FY 2025
State Planning and Research Program

SPR-PL-00 FY (25)
2025 State Fiscal Year
(7/1/24 to 6/30/25)

And

SPR-PL-00 FY (24)
2024 State Fiscal Year
(7/1/23 to 6/30/24)

Missouri Department of Transportation

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

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List of Abbreviations

AASHTO – American Association of State Highway and Transportation Officials
APA – American Planning Association
ARAN – Automatic Road Analyzer
ASTM – American Society for Testing and Materials
BEAP – Bridge Engineering Assistance Program
CAP – Compliance Assessment Program
CFR – Code of Federal Regulations
CPG – Consolidated Planning Grants
DOT – Department of Transportation
EPG – Engineering Policy Guide
EV – Electric Vehicle
EWG – East-West Gateway Council of Governments
FEMA – Federal Emergency Management System
FFY – Federal Fiscal Year
FHWA – Federal Highway Administration
FRP – Fiber Reinforced Polymer
FTA – Federal Transit Administration
FTZ – Foreign Trade Zone
GIS – Geographic information system
GPR – Ground-Penetrating Radar
HPMS – Highway Performance Monitoring System
HSM – Highway Safety Manual
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
MAFC – Mid-America Freight Coalition
MARC – Mid-America Regional Council
MDA – Mixture Design and Analysis
MERIC – Missouri Economic Research and Information Center
MHTC – Missouri Highway Transportation Commission
MoDOT – Missouri Department of Transportation
MPO – Metropolitan Planning Organization
MUTCD – Manual on Uniform Traffic Control Devices
NCAT – National Center for Asphalt Technology
NCHRP – National Cooperative Highway Research Program
NDT – Non-destructive Testing
NHI – National Highway Institute
NTPEP – National Transportation Product Evaluation Program

ONEDOT – Federal Highway Administration and Federal Transit Administration
OTO – Ozarks Transportation Organization
PCC – Portland Cement Concrete
PI – Principal Investigator
PIERS – Port Import Export Reporting Service
PL – Metropolitan Planning
PPG – Planning and Policy Group
QA – Quality Assurance
QC – Quality Control
RAS – Recycled Asphalt Shingles
RCA – Recycled Concrete Aggregate
RPC – Regional Planning Commission
RTAP – Rural Technical Assistance Program
RTS – Right Transportation Solutions
SASW – Spectral Analysis of Surface Waves
SCC – Self-Consolidating Concrete
SDE – Service Desk Express
SEMA – State Emergency Management System
SFY – State Fiscal Year
SHAL – Safety Handbook for Locals
SICOP – Snow and Ice Pooled Fund Cooperative Program
SPF – Safety Performance Functions
SPR – State Planning and Research
SPT – Standard Penetration Test
STARS – Missouri Statewide Traffic Accident Records System
STIP – Statewide Transportation Improvement Program
STSFA –Transportation Systems Funding Alternative
TAC – Technical Advisory Committee
TCD – Traffic Control Device
TCOAP – Thin-White Topping Concrete Overlays of existing Asphalt Pavement
TE – Transportation Enhancement
TEAP – Traffic Engineering Assistance Program
TIG – Technology Implementation Group
TMC – Transportation Management Center
TMS – Transportation Management Systems
TRB – Transportation Research Board
TP – Transportation Planning
TPF – Transportation Pooled Funds
TSP2 – Transportation Pavement Preservation Program
TTAP –Technology Transfer Assistance Program
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

Preface

This SPR Work Program is prepared as an overview of the MoDOT activities that relate to Sections 420.105 and 505, State Planning and Research, of Title 23, United States Code. MoDOT also considered the Planning Emphasis Areas (PEAs) in the development of the SPR Work Program.

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

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

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

Research, Development and Technology Transfer (SR) funds are used for research, and for development and technology transfer activities necessary in connection with the planning, design, construction and maintenance of highway, public transportation and intermodal transportation systems. The SPR work program describes the proposed work activities and estimated budgets for each work program element and the accomplishments for the prior year.

An administrative action will be completed for the purpose of incorporating the actual expenditure amounts for SFY 2024 work activities into the SFY 2025 SPR work program. This administrative action will be in the form of an addendum and provided to FHWA for informational purposes. It will be available for viewing on www.modot.org.

Introduction

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

MoDOT's Mission:

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

MoDOT's Tangible Results:

- Moving Missourians Safely
- Providing Outstanding Customer Service
- Delivering Efficient and Innovative Transportation Projects
- Operating a Reliable Transportation System
- Managing our Assets
- Stabilizing Resources and Engaging our Workforce
- Building a Prosperous Economy for All Missourians

MoDOT's Value Statements:

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

Financial Summary Sheet

As of May 31, 2024

A. Total Estimated Costs	SFY 2025	SFY 2024
Part I – Planning	$31,416,357	$26,067,673
Part II – Metropolitan Planning	$13,947,485	$14,062,190
***Part III – Research, Development and Technology**	$6,236,189	$5,601,557
TOTAL ESTIMATED COST	**$51,600,031**	**$45,731,420**

B. Available Federal Funds	SFY 2025	SFY 2024
Part I - State Planning		
Obligated but Not Spent	$2,106,715	$6,820,847
Unobligated Funds	$18,749,365	$19,071,122
Estimated Annual Apportionment	$18,358,183	$17,995,878
Less: Pooled Funds		
- ITTS TPF-5(390)…….$39,800 estimated	($39,800)	($39,800)
- MAFC Phase 4 TPF-5(509)….$52,000 estimated	($52,000)	($52,000)
SUBTOTAL – STATE PLANNING	**$39,122,463**	**$43,796,047**
Part II - Metropolitan Planning		
Obligated but Not Spent	$13,864,158	$10,509,792
Unobligated Funds	$11,523,945	$10,738,341
Estimated FHWA PL Annual Allocation	$7,134,022	$6,994,139
Estimated FTA 5303 Annual Allocation	$2,507,789	$2,411,336
SUBTOTAL – METRO PLANNING	**$35,029,914**	**$30,653,608**
Part III – Research		.
Obligated but not spent	$795,147	$3,031,638
Unobligated Funds	$10,879,780	$10,823,362
Estimated Annual Apportionment	$6,119,394	$5,998,626
Less:	($2,416,000)	($2,381,000)
- NCHRP…….$1,346,000 estimated		
- TRB Core……...$220,000 estimated		
- Pooled Funds…..….$850,000 estimated		
SUBTOTAL – RESEARCH	**$15,378,321**	**$17,472,626**
TOTAL FEDERAL FUNDS AVAILABLE	**$89,530,698**	**$91,922,281**

C. Proposed Budget Estimates for SFY 2025

Proposed Budget Estimates for SFY 2025	Federal Funds	Percent	Matching Funds	Total
State Planning	$25,293,086	80%	$6,123,271	$31,416,357
Metropolitan Planning (PL and 5303) (Estimated)	$11,157,988	80%	$2,789,497	$13,947,485
*** Research**	$4,524,951	80%	$1,131,238	$5,656,189
	$580,000	100%	$0.00	$580,000
TOTAL	**$41,556,025**		**$10,044,006**	**$51,600,031**

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

Research Calculation--Items that are 100% funded

AASHTO TSP	$110,000	SPR25RDS
LTAP	$420,000	SPR25TTS
MoDOT Lead Pooled Funds	$50,000	SPR25RDS
Total 100% Funded	$580,000	

Planning Calculation--Items that are 100% funded

Safe and Accessible Transportation Options	$800,000	SPR25SAS

Itemized Cost Budget Estimates

Part I – Planning

Transportation Planning Activities	SPR Federal Portion FY2025	Match FY 2025	Total
80% Federal			
• **Transportation Planning (SPR2540S)**	$9,150,237	$2,287,559	$11,437,796
SUBTOTAL	**$9,150,237**	**$2,287,559**	**$11,437,796**
District Transportation Planning			
• **CD (SPR25CDS)**	$1,530,035	$382,509	$1,912,543
• **KC (SPR25KCS)**	$1,721,482	$430,371	$2,151,853
• **NE (SPR25NES)**	$775,648	$193,912	$969,560
• **NW (SPR25NWS)**	$618,374	$154,593	$772,967
• **SE (SPR25SES)**	$1,130,598	$282,649	$1,413,247
• **SL (SPR25SLS)**	$1,751,025	$437,756	$2,188,781
• **SW (SPR25SWS)**	$884,710	$221,177	$1,105,887
SUBTOTAL	**$8,411,871**	**$2,102,968**	**$10,514,839**
Other Activities			
100% Federal - 2.5% Set-Aside funding			
• **Safe & Accessible Transportation Options (SPR25SAS)**	$800,000	$0	$800,000
80% Federal			
• **Multimodal Operations (SPR25MOS)**	$111,857	$27,964	$139,821
• **Information Systems (SPR25ISS)**	$1,784,788	$446,197	$2,230,985
• **Regional Planning Commission (SPR2527S)**	$1,541,000	$385,250	$1,926,250
• **Financial Services (SPR2593S)**	$1,435,113	$358,778	$1,793,891
• **Bridge Division (SPR25BRS)**	$966,298	$241,574	$1,207,872
• **Design Division (SPR2595S)**	$12,322	$3,081	$15,403
• **Consultant Contracts (SPR25DBS)**	$1,079,600	$269,900	$1,349,500
SUBTOTAL	**$7,730,978**	**$1,732,744**	**$9,463,722**
TOTAL PART I	**$25,293,086**	**$6,123,271**	**$31,416,357**

Part II – Urban (MPO)

Metropolitan Areas	Current CPG Contract Amount	Estimated FFY 2025 Local Match	Estimated Total FFY 2025 CPG Funds with Match
NW Arkansas	$8,000	$2,000	$10,000
Kansas City	$2,872,459	$718,115	$3,590,574
St. Louis	$4,753,061	$1,188,265	$5,941,326
Springfield	$993,235	$248,309	$1,241,544
Columbia	$891,121	$222,780	$1,113,901
Jefferson City	$392,521	$98,130	$490,651
Joplin	$681,187	$170,297	$851,484
St. Joseph	$269,406	$67,352	$336,758
Cape Girardeau	$296,998	$74,250	$371,248
TOTAL PART II	**$11,157,988**	**$2,789,497**	**$13,947,485**

Note:

- The estimated total of MPO contracts (CPG agreements) in place for the SFY 2025 SPR work program is $11,157,988
- The estimated PL amount is before post-apportionment set-asides; before penalties; before sequestration.
- For SFY 2025 SPR, estimated total apportioned PL Funds = $7,131,168 and Obligation limitation applied at 98%.

Part III – Research – SPR

Activity	SPR Federal Portion FY 2025	Match FY 2025	Total
• **Administration (SPR25ADS)**	$488,951	$122,238	$611,189
• **Research (SPR25RDS)**	$3,944,000	$946,000	$4,890,000
• **Technology Transfer (SPR25TTS)**	$672,000	$63,000	$735,000
***TOTAL PART III**	**$5,104,951**	**$1,131,238**	**$6,236,189**

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

Total MoDOT SPR Work Program

	SPR Federal Portion FY 2025	Match FY 2025	Total
• **Part I – Planning**	$25,293,086	$6,123,271	$31,416,357
• **Part II – Metropolitan Planning**	$11,157,988	$2,789,497	$13,947,485
• *** Part III – Research**	$5,104,951	$1,131,238	$6,236,189
TOTAL MoDOT SPR WORK PROGRAM	**$41,556,025**	**$10,044,006**	**$51,600,031**

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

CFR 420.107(c) Summary

FY 2024 FHWA Research Apportionment (25%)	**$6,119,394**
FY 2025 Research Budget	**$7,520,951**
Pooled Funds	*$850,000*
NCHRP	*$1,346,000*
TRB Core	*$220,000*
Part III Research (Federal Portion Only)	*$5,104,951*

WORK PLANS

Core and Mandated Activities

Part I – Planning

TRANSPORTATION PLANNING ACTIVITIES

TRANSPORTATION PLANNING DIVISION
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 Regional Rail Initiative that involves sharing of information regarding freight and passenger movements on rail and freight data update coordination, planning/economic studies, conducting MoDOT's satisfaction survey and Innovative Partnerships and Alternative Funding activities.

Proposed Activities:
- Continue providing for the management of Transportation Planning's core functions including, but not limited to, trainings and office supplies, equipment and travel expenses
- Host an annual statewide planning partner meeting to share transportation information and best practices
- Continue participating in the Midwest Regional Rail Initiative
- Attend conferences, peer exchanges, AASHTO meetings and training courses
- Conduct an economic impact analysis for the STIP
- Conduct MoDOT's report card survey
- Ongoing freight software server fee
- Continue to address emerging planning needs as directed by MoDOT's Commission and Executive Team
- Electric Vehicle (EV) Infrastructure Development Plan Updates
- Assessment of various FHWA and USDOT credit assistance tools for initiation in Missouri
- Advising on preparation of various discretionary grant applications to USDOT and FHWA

Prior Year Accomplishments:
- Hosted planning partner meeting and shared information regarding transportation funding, safety initiatives and planning for the next Statewide Transportation Improvement Program and asset management planning by regional group
- Attended conferences, peer exchanges, AASHTO meetings and training courses
- Conducted an economic impact analysis for the STIP
- Completed MoDOT's carbon reduction strategy

- Completed MoDOT's report card survey
- Developed applications for competitive discretionary grant programs

PLANNING AND PERFORMANCE GROUP

Purpose and Scope: Planning and Performance Group (PPG) includes the Planning and Policy, Strategic Planning, and Organization Performance activities. The amounts include personal services and fringe benefits for employees in these units.

Planning and Policy activities include maintaining 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. Additional activities ensure MoDOT's planning processes are compliant with federal regulations and move as seamless as possible.
Strategic Planning activities include aligning MoDOT's strategic planning process with its mission, values and tangible results. Additional activities include performance management coordination, State Planning and Research Work Program administration, Tracker production, and asset management plan development.

Proposed Activities:

- Engage the public in discussions about additional transportation investments and needs
- Continue assisting RPCs in:
    - developing and maintaining work programs and regional transportation plans
    - providing local consultation with rural local officials
- Continue assisting MPOs in developing and maintaining the following work products
    - unified planning work programs
    - transportation improvement programs
    - metropolitan transportation plans
    - air quality conformity determinations
    - public involvement plans
- Attend MPOs board and technical committee meeting
- Coordinate and support MoDOT's national involvement in performance measure development, coordination and implementation
- Coordinate transportation asset management plan development
- Administer the State Planning and Research Work Program
- Provide team facilitation for process improvement and business planning teams
- Continue to support and develop the Tracker performance management system
- Continue to coordinate and develop the Innovations Challenge program
- Conduct Transportation Planning Division's internal and external customer satisfaction surveys
- Manage OA, FHWA and AASHTO Awards coordination
- Produce and maintain Unfunded Needs List
- Update MoDOT's Long Range Transportation Plan and State Freight and Rail Plan

Prior Year Accomplishments:

- Assisted the RPCs with:
    - developing and maintaining work programs and regional transportation plans and
    - providing local consultation with rural local officials
- Facilitated the receipt of ONE DOT approval of MPO TIPs, UPWPs and Air Quality Conformity Determination work products, and TIP and UPWP amendments
- Engaged in public discussion about additional transportation investment needs

- 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
- Attended MPO Board & Technical committee meetings
- Coordinated and supported MoDOT's national involvement in performance measure development, coordination and implementation
- Coordinated transportation asset management plan development and assessed department performance in respect to the plan
- Updated and submitted State Planning and Research Work Program
- Supported and developed the Tracker performance management system including the production of the quarterly Tracker publications and coordination of the quarterly Tracker Review meetings
- Coordinated and further developed the Innovations Challenge program
- Managed OA, FHWA and AASHTO Awards Program
- Published Unfunded Needs List

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.

Proposed Activities:
- Produce and maintain the STIP in accordance with the guidelines of the Planning Framework and state and federal regulations
- Produce and maintain the Missouri Road and Bridge Program
- Produce various reports on STIP programs and projects as needed
- Maintain the new SIMS application (the application used to produce the STIP)
- Calculate project Award and Completed Adjustments for the districts
- Provide data to legislators regarding projects in their districts
- Participant and review of the lettings as part of the letting review group
- Participant and reviewer of agreements (cost share/cost participation) as part of the agreements review group

Prior Year Accomplishments:
- Updated STIP through the amendment process as needed
- Developed STIP reports
- Created error check reports in Cognos to help with STIP review

TRANSPORTATION SYSTEM ANALYSIS

Purpose and Scope: Transportation System Analysis Group includes Mapping and Customer Service, Pavement Analysis and Application Development, and Traffic Collection and Data. The group manages and administers field acquisition, asset data, traffic data, travel way data, analysis of asset/travel way data, data query and traffic operations. The budget amount also includes personal services and fringe benefits for all employees within this work unit.

Proposed Activities:

- Administer and continue to improve the HPMS program
- Analyze transportation data and provide timely and accurate information to MoDOT's customers
- Provide analysis, custom queries and reports using TMS data
- Maintain and publish the official Missouri State Highway Map
- Maintain and update state, county, and city maps and develop specialty maps as requested
- Conduct monthly TMS application update testing, provide support and TMS data restoration as required by our route update process
- Provide pavement data, analysis and projections for transportation decision-making
- Verify, maintain, and update MoDOT's linear referencing system for all public roads
- Monitor pavement data to evaluate current and past best practices in pavement management
    - Annual fee to FUGRO for ARAN software support
    - Purchase new Laser Count Monitoring System (LCMS) for ARAN
- Calculate and provide statewide travel data
    - Annual fee to StreetLight Data for collecting transportation data
- Collect, manage, and report data on all public roads in an effort to support the strategic and performance-based goals in the SHSP and HSIP
- Maintain roadway data and its attributes
- Continue the development of data zone applications
- Install and maintain Continuous Traffic count sites
- Collect short duration traffic counts
- Provide traffic data, analysis and projections for making transportation decisions

Prior Year Accomplishments:

- Administered HPMS program
- Analyzed and provided transportation data to customers and transportation decision makers
- Provided data for the development of the MoDOT Asset Management Plan
- Conducted monthly TMS application update testing, provided support and TMS data restoration
- Created state, county, city, and/or specialty maps as needed
- Published the official Missouri State Highway Map
- Provided analysis, custom queries and reports using TMS data
- Continued development of data zone applications
- Maintained MoDOT's linear referencing system and continually worked with counties to verify local roads
- Processed portable and permanent counts in accordance with the traffic monitoring guide for HPMS submittal
- Calculated and provided statewide travel data and reports
- Collected pavement data of Missouri's roadways
- Maintained an inventory of roadway lane data and its attributes
- Collected, managed, and reported data on all public roads

Financials	**Amount**	**Work ID Code**
Projected Budget SFY 2025	**$11,437,796**	SPR2540S
Budget Amount SFY 2024	$7,675,167	SPR2440S

DISTRICT TRANSPORTATION PLANNING

This program supports the department's district planning staff in efforts to provide comprehensive, cooperative and continuing transportation planning assistance and direction to the district staff, MPOs and RPCs. It includes the district staff efforts and activities with the MPOs, RPCs, local government officials and federal transportation agencies that support the long-range planning process and programming of transportation needs and pre-scoping activities. It also includes training on engineering standards and training on evaluation and accreditation of inspection and testing materials for highway, public transportation, and intermodal transportation systems.

District Transportation Planning	*SPR Number*	*SPR Federal Portion FY 2025*	*Match FY 2025*	*Total*	*Amended FY 2024 Budget*
• **CD**	SPR25CDS	1,530,034.69	382,508.67	1,912,543.36	2,642,243.00
• **KC**	SPR25KCS	1,721,482.11	430,370.53	2,151,852.64	2,258,454.00
• **NE**	SPR25NES	775,648.38	193,912.10	969,560.48	909,103.00
• **NW**	SPR25NWS	618,373.50	154,593.38	772,966.88	1,048,941.00
• **SE**	SPR25SES	1,130,597.89	282,649.47	1,413,247.36	1,323,795.00
• **SL**	SPR25SLS	1,751,025.02	437,756.26	2,188,781.28	1,607,274.00
• **SW**	SPR25SWS	884,709.50	221,177.38	1,105,886.88	859,184.00
	SUBTOTAL	**8,411,871.10**	**2,102,967.78**	**10,514,838.88**	**10,648,994.00**

OTHER ACTIVITIES

SAFE AND ACCESSIBLE TRANSPORTATION OPTIONS

Purpose and Scope: Incorporate planning processes that ensure the safe and adequate accommodation of all users of the transportation system, including pedestrians, bicyclists, public transportation users, children, older individuals, individuals with disabilities, motorists, and freight vehicles. This task is utilizing the 2.5% set aside of Safe and Accessible Transportation Options Planning funds.

Proposed Activities:

- Various studies to increase safe and accessible options for multiple travel modes for people of all ages and abilities

- Vulnerable Roadway User Assessment Update ($300,000)
- Long Range Transportation Plan Update ($500,000)

Prior Year Accomplishments:
- None

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$800,000**	SPR25SAS
Budget Amount SFY 2024	$250,000	SPR24SAS

MULTIMODAL OPERATIONS DIVISION

Purpose and Scope:
MoDOT is directing a portion of the SPR funds for freight planning efforts. Personal services and fringe benefits for two employees within this work unit are included in the budget amount.

