Texas SPR Work Program

Annual Performance and Expenditures Report (APER)

Sept. 1, 2022 - August 31, 2023

State Planning and Research (SPR) Part II

Texas Department of Transportation

RESEARCH AND TECHNOLOGY IMPLEMENTATION DIVISION

Table of Contents

Certification and Disclaimer Statements

State Planning & Research Program Part II - Research

Texas Department of Transportation
Research and Technology Implementation Division
125 E. 11TH Street
Austin, Texas 78701
Phone (512) 416-4730
Email: RTIMain@txdot.gov

In cooperation with:
U.S. Department of Transportation Federal Highway Administration

Research - SPR 0511(223)
Implementation Program – SPR2023 (152)

Fiscal Year 2023
(September 1, 2022 – August 31, 2023)

Certification Statement

I, Kevin Pete, Director, of the Research and Technology Implementation Division (RTI), Texas Department of Transportation (TxDOT), do hereby certify that the State is in compliance with all requirements of 23 U.S.C.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.

DocuSigned by:

Kevin Pete

D77263CBF1F9429...   1/24/2024

Director   Date

Disclaimer Statement

The FHWA's approval of reports constitutes acceptance of such reports as evidence of work performed but does not imply endorsement of a report's findings or recommendations. This report is prepared for FHWA-funded work and includes appropriate credit references and disclaimer statements. The preparation of this report has been financed in part through grant(s) from the Federal Highway Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

List of Tables

List of Figures

Section 1 Annual Report Summary and References

1.1   Approval and Authorization Process

1.1.1   Funding Research—23 CFR 420.115(b)

The Code of Federal Regulations (CFR)—specifically 23 CFR 420.115(b)—says that the federal government is contractually obligated to authorize work funded by the Federal Highway Administration (FHWA) in whole or in part, pursuant to 23 U.S. Code (USC) 106. The CFR requires that appropriate funds be available for the full federal share of the cost of work authorized.

The Texas Department of Transportation (TxDOT) funds research through its Research and Implementation Program, overseen by the TxDOT Research and Technology Implementation Division (RTI). RTI and the Texas state-supported universities conducting the research or implementation executed all project agreements.

RTI provided the fiscal year (FY) 2023 State Planning and Research (SPR) Part II Work Program to the Texas FHWA Division for review and approval. After the FHWA division administrator for the SPR program gave authorization, RTI executed the project agreements.

1.1.2   Reporting Requirements—23 CFR 420.117

The CFR—specifically 23 CFR 420.117—requires that TxDOT issue a report for FHWA approval to continue the agreement between TxDOT and FHWA to carry out statewide transportation planning activities as authorized.

According to 23 CFR 420.117, RTI is responsible for program monitoring and reporting requirements. RTI assigns a team of project managers to monitor the activities and performances of all subrecipients (state-supported universities) to assure that they are managing and performing the work satisfactorily and that they are meeting deadlines.

1.2   Comparison of Actual Performance with Established Goals and Program Overview

1.2.1   Overall Performance

In accordance with 49 CFR 18.40, RTI is fully responsible for managing the day-to-day operations of SPR Part II activities. RTI monitors program activities to assure compliance with applicable federal requirements and attainment of performance goals. Its monitoring covers each project, function and activity.

In FY 2023, RTI managed 169 active research projects with 19 universities. Of the 169 projects, 118 remain active projects, 51 closed/terminated and zero canceled during this reporting period. Each of these projects met specific agency screening criteria and aligned with TxDOT's organizational strategic goals, which are:

· Maintaining a safe system.

· Connecting Texas communities.

· Addressing congestion.

· Becoming a best-in-class agency.

These projects impacted TxDOT's core transportation function/services and added value and benefit to TxDOT, participating agencies/external partners, and Texas citizens.

RTI Guidance Documents

RTI executes a Cooperative Research and Implementation Agreement (CRIA) with each university or university system to conduct research projects. Under this CRIA, the university billings for an individual project agreement may exceed the university's fiscal year budget for that individual project agreement by up to 10 percent or $20,000 (whichever is less) without modification of the project agreement.

RTI has also published the Research Manual and the University Handbook. These two documents and the CRIA outline the provisions and processes of TxDOT's Research and Implementation Program.

Performance Measures

The performance for FY 2023 is an overall 75.4% on-time receipt of project deliverables. Analyses at this level also provides insight into where the program can improve in project monitoring efforts. The data provided for the purpose of this report is accurate as of November 10, 2023.
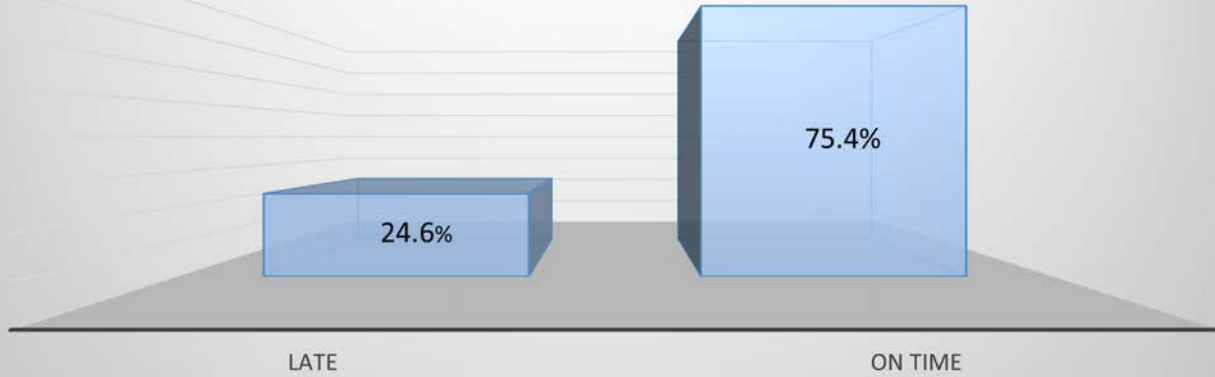
Figure 1. Bar Chart of Deliverables Submitted On Time

1.2.2 Obligation of Funds

Toll or Transportation Development Credits (TDC) are a federal transportation funding tool that can be utilized by states as a means of meeting local and state matching requirements for federal funding.

Table 1 shows how the federal funds appropriated to the Texas SPR II Program were obligated.

Table 1. Total Funding Obligated FY23

Program	SPR Program Number	Total Funding Obligated FY23	Federal 80%	State 20% TDC
Research Program	SPR 0511(223)	$25,256,050.44	$20,204,840.35	$5,051,210.09
RTI Division Program Management	SPR 0511(223)	$1,798,576.77	$1,438,861.42	$359,715.35
Research Program – Subtotal	**SPR 0511(223)**	**$27,054,627.21**	**$21,643,701.77**	**$5,410,925.44**
Implementation Program	SPR 2023(152)	$1,936,237.32	$1,548,989.86	$387,247.46
Innovation Program	SPR 2023(153)	$2,244,682.00	$1,795,745.60	$448,936.40
Grand Total		**$31,235,546.53**	**$24,988,437.22**	**$6,247,109.31**

Table 2. Contracting Entities Receiving SPR Funds

Entity That Received SPR Funds	SPR Contribution
Pooled-fund projects (lead agencies)	$2,601,134.00
National Cooperative Highway Research Program (NCHRP)	$5,441,252.00
Transportation Research Board (TRB) dues	$667,299.00

100% Federal

Program	SPR Program Number	Total Funding Expended FY23	Federal 100%
ADS Demonstration Grant Program	F 2021(463)	$1,511,377.00	$1,511,377.00

80/20% Federal

Program	SPR Program Number	Total Funding Expended FY23	Federal 80%	State 20% TDC
STIC Incentive	F 2022(240)	$73,725.00	$58,980.00	$14,745.00
STIC Incentive	F 2B23(249)	$56,107.50	$44,886.00	$11,221.50
Innovation	SPR 2023(153)	$2,244,682.00	$1,795,745.60	$448,936.40

1.2.3 Actual Expenses

Table 3a. Expenditures by Program for FY23

Program	Budgeted	Expended	Balance
Research	$26,585,373.25	$22,202,193.84	$4,383,179.41
Implementation	$795,324.00	$655,069.42	$140,254.58
Pooled-Fund	$ 2,601,134	$ 2,601,134	$0.00
Support Projects	$2,686,373.62	$2,329,845.64	$356,527.98
Special Initiative	$1,511,377.00	$802,375.14	$709,001.86
Management and Administration	$1,798,576.77	$1,834,217.71	$(35,640.94)
Total	**$35,978,158.64**	**$30,424,835.75**	**$5,553,322.89**

Table 3b. Expenditures by Functional Area for FY23

Functional Area	Budgeted	Expended	Balance
Construction, Maintenance & Materials	$6,507,960.24	$5,324,807.54	$1,183,152.70
Planning and Environmental	$3,241,322.09	$2,920,384.65	$320,937.44
Program Support	$2,524,081.12	$2,210,884.91	$313,196.21
Safety and Operations	$6,415,204.47	$4,728,480.99	$1,686,723.48
Strategy and Innovation	$4,164,340.63	$3,060,877.20	$1,103,463.43
Structures and Hydraulics	$8,725,539.32	$7,744,048.75	$981,490.57
Total	**$31,578,447.87**	**$25,989,484.04**	**$5,588,963.83**

FY23 Continuing Projects
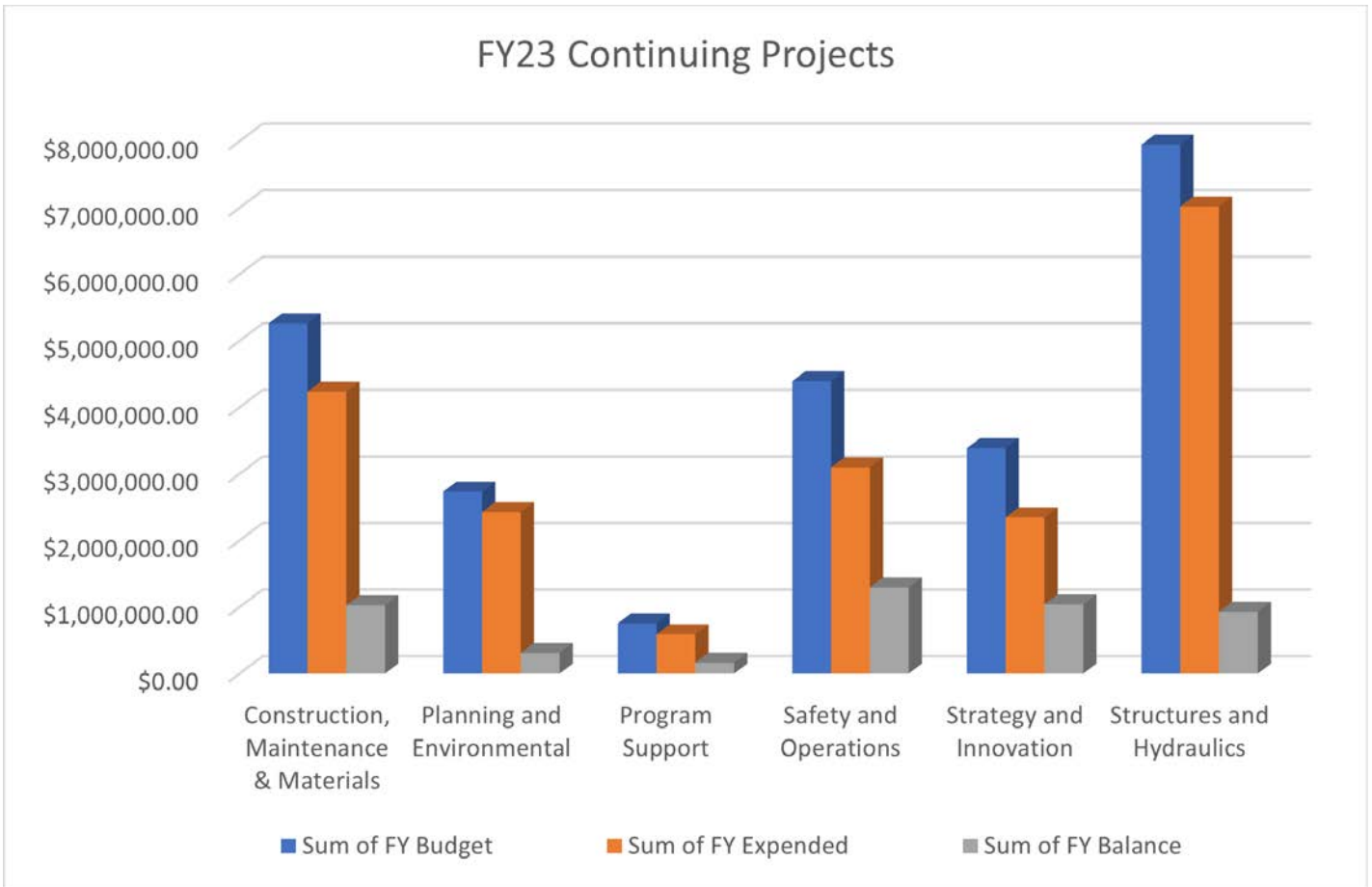
Figure 2: Funds Expended by Functional Area for Continuing Projects
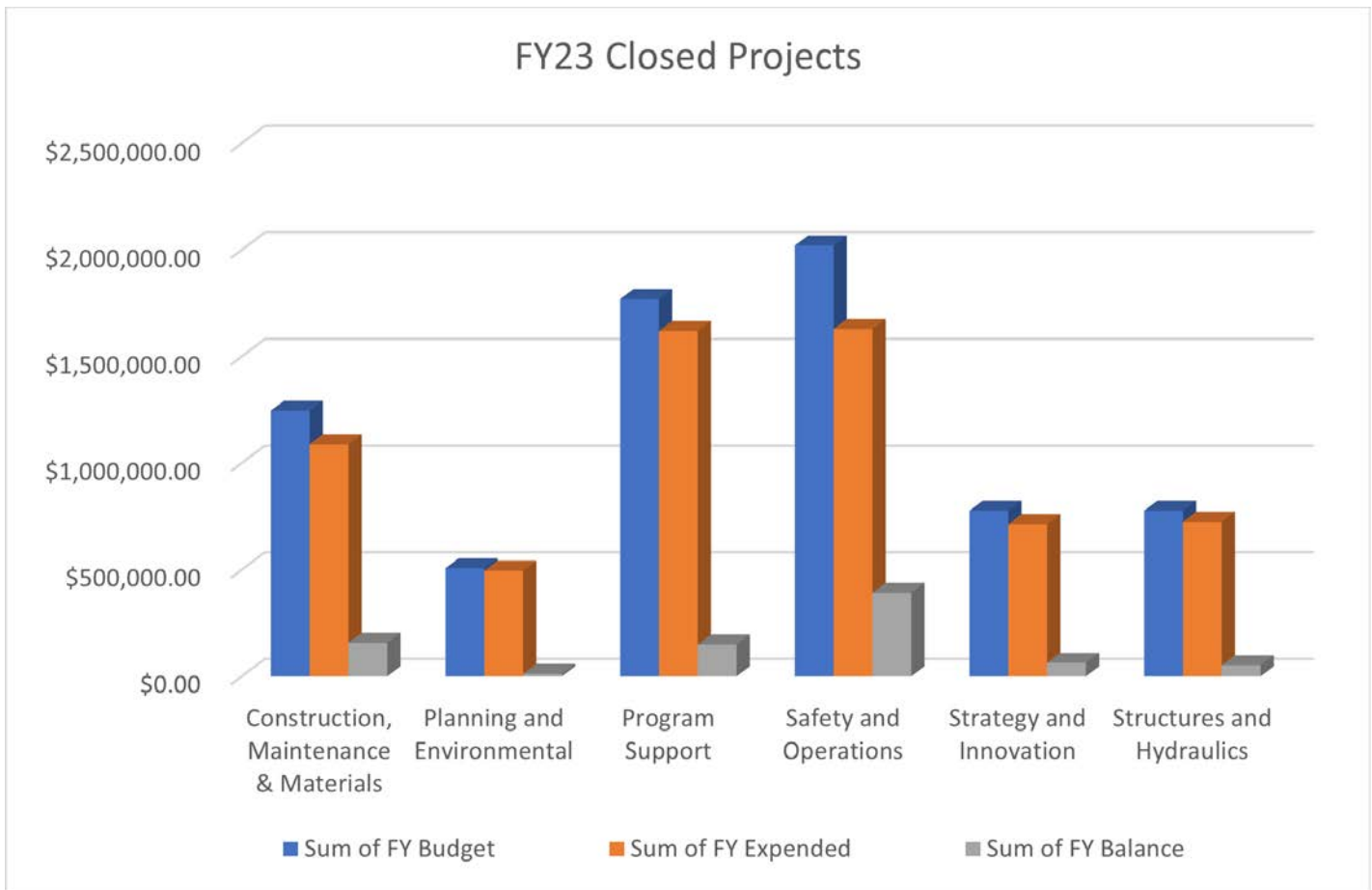
Figure 3: Funds Expended by Functional Area for Closed Projects

Table 4. Expenditures by University

University	FY23 Budget	FY23 Expended	FY23 Balance
CTR	$9,011,749.48	$7,365,784.15	$1,645,965.33
SFASU	$5,341.91	$0.00	$5,341.91
TAMUCC	$264,210.50	$247,939.43	$16,271.07
TAMUK	$1,597.50	$0.00	$1,597.50
TAR	$64,492.50	$37,024.97	$27,467.53
TARL	$18,315.00	$13,199.03	$5,115.97
TECH	$351,660.29	$250,099.08	$101,561.21
TEES	$1,511,377.00	$802,375.14	$709,001.86
TSU	$27,654.88	$23,732.05	$3,922.83
TTI	$14,900,051.50	$12,290,623.21	$2,609,428.29
TXST	$572,528.50	$480,345.66	$92,182.84
UH	$128,283.75	$128,283.76	($0.01)
UNT	$21,927.50	$914.71	$21,012.79
USGS	$1,022,186.00	$1,013,570.83	$8,615.17
UTA	$2,250,613.67	$2,096,783.51	$153,830.16
UTD	$51,506.25	$53,806.01	($2,299.76)
UTEP	$577,546.25	$550,644.94	$26,901.31
UTSA	$760,677.89	$615,838.57	$144,839.32
UT-TYLER	$36,727.50	$18,518.99	$18,208.51
Grand Total	**$31,578,447.87**	**$25,989,484.04**	**$5,588,963.83**

1.3 Acronyms and Abbreviations

Table 5. Lists acronyms used in this document and what they stand for.

Acronym	What it Stands for
APER	Annual Performance and Expenditures Report
CFR	Code of Federal Regulations
CRIA	Cooperative Research and Implementation Agreement
CTR	University of Texas at Austin's Center for Transportation Research
FAC	Functional Area Committee
FHWA	Federal Highway Administration
FY	Fiscal Year
LAMAR	Lamar University
PVAMU	Prairie View A&M University
RTI	Research and Technology Implementation Division
SFASU	Stephen F. Austin State University
SHSU	Sam Houston State University
SPR	State Planning and Research
TAMU	Texas A&M University
TAMU-C	Texas A&M University at Commerce
TAMU-CC	Texas A&M University at Corpus Christi
TAMUK	Texas A&M University - Kingsville
TAR	Texas A&M AgriLife Research
TARL	Tarleton State University
TDC	Transportation Development Credits

Acronym	What it Stands for
TECH	Texas Tech University Center for Multidisciplinary Transportation Research
TEES	Texas A&M Engineering Experiment Station
TEEX	Texas A&M Engineering Extension Service
TSU	Texas Southern University
TTI	Texas A&M Transportation Institute
TxDOT	Texas Department of Transportation
TXST	Texas State University
UH	University of Houston
UNT	University of North Texas
USC	U.S. Code
USGS	United States Geological Survey
UTA	University of Texas at Arlington
UT-Dallas	University of Texas at Dallas
UTEP	University of Texas at El Paso
UTHSC	University of Texas Health Science Center
UT-Permian Basin	University of Texas Permian Basin
UTSA	University of Texas at San Antonio
UT-Tyler	The University of Texas at Tyler
WTAMU	West Texas A&M University

1.4   Contact Information

Table 6. RTI Personnel

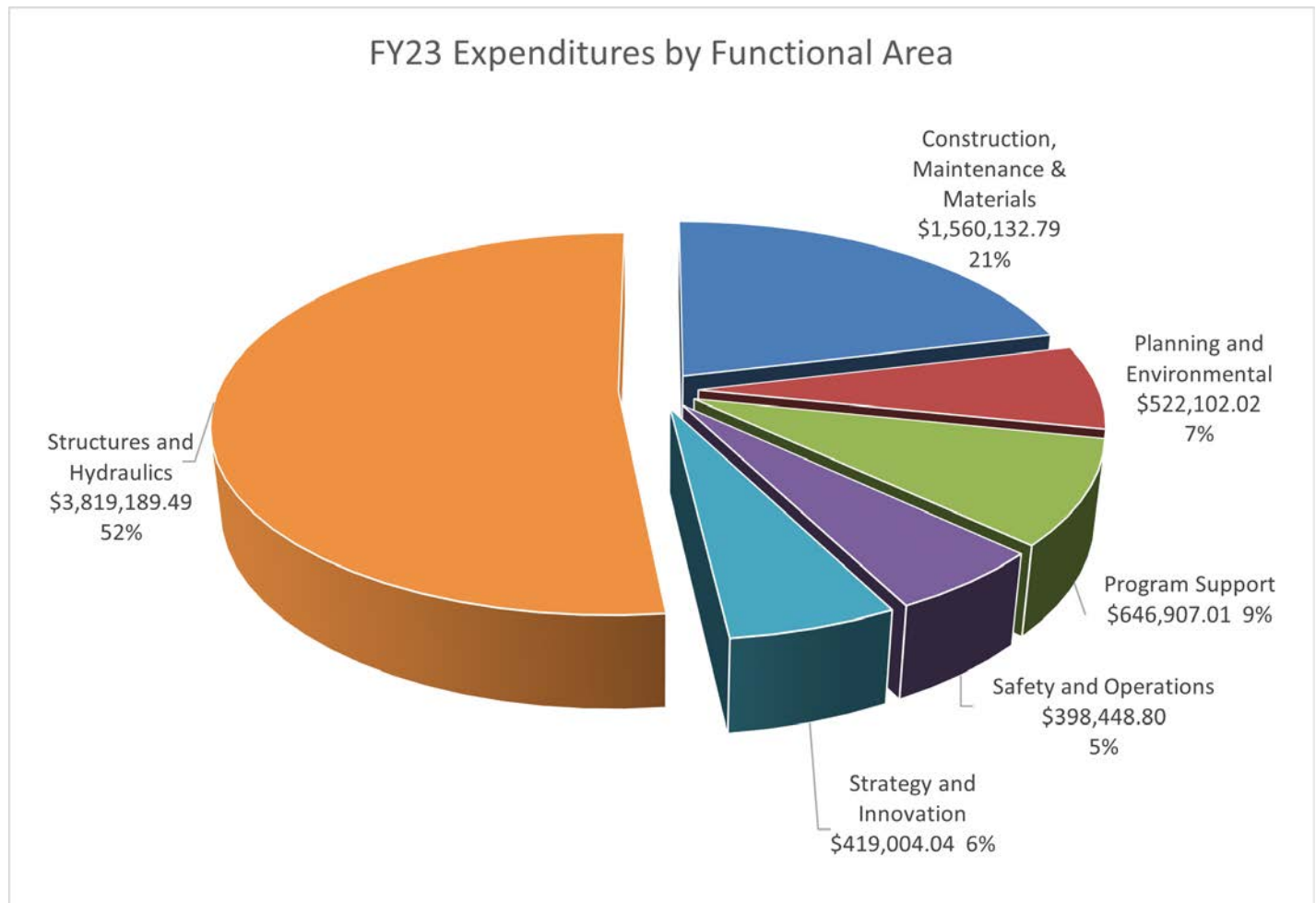| Name	Position Title	Phone Number	Email Address
Kevin Pete	RTI Director	512-416-4730	Kevin.Pete@txdot.gov
Phillip Hempel	Research and Technology Portfolio Section Manager	512-416-4731	Phillip.Hempel@txdot.gov
Veronica Tello	Executive Assistant	512-416-4732	Veronica.Tijerina@txdot.gov
Chris Glancy	Portfolio Manager	512-416-4747	Chris.Glancy@txdot.gov
Ned Mattila	Resource Specialist	512-416-4727	Ned.Mattila@txdot.gov
Laura Ludwig	Resource Specialist	512-416-3041	Laura.Ludwig@txdot.gov
Annette Trevino	Contract Administrator	512-486-5362	Annette.Trevino@txdot.gov
Emily Ruiz	Contract Specialist	512-486-5810	Emily.Ruiz@txdot.gov
Vacant	Contract Specialist		
Tamara Graham	Contract Specialist	512-416-2065	Tamara.Graham@txdot.gov
Joanne Steele	Project Manager	512-416-4657	Joanne.Steele@txdot.gov
Tom Schwerdt	Project Manager	512-416-4748	Tom.Schwerdt@txdot.gov
Wade Odell	Project Manager	512-416-4737	Wade.Odell@txdot.gov
Darrin Jensen	Project Manager	512-783-5388	Darrin.Jensen@txdot.gov
Jade Adediwura	Project Manager	512-486-5061	Jade.Adediwura@txdot.gov
Martin Dassi	Project Manager	512-416-4738	Martin.Dassi@txdot.gov
Katelyn Kasberg	Project Manager	512-298-9928	Katelyn.Kasberg@txdot.gov

