a 2-car data collection system to identify and record no passing zones; however, the system which has been used is obsolete and no longer supported by the manufacturer. Due to the lack of available systems on the market today, MoDOT is interested in having a system developed using current technology to give the department the capability of determining the proper locations of no passing zones and retaining a data base using GPS records for long term retention.

**Proposed Activities for SFY 2017:**

This project should be completed during the first quarter of fiscal year 2017. MoDOT will submit questions and concerns about the draft final report to the research team in early July. The final report is due on July 31, 2016.

**SFY 2016 Accomplishments:**

The research team did a mid-project presentation at MoDOT on July 9, 2015. At the meeting the advantages and disadvantages of the alternative systems were discussed. The research team and MoDOT agreed that a two-car system would be the best alternative to pursue and that the remainder of the project should be focused on developing such a system. Tasks this fiscal year included integration of components for the hardware system, preliminary testing of hardware and field software with a single vehicle in the field, refinement of the field data collection software, and conceptual development of the post-processing software. On February 4, 2016 the research team and MoDOT held a conference call to discuss issues that had come up during the project. A modified work plan was developed including a new timeline and an increase in project budget. The contract extension was signed on March 3, 2016, and the new contract end date is July 31, 2016. The draft final report is scheduled to be delivered the end of June.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$14,639
Budget Amount SFY 2016	\$49,435
Adjusted Budget Amount SFY 2016	\$62,422
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$10,526

**TR201515 - Investigation of J-Turn Design Factors using the ZouSimulator**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$99,207

**Contract Period:** 9/15/2014 to 10/31/2016

**Contract Investigator:** Dr. Carlos Sun

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

J-turns have been shown to improve safety on Missouri highways by reducing overall crashes by 34.8% and injury and fatal crashes by 53.7%. They are a type of alternative intersection design that could see greater implementation in Missouri. Because there is very limited formal design guidance, there are a number of J-turn design considerations that require investigating. Some of them are acceleration/deceleration lane configuration, u-turn spacing, and signage type and layout. This project uses a driving simulator study and a driver survey to analyze driver behavior to different J-turn configurations. A driving simulator study is a safe and cost-effective way of studying geometric design alternatives. The product from this research is a set of J-turn design guidelines that could be incorporated into the MoDOT Engineering Policy Guide.

**Proposed Activities for SFY 2017:**

A majority of the data analysis will be completed during the first few months of fiscal year 2017. The draft report is due August 31, 2016 and the final report is due October 31, 2016.

**SFY 2016 Accomplishments:**

During the summer of 2015 the participant trial scenarios and researcher script were finalized. Two signage scenarios were developed separately as they only involve route guidance. The other three design parameters (u-turn spacing, acceleration/deceleration configuration, and traffic level) are related leading to 8 different scenarios. A draft post-study survey on driver preference was revised and finalized according to comments from MoDOT. Automated data processing scripts were completed to automatically extract driving behavior performance measures from simulator log files. Performance measures include "time to collision" for each lane change, the location of lane changes, maximum and average speeds, total travel time, and missed turns. Unfortunately building renovations required the equipment to be moved temporarily which pushed the project completion date back until summer of 2016. A project extension was signed on February 18, 2016.

### **Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$14,037
Budget Amount SFY2016	\$39,967
Adjusted Budget Amount SFY 2016	\$25,930
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$59,240

### **TR201516 - FRP Deck Panels**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$45,000

**Contract Period:** 10/20/2014 to 10/15/2016

**Contract Investigator:** Dr. Jeff Volz

**Funding:** SPR 80%, State 20%

### **Project Description and Objectives:**

This project is a second phase of the work done in TR201203 Fiber Reinforced Polymer Bridge Deck Panels. In the previous project, an FRP panel was developed to be used on bridge decks in Missouri. This second phase is to develop the details necessary to put the FRP panels into a construction project. The objective of this project is to develop the final details necessary to fully implement this technology, such as panel-to-panel connections, panel-to-girder connections, and guardrail to panel connections. A cost analysis will also be completed.

### **Proposed Activities for SFY 2017:**

A no-cost extension has been granted due to manufacturing issues with some of the testing panels. The draft report is now scheduled to be submitted to MoDOT by August 30, 2016. The final report is due to MoDOT by September 30, 2016. The final contract end date has been changed to October 15, 2016 to allow some time after the submission to process the final invoice.

### **SFY 2016 Accomplishments:**

Overall, the panels have behaved linearly-elastic throughout the full range of testing, which is the typical response of FRP structural members. Failure involved buckling of the sloping webs of the panel as well as some localized buckling/fracture of the bottom face sheet near the supports. applied load. As a result, the panels were modified with a closer bolt spacing to increase load transfer. These panels were retested in January to evaluate the bolted joint option for the panel-to-panel connection. The research team tested three (3) additional full-scale FRP deck panels to verify performance and calibrate the LRFD-based design equations. The research team tested panel-to-girder connections and guardrail-to-panel

connections. Unfortunately, the test results were highly variable and, in general, well below the expected results. Forensic examination of the panels revealed a significant number of localized delaminations. Further investigations and discussions with the composite manufacturer revealed fabrication problems with these test panels. The composite manufacturer instituted additional QA/QC procedures and fabricated replacement test specimens. The full \$45,000 of SPR funds has been expended for the project. The project will continue using MoSTIC funds.

**Financials**

**Amount**

Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$23,847
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$21,153

**TR201518 - Roller Compacted Concrete**

- Project Type:** Contract Research
- MoDOT Contact:** Bill Stone
- Total Contract Amount:** \$90,000
- Contract Period:** 12/1/2014 to 2/28/2017
- 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 2017:**

The project is currently focusing on producing adequate air-void system in RCC. The goal of this task is to develop production techniques to adjust the amount of entrained air in RCC. Samples taken from each mixture will be tested for compressive strength, air-void system, permeable void ratio, electrical resistivity, freeze thaw resistance, and deicing salt-scaling resistance.

**SFY 2016 Accomplishments:**

Selection of several coarse aggregate from the state of Missouri has been carried out to investigate their suitability for roller compacted concrete (RCC). In addition to numerical analysis, aggregate types and combinations were optimized through experimental packing measurements using the ICT compaction method. Seventeen different aggregate combinations were then used to prepare RCC mixtures that were then tested for compressive strength, Vebe time, segregation index and electrical resistivity. The maximum packing density of the aggregate was found to correlate well with enhanced RCC performance.

**Financials**

**Amount**

Projected Budget SFY 2017	\$14,782
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Budget Amount SFY 2016	\$57,472
Adjusted Budget Amount SFY 2016	\$72,690
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$2,528

**TR201522 - MoDOT Customer Satisfaction Tracking Survey**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$108,404  
**Contract Period:** 3/4/2015 to 3/16/2018  
**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 2017:**

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. Activities relating to the Right Transportation Solutions were completed in Fiscal Year 2016, therefore there will not any further activities for that effort.

**SFY 2016 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. And a summary report is provided to MoDOT each month. For activities relating to the Right Transportation Solutions (RTS) portion of the project, surveys from the twenty-one projects being investigated during this research received, the data was entered and analyzed, and all comments were transcribed. Draft and final reports for the RTS activities were created and the RTS portion of the project was finalized in late December.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2018	\$12,887
Projected Budget SFY 2017	\$21,930
Budget SFY 2016	\$68,118
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$5,469

**TR201601 - Library Support Contract (2016-2017)**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$181,077  
**Contract Period:** 7/1/2015 to 6/30/2017

**Contract Investigator:** Charles Nemmers

**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 2017:**

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 and closing out the Transportation Library and Connectivity Pooled Fund TPF5(237). Discussion is underway about a successor Pooled Fund.