Proposed Activities:
- Engage stakeholders in discussions about additional freight transportation investments and needs
- Continue coordination with USACE for planning analysis to support modal shift from roads and rail to marine highways
- Continue assisting MoDOT team and planning partners integrate truck parking into planning and project development activities
- Provide technical assistance and coordination with public ports to increase freight flows on the marine highway system
- Continue administering the port capital improvement program, the freight enhancement program, and other state funded freight programs
- Continue assisting RPCs and MPOs professional development by identifying pertinent freight-focused virtual and in-person trainings offered
- Attend Mid America Regional Council's Goods Movement Committee meetings
- Engage with multistate freight coalitions to identify best practices and potential regional collaborations for efficient planning and movement of freight
- Identify trends and best practices for freight planning through literature review, attending Talking Freight webinars, attending AASHTO Council on Water Transportation, Planning Freight Task Force, and Special Committee on Freight meetings

Prior Year Accomplishments:

- Assisted multimodal stakeholders' development of high priority unfunded needs lists to share with the RPCs and MPOs
- Collaborated with USACE developing scope for planning analysis to support increasing freight flow on marine highway 70
- Provide technical assistance for extension of State Freight and Rail Plan Truck Parking Analysis to prioritize the truck parking needs
- Collaborated with public ports and RPCs on discretionary grant applications for freight projects.
- Administered the port capital improvement program, the freight enhancement program, and other state funded freight programs

- Assisted RPCs and MPOs professional development by identifying pertinent freight-focused virtual and in-person trainings offered
- Attended Mid America Regional Council's Goods Movement Committee meetings
- Attended AASHTO Council on Water Transportation, Council on Rail Transportation, Planning Freight Task Force, and Special Committee on Freight meetings to identify trends and best practices for freight

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$139,821**	SPR25MOS
Budget Amount SFY 2024	$253,903	SPR24MOS

INFORMATION SYSTEMS

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

Proposed Activities:

- Maintain and modernize the Transportation Management System (TMS)
    - Ongoing development and enhancements to system including the following key areas of TMS that provide critical support to MoDOT users and customers: Bridge, Outdoor Advertising, Travelways Management System, Statewide Transportation Improvement Program, Traffic & Congestion, Pavement Tools, Intelligent Transportation System, Safety System and Railroad Management System.
- Maintain and modernize the MoDOT Management System (MMS)

Prior Year Accomplishments:

- TMS Accident Table Consolidation
- Enhancements to TMS STIP Information Management System (SIMS)

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$2,230,985**	SPR25ISS
Budget Amount SFY 2024	$2,414,107	SPR24ISS

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 RPCs to carry out comprehensive and continuing transportation planning processes in cooperation with state and local planning partners. State Planning and Research funds that are allocated to RPCs assist with producing regional transportation plans, work programs involving transportation planning activities, citizen involvement processes, and other rural transportation planning efforts. Seventeen RPCs will receive federal SPR funding at approximately $78,000 each. Budget and actual amounts include local match.

Proposed Activities:
- Cooperate and collaborate with MoDOT on transportation planning processes
- Attend MACOG meetings held monthly in Jefferson City to discuss various issues with RPCs
- Participate in RPCs' transportation advisory committee meetings held in the respective regions throughout the state
- RPCs work with MoDOT and districts with developing work programs involving transportation planning activities
- Participate in monthly Partner Collaboration conference calls
- Assist MoDOT in developing Unfunded Needs list

Prior Year Accomplishments:
- Attended MACOG meetings held monthly in Jefferson City to discuss various issues with RPCs
- Participated in RPCs technical committee meetings held in the respective regions throughout the state
- Worked with RPCs and districts with developing work programs involving transportation planning activities
- Attended Statewide Planning Partner meeting hosted by MoDOT
- Assisted MoDOT in developing Unfunded Needs list

Financials	Amount	Work ID Code
Projected Budget SFY 2024	**$1,926,250**	SPR2527S
Budget Amount SFY 2023	$1,657,500	SPR2427S

FINANCIAL SERVICES

Purpose and Scope: These activities support MoDOT's budget, finance, funds management and infrastructure bank activities. In addition, funds will be managed to achieve a balanced budget and provide coordination of STIP and federal-aid projects. The budget amount also includes personal services and fringe benefits for employees within this work unit.

Proposed Activities:
- Provide activities to support MoDOT's budget, finance, funds management and infrastructure bank activities
    - Provide coordination of STIP and federal-aid projects
    - Prepare financial models to support department long-term plans and short-term cash needs
    - Provide information on innovative sources of funding for the department's transportation projects

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

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$1,793,891**	SPR2593S

Budget Amount SFY 2024	$1,349,143	SPR2493S

BRIDGE DIVISION

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

Proposed Activities:
- Prepare projects to be included in the STIP

Prior Year Accomplishments:
- Prepared projects to be included in the STIP

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$1,207,872**	SPR25BRS
Budget Amount SFY 2024	$1,064,833	SPR24BRS

DESIGN DIVISION

Purpose and Scope: MoDOT is directing a portion of the SPR funds for Design Division staff spending all or a portion of their time working on projects prior to them being included in the STIP. The budget also includes work for MoDOT safety initiatives.

Proposed Activities:
- Prepare projects to be included in the STIP
- Join the Candidate Conservation Agreement with Assurances for Monarch butterfly for MoDOT to plan for the monarch butterfly to be listed and enable MoDOT to continue constructing and maintaining the roadway network

Prior Year Accomplishments:
- Prepared projects to be included in the STIP
- Enhanced data driven safety analysis for STIP projects

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$15,403**	SPR2595S
Budget Amount SFY 2024	$354,026	SPR2495S

CONSULTANT CONTRACTS UTILIZING DBC BUDGET

Purpose and Scope: MoDOT is directing a portion of the SPR funds for MoDOT safety initiatives utilizing consultant services.

Proposed Activities:
- Develop Intersection Control Evaluation (ICE) guidance and implementation ($85,000)
- Traffic Signal Optimization ($84,500)

- Joplin Metropolitan Area Corridor Study ($900,000)
- Bridge Estimates for Asset Management Plan ($280,000)
- Improve safety evaluation for projects through data driven approach

Prior Year Accomplishments:

- SAFER tools to quantify safety
- Safety Performance Function (SPF) tools

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$1,349,500**	Various
Budget Amount SFY 2024	$400,000	Various

Part II – Urban Transportation Planning

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

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

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

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

Under CPG, the FTA and FHWA continue to distribute metropolitan planning 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(d) and 49 U.S.C. 5305(d)(2). MoDOT's distribution formula has been developed in consultation with the MPOs, and approved by FTA and FHWA for their respective programs.

The following chart shows the estimated amount of CPG funds (FHWA PL and FTA Section 5303) available for Missouri's MPOs to carry out the metropolitan transportation planning work activities to be budgeted for in each MPO's annual Unified Planning Work Program (UPWP). The MPOs will include the below listed CPG amounts or similar amounts in their UPWPs to complete activities necessary to carry out metropolitan transportation planning. Each MPO's UPWP is approved by the MPO's Policy Board and the

FHWA/FTA (ONEDOT). Planning grant agreements based on approved UPWPs are executed between the MPOs and MoDOT to allow the pass through of FHWA PL funds and 5303 Transit funds to the MPOs. SFY 2025 allocation estimate amount used 2020 census urbanized area populations.

Table 1: Total CPG Funds Available to MPOs for SFY 2025 UPWP Work Activities

Metropolitan Areas (Fiscal Year)	MPO Balances as of May 2024 (with FY 2024 allocation)*	Estimated FFY25 PL Allocation	Estimated FFY25 5303 Allocation	Estimated Total CPG Funds	Current CPG Contract Amount
NW Arkansas 07/01 -06/30	$5,592	$8,000	$0	$13,592	$8,000
Kansas City 01/01 - 12/31	$4,661,017	$2,054,914	$729,893	$7,445,824	$2,872,459
St. Louis 07/01 - 06/30	$16,872,576	$3,463,414	$1,284,127	$21,620,117	$4,753,061
Springfield 07/01 - 06/30	$1,320,482	$612,263	$201,571	$2,134,316	$993,235
Columbia 10/01 - 09/30	$1,324,365	$307,048	$101,146	$1,732,559	$891,121
Jefferson City 11/01 - 10/31	$686,311	$142,022	$36,210	$864,543	$392,521
Joplin 11/01 - 10/31	$1,025,476	$207,093	$61,815	$1,294,384	$681,187
St. Joseph 01/01 - 12/31	$935,374	$186,035	$53,529	$1,174,938	$269,406
Cape Girardeau 07/01 - 6/30	$742,758	$150,379	$39,498	$932,635	$296,998
TOTAL PART II	**$27,573,951**	**$7,131,168**	**$2,507,789**	**$37,212,908**	**$11,157,988**

* The MPOs balance is adjusted to include the actual SFY 2025 CPG allocation and equals the unobligated prior year (SFY 2024 and older) CPG allocated amounts. The MPOs balance column updates with payments of invoices and the allocation of CPG funds. The balance reported is a snapshot for the SPR work program update. The estimated total of MPOs' contracts (CPG agreements) that will be in place for the SFY 2025 SPR work program is $11,157,988.

MPOs annually program consolidated federal planning fund amounts in approved UPWPs to complete activities necessary to implement the metropolitan transportation planning process. MPO's UPWPs identify the available amounts of FHWA PL and FTA Section 5303 funds separately as funding sources but are not requested to identify the separate amounts on each work activity or in the financial summary. Each MPO's UPWP is approved by the MPO's Policy Board and the FHWA/FTA (ONE DOT). CPG agreements, based on approved UPWPs, are executed between the MPOs and MoDOT to allow the pass through of Federal planning funds to the MPOs. MPOs have up to four 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. These MoDOT District planning activities include data collection, data analysis and data sharing that supports and enhances the overall planning process within each metropolitan planning area. Activities include such work items as traffic counts, signal timing, analysis of planning and/or traffic studies and analysis of traffic volumes and safety concerns. These work items support a more informed, better decision-

making process for the MPOs and can be demonstrated to be directly attributable to the MPOs planning work elements. MPOs are able to utilize 80 percent of the value of MoDOT eligible metropolitan planning work as a credit to help provide the MPOs required 20 percent match for the Federal planning funds.

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

Kansas City MPO	$370,933
St. Louis MPO	$308,460
Springfield MPO	$60,000

PART III – RESEARCH

ADMINISTRATION

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

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$611,189**	SPR25ADS
Budget Amount SFY 2024	$600,557	SPR24ADS
Actual Cost SFY 2024	(See Addendum)	SPR24ADS

RESEARCH

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

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$4,890,000**	SPR25RDS
Budget Amount SFY 2024	$4,296,000	SPR24RDS
Actual Cost SFY 2024	(See Addendum)	SPR24RDS

TECHNOLOGY TRANSFER

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

Financials	Amount	Work ID Code
Projected Budget SFY 2025	**$735,000**	SPR25TTS
Budget Amount SFY 2024	$705,000	SPR24TTS
Actual Cost SFY 2024	(See Addendum)	SPR24TTS

Certification Statement

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

Jennifer Harper

Research Director

June 18, 2024
Date

Part III Research Summary

Project No.	Project Name	SFY 2025 Budget
SPR25ADS	Research Administration	$611,189
TR25CONT	Research Contingencies	$1,167,480
TR201313	Secretary of State Library MOU	$5,091
TR201610	AASHTO Technical Service Program SFY 2024 & SFY 2025	$201,000
TR201813	Leader-Follower TMA System	$105,167
TR202013	The Effect of Rubber Fills on the Performance of Infrastructure Phase 1	$15,445
TR202107	TITANv2 – Phase 2	$93,817
TR202109	Impact of Silt and Clay Particles on Freshwater Mussels	$74,539
TR202205	Analysis of Asphalt Mixtures Using Alternative Aggregate in SMA or SuperPave	$598
TR202206	Friction Enhancements to Asphalt Pavement Surfaces	$11,770
TR202212	Mitigating and Preventing MoDOT Safety-Related Incidents through Root-Cause Elimination and Utilization of Leading Safety Indicators	61,571
TR202219	HFST Review of Service Life	$49,878
TR202303	Consultant Estimating	$100,000
TR202306	TSR Replacement and Stripping Tests	$26,300
TR202309	Audible Alert and TMA Lighting	$118,090
TR202311	Asset Characterization Using Automated Methods	$84,340
TR202312	Methods for Monitoring the Movement of Wildlife Through Concrete Barrier Gaps	$45,465
TR202316	TMA Truck Safety	$170,221
TR202319	Impact Test of GFRP Reinforced Bridge Barriers	$15,117
TR202320	Safety Evaluation of J-turn Intersections in Missouri	$46,121
TR202323	LWD Phase II	$671
TR202325	MCTI Administration	$85,000
TR202401	Library Support Contract (2024-2025)	$134,094
TR202402	Striping Program	$16,831
TR202403	Shear Wave Velocity and Seismic Analysis Procedures	$120,629
TR202406	Using Rubber Powder to Improve F/T Resistance of Concrete	$100,000
TR202407	Missouri NBI Database Analysis-Phase II	$50,000
TR202409	Optimizing the STIP Letting and Construction Schedule	$100,000
TR202410	Effective Methods to Safely Communicate with CMVs	$90,032
TR202412	First and Last Mile Connectivity for People	$76,234
TR202413	Silane Bridge Deck Ratings	$75,000
TR202415	TSMO and Automation in Work Zones	$124,391
TR202416	Fluorescent Yellow-Green Signs	$104,651
TR202418	Implementation of Balanced Mixture Design in MO Test Sections	$19,888
TR202420	Testing Survey Methods for Detecting Bats Roosting in Bridges	$151,048
TR202421	Consultant Support for IC and PMTP Projects in 2024-2025	$105,554

TR202423	Accessing Standards and Specifications	$43,967
TR202504	Using AI to Write Land/Legal Descriptions	$125,000
TR202505	Simple for Dead, Continuous for Live (SDCL)	$150,000
TR202506	AI Enabled Vision System for Intersection Analytics	$125,000
TR202507	TITANv3 – Phase 3	$100,000
TR202508	Aggregate Quality and Size	$125,000
TR202509	Alternative Fuel Vehicles	$100,000
TR202510	Use of Small UAVs for Field Measurement of Hydraulic Parameters	$125,000
TR202511	Maximizing the Wizardry of WAZE Mobile Applications	$50,000
TR202512	Extension of Wildlife Barrier Passage	$150,000
solic. 1614	Establishment of a Public-Private Transp. Data Exchange Center	$50,000
TTAPT001	Local Technical Transfer Assistance Program (LTAP)	$420,000
TT200701	National Highway Institute (NHI)	$40,000
TTAPT001	BEAP and TEAP	$275,000
	total	$6,236,189

Pooled Funds

TPF-5(435)	Aurora Program (FY20-FY24) --new solicitation 1617	$25,000
TPF-5(437)	Technology Transfer Concrete Consortium (FY20-FY24) --new 1619	$12,000
TPF-5(438)	Smart WZ Deployment Initiatives (FY20-FY24) --new solicitation 1618	$50,000
TPF-5(441)	No Boundaries Transportation Maintenance Innovations--new solicitation posted soon	$10,000
TPF-5(447)	Traffic Control Device (TCD) Consortium (3)	$25,000
TPF-5(463)	Pavement Surface Properties Consortium: Phase III - Managing the Pavement Properties for Improved Safety	$20,000
TPF-5(464)	Hydrologic and Hydraulic Software Enhancements (SMS, WMS, Hydraulic Toolbox, and HY-8)	$10,000
TPF-5(465)	Consortium for Asphalt Pavement Research and Implementation (CAPRI)	$14,000
TPF-5(466)	National Road Research Alliance - NRRA (Phase II)	$150,000
TPF-5(479)	Clear Roads Phase III	$25,000
TPF-5(487)	Transp. Management Center Pooled Fund Study	$50,000
TPF-5(501)	Roadside Safety Pooled Fund - Phase 3	$65,000
TPF-5(504)	Cont. Bituminous Pvmnt Stripping Assesm. Through Non-dest. Testing	$25,000
TPF-5(507)	National Hydraulic Engineering Conference	$1,000
TPF-5(515)	Evaluation of Low-Cost Safety Improvements (ELCSI-PFS)	$10,000
TPF-5(516)	Highway Safety Manual 2nd Edition (HSM2) Implementation	$16,000
TPF-5(517)	Performance Centered Concrete Construction	$20,000
TPF-5(518)	Implem. of Structural Data from Traffic Speed Deflection Devices	$55,000

TPF-5(531)	Accelerated Performance Testing on the 2024 NCAT Pavement Test Track with MnROAD Research Partnership	$100,000
TPF-5(532)	MAASTO Connected Automated Vehicle (CAV) Steering Committee	$30,000
TPF-5(533)	Midwest Roadside Safety Pooled Fund Program	$65,000
Solic. 1605	Improving the Quality of Highway Profile Measurement	$30,000
Solic. 1606	Ahead of the Curve - Migration from NCHRP to AASHTO (TTS)	$10,000
Solic. 1610	Continuous Asphalt Mixture Compaction Assessment using Density Profiling System (DPS)	$25,000
N/A	Transportation Pooled Fund Contingency	$7,000
	Total Pooled Funds	$850,000
	TRB Core Subscription estimate	$220,000
	NCHRP FY 2025 estimate	$1,346,000
	Total	**$2,416,000**

Administration – SPR25ADS

Estimated Cost - $611,189

SPR25ADS – Research Administration

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount SFY 2025: $611,189
Contract Period: annual
Funding: SPR 80%, State 20%

Project Description and Objectives:
Research administration is a funding source for the administration of research activities. 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 2025:
The salary and expenses of the Research Director and Research Analysts will be charged against this item. Other MoDOT employees may code time to this project number when working on administering research contracts.

SFY 2024 Accomplishments:
The Research Section had 51 active contract research projects at the end of the third quarter. The Research Section completed a total of 15 projects and published 12 reports as of June 1, 2024.

Financials	Amount
Projected Budget SFY 2025	$611,189
Budget Amount SFY 2024	$600,557
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

Research – SPR24RDS

Estimated Cost - $4,890,000

TRyyCONT – Research Contingencies

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $1,167,480
Contract Period: 7/1/2024 to 6/30/2025
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 eventually become contract expenditures.

Proposed Activities for SFY 2025:
In addition to funds for unanticipated costs on current or ongoing activities, funds have been included for studies that may be initiated during State Fiscal Year 2025. These include administrative and other eligible costs.

SFY 2024 Accomplishments:
3 new projects were approved for funding in State Fiscal Year 2024 and three budget increases. The new projects are:
TR202418 Implementation of Balanced Mixture Design in Missouri Test Sections with Modifiers
TR202420 Bats Use of Bridges and Culverts Phase II
TR202421 Consultant Support for IC and PMTP Projects in 2024-2025

Financials	Amount
Projected Budget SFY 2025	$1,167,480
Budget Amount SFY 2024	$239,129
Adjusted Budget Amount SFY 2024	$0
Actual Cost SFY 2024	N/A
Prior to SFY 2024 Actual Cost	N/A

TR201313 – Secretary of State Library MOU

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: N/A
Contract Period: 7/1/2013 to 6/30/2025
Contract Investigator: Laura Kromer
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 2025:
It is expected that the SFY 2025 invoice will be received and sent for payment during the first quarter.

SFY 2024 Accomplishments:
The invoice was received in early September and the invoice was paid on September 7, 2023. The MOU for SFY 2025 has been developed and approved by both the Secretary of State's Office and MoDOT legal. All signatures have been obtained.

Financials	Amount
Projected Budget SFY 2025	$5,091
Budget Amount SFY 2024	$5,392
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

TR201610 – AASHTO Technical Service Program SFY 2024 & SFY 2025

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: N/A
Contract Period: 7/1/2023 to 06/30/2025
Contract Investigator: FHWA
Funding: SPR 100%

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

Proposed Activities for SFY 2025:
SPR funding for the technical service programs has been moved to the Research Section so that all TSPs can be paid for at once. This will help improve efficiencies. The only TSPs that will be paid from other divisions is the rail and transit which need to use their dedicated funding.

SFY 2024 Accomplishments:
The invoices for FY 2024 were received in July. Construction and Materials and the various divisions paid for their respective programs during the first quarter.

Financials	Amount
Projected Budget SFY 2025	$201,000
Budget Amount SFY 2024	$199,000
Adjusted Budget Amount SFY 2024	$201,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

TR201813 – Leader-Follower TMA System

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $600,096
Contract Period: 3/5/2018 to 12/31/2024
Contract Investigator: Robert Cabido
Funding: SPR 80%, State 20%

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

Proposed Activities for SFY 2025:
It was anticipated some of the 250-hour testing in a live mobile work zone will continue through the summer months and hopefully be completed in the first or second quarter of State Fiscal Year 2025.

SFY 2024 Accomplishments:
The research team supported the Kansas City Autonomous Truck Mounted Attenuator (ATMA) Team via Remote Access during live road deployment this quarter. It was determined that the testing will not be completed this striping season, so an extension was required again. The timeframe was for an additional year and a slight cost increase was added due to an additional year of training and support. The extension was completed, and the new end date is December 31, 2024. The Kratos team did a refresh training in the spring.