Table 7. Personnel from Participating Universities

Name (Liaison**)	University	Phone#	Email Address
Ashley Williams**	CTR	512-232-3085	CTRmain@engr.utexas.edu
Erin K. Lovelady C. Jerry Lin Liv Haselbach Ph.D. Candy Cazares**	LAMAR	409-880-8933 409-880-8760	eklovelady@lamar.edu jerry.lin@lamar.edu lhaselbach@lamar.edu ccazares2@lamar.edu
Judy Perkins** Kimberly Cooks Bobby Melvin	PVAMU	936-261-1655 936-261-1686 936-261-1556	juperkins@pvamu.edu kicooks@pvamu.edu bdmelvin@pvamu.edu
Jennifer Hanlon**	SFASU	936-468-1805	hanlonjd@sfasu.edu
Chad Hargrave** Maegan McKerrow	SHSU	936-294-1538 936-294-4649	cwhargrave@shsu.edu mnm002@shsu.edu
Dr. Robert N. Coulson	TAMU	979-845-9725-Ofc 979-777-7064Cell	r-coulson@tamu.edu
Cecelia Gassner** Dr. Brent Donham	TAMU-C	903-886-5172 903-886-5321	cece.gassner@tamuc.edu Brent.donham@tamuc.edu
Dr Michael Starek Kimberly Hawkenson** Research Office	TAMU-CC	361-825-3978 361-825-2730	michael.starek@tamucc.edu kimberly.hawkenson@tamucc.edu research.office@tamucc.edu
Patricia A. Foster**	TAMUK	361-593-3344	osr@tamuk.edu
Julie Bishop Debbie Danford**	TAR	979-458-8760 979-862-7205	jbishop@tamu.edu dedanford@ag.tamu.edu
Dr. Rupa Iyer Nelly Diciccio Maria Ross David Ventris**	TARL	254-459-5449 254-968-1923 254-459-6439	iyer@tarleton.edu diciccio@tarleton.edu MROSS@tarleton.edu dventris@tarleton.edu ospio@tarleton.edu
Moon Won** Office of Research Services	TECH	806-834-2248	Moon.Won@ttu.edu ors@ttu.edu
Jennifer Jackson**	TEES	979-847-6100	jmjackson@tamu.edu
Jonathan Dikes Tony Crites**	TEEX	979-458-6887 979-458-3300	jonathan.dikes@teex.tamu.edu tony.crites@teex.tamu.edu
Adana Brown Dr. Yi (Grace) Qi** Dr. Fengxiang Qiao	TSU	713-313-7457 713-313-1915	Adana.Brown@tsu.edu Yi.Qi@tsu.edu Qiao_fg@tsu.edu

Name (Liaison**)	University	Phone#	Email Address
Mary Levien**	TTI	979-317-2047	m-levien@tti.tamu.edu
Joanne Palmer Marivel Alvarez** Evy Gonzales	TXST	512-245-4524 512-245-2101	jp57@txstate.edu ma17@txstate.edu eg13@txstate.edu grants@txstate.edu
Fauzia Nisar** Shannon Gary* UH Proposals	UH	713-743-5773 713-743-6438	Fauzia.Nisar@times.uh.edu sgary@central.uh.edu uhproposals@listserv.uh.edu
Katie Herring** Charles Tarantino Emiley Locey	UNT	940-565-3252 940-565-3246 940-369-8192	Katie.Herring@unt.edu Charles.Tarantino@unt.edu Emiley.Locey@unt.edu GCA@unt.edu Proposals@unt.edu
Karen Beers Timothy Raines William H. Asquith	USGS	512-927-3580 806-742-3129	kabeers@usgs.gov thraines@usgs.gov wasquith@usgs.gov
Sarah Panepinto**	UTA	817-272-0243	Sarah.panepinto@uta.edu ogcs@uta.edu
Emily Lacy**	UTD	972-883-4572	emily.lacy@utdallas.edu
Cory Brown** Dr. Roberto Osegueda Imad Abdallah (HSI)	UTEP	915-747-5732 915-747-8907	cjbrown5@utep.edu orspra@utep.edu emadn@utep.edu
Carmen Martinez Kathy Kreidler	UTHSC	713-500-3091 713-500-3999	Carmen.martinez.1@uth.tmc.edu preaward@uth.tmc.edu
Liana Ryan** Sandra Garcia Veronica Stoller Jennifer Silver	UTSA	210-458-6472 210-458-8250 210-458-4234	liana.ryan@utsa.edu sandra.garcia4@utsa.edu veronica.stoller@utsa.edu jennifer.silver@utsa.edu
Angela Nunez Dr. Carla Reichard**	UT-TYLER	903-539-8472 512-565-5670	anunez@uttyler.edu research@uttyler.edu
Steve McLean**	WTAMU	806-651-2983	smclean@wtamu.edu srs@wtamu.edu
Timothy Pierce**	UT-Permian Basin	432-552-2537	pierce_t@utpb.edu orsp@utpb.edu
Edlyn Achiu Walsh**, Constantine Tarawneh	UTRGV	956-665-5008, 956-665-2607	sponpro@utrgv.edu, constantine.tarawneh@utrgv.edu

Section 2 Subrecipient Performance

2.1   CTR - University of Texas - Austin Center for Transportation Research

FY23 Expenditures by Functional Area

Construction, Maintenance & Materials
$1,560,132.79
21%

Planning and Environmental
$522,102.02
7%

Program Support
$646,907.01 9%

Safety and Operations
$398,448.80
5%

Strategy and Innovation
$419,004.04 6%

Structures and Hydraulics
$3,819,189.49
52%

Project Number	Project Name	Status
0-6936	Development of Integral/Semi-integral Abutments for TxDOT bridges	Active
0-6999-21	Texas Technology Task Force (TTTF)	Closed
0-7001	Utilizing Steel Fibers as Concrete Reinforcement in Bridge Decks	Active
0-7002	Evaluation of Geogrids for Asphalt Pavement Construction	Active
0-7007	Weather-Responsive Management Strategies	Closed
0-7011	Evaluation of Seamless Bridges	Closed
0-7012	Development of Non-Fracture Critical Steel Box Straddle Caps	Closed
0-7016	Develop Guidance for Structural Behavior of Tall Haunches in TxDOT Beam and Girder Bridges	Closed
0-7028-01	Integrated SiteManager and Pavement Analyst Database on an Online Platform	Active
0-7031-01	Develop Efficient Prediction Model of Highway Friction on an Annual Basis on Texas Network	Active
0-7033	Defining Operational Design Domains (ODDs) for the Safe Blending of Levels 0-4Connected and Autonomous Vehicles (CAVs) in the Traffic Stream	Closed
0-7034	Exploring the Use of Artificial Intelligence to Leverage TxDOT Data for Enhanced Corridor Management and Operations	Active
0-7039	Development of Knowledge in the Application of Strut-and-Tie Modeling	Closed
0-7041	Develop NextGen Texas Bridge Decks	Active
0-7042	Use of Larger Diameter Shear Studs for Composite Steel Bridges	Active
0-7060	Measuring Faulting on Jointed Concrete Pavements	Closed
0-7061	Optimizing Laboratory Curing Conditions for Hot Mix Asphalt to Better Simulate Field Behavior	Closed
0-7071	Evaluate Geophysical Methods to Detect Underground Voids	Closed
0-7073	Improving Testing Requirements in Item 300 Of TxDOT Standard Specifications	Active
0-7074	Increase the Allowable Content of Recycled Crushed Concrete Fine Aggregate in Class P Concrete	Closed
0-7087	Develop Standards for Temporary Concrete Median Barrier in Flood-Prone Areas	Active

Project Number	Project Name	Status
0-7088	Develop Closure Joint Materials Specification and Evaluate Performance for Side-By-Side Accelerated Bridge Construction (ABC) Superstructure Systems	Active
0-7089	Develop and Validate Precast Column Solutions for Texas Bridges	Active
0-7090	Evaluate the Deployment of High Strength Reinforcing Steel in Texas	Active
0-7093	Develop Refined Design Methods for Lean-On Bracing	Active
0-7095	Evaluate Improved Streamflow Measurement at TxDOT Bridges	Active
0-7102	Develop Models for Field Performance of Friction and Skid Number	Active
0-7113	Determine Service and Ultimate Behavior for Bent to Column Joints in TxDOT Substructures	Active
0-7115	Investigate Live Load Distribution and Stability of Prestressed Concrete Girders During Construction	Active
0-7116	Develop Deck and Overhang Design Guidelines for Sound Walls and Other Heavy Loads	Active
0-7117	Investigate the Strength of Struts Crossing Cold Joints	Active
0-7123	Define a Statewide Plan for a Sustainable Real-Time Travel Time Network for Texas Hurricane Evacuations and Safe Citizen Return	Closed
0-7129	Working with Autonomous Trucks to Improve Routine Maintenance Operations	Closed
0-7134	Improve Traffic Analysis and Mobility Modeling Using Information and Communication Technologies	Closed
0-7137	Assessment of Austin, El Paso, and San Antonio HERO Incident Management Programs	Active
0-7138	Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards	Active
0-7139	Determination of Pavement Surface Type	Active
0-7141	Evaluation of Nano-Materials in Concrete for Improved Durability	Active
0-7145	Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials	Active
0-7149	Determine Feasibility and Methodologies of Incorporating Third-Party Traffic Data into Transportation	Active
0-7164	Expanding Connected Vehicle Data Framework (CVDF) Data Sources to Increase Applications and Use on Texas Roadways	Active
0-7165	Logistics Sprawl Impacts on E-commerce Travel Patterns	Active
0-7168	Use of X-Ray Fluorescence (XRF) to Determine Tire Rubber Content in Asphalt Binders	Active

Project Number	Project Name	Status
0-9902-23	University of Texas Library Services	Active
5-4829-05	Implementation of Geosynthetic-stabilized Roadways for Base Course Reduction: Field Monitoring and Design Recommendations	Closed
5-6995-01	Implementation: Investigation of Retroreflective Pavement Markers (RPMs) in Rumble Strips	Closed
5-7081-01	Implementation of Understanding the Impact of Autonomous Vehicles on Long-distance Travel Mode and Destination Choice in Texas	Active
9-1532	TPF-5(508) Concrete Bridge Engineering Institute (CBEI)	Active

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-6936	Development of Integral/Semi-integral Abutments for TxDOT bridges	Active

Project Start Date: 09/01/2016
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,049,627.10
CTR Total Project Spend: $1,043,800.18

Completion Date: 12/31/2023
University #2:
Total Project Budget: $1,049,627.10
CTR FY23 Budget: $115,797.26
CTR FY23 Spend: $115,553.90

Project description: Review and reconcile utility accounts for highway illumination in the El Paso District (ELP) to evaluate the validity of billing invoices.

Work performed: Analyzed invoices and reconciled with field counts of highway illumination. Coordinated with utility provider and local municipality to eliminate invoices resulting from

Project Description: While the use of integral and semi-integral bridge abutments has reportedly been increasing nationwide, their construction in Texas has remained limited. These systems have been reported to minimize the costs associated with the installation, maintenance, and repair of bridge deck joints and bearings. In addition, they have the potential to minimize the "bump at the end of the bridge," which results in reduced maintenance costs. Although this technology has not been widely adopted in Texas, a reassessment of its potential cost and performance benefits is timely. This requires assessment of key design and construction aspects, including the characteristics of common soils in Texas, the details typically adopted for foundation, superstructure, and substructure, and the local pavement standards. Accordingly, this project proposes to assess the use of this technology in Texas by producing: (1) a review of US and international practices, as well as of existing data, to assess the applicability to conditions prevailing in Texas, (2) a thorough evaluation of structures already constructed in Texas, as well as of an integral bridge that will be constructed in 2016 in Texas by FHWA Federal Lands, and (3) a set of design details for using this technology in Texas conditions.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #6:
Amend the contract to extend the termination date, revise the budget, and update the project schedule to allow time to deliver the pilot short course for Task 10. The FY19-FY22 Budgets remain the same. The FY2023 Budget is decreased by $1,875.00 from $117,672.26 to $115,797.26; the FY2024 Budget is established at $1,875.00; the Itemized Project Budget Estimate remains $1,049,627.10.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6936

CTR Program Support

Project Number	Project Name	Status
0-6999-21	Texas Technology Task Force (TTTF)	Closed

Project Start Date: 10/23/2020
Lead University: CTR
Project Status: Closed
CTR Total Budget: $1,422,607.00
CTR Total Project Spend: $948,588.43

Completion Date: 08/31/2023
University #2:
Total Project Budget: $1,422,607.00
CTR FY23 Budget: $498,541.00
CTR FY23 Spend: $339,232.41

Project Description: The Texas Department of Transportation (TxDOT) needs support to manage the Texas Technology Task Force (TTTF). The Performing Agency shall be responsible for coordination of the TTTF. Authorized by Texas's 83rd Legislature General Appropriations Bill, S.B. No. 1, Item 44, VII-31, the Texas Department of Transportation (TxDOT) established the TTTF in 2013 to enhance its vision for the future of Texas's transportation systems. The TTTF began with a core knowledge group of transportation experts and has grown into a successful program that is responsible for managing the Emerging Technology Portfolio, publishing white papers on critical topics, delivering strategic plans such as the Technology Utilization Plan, developing communication strategies, and conducting TTTF meetings with in-depth technical analysis. Key objectives shall include, but are not limited to:

- Maintaining a core knowledge group and network of subject matter expertise

- Identifying emerging technologies and analyzing potential impacts

- Developing key strategies to integrate critical technologies into the Texas transportation system.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Revive and continue the contract as well as amend the contract in order to extend the period of agreement, update the scope and budget to allow for the continuance of services.

CTR Library Project Link
https://library.ctr.utexas.edu/
Presto/search/SearchResults.
aspx?q=0-6999-21

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7001	Utilizing Steel Fibers as Concrete Reinforcement in Bridge Decks	Active

Project Start Date: 05/17/2019
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,082,759.78
CTR Total Project Spend: $1,065,375.48

Completion Date: 12/31/2023
University #2:
Total Project Budget: $1,082,759.78
CTR FY23 Budget: $84,830.06
CTR FY23 Spend: $84,816.25

Project Description: The Performing Agency shall perform work aimed toward the development of steel fiber reinforced concrete (SFRC) mix designs and optimized top mat reinforcement detailing for use in fiber-reinforced cast-in-place (CIP) slabs constructed on top of stay-in-place precast concrete panels (PCP). The findings from this research shall be developed through the performance of targeted SFRC mixture design and material testing activities, numerical modeling activities used to assess SFRC CIP-PCP bridge deck structural performance, and the execution of idealized and full-scale SFRC bridge deck structural testing programs to validate the suitability of the crack control and load carrying abilities of proposed SFRC CIP slab design recommendations.

Approved Work Program Revisions

No. of FY23 Amendments: One
Amendment #3:

Amend the contract to extend the termination date, the project schedule to allow the completion of full-scale testing due to delays in Task 6, extend Task 7 and Task 8.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7001

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7002	Evaluation of Geogrids for Asphalt Pavement Construction	Active

Project Start Date: 05/14/2019
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,194,503.05
CTR Total Project Spend: $887,203.40

Completion Date: 08/31/2024
University #2:
Total Project Budget: $1,194,503.05
CTR FY23 Budget: $258,498.11
**CTR FY23 Spend:** $173,354.48

Project Description: Geogrids have been used in several Receiving Agency Districts to reinforce Hot-Mix Asphalt (HMA) with the objective of minimizing reflective cracking. Recent field evaluations have revealed that polymeric geogrids within HMA resulted in an additional promising benefit; increasing structural capacity and consequently reducing the required thickness of hot-mix overlays. Despite strong field evidence, important questions remain concerning proper geogrid selection criteria for this new application, what properties to specify, and how to quantify the increased structural capacity. The Performing Agency shall: (1) evaluate different types of polymeric and glass geogrids; (2) instrument field test sections along SH21 to validate constructability and assess long-term field performance; and (3) translate the research findings into practical specifications.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7002
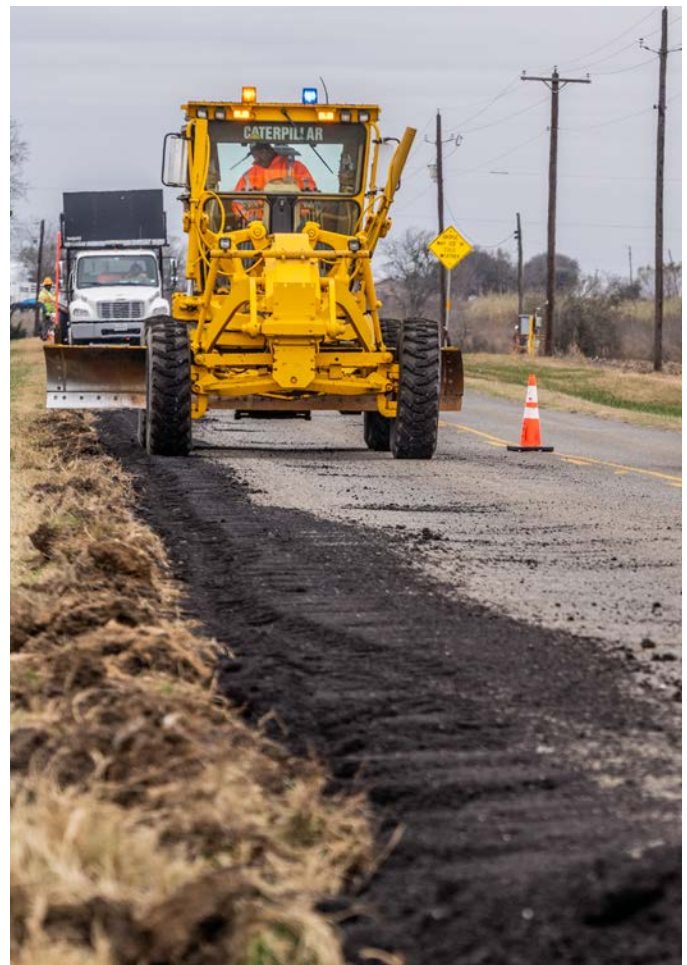
CTR Safety and Operations

Project Number	Project Name	Status
0-7007	Weather-Responsive Management Strategies	Closed

Project Start Date: 06/03/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $708,537.31
CTR Total Project Spend: $700,778.59

Completion Date: 06/30/2023
University #2:
Total Project Budget: $708,537.35
CTR FY23 Budget: $99,954.27
CTR FY23 Spend: $98,784.24

Project Description: Weather-responsive management and maintenance strategies are innovative approaches to traffic operations management and roadway maintenance that mitigate the effects of adverse weather on the transportation system. Desired outcomes of these strategies include reduced weather-related vehicle crashes, decreased delays, improved mobility, and environmental benefits. This project shall demonstrate a strategy to improve safety and reliability to reduce costs and improve dissemination of information to travelers via roadway ice maintenance and traffic operations integrations. The demonstrated strategy leverages mobile and connected vehicle data, as well as weather-related data sources, to closely track Receiving Agency ice prevention and response activities, public driving patterns, and regional precipitation. The outcome is to optimize the application of anti-icing agent and ice removal activities, as well as to inform travelers of road conditions and treatment progress. With this demonstration, this project enhances the value of current and future strategy implementation by showcasing data archiving and analysis processes that fit within the Receiving Agency IT architecture and cybersecurity model, actionable choices presented through decision support systems, better public awareness through relevant information dissemination strategies, system robustness through data quality checking, and better understanding through performance metrics. All of these elements are critical for any well-developed weather-responsive management and maintenance strategy.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7007

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7011	Evaluation of Seamless Bridges	Closed

Project Start Date: 07/19/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $810,497.00
CTR Total Project Spend: $771,422.75

Completion Date: 08/31/2023
University #2:
Total Project Budget: $810,497.00
**CTR FY23 Budget:** $111,790.00
CTR FY23 Spend: $126,122.40

Project Description: Conventional bridges use expansion joints to accommodate movements primarily caused by temperature changes in the bridge superstructure. However, water and contaminants that pass through the joints tend to accelerate deterioration of girders, bearings and substructure elements. The seamless bridge concept, which was first developed in Australia, eliminates the use of expansion joints between the bridge deck and the continuously reinforced concrete pavement (CRCP). Implementation of this technology has been reported to delay deterioration of bridge elements and totally eliminates the need for routine joint maintenance. In this project, the Research Team shall conduct fundamental and applied research techniques to develop comprehensive design guidelines for implementing seamless bridge technology in Texas. The primary goals of the project include the following: (a) characterize the interaction between CRCP in a transition slab and different base materials with and without bond breakers utilizing full-scale experiments, (b) develop modeling techniques to analyze the structural response of seamless bridge systems, © develop guidelines for determining the optimal length of the transition slab and corresponding reinforcing steel, (d) identify design issues associated with the use of a seamless connection for standard bridge structures, and monitor the field performance of a bridge constructed using a seamless transition.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7011
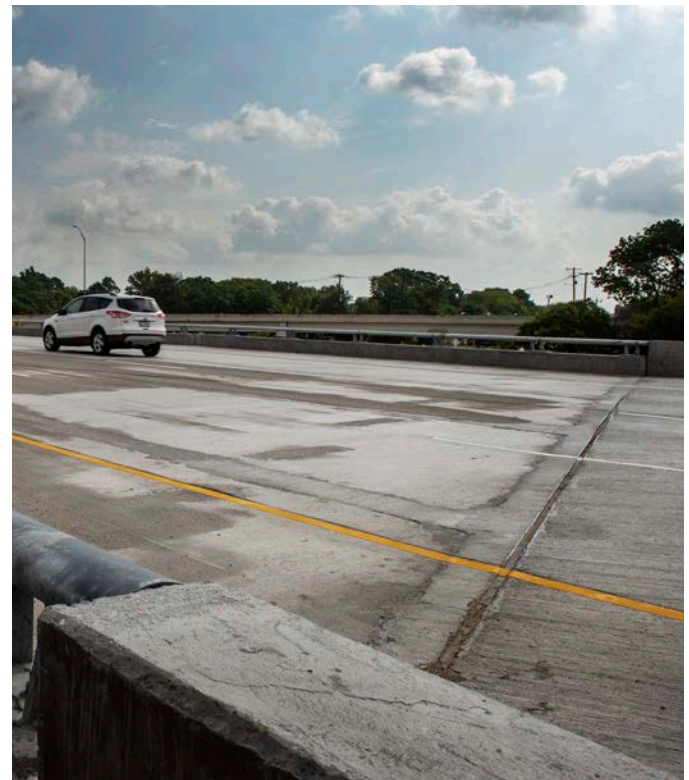
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7012	Development of Non-Fracture Critical Steel Box Straddle Caps	Closed

Project Start Date: 07/09/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $989,286.00
CTR Total Project Spend: $939,589.50

Completion Date: 05/31/2023
University #2:
Total Project Budget: $989,286.00
CTR FY23 Budget: $9,775.00
CTR FY23 Spend: $2,295.49

Project Description: Steel box straddle caps are commonly utilized in congested urban environments when intersecting roadways do not permit conventional piers. The high strength-to-weight ratio of steel makes the straddle caps efficient from a construction and performance perspective; however, the members are categorized as fracture-critical, necessitating more stringent design requirements and biennial hands-on inspections—creating significant long-term costs. The Performing Agency shall develop details that allow the straddle box caps to be classified as redundant members, removing the fracture-critical designation on the caps. The study shall not only target on new construction, but also evaluate methods of retrofitting existing caps to develop desired redundancy. The Performing Agency shall investigate the use of prestressing tendons/bars to provide redundancy to the steel box straddle caps. The methods of research include full-scale laboratory testing consisting of fatigue loading to initiate cracks and fracture tests under static loading on post-tensioned straddle box caps. Computational models shall be used to develop a comprehensive design methodology for system redundant straddle caps that are non-fracture-critical. The systems developed shall create significant benefits in both the life-cycle economy and long-term performance of steel straddle caps.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the contract to revise the termination date and the project schedule due to laboratory shutdowns which caused unforeseen delays as a result of COVID-19 impacts. The extension will allow the Performing Agency to complete Tasks 1, 8, 9 and 10.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7012

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7016	Develop Guidance for Structural Behavior of Tall Haunches in TxDOT Beam and Girder Bridges	Closed

Project Start Date: 07/10/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $990,349.00
CTR Total Project Spend: $980,614.53

Completion Date: 05/31/2023
University #2:
Total Project Budget: $990,349.00
CTR FY23 Budget: $55,563.00
CTR FY23 Spend: $45,995.08

Project Description: Deck haunches are commonly used on both prestressed concrete and structural steel girder bridges. The haunch is the area between the top of a bridge girder and the bottom of the concrete deck. Haunch geometry can be influenced by a variety of factors. A primary function of the haunch is to maintain a uniform deck thickness. Haunches are often needed to account for camber and cross-slope. Due to unusual geometric situations or design errors, beam and girder bridges sometimes require tall haunches, which calls into question the overall constructability and horizontal shear transfer between the girders and the deck. To date, no testing has been conducted to ensure the effectiveness of current TxDOT detailing practices. The proposed project will develop guidelines for analyzing and designing haunches having different heightsand reinforcement detailing. The research will include full-scale laboratory testing of a wide range of haunch details for both prestressed concrete and structural steel girder bridges. Detailed computational models will also be developed. A parametric study will represent the range of dimensions encountered for the vast majority of Texas bridges. Haunch analysis, design, and detailing guidelines will be provided at the conclusion of this project.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the contract to extend the termination date, update the project schedule to analyze the experimental data and allow comprehensive parametric study, and revise the Project Supervisor due to the Project Supervisor's leave of absence from Performing Agency.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7016
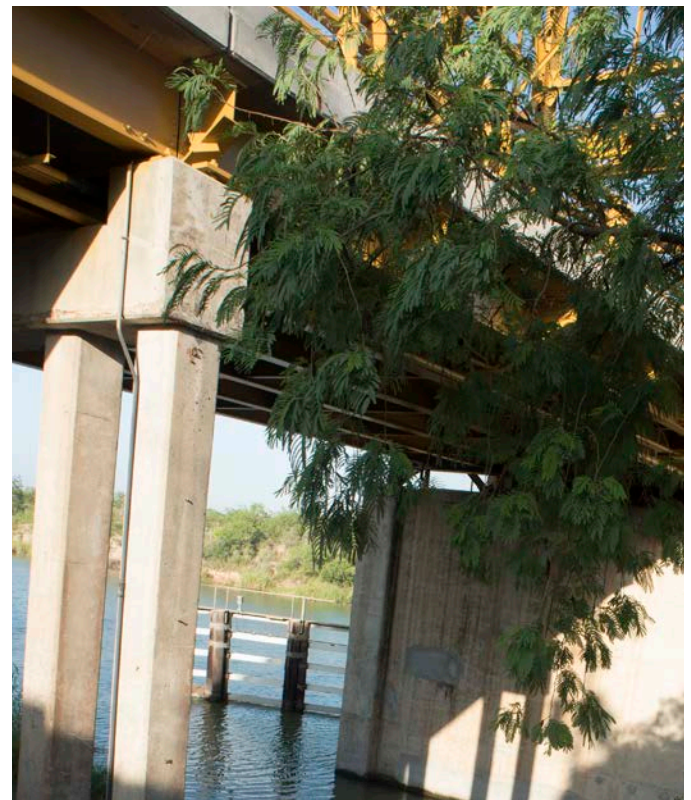
CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7028-01	Integrated SiteManager and Pavement Analyst Database on an Online Platform	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $139,964.98
CTR Total Project Spend: $74,665.98

Completion Date: 04/30/2024
University #2:
Total Project Budget: $139,964.98
CTR FY23 Budget: $96,022.25
CTR FY23 Spend: $74,665.98