**SFY 2016 Accomplishments:**

From 1Q16 to 3Q16, the librarian answered a total of 94 requests, 82 short and 12 long (127 total projected SFY16). 8,632 print and electronic items were circulated (11,912 total projected SFY16). 353 items were added to library catalog (388 total projected SFY16). Six items were borrowed from and 6 items lent to other libraries (21 items total projected SFY16). The librarian collaborated on projects with the Missouri State Library and began closeout of TPF-5(237) Pooled Fund project and discussion of next steps for a successor Pooled Fund. The librarian was very active assisting states with their submittals for the High Value Research solicitation. The librarian created a historical documentation of the HVR submittals and statistics relating to Sweet Sixteen selections. The librarian made a visit to the Northwest District on April 29, 2016 to attend the NW District Manager's meeting to promote Library Services.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$16,311
Projected Budget SFY 2017	\$83,218
Budget Amount SFY 2016	\$74,228
Adjusted Budget Amount SFY 2016	\$81,548
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201602-Poplar Street Approach-Phase II**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$49,763

**Contract Period:** 7/1/2015 to 7/31/2016

**Contract Investigator:** Riyadh Hindi

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

In order to minimizing computational cost of the Finite Element (FE) analysis, a dual-level modeling method is adopted. First, a macro model comprising 4-spans of the bridge between two expansion joints of 61 and 65 was created as reported in previous progress report. This model provides structural analysis data including deflection of the bridge superstructure. In addition, the critical location for the truck load is determined from this model. Then, in order to capture the out-of-plane distortion in the web-gap region, a more sophisticated finite element model (micro-model) which covers a small part of the bridge is developed. All boundary conditions for this model are imported from the macro-model.

**Proposed Activities for SFY 2017:**

Still to be completed is Task 4 involves the development of specifications and design policies for bridge construction. There is another field investigation that the Principal Investigator is coordinating with St. Louis District staff for a date to conduct. In addition, the submission of final draft report and the completion of all remaining work during the next few months is expected on or by July 31, 2016.

**SFY 2016 Accomplishments:**

The bulk of the work is completed with the Micro-model. The macro-model covers the full bridge between two expansions joints, while micro-model consists of 200 inches length of the bridge at one bracing location. The finite element evaluation included performing a series of detailed parametric studies to further evaluate retrofit strategies. The last field instrumentation for the repaired Poplar street bridge was performed during the week of June 6-10, 2016 and everything during that field work went well.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2017	\$13,313
Budget Amount SFY 2016	\$40,620
Adjusted Budget Amount SFY 2016	\$36,450
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201603-Accelerated Bridge Column Construction-Phase II**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$6,313

**Contract Period:** 10/21/2015 to 6/16/2016

**Contract Investigator:** Mohamed Elgawady and William Schonberg

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

This project is a continuation of phase I for accelerating bridge column construction using hollow-core fiber reinforced polymer-concrete-steel (HC-FCS) columns. A column was tested during phase I with no damage to the column itself. The test was terminated due to severe damage to the footing. During phase II, the column will be removed from the damaged footing and a new footing having a socket will be constructed. Then, the column will be inserted into the socket and retested under cyclic load. The strength of the new columns will be determined using the analytical models developed during phase I.

The specific objectives of phase II are as follows:

Objective #1: Determine the effects of using socket type connection on the flexural strength and stiffness of HC-FCS column.

Objective #2: Investigates the applicability of the analytical developed during phase I in predicting the strength of the new columns.

**Proposed Activities for SFY 2017:**

There are no activities for Fiscal Year 2017 as the project has been completed.

**SFY 2016 Accomplishments:**

Project continuation was granted as Phase II of the original efforts with an effective date of 10/16/16 and the completion date to 06/16/2016. Since the extension advancements have been the completion of Task # 1 design and construction of new footing for the previously tested column. The new footing will have a socket of 26 in. X 25 in. where a corrugated pipe will be installed prior to pouring the footing. After curing the footing for 7 days, the column will be inserted into the socket. Finally, the space between the corrugated pipe and column will be filled with non-shrinkage grout. The final report has been submitted to MoDOT and the project is completed.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$6,313
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201605-Monitoring Vibrations on the JC Truss Bridge**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$15,000

**Contract Period:** 8/1/2015 to 6/30/2016

**Contract Investigator:** Glenn Washer

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The objective of the research is to determine the frequency and cause of resonant vibrations of truss verticals on bridge A4497 over the Missouri River in Jefferson City, MO. Instrumentation to monitor the vibrations of four verticals will be installed on the bridge and monitored over two months. Data will be analyzed to determine how frequently resonance vibrations are occurring and to determine the ambient weather conditions causing the resonance vibrations

**Proposed Activities for SFY 2017:**

This project is scheduled to be completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

The task order for this project was signed on August 3, 2015. During the fall of 2016, wireless accelerometers and supporting hardware were procured for monitoring the bridge. A site visit to the bridge was made to review the monitoring logistics and traffic control requirements with MoDOT personnel. Video analysis was completed to estimate the vibration frequencies being experienced by the vertical members to be monitored. The monitoring system was installed on January 27, 2016. The monitoring system recorded multiple events where the vibration of the truss verticals exceeded normal values. The research team cross referenced the date and time of each event with wind speeds from the nearby Jefferson City airport. The system was removed

from the bridge on March 22, 2016. The final report was received and published in the Innovation Library in May.

<u>Financials</u>	<u>Amount</u>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$15,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

### **TR201606- Long Term Pavement Performance, Project 5P3131, Central District**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$42,000  
**Contract Period:** 7/1/2016 to 12/31/206  
**Contract Investigator:** Magruder Construction  
**Funding:** SPR 80%, State 20%

#### **Project Description and Objectives:**

FHWA has been interested in reviewing some of MoDOT's pavement treatments and project 5P3131 in Central District has been selected to have 11 of those different MoDOT treatment options placed during a construction project for FHWA to perform a Long Term Pavement Performance evaluation. The SPR funding is to assist with the difference in cost to place the different treatments for the FHWA evaluation.

#### **Proposed Activities for SFY 2017:**

Construction of the different pavement sections will begin in August 2016. It is anticipated all construction will be completed by late fall. FHWA's Long Term Pavement Performance group will be performing the evaluations on the project sections.

#### **SFY 2016 Accomplishments:**

It had originally been anticipated this project would take place in SFY 2016. However there were project delays and notice to proceed is scheduled for July 2016.

<u>Financials</u>	<u>Amount</u>
Projected Budget SFY 2017	\$42,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

### **TR201607-Striping Optimization Enhancements**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$20,000  
**Contract Period:** 12/9/2015 to 6/30/2016  
**Contract Investigator:** Ron McGarvey  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

This is a follow-up project to TR201501. The original project created a computer model for Central District to optimize striping routes. At the end of the initial project it was determined that a different output format was needed to make the program more user friendly. The outputs will include both a map and turn-by-turn directions for the striping crews. A few other enhancements include improvements to the user interface. The new model will be supplied to Central District in mid-March in time for planning of the 2016 spring striping season.

**Proposed Activities for SFY 2017:**

This project should be completed in fiscal year 2016 except for the final invoicing.