Financials	Amount
Projected Budget SFY 2025	$105,167
Budget Amount SFY 2024	$54,992
Adjusted Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$494,929

TR202013 – The Effect of Rubber Fills on the Performance of Infrastructure Phase 1

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $220,066
Contract Period: 10/15/2019 to 9/30/2024
Contract Investigator: Dr. Mohamed Elgawady
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project investigates using large chips of scrap tires having various shapes and sizes as tire derived aggregate (TDA) in different infrastructure applications including subgrade fill and the core of embankment fills as well as backfill material for retaining walls and bridge abutments. The TDA possesses unique engineering properties of being durable, lightweight, allowing drainage, and having cohesive abilities. Due to its lightweight, using TDA backfill will reduce the lateral pressures on retaining walls and bridge abutments which can reduce the design forces and hence lighter structural elements can be used. The lightweight backfill will also reduce the settlement of underlying soils and increase the global stability of the structural elements which may allow using a spread footing rather than deep foundations leading to significant savings in the construction costs. The drainage capabilities of the TDA can eliminate the need for a clean granular backfill.

Proposed Activities for SFY 2025:
It is anticipated this project will be completed in early SFY 2025. The draft report is due June 30, 2024, and the final report August 31, 2024.

SFY 2024 Accomplishments:
An extension was granted with a new end date of February 29, 2024, and then again until September 30, 2024. The new research student continued working on Task 6, Long-term compressibility tests of TDA and TDA-soil mixtures. In late fall the research student left, and new postdoctoral and undergraduate students were hired. The research team is finalizing the draft report which will be submitted by June 30th.

Financials	Amount
Projected Budget SFY 2025	$15,445
Budget Amount SFY 2024	$51,194
Adjusted Budget Amount SFY 2024	$35,749
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$168,872

TR202017 – Scour Analysis at Missouri Bridges-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper

Total Contract Amount: $199,996
Contract Period: 4/1/2020 to 6/30/23
Contract Investigator: Amanda Cox
Funding: SPR 80%, State 20%

Project Description and Objectives:
In the late 1990s MoDOT had a consultant perform a scour analysis on a number of bridges that had a high potential of being "scour critical" using Water-Surface PROfile (WSPRO) modeling to determine the hydraulic data. MoDOT would like to have a sampling of these bridges re-studied to evaluate the validity of the original scour analysis. The main objectives of the project are as follows: provide a methodology used to determine soil/rock sampling locations and depths, and the soil sampling and testing methods used; do a comparison of the scour analysis results using HEC-RAS (1D) hydraulic modeling data to results using SMS/SHR-2D hydraulic modeling data using the sampling methodology employed for this study; do a comparison of the scour analysis developed in the second objective to the current analysis method of using a single soil sample from the stream bed, and to the existing scour analysis results developed using WSPRO hydraulic model data; and do a risk assessment, due to scour, for the bridges studied by the project.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
The final report was submitted in early July and posted in the Innovation Library. The final invoice was received on October 5, 2023. This project is closed.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$0
Adjusted Budget Amount SFY 2024	$5,575
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$194,421

TR202020 – Evaluation of Recycled Components in Stone Matrix Asphalt Mixes-Completed

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $320,000
Contract Period: 7/27/2020 to 10/31/2023
Contract Investigator: Bill Buttlar
Funding: SPR 80%, State 20%

Project Description and Objectives:
Stone matrix asphalt (SMA), also called stone mastic asphalt, is a durable, rut-resisting wearing course employing a gap-graded aggregate structure and thick modified asphalt binder, typically with higher asphalt content and fibers. It has improved deformation resistance and durability due to the stone-on-stone structure of the mix. Recycled asphalt pavement (RAP), also called reclaimed asphalt pavement, is previously laid pavement that has been removed and reprocessed. When properly crushed and screened, RAP consists of high-quality, well-graded aggregates coated by asphalt cement. Recycled (or reclaimed) asphalt shingles (RAS) is the reprocessed byproduct of tear-off sheets of roofing shingles. These reclaimed products, along with other alternatives like select plastic wastes, processed tire rubber, and

other viable recycled material sources can potentially provide a "win-win" in identifying an end-use for a waste stream and reducing material costs for pavement. MoDOT has employed the use of RAP and RAS in conventional hot mix asphalt pavements for some time now, along with using the two in SMAs, albeit in limited quantity. This project aims to focus in on the optimal contents for various recyclable materials to be used in SMA mixes.

Proposed Activities for SFY 2025:
This project was completed in the 2nd quarter of SFY 2024.

SFY 2024 Accomplishments:
The final report was received on 11/8/23 and posted on 12/1/23. The final invoice was received and posted on 12/28/23. This project is completed.

Financials	Amount
Projected Budget SFY 2025	$0 ($5,481 left unspent)
Budget Amount SFY 2024	$19,283
Adjusted Budget Amount SFY 2024	$20,384
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$294,135

TR202107 – TITANv2 – Interactive, Web-Based Platform for Transportation Data Integration, Visualization and Predictive Analytics – Phase 2

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $449,932
Contract Period: 1/1/2021 to 12/31/2024
Contract Investigator: Dr. Yaw Adu - Gyamfi
Funding: SPR 80%, State 20%

Project Description and Objectives:
The rate of transportation data collection is poised to increase exponentially with mobile computing, community-based sensing and vehicle-to-vehicle and vehicle-to-infrastructure communications. Under TR201815 the research team designed a prototype interactive, web-based platform to assist decision makers at MoDOT by seamlessly integrating and analyzing transportation datasets. This phase 2 project will create a robust web platform that pulls together data from TMS and other sources to provide dashboards which help make sense of various data sets. The platforms are interactive and can provide real time information or longer duration information. This platform will also help the TMCs with real time travel information and performance measures.

Proposed Activities for SFY 2025:
This project will close out December 31, 2024. The draft report is due September 30, 2024, and the final report November 30, 2024.

SFY 2024 Accomplishments:
The research team held discussions with MoDOT Highway Safety and Traffic Division regarding comparison between TITAN crash risk prediction accuracy and the Waycare predictive analytics system. The TITAN accuracies were collated and sent to MoDOT for comparative analysis. Accuracies dropped by 8% due to lack of connected vehicle data. Most of the inaccuracies were from arterials; freeway accuracies remained unchanged. Data visualization software was upgraded to allow for cross-filter

zooms, fast interactivity, and new forms of charts for the APP CENTER. The research team addressed requested dashboard-related changes from MoDOT employees. Users are now able to view the data source used to compute the different performance measures on the dashboard. A description of each performance measure is also provided on user-click. A pop-up is shown if a user clicks on the "Crashes This Week" item. The pop-up captures information about the source of data used for calculating the clearance time and a description of what clearance time means.

Financials	**Amount**
Projected Budget SFY 2025	$93,817
Budget Amount SFY 2024	$80,000
Adjusted Budget Amount SFY 2024	$112,035
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$244,080

TR202109 – Impact of Silt and Clay Particles on Freshwater Mussels

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $600,000
Contract Period: 1/1/2021 to 8/31/2024
Contract Investigator: Dr. Baolin Deng & Dr. Kathleen Trauth
Funding: SPR 80%, State 20%

Project Description and Objectives:
Threatened and endangered (T&E) species considerations for Missouri Department of Transportation (MoDOT) and Federal Highway Administration (FHWA) federally funded projects include potential impacts to rare plants, animals, critical habitat, and natural communities (e.g., streams, caves, prairies, karst). The objectives of this project are as follows: evaluate the impact of silt, clay and other mineral elements, particularly those particle types associated with transportation-sector construction activities, to freshwater mussels and study the mechanisms for such impacts; examine the effects of increased turbidity on mussel feeding and reproduction; investigate how different types of soils and minerals affect freshwater mussels, including identifying important thresholds of impact for each; and evaluate new and existing approaches that could mitigate the impact of various sediments from construction activities to mussels.

Proposed Activities for SFY 2025:
It is anticipated the project will be completed in 1st quarter of SFY 2025. The final report is due July 31, 2024.

SFY 2024 Accomplishments:
A series of burial experiments were conducted to determine the key factors affecting the percentage of buried mussels that return to the sediment surface and the survival rate. Results showed that water exchange is critical to mussels once buried. A manuscript titled "Impacts of acute and chronic suspended solids exposure on juvenile freshwater mussels" was published in "Science of The Total Environment". The research team continues to analyze hydraulics in Missouri sensitive streams. The draft report was submitted on 6/3/2024.

Financials	Amount
Projected Budget SFY 2025	$74,539
Budget Amount SFY 2024	$130,000
Adjusted Budget Amount SFY 2024	$87,202
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$438,259

TR202110 – Industrial Internet-of-Things Asset Monitoring – Phase 2-Completed

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $266,850
Contract Period: 1/1/2021 to 12/31/2023
Contract Investigator: AECOM Technical Services, Inc.
Funding: SPR 80%, State 20%

Project Description and Objectives:
With MoDOT managed assets being so numerous and at different stages in their life cycles, having a means of monitoring critical infrastructure assets would be highly valued. Being able to access life-cycle data for different types of construction (bridges or pavement) could aid in better understanding of proactive and cost saving maintenance schedules along with determining life-cycle cost analyses for various assets. The Industrial Internet-of-Things (IIoT) is the name given to interconnected computing devices, sensors, instruments, and other technology that collects data or information at a prescribed interval of time and transmits that information over existing communications infrastructure. Phase 1 was completed in September 2020, and the Department decided to proceed with the second phase. Phase 2 will further explore the findings of Phase 1 and begin implementation through installation, monitoring of assets and analysis of data.

Proposed Activities for SFY 2025:
This project was completed in the 2nd quarter of SFY 2024.

SFY 2024 Accomplishments:
The research team provided a demonstration of the sensor dashboard showing information being collected from sensors and how to navigate the system. The final report was received on 12/27/23. The final report and summary were posted on 2/1/24. The final invoice was received and posted on 1/22/24. This project is completed.

Financials	Amount
Projected Budget SFY 2025	$0 (79.30 left unspent)
Budget Amount SFY 2024	$43,411
Adjusted Budget Amount SFY 2024	$42,229
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$224,542

TR202122 – LRFR Methodology for Missouri Bridges-Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $184,999

Contract Period: 5/28/2021 to 7/31/2024
Contract Investigator: Ganesh Thiagarajan and John Myers
Funding: SPR 80%, State 20%

Project Description and Objectives:
Load and Resistance Factor Rating, also referred to as LRFR, is an American Association of State Highway and Transportation Officials (AASHTO)-adopted guide manual for the condition evaluation of bridge structures. MoDOT has recently updated our load rating policy to better reflect the wide range of heavier vehicles legally travelling along Missouri roads. These updated rating practices are predominately based on the Load Factor Rating (LFR) methodology, with the allowance for the allowable stress rating methodology in special situations (example is timber bridges). The research team will provide MoDOT with recommendations of LRFR adoption. The contract itself is for $175,000 and a license for the software for the research team is $11,000.

Proposed Activities for SFY 2025:
The only activities to take place is to publish the final report.

SFY 2024 Accomplishments:
The draft report was submitted to MoDOT at the end of November 2023. Research provided formatting comments in December 2023 and the Bridge division provided their comments regarding the content in January 2024. MCTI met with MoDOT in February 2024 to discuss report concerns. A revised time extension of July 31, 2024, was given for the research team to rerun some of the simulations and analyses and get the report in proper Section 508 formatting compliance. A revised draft was submitted in May 2024. It is currently being edited for 508 compliance but is considered complete. The final invoice was received in June. This project is complete

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$18,995
Adjusted Budget Amount SFY 2024	$22,828
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$162,171

TR202123 – High Tension Guard Cable Inspection and Life Cycle-Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $300,000
Contract Period: 11/15/2021 to 5/15/2024
Contract Investigator: Glenn Washer and John Myers
Funding: SPR 80%, State 20%

Project Description and Objectives:
The Missouri Department of Transportation (MoDOT) began utilizing guard cable along interstate routes in the early 2000s, and since that time has installed more than 800 miles of guard cable on divided highways. For this project, MoDOT aims to take a deeper dive on the life of these systems to better understand this type of asset as it has been utilized by the Department for almost 20 years. Some of the objectives include analyzing the material properties after multiple impacts, reviewing installation and repair procedures, reviewing installation inspection and maintenance records along with available crash

reports, conducting field inspections of a representative sample of locations, and conducting a life cycle assessment.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024. The only activities in SFY 2025 will be the final invoice.

SFY 2024 Accomplishments:
Project status meetings were held with the TAC, and later the Chief Councils office, to review research activities and discuss emerging issues from the mechanical testing of guard cables. The research team completed nearly 200 mechanical tests of cable and hardware samples of various sources, ages, and configurations. Testing of several splice connections showed slippage of the connections at loads well below the cable strength. Analysis was completed for different crash scenarios and cable configurations, including effects of different soil stiffnesses and the results of impacts from high angle / high speed impacts that are more severe than standard crash conditions normally used. The project team submitted the draft report to MoDOT on February 25, 2024. MoDOT's comments were sent back to the team on March 29. A final draft of the report was submitted in June 2024, but the final invoice has not been received. The project will close out once that final invoice is paid.

Financials	**Amount**
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$185,393
Adjusted Budget Amount SFY 2024	$151,438
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	148,562

TR202201 – Library Support Contract (2022-2023)-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $200,918
Contract Period: 7/1/2021 to 6/30/2024
Contract Investigator: Henry Brown
Funding: SPR 80%, State 20%

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

Proposed Activities for SFY 2025:
This project was completed in SFY 2023 with the final payment in SFY 2024. The new Library Contract number is TR202401

SFY 2024 Accomplishments:
The final invoice was received in August and posted on 8/25/23. This project is closed, and the current fiscal year library activities are under TR202401.

Financials	Amount
Projected Budget SFY 2025	$0 ($11,041 left unspent)
Budget Amount SFY 2024	$0
Adjusted Budget Amount SFY 2024	$4,087
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$185,790

TR202203 – Intermediate Bents-Calculation of Restraint Factor-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $175,000
Contract Period: 9/8/2022 to 6/15/2024
Contract Investigator: Sarah Orton
Funding: SPR 80%, State 20%

Project Description and Objectives:
Currently MoDOT designs intermediate bents with prestressed concrete superstructures as a cantilever for longitudinal forces. In reality, they are at least partially restrained and not able to rotate significantly. MoDOT wishes to examine if this results in a significant overdesign. The research will result in a recommendation for design factors.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
A field test took place for bridge A8697 on Sept 27th and initial results showed deflections similar to the FE model indicating that the model accurately represented the rotational restraint of the diaphragm. Rotational stiffness of the joint is due mostly to the diaphragm to bent cap connection with some flexibility within the diaphragm. Initial parametric analysis showed that column length is a major driver of the k-factor with longer columns having lower k-factors. However, for shorter columns the k-factor can approach 2. The draft report was received on March 27, 2024. It was sent to the TAC for comments. The final report was received in early May and was approved. The report was published in June. This project is completed.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$122,132
Adjusted Budget Amount SFY 2024	$112,928
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$62,072

TR202204 – Type N PTFE Bearing Designs-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $200,000
Contract Period: 11/15/2022 to 5/31/2024
Contract Investigator: Jonathan C. McGormley

Funding: SPR 80%, State 20%

Project Description and Objectives:
MODOT currently specifies filled or unfilled flat PTFE bearings per section 1038.4.4 for expansion bearings. The design friction coefficients are in EPG section 751.50. MoDOT believes that if designers follow our specifications, then the filled PTFE and/or cold values may be conservatively used but that it leads to friction forces that are sizable. The dynamic friction force is often larger than the forces that would be applied to a fixed bent due to temperature, wind, or braking. This nullifies the benefits of using the expansion bearing. This research will look at what design coefficients of friction should be used when distributing forces for substructure design. The research will also determine if dimpled lubricated pads are an effective alternate and if so, what should be added to the specs to address maintenance issues with this type of bearing.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
In late September, testing was conducted on the four bearing pad specimens. This testing completed the Phase I test matrix and included two tests from Phase II. The test results were analyzed and presented to MoDOT on Oct. 26, 2023. Following discussions with MoDOT, the specifications for Phase II's bearing pads were finalized, and orders were placed with the same manufacturer utilized for the Phase I tests. The Phase II bearings include three specimens varying in size and each consisting of dimpled PTFE without glass fibers. In early March, testing was conducted on three new bearing pad specimens, thereby completing the Phase II test matrix. The Phase II bearings comprised three specimens, each varying in size and type. The draft report was received on May 3rd, 2024. Comments were sent back mid-May and the final report was received on May 29, 2024. The report was published on June 13th. This project is complete.

Financials	**Amount**
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$150,289
Adjusted Budget Amount SFY 2024	$140,216
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$59,784

TR202205 – Analysis of Asphalt Mixtures Using Alternative Aggregate in SMA or SuperPave

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $199,999
Contract Period: 5/2/2022 to 8/31/2024
Contract Investigator: Jenny Liu
Funding: SPR 80%, State 20%

Project Description and Objectives:
The objective of this study is to identify and compare alternatives to Traprock through testing and laboratory evaluation along with conducting a literature review of current practices of neighboring DOTs. MoDOT is interested in finding other locally available, durable crushed aggregates for use in SMA and higher level Superpave mixes that could handle interstate traffic and are less expensive than Traprock.

Proposed Activities for SFY 2025:
This project was given a four-month extension to finalize testing and is now scheduled to be completed in the first quarter of SFY 2025. The final report is due 7/31/2024 with the contract ending 8/31/2024.

SFY 2024 Accomplishments:
In SFY 2024 all the mix designs for SMA mixes with alternative aggregates were completed by S&T. The AMPT tests, including AMPT Stress Sweep Rutting Tests, AMPT Dynamic Modules Test, and AMPT Cyclic Fatigue Test, were completed. The design and testing for the HMA Superpave mixtures with different alternative aggregates were completed along with physical property assessments, including gradation, specific gravity, and absorption for each stockpile. Aggregate durability tests, including Micro-Deval abrasion, degradation after compaction, and soundness tests were also completed. The loose mixtures composed of Superpave mixture with chat, limestone, and gravel were manufactured and shipped to UoI. All testing was completed, and the draft final report was submitted on 5/31/2024.

Financials	Amount
Projected Budget SFY 2025	$598
Budget Amount SFY 2024	$69,999
Adjusted Budget Amount SFY 2024	$78,850
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$120,551

TR202206 – Friction Enhancements to Asphalt Pavement Surfaces

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $175,000
Contract Period: 2/1/2022 to 9/30/2024
Contract Investigator: Magdy Abdelrahman and John Meyers
Funding: SPR 80%, State 20%

Project Description and Objectives:
The relatively high cost of constructing, and removing, HFST with polymer resins along with the durability concerns due to existing pavement conditions, has led state agency to consider high friction surface treatment with asphalt-based binders as an alternative. This project will evaluate alternative binders for use in surface friction treatments. The main objective of this research study is to evaluate, assess, and identify the use of high friction alternative aggregate sources in asphalt-based surface treatment applications.

Proposed Activities for SFY 2025:
This project is scheduled to be completed in SFY 2025 with the draft final report and summary being due 6/30/2024. The final report and summary are due 8/31/2024 with the contract ending 9/30/2024.

SFY 2024 Accomplishments:
The research team continued to review literature on HFST, HFCS, and materials and testing; throughout SFY 2024. Researchers installed new equipment for developing the modified asphalt PG binders. The team gave a presentation on the progress of the project at the Missouri Asphalt Conference in Rolla in December 2023. The research team collected data and contents in preparation of the draft final report. They also prepared materials for the polymer modified binder slabs and completed set-up arrangements for the pull-off testing on asphalt binders. During the final quarter of SFY 2024 the research team

finalized the Life-Cycle-Cost (LCC) analysis of the friction applications with selected binders along with completing the friction testing using both the British Pendulum (BP) coupons and the Dynamic Friction Testing (DFT) slabs. The team completed making and testing of slabs made with polymer modified asphalt binders, including the pull-off testing on selected binders.

Financials	Amount
Projected Budget SFY 2025	$11,770
Budget Amount SFY 2024	$72,916
Adjusted Budget Amount SFY 2024	$92,774
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$70,456

TR202207 – Pile Set-up and Restrike Procedures-Completed

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $150,000
Contract Period: 2/25/2022 to 8/25/2023
Contract Investigator: Brent Rosenblad
Funding: SPR 80%, State 20%

Project Description and Objectives:
The objective of this research is to provide MoDOT with a better understanding of pile set-up in Missouri soils and provide the department with a pile restrike procedure for different types of piles. The department would like a more detailed pile restrike and set-up procedure that also considers contractor's tight timelines. A typical 7 or 14 day restrike procedure is not advantageous to a contractor's schedule.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
The draft final report was received in May 2023. The report was reviewed, and comments sent back to the researchers. The revised final report and research summary was received July 28th and accepted. Researchers gave a final presentation on August 8th. The final invoice was received 9/20/2023. This project is completed.

Financials	Amount
Projected Budget SFY 2025	$0 ($784 left unspent)
Budget Amount SFY 2024	$39,692
Adjusted Budget Amount SFY 2024	$21,936
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$127,280

TR202212 – Mitigating and Preventing MoDOT Safety-Related Incidents through Root-Cause Elimination and Utilization of Leading Safety Indicators

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $249,999

Contract Period: 9/1/2022 to 9/1/2024
Contract Investigator: Islam El-adaway
Funding: SPR 80%, State 20%

Project Description and Objectives:
A top priority for MoDOT is to prevent worker injury and fatalities. Part of preventing accidents is to get at the root causes of incidents and develop leading safety indicators. This project will analyze incident reports on Missouri highway projects and use statistical modeling to determine the root-causes of incidents that have occurred. The researchers will survey contractors to determine what leading safety indicators they utilize and evaluate if they match with the root-causes identified through the modeling. Deliverables will include new leading safety performance measurements, a plan for monitoring, and evaluation policies to be considered by MoDOT.