Project Description: The Receiving Agency maintains several databases to record materials, construction, and performance information for roadway projects: materials and test records in the SiteManager database; construction related information in TxDOT Connect or Design and Constructions Information System; and performance measures in the Pavement Analyst database. Data from these databases has been compiled in a recent project to identify relationships between the materials and construction records and observed long-term performance of hot mix asphalt pavements. The objective of this project is to implement this work through a visualization and analysis tool via a commercially available software and that can be accessed in near real time by the Receiving Agency on an ongoing basis. The Performing Agency shall utilize Tableau Prep Builder to integrate data from all data sources and develop the visualization and identification interface on Tableau Packaged Workbook. In addition to the aforementioned databases, maintenance history from Compass and GIS information from the Receiving Agency Open Portal to locate and map all projects shall be incorporated. A text and visual guide on how to use the Tableau interface shall be developed, and an online workshop shall be held to demonstrate the functionality of the interface to the Receiving Agency's Divisions and Districts. Such a tool shall allow the Receiving Agency to investigate all construction and maintenance projects performed on a pavement section and understand the effect of materials, design and construction processes on the long-term pavement performance.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.
aspx?q=0-7028-01

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7031-01	Develop Efficient Prediction Model of Highway Friction on an Annual Basis on Texas Network	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $357,134.51
CTR Total Project Spend: $31,323.64

Completion Date: 08/31/2024
University #2:
Total Project Budget: $357,134.51
CTR FY23 Budget: $181,555.85
CTR FY23 Spend: $31,323.64

Project Description: The number of wet-weather crashes is a significant problem in Texas, consequently, the provision of pavement surfaces with adequate skid resistance or friction is of utmost importance for promoting public safety and saving lives. Measuring skid numbers for the entire Texas roadway network on an annual basis is challenging and inefficient because of the regular stops necessary to refill the water tanks. Fortunately, recent laser technology allows the measurement of texture at high resolution and speed in an efficient manner. Today, a contractor collects only macrotexture for Receiving Agency and delivers mean profile depth (MPD), which is a very poor predictor of skid. Consequently, the Receiving Agency personnel have to go out and collect skid data at a high cost to calculate skid numbers. Currently the Receiving Agency collects skid resistance on about 33% of their network on an annual basis (approximately 50% of the Interstate system and 25% of the non-Interstate system). The objective of this project is to (i) continue the work that started under Receiving Agency's Project 0-7031, (ii) enhance the system that was developed as part of that project and (iii) update the models developed by collecting texture and skid on, at least 3,000 additional pavement sections distributed in at least six different Districts. This information shall be used to calibrate and validate equations to predict friction and skid numbers with a high degree of accuracy. This research would result in an enhanced system to collect texture data at highway speed for the entire Texas on-system network on an annual basis. The system is intended to be compact and capable of retrofitting to any surveying vehicle with minimal time and effort. This shall provide not only savings but additional safety to operations.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7031-01

CTR Strategy and Innovation

Project Number	Project Name	Status
0-7033	Defining Operational Design Domains (ODDs) for the Safe Blending of Levels 0-4 Connected and Autonomous Vehicles (CAVs) in the Traffic Stream	Closed

Project Start Date: 09/01/2016
Lead University: CTR
Project Status: Closed
CTR Total Budget: $643,666.00
CTR Total Project Spend: $636,703.38

Completion Date: 05/31/2023
University #2:
Total Project Budget: $643,666.00
CTR FY23 Budget: $46,386.00
CTR FY23 Spend: $39,392.96

Project Description: This project explores the establishment of a robust Operational Design Domain (ODD) framework for automated driving systems. The project will use a hybrid policy and technical process to define, prioritize, and simulate and test ODDs for autonomous driving.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7033
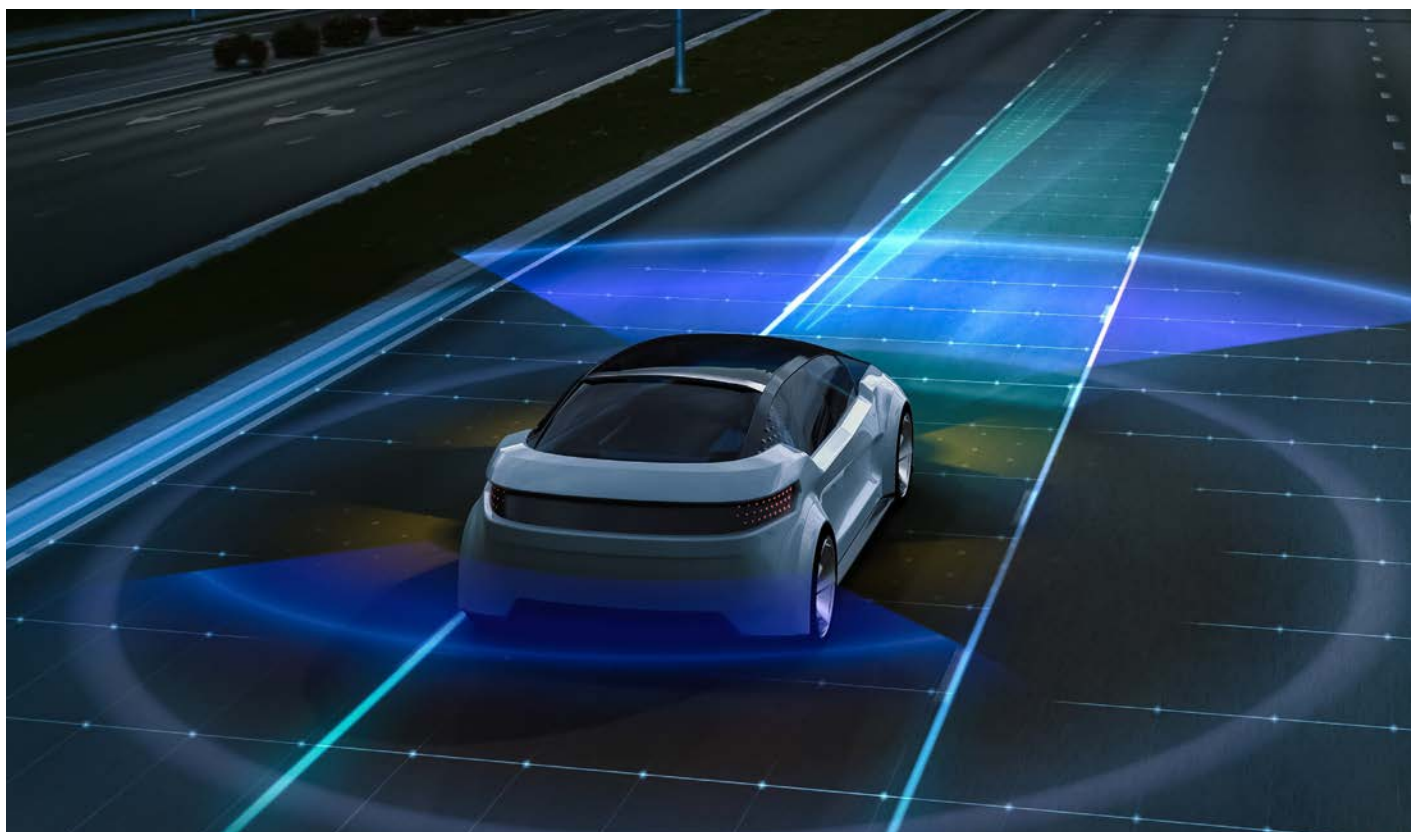
CTR Strategy and Innovation

Project Number	Project Name	Status
0-7034	Exploring the Use of Artificial Intelligence to Leverage TxDOT Data for Enhanced Corridor Management and Operations	Active

Project Start Date: 08/01/2019
Lead University: CTR
Project Status: Active
CTR Total Budget: $608,862.28
CTR Total Project Spend: $570,310.36

Completion Date: 10/31/2023
University #2:
Total Project Budget: $608,862.28
CTR FY23 Budget: $94,642.54
CTR FY23 Spend: $90,897.49

Project Description: This project will develop a thorough understanding of the concrete and tangible benefits that artificial intelligence (AI) may offer to the Receiving Agency when considering the vast volumes of data currently collected and will explore emerging planning and operations applications. A twofold research approach will provide both a broad, high-level summary of the state of the art/practice in AI and its relevance to the Receiving Agency, and an in-depth analysis of one or two selected applications. The review of the state of the art will include a literature and data survey and creation of a prospectus summarizing the techniques and tools relevant to the Receiving Agency given data availability and planning/operation priorities. For the use cases, the Performing Agency will consider applications involving system performance estimation and system control using Markov and non-Markov decision processes. After completing a preliminary research phase, the Performing Agency will host a workshop for the Receiving Agency and its partners to demonstrate the explored concepts and collect feedback to inform the model application and testing. Project deliverables will include a comprehensive report, including a quantitative and qualitative evaluation of the selected use cases, and access to the datasets and code-base used in this project.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #5:
Amend the contract to update the project schedule, revise the budget and termination date to allow for additional research time for completion of the project. The FY23 Budget is decreased from $107,767.54 to $94,642.54; the FY24 Budget is established at $13,125.00; Total Project Budget Estimate will remain at $608,862.28.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7034
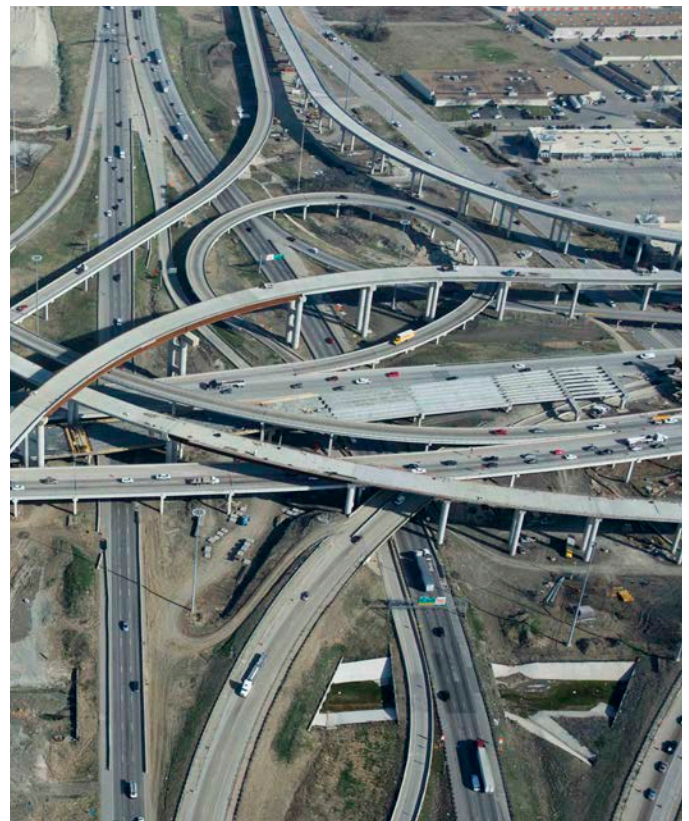
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7039	Development of Knowledge in the Application of Strut-and-Tie Modeling	Closed

Project Start Date: 12/16/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $1,082,960.05
CTR Total Project Spend: $1,083,645.87

Completion Date: 05/31/2023
University #2:
Total Project Budget: $1,082,960.05
CTR FY23 Budget: $196,329.28
CTR FY23 Spend: $195,740.33

Project Description: The Performing Agency shall fill knowledge gaps in the 2017 AASHTO LRFD Bridge Design Specifications including but not limited to:

· Strength of nodes in which tension fields in three orthogonal direction are present.

· Stress concentrations observed at curved bar nodes (locations where the reinforcing bars change direction) can be critical. The tighter the radius of the bend, the higher these stresses are. Development of design recommendations for this special class of CTT nodes has not yet occurred in the U.S., due to lack of supporting test data. Developing key strategies to integrate critical technologies into the Texas transportation system.

· Triaxial confinement benefits offered by confining reinforcement have not been researched and codified.

· AASHTO LRFD Bridge Design Specifications limit the spacing of crack control reinforcing to d/4 or 12 in, i.e., "d/4 limit". This limit can be relaxed, if supported by experimental evidence.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7039

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7041	Develop NextGen Texas Bridge Decks	Active

Project Start Date: 12/09/2019
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,195,069.27
CTR Total Project Spend: $1,078,723.48

Completion Date: 05/31/2024
University #2:
Total Project Budget: $1,195,069.27
CTR FY23 Budget: $216,286.79
CTR FY23 Spend: $216,286.29

Project Description: The Performing Agency shall conduct a comprehensive experimental and analytical investigation to develop appropriate design criteria for using partial-depth precast panels that can span the full width of bridge superstructure. The Performing Agency shall develop and validate a precast deck panel system with wire trusses that will integrate with precast panel practices in Texas. The Performing Agency shall study the behavior of full-scale bridge superstructure models under design loads, typical overloads, and at ultimate conditions. The Performing Agency shall develop and test standard details for partial-depth deck panels in the laboratory for use in the Receiving Agency's standards for bridges constructed in Texas. The Performing Agency shall provide design guidelines that reflect the knowledge developed during the course of the project's experimental and analytical investigations.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:
Amend the contract to extend the period of agreement and update the project schedule and budget to allow for the completion of testing due to an unforeseen delay in the full-scale bridge deck testing (Task 4) and fatigue testing (Task 5). The FY2023 budget shall be increased by $59,834.61 from $156,452.18 to $216,286.79. An FY2024 budget is established for $68,536.48. The Total Itemized Project Budget Estimate is increased by $128,371.08 from $1,066,698.18 to $1,195,069.27.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7041
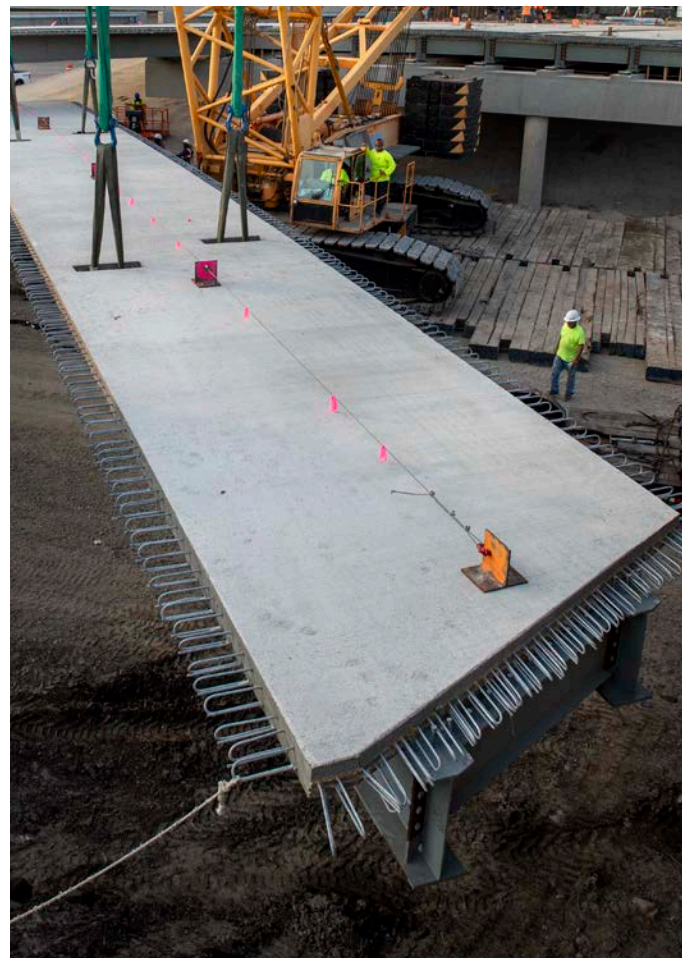
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7042	Use of Larger Diameter Shear Studs for Composite Steel Bridges	Active

Project Start Date: 12/17/2019
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,267,152.60
CTR Total Project Spend: $1,115,097.40

Completion Date: 10/31/2023
University #2:
Total Project Budget: $1,267,152.60
CTR FY23 Budget: $339,150.00
CTR FY23 Spend: $211,317.76

Project Description: Efficient steel bridge girder design makes use of composite action between the concrete bridge deck and the steel girders. Shear studs welded to the girder top flange provide the critical link between the deck and girders. Satisfying AASHTO fatigue requirements normally leads to a very large number of shear studs, which makes placing partial-depth precast panels extremely difficult and results in a safety hazard for workers during erection or early construction stages. Using larger-diameter shear studs shall significantly reduce the number of studs required on composite steel girders. This project focuses on the feasibility of using shear stud diameters greater than 7/8 inch for composite steel bridge construction, and the development of design guidelines for evaluating the static and fatigue strength of larger diameter shear studs. The Performing Agency shall perform:

- laboratory testing using push-out or similar specimens to obtain data to evaluate both the static strength and fatigue strength of larger diameter shear studs.

- large-scale composite beam tests and associated computational studies to provide an evaluation of the performance of composite steel bridge girders with larger diameter shear studs.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #5:
Amend the contract to update the Work Plan, Budget, and Project Schedule to extend Task 7 to allow completion of the large-scale beam tests. The FY2023 budget is decreased by $5,250.00 from $344,400.00 to $339,150.00. The FY2024 budget is established at $5,250.00. The Itemized Project Budget Estimate remains $1,267,152.60.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7042

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7060	Measuring Faulting on Jointed Concrete Pavements	Closed

Project Start Date: 12/17/2019
Lead University: CTR
Project Status: Closed
CTR Total Budget: $499,769.03
CTR Total Project Spend: $400,438.09

Completion Date: 08/31/2023
University #2:
Total Project Budget: $499,769.03
CTR FY23 Budget: $81,868.03
CTR FY23 Spend: $44,004.41

Project Description: On an annual basis, the Receiving Agency collects most of its required distress information through a contracted vendor. However, faulting, one of the essential distresses, is estimated from longitudinal profile data, which is neither reliable nor accurate enough for establishing performance measures. Recent reforms enacted by MAP-21 (Moving Ahead for Progress in the 21st Century Act) include transitioning to a performance-based program, including establishing national performance goals for Federal-aid highway programs. The FAST Act (Fixing America's Surface Transportation Act) continues this performance management approach, within which states invest resources in projects that collectively shall make progress toward national goals. The FAST Act shortens the timeframe for states and metropolitan planning organizations to make progress toward meeting performance targets under the National Highway Performance Program and clarifies the significant progress timeline for the Highway Safety Improvement Program performance targets. It is under this framework that the Performing Agency shall develop a reliable measurement system to identify, measure, and calculate faulting on all jointed concrete pavements(JCP). In particular, this project has the objective of developing a system to collect and verify faulting data of JCP in an accurate manner at highway speeds during daylight conditions. This project shall deliver end products to meet a TRL Level 8.

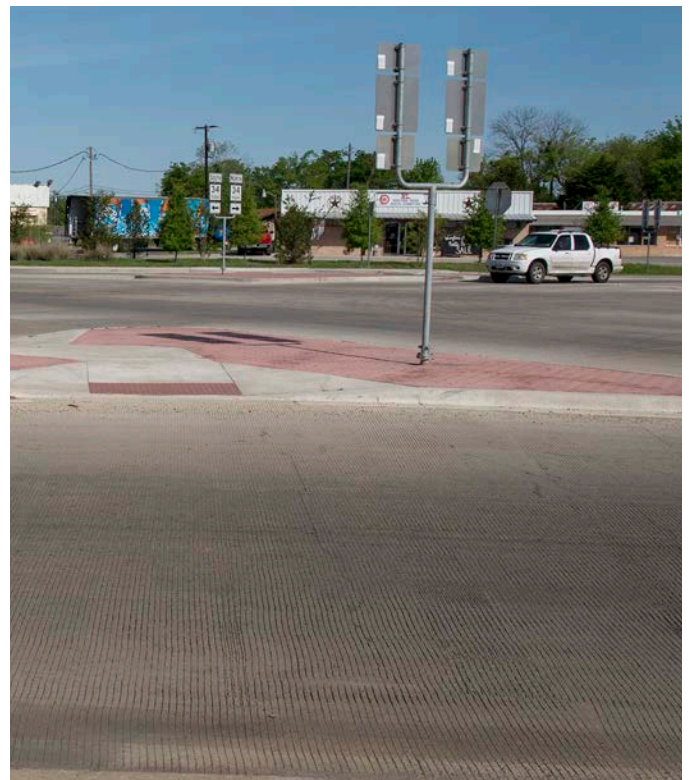### Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the contract to revise the termination date, reallocate funds in the FY23 budget categories and update the project schedule to allow more time to complete final tasks and deliverables.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7060

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7061	Optimizing Laboratory Curing Conditions for Hot Mix Asphalt to Better Simulate Field Behavior	Closed

Project Start Date: 12/09/2019
Lead University: UTEP
Project Status: Closed
CTR Total Budget: $406,498.56
CTR Total Project Spend: $346,018.66

Completion Date: 01/31/2023
University #2: CTR
Total Project Budget: $900,498.56
CTR FY23 Budget: $38,893.66
CTR FY23 Spend: $33,049.77

Project Description: The Performing Agencies shall investigate existing and novel laboratory methods to determine protocols that simulate the two critical aging states needed to design an asphalt mixture to resist rutting and cracking, and provide information on how curing effects the physical and engineering performance of binders and mixtures. The Performing Agencies shall provide findings that can be used to cure asphalt mixtures as their rutting and cracking resistance is being evaluated as a part of a mix design process (e.g., as in the case of a balanced mix design).

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7061

CTR Planning and Environmental

Project Number	Project Name	Status
0-7071	Evaluate Geophysical Methods to Detect Underground Voids	Closed

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Closed
CTR Total Budget: $352,134.12
CTR Total Project Spend: $332,187.50

Completion Date: 07/31/2023
University #2:
Total Project Budget: $352,134.12
CTR FY23 Budget: $48,799.94
CTR FY23 Spend: $48,629.80

Project Description: Construction delays and costly change orders can occur when subsurface voids are unexpectedly encountered on transportation projects. Unfortunately, voids and caves are common in the karst geology beneath two of the four most populated metropolitan areas in Texas (Austin and San Antonio). This project shall assist in assessment of subsurface conditions by investigating and testing the most promising surface-deployed geophysical imaging methods that can be used to identify voids. First, the Performing Agency shall perform a thorough literature review of imaging methods such as Ground Penetrating Radar (GPR), Electrical Resistivity Tomography (ERT), Multi-channel Analysis of Surface Waves (MASW), and Full Waveform Inversion (FWI) of stress waves to investigate their strengths, weaknesses, and applicability to the clay-over-limestone karst geology of central Texas. Second, the Performing Agency shall conduct 2D/3D imaging synthetic and field trial tests using each of the most promising methods, the latter at two sites chosen by the Receiving Agency where the subsurface is known to include voids. Third, the Performing Agency shall evaluate the performance of each method considering its accuracy, cost, advantages, and limitations. Fourth, based on our findings, the Performing Agency shall recommend a strategy that will be most useful for identifying voids on infrastructure projects.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #2:
Amend the budget due to delays in recruiting graduate students in the beginning phases of the project, which has caused unforeseen delays as a result of COVID-19 impacts. This will allow for a second student in the last phase of the project to assist in completion of the already-planned research and the project deliverables. Increase the FY23 budget by $23,609.00 from $25,190.94 to $48,799.94. The Itemized Project Budget Estimate Project Budget is increased by $23,609.00 from $328,525.12 to $352,134.12.