**SFY 2016 Accomplishments:**

This is a follow-up project to TR201501. The original project created a computer model for Central District to optimize striping routes. At the end of the initial project, it was determined that a different output format was needed to make the program more user friendly. The outputs will include both a map and turn-by-turn directions for the striping crews. A few other enhancements include improvements to the user interface. During the winter of 2016, the research team modified the outputs of the striping optimization model. The outputs were shared with MoDOT staff, and a number of revisions were made based on MoDOT feedback. The research team also modified the optimization model underlying this work, to correct for considerations that had not been previously incorporated in the model (such as limiting the locations that a crew can turn around to intersections between MoDOT-maintained roads). The final report was submitted on June 13, 2016. MoDOT staff reviewed the report and sent back comments in late June.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$15,295
Budget Amount SFY 2016	\$17,500
Adjusted Budget Amount SFY 2016	\$4,705
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201608-Transportation Infrastructure Conference**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$3,000

**Contract Period:** 10/1/2015 to 12/31/2015

**Contract Investigator:** Missouri S&T

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The Transportation Infrastructure Conference is an annual Conference that was initiated by the Missouri University of Science and Technology. It is conducted in the fall of the year to highlight research projects.

**Proposed Activities for SFY 2017:**

A 2017 Transportation Infrastructure Conference is planned. MoDOT will identify this through a new project number for Fiscal Year 2017. No activities proposed for Project TR201608 for Fiscal Year 2017.

**SFY 2016 Accomplishments:**

MoDOT, Missouri S&T, and St. Louis University conducted an Infrastructure Conference on December 4, 2015. This was the fourth annual conference and the first that SLU was a co-sponsor. MoDOT contributed \$3,000 for the logistics for the conference.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$3,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201609-MEPDG Local Calibration**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$250,000

**Contract Period:** 3/2/2016 to 8/31/2017

**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 2017:**

Anticipated completion of lab and field-testing, traffic estimation procedures, climate data updates, validation of MEPDG models, and calibration of MEPDG models, design sensitivity analysis and input database library. The final report draft will be submitted in early fiscal year 2018.

**SFY 2016 Accomplishments:**

January 19th, the RFP proposal review panel met and decided to award the contract to RAO Consulting. January 21st, RAO Consulting was notified of the awarded contract via acceptance letter. February 5th, RAO Consulting submitted their proposed work plan, schedule and budget. February 18th, the Standard Research Agreement was drafted and mailed to RAO Consulting and all documents signed and returned by RAO Consulting on March 4th. February 19th the Worker Eligibility Affidavit was sent to RAO and returned on February 24th. March 1st the MHTC Contract Submittal Form was executed. On March 7, 2016, the Standard Research Agreement Contract was executed. RAO Consulting was notified via Contract Support letter. Kick-off Meeting between RAO Consulting and MoDOT took place at the Central Laboratory on March 31st. April 15th informed Rao of their need to register with the MissouriBUYS system for project payments. April 20th, supplied Rao via e-mail with the MoDOT data management tracker form. Anticipation of completion of Task # 1 work plan and its objectives: information data gathering (traffic, materials climate performance etc.), implementation roadmap, detailing methodologies, update of user manuals and description of final reports and deliverables. Beginning stages of lab-field testing.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$101,500
Projected Budget SFY 2017	\$148,500
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201610-AASHTO Technical Service Program**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$124,000

**Contract Period:** 7/1/2014 to 06/30/2017

**Contract Investigator:** FHWA

**Funding:** SPR 80%, State 20%

**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 2017:**

MoDOT is expected to participate in the following AASHTO Technical Service Programs for Fiscal Year 2017: • National Transportation Product Evaluation Program (NTPEP), \$17,000. • AASHTO Innovation Initiative, formerly Technology Implementation Group (TIG), \$6,000. • Transportation Curriculum Coordination Council (TC3), \$20,000

**SFY 2016 Accomplishments:**

MoDOT participated in the following AASHTO Technical Service Programs for Fiscal Year 2016: • National Transportation Product Evaluation Program (NTPEP), \$17,000. • AASHTO Innovation Initiative, formerly Technology Implementation Group (TIG), \$6,000. • Transportation Curriculum Coordination Council (TC3), \$20,000

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$43,000
Budget Amount SFY 2016	\$43,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$38,000

**TR201611- St. Louis In-Laid Pavement Markers Survey**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$84,626

**Contract Period:** 5/1/2016 to 11/30/2016

**Contract Investigator:** Carmine Dwyer

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

In an effort to gain further visibility for lane markings the St. Louis District has placed In-Laid Pavement Markers on various roadways in their district. The inlaid pavement marker consists of a retro-reflective pavement marker installed below the pavement surface. In addition to cutting a location for the marker, a slot shall be grooved in to the pavement both before and after the marker to allow for visibility of the marker and drainage. MoDOT has developed this project to conduct a survey to evaluate the perception of stakeholders regarding the marker's performance from a user's perspective and gauge the effectiveness of the markers. This is not an engineering study.

**Proposed Activities for SFY 2017:**

Upon completion of the survey development the remaining tasks of the project will occur. These include the Data Collection and Data Analysis along with the Draft and Final Report.

**SFY 2016 Accomplishments:**

The Request for Proposal was posted on February 29, 2016. A proposal was received on March 31, 2016 from Applied Research Associates. The Standard Research Agreement was submitted to the Commission Secretary's Office for execution on May 6, 2016. The survey development was the bulk of the work after execution of the contract. The kick-off meeting for the project was conducted on June 8, 2016. The principal investigator went over the work plan and schedule. The research team and MoDOT staff discussed potential questions for the survey effort. This also afforded the research team an opportunity to do a field investigation and see the in-laid pavement markers at night.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$84,626
Projected Budget SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201612-Work Zone Simulator Analysis: Alternate Lane Configurations**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$75,009  
**Contract Period:** 5/1/2016 to 12/31/2016  
**Contract Investigator:** Suzi Long  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

This project will develop driving scenarios using the Missouri S&T driver simulator for use in the evaluation of a Missouri alternate lane shift sign configuration for work zones. Drivers will complete the scenarios comparing the current FHWA approved merge sign configuration with an alternate merge sign configuration proposed by MoDOT. Drivers between the ages of 18 and 64+ will be recruited to drive through the simulation.

**Proposed Activities for SFY 2017:**

A majority of the work will be completed during the first few quarters of fiscal year 2017. The driving simulator data collection will take place in June through August of 2016. Data analysis is scheduled to take place during September and October of 2016. The draft final report is due November 1, 2016 and the final report is due November 30, 2016.

**SFY 2016 Accomplishments:**

The task order with Missouri S&T was signed on February 26, 2016. The project start date was May 1, 2016. The Literature search and Simulator Programming started in May. MoDOT staff visited the Rolla campus on June 15, 2016 to drive through the simulator and offer suggestions prior to recruitment of volunteers.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$59,411
Budget Amount SFY 2016	\$15,598
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201613-Work Zone Split Traffic Symbol Sign**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$75,000  
**Contract Period:** 5/15/2016 to 1/30/2017  
**Contract Investigator:** Praveen Edara  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

MoDOT's St. Louis District has gotten FHWA approval to do a pilot project using a new work zone sign. The sign is used when work is done in the middle of the roadway and lanes shift around the work zone. Currently 2 MUTCD signs are required, one on either side of the road. The sign being piloted shows all information on 1 sign. A field evaluation is being done to monitor driver reaction and traffic delays.

**Proposed Activities for SFY 2017:**

The construction project utilizing the pilot work zone signs is scheduled to begin in early summer. It is anticipated the portion of the project using the pilot work zone signs will be in August. Data analysis will take place in late August, September and October. The draft final report is due on November 7, 2016 and the final report is due December 15, 2016.