Proposed Activities for SFY 2025:
The final report is due in the 1st quarter of SFY 2025. The project will close on 9/1/25.

SFY 2024 Accomplishments:
Surveys were disseminated to the contractors that MODOT works with, and the MODOT employees. The employee survey gathered 261 completed responses (with 481 unfinished responses), while the contractor survey only gathered 26 completed responses (with 58 unfinished responses). A research manuscript has been accepted for journal publication and for a presentation at the Construction Research Congress (CRC 2024) conference. The draft report was received on 4/24/24.

Financials	Amount
Projected Budget SFY 2025	$61,571
Budget Amount SFY 2024	$199,999
Adjusted Budget Amount SFY 2024	$152,228
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$36,200

TR202213 – Identification of a Response and Rescue Network for the St. Louis Region (renamed from last work program)-Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $224,999
Contract Period: 5/1/2022 to 6/10/2024
Contract Investigator: Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
In the event an earthquake hits the New Madrid Fault there could be significant damage in the St. Louis region. Not only is it important to plan for evacuation of the residents but you also need to have a plan for how to get workers into the city for emergency response activities. Compounding the issue is the fact that there could be damage to bridges with the potential of collapse and bottlenecked roadways. The objective of this project would be to develop a list or routes and details on how to evacuate affected individuals and routes and directions for emergency response workers. A list of bridges that would need to be blocked due to susceptibility of collapse would also be part of the deliverables.

Proposed Activities for SFY 2025:
The research project was completed in SFY 2024. The only activity that might take place in SFY 2025 is the final invoice.

SFY 2024 Accomplishments:
A simulation model was completed and used to study 12 evacuation scenarios for the St. Louis region. A summary of results was presented to MoDOT Emergency Management Staff. The results were also used to plan and deliver the tabletop exercise. The tabletop exercise was held in St. Louis at the MoDOT TMC on September 21, 2023, with various stakeholders including first responders, hospitals, and local agencies. The draft final report and summary were prepared and submitted to MoDOT in March 2024. Chris Engelbrecht and Rick Bennett gave a presentation on the key findings of the research at the Transportation Engineers Association of Missouri (TEAM) conference in Branson, MO, on March 15, 2024. The final report was submitted to MoDOT in May 2024. This project is complete.

Financials	**Amount**
Projected Budget SFY 2025	$0 ($511 left unspent)
Budget Amount SFY 2024	$108,464
Adjusted Budget Amount SFY 2024	$112,704
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$111,784

TR202214 – Developing a Hazard Detection and Alert System to Prevent Worker Fatalities - Completed

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $200,000
Contract Period: 2/28/2022 to 2/28/2023
Contract Investigator: Sejun Song and John Kevern
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project will focus on providing MoDOT with a reliable system that detects the proximity of backing heavy fleet vehicles or equipment in construction sites to workers or other objects. The system will be capable of alerting workers in close proximity to the backing vehicle along with the vehicles operator. The project is to: 1) conduct a critical review of existing commercial alert systems to prevent work/construction zone crashes, and 2) develop an affordable, easy-to-use, adaptable, prompt, accurate, and reliable hazard detection and alert system that connects heavy fleet vehicles and the work/construction zone crews using advance communication technologies that can overcome the limitations of existing commercial alert systems.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024. The only activity that might take place in SFY 2025 is the final invoice.

SFY 2024 Accomplishments:
The project team completed a new vehicle proxy tag (VPT) design to overcome significant obstacles. The team secured a six-month no-cost extension to ensure sufficient time for project completion and achieving objectives according to the field tests. The team confirmed the stability between the driver app (iVPC) and proxy, they also identified the RSSI variation patterns between VPT and HTs. The project team designed and implemented an algorithm to stabilize the RSSI variation between VPT and HTs. They

submitted a draft final report in November, the report was reviewed and sent back with multiple notes and revisions. The final report and research summary was due 12/31/2023, but the report was sent back with multiple notes and revisions. The team submitted the revised final report in March, but final testing of the system showed that it will not work as intended in a work zone. The research team updated the report to indicate this.

Financials	Amount
Projected Budget SFY 2025	$0 ($4,021 left unspent)
Budget Amount SFY 2024	$17,635
Adjusted Budget Amount SFY 2024	$37,178
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$158,801

TR202215 – Missouri DOT Data Acquisition and Data Processing Utilizing Artificial Intelligence and Machine Learning - Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $300,672
Contract Period: 6/15/2022 to 6/30/2024
Contract Investigator: Kyle Schneweis
Funding: SPR 80%, State 20%

Project Description and Objectives:
The ability to collect data and imagery has changed dramatically in recent years and the limiting factor is now the ability to process the large quantities that can be collected quickly. Processing the data utilizing newer technologies such as artificial intelligence and machine learning may allow MoDOT to utilize these new technologies to do things such as inspections and conducting inventory in a more efficient manner. This project would explore what areas MoDOT could benefit from these technologies and perform a benefit cost analysis for each.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024. The only activity that might occur in SFY 2025 is the final invoice.

SFY 2024 Accomplishments:
The project team completed the Median Inventory Pilot, AADT factoring grouping pilot, held the AI/ML peer exchange, and provided quarterly progress reports to the TAC. The project team also met with MoDOT to transition the project to new subject matter experts. The draft report was submitted to MoDOT in April 2024, the final report was received in June 2024, and the final presentation given on June 7, 2024. This project is complete.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$64,704
Adjusted Budget Amount SFY 2024	$124,185
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$176,487

TR202219 – HFST Review of Service Life

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $199,943
Contract Period: 6/1/2023 to 12/19/2024
Contract Investigator: Jay Bledsoe
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT began using High Friction Surface Treatments in 2013. What begin as three initial placements has grown into a large program each year. While HFSTs can be an effective safety improvement they are costly and if applied incorrectly can begin to deteriorate quickly. This project will look at the large number of HFSTs currently in place over the years and see how long they are "holding up." It should be noted that past research has shown that even when HFSTs appear to be in poor condition they often are still providing good friction values. Since HFST is strictly a safety improvement and not a maintenance treatment; the condition of the pavement prior to treatment is also important and will be reviewed as part of the project. It is anticipated this project will be looking at a visual survey of the condition mostly through ARAN video.

Proposed Activities for SFY 2025:
The project is scheduled to be completed in the first half of SFY 2025. The draft report is due 9/19/24 and the final report due 11/21/24.

SFY 2024 Accomplishments:
The researchers completed the literature review and submitted findings to MoDOT on Sept. 30, 2023. In addition to the literature review, a questionnaire was sent to 16 State transportation agencies concerning their experience with HFSTs. Files provided from MoDOT have been updated and additional data concerning before and after application condition have been obtained. Rating methods currently in use by MoDOT have been reviewed and statistically evaluated as to their effective use in selecting potential HFST projects and predicting performance. Data showed little evidence of early failure based on the segments provided due to the elimination of segments placed on ramps.

Financials	Amount
Projected Budget SFY 2025	$49,878
Budget Amount SFY 2024	$100,000
Adjusted Budget Amount SFY 2024	$150,065
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202221 – Consultant Support for Intelligent Compaction and Paver-Mounted Thermal Profiling Projects in 2022-2023 – Completed
Project Type: Contract
MoDOT Contact: Scott Breeding
Total Contract Amount: $440,263
Contract Period: 3/1/2022 to 4/30/2024
Contract Investigator: George Chang

Project Description and Objectives:
This project provides consultant support for MoDOT projects for the 2022 and 2023 construction seasons. The consultant has developed and lead contractor Intelligent Compaction (IC) and Paver-Mounted Thermal Profiling (PMTP) training and project support for MoDOT projects in previous years. This current research project will provide training, data, and field support as needed for each of the IC-PMTP MoDOT Asphalt Projects constructed in 2022 and 2023. This project will also begin the process of addressing the Quality Assurance (QA) testing required by FHWA.

Proposed Activities for SFY 2025:
This project was completed in SFY2024.

SFY 2024 Accomplishments:
The project team continued to provide remote support to both MoDOT staff and contractors. There was on-site support to multiple projects and districts in mid-July. The research team piloted "innovative boundary" collection. The researchers conducted a Feedback Meeting and Executive Briefing in Jefferson City, MO on December 13 and 14, 2023. The draft report was received on 2/15/24 and reviewed by MoDOT TAC Team. The final report and summary were posted on 3/27/24.

Financials	**Amount**
Projected Budget SFY 2025	$0 ($21,380 left unspent)
Budget Amount SFY 2024	$88,483
Adjusted Budget Amount SFY 2024	$109,293
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$309,590

TR202303 – Consultant Estimating

Project Type: Contract Research
MoDOT Contact: Jeff Cremer - Design
Total Contract Amount: $100,000
Contract Period: 5/1/2024 – 5/1/2025
Contract Investigator: MCTI
Funding: SPR 80%, State 20%

Project Description and Objectives:
Design is looking at how to better negotiate work tasks and hours with consultants. Consultant Services would like to have a better handle on a job, its work tasks, hours, etc. in an estimating tool. MoDOT believes Pennsylvania and Florida might have some type of system. It would be great to be able to learn from them and see what data would be applicable for Missouri as well as what other states might have. This project is being administered by the Design Division.

Proposed Activities for SFY 2025:
The research team will submit four quarterly progress reports (July 1, October 1, January 1, and April 1. The draft report for this project is due January 30, 2025 and the final due on May 1, 2025. MCTI will give a final presentation after the final report is submitted.

SFY 2024 Accomplishments:
MoDOT Research worked with the Design Division on the details relating to this project. The RFP was posted on October 4, 2023, and the project awarded to MCTI on December 18, 2023. The contract was signed on May 2, 2024.

Financials	Amount
Projected Budget SFY 2025	$100,000
Budget Amount SFY 2024	$25,000
Adjusted Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202306 – TSR Replacement and Stripping Tests (renamed from last work program)

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $250,000
Contract Period: 6/15/2023 to 1/1/2025
Contract Investigator: Bill Buttlar
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project will look at the use of river gravel in asphalt mixes and the effectiveness of performance tests in measuring the quality and durability. A few mixes recently with Osage River Gravel have had issues with stripping when the river gravel has been in the lower layers. They seem to be performing fine on the surface but in the lower layer where they sit near the bottom and may remain saturated for a period of time, they are causing stripping. We need to be able to correlate these mixes to the Balanced Mix Design tests so that they fail when we have a mix that is going to strip.

Proposed Activities for SFY 2025:
The research team will complete testing of mixes and recommend a new testing procedure from the collected data. The draft and final reports are due in the 1st quarter of SFY 2025. The project closes in the 2nd quarter of SFY 2025.

SFY 2024 Accomplishments:
The kickoff meeting was held at MoDOT on July 5, 2023. Four mix designs were given to the research team and the team contacted the quarries to obtain aggregates to re-create those mixtures. The research team also agreed to focus on investigating alternative data analysis methods for determining stripping potential of mixtures from Hamburg rutting data. The literature review and laboratory mixing started in the third quarter.

Financials	Amount
Projected Budget SFY 2025	$26,300
Budget Amount SFY 2024	$100,000
Adjusted Budget Amount SFY 2024	$223,700
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202309 – Audible Alert and TMA Lighting

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $396,533

Contract Period: 12/1/2022 to 1/31/2025
Contract Investigator: Yaw Adu-Gyamfi
Funding: SPR 80%, State 20%

Project Description and Objectives:
What is the correct lighting/TMA package we should be using on our TMAs? The Safety Focus Team has been sent multiple ideas from the districts regarding possible TMA lighting ideas for consideration. The Team put out a formal call to the districts to submit ideas for possible research. This project would work with FHWA to develop the research necessary to determine if the lighting suggestions improve driver attention and awareness to the TMA and provide the data needed to FHWA for acceptance. This project will also explore an updated Audible Alert system. Information would also be pulled from NCHRP project 05-24 to determine the lighting that was found to be effective during that study.

Proposed Activities for SFY 2025:
The research team will continue to field test the prototype device and redesign with improvements as needed. A user manual will be developed with step-by-step instructions and tutorial videos. The draft and final reports are due in the 2nd quarter of SFY 2025.

SFY 2024 Accomplishments:
Significant progress was achieved in the Automated Truck Mounted Attenuators (TMAs) Warning System project. The project saw the successful implementation and validation of enhanced prototypes, featuring refined alarm triggers, precise lane detections, and accurate distances to collision measurements. The prototypes underwent three comprehensive field tests, demonstrating their advanced capabilities in tracking vehicles within designated lanes and activating alerts based on speed and predetermined distances. A prototype was installed on a TMA at the MoDOT Maintenance shed at Fulton. Additional testing was conducted at the MSHP Test Track in Jefferson City, MO.

Financials	Amount
Projected Budget SFY 2025	$118,090
Budget Amount SFY 2024	$125,505
Adjusted Budget Amount SFY 2024	$169,003
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$109,440

TR202311 – Asset Characterization Using Automated Methods

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $200,000
Contract Period: 6/1/2023 to 11/30/2024
Contract Investigator: Sungyop Kim and Donald Baker
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project would explore the possible ways of using existing LiDAR and/or other third-party data to identify and catalog various assets such as bridges and culverts and some additional information about them. Possibly done in 2 phases. Phase I would look at the following: 1. Identify various data attributes that should be produced from the research (culvert dimensions, bridge span etc.). 2. Evaluate the minimal level of accuracy of the data required for it to be usable. 3. Identify first party and third-party data that

are available to produce the data. 4. Develop a machine learning algorithm to extract the relevant data. 5. Test the algorithm for select locations and evaluate if the results meet the need.

Proposed Activities for SFY 2025:
The asset characterization model development was delayed; however, the project is back on track with the new model development team. The project team was granted an extension of 3 months with no budget change. The team has found some challenges in the asset characterization model for bridges, but the team will complete prototype asset characterization models for culverts and LWCs and begin to develop a UI for the asset characterization models. Researchers also will complete the 2D hydraulic model. This project is scheduled to be completed in SFY 2025 with the draft final report and summary being due 8/31/2024. The final report and summary are due 10/31/2024 with the contract ending 11/30/2024.

SFY 2024 Accomplishments:
In SFY 2024 the project team completed the evaluation of potential 3D LiDAR programs, Scaniverse was chosen as the 3D LiDAR scanning program for the project. Using GIS, potential bridge, culvert, and low water crossing locations were searched, and more than 50 sites were visited to assess accessibility and the suitability of LiDAR scanning. The team developed a prototype 2D hydraulic model using USACE's HEC-RAS model. Dr. Shu-Ching Chen, a Professor of Computer Science at UMKC, and his doctoral students joined the project team to lead the automated asset characterization model development with MoDOT's approval. The researchers developed a preliminary automated asset characterization model for single-barrel box culverts.

Financials	Amount
Projected Budget SFY 2025	$84,340
Budget Amount SFY 2024	$115,000
Adjusted Budget Amount SFY 2024	$115,660
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202312 – Methods for Monitoring the Movement of Wildlife Through Concrete Barrier Gaps

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $245,500
Contract Period: 11/1/2022 to 12/1/2024
Contract Investigator: Brock Ortega
Funding: SPR 80%, State 20%

Project Description and Objectives:
Installation of concrete median barriers in divided highway settings has reduced the number of traffic fatalities in Missouri. However, their implementation has potentially caused an unintended negative effect on wildlife movement across the transportation system. Although little research exists on the effects of concrete median barriers, it is generally accepted that solid jersey barriers stop small animal passage on divided highways, effectively fragmenting habitat and eliminating connectivity. This fragmentation and behavioral adaptation can lead to reduced biological diversity, changes in animal communities and increase threat of extinctions. To combat these negative effects, the MoDOT Environmental Section has implemented the wildlife median barrier (WMB) innovation. The purpose of this research project is to develop ways to monitor the movement of small animals through the WMBs. This determination will

show if the WMBs are or are not working. If successful, this practice can be implemented on other projects.

Proposed Activities for SFY 2025:
The project team will continue with monthly project status meetings, going to the site and collecting data, during the first quarter of SFY 2025. The draft report is due on August 1, 2024, and the final report due October 1, 2024.

SFY 2024 Accomplishments:
The project team held monthly/quarterly meetings with the MoDOT/TAC throughout the year. The literature review and survey of other DOT agencies was completed, and a list of focal species finalized. The research team also placed 40 cameras and track plates on July 11, 2023, and then removed on September 26, 2023. Roadkill surveys and coverboard surveys were completed and scupper photos analyzed.

Financials	Amount
Projected Budget SFY 2025	$45,465
Budget Amount SFY 2024	$90,000
Adjusted Budget Amount SFY 2024	$151,157
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$48,878

TR202313 – Truck Parking Investments for Missouri-Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $199,486
Contract Period: 11/1/2022 to 8/1/2023
Contract Investigator: Katie Kirk
Funding: SPR 80%, State 20%

Project Description and Objectives:
In November 2021, Gov. Mike Parson created the Missouri Supply Chain Task Force (Task Force). This group held meetings across the state to identify supply chain problems facing Missouri businesses and citizens and develop potential solutions to address these challenges. Of the 32 recommendations in the Task Force's final report, two focus specifically on truck parking. The first, (#29), recommends the State and MoDOT develop a communication method that can safely and effectively relay critical information inside the truck without posing any safety risk to the driver. The second, (#30), recommends MoDOT and private operators of truck parking sites invest in increasing availability in areas that are known to have high demand and insufficient capacity, on both interstate and non-interstate roads. Using the information gathered by the SFRP and Task Force, this project seeks recommendations of where to expand truck parking in Missouri. Sites should be prioritized based on a cost-benefit analysis to ensure the greatest return on state investment.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
The final report was submitted to MoDOT on July 10, 2023, and final presentation given to the TAC on July 21, 2023. Cambridge Systematics and WSP developed and submitted a paper on this project to TRB

on July 31, 2023. It was presented at the TRB Annual Meeting in Washington, DC in January 2024. The final invoice was paid on September 29, 2023. This project is complete.

Financials	Amount
Projected Budget SFY 2025	$0 ($29,935 left unspent)
Budget Amount SFY 2024	$36,114
Adjusted Budget Amount SFY 2024	$40,441
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$129,110

TR202316 – TMA Truck Safety

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $249,997
Contract Period: 8/9/2023 to 2/6/2025
Contract Investigator: Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT has had many TMA hits and the seat/seatbelt/cab area have had differing types of damage. This project would look to see if certain types of trucks, seats, and/or restraint combinations tend to keep the driver safer than others. This would most likely consist of computer modeling for at least the first phase since crash testing multiple configurations would be too costly. Efforts would be made to get information from manufacturers but likely that information would not be shared.

Proposed Activities for SFY 2025:
The research team will develop modeling scenarios of different configurations and present them to MoDOT along with cost information for the recommended configuration. The draft report is due in the 2nd quarter of SFY 2025. The final report and completion of the project will be in the 3rd quarter of SFY 2025.

SFY 2024 Accomplishments:
The project kickoff meeting was held on August 9, 2023. The research team has reviewed incident reports for the previous five years and contacted TMA vendors and trucking agencies. A literature review included published literature, technical reports, DOT guidelines, and other relevant sources and developed questions for interviewing heavy vehicle manufacturers. A field visit was completed to St. Charles Maintenance Facility on 10/25/23 to assess the impacts after a TMA crash. The collected data was used to model crash scenarios, and a video clip of two modeling scenarios was shared with MoDOT.

Financials	Amount
Projected Budget SFY 2025	$170,221
Budget Amount SFY 2024	$75,000
Adjusted Budget Amount SFY 2024	$79,776
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202319 – Impact Test of GFRP Reinforced Bridge Barriers

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $160,000
Contract Period: 1/1/2023 to 12/30/2024
Contract Investigator: Chenglin Wu and John Myers
Funding: SPR 80%, State 20%

Project Description and Objectives:
This research will focus on the dynamic testing and analysis of GFRP reinforced concrete barrier walls. The pendulum impact test has been selected as the main approach due to its high cost-effectiveness. Researchers will construct segments of full-scale GFRP concrete barriers and test them under pendulum crush loading to evaluate the design. The impact energy coming from the kinetic motion and mass of the pendulum provides an efficient way of mimicking the vehicle impact loading exerted onto the concrete bridge barriers. From the test, the failure modes and details will be carefully examined and compared with the numerical modeling results building on Phase I activities to validate and improve the existing design. The expected outcome of this project will be a correlation between the GFRP reinforcement and impact resistance from the pendulum tests.

Proposed Activities for SFY 2025:
In SFY 2025 the team will complete the impact test of the specimens. Researchers are still coordinating with the testing facility. After testing, the results will be analyzed, and a project report will be produced. This project is scheduled to be completed in SFY 2025. The draft final report and summery are due 8/31/2024 with the final report and summary due 11/30/24, the contract ends 12/30/2024.

SFY 2024 Accomplishments:
The team had multiple meetings with the manufacturing company and MoDOT to finalize the design of the GFRP bars, they obtained the bars from the manufacturing company without additional cost. They determined the strain-gauge design based on the analysis and completed the formwork preparation for the first specimen casting. The team assembled the reinforcement cages and successfully installed the strain gauges needed for the test; they re-designed the test setup to accommodate the barrier-slab joint. Due to delays, the project was extended. The team revised the design for the GFRP barrier design to allow more specimens to be fabricated and tested. The specimens were poured in the lab and are being cured.