Amendment #3:
Amend the contract to revise the termination date and the project schedule to allow the Performing Agency to more accurately assess the geophysical methods under investigation and to allow for field tests to be completed and the data to be incorporated into the deliverable.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7071
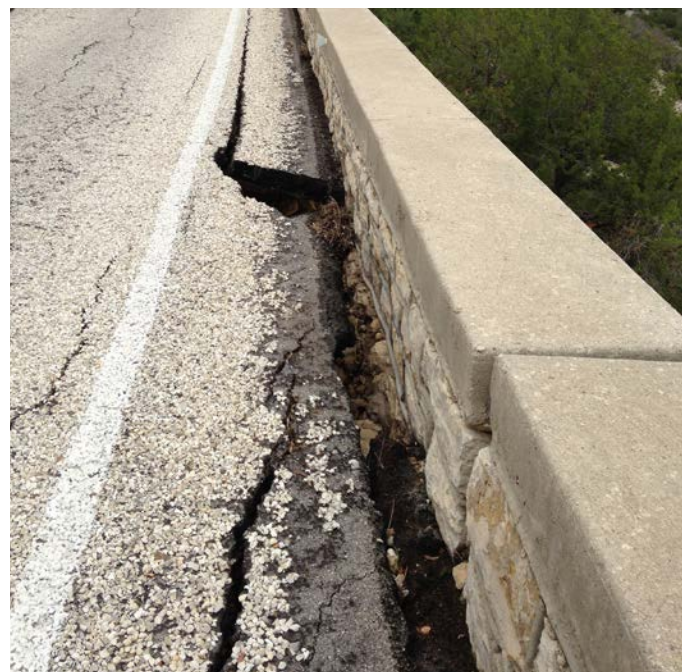
CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7073	Improving Testing Requirements in Item 300 Of TxDOT Standard Specifications	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $467,451.17
CTR Total Project Spend: $267,110.42

Completion Date: 08/31/2025
University #2: TTI
Total Project Budget: $1,130,000.00
CTR FY23 Budget: $103,004.09
CTR FY23 Spend: $99,402.19

Project Description: The Receiving Agency's standard specification Item 300, Asphalts, Oils, and Emulsions, includes more than 48 different test procedures or conditioning procedures for asphalt concrete (AC) graded binders (12), cutbacks (8), emulsified binders (17), and performance-graded (PG) binders (11) used in different pavement construction and maintenance applications. This does not include testing requirements for recycling agents, crack sealants, or asphalt rubber binder. The Receiving Agency regularly performs many of these tests for quality management or quality assurance purposes. This test schedule presents a challenge for the binder lab in terms of maintaining test procedures, acquiring and maintaining test equipment, calibrating equipment, and training personnel. Some specification tests are legacy tests that once were the state-of-the-art and thought to be related to asphalt binder performance. Many of these legacy tests are not used in more recently developed specifications, as other tests are now available and may be more indicative of performance. This project seeks to review the Receiving Agency's Item 300 binder specifications and tests for relevance; determine whether they assess safety, performance, or constructability; and take into account accuracy, efficiency, and environmental considerations. The project shall also make recommendations for changes.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:
Amend the contract to extend the termination date, revise the Work Plan to correct task numbering and add additional tasks, add the FY 2024 and FY 2025 budgets, and extend the Project Schedule to advance the impact of the project with incorporating findings from other national research studies which were recently completed. Performing Agency 1: The FY 2021 budget remains $97,548.83. The FY 2022 budget remains $89,447.08. The FY 2023 budget remains $103,004.09. The FY 2024 budget is established at $134,889.57. The FY 2025 budget is established at $ $140,110.43. Total Project Budget is increased by $275,000.00 from $290,000.00 to $565,000.00. Performing Agency 2: The FY 2021 budget remains $100,000.00. The FY 2022 budget remains $100,000.00. The FY 2023 budget remains $90,000.00. The FY 2024 budget is established at $125,000.00. The FY 2025 budget is established at $150,000.00. Total Project Budget is increased by $275,000.00 from $290,000.00 to $565,000.00. The Itemized Project Budget Estimate is increased by $550,000.00 from $580,000.00 to $1,130,000.00.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7073

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7074	Increase the Allowable Content of Recycled Crushed Concrete Fine Aggregate in Class P Concrete	Closed

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Closed
CTR Total Budget: $357,000.00
CTR Total Project Spend: $252,449.14

Completion Date: 08/31/2023
University #2:
Total Project Budget: $357,000.00
CTR FY23 Budget: $58,500.00
CTR FY23 Spend: $21,045.72

Project Description: Over 140 million tons of recycled concrete aggregate (RCA) are produced in the United States per year, and this material has been used in a host of transportation infrastructure applications, including fills, embankments, bases, subbases, and concrete pavements. Currently, Receiving Agency limits the maximum amount of recycled crushed concrete fine aggregate (RCFA) allowed in Class P paving concrete to 20% (by mass replacement of virgin sand). However, this limit is somewhat arbitrary, and in fact, much higher replacement levels have been used successfully by Receiving Agency and other state highway agencies in the past. The goal of this project is to evaluate the key technical and construction-related issues that potentially limit the RCFA content in new concrete pavements, and based on laboratory and field evaluations, provide recommendations on maximum RCFA contents. This shall be accomplished by performing a thorough review of literature and current practice, conducting a comprehensive laboratory investigation, and constructing and monitoring new pavement sections containing higher amounts of RCFA. Based on the findings from this project, recommendations shall be made to revise existing Receiving Agency recommended practice and specifications to potentially allow for RCFA contents above the current 20 percent threshold.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/
SearchResults.aspx?q=0-7074

CTR Safety and Operations

Project Number	Project Name	Status
0-7087	Develop Standards for Temporary Concrete Median Barrier in Flood-Prone Areas	Active

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Active
CTR Total Budget: $205,071.50
CTR Total Project Spend: $195,233.80

Completion Date: 10/31/2023
University #2: CTR
Total Project Budget: $638,887.25
CTR FY23 Budget: $17,073.16
CTR FY23 Spend: $12,274.35

Project Description: Portable concrete median barriers are used in work zones to prevent serious cross-median crashes and vehicle penetration in work zones. These barriers are used on highways to provide positive containment of vehicles and to reduce maintenance and repair needs. When implemented in flood-prone areas, portable concrete median barriers can act as a dam for flood waters until the damming of water causes the barrier to displace and break, as recently occurred in the Houston and Beaumont Districts during severe storms. These situations required significant repair before the highways could be reopened and the level of safety for motorists restored. Any required barrier maintenance or repair increases risk to maintenance personnel and can result in significant congestion if a lane closure is required. There is a need to develop and evaluate an appropriate portable concrete median barrier in compliance with the 2016 edition of the American Association of State Highway and Transportation (AASHTO) Manual for Assessing Safety Hardware (MASH) Test Level (TL-3) for implementation in flood-prone areas. To meet this objective, the Performing Agencies shall design such a barrier to accommodate passage of flood water, to decrease risk to motorists, and to reduce level of damage to the highway.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #2:
Amend the contract to extend the termination date and to update the Project Schedule due to delays in the construction of the barriers needed for testing and to allow time for full-scale crash testing and project documentation.

Amendment #3:
Amend the contract to extend the termination date, to update the Project Schedule, and to revise Work Plan to perform additional testing. TTI: The FY 2021 budget remains $109,897.00; the FY 2022 budget remains $91,587.50; the FY 2023 budget increases by $65,885.00 from $150,233.75 to $216,118.75; the FY 2024 budget is established at $16,212.50; TTI's Total Project Budget increases by $82,097.50 from $351,718.25 to $433,815.75. CTR: The FY 2021 budget remains $105,554.50; the FY 2022 budget remains $80,493.59; the FY 2023 budget increases by $4,798.00 from 12,275.16 to $17,073.16; the FY 2024 budget is established at $1,950.25; CTR's Total Project Budget increases by $6,748.25 from $198,323.25 to $205,071.50. The Itemized Project Budget Estimate increases by $88,845.75 from $550,041.50 to $638,887.25.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7087

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7088	Develop Closure Joint Materials Specification and Evaluate Performance for Side-By-Side Accelerated Bridge Construction (ABC) Superstructure Systems	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $832,093.98
CTR Total Project Spend: $456,173.28

Completion Date: 05/31/2024
University #2:
Total Project Budget: $832,093.98
CTR FY23 Budget: $271,355.26
CTR FY23 Spend: $72,343.90

Project Description: The Performing Agency shall develop, investigate, and implement optimized concrete mixtures to be used in closure pour connections between precast elements in side-by-side accelerated bridge construction (ABC) superstructure systems. The Performing Agency shall:

- Involve the use of innovative materials and mixture proportions that are intended to provide high early strengths to facilitate accelerated bridge construction, while ensuring that good long-term durability is also achieved.

- Develop mixtures including rapid-setting, fiber-reinforced concrete (RSFRC) and ultra-high-performance concrete (UHPC).

- Evaluate in the laboratory (materials and full-scale structural testing) and on outdoor exposures to fully characterize the critical fresh, hardened, structural, and durability properties that are need for closure pour connections.

- Select for full-scale implementation and monitoring in ABC projects scheduled for construction in the Amarillo, Bryan, and Dallas Districts based on the findings of the literature review and laboratory/exposure site tests, candidate RSFRC and UHPC mixtures.

- Develop a suite of mixtures by developing a wide range of mixtures with varying rheological properties, strength gain characteristics, and toughness values from which the Receiving Agency may select for any given closure pour connection.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to update the project schedule to reflect Tasks 4 and 5 due to availability of ABC bridges under construction COVID related scheduling challenges and delays of the large-scale testing for Task 4.

Amendment #2:
Amend the contract to extend the termination date and revise the budget and the project schedule to facilitate the completion of large-scale structural testing, the continuation of long-term durability testing, and additional monitoring of UHPC bridges in Amarillo and Bryan Districts. The FY 2023 Budget is remains $271,355.26; the FY 2024 budget is established at $53,593.98; the Itemized Project Budget Estimate is increased by $53,593.98 from $778,500.00 to $832,093.98.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7088

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7089	Develop and Validate Precast Column Solutions for Texas Bridges	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,065,724.09
CTR Total Project Spend: $930,361.11

Completion Date: 08/31/2024
University #2:
Total Project Budget: $1,065,724.09
CTR FY23 Budget: $354,311.28
CTR FY23 Spend: $315,966.86

Project Description: The Performing Agency shall develop and validate practical standard designs and connection details for precast concrete columns. The Performing Agency shall provide the following:

- Develop cost-effective bridge column solutions employing precast solid sections and precast hollow sections with a cast-in-place (CIP) core.

- Characterize the composite behavior between precast elements and CIP concrete in precast shell columns and socket connections.

- Conduct large-scale laboratory tests to validate the constructability and structural performance of the proposed precast column systems and connections.

- Develop design guidelines and draft specifications for implementation of precast columns in Texas bridges.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:
Amend the contract to extend the termination date, revise the project schedule and budget to allow the completion of full-scale testing due to an unforeseen delay in Task 5 and Task 7. The FY 2021 Budget remains $269,145.46. The FY 2022 Budget remains $367,742.98. The FY 2023 Budget remains $354,311.28. The FY 2024 Budget is established at $74,524.37. The Itemized Project Budget Estimate is increased by $74,524.37 from $991,199.72 to $1,065,724.09.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7089
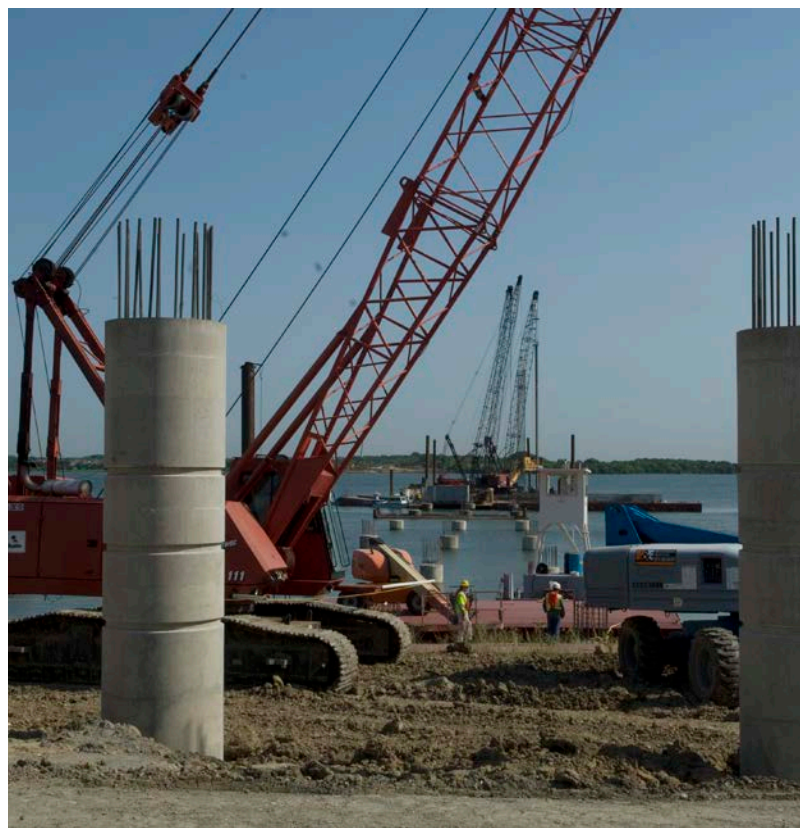
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7090	Evaluate the Deployment of High Strength Reinforcing Steel in Texas	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,175,887.21
CTR Total Project Spend: $992,240.56

Completion Date: 08/31/2024
University #2:
Total Project Budget: $1,175,887.21
CTR FY23 Budget: $381,259.85
CTR FY23 Spend: $381,251.71

Project Description: The Performing Agency shall:

- Demystify the use of high strength reinforcing steel in Texas bridge design in Phase 1. This shall be accomplished through examination of Texas bridge components and systems. Phase 1 shall address where and when it makes sense to use high strength reinforcing, what benefits can be realized, who else is using high strength reinforcing and how they are using it.Conduct large-scale laboratory tests to validate the constructability and structural performance of the proposed precast column systems and connections.

- Supplement Phase 1 through a series of analytical and experimental test programs covering a wide range of structural bridge components in Phase 2. This shall include realistically scaled structural testing in combination with numerical modeling to address data gaps related to serviceability performance and ultimate strength behavior.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7090
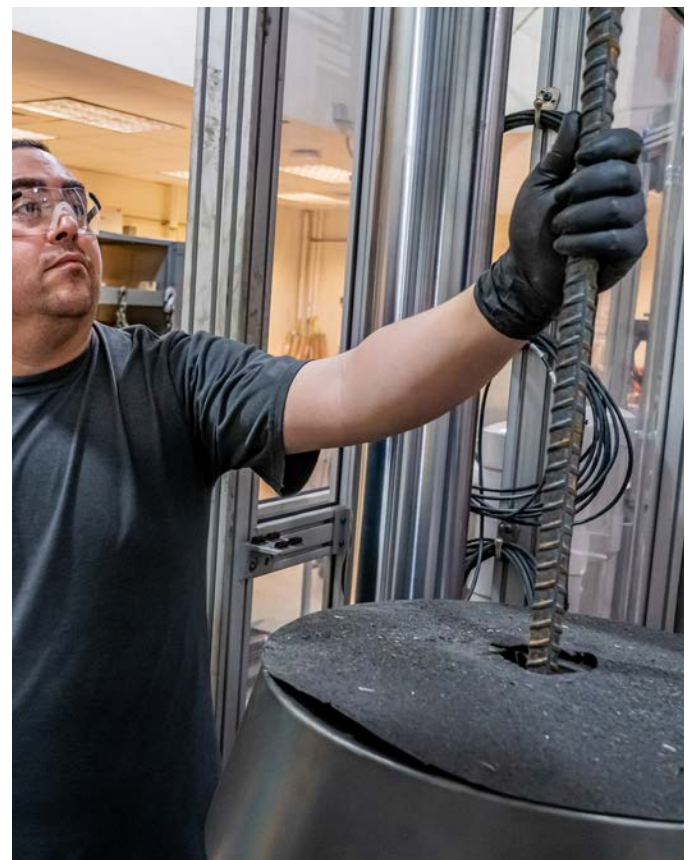
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7093	Develop Refined Design Methods for Lean-On Bracing	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $600,000.00
CTR Total Project Spend: $528,978.62

Completion Date: 01/31/2024
University #2: TTI
Total Project Budget: $980,000.00
CTR FY23 Budget: $185,938.00
CTR FY23 Spend: $161,869.64

Project Description: The Performing Agencies shall instrument and conduct field monitoring of bridges with lean-on bracing identified in Task 3. The monitoring shall include bridges under construction and also completed bridges subjected to controlled loading using trucks to better understand the behavior described in Tasks 2, 4 and 7. The Performing Agencies shall carry out parametric Finite Element Analyses (FEA) along with the field monitoring and develop improved guidelines to facilitate widespread use of lean-on bracing applications in Texas bridges.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to revise the work plan and the budget to add a subcontractor due to the transfer of a research team member and student for Performing Agency 2. Performing Agency 1: The FY 2023 Budget remains $225,000.00. The Performing Agency 1 Total Project Budget remains $600,000.00. Performing Agency 2: The FY 2023 Budget remains $142,500.00. The Performing Agency 2 Total Project Budget remains $380,000.00. The Itemized Project Budget Estimate remains $980,000.00.

Amendment #2:
Amend the contract to to revise the term date, the FY23 and FY24 budgets and schedule to allow the research team to complete the parametric finite element analyses and to develop suitable design recommendations. Decrease CTR's FY23 budget by $39,062.00 from $225,000.00 to $185,938.00. Establish a FY24 budget for CTR of $39,062.00. CTR's Total Project Budget remains $600,000.00 Decrease TTI's FY23 budget by $33,767.00 from $142,500.00 to $108,733.00. Establish a FY24 budget for TTI of $33,767.00. TTI's Total Project Budget remains $380,000.00. The Itemized Project Budget Estimate remains the same.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7093

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7095	Evaluate Improved Streamflow Measurement at TxDOT Bridges	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
CTR Total Budget: $3,057,491.33
CTR Total Project Spend: $2,879,459.33

Completion Date: 10/31/2023
University #2: USGS
Total Project Budget: $6,602,641.36
CTR FY23 Budget: $620,944.78
CTR FY23 Spend: $604,737.96

Project Description: The Receiving Agency maintains 30,000 bridges, some of which have been threatened by flooding, especially during the past four years. Better information on forecast flood inundation would help anticipate bridge and road flooding; inform decisions before, during, and after flooding; and help deploy resources for bridge inspection after flooding is over. The National Weather Service began in August 2016 operating a National Water Model, continually providing real-time forecasting on 190,000 miles of Texas streams and rivers. This project shall establish and maintain a Receiving Agency Flood Monitoring Network that consists of 80 gauges—60 new gauges installed as part of this project and 20 existing gauges installed as part of a previous Receiving Agency project. The new gauges shall be located in watersheds as defined by the USGS or TWDB, selected to provide a range of observation on main stem and tributary rivers and on soil and slope conditions in Texas river and coastal basins, and shall be complementary to existing observation networks. Observational data from the gauges and flood forecast information shall be made accessible through a Receiving Agency Flood Forecast System and Operational Data Website.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #3:
Amend the contract to revise the budget, scope, and project schedule and add a subcontractor due to roadway locations to accurately depict on-system roadways on flood related mapping tools during the flood emergency response exercises. Performing Agency 1 (CTR): The FY23 budget is increased by $78,250.00 from $542,495.01 to $620,745.01. The Performing Agency 1 Total Project Budget shall increase by $78.250.00 from $2,836,439.00 to $2,914,689.00. Performing Agency 2 (USGS): The FY2023 budget remains $1,334,000.00. The Total Budget for Performing Agency 2 remains $3,545,150.00. The Itemized Project Budget Estimate increased by $78,250.00 from $6,381,589.00 to $6,459,839.00.

Amendment #4:
Amend the contract to extend the termination date, add scope, revise the budget, and update the project schedule to complete the Streamflow II deliverables. CTR budget: The FY2021 budget remains $1,728,999.21; The FY2022 budget remains $564,944.78; The FY2023 budget remains $620,745.01; The FY2024 budget is established for $142,802.36; CTR's Total Project Budget shall increase by $142,802.36 from $2,914,689.00 to $3,057,491.36. USGS budget: The FY2021 budget remains $893,350.00; The FY2022 budget remains $1,316,800.00; The FY2023 budget is decreased by $311,814.00 from $1,334,000.00 to $1,022,186.00; The FY2024 budget is established for $311,814.00. USGS's Total Project Budget remains $3,545,150.00. The Itemized Project Budget Estimate increased by $142,802.36 from $6,459,839.00 to $6,602,641.36.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7095

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7102	Develop Models for Field Performance of Friction and Skid Number	Active

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Active
CTR Total Budget: $471,872.25
CTR Total Project Spend: $277,523.44

Completion Date: 02/28/2024
University #2:
Total Project Budget: $471,872.25
CTR FY23 Budget: $172,756.64
CTR FY23 Spend: $136,563.34

Project Description: The Receiving Agency's Maintenance Division has recently implemented a comprehensive and more powerful pavement management system known as Pavement Analyst (PA). The new system is capable of prioritizing maintenance and rehabilitation (M&R) activities for different time horizons based on a series of decision trees that account for current distress levels, scores, traffic, location, environment, etc. The decision trees incorporate new variables, such as skid and texture which are correlated to the number of wet weather crashes. Controlling these variables shall significantly improve the safety of the Texas highway network. There are no current models for the prediction of skid or texture that can be used on Pavement Analyst. The existing models are based on laboratory characterization and the exponential decay rate is estimated from laboratory performance. The objective of this research project is to develop a performance model to predict pavement skid number as a function of time, for use in the Receiving Agency's pavement management system, i.e. Pavement Analyst. The Performing Agency shall develop models that account for field prediction of skid and texture, to be incorporated into Pavement Analyst and to aid in the selection of optimal M&R activities. These models shall also account for treatment type: PM, LRhb, MRhb, and HRhb.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7102

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7113	Determine Service and Ultimate Behavior for Bent to Column Joints in TxDOT Substructures	Active

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,275,132.89
CTR Total Project Spend: $638,984.76

Completion Date: 08/31/2025
University #2:
Total Project Budget: $1,275,132.89
CTR FY23 Budget: $378,309.79
CTR FY23 Spend: $378,306.94

Project Description: The Bridge Design Manual requires consideration of various extreme events such as lateral stream loads and debris accumulation during flooding, severe scouring, and loss of supports due to collision for multi-column bent cap design. Typically, column-to-cap connections are designed as simple supports. As a result, current/past details have no confinement in bent cap joints, and the longitudinal column reinforcement is not always fully developed into the cap. Detailing joints for developing plastic capacity, as well as to permit sufficient load redistribution, is a common strategy in design for extreme loading scenarios (e.g., seismic design). To accommodate this increased moment demand, the standard column-to-cap connection requires improved detailing techniques. The Performing Agency shall utilize analytical/computational methods and an experimental program to investigate the performance of bent cap connections with traditional and improved details. The Performing Agency shall provide practical, easily implementable design recommendations for column-bent connections through these activities:

- Reviewing literature to identify state-of-the-art detailing techniques and design parameters
- Performing analytical or computational analysis to determine moment demand induced by extreme events
- Developing improved detailing methods and retrofitting methods
- Conducting large-scale structural experiments to investigate the performance of various details
- Providing design guidelines for designers to account for the extreme events.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to extend the termination date, revise the Work Plan to design and test three additional specimens in Task 4, add the FY 2025 budget, and extend the Project Schedule to allow for the additional testing. The FY 2022 Budget remains $262,221.79. The FY 2023 Budget remains $378,309.79. The FY 2024 Budget remains $359,434.81. The FY 2025 Budget is established for $275,166.50. The Itemized Project Budget Estimate is increased by $275,166.50 from $999,966.39 to $1,275,132.89.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7113

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7115	Investigate Live Load Distribution and Stability of Prestressed Concrete Girders During Construction	Active

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Active
CTR Total Budget: $998,766.67
CTR Total Project Spend: $466,258.55

Completion Date: 01/15/2025
University #2: CTR
Total Project Budget: $998,766.67
CTR FY23 Budget: $352,562.00
CTR FY23 Spend: $256,488.98

Project Description: The Performing Agency shall focus on the stability of long-span prestressed concrete I- and U-girders during erection and construction. The Performing Agency shall consider the distribution of live load in the completed bridge as well the role of diaphragms in stability and live load distribution and develop methods of analysis of the girder behavior. The Performing Agency shall focus on the stability of long-span prestressed concrete I- and U-girders during erection and construction. The Performing Agency shall consider the distribution of live load in the completed bridge as well the role of diaphragms in stability and live load distribution and develop methods of analysis of the girder behavior.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7115
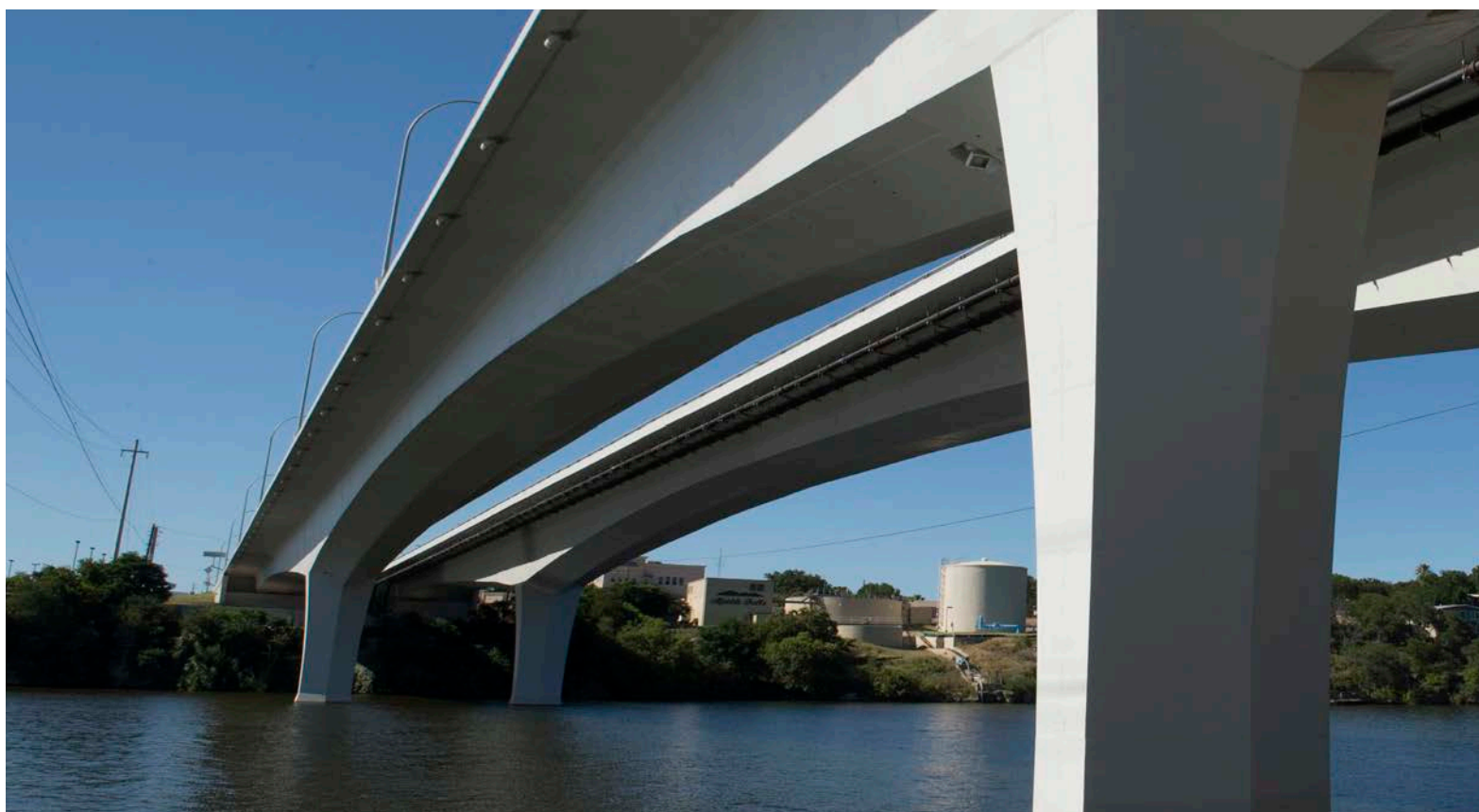
CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7116	Develop Deck and Overhang Design Guidelines for Sound Walls and Other Heavy Loads	Active

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Active
CTR Total Budget: $599,347.64
CTR Total Project Spend: $326,658.08

Completion Date: 08/31/2024
University #2:
Total Project Budget: $599,347.64
CTR FY23 Budget: $202,073.89
CTR FY23 Spend: $161,508.73

Project Description: Economic considerations typically encourage limiting the total number of girders across the width of most bridges. The width of bridge overhangs is normally proportioned so that the same girder sections can be used for both the interior and fascia girders. While many state transportation agencies have guidelines on sizing and detailing bridge overhangs, the current provisions are generally based on rules-of-thumb developed through experience. The Performing Agency shall develop guidelines for analyzing and designing bridge decks and overhangs to accommodate increased loads due to heavy rails or sound walls. Detailed computational models shall be developed and validated against available test data. A parametric study shall represent the range of design variables encountered for representative Texas bridges. The Performing Agency shall allow engineers to select the deck thickness, reinforcement detailing, and overhang geometry for a specific project given the bridge railing type, girder spacing, and total number of girders to which the load is distributed. The research shall consider commonly used girder systems and focus on identifying cross-sectional profiles that lead to improved performance for cases with heavier loads compared to standard overhangs.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:
Amend the contract to replace the Project Supervisor due to a leave of absence of the original Project Supervisor.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7116

CTR Structures and Hydraulics

Project Number	Project Name	Status
0-7117	Investigate the Strength of Struts Crossing Cold Joints	Active

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Active
CTR Total Budget: $1,366,368.89
CTR Total Project Spend: $653,819.92

Completion Date: 06/30/2025
University #2:
Total Project Budget: $1,366,368.89
CTR FY23 Budget: $391,061.51
CTR FY23 Spend: $391,059.04

Project Description: Cold joints commonly occur in concrete structures, whether they are a part of new construction (e.g., staged construction, roadway expansion projects, spliced girder bridges) or retrofit efforts (e.g., interface between the new structural elements and the older concrete components). In many cases, the cold joints occur within "disturbed regions" of a structure. The preferred design method in the AASHTO LRFD Bridge Design Specifications for disturbed regions is the strut-and-tie design method. While the commentary states that the capacity of cold joints should be checked in addition to traditional strut-and-tie design checks, there is no specific guidance provided for how to include shear-interface resistance in the context of the strut-and-tie design provisions. Thus, there is a need to develop specific design recommendations for use in the AASHTO LRFD Bridge Design Specifications, as well as the TxDOT Bridge Design Manual. The Performing Agency shall investigate the strength of struts crossing cold joints through a comprehensive analytical and experimental test program informed by a literature review and examination of common cold joint cases encountered by bridge designers. The design recommendations developed shall provide the guidance for implementing the necessary design checks at cold joints encountered in Texas bridge design practice.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7117

CTR Planning and Environmental

Project Number	Project Name	Status
0-7123	Define a Statewide Plan for a Sustainable Real-Time Travel Time Network for Texas Hurricane Evacuations and Safe Citizen Return	Closed

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Closed
CTR Total Budget: $399,868.11
CTR Total Project Spend: $345,046.46

Completion Date: 08/31/2023
University #2:
Total Project Budget: $399,868.11
CTR FY23 Budget: $203,041.56
CTR FY23 Spend: $158,989.59

Project Description: Hurricanes in Texas have posed considerable challenges to the evacuation of large populations and the transmission of information from the real-time traffic monitoring infrastructure. Given the societal, economic, and strategic significance of the hurricane evacuation route network, ensuring sufficient coverage and resilience against disruptions is essential. The limited available resources and the expanded network size, which includes rural areas, presents several technical and economic difficulties. To implement an effective strategy to address these issues, it is crucial for the Receiving Agency to develop a statewide plan for the sustainability and sufficiency of the evacuation network. The Performing Agency shall provide guidance for decision-makers in assessing the needs for determining additional monitoring stations on an expanded evacuation network including major Texas cities. To do so, the Performing Agency shall assess the availability and maintainability of different resources by collecting input from multiple stakeholders and developing a prioritized list of interventions based on socioeconomic criteria. Based on the projected usage of information transfer technologies, the project shall explore and recommend alternatives for failsafe systems.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to revise the project supervisor.