**SFY 2016 Accomplishments:**

The request for proposals was posted February 29, 2016. Proposals were received on April 7 and the selection team met on April 18, 2016. The team of MU and CBB were selected. The task order was sent to MU on May 5, 2016. The contract was executed by MoDOT on May 16, 2016.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$75,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201615-Transportation Research Methods Training**

**Project Type:** Contract Research

**MoDOT Contact:** Jen Harper

**Total Contract Amount:** \$99,618

**Contract Period:** 2/23/2016 to 4/1/2017

**Contract Investigator:** Suzi Long

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

This project will develop a training methodology focused on external funding. This hands-on training will present the basics of external funding identification, teambuilding and collaborative partners, and proposal element design. Real-time searches and tutorials will be presented as part of the project. In addition, actual proposals will be “red teamed”, or reviewed for completeness/readability, and a research methods handbook prepared as the deliverable for the final report.

**Proposed Activities for SFY 2017:**

The bulk of the project will take place during the first half of fiscal year 2017. Tutorial 2--Collaborative Partnerships: Building a Winning Team should take place in early July. Tutorial 3--Proposal Design Basics should take place in August 2016. Tutorial 4--Proposal "red teaming" should occur in late August or early September. The draft Research Methods Handbook and final report are due in December 2016. The final handbook and report are due in January 2017. This project should be closed out by March 2017.

**SFY 2016 Accomplishments:**

The project task order with Missouri S&T was signed on February 22, 2016. The research team focused on the literature review and funding environment analysis during spring of 2016. The first training class took place on June 24, 2016.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$91,136
Budget Amount SFY 2016	\$8,482
Actual Cost SFY 2016	(See Addendum Aug. 2016)

Prior to SFY 2016 Actual Cost \$0

### **TR201616-Missouri Highway Safety Manual Recalibration**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$145,977  
**Contract Period:** 4/18/2016 to 12/31/2017  
**Contract Investigator:** Carlos Sun  
**Funding:** SPR 80%, State 20%

#### **Project Description and Objectives:**

AASHTO's Highway Safety Manual (HSM) was calibrated in 2013 using 2009 to 2011 data to reflect Missouri driver population, conditions, and environment. This project involves the recalibration of the HSM for Missouri. All 25 HSM values (16 facilities) that were previously calibrated will be recalibrated using additional data since 2011. The facilities that previously resulted in calibration values close to or higher than 2.0 will be carefully reviewed. In addition, crash severity distributions in terms of fatal, severe injury, minor injury, and property damage only (PDO) will be produced.

#### **Proposed Activities for SFY 2017:**

Tasks during fiscal year 2017 include collecting and verifying site data and developing crash severity distributions. The severity levels to be researched are fatal, severe injury, minor injury, and property damage only. Sixteen different facility types will be reviewed. This project will be finished during the first half of fiscal year 2018.

#### **SFY 2016 Accomplishments:**

The task order for this project was signed on April 19, 2016. This project was just beginning in fiscal year 2016. Much of the focus was on the literature review and identifying calibration sites.

<u>Financials</u>	<u>Amount</u>
Projected Budget SFY 2018	\$54,514
Projected Budget SFY 2017	\$91,463
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

### **TR201621-Solar Roadways Evaluation**

**Project Type:** Contract Research  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$102,000  
**Contract Period:** 7/1/2016 to 10/1/2018  
**Contract Investigator:** Scott and Julie Brusaw  
**Funding:** SPR 80%, State 20%

#### **Project Description and Objectives:**

The primary purpose of Solar Roadways is to generate clean renewable energy on surfaces such as roadways, parking lots, sidewalks, etc. The idea is to generate electricity where substantial solar energy already hits a surface but is currently not being captured and turned into energy. The solar panels will be

placed on the walkway of the WB I-44 Conway Rest Area. This location allows for quick and safe evaluation of the panels at any time without disruption to the traveling public. For the first DOT installation it was determined to place the panels in a walkway as opposed to the travel way to remove the concern of snow plow blades hitting the panels.

**Proposed Activities for SFY 2017:**

The bulk of the work will take place during the first few quarters of fiscal year 2017. It is anticipated that placement of the panels will take place soon after Labor Day. Monitoring will continue through fall of 2018.

**SFY 2016 Accomplishments:**

At the time of the draft work program, MoDOT staff was working with Solar Roadways to develop the details of the project and get the contract signed.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2017	\$102,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201701 – Internal Curing**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$50,000

**Contract Period:** 7/01/2016 to 10/31/2017

**Contract Investigator:** Dr. Kamal Khayat

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The project seeks to develop proper methodology to use internal curing materials to improve the performance and to prolong the service life of concrete. Typical mix design of high-performance concrete (HPC) approved by MoDOT will be used for the baseline mixture and will be modified with different types and contents of materials used for internal curing. The project will establish new mix design and curing recommendations of concrete made with internal curing materials and validate their performance through laboratory investigation and field demonstration.

**Proposed Activities for SFY 2017:**

The project has a final report submission date of September 30, 2017. Thus the majority of the project (Literature Review, Laboratory testing and Field implementation) will take place in SFY 2017. The final deliverables of the project will be in early SFY 2018.

**SFY 2016 Accomplishments:**

The project has a July 1, 2016 start date. Therefore, there were no activities in SFY 2016 except for the development of the proposal and Task Order for execution.

**Financials**

	<u>Amount</u>
Projected Budget SFY 2018	\$10,000
Projected Budget SFY 2017	\$40,000
Budget Amount SFY 2016	\$0

Actual Cost SFY 2016  
 Prior to SFY 2016 Actual Cost

(See Addendum Aug. 2016)  
 \$0

**TR201702 - High Volume Recycled Materials-Phase II**

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$40,000  
**Contract Period:** 7/01/2016 to 7/31/2017  
**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 TR2015-02 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 2017:**

The project has a final report submission date of June 30, 2017. The research includes laboratory investigation, field implementation and monitoring, life-cycle analysis and development of recommendations and guidelines.

**SFY 2016 Accomplishments:**

The project has a July 1, 2016 start date. Therefore, there were no activities in SFY 2016 except for the development of the proposal and Task Order for execution.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$5,000
Projected Budget SFY 2017	\$35,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

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

**Project Type:** Contract Research  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$40,000  
**Contract Period:** 7/01/2016 to 7/31/2017  
**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 proposed 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 2017:**

The project has a final report submission date of June 30, 2017. The research includes laboratory investigation, field implementation, field survey, life-cycle analysis and development of recommendations and guidelines.

**SFY 2016 Accomplishments:**

The project has a July 1, 2016 start date. Therefore, there were no activities in SFY 2016 except for the development of the proposal and Task Order for execution.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$5,000
Projected Budget SFY 2017	\$35,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201704 - Design of Ultra High Performance Concrete for Thin Overlays**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$40,000

**Contract Period:** 7/01/2016 to 7/31/2017

**Contract Investigator:** Dr. Kamal Khayat

**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

The main objective of this research is to develop a UHPC as a reliable, economic, low carbon foot print and durable concrete overlay material that can offer shorter traffic closures due to faster construction and long-term service life. This project aims at maximizing the performance of a thin layer of pavement material by reaching to an optimized composition of SCMs and proper types and amounts of fibers.

**Proposed Activities for SFY 2017:**

The project has a final report submission date of June 30, 2017. The research includes laboratory investigation, field implementation, field survey, life-cycle analysis and development of recommendations and guidelines.