Financials	Amount
Projected Budget SFY 2025	$15,117
Budget Amount SFY 2024	$100,000
Adjusted Budget Amount SFY 2024	$113,643
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$31,240

TR202320 – Safety Evaluation of J-turn Intersections in Missouri

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $299,722
Contract Period: 1/1/2023 to 7/31/2024
Contract Investigator: Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
The project objective is to investigate the safety effectiveness of J-turn intersections in Missouri. The research methodology to meet this objective includes study design, data collection and analysis, and a review of existing literature. Attainment of the project objective will lead to greater understanding of the safety benefits of J-turns and the effect of site characteristics (e.g., geometrics, traffic volume) on crash frequency and severity.

Proposed Activities for SFY 2025:
The final report will be accepted in early SFY 2025. Once the final invoice has been paid this project will be closed.

SFY 2024 Accomplishments:
The research team (RT) did a detailed analysis of individual crash diagrams at J-turn sites by recording all the crash locations and types and visualized them using AutoCAD. The RT team completed the task of data collection and before-after safety evaluation. Findings of the Empirical Bayes before-after analysis for 4-leg J-turn intersections found that these sites witnessed an average decrease in total crashes of 33% (CMF = 0.67) and fatal and injury crashes of 49% (CMF = 0.51). The team generated CAD drawings showing common crash locations and types at J-turn intersections. The draft report was submitted for MoDOT review on April 28, 2024, and the final is due on June 30, 2024.

Financials	Amount
Projected Budget SFY 2025	$46,121
Budget Amount SFY 2024	$180,000
Adjusted Budget Amount SFY 2024	$170,009
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$83,592

TR202322 – Vulnerable Road User (VRU) Safety Assessment-Completed

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $197,547
Contract Period: 1/1/2023 to 10/31/2023
Contract Investigator: MCTI-Missouri S&T
Funding: SPR 80%, State 20%

Project Description and Objectives:
The overall objective is to bring down VRU deaths and injuries as consistent with a vision towards zero fatalities by 2030. A data-driven approach helps to focus on the most vulnerable users and to target the most effective countermeasures. A related objective is to produce an initial Vulnerable Road User Safety Assessment for Missouri as described in 23 U.S.C. §148(1) as part of Missouri's Strategic Highway Safety Plan, currently named the Show-Me Zero Plan.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
Stakeholder engagement meetings were held July 17 and August 17, 2023, both online and in-person at the Construction and Materials Lab in Jefferson City. The draft report was submitted to MoDOT and

FHWA on August 30, 2023, for review. Comments were sent back to MU on September 22. The final report was received by MoDOT and is posted in the Innovation Library. The final invoice was posted in January. This project is closed.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$157,547
Adjusted Budget Amount SFY 2024	$71,570
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$125,977

TR202323 – LWD Phase II

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $75,342
Contract Period: 2/1/2023 to 7/31/2024
Contract Investigator: Xiong Zhang
Funding: SPR 80%, State 20%

Project Description and Objectives:
The principal objective of this Phase II project is to accumulate more field test data to improve the standards for the implementation of the Zorn LWD for the acceptance of unbound material layers.

Proposed Activities for SFY 2025:
The only activity scheduled for SFY 2025 is acceptance of the final report and the final invoice.

SFY 2024 Accomplishments:
In SFY 2024 several construction sites were selected for field testing and sampling. A leveling platform for the Ohaus MB 120 was designed and manufactured for further assessment in the field. Researchers completed soil classifications and Proctor tests for all five types of soils collected. The research team conducted LWD tests and repeated load triaxial (RLT) tests for soils and initiated the SWCC test. The team verified the feasibility of Ohaus MB 120 in both field and lab settings with fine- and coarse-grained soils. The team completed LWD tests and repeated load triaxial (RLT) tests for the New Florence CL, Holts Summit GM, and Rolla CL soils, and also completed SWCC salt concentration tests for the Sikeston SM, New Florence CL, Holts Summit GM, and Rolla CL soils. The final report and summary are anticipated to be received at the end of June.

Financials	Amount
Projected Budget SFY 2025	$671
Budget Amount SFY 2024	$70,342
Adjusted Budget Amount SFY 2024	$71,771
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$2,900

TR202325 – MCTI Administration

Project Type: Contract Research
MoDOT Contact: Jen Harper

Total Contract Amount: $255,000
Contract Period: 11/18/2022 to 11/30/2025
Contract Investigator: John Myers
Funding: SPR 80%, State 20%

Project Description and Objectives:
MCTI is a partnership between MoDOT and the 4 University Campuses: Columbia, Kansas City, St. Louis, and Missouri S&T. MoDOT and the University of Missouri System (UMS) have a long-standing, collegial relationship in working on transportation problems together, leading to local and national impact. This relationship includes MoDOT funding of sponsored research projects, MoDOT projects serving as center matching funds, access to field demonstration projects and test sections, educational programs, scholarships, and internships. However, the administration of research funding to universities is a significant burden on MoDOT, along with the transfer of technology across Missouri and beyond. In addition, the lack of streamlined, highly coordinated research efforts have, at times, led to MoDOT research dollars flowing out of Missouri, and to redundancies with other national efforts. Following the practice of other states, this center is a collaboration to move transportation research forward in Missouri. This administrative funding will help MoDOT with some of the administrative duties such as tracking project process and report editing and 508 compliance.

Proposed Activities for SFY 2025:
It is expected the TACs will meet again in August or September of 2024. The work to move some of the administration efforts to Rolla is still on-going. Coordination with several technical editors will continue as well.

SFY 2024 Accomplishments:
Two meetings take place each month. One of the meetings per month is for the larger group with additional representation on each campus. The TAC meetings took place in early September 2023. Each TAC selected 3-6 topic areas for submitting research needs statements. Work is ongoing in updating the website with current information and working to put teams together for larger national projects.

Financials	Amount
Projected Budget SFY 2026	$85,000
Projected Budget SFY 2025	$85,000
Budget Amount SFY 2024	$85,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202401 – Library Support Contract (2024-2025)

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $231,641
Contract Period: 7/1/2023 to 6/30/2025
Contract Investigator: Henry Brown
Funding: SPR 80%, State 20%

Project Description and Objectives:
The demand for information services has increased as more MoDOT users are realizing the timely, diverse, and high-quality information they receive using the services of the current librarian. The major objective of this project is to provide library, research, and reference support services for MoDOT.

University of Missouri-Columbia will provide the services of a Master of Library Science (MLS) librarian who will work 40 hours per week and will be located at the Secretary of State's State Library and MoDOT in Jefferson City.

Proposed Activities for SFY 2025:
The librarian will continue to provide reference and research support services to MoDOT employees. Other services include circulation, cataloging, collection management (which includes digital repositories) & maintenance, marketing & outreach in addition to website content creation. Ongoing activities include coordinating and collaborating with the Missouri State Library.

SFY 2024 Accomplishments:
During SFY 2024, the librarian answered 51 reference questions. A total of 16,465 print and electronic library items were circulated or accessed. Forty new items were added to the collection. Nine new reports were added to Innovation Library, including Transportation Infrastructure Asset Monitoring Through the Industrial Internet-of-Things and Consultant Support for Intelligent Compaction and Paver-Mounted Thermal Profiling Projects in 2022-2023. Projects undertaken this year include weeding the library's media collection, which is nearly complete, and migration to a new integrated library system and catalog, as well as moving MoDOT's research reports to the MoSpace repository. Additionally, the librarian presented to the District HR reps and hopes to continue building a positive relationship with them.

Financials	**Amount**
Projected Budget SFY 2026	$10,000
Projected Budget SFY 2025	$134,094
Budget Amount SFY 2024	$115,000
Adjusted Budget Amount SFY 2024	$87,547
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202402 – Striping Program

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $125,000
Contract Period: 8/2/2023 to 7/3/2024
Contract Investigator: Henry Brown/Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
There is a potential the 11th edition of the MUTCD, when released, will require all edgeline markings to be a minimum of 6" which will be an increase from the current 4" minimum. This will significantly impact MoDOT given our pavement marking program far exceeds MUTCD requirements. With current staffing and equipment levels and a reduction of over 12,000 miles of striping production per year (due to increased refilling of paint, etc.), MoDOT would need to discontinue applying centerline markings on its 12,500 miles of low volume roadways in order to increase the width of the edgelines on the 15,500 miles of two-lane roadways which now get edgelines. Overall, MoDOT needs information to help determine what direction to take in response to the likely federal rule change that would result in no safety impact or a safety improvement.

Proposed Activities for SFY 2025:
The only activities scheduled for SFY 2025 is payment of the final invoice.

SFY 2024 Accomplishments:
The project kickoff meeting was held on August 17, 2023. A literature review including evaluation studies and approximately 25 DOT policies was performed. Interviews were conducted with the following seven DOTs: Georgia, Iowa, Michigan, Minnesota, New Hampshire, Pennsylvania, and Wisconsin. Summaries of the DOT interviews will be finalized and sent to the state DOTs for review. The draft report was submitted in April and the final report on June 5, 2024.

Financials	Amount
Projected Budget SFY 2025	$16,831
Budget Amount SFY 2024	$75,000
Adjusted Budget Amount SFY 2024	$108,169
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202403 – Shear Wave Velocity and Seismic Analysis Procedures

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $199,997
Contract Period: 7/1/2023 to 7/1/2025
Contract Investigator: SCI Engineering Inc.
Funding: SPR 80%, State 20%

Project Description and Objectives:
The AASHTO LRFD Bridge Design Specifications and AASHTO Guide Specifications for LRFD Seismic Bridge Design are being revised to include the direct use of the site class based on the time-average shear wave velocity (VS) in the upper 100 feet of a geologic profile, rather than average Standard Penetration Test (SPT) blow counts or other methods. Due to the greater emphasis on VS measurements in AASHTO procedures, MoDOT would like to explore methods to determine VS profiles at a project site that could be done in the preliminary stages without having to deploy a drill rig, Cone Penetration Test (CPT) rig, or crew to obtain the data. The goal of the proposed project is to update and refine seismic site investigation and analysis procedures in anticipation of upcoming changes to AASHTO specifications.

Proposed Activities for SFY 2025:
The research team will coordinate with MoDOT to do 1) a field demonstration of the recommended method and 2) create a training and training manual. The draft report will be submitted by April 1, 2025, and the final report by June 1, 2025.

SFY 2024 Accomplishments:
A kickoff meeting with SCI Engineering (research team) was held on August 9, 2023. Task 2 “Literature Search” looked at published papers and software manuals related to shear wave velocity testing. Detailed descriptions of the methods for determining the shear-wave velocity of the subsurface was generated. Each method was evaluated for applicability, equipment, and personnel requirements, straightforwardness of data analysis and interpretation. The research team compiled a list of equipment and software packages that can be used for data acquisition and processing and identified initial test locations for further shear wave velocity data collection. The team collected and analyzed MASW and ReMi data sets, and compared the results and provided a final recommendation on one “best” method.

Financials	Amount
Projected Budget SFY 2026	$30,000
Projected Budget SFY 2025	$120,629
Budget Amount SFY 2024	$50,000
Adjusted Budget Amount SFY 2024	$49,368
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202406 – Using Rubber Powder to Improve Freeze and Thaw Resistance of Concrete

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $180,000
Contract Period: 1/15/2024 to 1/15/2026
Contract Investigator: Dimitri Feys/John Meyers
Funding: SPR 80%, State 20%

Project Description and Objectives:
Air-Entraining admixture (AEA) has been used in concrete mixtures for many years. The purpose of AEA is to develop microscopic air bubbles during the mixing process. These air bubbles will increase the freeze/thaw durability by providing microscopic chambers within the hardened concrete for water to travel to and from during the freeze/thaw cycles. Concrete mixtures often have supplementary cementitious materials (SCM) included in them; these SCM sometimes require continuous adjustments of AEA to control air content in the mix. Preliminarily testing in MoDOT's Construction Material Laboratory showed that concrete incorporating rubber additive passed 300 cycles of the ASTM C666 with no weight losses. The main advantage of the rubber is that the rubber particles act as mechanical springs inside the concrete that can expand and compress to accommodate the water expansion and shrinkage. This research project will determine the optimum rubber powder particle size and powder percentage required for concrete mixtures to improve freeze-thaw resistance.

Proposed Activities for SFY 2025:
The research team will begin the evaluation of different concrete mixtures with rubber particles and begin testing while keeping MoDOT updated on progress. The project will continue into SFY 2026.

SFY 2024 Accomplishments:
The RFP was posted on October 10, 2023, 6 proposals were received. The TAC Team selected a proposal, and the research team was notified on December 20, 2023. A kick-off meeting was held with the MoDOT technical advisory committee and the research team on 1/31/24 to discuss the project. The literature review on concrete freeze-thaw durability began in February. A comparison was made between the withdrawn ASTM C672 and CSA A23.2-22C, which will form the basis of a new ASTM C672.

Financials	Amount
Projected Budget SFY 2026	$71,757
Projected Budget SFY 2025	$100,000
Budget Amount SFY 2024	$25,000
Adjusted Budget Amount SFY 2024	$8,243
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202407 – Missouri NBI Database Analysis-Phase II

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $200,000 estimated
Contract Period: 24 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
This is Phase 2 of Missouri's NBI database analysis. The research is expected to identify gaps in data collection and result in a recommended combined data tracking system to include not only bridge condition ratings from bridge inspections, but also other key variables that are not well tracked or accurately tracked such as maintenance treatments, winter weather treatments, and intervention techniques. The research is anticipated to identify the impact of parameters studied for bridge type and geometry selection during preliminary design as well as identifying preservation strategies and optimal intervention timeframe. Economic cost benefit of system selection and life-cycle costs will also be investigated. It will also develop a methodology for district staff to utilize the information generated from Phase 1.

Proposed Activities for SFY 2025:
A meeting is scheduled in July 2024 to discuss a desired plan to move forward.

SFY 2024 Accomplishments:
A team was organized to develop a plan to move forward with this project. It was determined that before the project scope could be developed, MoDOT's bridge section needed to determine the path it wants to take.

Financials	Amount
Projected Budget SFY 2027	$50,000
Projected Budget SFY 2026	$100,000
Projected Budget SFY 2025	$50,000
Budget Amount SFY 2024	$25,000
Adjusted Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202409 – Optimizing the STIP Letting and Construction Schedule

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $250,000 estimated
Contract Period: 18 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Using historic project data, MoDOT is interested in identifying which projects should be advertised or "let" throughout the year in order to optimize schedules, aid in prioritization of work, and maximize cost-savings. With the same information, MoDOT would like to have a tool or methodology to identify the

average annual workload of contractors to determine remaining capacity each year and when it might be most optimal to let projects in certain regions. For example, if MoDOT knows that certain contractors are close to being at full capacity in a specific region or district they commonly bid in, MoDOT may choose to delay (or accelerate when possible) a project to allow more schedule flexibility and ensure competition. This may involve the use of artificial intelligence or machine learning technologies.

Proposed Activities for SFY 2025:
Proposals are due on July 18, 2025. An award and kickoff meeting will be held over the first and second quarters. Work on this project will take place in SFY 2025 and 2026.

SFY 2024 Accomplishments:
Research worked with Design to develop the RFP. This RFP was posted on June 6, 2024.

Financials	Amount
Projected Budget SFY 2026	$150,000
Projected Budget SFY 2025	$100,000
Budget Amount SFY 2024	$40,000
Adjusted Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202410 – Effective Methods to Safely Communicate with CMVs

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $200,000
Contract Period: 7/1/2023 to 1/2/2025
Contract Investigator: Praveen Edara
Funding: SPR 80%, State 20%

Project Description and Objectives:
Recommendation 29 in the Missouri Supply Chain Task Force's final report focuses on the development of a communication method to relay critical information safely and effectively inside commercial motor vehicles (CMV) without posing a safety risk to the driver and the traveling public. MoDOT has a need to communicate with drivers of CMVs about exceptions to the norm on their route. These exceptions can include stationary features, such as a low bridge clearance or steep grade, and variable road conditions such as a work zone, narrowed lanes, a crash ahead, or a weather impact. Many methods for notification involve sending notices through a phone application. However, federal law prohibits CMV drivers from touching a mobile phone or reading messages while in operation. Current applications do not distinguish between general text messages and critical route information. This research would identify effective ways (or a system) for timely notifications to drivers allowing them to make informed decisions on whether to continue on the route, detour, or park at a safe location. This should also result in a more reliable highway freight delivery system.

Proposed Activities for SFY 2025:
The draft report is due on October 1, 2024, and the final report by December 2, 2024. The final presentation should be no later than December 15, 2024.

SFY 2024 Accomplishments:
The project kickoff meeting was held on July 14, 2023. A stakeholder workshop was conducted on August 28, 2023. Virtual meetings were conducted with the Eastern Transportation Coalition and FHWA OST Office to obtain their input on ongoing CMV Communication efforts in other states and the Transportation Data Exchange (TDx) initiative. The survey of state DOTs and their approaches to communicating with CMVs was developed, reviewed, and sent out. The research team completed the literature review, brainstorming workshop, and started analyzing data standards. The team presented the project at the MoDOT CMV Strategic Workshop in March 2024.

Financials	Amount
Projected Budget SFY 2025	$90,032
Budget Amount SFY 2024	$100,000
Adjusted Budget Amount SFY 2024	$109,968
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202412 – First and Last Mile Connectivity for People

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $140,596
Contract Period: 11/20/2023 to 9/30/2024
Contract Investigator: Shared Use Mobility Center
Funding: SPR 80%, State 20%

Project Description and Objectives:
In November 2021, Gov. Mike Parson created the Missouri Supply Chain Task Force. This group held meetings across the state to identify supply chain problems facing Missouri businesses and citizens and develop potential solutions to address these challenges. Recommendation 19 in the Task Force's final report focuses on the development of dedicated microtransit programs for employment centers. The goal of this research project is to: 1) understand how other state departments of transportation and metropolitan planning organizations (MPOs) support first and last mile mobility connections for their workforces; and 2) how MoDOT could utilize those best practices and tie them into the Supply Chain Task Force recommendation.

Proposed Activities for SFY 2025:
The final report is due August 31, 2024.

SFY 2024 Accomplishments:
A kickoff meeting for this project was held on December 10, 2023, between MoDOT Research and Multimodal Operations and the SUMC team. On January 18, 2024, the research team hosted a meeting with MoDOT to discuss the proposed cases for the literature review. SUMC organized first/last mile service cases in a matrix describing key features related to context, operations, and service models and recommended case studies for review and approval. The research team developed a case study document for each of the 15 first/last mile cases included in the literature review. The draft report will be submitted on June 30, 2024.

Financials	Amount
Projected Budget SFY 2025	$76,234
Projected Budget SFY 2024	$50,000
Adjusted Budget Amount SFY 2024	$64,362
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202413 – Silane Bridge Deck Ratings

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $200,000 estimated
Contract Period: 24 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT has been very methodical and consistent with bridge deck ratings, it would be great to look at progression of silane bridge deck ratings since MoDOT moved to silane sealers 10-15 years ago. The research would determine if deterioration has slowed. MoDOT now uses 100% silane and have been told that decks with 100% silane only need to be sealed once and never again. This project will look at that claim to determine if it is accurate that we would never seal again, or if not if the frequency of reapplication can be reduced.

Proposed Activities for SFY 2025:
The selection of the research team will take place in early July 2024. Once the research team is selected a kick-off meeting will be scheduled to develop the final work plan.

SFY 2024 Accomplishments:
The RFP was posted on 5/1/24 and the proposals were received on 6/18/24.

Financials	Amount
Projected Budget SFY 2027	$25,000
Projected Budget SFY 2026	$100,000
Projected Budget SFY 2025	$75,000
Budget Amount SFY 2024	$0
\Adjusted Budget Amount SFY 2024	(See Addendum)
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	

TR202415 – TSMO and Automation in Work Zones

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $228,037
Contract Period: 9/20/2023 to 8/1/2025
Contract Investigator: SRF Consulting Group
Funding: SPR 80%, State 20%

Project Description and Objectives:
In a time when there is a workforce shortage in highway construction and an increase in distracted driving, speeding, and work zone crashes, there is a need to identify strategies that can benefit both areas. This research project was requested to identify implementable Transportation Systems Management and Operations (TSMO) strategies that benefit both areas of workforce shortage and safety to be incorporated into Missouri work zones on and off system. The goal of this research is to identify TSMO strategies available, examples of their use, demonstration in Missouri work zones, determination of their effectiveness, and a final list of recommended strategies with construction ready language to be incorporated into future projects.

Proposed Activities for SFY 2025:
SRF will provide draft SWZ layouts for the I-44 project. Due to the I-44 project spanning two construction seasons, SRF will request an extension of this project into CY 2026.

SFY 2024 Accomplishments:
The kickoff meeting with SRF and the TAC was held on October 10, 2023. The research team conducted phone interviews and an email questionnaire with the TAC and TMC leads for input on potential SWZ/TSMO solutions which were later included in the literature search. SRF also wrote a white paper on procurement for SWZs, a TSMO strategy memorandum, and gave a TSMO presentation at the Resident Engineer meeting on February 13, 2024. A TSMO project for I-44 was identified and the research team developed a JSP for the incorporation into the bid documents.