Amendment #2:
Amend the contract to extend the termination date, to revise the project schedule, and reallocate funds in the budget to allow additional time due to the recent change in Project Supervision. The FY2023 budget is decreased by $25,464.47 from $203,041.56 to $177,577.09. The FY 2024 budget is established at $25,464.47. The Total Itemized Project Budget Estimate remains $399,868.11.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7123

CTR Strategy and Innovation

Project Number	Project Name	Status
0-7129	Working with Autonomous Trucks to Improve Routine Maintenance Operations	Closed

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Closed
CTR Total Budget: $324,854.33
CTR Total Project Spend: $284,747.90

Completion Date: 08/31/2023
University #2:
Total Project Budget: $324,854.33
CTR FY23 Budget: $166,212.31
CTR FY23 Spend: $146,823.40

Project Description: Texas has become a major hub for automated trucking activities with companies operating routes daily. Quality infrastructure is essential for the safety of today's drivers and critical to the future of a growing connected and automated vehicle (CAV) market. Data generated by these advanced vehicles can unlock significant benefits and savings—especially for routine maintenance operations. Traditional maintenance data is sparse and lacks precision, relying heavily on Receiving Agency personnel to conduct inspections and drivers to report issues. By partnering with automated trucking companies, the Receiving Agency gains high-resolution, real-time data on pavement, signage and other assets that can be used to modernize routine maintenance operations. The Performing Agency shall develop and test an end-to-end Intelligent Routine Maintenance Framework—from detection to resolution. Key results shall include:

- A public-private partnership network of stakeholders who build consensus on standards and data sharing agreements
- An Intelligent Routine Maintenance Framework that integrates new CAV data sources, streamlines workflows, and monitors performance measures
- A prototype maintenance system tested with data from at least two automated trucking companies
- Infographics and visualization tools that communicate qualitative and quantitative project benefits
- A Sustainability and Growth Plan that includes complementary artificial intelligence (AI) solutions, cost-benefit analysis and procurement documents.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7129

CTR Planning and Environmental

Project Number	Project Name	Status
0-7134	Improve Traffic Analysis and Mobility Modeling Using Information and Communication Technologies	Closed

Project Start Date: 09/01/2021
Lead University: CTR
Project Status: Closed
CTR Total Budget: $195,908.55
CTR Total Project Spend: $191,728.15

Completion Date: 03/31/2023
University #2:
Total Project Budget: $195,908.55
CTR FY23 Budget: $73,335.15
CTR FY23 Spend: $70,324.02

Project Description: The omnipresence of information and communication technologies (ICTs), such as smartphones, GPS, Bluetooth, and tablets, is inevitably influencing travel behaviors. ICT popularity presents opportunities to advance accessibility for all users. More than 96 percent of all U.S. adults own a cellphone and about 81 percent have a smartphone. These devices gather data on a continual basis, with the potential to collect mobility patterns at a fine, individualized human scale. ICTs have already led to changes in data collection capabilities and the analysis of human mobility patterns. The Receiving Agency can harness these capabilities and adjust analysis approaches to maintain a good level of service throughout the state transportation system. Accordingly, the Performing Agency shall investigate two issues:

- How can ICT-based travel data collection aid in the capture of human and traffic mobility patterns more efficiently and effectively than traditional travel data collection programs alone?

- How is ICT use changing individuals' activity accessibility options and impacting their travel behavior? In addressing these questions, the Performing Agency shall use a multiple-step approach, with each task building upon earlier ones.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7134

CTR Safety and Operations

Project Number	Project Name	Status
0-7137	Assessment of Austin, El Paso, and San Antonio HERO Incident Management Programs	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $393,182.94
CTR Total Project Spend: $128,400.62

Completion Date: 08/31/2024
University #2: CTR
Total Project Budget: $393,182.94
CTR FY23 Budget: $196,239.98
CTR FY23 Spend: $128,400.62

Project Description: The Receiving Agency aimed at improving safety and keeping traffic flowing, the Highway Emergency Response Operator (HERO) program was established to clear minor crashes from roadways and assist motorists in need. Following the public's positive response, more districts have instituted HERO programs in recent years. Although HERO has proven popular, the program has not been formally assessed. The objective of this project is to conduct a systematic assessment of HERO in Austin, El Paso, and San Antonio. The Performing Agency shall perform comprehensive analyses in terms of operational efficiency, staffing and equipment levels, incident response and clearance time improvements, impacts on travel delay, and benefit to cost ratio through a series of on-site interviews, data analysis, and Dynamic Traffic Assignment micro-simulations. The Performing Agency shall compare clearance times on Safety Service Patrol (SSP) routes vs. non-SSP routes, and contract service vs. non-contract service. Recommendations and guidance shall be provided to the Receiving Agency's districts and Traffic Safety Division to improve HERO effectiveness and efficiency. This project shall give the Receiving Agency a thorough understanding of HERO as well as future improvement recommendations.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7137

CTR Planning and Environmental

Project Number	Project Name	Status
0-7138	Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
CTR Total Budget: $70,976.64
CTR Total Project Spend: $31,535.45

Completion Date: 08/31/2024
University #2: CTR
Total Project Budget: $404,050.89
CTR FY23 Budget: $35,165.51
CTR FY23 Spend: $31,535.45

Project Description: Outdoor advertising signs impact millions of travelers around the world every day. These signs are designed to attract driver attention thus taking it away from the driving task. Driver inattention and distraction are two of the most critical factors for road safety. Receiving Agency regulation of outdoor advertising signs must deal with changing technologies, including digital billboards, which allow for modifications to sign illumination, motion, and content. Regulations are not keeping pace with changing sign trends and must be updated to address potential impacts on road user safety. This research project focuses on the degree of driver distraction caused by typical and digital advertising sign contents. The project includes a comprehensive state-of-the-practice review, crash investigation, and an on road human factors evaluation. The illumination levels and content (including motion) during daytime and nighttime travel for dry and wet-weather conditions are considered. This research project shall provide the Receiving Agency with tools and resources to help manage outdoor digital advertising billboards by establishing practical criteria for sign illumination and content. These resources shall allow the Receiving Agency to manage the advertising signs such that road user safety is accounted for while maintaining the ability of sign owners to develop effective means of communicating with the public.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/
search/SearchResults.aspx?q=0-7138

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7139	Determination of Pavement Surface Type	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $414,534.69
CTR Total Project Spend: $123,563.79

Completion Date: 08/31/2024
University #2:
Total Project Budget: $414,534.69
CTR FY23 Budget: $188,944.43
CTR FY23 Spend: $123,563.79

Project Description: An accurate knowledge of the pavement surface type is fundamental to efficient pavement management. Knowledge of the surface type is important for tracking the performance of different surfaces and predicting skid numbers and noise. While surface type is already a data element in Pavement Analyst, it lacks the necessary accuracy. Previous Receiving Agency projects have attempted to populate this field by combining different data sources, but the results have not been implemented because of lack of accuracy. Laser, video, and 3D technologies have made it possible to scan large networks and obtain full coverage on an annual basis. Artificial intelligence and these technologies can be used to predict surface type with an accuracy higher than 90%. This research project shall utilize the latest technologies to develop equipment and a methodology for determining surface type. To accomplish this goal, the Performing Agency shall conduct a literature review to identify potential technologies, evaluate them and determine the technology with the highest potential, develop a set of technical specifications for the system, set a target for the degree of accuracy, develop an experimental design, use the system developed to determine surface type, evaluate its performance, and assemble and deliver a final system.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7139

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7141	Evaluation of Nano-Materials in Concrete for Improved Durability	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $611,267.44
CTR Total Project Spend: $162,939.61

Completion Date: 05/31/2026
University #2:
Total Project Budget: $611,267.44
CTR FY23 Budget: $165,843.84
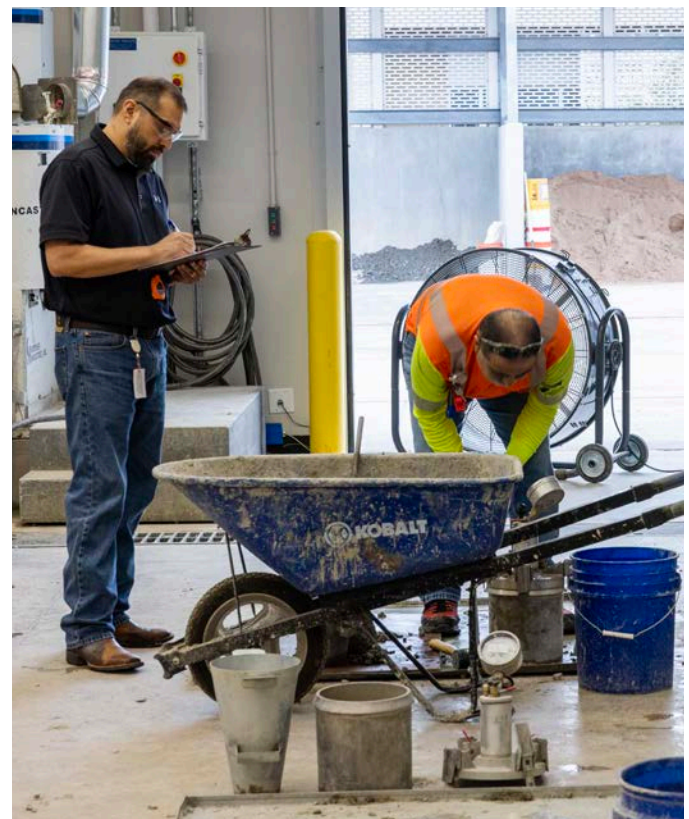**CTR FY23 Spend:** $162,939.61

Project Description: The application of nanotechnology in the construction industry has led to significant advancements in enhancing the mechanical properties of concrete through changing concrete's structure at the nanolevel. However, advancements in understanding how to leverage nanomaterials to combat durability issues has lagged behind the progress made on the mechanical property side. Concrete is susceptible to various physical and chemical degradation mechanisms that can reduce its service life. Historically, Class F fly ash has been used to address many of these degradation issues. However, with changes in fly ash quality and availability, identifying other materials that the Receiving Agency can use to protect concrete against durability issues are needed. Over the last 20 years, much progress has been made in using nanomaterials in concrete mixtures, for example, nanoparticles have even been used in high-volume fly ash cementitious systems to offset the negative effects of fly ash on rate of hydration and early-age strength gain. This project shall investigate the use of nanomaterials on the properties of concrete mixtures, with special emphasis placed on durability properties and self-healing capabilities. Various nanomaterials shall be used, alone and in combination with supplementary cementing materials (SCMs). The most promising mixtures shall be selected for field trails to validate laboratory findings.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7141

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7145	Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
CTR Total Budget: $263,552.77
CTR Total Project Spend: $121,165.96

Completion Date: 10/31/2024
University #2: CTR
Total Project Budget: $635,610.78
CTR FY23 Budget: $121,620.28
CTR FY23 Spend: $121,165.96

Project Description: Asphalt binders are one of the most expensive and critical materials used in the construction of the roadways in Texas, costing taxpayers hundreds of millions of dollars annually. It has been widely recognized that asphalt binders with the same performance grade (PG) can perform very differently due to changes in crude source, refining processes used, modification technique, and other factors. Several districts recently reported early cracking issues with some mixes which had historically performed well, while other districts had mix design and quality assurance (QA) problems when the binder source was switched and/or a different recycled asphalt pavement (RAP) stockpile was used. Thus, the objective of this project is to develop rapid new tests for detecting poor quality binders and RAP materials. To achieve this objective, the Performing Agencies shall review the literature to identify candidate tests that can be used for screening binders and RAP materials. The Performing Agencies shall further refine the most promising tests using laboratory mixture performance tests as a benchmark. The Performing Agencies shall also provide a standard test method and specification limit for each of the final test methods.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7145

CTR Planning and Environmental

Project Number	Project Name	Status
0-7149	Determine Feasibility and Methodologies of Incorporating Third-Party Traffic Data into Transportation	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $266,457.08
CTR Total Project Spend: $171,694.84

Completion Date: 02/29/2024
University #2:
Total Project Budget: $266,457.08
CTR FY23 Budget: $209,948.65
CTR FY23 Spend: $171,694.84

Project Description: With the increasing availability of third-party traffic and transportation data, there is a growing interest among government agencies to incorporate these into planning and operations. These data can also provide valuable input to many other applications, such as improving traffic safety by identifying hotspots for traffic accidents, reducing intersection congestion by enabling smart traffic control, and streamlining the visualization of traffic maps. In this project, the Performing Agency shall synthesize various sources of third-party data and the Receiving Agency's current workflows in transportation planning, traffic management, and visualization capabilities that can benefit from their incorporation. Based on the evaluation of data source characteristics, historic usage, strengths and limitations, and possible context in the Receiving Agency's workflows, the Performing Agency shall develop pathways for data integration including effective public-private partnerships. In addition to a research report, this project shall provide a data integration decision support system that recommends the most appropriate implementation strategy given input parameters and query type (data-, application-, or policy-driven). Using the information gathered, the Performing Agency shall also design procedures for implementing proven technology (as determined through this research) that integrate third-party data sources within a range of Receiving Agency work environments.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7149
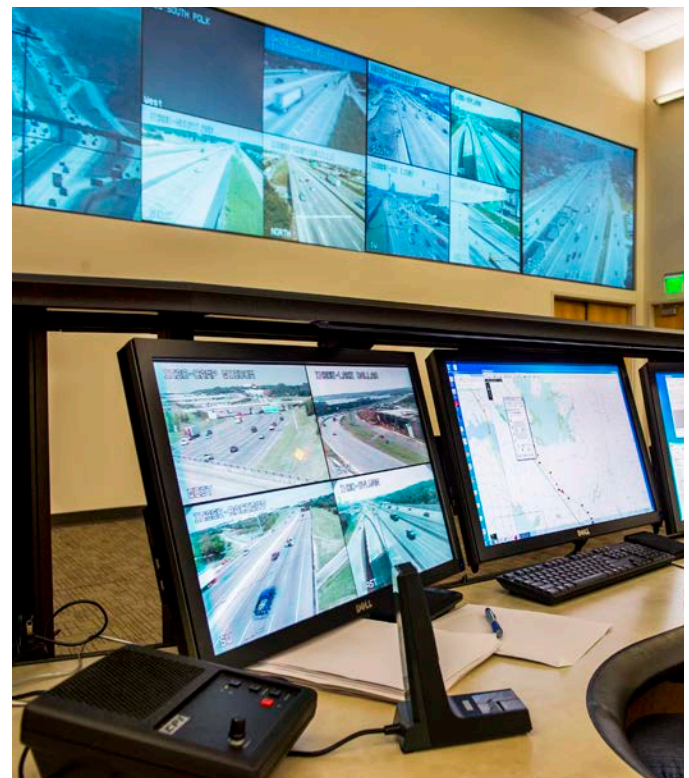
CTR Strategy and Innovation

Project Number	Project Name	Status
0-7164	Expanding Connected Vehicle Data Framework (CVDF) Data Sources to Increase Applications and Use on Texas Roadways	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $350,000.00
CTR Total Project Spend: $54,128.26

Completion Date: 08/31/2024
University #2:
Total Project Budget: $350,000.00
CTR FY23 Budget: $174,880.77
CTR FY23 Spend: $54,128.26

Project Description: Connected vehicle (CV) technology is enabling transportation systems to become safer and smarter. Texas is assembling a robust CV ecosystem, with several CV deployments underway. At the heart is the Connected Vehicle Data Framework (CVDF), a data exchange that enables the Receiving Agency to publish key information, such as work zone locations and travel times, as well as ingest data from other public agencies and third parties regarding traffic characteristics, road weather conditions, and safety events. Constraints in data access and format standardization, however, limit the CVDF from realizing its full potential. This project shall leverage the existing CVDF that currently supports the Texas Connected Freight Corridors project to expand its efficacy through applications, data partners, and corridors. By expanding the CVDF, the Receiving Agency will unlock new benefits—improved real-time traveler information; increased CV adoption in passenger and freight markets; and more strategic infrastructure investments. This project shall deliver a CVDF Expansion Toolkit that includes:

- New applications that improve safety and mobility (e.g., truck parking availability, road weather warning, border wait times)

- Recommended data partners from local and regional agencies as well as third-party data providers to improve traffic operations

- Corridor investment strategies that identify Texas roadways for CV operations and describe infrastructure readiness tactics.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7164

CTR Planning and Environmental

Project Number	Project Name	Status
0-7165	Logistics Sprawl Impacts on E-commerce Travel Patterns	Active

Project Start Date: 09/01/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $293,389.26
CTR Total Project Spend: $199,917.91

Completion Date: 02/29/2024
University #2:
Total Project Budget: $293,389.26
CTR FY23 Budget: $208,021.45
CTR FY23 Spend: $199,917.91

Project Description: E-commerce services and facilities have the benefits of bringing new employment opportunities to communities and meeting consumer needs, but they also attract heavy traffic, which results in congestion and negative environmental and economic repercussions. In this context, the current project offers a new lens for studying future e-commerce facility siting, considering (1) current and projected consumer demands that will drive facility siting from the perspective of e-commerce companies. It also considers (2) the industry and workplace standards and the tax and zoning policies of governing bodies (including the Receiving Agency's own land-use regulation and standards) that can affect, and be proactively employed to influence, facility siting from the perspective of the Receiving Agency. This project shall provide a predictive mechanism that is not simply reactive to e-commerce companies' facility siting preferences but that can be proactively leveraged by the Receiving Agency, who can use land-use regulations and standards to influence the siting of e-commerce facilities in ways that bring home the positives of e-commerce to Texans while tempering negative repercussions for the transportation network.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7165

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7168	Use of X-Ray Fluorescence (XRF) to Determine Tire Rubber Content in Asphalt Binders	Active

Project Start Date: 10/05/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $217,822.05
CTR Total Project Spend: $161,643.28

Completion Date: 12/31/2023
University #2:
Total Project Budget: $217,822.05
CTR FY23 Budget: $185,871.21
CTR FY23 Spend: $161,643.28

Project Description: Tire rubber is required in certain asphalt binders, e.g., AC-205TR, used for chip seal construction. These binders are specified and used in several districts across the state. Current Receiving Agency Standard Specification Item 300, Asphalts, Oils, and Emulsions, includes using test procedure Tex-533-C, Determining Polymer Additive Percentages in Polymer Modified Asphalt Cements. This test procedure is only performed in the Receiving Agency Materials and Tests Division (MTD). This test can be implemented in the field with a portable XRF device and test procedure Tex-533-C can be used in conjunction with a calibration chart to test and obtain a quantitative estimate of tire rubber at the district level. The Performing Agency shall make this device available to district personnel and to train them to use the device on a routine basis. The Performing Agency shall revise test procedure Tex-533-C, if needed, to account for procedures to use in the field since the device is portable.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7168

CTR Program Support

Project Number	Project Name	Status
0-9902-23	University of Texas Library Services	Active

Project Start Date: 08/31/2022

Lead University: CTR

Project Status: Active

CTR Total Budget: $1,313,756.17

CTR Total Project Spend: $307,674.60

Completion Date: 08/31/2025

University #2:

Total Project Budget: $1,313,756.18

CTR FY23 Budget: $422,042.05

CTR FY23 Spend: $307,674.60

Project Description: The Performing Agency shall provide publishing services, library information services, and collection management to support the federally-funded State Planning and Research Part II (SPR II) Work Program managed by the Receiving Agency's Research and Technology Implementation Division (RTI). The Performing Agency shall provide the facilities, technical oversight, and trained professional, technical, and clerical staff needed to respond to the Receiving Agency's research information needs and to update, preserve, and facilitate public access to the collection of published resources contained in the Receiving Agency's transportation research library (TxDOT Research Library). The U.S. Department of Transportation (USDOT) Public Access Plan ensures public access to unclassified publications and digital data sets arising from the USDOT's research and development funding, which includes the SPR Part II Work Program (Research Program). The Performing Agency shall support transparency and long-term stewardship of Research Program results by providing online public access to Research Program information, performing services that ensure the Receiving Agency follows USDOT Public Access Plan guidelines, and serving as the Receiving Agency's official repository for all Research Program deliverables.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-9902-23

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
5-4829-05	Implementation of Geosynthetic-stabilized Roadways for Base Course Reduction: Field Monitoring and Design Recommendations	Closed

Project Start Date: 05/02/2018
Lead University: CTR
Project Status: Closed
CTR Total Budget: $873,369.74
CTR Total Project Spend: $842,547.25

Completion Date: 08/31/2023
University #2:
Total Project Budget: $873,369.74
CTR FY23 Budget: $135,550.78
CTR FY23 Spend: $135,507.39

Project Description: The Performing Agency shall conduct this implementation project, supporting the ongoing reconstruction of segments of IH10 near San Antonio. The Receiving Agency shall use geogridstabilization to aid in design of roadway sections allowing for reduced base course thickness. The Performing Agency shall support the design, construction, monitoring and data interpretation of pavement test sections to be constructed in IH10 using multiple geogrid products.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #5:
Amend the contract to update the Work Plan, add the FY 2023 Budget, and extend the Project Schedule to allow continued generation of perishable data, delivery of tangible deliverables and, at the same time, transition TxDOT's IH10 field monitoring facility to the appropriate Division. The FY23 budget is added in the amount of $135,550.78. The Total Project Budget shall increase by $135,550.78 from $737,818.96 to $873,369.74.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-4829-05

CTR Construction, Maintenance & Materials

Project Number	Project Name	Status
5-6995-01	Implementation: Investigation of Retroreflective Pavement Markers (RPMs) in Rumble Strips	Closed

Project Start Date: 10/25/2021
Lead University: CTR
Project Status: Closed
CTR Total Budget: $439,072.33
CTR Total Project Spend: $318,331.57

Completion Date: 08/31/2023
University #2:
Total Project Budget: $439,072.33
CTR FY23 Budget: $181,543.84
CTR FY23 Spend: $157,086.98

Project Description: The use of snowplows in northern Texas frequently results in loss of retroreflective pavement markers (RPMs). The loss of RPMs is not only costly, but also creates unsafe driving conditions during inclement weather. Research Project 0-6995-Determine Use of Alternative Retroreflective Pavement Markers (RPMs) on Highways with Centerline Rumble Strips and Winter Weather Pavement Marking Improvements showed that rumble strips can be used in a multifunctional way to provide not only sound awareness, but also protect the retroreflective pavement markers from snowplows. The aims of this implementation project are to build upon the findings of Research Project 0-6995 and to (1) validate the visibility results of the RPMs in rumble strips from different distances and vehicle speeds and (2) confirm the long-term performance of the markers in rumble strips.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-6995-01

CTR Strategy and Innovation

Project Number	Project Name	Status
5-7081-01	Implementation of Understanding the Impact of Autonomous Vehicles on Long-distance Travel Mode and Destination Choice in Texas	Active

Project Start Date: 11/04/2022
Lead University: CTR
Project Status: Active
CTR Total Budget: $159,917.34
CTR Total Project Spend: $87,761.93

Completion Date: 12/31/2023
University #2:
Total Project Budget: $159,917.34
CTR FY23 Budget: $97,309.38
CTR FY23 Spend: $87,761.93