**SFY 2016 Accomplishments:**

The project has a July 1, 2016 start date. Therefore, there were no activities in SFY 2016 except for the development of the proposal and Task Order for execution.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$5,000
Projected Budget SFY 2017	\$35,000
Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$0

**TR201705 - Implementation of FR Self-Consolidating Concrete for Repair of Bridge Sub-Structures and FR Super-Workable Concrete for Infrastructure Construction-Phase II**

**Project Type:** Contract Research

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$40,000

**Contract Period:** 7/1/2016 to 7/31/2017

**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 2017:**

The FR-SCC and FR-SWC mixtures optimized in the lab will be verified first at the concrete batching plant where the concrete will be produced for the field implementation. The pre-verification mainly focus on verifying fresh properties of the concrete produced at the batching plant, which are to be similar to those of the concrete optimized in the lab in RE-CAST 3A Phase I project. Recommendations for the use of FR-SCC for repair of bridge substructures and FR-SWC for the construction of infrastructure elements will be developed. These recommendations will be employed for the design of these advanced materials. Performance-based specification for the use of FR-SCC and FR-SWC in transportation-related infrastructure will be established.

**SFY 2016 Accomplishments:**

The project has a July 1, 2016 start date. Therefore, there were no activities in SFY 2016 except for the development of the proposal and Task Order for execution.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2018	\$5,000
Projected Budget SFY 2017	\$35,000
Budget Amount SFY 2016	\$0
Adjusted Budget Amount SFY 2016	\$0
Actual Cost SFY 2016	(See Addendum Aug. 2016)

Prior to SFY 2016 Actual Cost

\$0

## MoDOT Lead Pooled Fund Studies

### TR201127 - Library Connectivity and Development TPF-5(237)

**Project Type:** Pooled Fund Contract  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$1,525,285  
**Contract Period:** 4/1/2011 to 9/30/2015  
**Contract Investigator:** Maggie Sacco  
**Funding:** SPR 100%

#### Project Description and Objectives:

This Transportation Pooled Fund (TPF) aims to support the coordinated development of transportation libraries, enhance existing efforts to develop and implement a national transportation information infrastructure using Transportation Knowledge Networks (TKNs) and extend efforts beyond those of the TPF-5(105) Transportation Library Connectivity pooled fund. It will be accomplished through member activities, support of local library services, partnerships with professional groups such as TRB's Library and Information Science for Transportation Committee, SLA's Transportation Division and the services of a qualified consultant. This type of collaboration will allow for shared problem solving, resources as well as potential time and cost savings through best practices, defrayed costs and collective purchasing power.

#### Proposed Activities for SFY 2017:

This project was completed in fiscal year 2016.

#### SFY 2016 Accomplishments:

All activities have been completed for the contract. Close out of the pooled fund contract is still on-going.

#### Financials

	<u>Amount</u>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$132,596
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$1,392,689

### TR201131 - Innovative Maintenance TPF-5(239)

**Project Type:** Pooled Fund Contract  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$259,565  
**Contract Period:** 7/1/2011 to 7/1/2015  
**Contract Investigator:** Kevin Chesnik  
**Funding:** SPR 100%

**Project Description and Objectives:**

Implementing Maintenance Innovations from State to State (IMISS) pooled fund changed its name to No Boundaries. The No Boundaries pooled fund is an open and practical application of highway maintenance practices aimed to meet the needs of roadway maintenance agencies in the U.S. and around the world. One of the strategies for achieving longer life facilities is to use innovative technologies and practices. In order to foster new technologies and practices, experts from state DOTs, Federal Highway Administration (FHWA), academia and industry must collaborate to identify and examine new and emerging technologies and systems. This project will promote promising ready-to-deploy innovations that can be used by other DOTs and hence save time and money. Communicating successful research products throughout the U.S. is essential for proving research products that can be integrated into DOTs to make a difference.

**Proposed Activities for SFY 2017:**

This project was completed in fiscal year 2016.

**SFY 2016 Accomplishments:**

This pooled fund closed on June 30, 2015. The final invoice was processed in fiscal year 2016 along with closeout activities.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$31,952
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$227,613

**TR201144 - Thermography Technologies Phase II TPF-5(247)**

**Project Type:** Pooled Fund Contract  
**MoDOT Contact:** Jen Harper  
**Total Contract Amount:** \$790,000  
**Contract Period:** 11/10/2011 to 12/31/2015  
**Contract Investigator:** Dr. Glenn Washer  
**Funding:** SPR 80%, State 20%

**Project Description and Objectives:**

This project is a Missouri led Pooled Fund. The initial pooled fund research project for Thermography Technologies developed methodologies and procedures to utilize inferred (IR) cameras under field conditions. A combination of field testing by participating State Departments of Transportation (DOTs) and a laboratory study was conducted. Guidelines were developed for state practitioners to follow when using the Thermographic Imaging for inspection of bridges. The objective of this research is to validate and improve upon the guidelines developed during phase I.

**Proposed Activities for SFY 2017:**

This project was completed in state fiscal year 2016.

**SFY 2016 Accomplishments:**

During SFY2016 development of the hardware and software for the Ultra-Time Domain system was completed and deployed on several bridges in Columbia. The project team also tested the Deck and Soffit

Scanner (IR-DSS) during the fall. The IR-DSS is an infrared system designed to be mounted on a vehicle to be scanned across the surface of a bridge deck or beneath the deck to capture data in the soffit area. Volume 1 of the final report was completed and posted on the MoDOT website. The final report was submitted to the Technical Advisory Committee on February 14, 2016. The TAC supplied comments back to the reserachers in early March. The final report was published in the Innovation Library and the final invoice was paid. This project is complete..

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$0
Budget Amount SFY 2016	\$57,738
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	\$732,262

## Pooled Fund Studies

**TPF-5(193)-Midwest States Pooled Fund Crash Test Program**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$195,000  
**Contract Period:** 11/19/2008 to 6/30/2016  
**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](http://www.mwrsf.unl.edu)

**Financials**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$65,000
Transferred Funds SFY 2016	\$65,000

**TPF-5(218)-Clear Roads Winter Highway Operations**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$150,000  
**Contract Period:** 7/17/2009 to 7/17/2017  
**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.

<b><u>Financials</u></b>	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

### **TPF-5(233)-Technology Transfer Intelligent Compaction**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$45,000  
**Contract Period:** 7/1/2010 to 6/30/2016  
**Contract Investigator:** Iowa DOT  
**Funding:** SPR 100%

#### **Project Description and Objectives:**

In 2008 and 2009 the Iowa Department of Transportation and the Earthworks Engineering Research Center (EERC) hosted an annual workshop on Intelligent Compaction for Soils and Hot-mix Asphalt (HMA). As part of the workshop, a roadmap for addressing the research and educational needs for integrating intelligent compaction technologies into practice was developed. An ongoing forum is needed to provide broad national leadership that can rapidly address the needs and challenges facing Departments of Transportation with the adoption of intelligent compaction technologies.

<b><u>Financials</u></b>	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$9,000
Transferred Funds SFY 2016	\$9,000

### **TPF-5(255)-Highway Safety Manual**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Jen Harper  
**MoDOT Total Commitment:** \$100,000  
**Contract Period:** 1/19/2012 to 12/31/2019  
**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.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$0
Transferred Funds SFY 2016	\$0

#### **TPF-5(267)-2012 NCAT Pavement Test Track**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$100,000  
**Contract Period:** 6/1/2012 to 9/30/2018  
**Contract Investigator:** Alabama DOT  
**Funding:** SPR 100%

#### **Project Description and Objectives:**

The 2012 NCAT Pavement Test Track is expected to consist of an even larger structural experiment as well as more mill or inlay surface mixes, with formal research sponsorship expanded to include private sector partners.