Financials	Amount
Projected Budget SFY 2026	$30,000
Projected Budget SFY 2025	$124,391
Budget Amount SFY 2024	$50,000
Adjusted Budget Amount SFY 2024	$73,646
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202416 – Fluorescent Yellow-Green Signs

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $150,000
Contract Period: 8/1/2023 to 11/1/24
Contract Investigator: MCTI - Henry Brown
Funding: SPR 80%, State 20%

Project Description and Objectives:
In the MUTCD, fluorescent yellow green (FYG) is the required color used for school signs and can be used as an option for bicycle and pedestrian (B/P) crossing signs. Due to the uniqueness of appearance, MoDOT reserves the FYG primarily for school signs. The only time MoDOT uses FYG for B/P crossing signs is if a state route and a city route crossed and the city used FYG at that location. MoDOT has been encouraged to change current pedestrian crossing signs from Fluorescent Yellow (FY) to FYG. This is based in the perception that FYG is safer than FY. However, MoDOT has a large inventory of FY signs on the state system with each sign lasting at least 15 years and would not consider switching to FYG signs in part (or whole) unless there is fact-based evidence that the color change would provide a significant safety benefit due to fiscal and logistical impacts. MoDOT is interested in discovering other state DOT policies and research regarding the use of FYG in pedestrian crossing signs. The department wants to

know if current research indicates any significant safety impact to bicyclists and pedestrians if FYG signs are used instead of FY.

Proposed Activities for SFY 2025:
The research team will assemble the draft report and submit it to MoDOT by August 1, 2024. The final report will be submitted on October 1, 2024.

SFY 2024 Accomplishments:
The project kickoff meeting was held on August 24, 2023. The research team created and distributed a survey to DOTs and MPOs on their policies, guidelines and /or practices for the use of FYG for pedestrian crossing signs. Based on the survey results, the research team held interviews with selected DOTs and MPOs to further understand their policies and guidelines.

Financials	Amount
Projected Budget SFY 2025	$104,651
Budget Amount SFY 2024	$75,000
Adjusted Budget Amount SFY 2024	$45,349
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202417 – Comprehensive Data Analysis for AMPT Tests on MO 740 and HWY-Completed

Project Type: Contract Research
MoDOT Contact: Jen Harper
Total Contract Amount: $19,291
Contract Period: 4/20/2023 to 11/30/2023
Contract Investigator: MCTI-Missouri S&T
Funding: SPR 80%, State 20%

Project Description and Objectives:
The S&T research team will process the AMPT testing data collected in the MO 740 and the HWY 54

projects. The data include the dynamic modulus test, the cyclic fatigue test, and the stress sweep rutting (SSR) test. The testing data on the MO 740 project were generated by the S&T team, and the tests for the HWY 54 project were performed by MoDOT. (Previously was approved by FHWA to utilize grant funding S073201C but it was closed out by MoDOT Financial Services.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
In this quarter, the AMPT data analysis for both the Highway 54 and the Stadium projects were completed by S&T. The rutting and fatigue resistance of the mixtures were analyzed using the index parameters on the material scale as well as on the structural level using FlexPAVE simulations. For the Highway 54 mixtures, the mix performance was correlated to the volumetric properties measured during quality assurance. The different types of mixtures, i.e., mixtures containing ground tire rubber, waste plastics, and the control mix, were evaluated. In addition, the analysis results were compared with the field performance, based on the images recorded from the ARAN survey, Google Earth, and Google Maps. The draft report was received on November 7, 2023, and comments were sent back the same week. The final report was submitted in mid-December and was posted in the Innovation Library. The final invoice was paid, and this project is closed.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$13,000
Adjusted Budget Amount SFY 2024	$19,291
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202418 – Implementation of Balanced Mixture Design in Missouri Test Sections with Modifiers

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $249,998
Contract Period: 5/10/2023 to 1/31/2025
Contract Investigator: MCTI-UMC
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT identified a demonstration project which is a 6-mile stretch (approximately) of I-155 located in Pemiscot County. Nine separate modified mix designs were constructed during this project. The modifications include ground tire rubber (GTR), post-consumer recycled plastics (PCR-P), styrene-butadiene-styrene (SBS), and polyphosphoric acid (PPA). The experimental sections include both dense-graded and Stone Matrix Asphalt (SMA) mixture types. MoDOT also implemented new BMD test thresholds for different mix types according to the JSP for this project. The dense-graded mixtures have a minimum CT- Index threshold of 45 and the elevated BMD requirement is 80 for the CT-Index test. For SMA mixtures, the CT-Index requirement is 160. Maximum rut depth requirement for all mixes is 12.5 mm at 15,000 passes.

Proposed Activities for SFY 2025:
The research team will continue field distress surveys of test sections. The draft and final report is due in the 2nd quarter of SFY 2025. The project is scheduled to be completed by 1/31/25.

SFY 2024 Accomplishments:
MU finished testing all the Plant Produced Plant Compacted (PMPC) mixtures. BMD testing started for Plant Produced Lab Compacted (PMLC) mixtures or also referred to as reheated mixtures. The low-temperature cracking tests (ASTM D7313) were completed for all PMLC (plant mixed/lab compacted) mixes on this project. Testing of LMLC (lab mixed/lab compacted) SMA's is underway along with testing of PMLC mixes for moisture sensitivity.

Financials	Amount
Projected Budget SFY 2025	$19,888
Budget Amount SFY 2024	$0
Adjusted Budget Amount SFY 2024	$230,110
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202419 – GPR Analysis of I-70-Completed

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $249,950
Contract Period: 7/1/23 to 5/31/24
Contract Investigator: Infrasense
Funding: SPR 80%, State 20%

Project Description and Objectives:
As part of Pooled Fund TPF-5(385) Infrasense collected ground penetrating radar (GPR) on I-44 from mile marker 113 to 129 in both the eastbound and westbound directions. This data was collected to supplement continuous deflection testing performed along the I-44 corridor and the data was analyzed by Infrasense in project TR202301. MoDOT wishes to do further testing on the I-70 corridor that will be collected as part of the pooled fund project in the spring of 2023. Since the GPR data analysis was not part of the pooled fund study this project would provide the funding to analyze the data and compare it to the continuous deflection data. Having baseline data for the I-70 corridor is important for understanding the condition of the pavement and could be beneficial for any reconstruction activities in the future. The deliverables from the analysis will include pavement layer thickness, layer elastic moduli, required overlay thickness estimate, and remaining service life estimate.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
The research team completed GPR pavement layer thickness analysis for the entire project. The GPR results have been provided to NCE to initiate Traffic Speed Deflectometer (TSD) structural analysis. TSD data deficiencies were identified and discussed with ARRB. The research team completed the structural analysis using updated Traffic Speed Deflectometer (TSD) data and pavement layer thickness and stripping analysis. The final report was received on 5/13/24.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$250,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202420 – Testing Survey Methods for Detecting Bats Roosting in Bridges

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $249,840
Contract Period: 4/1/2024 to 6/30/2025
Contract Investigator: Copperhead Environmental Consulting, Inc.
Funding: SPR 80%, State 20%

Project Description and Objectives:
The objective of this project is to ascertain the most effective bat survey technique for bridges by comparing the detection probabilities of various methods. The expected final deliverables include a report

that lists the most successful method(s) for surveying for bats in bridges with supporting evidence. The research team will provide information on other methods tested.

Proposed Activities for SFY 2025:
Researchers will complete surveys of 20 bridges with a total of 4 visits to each bridge. A 2-person field crew will visit bridges in the active season, i.e., between April and October. Using a combination of unaided and aided sight and sound, the research team will use 10 detection methods for testing. These are organized by time of day (day or evening) and then by increasing disturbance to roosting bats. This project is scheduled to be completed in SFY 2025 with the draft final report and summary due 2/28/25 and the final report and summary due 5/31/25. The contract will end 6/30/2025.

SFY 2024 Accomplishments:
This second phase project started 3/1/24. A kickoff meeting with Copperhead was held 3/8/24. The researchers have scheduled the first round of field work for the project.

Financials	Amount
Projected Budget SFY 2026	$30,000
Projected Budget SFY 2025	$151,048
Budget Amount SFY 2024	$0
Adjusted Budget Amount SFY 2024	$58,792
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202421 – Consultant Support for Intelligent Compaction and Paver-Mounted Thermal Profiling Projects in 2024-2025

Project Type: Contract
MoDOT Contact: Scott Breeding
Total Contract Amount: $256,192
Contract Period: 1/1/2024 to 4/30/2026
Contract Investigator: George Chang

Project Description and Objectives:
This project provides consultant support for MoDOT projects for the 2024 and 2025 construction seasons. The consultant has developed and lead contractor Intelligent Compaction (IC) and Paver-Mounted Thermal Profiling (PMTP) training and project support for MoDOT projects in previous years. To ensure the continued success of the MoDOT IC-PMTP projects in 2024 and beyond, MoDOT procured Consulting Support for the designated IC-PMTP projects in the 2024 and 2025 construction seasons and the implementation of data quality assurance (QA) and future acceptance with IC-PMTP data.

Proposed Activities for SFY 2025:
The research team will continue to provide support for contractors and MoDOT employees for the construction season as needed. A final report will be submitted by 3/30/25 for the 2024 construction season.

SFY 2024 Accomplishments:
A kickoff meeting was conducted remotely on 1/17/24. The team meet with Propeller on 1/29/24 to discuss changes or concerns for the upcoming construction season. The training materials have been updated. Two remote trainings sessions were held on February 26-27, 2024, for MoDOT and contractors.

Financials	Amount
Projected Budget SFY 2026	$100,000
Projected Budget SFY 2025	$105,554
Budget Amount SFY 2024	$0
Adjusted Budget Amount SFY 2024	$50,638
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202423 – Accessing Standards and Specifications

Project Type: Contract Research
MoDOT Contact: Lauren Bielecki
Total Contract Amount: $43,967 annually
Contract Period: 7/1/2023 to 6/30/2025
Contract Investigator: Joe Stevens
Funding: SPR 80%, State 20%

Project Description and Objectives:
MoDOT currently has a decentralized approach for many specifications. In surveying divisions and districts, it was found some specifications were purchased by multiple areas. MoDOT worked with General Services to find an online service that provides access to needed specifications with the flexibility to add and delete our subscription.

Proposed Activities for SFY 2025:
The vendor has the ability to run reports to determine utilization of each of the specifications. Quarterly these will be checked and determined if they are being utilized. Each year they can be modified. Before the next contract renewal, it will be decided if we need to retain all current specifications or make adjustments for the following year.

SFY 2024 Accomplishments:
In fall 2021, MoDOT implemented Techstreet, an online standards portal. The contract has been renewed through 2024. Feedback continues to be positive. A couple new specifications were added in SFY 2023 as requested by MoDOT staff. Invoicing took place and work continues with how to market.

Financials	Amount
Projected Budget SFY 2025	$43,967
Budget Amount SFY 2024	$37,490
Adjusted Budget Amount SFY 2024	$43,967
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

TR202504 – Using AI to Write Land/Legal Descriptions

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $175,000 estimated
Contract Period: 15 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Land / legal descriptions are long and tedious to write. This project examines the potential of using Artificial Intelligence to develop a rough draft of the land / legal description which would then be edited by MoDOT staff.

Proposed Activities for SFY 2025:
The RFP will be published in the first quarter of SFY 2025. An award and project kickoff will take place during the second quarter.

SFY 2024 Accomplishments:
This project will start in State Fiscal Year 2025.

Financials	Amount
Projected Budget SFY 2026	$50,000
Projected Budget SFY 2025	$125,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202505 – Simple for Dead, Continuous for Live (SDCL) - MoDOT Steel Superstructure Standards

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $300,000 estimated
Contract Period: 18 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Use of SDCL steel superstructures on Missouri roadways can potentially save money on projects where the current standards (continuous for dead and live load) are more expensive and/or cannot compete with concrete superstructures. The research team will create engineering policy guidance with standard details for inclusion in Section 751.14. Guidance would include span configurations where this methodology is best value or competitive. Standard details would primarily address the superstructure detail over intermediate bents.

Proposed Activities for SFY 2025:
The RFP will be published in the first quarter of SFY 2025. An award and project kickoff will take place during the second quarter.

SFY 2024 Accomplishments:
Research staff worked with Bridge staff to develop the RFP. This project will start in SFY 2025.

Financials	Amount
Projected Budget SFY 2026	$150,000
Projected Budget SFY 2025	$150,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202506 – AI Enabled Vision System for Intersection Analytics

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $150,000
Contract Period: 9 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project would develop an AI vision system that will: 1) identify, categorize, and quantify vehicles, pedestrians, and cyclists at intersections, 2) perform constant movement counts, 3) detect wrong way driving and notify the TMC in near real-time, and 4) recognize red-light running violations through Signal Phase and Timing (SPaT) integration. With this information, data can be visualized and used to produce signal optimizations and seasonal timing treatments.

Proposed Activities for SFY 2025:
It is anticipated that the request for proposal will be developed and released in early fall with a start date in late fall or early winter.

SFY 2024 Accomplishments:
This project will start in SFY 2025.

Financials	Amount
Projected Budget SFY 2026	$25,000
Projected Budget SFY 2025	$125,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202507 – TITANv3 – Interactive, Web-Based Platform for Transportation Data Integration, Visualization and Predictive Analytics – Phase 3

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $300,000
Contract Period: 3 years estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project is Phase 3 of the TITAN program. This project will look at adding some updates to the TITAN program. Maintenance activities on the TITAN system are being taken over by Highway Safety and Traffic

Proposed Activities for SFY 2025:
The TAC will work with the research team to develop a scope of work for the additional features to be added to TITAN. It is anticipated the contract will start on January 1st, 2025, after the current contract expires.

SFY 2024 Accomplishments:
This project will start in State Fiscal Year 2025.

Financials	Amount
Projected Budget SFY 2027	$100,000
Projected Budget SFY 2026	$100,000
Projected Budget SFY 2025	$100,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202508 – Aggregate Quality and Size

Project Type: Contract Research
MoDOT Contact: Brent Schulte
Total Contract Amount: $200,000 estimated
Contract Period: 18 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
Can some local aggregates meet concrete pavement aggregate requirements if the maximum particle size is reduced? This project would look at aggregates of various sizes and from different ledges. The aggregate samples and test mixes will undergo various durability tests.

Proposed Activities for SFY 2025:
It is anticipated that the request for proposal will be developed and released in early fall with a start date in late fall or early winter.

SFY 2024 Accomplishments:
This project will start in SFY 2025

Financials	Amount
Projected Budget SFY 2026	$75,000
Projected Budget SFY 2025	$125,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202509 – Alternative Fuel Vehicles

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $125,000

Contract Period: 12 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
There is no uniformity among states for collecting revenue on alternative fuel vehicles, and Missouri is behind on addressing revenue collection. This project would look at surrounding states legislation on alternative fueled vehicles. Indiana is moving forward with a new collection method and will be explored in this research.

Proposed Activities for SFY 2025:
The RFP will be published in the first quarter of SFY 2025. An award and project kickoff will take place during the second quarter.

SFY 2024 Accomplishments:
Research staff worked with MCS staff to understand the need for the project. Staff developed an RFP for review. This project will start in SFY 2025.

Financials	Amount
Projected Budget SFY 2026	$25,000
Projected Budget SFY 2025	$100,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202510 – Use of Small UAVs (Unmanned Aerial Vehicles) for Field Measurement of Hydraulic Parameters in Small Drainage Basins

Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $200,000 estimated
Contract Period: 18 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
This project will examine the feasibility of using UAVs (aka drones) to field measure water surface elevations with corresponding velocities and water depths (bathymetry) within a 10% accuracy in calculated discharge compared to conventional methods. Conventional methods would include surveying each section and using some form of a current meter such as the USGS Type AA Current Meter to determine streamflow velocities. Conventional methods for determining discharge require surveying and can be time consuming, costly, and unsafe during flooding events, thus is seldom undertaken for smaller drainage basins. Any high-water marks recorded are hard to determine what the corresponding discharge was for that elevation, hence, unreliable for the calibration of hydraulic models. Being able to efficiently and safely determine an accurate water surface elevation with the corresponding velocity and water depths across a section can help calibrate hydraulic modeling when it comes time for replacing the structure. If used during a flooding event, it could provide more useful information than a typical high-water mark or extreme high-water mark as an associated discharge can be connected to that elevation.

Proposed Activities for SFY 2025:
It is anticipated that the request for proposal will be developed and released in early fall with a start date in late fall or early winter.

SFY 2024 Accomplishments:
This project will start in SFY 2025.

Financials	Amount
Projected Budget SFY 2026	$75,000
Projected Budget SFY 2025	$125,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	$0

TR202511 – Maximizing the Wizardry of WAZE Mobile Applications to Expand Traveler Advisory Information and Collect Crowd-Sourced Data in Order to Improve Driver Safety
Project Type: Contract Research
MoDOT Contact: Scott Breeding
Total Contract Amount: $150,000
Contract Period: 24 months estimated
Contract Investigator: TBD
Funding: SPR 80%, State 20%

Project Description and Objectives:
In 2022, KC Scout launched a pilot project with WAZE™ using their in-vehicle dashboard "Hazard" application to enable drivers to instantly and safely report potholes to MoDOT's Customer Service. This innovation proved successful over the course of the project, enabling highly accurate pothole GPS location identification which then enabled Maintenance to identify patterns of problem areas for targeted fill and correction efforts. Utilizing Google Earth mapping, a pictorial view of collected pothole data allowed scheduling of maintenance activities rather than the isolated way of hunting for and filling potholes on a one-by-one basis as they were called or emailed into the DOT. These individual reports were quite often vague in terms of location, direction of travel and required a good deal of "seek and find" efforts
on the part of Maintenance, wasting valuable time and resources. The intent of this research study is to investigate and expand DOT use of other crowd-sourced applications within WAZE™ which include other types of on-road, shoulder and weather hazards. The success of our "Pothole CPR – Customer Provided Reporting" project leads us to believe that many other benefits could be derived from further investigation of these additional mobile-enabled services.

Proposed Activities for SFY 2025:
It is anticipated that the request for proposal will be developed and released in early fall with a start date in late fall or early winter.

SFY 2024 Accomplishments:
The Project will start in SFY 2025.

Financials	Amount
Projected Budget SFY 2027	$25,000
Projected Budget SFY 2026	$75,000
Projected Budget SFY 2025	$50,000
Budget Amount SFY 2024	$0

Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	

TR202512 – Extension of Wildlife Barrier Passage

Project Type: Contract Research
MoDOT Contact: Jenni Hosey
Total Contract Amount: $200,000 estimated
Contract Period: 12 months estimated
Contract Investigator: Dudek
Funding: SPR 80%, State 20%

Project Description and Objectives:
This would extend the I-49 wildlife median barrier research for another year to gain additional data. Extension of the project is contingent on finding contracted traffic control.

Proposed Activities for SFY 2025:
If TR202312 is extended for another year, it would have a revised contract period and contract amount. This project number would be removed.

SFY 2024 Accomplishments:
Research worked with Dudek and Design to determine if TR202312 could be extended another year for additional data.

Financials	**Amount**
Projected Budget SFY 2026	$50,000
Projected Budget SFY 2025	$150,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	$0
Prior to SFY 2024 Actual Cost	

MoDOT Lead Pooled Fund Studies

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

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $100,000/$850,000
Contract Period: 11/1/2018 to 8/15/2024
Contract Investigator: Glenn Washer – University of Missouri-Columbia
Funding: SPR 100%

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

Proposed Activities for SFY 2025:
The last reporting documents will be received in the first few weeks of SFY 2025. The only other activities left are to pay the final invoice, do the closeout spreadsheet, and return any remaining funds to the participating states.

SFY 2024 Accomplishments:
Back-casting and updating of risk model spreadsheets were completed for participating states. Analysis of these data did not provide the expected insight regarding weighting the models to be effective given the FHWA guidelines for RBI. The sensitivity studies that were completed provided some insight regarding if the RBI models would be effective, but the population of bridges used for back-casting, which were randomly selected, did not provide consistent results. To address this issue, the research team (RT) developed a different approach to weighting the models using a Monte Carlo (MC) simulation process. As part of that process, NBI element-level data and component-level data from state-owned and NHS bridges was analyzed to assess the criteria for attributes in the risk models and provide appropriate weights. Using those data, a MC simulation process was developed that allows for weights of different attributes to be effectively modeled. The analysis of back-casting results for individual components was analyzed statistically and compared with MC simulations in order to develop systematic process for "calibrating" the risk models developed by Reliability Assessment Panels (RAPs). The last quarter of the fiscal year focused on reporting for the project with a technical interim report on back-casting submitted that presented data analysis and introduced a data -driven process for analyzing and verifying risk models and a final report that summarized previous activities, back-casting results, data analysis approach, and other results for the research.

Financials	**Amount**
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$100,000

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

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $125,000/$575,000
Contract Period: 8/01/2019 to 7/31/2025
Contract Investigator: Dr. Genda Chen – Missouri University of Science and Technology
Funding: SPR 100%

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

The goals of this pooled-fund initiative are to engage closely with several state departments of transportation (DOTs) in the early stage of technology development at the INSPIRE University Transportation Center, and leverage the center resources to develop case studies, protocols, and

guidelines that can be adopted by state DOTs for bridge inspection without adversely impacting traffic. The initiative involves the integration, field demonstration and documentation of a robotic system of structural crawlers, UAVs, NDE devices, sensors, and data analytics. Depending on the interest of participating DOTs, the objectives of this initiative include, but are not limited to:

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

Proposed Activities for SFY 2025:
The last year of the project will focus on drafting the protocols, guidelines, and criteria. The draft report is due May 31, 2025, and the final report July 31, 2025.