Project Description: The 0-7081 research project produces a model that forecasts long-distance demand by autonomous passenger and freight vehicles. It combines rigorous insight gained from literature, survey results, and a variety of data sets to predict a future 20+ years from now, where autonomous vehicles are readily available for all ground-based travel. Key findings thus far include 15+% added VMT to the Texas and US networks, 10+% longer passenger-trip distances (within the state), and notable mode-share losses for freight rail and passenger air travel. While this project delivers complex long-distance travel-demand model specifications for passengers and freight, including all parameter estimates, the models are not yet ready for in-house applications by the Receiving Agency personnel. The research team proposes an implementation project to put all passenger and freight-based travel demand equations and parameters (and various input files, like network distances and travel times, export demand volumes by industry, weight per container by industry) into a user-friendly TransCAD-based package for the Receiving Agency employees to use in coming years. The team also proposes hosting several training sessions for the Receiving Agency staff and stakeholders (like MPO staff and their consultants, across the state and nation). In this way, the Receiving Agency and its partners can run hundreds of diverse simulations over the coming years, thereby implementing this research work fully, while adding new forecasts and value for infrastructure maintenance and expansion, traffic management, and trade and travel support across the state and nation.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:
Amend the contract to extend the termination date, and revise the budget and project schedule to allow the research team to produce a higher quality product. The FY 2023 Budget is decreased by $39,293.32 from $136,602.70 to $97,309.38. The FY 2024 Budget is increased by $39,293.32 from $23,314.64 to $62,607.96. The Itemized Project Budget Estimate remains $159,917.34

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7081-01

CTR Structures and Hydraulics

Project Number	Project Name	Status
9-1532	TPF-5(508) Concrete Bridge Engineering Institute (CBEI)	Active

Project Start Date: 06/21/2023
Lead University: CTR
Project Status: Active
CTR Total Budget: $2,917,900.00
CTR Total Project Spend: $182,344.48

Completion Date: 05/31/2027
University #2:
Total Project Budget: $2,917,900.00
CTR FY23 Budget: $182,345.00
CTR FY23 Spend: $182,344.48

Project Description: The objective of TPF-5(508) Concrete Bridge Engineering Institute (CBEI) Transportation Pooled Fund (TPF) is to create a national resource for innovative workforce development programs and implementation of new technologies in the field of concrete bridges, establishing a consortium of member states. CBEI shall be the center of concrete bridge related research, education, and training at the Performing Agency, the University of Texas at Austin in the Cockrell School of Engineering. The Performing Agency shall work with bridge stakeholders (primarily state and federal transportation agencies) and seek input from industry groups representing the concrete bridge community to develop pioneering, practical, and effective programs that will have national impact with the goal of addressing issues encountered in concrete bridges and implementing plans to work toward ensuring resiliency expectations for concrete bridges. The Performing Agency's specific objectives are to develop and implement the following services with coordinated input from members of the pooled fund:

- three training programs which will include both classroom and hands-on training - 1) Concrete Bridge Deck Construction Inspection Program, 2) Concrete Materials for Bridges Program and 3) Post-tensioning (PT) Laboratory
- the Concrete Solutions Center
- the Bridge Component Collection
- the Concrete Solutions Center comprised of workshops, seminars, and project technical support. The Performing Agency shall develop and administer the Technology Development Program for the evaluation and implementation of new and emerging technologies in the field of concrete bridges.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:
Revise the budget to move funds for the subcontractor for Task 4, Site Preparation. The FY2023 budget is decreased by $34,246.25 from $222,841.25 to $188,595.00; the FY2024 budget is increased by $34,246.25 from $1,009,426.31 to $1,043,672.56; the FY2025 budget remains $885,822.70; the FY2026 budget remains $522,507.25; the FY2027 budget remains $277,302.49; the Itemized Project Budget Estimate remains $2,917,900.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=9-1532

2.2   SFASU - Stephen F. Austin State University

FY23 Expenditures by Functional Area

Planning and
Environmental
$0.00
0%
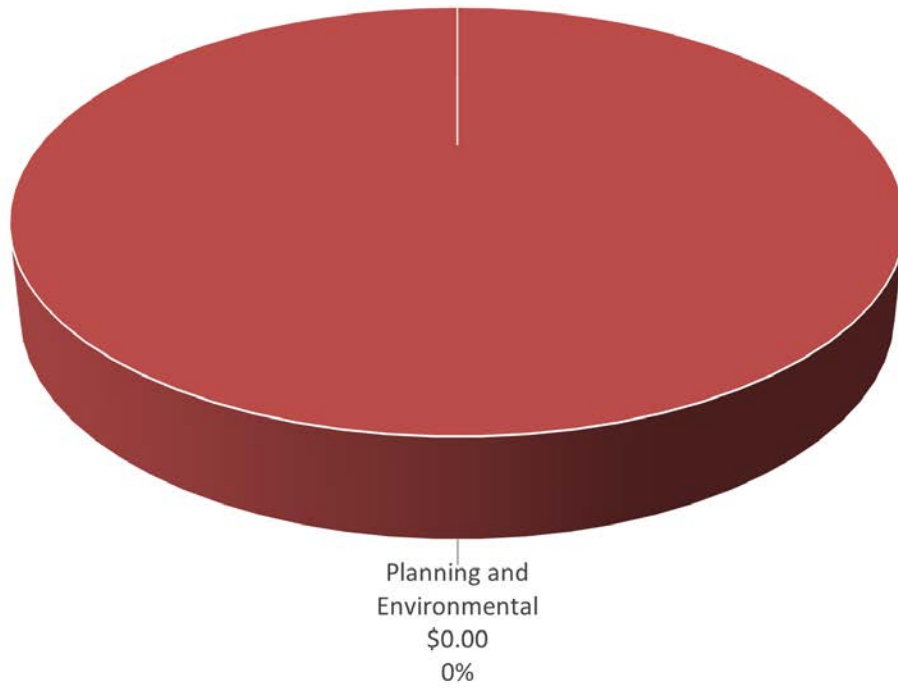
SFASU Planning and Environmental

Project Number	Project Name	Status
0-7100	Sediment Control Approved Products List	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
SFASU Total Budget: $10,683.82
SFASU Total Project Spend: $5,065.75

Completion Date: 10/31/2023
University #2: SFASU
Total Project Budget: $293,890.57
SFASU FY23 Budget: $5,341.91
SFASU FY23 Spend: $0.00

Project Description: The Environmental Protection Agency (EPA) guidance document National Management Measure to Control Nonpoint Source Pollution from Urban Areas (November 2005, EPA-841-B-05-004) requires all construction site activities to reduce the amount of sediment generated (erosion control) and reduce the off-site transport of sediment and construction-related chemicals (sediment and chemical control). While there are several pollutants of concern (oils, gasoline, degreasers, paints, etc.), sediment from construction sites is by far the largest pollutant source (Canning, 1988). Eroded sediment from construction sites causes many problems, including adverse impacts on water quality as well as decreased capacity of reservoirs and streams, resulting in possible flooding. Sediment control devices (SCDs) are used on construction sites to retain sediment and prevent stormwater from adversely affecting adjacent waterways. SCDs include silt fences, wattles, sediment logs and basins, filter dams, and inlet protection devices. These products are designed to be installed for specific applications (curb inlets, drop inlets, perimeter protection, etc.) However, there is no scientifically sound, repeatable testing methodology that replicates field conditions to test and determine SCD performance. This project shall develop a formal testing protocol, test apparatus and propose thresholds for a performance-based sediment control device testing program that will assist the designer/engineer in selecting the most effective sediment control best management practice.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to update the project budget for Performing Agency 1 due to increased construction material/labor costs for additional work determined at the construction pre-bid meeting. TTI Budget: The FY 2022 budget remains $92,167.00. The FY 2023 budget is increased by $31,250.00 from $159,789.75 to $191,039.75. TTI's Total Project Budget is increased by $31,250.00 from $251,956.75 to $283,206.75. SFASU: Project Budget remains $10,683.82. The Itemized Project Budget Estimate is increased by $31,250.00 from $262,640.57 to $293,890.57.

Amendment #2:
Amend the contract to revise the budget for Performing Agency 1 (TTI) and Project Schedule to allow time to collect required performance data on the sediment control devices. TTI's FY 2022 budget remains $92,167.00; the FY 2023 budget is decreased by $4,999.75 from $191,039.75 to $186,040.00; the FY 2024 budget is established at $4,999.75. TTI's Total Project Budget remains $283,206.75. Performing Agency 2's (SFASU) FY 2022 budget remains $5,341.91; the FY 2023 budget remains $5,341.91; SFASU's Total Project Budget remains $10,683.82. The Itemized Project Budget Estimate remains 293,890.57.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7100

2.3 TAMUCC - Texas A&M University at Corpus Christi

FY23 Expenditures by Functional Area

Planning and Environmental
$20,951.43 8%

Strategy and Innovation
$41,539.24 17%

Safety and Operations
$185,448.76
75%

	Project Number	Project Name	Status
	0-7127	Examine Reconnaissance Scanning of Underground Utilities in the ROW	Active
	0-7157	Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities	Active
	0-7159	Develop Guidelines for the Use of Unmanned Aerial Systems (UASs) and Smartphones for Construction and Utility Inspections	Active

TAMUCC Planning and Environmental

Project Number	Project Name	Status
0-7127	Examine Reconnaissance Scanning of Underground Utilities in the ROW	Active

Project Start Date: 09/21/2021
Lead University: TTI
Project Status: Active
TAMUCC Total Budget: $132,015.00
TAMUCC Total Project Spend: $72,977.66

Completion Date: 08/31/2024
University #2: TAMUCC
Total Project Budget: $1,135,880.75
TAMUCC FY23 Budget: $26,548.75
TAMUCC FY23 Spend: $20,951.43

Project Description: Mapping of buried utilities using rigorous subsurface utility engineering (SUE) quality level B (QLB), as is frequently performed or recommended, can be costly. It can also be ineffective for unknown utilities (i.e., utilities that exist but for which no information is available). This is particularly common and problematic in areas of oil and gas operations. When undiscovered until construction, these unknown utilities may cause serious scheduling disruptions as well as higher construction costs, along with safety and environmental risks. There is a need for a faster, less expensive method of scanning the right of way (ROW) for these unknown utilities. This research shall evaluate, select and test the application of newly available geophysical measurement systems. These systems would allow quickly and cheaply detecting and mapping unknown pipelines or other utilities in the ROW. It compares the effectiveness and cost of deployment to standard QLB SUE and reports on technologies that are both technically and cost effective for identifying unknown utilities.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:
Amend the contract to extend the termination date, update the Project Schedule and Work Plan to revise Tasks 3-8 and revise the budget for the purpose of using the newly developed artificial intelligence data processing capability, gather data at new sites to complete the testing and evaluation of the technologies. TTI: The FY 2022 budget remains $364,873.75; the FY 2023 budget is decreased by $62,504.00 from $299,620.25 to $237,116.25; the FY 2024 budget is established at $401,875.75; TTI's Total Project Budget is increased by $339,371.75 from $664,494.00 to $1,003,865.75. TAMUCC: The FY 2022 budget remains $55,856.25; the FY 2023 budget remains $26,548.75; the FY 2024 budget is established at $49,610.00; TAMUCC's total Project Budget is increased by $49,610.00 from $82,405.00 to $132,015.00. The Itemized Project Budget Estimate is increased by $388,981.75 from $746,899.00 to $1,135,880.75.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7127

Project Number	Project Name	Status
0-7157	Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities	Active

Project Start Date: 09/01/2022

Lead University: TAMUCC

Project Status: Active

TAMUCC Total Budget: $320,776.50

TAMUCC Total Project Spend: $197,411.32

Completion Date: 08/31/2024

University #2: TTI

Total Project Budget: $499,992.00

TAMUCC FY23 Budget: $187,350.50

TAMUCC FY23 Spend: $185,448.76

Project Description: Unmanned aircraft systems (UASs) equipped with digital cameras, light detection and ranging (LiDAR) sensors, or both enable the collection of high spatial resolution three-dimensional (3D) quantitative geospatial data. This data may be used to support a variety of surveying and mapping activities, potentially with lower costs and greater safety than traditional survey methods. When using a camera, the technique is called Structure-from-Motion photogrammetry or UAS-SfM. In practice, there are important differences between UAS-SfM and UAS-LiDAR including measurement fidelity, operational considerations, post-processing workflows, and cost-effectiveness. With a lack of clear guidance on when UAS-SfM versus UAS-LiDAR is the best fit for a specific task, there is a need to evaluate the real-world performance capabilities and limitations of both technologies.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7157

TAMUCC Strategy and Innovation

Project Number	Project Name	Status
0-7159	Develop Guidelines for the Use of Unmanned Aerial Systems (UASs) and Smartphones for Construction and Utility Inspections	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TAMUCC Total Budget: $100,461.25
TAMUCC Total Project Spend: $41,539.24

Completion Date: 08/31/2024
University #2: TAMUCC
Total Project Budget: $482,278.00
TAMUCC FY23 Budget: $50,311.25
TAMUCC FY23 Spend: $41,539.24

Project Description: Unmanned aircraft systems (UASs) equipped with miniaturized cameras enable the collection of high resolution, three-dimensional (3D) geospatial data at lower costs than traditional techniques. New technologies also make it possible to gather pictures and video using smartphones, which can be fed to Structure from Motion (SfM) software to develop highly accurate 3D products. Operating UASs requires trained pilots and observers, but smartphones do not. There is a need to test whether construction contractor crews in the field can gather data using either of these technologies and upload the imagery and video to a server to enable inspectors to conduct inspections remotely. The Performing Agencies shall conduct a literature review of UAS-SfM and smartphone technologies; prepare a list of use cases and case studies to test relevant technologies; conduct field tests to document advantages, disadvantages, complementary capabilities, and potential implementation scenarios and costs; prepare recommended settings, procedures, use cases, and operational workflows to ensure repeatable data collection and processing; and prepare guidelines for quality assurance and control of inspections conducted with UAS- and smartphone-based SfM photogrammetry, as well as identify project suitability for the adoption of these technologies to support construction and utility inspection activities at the Receiving Agency.

Approved Work Program Revisions
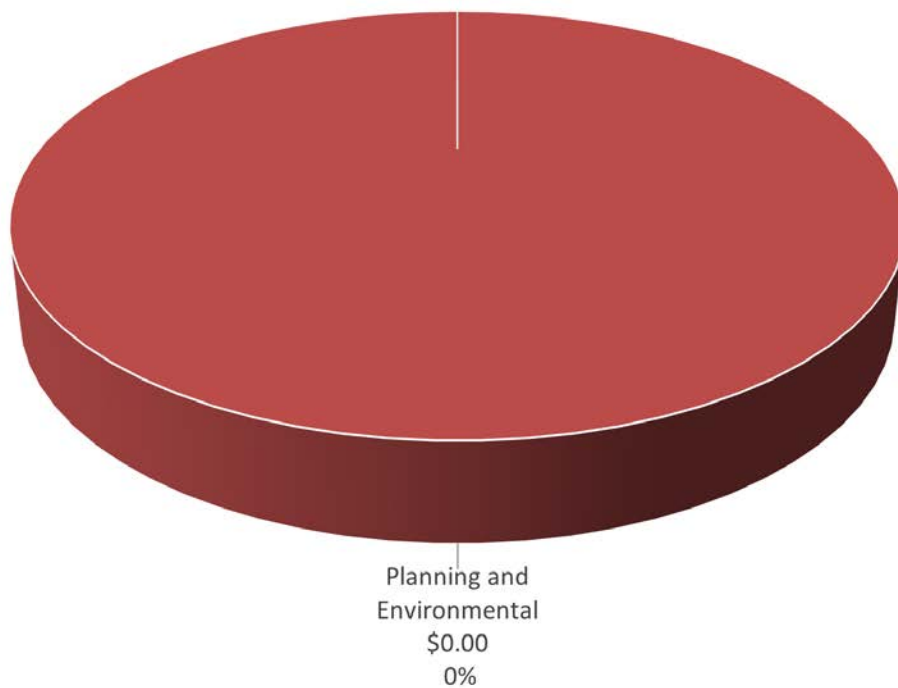No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7159

2.4 TAMUK - Texas A&M University - Kingsville

FY23 Expenditures by Functional Area

Planning and
Environmental
$0.00
0%

TAMUK Planning and Environmental

Project Number	Project Name	Status
0-7133	Develop Guidebook for Managing System Costs: Operational and Capital Cost Management at Rural and Small Urban Public Transit Systems	Active

Project Start Date: 09/01/2021

Lead University: TTI

Project Status: Active

TAMUK Total Budget: $14,997.50

TAMUK Total Project Spend: $13,400.00

Completion Date: 03/31/2024

University #2: TAMUK

Total Project Budget: $213,562.50

TAMUK FY23 Budget: $1,597.50

TAMUK FY23 Spend: $0.00

Project Description: Rural and small urban transit systems across the United States face fiscal challenges caused by the growing gap between the cost of providing transit service and available federal, state, and local funding. In Texas, the fiscal challenges facing rural and small urban transit systems are compounded by not only an increasing population but also revenue and ridership impacts related to COVID-19. Rural and small urban transit systems also often face high levels of staff turnover and a lack of knowledge management procedures to sustain cost management practices over time. The Performing Agencies shall equip the Receiving Agency's transit systems to understand, predict, and manage operational/capital costs and provide a reliable go-to-resource for cost management best practices.

Approved Work Program Revisions

No. of FY23 Amendments: 0
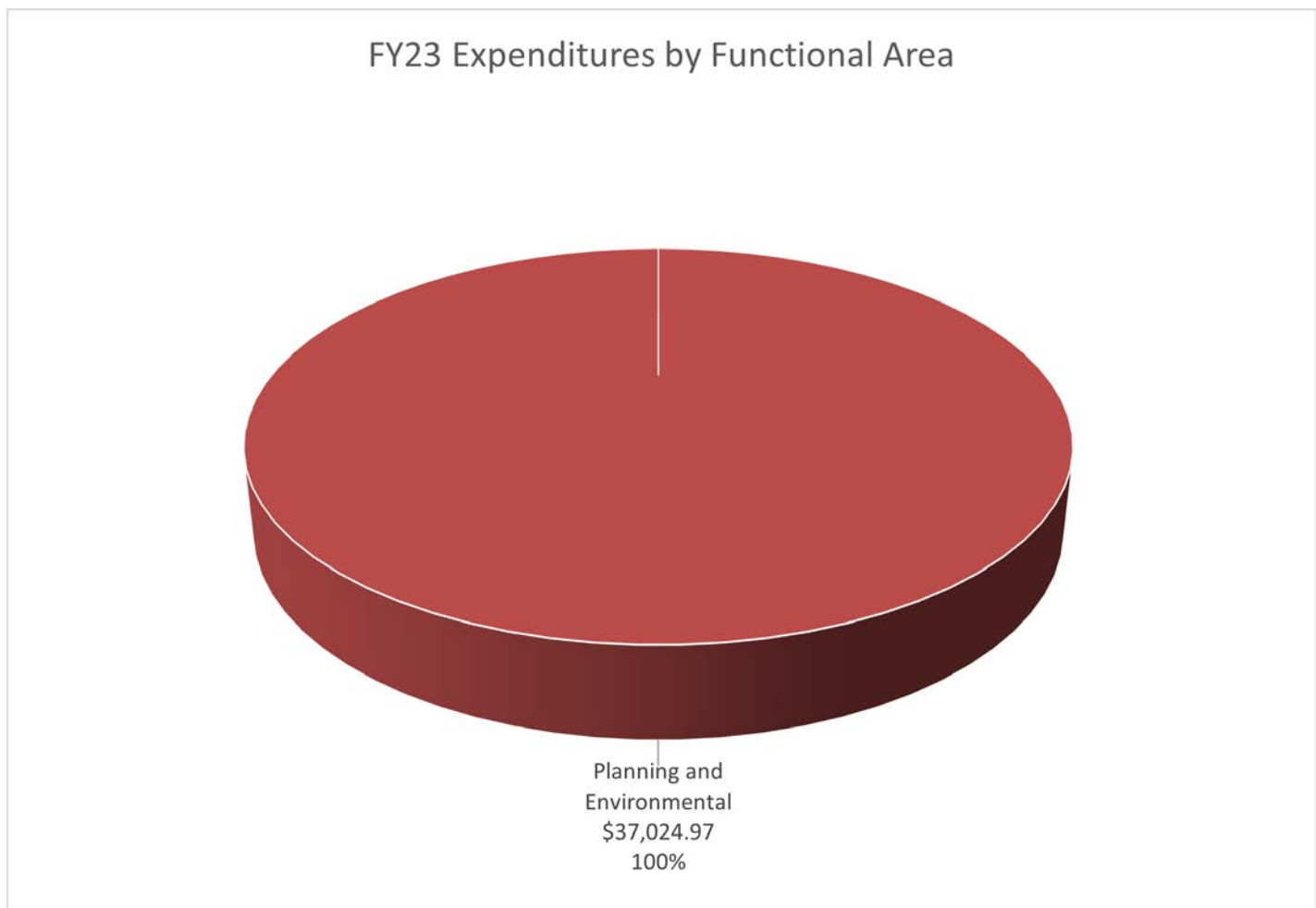
CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7133

2.5   TAR - Texas A&M AgriLife Research

FY23 Expenditures by Functional Area

Planning and
Environmental
$37,024.97
100%

TAR Planning and Environmental

Project Number	Project Name	Status
0-7022-01	Monarch Conservation Strategies for Texas Roadways	Active

Project Start Date: 02/17/2023
Lead University: TTI
Project Status: Active
TAR Total Budget: $179,685.00
TAR Total Project Spend: $37,024.97

Completion Date: 08/31/2025
University #2: TAR
Total Project Budget: $580,659.50
TAR FY23 Budget: $64,492.50
TAR FY23 Spend: $37,024.97

Project Description: The US Fish and Wildlife Service (USFWS) supported federal listing of the monarch butterfly (Danaus plexippus) in December 2020, but listing is currently delayed due to other higher priority listing actions. Texas roadways play a critical role in the successful spring and fall migrations of the eastern monarch butterfly population. Receiving Agency project 0-7022, "Evaluating Fall Monarch Butterfly Roadkill Hotspot Incidence and Potential Roadkill Mitigation" has revealed perennial hotspots for fall monarch butterfly roadkill in Texas. Yearly roadkill can comprise up to 2.5% of the Mexican overwintering population. Spring and fall roadside milkweed and monarch-preferred nectar plant hotspots have also been identified which provide critical resources to monarchs in terms of both milkweed larval food and flower nectar for adults.

Approved Work Program Revisions
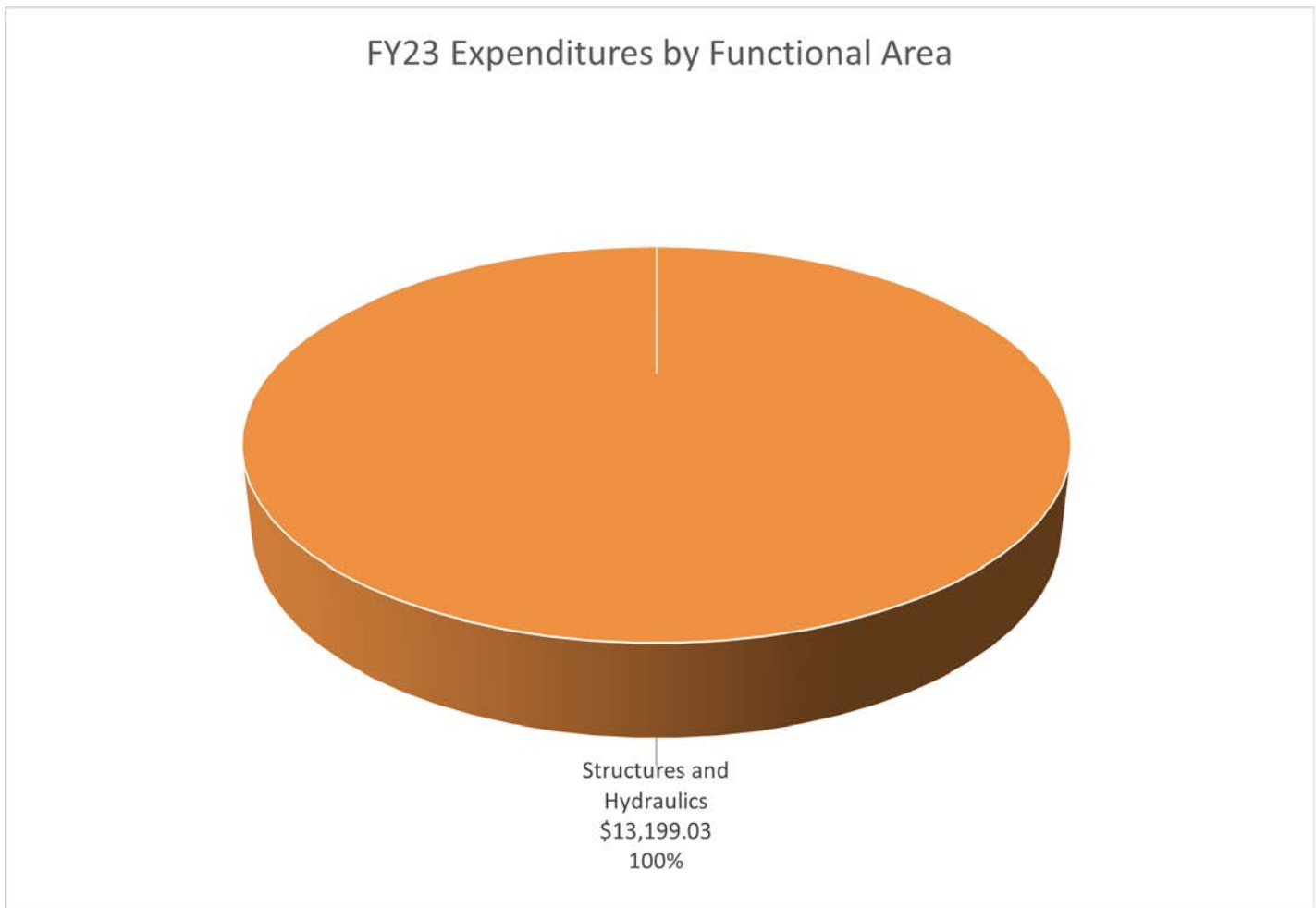No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7022-01

2.6   TARL - Tarleton State University

FY23 Expenditures by Functional Area

Structures and
Hydraulics
$13,199.03
100%

TARL Structures and Hydraulics

Project Number	Project Name	Status
0-7161	Settlement Criteria and Design Approach for Embankments and Retaining Walls Built on Compressible Soils	Active

Project Start Date: 09/12/2022
Lead University: UTSA
Project Status: Active
TARL Total Budget: $50,000.00
TARL Total Project Spend: $13,567.71

Completion Date: 08/31/2024
University #2: TARL
Total Project Budget: $218,455.00
TARL FY23 Budget: $18,315.00
TARL FY23 Spend: $13,199.03