The primary objectives are:

- On the existing 1.7 mile NCAT test oval, construct 200 feet of test sections representative of in-service roadways on the open transportation infrastructure.
- Apply accelerated performance truck traffic in two years following construction.
- Assess and compare functional and structural field performance of trafficked sections on a regular basis via surface and subsurface measures.
- Validate M-E approach to pavement analysis and design using both surface and subsurface measures.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$120,000
Committed Funds SFY 2016	\$120,000
Transferred Funds SFY 2016	\$120,000

#### **TPF-5(269)-Unbonded Concrete Overlays Pooled Fund**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Jen Harper  
**MoDOT Total Commitment:** \$80,000  
**Contract Period:** 6/17/2013 to 4/30/2017  
**Contract Investigator:** Minnesota DOT  
**Funding:** SPR 100%

#### **Project Description and Objectives:**

One pavement rehabilitation option that has been gaining popularity in the U.S. recently is unbonded concrete overlays of existing concrete or composite pavements (UCOCP). While thicker (>7") unbonded concrete overlays have performed very well in many states, current economic restrictions, as well as an interest in using less materials

(sustainability), are guiding agencies toward optimizing concrete overlays. This can be done by making the best use of the existing pavement structure and designing a cost effective interlayer and concrete overlay. The primary purpose of this project is to create a unified national design guide for unbonded concrete overlays of existing concrete and composite pavements.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$0
Transferred Funds SFY 2016	\$0

### **TPF-5(273)-Institute for Trade and Transportation Studies - ITTS**

**Project Type:** Pooled Funds

**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$79,600

**Contract Period:** 12/1/2012 to 11/30/2017

**Contract Investigator:** Louisiana Department of Transportation and Development

**Funding:** SPR 100%

#### **Project Description and Objectives:**

The Southeastern Transportation Alliance was formed in 1996 for the purpose of undertaking the Latin America Trade and Transportation Study (LATTS). The premise of the study was the recognition that Latin America is poised for growth and this presents huge trade potential for southeastern states. Following the completion of LATTS (Phase I) in March 2001, the study was taken to the next level under the name LATTS II. LATTS II was a two-year analysis of the critical infrastructure needs identified in LATTS (Phase I). To continue the original study initiatives, the remaining Alliance states decided to form an independent entity entitled the Institute for Trade and Transportation Studies (ITTS). The purpose of ITTS is to estimate trade volumes with Latin America and other international trade, evaluate infrastructure investments needed to support growth in international trade, and develop strategies to guide infrastructure investments.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$39,800
Committed Funds SFY 2016	\$39,800
Transferred Funds SFY 2016	\$39,800

### **TPF-5(285)-Lightweight Deflectometer Measurements**

**Project Type:** Pooled Funds

**MoDOT Contact:** Jen Harper

**MoDOT Total Commitment:** \$50,000

**Contract Period:** 11/1/2013 to 12/31/2016

**Contract Investigator:** Maryland DOT

**Funding:** SPR 100%

#### **Project Description and Objectives:**

Previous research has shown the potential of lightweight deflectometers (LWDs) for determining the moduli of natural subgrades and compacted soil layers, including granular bases. There is currently no widely recognized standard for interpreting the load and deflection data obtained during construction QA testing and then relating these measurements to the elastic modulus values used in pavement design. The primary objective of this study is to provide state DOT and local government engineers with a practical and theoretically sound methodology for the

evaluation of in-place elastic modulus of unbound layers, subgrades, and other earthwork from LWD field test data. This will require evaluation of the abilities of LWDs to determine in-place moduli that reflect moisture influences, stress/strain dependency, and layering effects.

**Financials**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$0
Transferred Funds SFY 2016	\$0

**TPF-5(293)-Mid-America Freight Coalition-II**

**Project Type:** Pooled Funds

**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$75,000

**Contract Period:** 11/6/2013 to 12/31/2016

**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**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$25,000
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

**TPF-5(295)-Smart Work Zone Deployment Initiatives (SWZDI)**

**Project Type:** Pooled Funds

**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$150,000

**Contract Period:** 5/15/2014 to 1/1/2019

**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.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$50,000
Committed Funds SFY 2016	\$50,000
Transferred Funds SFY 2016	\$50,000

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

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$7,000 (estimated)  
**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; 2017 will be the first year of participation.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$7,000 (estimate)
Committed Funds SFY 2016	\$0
Transferred Funds SFY 2016	\$0

**TPF-5(303)-2015 Performance Measures Technical Transfer Conference and Asset Management Peer Exchange**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Jen Harper  
**MoDOT Total Commitment:** \$12,000  
**Contract Period:** 9/1/2014 to 7/31/2016  
**Contract Investigator:** Iowa DOT  
**Funding:** SPR 100%

**Project Description and Objectives:**

The focus of this pooled fund project will be in the area of the National Highway Performance Program. The primary activities of this pooled fund project are technology exchange, information sharing, and the facilitation of partnering relationships among state agencies, AASHTO, FHWA and other appropriate associates. A two day performance measures conference will be hosted by TRB for member states and other interested parties.

<u>Financials</u>	<u>Amount</u>
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Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$0
Transferred Funds SFY 2016	\$0

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

**Project Type:** Pooled Funds  
**MoDOT Contact:** Jen Harper  
**MoDOT Total Commitment:** \$20,000  
**Contract Period:** 9/14/2014 to 9/30/2019  
**Contract Investigator:** FHWA  
**Funding:** SPR 100%

#### Project Description and Objectives:

The Mechanistic Empirical Pavement Design Guide (MEPDG) was developed under the National Cooperative Highway Research Program (NCHRP) project 1-37A with an objective to provide the highway community with a state-of-the-practice tool for the design for new and rehabilitated pavement structures. The next phase is implementation, adoption, and use by AASHTO member states and Canadian Provinces. This pooled fund will serve to meet the need for forums to discuss ME Design implementation efforts and will also coordinate implementation efforts on a regional and National level.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$10,000
Committed Funds SFY 2016	\$10,000
Transferred Funds SFY 2016	\$10,000

### TPF-5(313)-Technology Transfer Concrete Consortium (TTCC)

**Project Type:** Pooled Funds  
**MoDOT Contact:** Jen Harper  
**MoDOT Total Commitment:** \$16,000  
**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.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$8,000
Committed Funds SFY 2016	\$8,000
Transferred Funds SFY 2016	\$8,000

**TPF-5(316)-Traffic Control Device (TCD) Consortium (Traffic)****Project Type:** Pooled Funds**MoDOT Contact:** Jen Harper**MoDOT Total Commitment:** \$25,000**Contract Period:** 1/14/2015 to 1/14/2020**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**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$25,000
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

**TPF-5(317)-Low Cost Safety Improvements****Project Type:** Pooled Funds**MoDOT Contact:** Bill Stone**MoDOT Total Commitment:** \$10,000**Contract Period:** 2/10/2015 to 2/9/2020**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**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$5,000
Committed Funds SFY 2016	\$5,000
Transferred Funds SFY 2016	\$5,000

**TPF-5(319)-Transportation Management Center Pooled Fund Study****Project Type:** Pooled Funds**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$25,000  
**Contract Period:** 4/17/2015 to 4/16/2018  
**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).

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$0
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

**TPF-5(326)-Performance Management**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$30,000  
**Contract Period:** 7/1/2015 to 6/30/2017  
**Contract Investigator:** Rhode Island DOT  
**Funding:** SPR 100%

**Project Description and Objectives:**

The focus of this pooled fund project will be to research and assess training and educational needs of contributing members, develop and deliver training, and to facilitate the sharing and retention of performance management best practices.