SFY 2024 Accomplishments:
A third generation of Missouri S&T's invention on a hybrid flying and traversing drone was tested at two bridge sites. The hybrid drone was successfully attached to the bottom flange of a steel girder and traversed along the girder for high-fidelity imaging on the underside of bridge decks and steel girders. The high-quality images and videos taken from the hybrid drone have significantly less noise than those taken from commercial drones due to illumination change, drone controllability, and wind-induced vibration. The procedure for horizontal hyperspectral imaging and LiDAR scanning was developed. Currently a plan is underway to collect a new dataset to test out the proposed procedure for its efficiency and accuracy. Multimodal data fusion is underway to stitch and visualize thermal and RFB images from FLIR cameras for the inspected bridges. Work is ongoing to develop multi-user collaboration between inspectors wearing HoloLenses.

Financials	**Amount**
Projected Budget SFY 2026	$0
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$125,000

TR202011 / TPF-5(462) – Assessment and Repair of Prestressed Bridge Girders Subjected to Over-Height Truck Impacts (OHTI)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $185,000/$805,000
Contract Period: 1/1/2021 to 12/31/2024
Contract Investigator: Dr. Mohamed Elgawady – Missouri University of Science and Technology
Funding: SPR 100%

Project Description and Objectives:
Based on bridge failure incidents that occurred between 1967 and 2006, vessel and vehicle impacts are the second highest cause of bridge failure. This project will include a comprehensive experimental and analytical program to assess the damage to bridge girders due to over-height truck impact. The remaining carrying capacity of the damaged bridge girders will be determined, which will allow stakeholders (e.g., DOT engineers) to prioritize girder repairs. Then, different repair measures will be investigated. The carrying capacity of the repaired girders will be determined as well. The remaining carrying capacities of both the damaged and repaired girders will be determined using analytical and finite element models. The anticipated testing includes testing fourteen full-scale prestressed girders under impact load. Standard detailing and design provisions for the proposed repair techniques will be developed.

Proposed Activities for SFY 2025:
Testing and analysis will be completed during the beginning of SFY 2025. The draft report is due October 1, 2024, and the final on December 1, 2024.

SFY 2024 Accomplishments:
Five prestressed concrete girders have now been tested under lateral impact loads to assess their structural behavior and response. Restraint at the top flange has been varied as well as the weight of the impact mass. The first beam that had undergone the crash simulation was repaired and will be tested in flexure soon. The second through fifth girders are being repaired and will be retested. Girders six through fourteen are being prepared for initial testing.

Financials	Amount
Projected Budget SFY 2025	$0
Projected Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$135,000

TR202317 / S079801S / TPF-5(502) - Missouri/Kansas 2023 Peer Exchange Pooled Fund-Completed

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $50,000 MoDOT contribution
Contract Period: 8/18/2022 to 9/29/2023
Contract Investigator: TTI
Funding: SPR 100%

Project Description and Objectives:
State DOT Research Sections are required by FHWA to participate in peer exchanges of its Program Development and Program Management processes periodically (at least every five years) as described in 23 CFR 420.209(a). The objective of the peer exchange program is to give state DOT Research Programs a means to improve the quality and effectiveness of their research program. Most states will select two to three topics to focus on for their peer exchange and then invite other states to participate based on the topics. This pooled fund would be to hire a consultant to help facilitate and arrange the pooled fund for a combination MoDOT/Kansas meeting.

Proposed Activities for SFY 2025:
This project was completed in SFY 2024.

SFY 2024 Accomplishments:
The only thing that took place in SFY 2024 was the final invoice which was paid in November 2023. This project is closed.

Financials	Amount
Projected Budget SFY 2025	$0
Budget Amount SFY 2024	$50,000
Adjusted Budget Amount SFY 2024	$36,200
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

Solicitation 1614 - Establishment of a Public-Private Transportation Data Exchange Center

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT/Total Commitment: $200,000 MoDOT contribution
Contract Period: TBD
Contract Investigator: MCTI
Funding: SPR 100%

Project Description and Objectives:
DOTs across the country are paying third-party vendors to provide traffic data from their own roadways. The data is costly, and the source of the data is not verifiable. An entire industry is emerging that increasingly perceives DOTs as their primary financial source. Currently a significant number of vehicles are equipped with sensors, cameras, and in some cases lidar technology, which have the capability to provide DOTs accurate information pertaining to vehicular movements on our roadways. This information is currently retained by the Original Equipment Manufacturers (OEMs). If this information was shared with the departments of transportation, it could lead to a safer and more efficient system for their users. Cooperative efforts by a consortium of State entities to facilitate this data exchange could yield substantial benefits for the DOT, the OEMs, but most importantly the people driving on the roadways. Historically, there has been a reluctance within the private sector to share information with government agencies. The premise of this TPF study is to collaboratively look at the development of a data repository that could act as an impartial arbiter of data to ensure all personal identifying details are excluded. The goal of the project is to develop a secure computing, data analytics, and storage infrastructure with a data repository (data warehouse or data lake) that will collect all relevant vehicle data as well as other types of data (including environment data, weather data, among other sources) and share the data with DOTs for data analyses without any identifying information attached to improve transportation decision-making.

Proposed Activities for SFY 2025:
MoDOT will set up a meeting with the partner states to develop the final scope of work. A contract with MCTI will be executed so the project can begin.

SFY 2024 Accomplishments:
MoDOT worked with MCTI to develop a draft scope of work. The solicitation was posted on April 19, 2024. MoDOT met with possible partner states at the Spring AASHTO meeting in April to discuss the goals of the project and clarify questions.

Financials	Amount
Projected Budget SFY 2028	$50,000
Projected Budget SFY 2027	$50,000
Projected Budget SFY 2026	$50,000
Projected Budget SFY 2025	$50,000
Budget Amount SFY 2024	$0
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	$0

Pooled Fund Studies

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

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

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $120,000
Contract Period: 1/1/2017 to 9/30/2024
Contract Investigator: California DOT
Funding: SPR 100%

Project Description and Objectives:
When an earthquake occurs, the U. S. Geological Survey (USGS) ShakeMap portrays the extent of potentially damaging shaking. In turn, the ShakeCast system, a freely available, post-earthquake situational awareness application, automatically retrieves earthquake shaking data from USGS ShakeMap, analyzes shaking intensity data against users' facilities (e.g., bridges, buildings, roads), sends notifications of potential impacts, and generates maps and other web-based products for emergency managers and responders. ShakeCast is particularly suitable for earthquake planning and response purposes by Departments of Transportation (DOTs), in part since it can utilize State's existing NBI databases to implement shaking-based inspection priority and impact assessments. This collaborative effort will bring participating DOTs into full ShakeCast operation for post-earthquake assessment of state and local bridge inventories. The project will provide a mechanism to actively engage representatives from state DOTs with the common interests in implementing and expanding the application of ShakeCast technologies to improve emergency response capabilities.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$15,000
Transferred Funds SFY 2024	$15,000

TPF-5(424) – National Cooperative Highway Research Program (NCHRP) FY 2024 & TPF-5(425) - National Cooperative Highway Research Program (NCHRP) FY 2025

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $2,692,000 estimated
Contract Period: 7/1/2023 to 6/30/2025
Contract Investigator: NCHRP

Funding: SPR 100%

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

Financials	Amount
Committed Funds SFY 2025 (estimated)	$1,346,000
Committed Funds SFY 2024	$1,320,000
Transferred Funds SFY 2024	$1,346,267

TPF-5(430) – Midwest Roadside Safety Pooled Fund Program/TPF-5(533) Midwest Roadside Safety Pooled Fund Program (FY25-FY29)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $325,000
Contract Period: 1/21/2020 to 12/31/2023
Contract Investigator: Nebraska DOT
Funding: SPR 100%

Project Description and Objectives:
This project is continuation of work done under project SPR-3(017) and SPR-5(193), in which MoDOT has been a participant since 1991. The study has proved to be successful to this point and will remain active under the new project number. The purpose of the project is to crash test highway roadside appurtenances to assure they meet criteria established nationally. For more information, please refer to the Midwest Roadside Safety website: www.mwrsf.unl.edu

Financials	Amount
Committed Funds SFY 2025	$65,000 new solitation
Committed Funds SFY 2024	$65,000
Transferred Funds SFY 2024	$65,000

TPF-5(435) – Aurora Program (FY20-FY24) – new solicitation posted 1617

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 1/1/2020 to 12/31/24
Contract Investigator: Iowa DOT
Funding: SPR 100%

Project Description and Objectives:
The Aurora Program is a consortium of public agencies focused on collaborative research, evaluation, and deployment of technologies for detailed road weather monitoring and forecasting. Members seek to implement advanced road weather information systems (RWIS) that fully integrate state-of-the-art

roadway and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures; ultimately lessening adverse impacts of inclement weather.

Financials	Amount
Committed Funds SFY 2025	$25,000
Committed Funds SFY 2024	$25,000
Transferred Funds SFY 2024	$25,000

TPF-5(437) – Technology Transfer Concrete Consortium (FY20-FY24) - new solicitation posted 1619

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Commitment: $44,000
Contract Period: 1/1/2020 to 12/31/2024
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. 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 and then TPF-5(313) with the current project name. TTCC will provide new developments in concrete paving leading to implementation of new technologies and longer life pavements through the use of innovative testing, technology transfer, and construction optimization technologies and practices.

Financials	Amount
Committed Funds SFY 2025	$12,000
Committed Funds SFY 2024	$8,000
Transferred Funds SFY 2024	$12,000

TPF-5(438) – Smart Work Zone Deployment Initiatives (SWZDI)-FY20-FY24 - new solicitation posted 1618

Project Type: Pooled Funds

MoDOT Contact: Jen Harper
MoDOT Commitment: $200,000
Contract Period: 10/1/2019 to 12/31/2023
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 previous pooled fund number was TPF-5(295). The program is an ongoing cooperative effort between State Departments of Transportation, universities, and industry. Commercial products are provided by private vendors for evaluation, although

this is not the only focus of contracted projects. State DOTs provide funds, prioritize products with respect to the anticipated benefits to their construction and maintenance activities, and cooperate with researchers to identify test sites and conduct the evaluations.

Financials	Amount
Committed Funds SFY 2025	$50,000
Committed Funds SFY 2024	$50,000
Transferred Funds SFY 2024	$50,000

TPF-5(441) – **No Boundaries Transportation Maintenance Innovations - new solicitation will be posted soon.**

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $50,000
Contract Period: 9/30/2020 to 9/01/2024
Contract Investigator: Colorado DOT
Funding: SPR 100%

Project Description and Objectives:
Through this pooled fund project, the Colorado 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) and then Ohio under TPF-5(330). It is anticipated that this consortium will become the national forum for state involvement in the technical exchange needed for collaboration and new initiatives and be a forum for advancing the application and benefit of research technologies. Workshops will continue to be provided for the states participating in the pooled fund project.

Financials	Amount
Committed Funds SFY 2025	$10,000
Committed Funds SFY 2024	$10,000
Transferred Funds SFY 2024	$10,000

TPF-5(442) – **Transportation Research and Connectivity (librarian toolkit / knowledge networking / information condition / analysis of resources / digitization efforts / ADA support)**

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $75,000
Contract Period: 4/27/2020 to 2/28/2025
Contract Investigator: Oklahoma DOT
Funding: anticipated SPR 100%

Project Description and Objectives:
With the number of transportation librarians shrinking nationwide and the number of complex issues facing transportation researchers only increasing, several solutions will be developed in the proposed study to remedy the aforementioned problems. To increase professionalism and standardization among

non-library information managers, a toolkit will be developed that will offer guidance on best practices and be scalable to the research organization's size and abilities. Separately, a white paper on the changing nature of transportation libraries in the 21st century will be produced. This document will provide a roadmap for transportation organizations to follow with respect to current conditions of transportation information infrastructure. It will identify recurring problems, recommend solutions, and help organizations adapt to the rapid change that is occurring across the research landscape.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(443) – Continuous Asphalt Mixture Compaction Assessment using Density Profiling System (DPS)—new solicitation 1610

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $75,000
Contract Period: 1/13/2020 to 12/31/2024
Contract Investigator: Minnesota DOT
Funding: SPR 100%

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

Financials	Amount
Committed Funds SFY 2025	$25,000
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(447) – Traffic Control Device (TCD) Consortium (3)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 2/12/20 to 2/12/2025
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) and TPF-5(316).

Financials	Amount
Committed Funds SFY 2025	$25,000
Committed Funds SFY 2024	$25,000
Transferred Funds SFY 2024	$25,000

TPF-5(448) – Integrating Construction Practices and Weather into Freeze Thaw Specifications

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $60,000
Contract Period: 10/1/2019 to 1/31/2025
Contract Investigator: Oklahoma DOT
Funding: SPR 100%

Project Description and Objectives:
It has been suggested that the freeze-thaw behavior of concrete can be related to the rate at which the concrete absorbs water and reaches a critical degree of saturation. After the critical degree of saturation is reached and frozen the sample begins to crack and the stiffness degrades rapidly. This mechanism was suggested by Fagerlund and then expanded by research completed under pooled fund – TPF-5-297. Despite these advancements, there is still more work that is needed. The ultimate goal of this work is to build on previous research efforts to produce improved specifications and advance existing test methods, while improving the underlying understanding of freeze thaw damage. This work will specifically focus on construction practices and the impact of weather.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(460) – Flood-frequency Analysis in the Midwest: Addressing Potential Nonstationary Annual Peak-flow Records

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $222,400
Contract Period: 11/2/2020 to 12/31/2024
Contract Investigator: South Dakota DOT
Funding: SPR 100%

Project Description and Objectives:
Peak-flow frequency analysis is essential for flood insurance studies, floodplain management, and the design of transportation infrastructure. In recent decades, better understanding of long-term hydroclimatic persistence, as well as concerns about potential climate change and land-use change have caused the stationarity assumption, underpinning for flood-frequency analysis, to be reexamined. The federal guidelines of Bulletin 17B (Interagency Advisory Committee on Water Data, 1982) and the recent updates in Bulletin 17C (England et al., 2018) recognize that the conventional assumptions for performing flood frequency analyses (e.g., the annual time series is a representative time sample of random homogeneous events and that the stochastic processes that generate floods are stationary or

invariant in time) are violated in some cases. The overall goal of this study is to evaluate the combined effects of multidecadal climatic persistence (including hydroclimatic shifts), gradual climate change, and land-use change on peak-flow frequency analyses in the multi-state region in the Midwest. This study is intended to provide a framework for addressing potential nonstationary issues in statewide flood-frequency updates that commonly are conducted by the USGS in cooperation with state DOTs throughout the nation on an ongoing basis.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$55,600
Transferred Funds SFY 2024	$55,600

TPF-5(463) – Pavement Surface Properties Consortium: Phase III - Managing the Pavement Properties for Improved Safety

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $100,000
Contract Period: 1/1/2021 to 9/30/2026
Contract Investigator: Virginia DOT
Funding: SPR 100%

Project Description and Objectives:
Functional pavement considerations are fundamental to the performance and management of pavements. In addition to structural and durability requirements, an optimum wearing surface should provide a combination of a good riding quality, adequate friction & water handling capability, and a low noise level. All these properties are highly influenced by the various components of the pavement surface texture. The mission of the Surface Properties Consortium has been to conduct applied research focused on enhancing the level of service provided by the roadway transportation system by optimizing pavement surface characteristics. The focus of Phase III will be on continuing to support the implementation of asset management approaches and tools that help improve the safety of our road networks by reducing the number of crashes and related fatalities. It will represent a concerted effort to bring pavement design and evaluation experts together with maintenance and safety professionals to maximize the contribution of the pavement community Towards Zero Deaths on US highways. It will also seek participation of industry through the pooled-fund or an industrial affiliate program.

Financials	Amount
Committed Funds SFY 2025	$20,000
Committed Funds SFY 2024	$20,000
Transferred Funds SFY 2024	$20,000

TPF-5(464) – Hydrologic and Hydraulic Software Enhancements (SMS, WMS, Hydraulic Toolbox, and HY-8)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $50,000
Contract Period: 10/1/2020 to 12/31/2025
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The Federal Highway Administration (FHWA) sponsors ongoing development of four computer programs that perform both routine and complex hydrologic and hydraulic analyses of watersheds, river and stream systems, and transportation infrastructure. These programs incorporate procedures and equations documented in FHWA Hydraulic Design Series (HDS) documents, Hydraulic Engineering Circulars (HEC), technical briefs, and research reports. The four software systems are: Surface-water Modeling System (SMS), Watershed Modeling System (WMS), Hydraulic Toolbox, and HY-8 Culvert Hydraulic Analysis Program. The continual evolution of the national hydraulic engineering state of practice necessitates ongoing development of and upgrades to these tools. This pooled fund will enhance the capabilities of the software programs, update the software user manual documentation, make new software versions publicly available, and do technology transfer activities.

Financials	Amount
Committed Funds SFY 2025	$10,000
Committed Funds SFY 2024	$10,000
Transferred Funds SFY 2024	$10,000

TPF-5(465) – Consortium for Asphalt Pavement Research and Implementation (CAPRI)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $70,000
Contract Period: 1/21/2021 – 12/31/2025
Contract Investigator: Alabama DOT
Funding: SPR 100%

Project Description and Objectives:
As owners and operators of the nation's surface transportation infrastructure, state departments of transportation (DOTs) are striving to design and build longer lasting and more cost-effective asphalt pavements that meet a higher level of sustainability, safety, and user satisfaction for the public. To achieve this goal, state DOTs continue to adopt innovative technologies and optimized practices for designing, constructing, and preserving asphalt pavements. The adopted innovative technologies and practices are often developed from the collaborative research efforts supported by the state DOTs, Federal Highway Administration (FHWA), and industry. To continue fostering the development of new technologies and practices, this pooled fund study will identify and address national priority research and implementation needs for asphalt pavements that state DOTs face today and in the future. CAPRI will operate as a voluntary consortium of flexible pavement stakeholders that is open to all state, local, and federal highway agencies, industry associations, individual companies, academic institutions, and research organizations. The Alabama DOT will serve as the lead state and the National Center for Asphalt Technology (NCAT) at Auburn University will handle administrative duties for the project. Each participating entity may appoint one voting representative to CAPRI.

Financials	Amount
Committed Funds SFY 2025	$14,000
Committed Funds SFY 2024	$14,000
Transferred Funds SFY 2024	$14,000

TPF-5(466) – National Road Research Alliance - NRRA (Phase II)

Project Type: Pooled Funds

MoDOT Contact: Jen Harper
MoDOT Total Commitment: $750,000
Contract Period: 2/1/2021 to 1/31/2026
Contract Investigator: Minnesota
Funding: SPR 100%

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

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

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

Financials	Amount
Committed Funds SFY 2025	$150,000
Committed Funds SFY 2024	$150,000
Transferred Funds SFY 2024	$150,000

TPF-5(467) – Research Project Tracking System

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $49,500
Contract Period: TBD
Contract Investigator: Kentucky
Funding: SPR 100%

Project Description and Objectives:
Each state in the U.S. has a transportation research program, typically managed by designated staff in the state DOT (or equivalent agency). While these programs vary substantially in size, complexity, staffing level, and resource availability, there are certain needs that are generally common to all programs. One of these needs is a tracking system for active and completed research projects. The tracking system can be used for numerous functions. The objective of the project is to develop common functional requirements, a software solution and maintenance of the software solution for a Research Program Tracking System to be used by multiple DOTs.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(471) – Real-time Monitoring of Concrete Strength to Determine Optimal Traffic Opening Time (note: the project name changed)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $75,000
Contract Period: 5/17/2021 to 5/30/2024
Contract Investigator: Indiana DOT
Funding: SPR 100%

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

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(479) – Clear Roads Phase II

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 1/1/2017 to 6/30/2025
Contract Investigator: Minnesota DOT
Funding: SPR 100%

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

Financials	Amount
Committed Funds SFY 2025	$25,000
Committed Funds SFY 2024	$25,000

Transferred Funds SFY 2024	$25,000

TPF-5(485) – Consequences-Based Analysis of Undrained Shear Behavior of Soils and Liquefaction Hazards, Phase 1: Filling the Data Gaps

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $60,000
Contract Period: 9/30/2021 to 9/30/2025
Contract Investigator: Utah DOT
Funding: SPR 100%

Project Description and Objectives:
Soils experience reductions in shear strength when pore pressures increase, which can happen under different types of loadings such as static loadings or earthquake-induced cyclic loadings. At present, widely used correlations for soil strength loss have inconsistencies, especially as it relates to some soil types and their amounts of soil strength loss and associated strains. For example, since the early 1970s, geotechnical engineers worldwide have largely relied upon empirical correlations to predict soil liquefaction susceptibility, triggering, and consequences/damage due to earthquakes. The overall objective of this multi-year, multi-phase effort is to create a true performance-based model to evaluate the consequences of undrained response in all soils, including consequences resulting from earthquake-induced liquefaction and cyclic softening. Through this overall project, a more robust method for estimating field performance of soils during undrained events (including earthquakes) will be developed and tested. Due to the ability of the CPT to collect nearly continuous profiles of data in most soil types, these studies will focus initially on using CPT data for analyzing undrained shear behavior and liquefaction hazards. The framework is intended to be adaptable to other methods such as Standard Penetration Test (SPT), laboratory testing and analysis, and shear wave velocity (Vs) data.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$20,000
Transferred Funds SFY 2024	$20,000

TPF-5(487) – Transportation Management Center Pooled Fund Study

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $250,000
Contract Period: 4/17/2015 to 4/16/2027
Contract Investigator: FHWA
Funding: SPR 100%

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

coordinate with others with TMC interests; and (6) promote and facilitate technology transfer related to TMC issues nationally. This project is a continuation of TPF-2(207).