Project Description: Soil improvement is essential for construction of embankments and retaining walls over highly compressible soils. However, due to diversity of soil improvement technologies, selection of suitable technology is an important and demanding task. Especially, if more than one soil improvement methods need to be used jointly to meet settlement, cost, and time requirements. To facilitate the selection process, this project shall: (1) collect and compile performance data of constructed embankments and retaining walls to establish settlement criteria based on their functionality and relative locations to a bridge, (2) analyze most commonly-used soil improvement methods in Texas to generate cost vs. construction time charts that can be used for preliminary screening, (3) develop a calculator that can calculate cost and time based on the determined settlement criteria for various soil improvement methods as well as their combinations so cost and benefit can be assessed, and (4) identify optimal combination of preloading with other methods under different Texas soil conditions. The focus of this project shall be preloading with/without wick drain, pile/columns supported embankment and lightweight fills. This project shall provide not only charts and tables that are ready to use in design but also design tools to analyze complicated situations.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7161
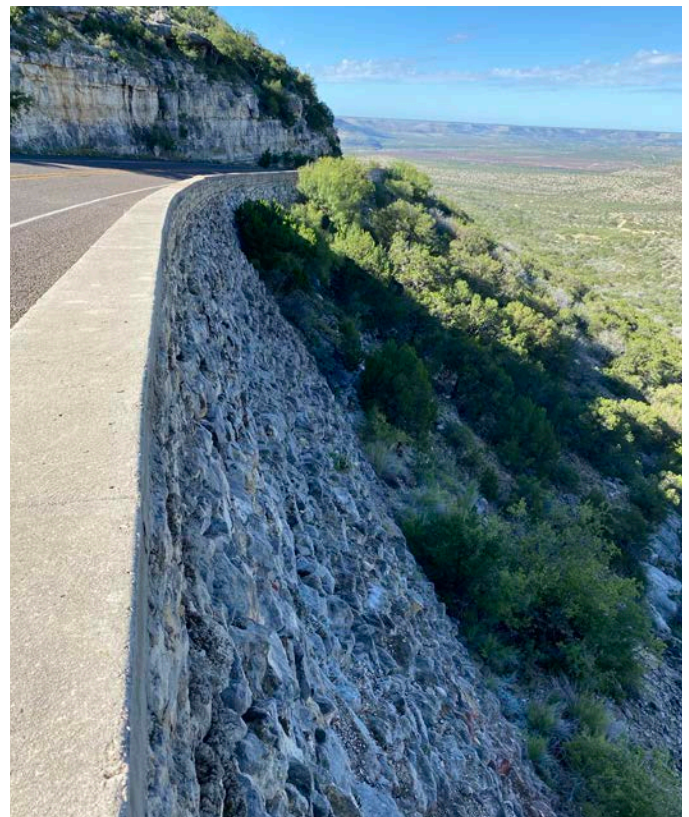
2.7 TECH - Texas Tech University - Center for Multidisciplinary Research in Transportation
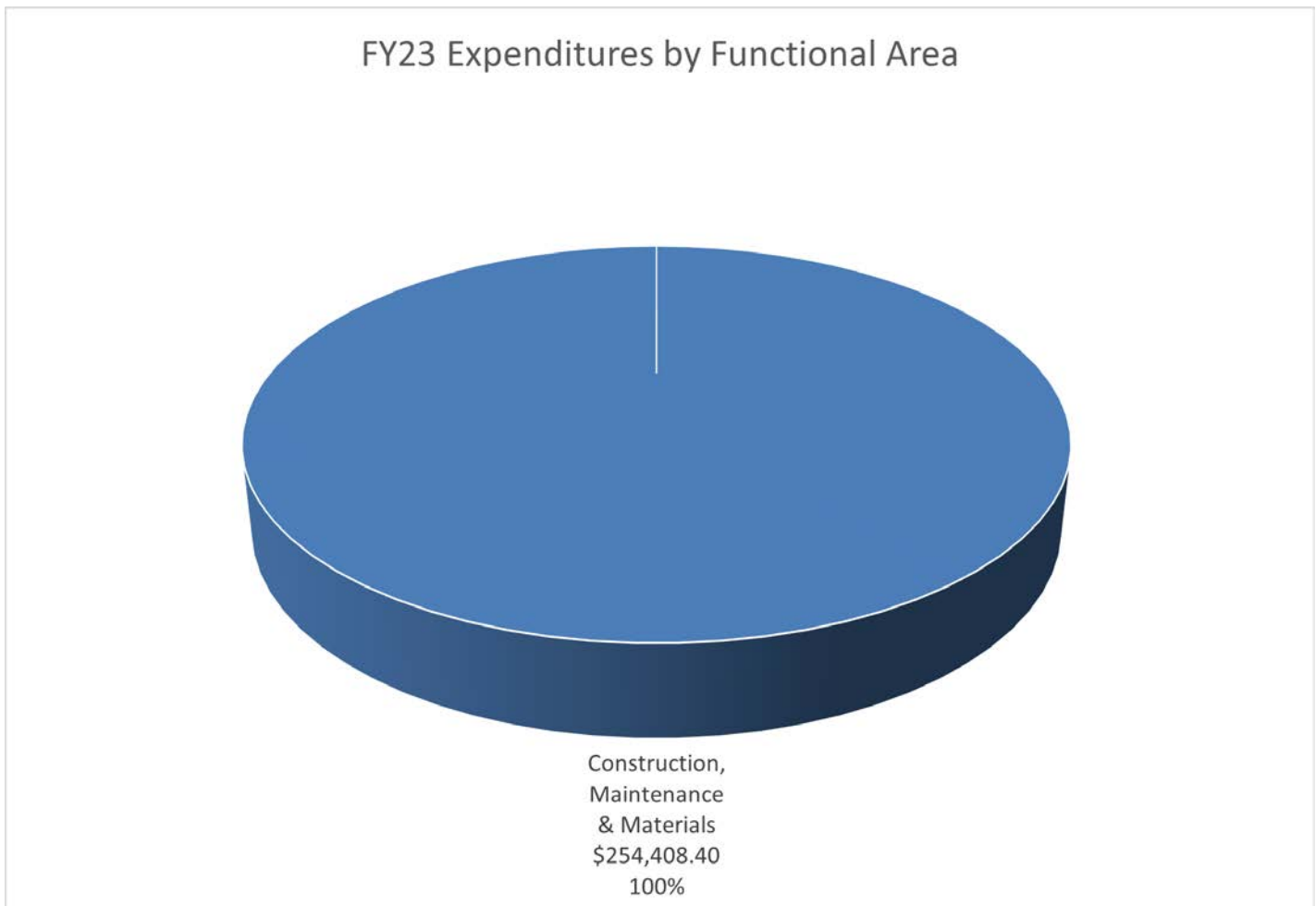
FY23 Expenditures by Functional Area

Construction,
Maintenance
& Materials
$254,408.40
100%

Project Number	Project Name	Status
0-7147	Project Level Performance Database for Rigid Pavements in Texas, Phase III	Active
0-7148	Develop Design Details for CRCP Whitetopping at Intersections	Active
5-6910-01	Implementation of Concrete Overlay Evaluation and Design	Closed

TECH Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7147	Project Level Performance Database for Rigid Pavements in Texas, Phase III	Active

Project Start Date: 09/01/2022

Lead University: TECH

Project Status: Active

TECH Total Budget: $749,999.55

TECH Total Project Spend: $169,223.68

Completion Date: 08/31/2025

University #2:

Total Project Budget: $749,999.55

TECH FY23 Budget: $241,544.29

TECH FY23 Spend: $169,223.68

Project Description: The primary tasks in this project will consist of:

- Collecting field performance information on rigid pavements

- Gathering field performance information on experimental and special sections in Texas

- Evaluating the effectiveness of special or innovative techniques tried in Texas

- Developing a platform for storing all the information collected in this study in a central server with various features embedded so that the information could be easily accessible in a systematic way

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7147

TECH Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7148	Develop Design Details for CRCP Whitetopping at Intersections	Active

Project Start Date: 09/01/2022
Lead University: TECH
Project Status: Active
TECH Total Budget: $299,591.25
TECH Total Project Spend: $72,748.47

Completion Date: 08/31/2025
University #2: TTI
Total Project Budget: $599,563.25
TECH FY23 Budget: $94,216.00
TECH FY23 Spend: $72,748.47

Project Description: The Performing Agencies shall establish a method to evaluate the existing pavement structural condition and design continuously reinforced concrete pavement (CRCP) overlays, both thin and thick. The design methods will include non-destructive (NDT) pavement evaluation techniques and tools, deflection based CRCP slab thickness design procedures, and CRCP reinforcing design details. The Performing Agencies shall identify state-of-the-art practices that can be implemented as well as areas that need additional research. The findings from this research will result in procedures that will be used to design CRCP overlays, both thin and thick.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7148

TECH Construction, Maintenance & Materials

Project Number	Project Name	Status
5-6910-01	Implementation of Concrete Overlay Evaluation and Design	Closed

Project Start Date: 05/21/2019
Lead University: TECH
Project Status: Closed
TECH Total Budget: $148,168.25
TECH Total Project Spend: $109,679.23

Completion Date: 08/31/2023
University #2:
Total Project Budget: $148,168.25
TECH FY23 Budget: $15,900.00
TECH FY23 Spend: $12,436.25

Project Description: The primary tasks in this implementation project are to train Receiving Agency Staff (1) to evaluate existing Portland Cement Concrete (PCC) pavements and develop appropriate optimum overlay strategies and (2) to conduct early-age performance evaluations of PCC overlays. This implementation project also includes the development of training materials and other documents that shall be used to modify the PCC overlay portion of TxDOT Pavement Manual. The Receiving Agency has many miles of concrete pavement that have already passed or are approaching the end of their design lives, which will require some form of rehabilitation in the near future. The PCC overlay design program developed under previous research project #0-6910 represents significant improvements over existing PCC overlay design programs, primarily because the new program is based on the "mechanistic" condition of the existing pavement, not "visual condition" of the pavement. The findings from this implementation project shall help the Receiving Agency deploy cost-effective pavement rehabilitation programs.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the project to extend the project term and update the project deliverables table due to the Receiving Agency's construction project delays.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-6910-01

2.8   TEES - Texas A&M Engineering Experiment Station

FY23 Expenditures by Functional Area

Safety and Operations
$802,375.14
100%
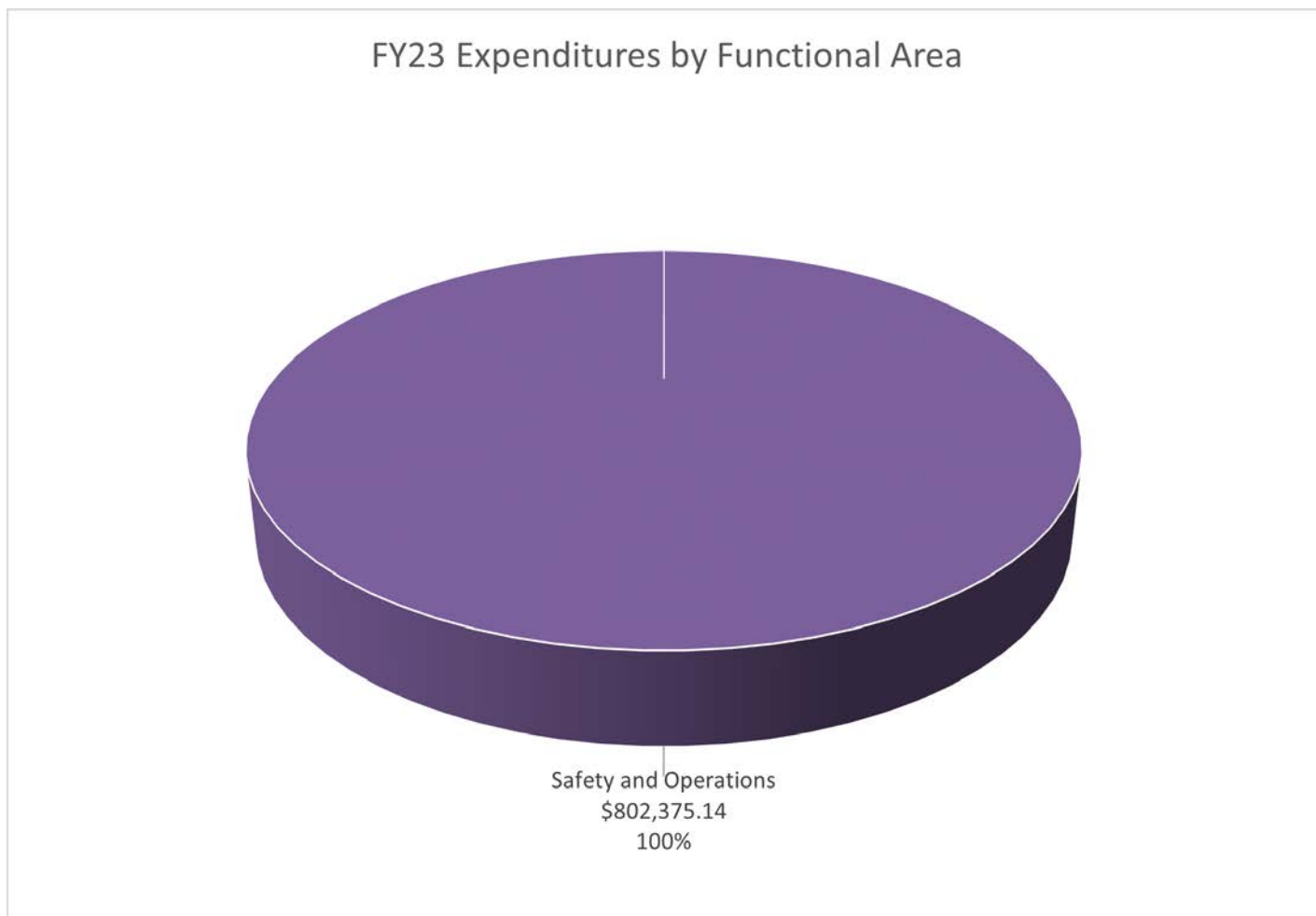
TEES Safety and Operations

Project Number	Project Name	Status
0-7099	AVA: Automated Vehicles for All	Active

Project Start Date: 01/26/2021
Lead University: TEES
Project Status: Active
TEES Total Budget: $7,063,787.00
TEES Total Project Spend: $3,220,712.33

Completion Date: 08/31/2025
University #2:
Total Project Budget: $7,063,787.00
TEES FY23 Budget: $1,511,377.00
TEES FY23 Spend: $802,375.14

Project Description: USDOT awarded federal funds to Texas A&M Engineering Experiment Station (TEES) to take the lead on and subcontract with George Washington University, University of California at Davis, University of Illinois at Urbana-Champaign to study and test the safe integration of automated driving systems on rural Texas roadways for the purpose of the Automated Driving System Demonstration Grants program. TxDOT through RTI will help foster these efforts in partnership with FHWA and govern reimbursement of this project, in a separate Grant Subrecipient Agreement with TEES. All necessary Grant documents that outline the details of this agreement have been completed and attached.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7099

2.9   TSU - Texas Southern University

FY23 Expenditures by Functional Area
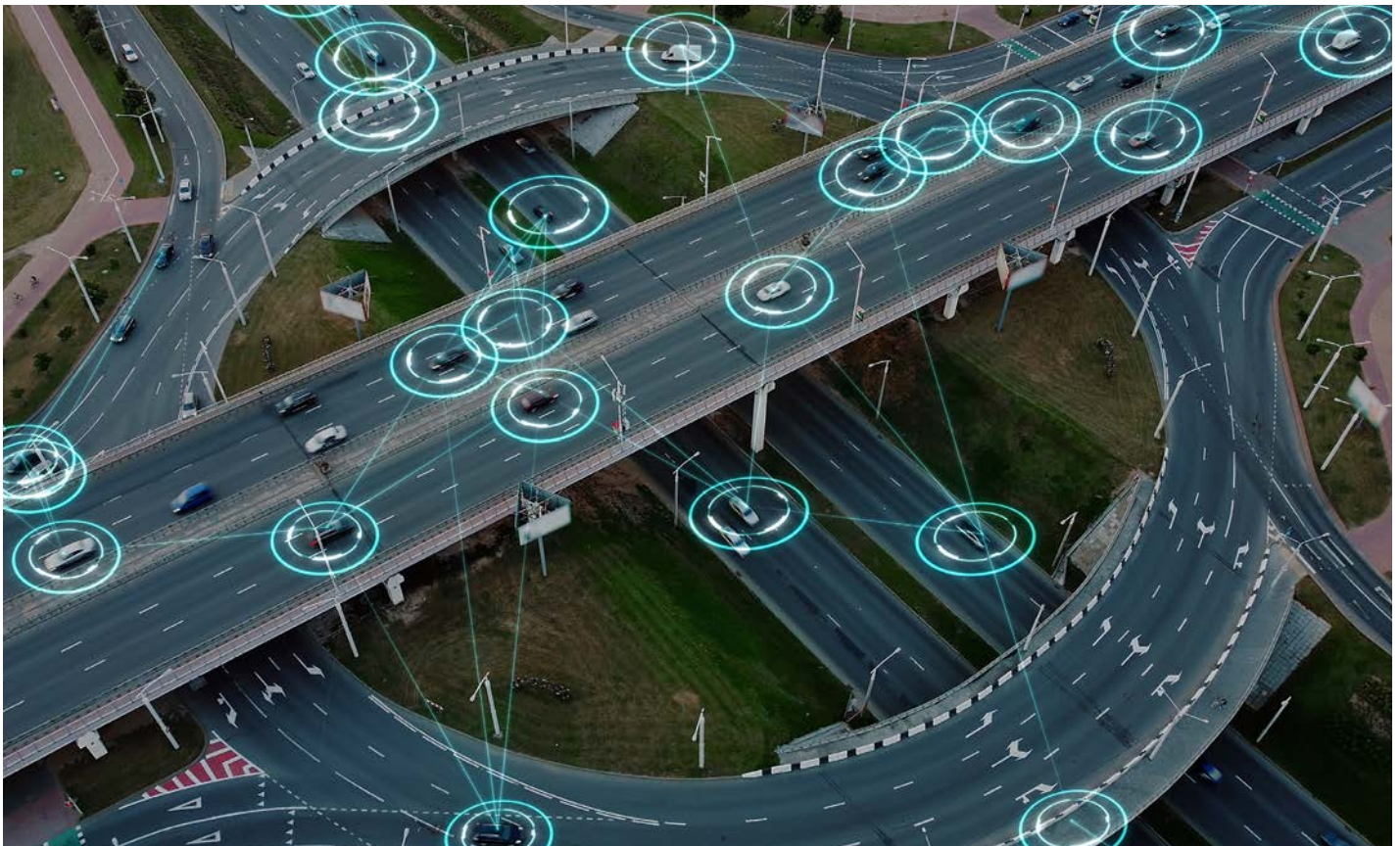
Strategy and
Innovation
$23,732.05 100%

TSU Strategy and Innovation

Project Number	Project Name	Status
0-7131	Leveraging Artificial Intelligence (AI) Techniques to Detect, Forecast, and Manage Freeway Congestion	Closed

Project Start Date: 09/14/2021
Lead University: TTI
Project Status: Closed
TSU Total Budget: $55,309.76
TSU Total Project Spend: $50,573.40

Completion Date: 08/31/2023
University #2: TSU, TXST
Total Project Budget: $297,203.76
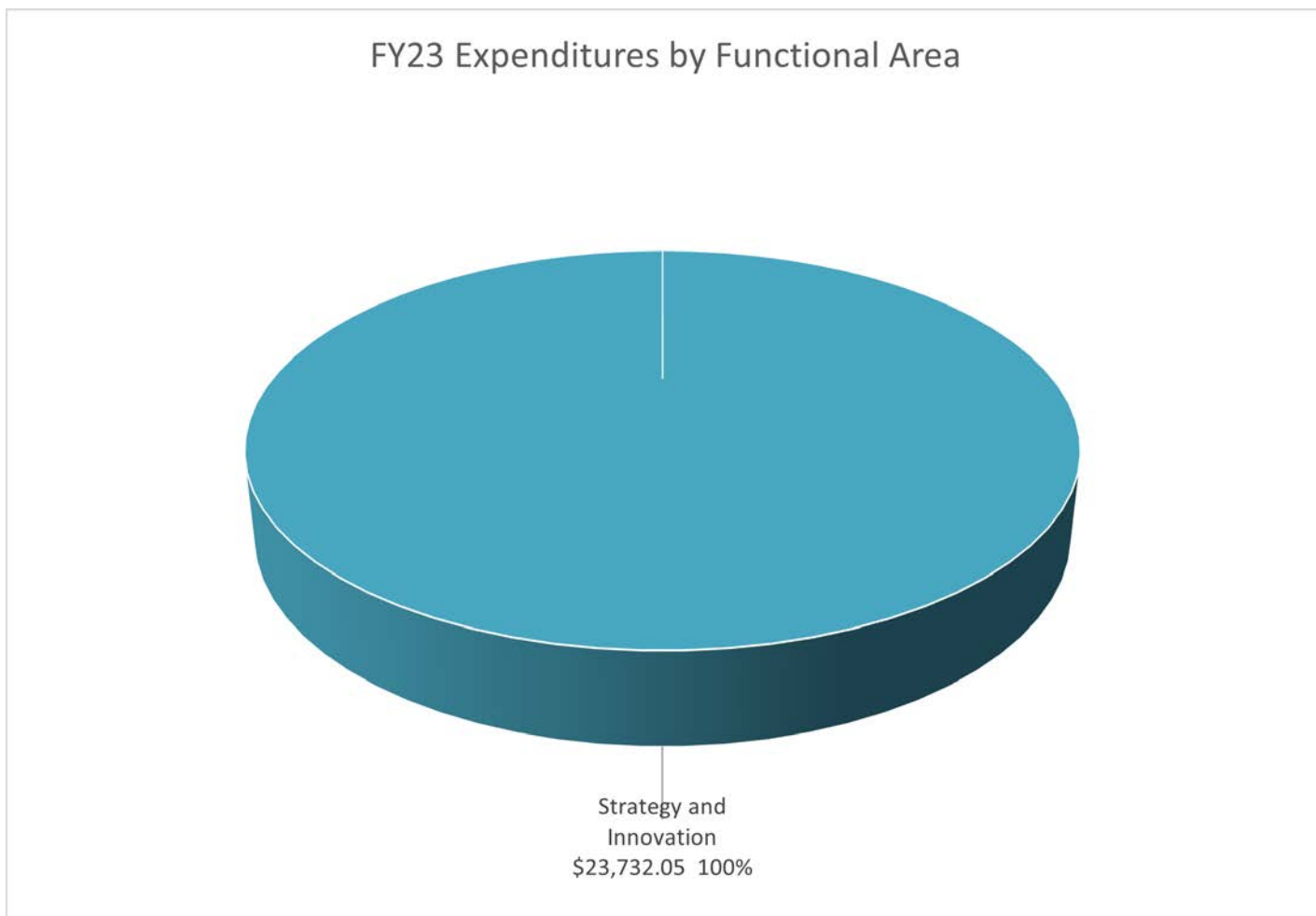**TSU FY23 Budget:** $27,654.88
TSU FY23 Spend: $23,732.05

Project Description: To improve the quality and effectiveness of the Texas surface transportation system, it is important to be able to predict where and when prolonged congestion will start and how it will spread, as well as to track atypical events and estimate their evolution. Artificial intelligence (AI) approaches provide a unique opportunity to estimate precise congestion measures by utilizing data from agency-owned sensors, third-party providers, and big enterprise data. This project envisions to mitigate the current research gap by conducting two major project phases. The first phase can confirm the validity of commercial data sources for planning and operations, while the second involves understanding which AI models/ algorithm are the most suitable for addressing Receiving Agency needs based on desirable use cases and data availability. Furthermore, it is important to analyse the required data models and workflows to determine whether it is sustainable to train, test, and validate the proposed AI techniques. The Performing Agencies understand that achieving the research goals requires a comprehensive analysis and documentation of commercial big data platforms and datasets, appropriate AI algorithms, and robust prototype tool to foster return on investment (ROI) and reduce freeway congestion.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:

Performing Agency 1 (TTI): The FY 2022 budget remains $103,187.50. The FY 2023 budget is decreased by $84,637.50 from $138,706.50 to $54,069.00. The Performing Agency 1 Total Project Budget is decreased by $84,637.50 from $241,894.00 to $157,256.50. Performing Agency 2 (TSU): No revisions to budget. The Performing Agency 2 Total Project Budget remains $55,309.76. Performing Agency 3 (TXST): The FY 2023 budget is added for $84,637.50. The Performing Agency 3 Total Project Budget is established at $84,637.50. The Itemized Project Budget Estimate Project Budget remains $297,203.76.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7131

2.10 TTI - Texas A&M - Transportation Institute

FY23 Expenditures by Functional Area

Structures and Hydraulics
$1,922,167.82
16%

Construction, Maintenance & Materials
$2,686,111.37
22%

Strategy and Innovation
$2,240,897.84
18%

Planning and Environmental
$2,121,696.74
17%

Program Support
$283,338.19 2%

Safety and Operations
$3,036,411.25
25%

Project Number	Project Name	Status
0-6674-03	Automated IDEAL Cracking and Rutting Tests	Closed
0-6701-02	Planning and Environmental Linkages Toolkit	Active
0-6837-03	Assessment of Innovative and Automated Freight Systems and Development of Evaluation Tools - Phase III	Closed
0-6872-01	Use of Geothermal Energy for De-icing Approach Pavement Slabs and Bridge Decks - Phase II	Active
0-6958	Developing Performance Specification for High Performance Concrete	Active
0-6974	Digital Publication and Outreach Services in Support of Research	Active
0-6982	Utilization of UHPC Bridge Superstructures in Texas	Closed
0-6994	Develop a Retrofit Design for Guard Fence System to Enhance Motorcycle Safety	Closed
0-7004	Improve System Emergency Response Performance in the Houston District Using Connected Vehicle Technology	Active
0-7006	Design, Construction, and Performance Monitoring of Stabilization of Expansive Soils and Cement	Active
0-7013	Performance and Improvement of Texas Poor Boy Continuous Bridge Deck Details	Closed
0-7021-01	Develop Enhanced Protection of Median Openings Between Parallel Bridge Structures	Closed
0-7022-01	Monarch Conservation Strategies for Texas Roadways	Active
0-7024	Assessing Ozone Impacts on Electric Vehicle (EV) Adoption in Texas	Closed
0-7027	Accelerating Mix Designs for Base Materials	Active
0-7037	Develop Models for Freight Flows and Commercial Travel Patterns within Texas Urban Regions	Active
0-7038	Develop Bridge Weigh-in-Motion Approach to Measure Live Loads on Texas Highways	Closed
0-7040	Evaluation of Corrosion Prevention and Mitigation Approaches Used on Texas Bridges	Active
0-7047	Establish Guidelines for Designing Auxiliary Lanes on Frontage Roads	Closed
0-7073	Improving Testing Requirements in Item 300 Of TxDOT Standard Specifications	Active
0-7075	Determine the Influence of Thermal Segregation on Current Asphalt Mixtures	Closed
0-7076	Develop Laboratory Mix Design of Full Depth Reclamation (FDR) Projects Using Foamed Asphalt Binder and Emulsified Asphalt	Active
0-7082	Evaluate Attachments to Concrete Barrier Systems to Deter Pedestrians	Closed