Funding will be used to:

- Identify Gaps in TPM Knowledge, Skills and Abilities—Conduct a needs analysis for learning and capacity development of contributing members resulting in a short and long-term capacity building roadmap;
- Develop and Deliver Learning and Capacity Development Resources—Develop training and educational material to meet the gaps identified in the knowledge, skills and abilities;
- Establish a TPM Information Clearinghouse—The TPM Information Clearinghouse will be used to showcase PM best practices, foster collaboration, and serve as a repository for PM resources; and
- Support Knowledge Transfer Among Pooled Fund States

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$10,000
Committed Funds SFY 2016	\$10,000
Transferred Funds SFY 2016	\$10,000

**TPF-5(330)-No Boundaries Roadway Maintenance Practices**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$30,000  
**Contract Period:** 9/1/2015 to 9/1/2018  
**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.

Note: A \$20,000 transfer was made in SFY 2016. This transfer covers the SFY 2015, which was not made in SFY 2015 in the amount of \$10,000 and the SFY 2016 transfer of \$10,000.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$10,000
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

**TPF-5(342)-TRB Research Subscription SFY 2016 & SFY 2017**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$314,872  
**Contract Period:** 7/1/2014 to 9/30/2016  
**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.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017 (estimated)	\$165,000
Committed Funds SFY 2016	\$165,254
Transferred Funds SFY 2016	\$165,254

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

**Project Type:** Pooled Funds

**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$75,000

**Contract Period:** 1/19/2016 to 6/30/2019

**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 geospatial 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**

	<b><u>Amount</u></b>
Committed Funds SFY 2017	\$25,000
Committed Funds SFY 2016	\$25,000
Transferred Funds SFY 2016	\$25,000

### **TPF-5(341)-National Road Research Alliance**

**Project Type:** Pooled Funds

**MoDOT Contact:** Bill Stone

**MoDOT Total Commitment:** \$450,000

**Contract Period:** 4/19/2016 to 6/30/2019

**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

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$150,000
Committed Funds SFY 2016	\$150,000
Transferred Funds SFY 2016	\$150,000

**TPF-5(416)-National Cooperative Highway Research Program (NCHRP) SFY 2016 & TPF-5(417)-National Cooperative Highway Research Program (NCHRP) SFY 2017**

**Project Type:** Pooled Funds  
**MoDOT Contact:** Bill Stone  
**MoDOT Total Commitment:** \$2,091,014  
**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.

<u>Financials</u>	<u>Amount</u>
Committed Funds SFY 2017	\$1,050,000.00
Committed Funds SFY 2016	\$1,041,014.00
Transferred Funds SFY 2016	\$1,041,014.00

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## Development – SPR17DVS

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### Estimated Cost - \$82,041

**TDyy0701 - Product testing in general**

**Project Type:** New Products  
**MoDOT Contact:** Jason Collins  
**Contract Period:** 7/1/2015 to 6/30/2017  
**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 2017:**

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 2016 Accomplishments:**

The new products system continues to be split between specification compliant and non-compliant products.

**Financials**

Projected Budget SFY 2017  
 Budget Amount SFY 2016  
 Actual Cost SFY 2016  
 Prior to SFY 2016 Actual Cost

Amount  
 \$82,041  
 \$19,567  
 (See Addendum Aug. 2016)  
 N/A

## Technology Transfer – SPR17TTS

### Estimated Cost - \$490,000

LTAP = \$300,000  
 NHI = \$40,000  
 BEAP = \$120,000  
 TEAP = \$30,000

**TTAP - LTAP Program**

**Project Type:** Contracts Other  
**MoDOT Contact:** Bill Stone  
**Contract Investigator:** Missouri S&T  
**Funding:** SPR 100%

TTAP Number	Calendar Year	SPR Work Program Timeline	Contract \$
TTAP-T001(30)	2015	7/1/15 through 12/31/15	\$171,748
TTAP-T001(31)	2016	1/1/16 through 12/31/16	\$300,000

TTAP-T001(32) assumed	2017	1/1/17 through 6/30/17	\$100,000
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### **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 2015:**

There was an Ambassadors meeting on October 21, 2015. At the meeting the LTAP Director and staff covered a summary of the class activities for the year. Also discussed was discussion of potential additional classes. Also included was an overview session of the LTAP Supervisory Communication Skills Using DISC Assessment training that is offered as part of our Scholars Level III. Overall for Calendar Year 2015, there were 138 classes with 4,489 attendees.

#### **CY 2016:**

Due to turnover at the University of Missouri S&T, the Task Order was delayed in being executed. The Task Order was executed by the Commission on February 2016. There was a joint Advisory Committee and Ambassadors meeting on April 28, 2016. At the meeting there was discussion of new courses that are being developed and that it was time to update some past courses to keep them fresh.

### **Proposed Activities**

#### **CY 2016 & CY 2017:**

- 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**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$300,000
Budget Amount SFY 2016	\$300,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Actual Cost SFY 2015	\$269,754

**TT200701 - NHI National Highway Institute Training SFY 2016 & SFY 2017**

**Project Type:** Contracts Other  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$80,000  
**Contract Period:** 7/1/2015 to 6/30/2017  
**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 2017:**

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 2016 Accomplishments:**

There were two classes conducted for Fracture Critical Inspection Techniques for Steel Bridges. One of the trainings was conducted from March 15-18, 2016 and was invoiced for \$18,450. The second training was conducted on March 22-25, 2016 and was invoiced for \$22,550.00. The two classes totaled \$41,000.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$40,000
Budget Amount SFY 2016	\$40,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	N/A

**BEAP Program 2016 and 2017**

**Project Type:** Contracts Other  
**MoDOT Contact:** Bill Stone  
**Total Contract Amount:** \$240,000  
**Contract Period:** 7/1/2015 to 6/30/2017

**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 2017:**

Provide opportunity for local agencies to get technical assistance for bridge engineering problems. It is estimated that the available funds will allow for around 35 BEAP projects. The total number of projects per year will vary depending on the scope and final cost of individual projects.

**SFY 2016 Accomplishments:**

The funding allocation for SFY2016 has allowed for 33 BEAP studies to provide technical assistance for operational problems on 46 local agency bridges. As of 5/16/16, 26 of these studies have been completed with the remaining 7 studies to be completed by the end of the fiscal year.

**Financials**

	<b><u>Amount</u></b>
Projected Budget SFY 2017	\$120,000
Budget Amount SFY 2016	\$120,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	N/A

The BEAP program is managed by the Bridge Division

**TEAP Programs 2016 and 2017**

**Project Type:** Contracts Other

**MoDOT Contact:** Bill Stone

**Total Contract Amount:** \$60,000

**Contract Period:** 7/1/2015 to 6/30/2017

**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 2017:**

Provide opportunity for local agencies to get technical assistance for traffic engineering problems. It is estimated that the available funds will allow for around 11 TEAP projects. 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 2016 Accomplishments:**

The funding allocation for SFY2016 has 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**

	<u>Amount</u>
Projected Budget SFY 2017	\$30,000
Budget Amount SFY 2016	\$30,000
Actual Cost SFY 2016	(See Addendum Aug. 2016)
Prior to SFY 2016 Actual Cost	N/A

The TEAP program is managed by the Design Division

# ADDENDUM

State Planning and Research Program  
Fiscal Year 2016 Annual Report - (07/01/2015-06/30/2016)