Financials	Amount
Committed Funds SFY 2025	$50,000
Committed Funds SFY 2024	$50,000
Transferred Funds SFY 2024	$50,000

TPF-5(495) – 2023 Technology Exchange on Low Volume Road Design, Construction and Maintenance

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $12,000
Contract Period: 1/1/2022 to 12/31/2023
Contract Investigator: Iowa DOT
Funding: SPR 100%

Project Description and Objectives:
The primary activities of this pooled fund project are technology exchange, information sharing, and the facilitation of partnering relationships among state agencies and participating members with FHWA, Local Public Agencies and other appropriate agencies and associations. Technology exchange activities in conjunction with the 13th International Conference on Low Volume Roads will be advantageous to participating members. Specifically, this pooled fund will: 1. Provide communication and information sharing among member participants: Discuss research, development, and technology transfer needs in the areas of design, construction, maintenance, and safety on low volume roads and provide research ideas to TRB in the areas of Low Volume Roads. 2. Member workshop at the 13th International Conference on Low Volume Roads: Provide a technology and knowledge exchange forum to enhance the practical knowledge of pooled fund participants concerning low volume road management with a focus on encouraging State DOT and other agency participation in the pooled fund. 3. Pooled Fund Member Meeting on Low Volume Road Issues: Provide a technology and knowledge exchange forum focused on Low Volume Road issues. Topics may include agency collaboration, funding, asset management, shared ROW/utilities, safety programs, emergency response, training and certifications, maintenance of traffic, federal oversight, standards, and specifications, contracting methods, environmental issues, energy development, maintenance, material sources and quality, and bonding. 4. Technology Transfer through paper publication, webinars, technology field demonstrations, and expanding access to solutions on issues selected by pooled fund member in areas of Low Volume Road Design, Construction and Management.

Financials	Amount
Committed Funds SFY 2025	$0
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(501) – Roadside Safety Pooled Fund - Phase 3

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $325,000
Contract Period: 1/1/2016 to 9/8/2027
Contract Investigator: Washington

Funding: SPR 100%

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

- December 31, 2017: W-beam barriers and cast-in-place concrete barriers;
- June 30, 2018: W-beam terminals;
- December 31, 2018: Cable barriers, cable barrier terminals, crash cushions;
- December 31, 2019: Bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and other breakaway hardware;
- Also, temporary work zone devices, including portable barriers, manufactured after December 31, 2019, must have been successfully tested to the 2015 edition of MASH.

Financials	Amount
Committed Funds SFY 2025	$65,000
Committed Funds SFY 2024	$65,000
Transferred Funds SFY 2024	$65,000

TPF-5(504) – Continuous Bituminous Pavement Stripping Assessment Through Non-destructive Testing

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $125,000
Contract Period: 5/1/2023 – 1/1/2027
Contract Investigator: Minnesota DOT
Funding: SPR 100%

Project Description and Objectives:
After the SHRP2 R06D study, several states (FL, TX, NM, CA, KY, and MN) participated in an Implementation Assistance Program (IAP) sponsored by FHWA and AASHTO, aimed at determining if the 3D-GPR and the IE/SASW technologies met "proof of concept" and were ready for national implementation. The primary objective of the proposed pooled-fund project is to establish a research consortium focused on addressing the R06D and IAP recommendations. As per the IAP and R06D findings and recommendations, particular emphasis will be placed on using 3D-GPR along with Traffic Speed Deflectometer (TSD) and/or Falling Weight Deflectometer (FWD) to detect the location, distribution, and severity of stripping in full-depth and composite bituminous pavements. Recognizing that 3D-GPR and TSD may not be readily available to all participating states, the study will allocate a portion of the pool fund to hire consulting firms for 3D-GPR and TSD surveys on the projects considered in this study.

Financials	Amount
Committed Funds SFY 2025	$25,000
Committed Funds SFY 2024	$25,000
Transferred Funds SFY 2024	$25,000

TPF-5(507) – National Hydraulic Engineering Conference

Project Type: Pooled Funds
MoDOT Contact: Jen Harper

MoDOT Total Commitment: $5,000
Contract Period: TBD
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
For more than 20 years, the FHWA has led the coordination of opportunities for collaboration, technology deployment, and best practice information sharing among transportation hydraulic engineers and practitioners. In recent years, FHWA has partnered with the AASHTO Technical Committee on Hydrology and Hydraulics and the TRB AFB60 Subcommittee to coordinate the opportunities. These coordinated opportunities have improved the state of the practice of transportation hydraulic engineers and practitioners. The objectives of this study are: 1. Provide opportunities for communication and information sharing among state hydraulic engineers, federal agencies, and national technical organizations (AASHTO TCHH and TRB AFB60) through the National Hydraulic Engineering Conference, and 2. Provide a technology and knowledge exchange forum to enhance the practical knowledge of member states concerning transportation hydraulic engineering, including advanced modeling technologies, FHWA initiatives, and best practices.

Financials	Amount
Committed Funds SFY 2025	$1,000
Committed Funds SFY 2024	$1,000
Transferred Funds SFY 2024	$1,000

TPF-5(515) – Evaluation of Low-Cost Safety Improvements (ELCSI-PFS)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $50,000
Contract Period: TBD
Contract Investigator: FHWA
Funding: SPR 100%

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

Financials	Amount
Committed Funds SFY 2025	$10,000
Committed Funds SFY 2024	$10,000
Transferred Funds SFY 2024	$10,000

TPF-5(516) – Highway Safety Manual 2nd Edition (HSM2) Implementation

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $80,000

Contract Period: TBD
Contract Investigator: FHWA
Funding: SPR 100%

Project Description and Objectives:
The goal of this project is to accelerate implementation of HSM2 and related analytical tools to assess current and future safety performance of existing roadways and alternative designs, and help practitioners make more informed decisions, better target investments, and reduce fatalities and serious injuries on the nation's roadways. This includes activities before and after publication of HSM2 which is anticipated in 2025.

Financials	Amount
Committed Funds SFY 2025	$16,000
Committed Funds SFY 2024	$16,000
Transferred Funds SFY 2024	$16,000

TPF-5(517) – Performance Centered Concrete Construction

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

Project Description and Objectives:
A Performance Centered Concrete Construction initiative will assure that any new concrete pavement or overlay will last for the intended period, with a minimum of distress, at a low life-cycle cost in an increasingly sustainable way. Reducing the need to replace or repair any concrete pavement will provide the direct benefits of saving money, decreasing CO2 footprint, and easing traffic delays – all of which are beneficial to sustainability. Fewer closures over the life of the pavement also enhances the safety of the traveling public and roadworkers. This is a continuation of TPF-5(368) with a slightly different focus.

Financials	Amount
Committed Funds SFY 2025	$20,000
Committed Funds SFY 2024	$20,000
Transferred Funds SFY 2024	$20,000

TPF-5(518) – Implementation of Structural Data from Traffic Speed Deflection Devices (Previously TPF-5(385) Pavement Structural Evaluation with Traffic Speed Deflection Devices (TSDDs))

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $275,000
Contract Period: TBD
Contract Investigator: Virginia DOT
Funding: SPR 100%

Project Description and Objectives:
Research has shown that incorporating pavement structural condition along with pavement surface condition in a pavement management decision-making process leads to better-informed decisions, and more cost-effective pavement rehabilitation and preservation strategies. Recognizing this, some highway agencies have investigated the use of Falling Weight Deflectometer (FWD) for pavement management applications. While FWDs are a common device for project level structural evaluation, they are inefficient at the network level. FWD measurements are made at discrete points along the pavement sections and the equipment must remain stationary on the road during each testing point (typically 1-4 minutes, depending on the protocol). This requires lane closures that disrupt traffic and traffic control, which limits the productivity and the number of discrete points where measurements can be obtained. Over the last 15 years, traffic speed deflection devices (TSDDs) that can near-continuously measure pavement structural condition while traveling at traffic speed have been developed. The objective of the proposed pooled-fund project is to establish a research consortium focused on providing participating agencies guidelines on how to specify collection and use data collected with TSDDs for network- and project-level (if feasible) pavement management applications. Specific tasks within this multi-year program will be developed in cooperation with the consortium participants. In addition, the consortium will also provide participating agencies with a mechanism to conduct pilot demonstration testing in their respective networks.

Financials	**Amount**
Committed Funds SFY 2025	$55,000
Committed Funds SFY 2024	$55,000
Transferred Funds SFY 2024	$55,000

TPF-5(530) – TRB Research Subscription FY 2024 & TPF-5(5XX) – TRB Research Subscription FY 2025

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $435,070
Contract Period: 7/1/2022 to 6/30/2024
Contract Investigator: TRB
Funding: SPR 100%

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

Financials	**Amount**
Committed Funds SFY 2025 (estimate)	$220,000 est.
Committed Funds SFY 2024	$211,000
Transferred Funds SFY 2024	$215,070

TPF-5(531) – Accelerated Performance Testing on the 2024 NCAT Pavement Test Track with MnROAD Research Partnership

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $300,000
Contract Period: TBD
Contract Investigator: Alabama DOT
Funding: SPR 100%

Project Description and Objectives:
The NCAT Pavement Test Track was originally constructed as a result of interest and support from state Departments of Transportation (DOTs) who shared a concern for building and preserving safe, sustainable, resilient, and cost-effective pavement infrastructure. Track research operations began in the summer of 2000. The summer 2024 rebuild is the starting point for the nineth research cycle, with many high reward research options available for potential sponsors. NCAT is again partnering with MnROAD in the 2024 research cycle to execute a pavement performance experiment with nationwide implementation impact.

Financials	Amount
Committed Funds SFY 2025	$100,000
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

TPF-5(532) – MAASTO Connected Automated Vehicle (CAV) Steering Committee

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $150,000
Contract Period: TBD
Contract Investigator: Michigan
Funding: SPR 100%

Project Description and Objectives:
The Mid-America Association of State Transportation Officials (MAASTO) Board unanimously nominated MDOT to lead an initiative to coordinate and facilitate the creation of a pooled fund study project. The intended purpose of the proposed TPF study is to support a collaborative research and project consortium on the topic of CAV technology. There is a need for establishing a common strategic direction for advancing CAV's deployments amongst its member states. This proposed pooled fund project will focus on movement toward resolution of a common direction for the body of ten (10) states in the Region (Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin). The objective of this TPF study is to provide; as needed, engineering and/or technical support services for the research, development, deployment, operations, and maintenance of CAV technology, along with advancing various CAV related initiatives.

Financials	Amount
Committed Funds SFY 2025	$30,000
Committed Funds SFY 2024	$30,000
Transferred Funds SFY 2024	$0

Solicitation 1605 – Improving the Quality of Highway Profile Measurement

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $150,000
Contract Period: TBD
Contract Investigator: Illinois DOT
Funding: SPR 100%

Project Description and Objectives:
The goal of the proposed pooled fund study "is to continue and extend the work of TPF-5(063) and TPF-5(354)", which was led by the Federal Highway Administration and South Dakota DOT, respectively. The project will enable states and FHWA to 1) identify data integrity and quality issues associated with measuring and analyzing pavement profiles, 2) suggest approaches to addressing identified problems, 3) initiate and monitor projects to address identified problems, 4) disseminate results, and 5) assist in solution deployment. The pooled fund study will enable participants to identify and resolve operational issues common among devices used to measure pavement profiles. The study will focus on data quality issues that arise from the use and operation of inertial profilers and other systems designed to measure pavement profiles.

Financials	Amount
Committed Funds SFY 2025	$30,000
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

Solicitation 1606 – Ahead of the Curve - Migration from NCHRP to AASHTO Technical Training Solutions (TTS)

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment: $20,000
Contract Period: TBD
Contract Investigator: Louisiana DOT
Funding: SPR 100%

Project Description and Objectives:
In 2011, raising the profile and stature of transportation research became a major theme during meetings of the TRB Technical Activities Council, the TRB standing committees on Conduct of Research and Technology Transfer, and the summer meeting of the AASHTO RAC/TRB state representatives. It quickly became established that a standardization of transportation research management was needed. Discussions among TRB staff and volunteers led to recommend a program that in 2012 that came to be known as "Ahead of the Curve (AOTC) Mastering the Management of Transportation Research and Innovation." The mission of the initiative was 'to develop and deliver a TRB program that enhances the knowledge, skills, and abilities of managers of transportation research programs and those responsible for innovation in a coordinated manner and on a continuing basis. The AOTC Program is comprised of four required core courses that are built upon the research cycle and twelve more subject detailed electives presented through webinar format. Below is a list of the required core courses and descriptions. A survey conducted at the AASHTO RAC meeting in 2023 indicated that more than half the states in attendance

would support a pooled fund effort to move the AOTC material to TTS with the remaining attendees would probably support the effort but need additional approval from their respective agencies first. AASHTO has agreed to work with the pooled fund study Technical Advisory Committee (TAC) and chosen contractor to ensure quality control and acceptance of the AOTC course material into the AASHTO TTS program. With these courses available in the AASHTO TTC program, member states research offices, and other staff as necessary, will have easy access to the entire AOTC program in an on-demand format.

Financials	Amount
Committed Funds SFY 2025	$10,000
Committed Funds SFY 2024	$0
Transferred Funds SFY 2024	$0

N/A – Transportation Pooled Fund Contingency

Project Type: Pooled Funds
MoDOT Contact: Jen Harper
MoDOT Total Commitment SFY 2025: $7,000
Contract Period: TBD
Contract Investigator: N/A
Funding: anticipated SPR 100%

Project Description and Objectives:
At the time of this document, state DOTs are just now working on the upcoming 2023 pooled fund solicitations. It is anticipated that Missouri DOT staff will request to enter into several other pooled fund projects in State Fiscal Year 2023. This Contingency project is to account for those requests over the next 13 months.

Financials	Amount
Committed Funds SFY 2025	$7,000
Committed Funds SFY 2024	$85,400
Transferred Funds SFY 2024	N/A

Technology Transfer – SPR25TTS

Estimated Cost - $735,000

LTAP = $420,000
NHI = $40,000
BEAP = $200,000
TEAP = $75,000 ($15,000 is local match)

TTAP – LTAP Program

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

TTAP Number	Calendar Year/Switch to FFY in 2022	SPR Work Program Timeline	Contract $
TTAP-T001(043)	SFY 2024	7/1/23 – 6/30/24	$420,000
LTAP-T001(044)	SFY 2025	7/1/24 – 6/30/25	$420,000

Project Description and Objectives:
The Local Technical Assistance Program (LTAP) was established by the Federal Highway Administration (FHWA) in 1982 in response to a recognized need for funding and technical support to the 38,000 communities that maintain local roads and bridges. The Missouri LTAP center is located at Missouri University of Science and Technology. The center enables local counties, parishes, townships, cities, and towns to improve their roads and bridges by supplying them with a variety of training programs; new and existing technology updates; and personalized technical assistance. Through these core services, the LTAP center provides access to training and information that may not otherwise be accessible.

Accomplishments
SFY 2024:
Missouri S&T was selected to administer the LTAP program for the next 3 years with the possibility of two one-year extensions, the new contract started July 1, 2023. For the first three quarters of state fiscal year (SFY) 2024, LTAP conducted 90 classes with 7,266 attendees. The most requested trainings this past SFY were Backhoe Safety training, Work Zone Safety and Flagger training, ADA Compliance for the Public Right of Way and Critical Thinking Skills for Managing Contract Changes. The LTAP advisory meeting was held at Missouri S&T on May 7, 2024.

Proposed Activities
SFY 2025:
- 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 further promotion of LTAP training and services.
- Continue to assist the MoDOT Local Public Agency efforts through training and other administrative opportunities.
- Evaluate program effectiveness.
- Create efficiencies in providing tech transfer materials and training by sharing resources and cost

sharing with the Rural Technical Assistance Program (RTAP) on such deliverables as e-newsletters, arranging training and providing materials.

Financials	Amount
Projected Budget SFY 2025	$420,000
Budget Amount SFY 2024	$420,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

TT200701 – NHI National Highway Institute Training SFY 2024 & SFY 2025

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $50,000
Contract Period: 7/1/2023 to 6/30/2025
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 for department staff to attend training. 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 2025:
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 goals.

SFY 2024 Accomplishments:
No classes were scheduled this year.

Financials	Amount
Projected Budget SFY 2025	$40,000
Budget Amount SFY 2024	$10,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

BEAP Program 2024 and 2025

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount: $400,000
Contract Period: 7/1/2023 to 6/30/2025
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 2025:
For State Fiscal Year 2024 and beyond an increase of $50,000 was approved to account for increases in costs for consultant fees. The hope is to prevent any reduction in the number of studies each year that MoDOT can support due to inflation costs. BEAP will continue to provide opportunities 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 2024 Accomplishments:
The funding allocation for SFY 2024 was $200,000. As of May 7, 2024, 32 studies have been approved for funding with a total estimated cost of $208,180. These studies involve, 25 local agency bridges, 7 non-NBI length structures (less than 20'), and 3 studies on low water crossings that had some type of operational problem. Currently, 23 of these studies have been completed. The remaining 9 projects have the reports and invoices pending. It is anticipated that the reports and invoices for the remaining 9 projects will be received, approved and payments will be made to the consultants by July 1, 2024.

Financials	**Amount**
Projected Budget SFY 2025	$200,000
Budget Amount SFY 2024	$200,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

TEAP Programs 2024 and 2025

Project Type: Contracts Other
MoDOT Contact: Jen Harper
Total Contract Amount SPR: $120,000
Total Contract Amount Local Agency Match: $30,000
Total Contract Amount: $150,000
Contract Period: 7/1/2023 to 6/30/2025
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 2025:
For State Fiscal Year 2022 and beyond an increase of $30,000 was approved to account for increases in costs for consultant fees. The hope is to prevent any reduction in the number of studies each year that MoDOT can support due to inflation costs. TEAP will continue to provide opportunities for local agencies to get technical assistance for traffic engineering problems. The total number of projects per year will vary depending on the scope and final cost of individual projects. The TEAP program is managed by MoDOT's Design Division's LPA group.

SFY 2024 Accomplishments:
The funding allocation for SFY 2023 allowed for 13 TEAP studies to provide technical assistance for local agency roadways. The eleven projects were from a combination of technical transfer funding and highway safety funding.

Financials	**Amount**
Projected Budget SFY 2025	$75,000
Budget Amount SFY 2024	$75,000
Actual Cost SFY 2024	(See Addendum)
Prior to SFY 2024 Actual Cost	N/A

ADDENDUM

State Planning and Research Program

Fiscal Year 2024 Annual Report - (07/01/2023 - 06/30/2024)

PART I - PLANNING

Transportation Planning Activities	SFY 2024 Amended Budget with Match	SFY 2024 Expenditures with Match
• Transportation Planning	$7,675,167	$7,538,696
• Safe and Accessible Transportation Options	$250,000	$0
SUBTOTAL	**$7,925,167**	**$7,538,696**
District Transportation Planning		
• CD	$2,642,243	$2,141,212
• KC	$2,258,454	$2,672,003
• NE	$909,103	$867,451
• NW	$1,048,941	$1,069,869
• SE	$2,230,000	$2,018,546
• SL	$1,607,274	$1,507,275
• SW	$859,184	$1,046,143
SUBTOTAL	**$11,555,199**	**$11,322,498**
Other Activities		
• Multimodal Operations	$253,903	$101,731
• Information Systems	$2,414,107	$3,223,644
• Regional Planning Commission	$1,657,500	$1,316,059
• Financial Services	$1,349,143	$1,643,103
• Bridge Division	$1,064,833	$1,161,291
• Design Division	$354,026	$51,866
• Consultant Contracts	$400,000	$38,641
SUBTOTAL	**$7,493,512**	**$7,536,334**
TOTAL PART I	**$26,973,878**	**$26,397,529**

Part II – Urban (MPO) – PL

Metropolitan Areas	FY 2024 CPG Funds	FY 2024 CPG Expenditures*
NW Arkansas	$5,000	$5,000
Kansas City	$2,872,459	$1,169,288
St. Louis	$4,383,275	$2,190,665

Springfield	$1,037,729	$891,226
Columbia	$891,121	$200,669
Jefferson City	$392,521	$75,350
Joplin	$841,187	$127,808
St. Joseph	$269,406	$63,151
Cape Girardeau	$221,175	$129,473
TOTAL PART II	**$10,913,873**	**$4,852,631**

* As of 08/01/2024 - For Information Only - Does not reflect complete fiscal year

Part III – Research – SPR

Activity	**SFY 2024 Amended Budget with Match**	**SFY 2024 Expenditures with Match**
• Administration (SPR24ADS)	$640,557	$639,909
• Research (SPR24RDS)	$4,571,000	$4,583,808
• Technology Transfer (SPR24TTS)	$705,000	$696,392
TOTAL PART III	**$5,916,557**	**$5,920,109**

TOTAL MoDOT SPR WORK PROGRAM

	SFY 2024 Amended Budget with Match	**SFY 2024 Expenditures with Match**
• Part I – Planning	$26,973,878	$26,397,529
• Part II – Metropolitan Planning	$10,913,873	$4,852,631
• Part III – Research	$5,916,557	$5,920,109
TOTAL MoDOT SPR WORK PROGRAM	**$43,804,308**	**$37,170,268**