## Part I – Planning

Transportation Planning Activities	FY 2016 Budget	FY 2016 Expenditures
• Administration	\$494,769	\$373,262
• Planning Performance Group		
o Planning and Policy Group	\$415,252	\$548,192
o Strategic Planning Group	\$480,801	\$395,392
• Statewide Programming	\$641,384	\$669,707
• Transportation Systems Management	\$4,788,890	\$3,234,306
o Administration	\$133,201	\$145,892
o Mapping and Customer Service	\$1,152,687	\$619,491
o Pavement Analysis and Application Dev.	\$653,423	\$561,652
o Traffic/Collection	\$1,458,598	\$438,483
▪ Field Acquisition	\$891,506	\$972,224
o Data	\$499,476	\$496,564
<b>SUBTOTAL</b>	<b>\$6,821,096</b>	<b>\$5,220,859</b>
<i>District Transportation Planning</i>		
• CD	\$306,080	\$339,037
• KC	\$711,890	\$1,061,773
• NE	\$186,176	\$360,326
• NW	\$95,100	\$198,115
• SE	\$249,386	\$151,019
• SL	\$300,155	\$291,543
• SW	\$431,560	\$412,292
<b>SUBTOTAL</b>	<b>\$2,280,347</b>	<b>2,814,107</b>
<i>Other Activities</i>		
• Information Systems	\$2,861,640	\$2,861,640
• Regional Planning Commission	\$1,250,000	\$1,199,026
• Financial Planning & Reporting	\$1,069,158	\$1,248,249
<b>SUBTOTAL</b>	<b>\$5,180,798</b>	<b>\$5,308,915</b>
<b>TOTAL PART I</b>	<b>\$14,282,241</b>	<b>\$13,343,881</b>

## Part II – Urban (MPO) – CPG

Metropolitan Areas (Fiscal Year)	FY 2016 CPG Funds with Match	FY 2016 CPG Expenditures with Match
• NW Arkansas - 07/01 - 06/30	\$16,250	\$19,200
• Kansas City - 01/01 - 12/31	\$2,185,203	\$2,163,032
• St. Louis - 07/01 - 06/30	\$3,906,178	\$3,232,248
• Springfield - 07/01 - 06/30	\$687,930	\$739,442
• Columbia - 10/01 - 09/30	\$319,051	\$249,911
• Jefferson City - 11/01 - 10/31	\$182,876	\$155,316
• Joplin - 11/01 - 10/31	\$232,733	\$268,697
• St. Joseph - 01/01 - 12/31	\$224,574	\$95,444
• Cape Girardeau - 07/01 - 06/30	<u>\$170,658</u>	<u>\$ 0</u>
	<b>\$7,925,453</b>	<b>\$6,923,291</b>

## Part III – Research – SR

Activity	FY 2016 Budget	FY 2016 Expenditures
• Administration (SPR14ADS)	\$ 322,074	\$320,171
• Research (SPR14RDS)	\$1,673,908	\$1,179,539
• Development (SPR14DVS)	\$ 19,567	\$3,060
• Technology Transfer (SPR14TTS)	<u>\$ 493,000</u>	<u>\$563,901</u>
<b>TOTAL PART III</b>	<b>\$ 2,508,549</b>	<b>\$2,066,671</b>

## TOTAL MoDOT SPR WORK PROGRAM

	FY 2016 Budget	FY 2016 Expenditures
• Part I – Planning	<b>\$14,282,241</b>	<b>\$13,144,043</b>
• Part II – Metropolitan Planning	<b>\$ 7,925,453</b>	<b>\$6,923,291</b>
• Part III – Research	<b><u>\$ 2,508,549</u></b>	<b><u>\$2,066,671</u></b>
<b>TOTAL MoDOT SPR WORK PROGRAM</b>	<b>\$24,716,243</b>	<b>\$22,134,005</b>

Part III Research  
 Addendum August 2016  
 SFY2016 Budget to Actual

Project Number	Project Description	SFY 2016 Budget	SFY 2016 Actual
<b>Administration - SPR16ADS</b>			
TA166601	Research Administration	\$322,074.00	\$320,170.97
<b>Research - SPR16RDS Research</b>			
Research General			
TR16CONT	Research Contingencies	\$590,400.00	N/A
Research Contracts			
TR201228	Statewide Report Card Survey--Completed	\$15,616.60	\$15,615.60
TR201236	SCC Implementation Project--Completed	\$72,802.00	\$72,801.08
TR201313	Secretary of State Library MOU	\$4,582.00	\$4,582.39
TR201401	Library Support Contract (2013-2015)--Completed	\$24,889.00	\$6,849.03
TR201405	Highway Safety Manual-Freeways--Completed	\$12,806.00	\$12,805.37
TR201417	GRS Rustic Road Bridge	\$8,468.00	\$6,299.45
TR201501	Improving Striping Operations through System Optimization--Completed	\$23,077.30	\$23,077.30
TR201502	High Volume Recycled Materials	\$47,686.00	\$47,136.53
TR201503	Economical and Crack Free High Performance Concrete	\$44,666.00	\$33,581.35
TR201504	Crash Landing Correction for Freeways--Completed	\$35,786.00	\$35,786.41
TR201505	Fiber Reinforced Concrete	\$43,747.00	\$39,625.26
TR201506	Evaluation of Finger Plate and Flat Plate Connection--Completed	\$190,301.00	\$190,300.68
TR201509	Evaluation of Erosion Control Blankets	\$78,259.00	\$64,705.92
TR201510	System-wide Safety Improvements and Design Guidance--Completed	\$40,241.00	\$40,241.00

TR201512	Alternative Merge Sign Simulation	\$84,769.00	\$83,821.23
TR201513	Evaluation of Aviation Specifications--Completed	\$4,528.00	\$4,527.64
TR201514	No Passing Zone Guidance	\$49,435.00	\$62,421.97
TR201515	Investigation of J-Turn Design Factors using the ZouSimulator	\$39,967.00	\$25,930.60
TR201516	FRP Deck Panels	\$23,847.00	\$23,847.36
TR201518	Roller Compacted Concrete	\$57,472.00	\$72,689.58
TR201522	MoDOT Customer Satisfaction Tracking Survey	\$68,118.00	\$68,118.00
TR201601	Library Support Contract (2016-2017)	\$74,228.00	\$88,865.48
TR201602	Poplar Street Approach-Phase II	\$40,620.00	\$36,449.63
TR201603	Accelerated Bridge Column Construction-Phase II --Completed	\$6,313.00	\$6,313.00
TR201605	Monitoring Vibrations on the JC Truss Bridge ---Completed	\$15,000.00	\$15,000.00
TR201606	Long Term Pavement Performance, Project 5P3131, Central District	\$0.00	\$0.00
TR201607	Striping Optimization Enhancements	\$17,500.00	\$5,867.36
TR201608	Transportation Infrastructure Conference--Completed	\$3,000.00	\$3,000.00
TR201609	MEPDG Local Calibration	\$0.00	\$18,106.02
TR201610	AASHTO Technical Service Program	\$38,000.00	\$43,000.00
TR201611	St. Louis In-Laid Pavement Markers Survey	\$0.00	\$4,094.01
TR201612	Work Zone Simulator Analysis: Alternate Lane Configurations	\$10,000.00	\$15,598.30
TR201613	Work Zone Split Traffic Symbol Sign	\$0.00	\$0.00
TR201615	Transportation Research Methods Training	\$15,000.00	\$8,481.74
TR201616	Missouri Highway Safety Manual Recalibration	\$0.00	\$0.00
TR201621	Solar Roadways Evaluation	\$0.00	\$0.00
TR201701	Internal Curing	\$0.00	\$0.00
TR201702	High Volume Recycled Materials-Phase II	\$0.00	\$0.00
TR201703	Economical and Crack Free High Performance Concrete-Phase II	\$0.00	\$0.00
TR201704	Design of Ultra High Performance Concrete for Thin Overlays	\$0.00	\$0.00
TR201705	Implementation of FR Self-Consolidating Concrete for Repair of Bridge Sub-Structures and FR Super-Workable Concrete for Infrastructure Construction-Phase II	\$0.00	\$0.00
		\$1,190,723.00	\$1,179,539.29