Project Number	Project Name	Status
0-7086	Roadside Safety Device Analysis, Testing, and Evaluation Program	Active
0-7087	Develop Standards for Temporary Concrete Median Barrier in Flood-Prone Areas	Active
0-7093	Develop Refined Design Methods for Lean-On Bracing	Active
0-7096	Traffic Control Device Analysis, Testing and Evaluation Program	Closed
0-7100	Sediment Control Approved Products List	Active
0-7103	Investigating Prime versus Curing: Where, When and Why	Active
0-7104	Establish Performance-Based Acceptable Lab-Molded Density Range for Mix Design and QC/QA	Active
0-7105	Measuring Seal Coat Rate Field Adjustments	Active
0-7106	Quantify Maximum Accumulated Seal Coat Layers for Stability	Active
0-7107	Determine Feasibility and Methodologies of Using Structural Data from Traffic Speed Deflection Devices in Network-Level Treatment Decision Making	Active
0-7110	Develop Cost Effective Design and Rehabilitation Strategies for Permeable Friction Courses	Closed
0-7111	Determine Impact of Field Sands on Workability and Engineering Properties of Superpave Mixtures in Texas	Active
0-7112	Development of a Continuous for Live Load Prefabricated Steel Accelerated Bridge Construction (ABC) Unit for Texas Bridges	Active
0-7114	Re-Examine Minimum Reinforcement Requirements for Shear Design	Active
0-7118	Improving the Utilization and Effectiveness of Smart Work Zone Deployments	Closed
0-7119	Develop Standardized Operational Evaluation of Wrong-Way Driving Detection Technologies	Closed
0-7120	Develop Transition for MASH Test Level 4 (TL-4) Compliant Guardrail System	Closed
0-7121	Determine Adequacy of Installation of Existing Roadside Barriers on High-Speed Roadways	Closed
0-7122	Evaluate Alternative Methods to Examine Visibility of Pavement Markings	Active
0-7124	Develop A New Tool for Evaluating Infrastructure and Planning Impacts from Changes in Truck Traffic and Truck Technologies	Active
0-7125	Expand Applications for Texas Connected Freight Corridor	Closed
0-7127	Examine Reconnaissance Scanning of Underground Utilities in the ROW	Active

Project Number	Project Name	Status
0-7128	Digitizing Traffic Control Infrastructure for Autonomous Vehicles (AV)	Closed
0-7130	Investigate Potential Connected and Automated Vehicle (CAV) Liability Issues Within TxDOT	Closed
0-7131	Leveraging Artificial Intelligence (AI) Techniques to Detect, Forecast, and Manage Freeway Congestion	Closed
0-7132	Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentrations	Active
0-7133	Develop Guidebook for Managing System Costs: Operational and Capital Cost Management at Rural and Small Urban Public Transit Systems	Active
0-7136	Texas Guidelines for Optimizing Roadway Cross-Section	Closed
0-7138	Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards	Active
0-7140	Develop Improved Queue Warning System Combining Multiple Data Sources	Active
0-7142	Develop Safety Scoring Tool for the Wet Surface Crash Reduction Program	Active
0-7143	Develop Methodologies for Reducing Costs in Full Depth Reclamation (FDR) Construction	Active
0-7144	Develop a Real-time Decision Support Tool for Urban Roadway Safety Improvement	Active
0-7145	Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials	Active
0-7148	Develop Design Details for CRCP Whitetopping at Intersections	Active
0-7151	Develop Recommendations for Evaluating Surface Types and Aggregate Properties to Minimize Wet Weather Crashes	Active
0-7152	Estimating Latent Bicyclist and Pedestrian Demand for Shared Use Path Design	Active
0-7153	Develop Design of Hot-Mix Cold-Laid (HMCL) Mixtures with the Superpave Gyratory Compactor	Active
0-7155	Develop/Refine Design Provisions for Headed and Hooked Reinforcement	Active
0-7156	Using Vehicle Probe Data to Evaluate Speed Limits on Texas Highways	Active
0-7157	Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities	Active
0-7159	Develop Guidelines for the Use of Unmanned Aerial Systems (UASs) and Smartphones for Construction and Utility Inspections	Active
0-7163	Synthesis of Lacustrine Wave Scour Evaluation Methods	Closed
0-7166	Leveraging Probe-Based Data to Enhance Long-Term Planning Models	Active

Project Number	Project Name	Status
0-7167	Evaluate Performance of Sealers and Coatings Applied to TxDOT Bridge Substructures	Active
0-7169	Post-NEVI Electric Vehicle Infrastructure Research (Freight, Fleet, and Multi-family Housing	Active
0-7170	Evaluate Bridge Deck Condition and Replacement Methods	Active
0-9908-22	Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentrations	Active
5-7049-01	Develop Guidebook for Managing System Costs: Operational and Capital Cost Management at Rural and Small Urban Public Transit Systems	Active
5-7083-01	Texas Guidelines for Optimizing Roadway Cross-Section	Active
5-9050-02	Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards	Active
9-1531	Develop Improved Queue Warning System Combining Multiple Data Sources	Active

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-6674-03	Automated IDEAL Cracking and Rutting Tests	Closed

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Closed
TTI Total Budget: $370,637.25
TTI Total Project Spend: $373,286.87

Completion Date: 08/31/2023
University #2:
Total Project Budget: $370,637.25
TTI FY23 Budget: $173,000.00
TTI FY23 Spend: $171,610.86

Project Description: The objective of this project is to complete the design and construction of the automated test system and to deliver an automated IDEAL cracking and rutting test system working unit to the Receiving Agency's MTD lab. The automated test system, includes (1) specimen rapid cooling unit, (2) auto-air void measurement unit, (3) specimen conditioning unit for both room and high temperature, (4) automation arm unit, and (5) automated IDEAL cracking test (IDEAL-CT), IDEAL rutting test (IDEAL-RT), and indirect tensile (IDT) strength test unit, and (6) waste disposal unit. This automated test system shall shorten test time and improve lab safety, test efficiency and accuracy. The Performing Agency shall work closely with the Receiving Agency to build one automated lab test system. The Performing Agency shall conduct comprehensive parallel comparison with the standard (manual) test system to ensure that the automated test results align with the current standard tests. The Performing Agency shall develop a user manual for the automated test system. Additionally, the Performing Agency shall provide training and demonstrations to Receiving Agency lab technicians after delivering the automated test system.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6674-03

TTI Planning and Environmental

Project Number	Project Name	Status
0-6701-02	Planning and Environmental Linkages Toolkit	Active

Project Start Date: 03/03/2023   **Completion Date:** 08/31/2024
Lead University: TTI   **University #2:**
Project Status: Active   **Total Project Budget:** $388,735.50
TTI Total Budget: $388,735.50   **TTI FY23 Budget:** $162,292.50
TTI Total Project Spend: $125,942.93   **TTI FY23 Spend:** $118,960.73

Project Description: The Receiving Agency funded research project 0-6701 in FY 2012 to investigate potential methods of linking transportation planning in Texas with the environmental clearance process required of the National Environmental Policy Act (NEPA). The study approach and findings were documented in a guidance document entitled Texas Department of Transportation (TxDOT) Resource for Linking Planning with Project Planning in Support of NEPA (0-6701-P1). The research that produced 0-6701-P1 was developed a decade ago prior to the Receiving Agency's participation in the NEPA Assignment program under 23 U.S.C. 327 and the Memorandum of Understanding with FHWA. In early FY2022, the Performing Agency renewed this effort in 0-6701-01 by conducting structured interviews with the Receiving Agency's planning and environmental subject matter experts, five of the state's Metropolitan Planning Organizations (MPOs), and five state Departments of Transportation (DOTs) that pioneered Planning and Environmental Linkages (PEL) to determine the need for updated/new PEL guidance. The structured interviews conducted in 0-6701-01 revealed the need for updated/additional PEL guidance. In 0-6701-02 the Performing Agency shall develop a user-friendly PEL Toolkit that the Receiving Agency's Divisions and District staff, as well as transportation partners can reference when using PELs in the state of Texas.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to revise the budget and Project Schedule to accommodate a later than expected start date for the project and scheduling constraints for the workshop. The FY 2023 budget is decreased by $165,015.00 from $327,307.50 to $162,292.50. The FY 2024 budget is increased by $165,015.00 from $61,428.00 to $226,443.00. The Itemized Project Budget Estimate remains $388,735.50.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6701-02
TTI Planning and Environmental

Project Number	Project Name	Status
0-6837-03	Assessment of Innovative and Automated Freight Systems and Development of Evaluation Tools - Phase III	Closed

Project Start Date: 06/13/2019
Lead University: TTI
Project Status: Closed
TTI Total Budget: $2,331,767.00
TTI Total Project Spend: $2,270,837.69

Completion Date: 02/28/2023
University #2:
Total Project Budget: $2,331,767.00
TTI FY23 Budget: $307,660.10
TTI FY23 Spend: $298,341.98

Project Description: In research project 0-6837 (Phase I), the Performing Agency conducted a comprehensive review of innovative and automated freight strategies and technologies (S/T) used worldwide. The Performing Agency initially identified a total of 57 different S/T from this review. In consultation with the Receiving Agency, the Performing Agency selected nine S/T areas, that could improve future freight distribution in Texas, to advance to research project 0-6837-01 (Phase II). In Phase II, the Performing Agency conducted an analysis which used the Systematic Technology Reconnaissance, Evaluation, and Adoption Methodology (STREAM) process from National Cooperative Highway Research Program Report 750, Volume 3, to evaluate each S/T's effectiveness. In Project 0-6837-03 (Phase III), the Performing Agency shall evaluate innovative strategic freight operational changes and technology applications recommended by the Receiving Agency at the conclusion of Phase II to ensure continued timely flow of commercial freight through the Texas transportation system. Phase III was planned to consist of seven distinctive project activities based upon the results of Phases I & II of the project. The activities advanced for Phase III research were selected by the Receiving Agency and address four of the nine freight S/T areas that were examined during Phase II. The selected S/T areas are: 1)Port Area Intelligent Transportation Systems (ITS) 2)Separation of Trucks from Automobiles/Truck-Only Infrastructure 3)Truck Parking Information 4)Border Advanced Traveler Information. Multiple Port Area ITS-related activities were chosen while the other three S/T areas produced one activity each. Phase III examines freight traffic changes near seaports after ITS equipment implementation, communication of rail blockages at a port entrance to approaching trucks, modeling of truck-only lane impacts within a major freight corridor, truck parking-related sensing and communication at existing Receiving Agency rest areas, and border crossing enhancement through coordinated information exchange. Each Phase III activity has independent utility and furthers implementation goals of the Texas Freight Mobility Plan (TFMP).

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6837-03

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-6872-01	Use of Geothermal Energy for De-icing Approach Pavement Slabs and Bridge Decks - Phase II	Active

Project Start Date: 10/09/2020
Lead University: UTA
Project Status: Active
TTI Total Budget: $528,611.15
TTI Total Project Spend: $375,536.39

Completion Date: 08/31/2024
University #2: TTI
Total Project Budget: $1,219,936.89
TTI FY23 Budget: $158,979.15
TTI FY23 Spend: $151,778.39

Project Description: De-icing using geothermal energy can provide the Receiving Agency with a better alternative than the existing method of using deicing with sands and/or salts. This research project shall explore the potential for retrofitting bridges with a hydronic pipe geothermal heating system and achieve Technology Readiness Levels (TRL) level 6 through prototype demonstration in a relevant environment. At the end of the project, the geothermal deicing technology shall be ready for prototype demonstration in an operational environment (TRL level 7).

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #2:
Due to construction delay and increase material and labor costs, it has become necessary to amend the contract to extend the termination date, increase the total project cost for the completion of the pilot geothermal bridge, amend the scope to allow for installation and test a new geofoam insulation panel in comparison with the spray foam panel and update the Project Schedule. For UTA FY 2021 remains $96,259.27; FY 2022 remains $239,577.42; FY 2023 budget is increased by $151,767.93 from $68,781.80 to $220,549.72; UTA's total project budget is $556,386.42. For TTI FY 2021 remains $70,169.60; FY 2022 remains $165,020.90; FY 2023 budget is increased by $60,921.45 from $98,057.70 to $158,979.15; TTI's total project budget is $394,148.05. The Itemized Project Budget Estimate for the project is increased by $212,689.38 from $737,866.69 to $950,556.07.

Amendment #3:
Amend the contract to extend the termination, to revise the Project Schedule and the Project Work Plan to move testing the newly completed pilot geothermal bridge over one winter and add a new Task 11, Develop an Automatic and Optimized De-Icing Operation Control Strategy. The FY 2023 budget for CTR remains $220,549.73; an FY 2024 budget for CTR is established in the amount of $134,939.32; the Total Project Cost for CTR is increased by $134,939.32 from $556,386.42 to $691,325.74. The FY 2023 budget for TTI remains $158,979.15; an FY 2024 budget for TTI is established in the amount of $134,441.50; the Total Project Cost for Performing Agency 2 is increased by $134,441.50 from $394,169.65 to $528,611.15. The Total Itemized Project Budget Estimate is increased by $269,380.82 from $950,556.07 to $1,219,936.89.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6872-01

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-6958	Developing Performance Specification for High Performance Concrete	Active

Project Start Date: 09/01/2017
Lead University: TTI
Project Status: Active
TTI Total Budget: $1,142,586.00
TTI Total Project Spend: $1,020,314.54

Completion Date: 04/30/2024
University #2:
Total Project Budget: $1,142,586.00
TTI FY23 Budget: $200,000.00
**TTI FY23 Spend:** $207,955.29

Project Description: In the past, achieving high strength was considered by the Receiving Agency as the main design criteria to formulate high performance concrete. The Receiving Agency considers mix design options 1-4 in item 421 as high performance concrete (HPC) and these options were developed for ASR mitigation and not for other durability aspects. Very little work has been done to determine if these options are adequate to provide long-term durability often needed when HPC is specified. The main objective of this study is to develop performance specification for high performance concrete in order to ensure high performance in terms of durability. The Performing Agency will conduct a combination of both field investigation and laboratory study in order to achieve this objective. The Performing Agency shall use both conventional and innovative new lab testing methods to determine the key performance characteristics (i.e., prescribing acceptable limits of permeability, shrinkage, surface resistivity, and chloride ingress - basis for developing performance specification) followed by developing specific prescriptive requirements in order to formulate wide varieties of prescriptive mixes that can meet the durability requirements matching with different exposure conditions. A combined approach of relating mix design parameters, lab based durability test results, mechanical properties, structural dimensions, climatic conditions, and / exposure conditions through suitable service life prediction model and predicting will be used to ensure long term durability (at least 75 years) for the HPCs in typical aggressive environments. This will lead to develop performance- and prescriptive-based concrete specifications for HPC. This could potentially encourage contractors to effectively use these fine-tuned prescriptive HPC mixtures without the need of conducing additional long duration testing and ensure making long lasting durable concrete and save taxpayers' dollars.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6958
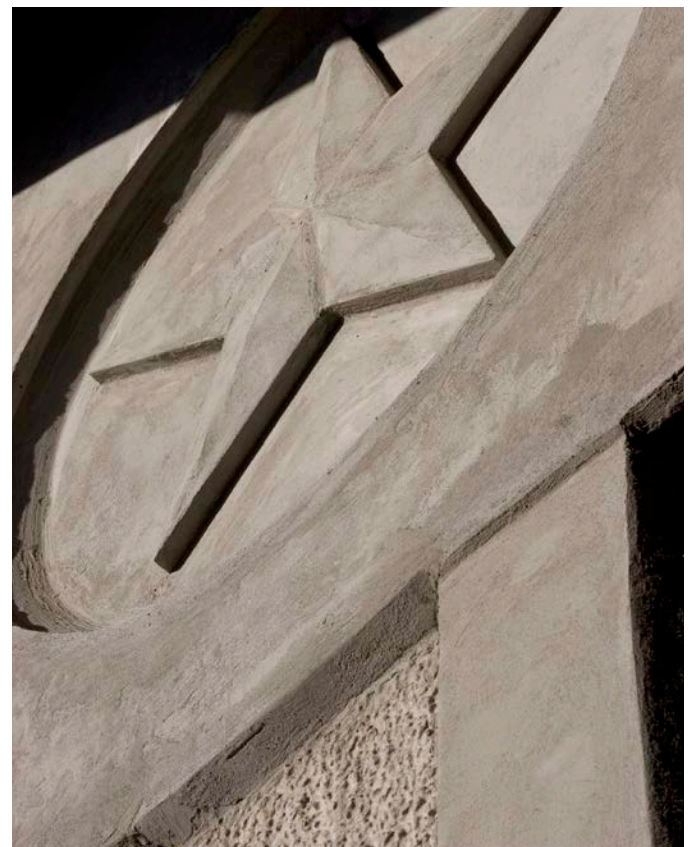
TTI Program Support

Project Number	Project Name	Status
0-6974	Digital Publication and Outreach Services in Support of Research	Active

Project Start Date: 07/11/2018
Lead University: TTI
Project Status: Active
TTI Total Budget: $1,913,647.00
TTI Total Project Spend: $1,136,089.81

Completion Date: 08/31/2025
University #2:
Total Project Budget: $1,913,647.00
TTI FY23 Budget: $332,752.25
TTI FY23 Spend: $283,338.19

Project Description: The Performing Agency shall produce Video Summary Report's (VSRs) for the Receiving Agency which summarize transportation research and implementation projects. Additionally, the Performing Agency shall also produce outreach materials for the Receiving Agency that will be transportation research related material and may include additional related subjects of interest.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6974

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-6982	Utilization of UHPC Bridge Superstructures in Texas	Closed

Project Start Date: 09/01/2018
Lead University: TTI
Project Status: Closed
TTI Total Budget: $1,526,978.50
TTI Total Project Spend: $1,463,126.53

Completion Date: 10/31/2022
University #2:
Total Project Budget: $1,526,978.50
TTI FY23 Budget: $17,210.50
TTI FY23 Spend: $11,243.74

Project Description: The Receiving Agency has led the nation in developing innovative bridge design and construction solutions for decades through its strong research and development programs. This project aims to extend this progressive tradition. The use of ultra-high performance concrete (UHPC) in Texas bridges has the potential of producing substantial improvements to bridge construction. For example, the recent Malaysian experience with UHPC proved the fact that bridge superstructure weight can be reduced by 40 percent. For long-span bridges, such self-weight reductions can result in significant design and construction benefits. Within this context, this projects aims to identify the applications in which the use of UHPC can be leveraged to develop new structural systems. The three major technical objectives of this research are outlined in the project statement as follows:

1) Conduct an analytical feasibility study to identify the material properties for which a nonproprietary UHPC mixture design should be developed to deliver the optimal design benefits.

2) Develop a nonproprietary concrete mixture design to meet the needs identified in Technical Objective 1.

3) Conduct experiments (full-scale and material-level) to study long-term mechanical properties (for example tensile creep) in an effort to eliminate or minimize the use of ordinary reinforcing bars in UHPC applications.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6982

TTI Safety and Operations

Project Number	Project Name	Status
0-6994	Develop a Retrofit Design for Guard Fence System to Enhance Motorcycle Safety	Closed

Project Start Date: 09/01/2018
Lead University: TTI
Project Status: Closed
TTI Total Budget: $876,264.25
TTI Total Project Spend: $808,768.64

Completion Date: 08/31/2023
University #2:
Total Project Budget: $876,264.25
TTI FY23 Budget: $252,322.50
TTI FY23 Spend: $190,390.83

Project Description: Motorcyclists are among the most vulnerable users of the road system and the appropriate design of roadside safety systems plays an important role in the severity of motorcycle crashes.Data show that from 2004, the number of fatalities related to motorcycle impact against safety barriers was greater than the number of fatalities recorded from the impact of passenger car users against same roadside safety devices. Although there are no guidelines addressing proper test and use of motorcycle retrofit barriers, there is a need to develop an appropriately designed guardrail system retrofit to address motorcycle-rider fatalities associated with barrier impacts, which can happen with the rider being either in a sliding or upright position. The Performing Agency shall consider such a retrofit system for placement on appropriate high speed roadways at locations that are more likely to be associated with motorcycle impact fatalities and severe injuries. The Performing Agency shall develop an appropriate motorcycle- friendly retrofit guard fence system for evaluation to determine its compliance with the 2016 Manual for Assessing Safety Hardware (MASH), per Federal Highway Administration (FHWA) requirement.

Approved Work Program Revisions
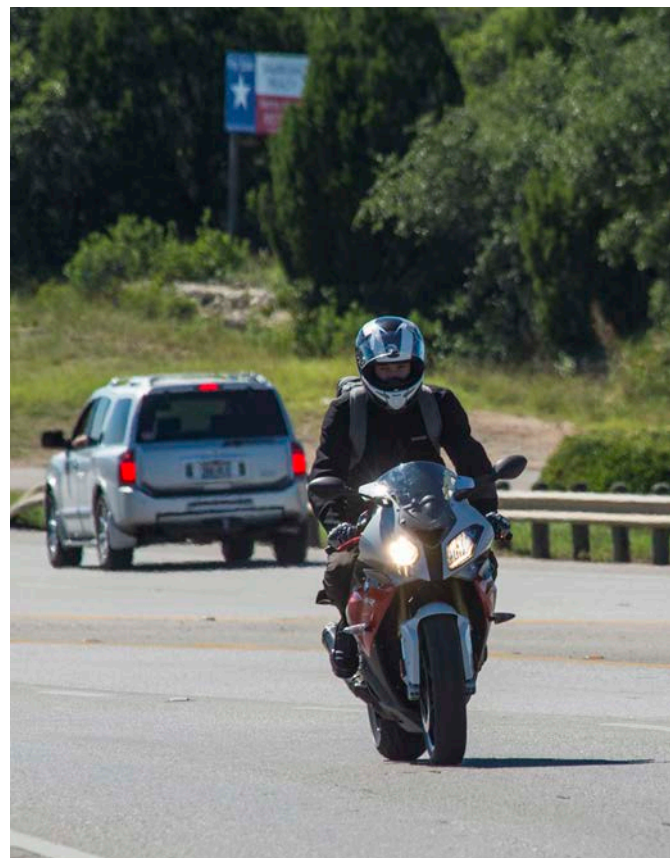No. of FY23 Amendments: One

Amendment #6:
Amend the contract to replace the Principal Investigator due to the departure of the Project Supervisor.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6994

TTI Safety and Operations

Project Number	Project Name	Status
0-7004	Improve System Emergency Response Performance in the Houston District Using Connected Vehicle Technology	Active

Project Start Date: 07/18/2019
Lead University: TTI
Project Status: Active
TTI Total Budget: $480,124.25
TTI Total Project Spend: $469,700.87

Completion Date: 12/31/2023
University #2:
Total Project Budget: $480,124.25
TTI FY23 Budget: $90,795.50
TTI FY23 Spend: $88,669.99

Project Description: Emergency response services play a vital role in saving lives and minimizing property damage when major events or incidents happen. The Dedicated Short Range Communication (DSRC) and Bluetooth Low Energy (BLE) technologies have the potential to improve the efficiency and roadway safety related to emergency management services. The primary objective of this project is to develop and test DSRC- and BLE-based prototype systems for enhancing emergency preemption and notification. Another objective is to provide the Receiving Agency with guidelines for implementing DSRC and BLE technologies for supporting emergency response services. To this end, the Performing Agency shall:

1) Identify methodologies for improving emergency vehicle signal preemption in a connected environment.

2) Develop and test prototype DSRC-based and BLE-based systems to broadcast Signal Phase and Time (SPaT) messages, Emergency Vehicle Alerts (EVAs), and other notifications to emergency vehicles and other roadway users in the vicinity.

3) Enhance signal preemption performance; (4) Assist the Receiving Agency in implementing the prototype systems at selected Houston field sites; and (5) Identify anticipated cost and benefit of the connected emergency response system. The key products of the project include DSRC and BLE prototype systems that operate with the Receiving Agency's infrastructure and guidelines for implementing the system.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7004

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7006	Design, Construction, and Performance Monitoring of Stabilization of Expansive Soils and Cement	Active

Project Start Date: 04/24/2019
Lead University: TTI
Project Status: Active
TTI Total Budget: $1,730,912.75
TTI Total Project Spend: $1,050,285.01

Completion Date: 08/31/2024
University #2:
Total Project Budget: $1,730,912.75
TTI FY23 Budget: $316,623.75
TTI FY23 Spend: $244,721.20

Project Description: The Receiving Agency is actively looking for alternatives to stabilize expansive soils and cement treated bases with polypropylene fiber. Polypropylene fiber, hereafter is referred to as fiber. Many areas in Texas have problems stabilizing expansive soils with traditional stabilizers (i.e. lime, cement, fly ash, or in combination) because of the high levels of sulfates in the soil. Many major pavement failures have occurred due to lime/cement induced sulfate heaves. In addition, reflection cracks from cement treated bases have been reported in numerous projects. Expansive soils have caused extensive pavement heaves, bumps and longitudinal cracks. The repetitive shrinking and swelling is responsible for the development of cracks, heaves and bumps on Texas roads. Roadway surface cracks allow water intrusion which degrades underlying pavement layers, and prematurely fails the pavement structure. Surface heaves and bumps are a driver safety issue. Cracks, heaves, and bumps are extremely expensive to repair over the life of the pavement, and it would be more economical and safer to the public to mitigate their occurrences during construction. Previous research results indicate that the fiber-reinforced cement treated bases has shown to increase performance. Significant improvements in both shear and compressive strengths, as well as flexibility, have been reported in fiber reinforced soils and fiber reinforced cement treated bases. Also, fiber reinforced clays and sands were able to reduce volumetric shrinkage strains and swell pressures. It is expected that these types of improvements would directly mitigate the aforementioned distresses. There are huge potential benefits of applying polypropylene fiber to stabilize expansive soils and cement treated bases to (1) increase strength, (2) reduce shrinkage potential, (3) reduce chemical stabilizer content, and (4) increase flexibility/ductility. There is a critical need to incorporate fiber in the Receiving Agency's "Modification and Stabilization of Soils and Base for Use in Pavement Structures" guidelines. Therefore, this study will develop appropriate laboratory test methods to evaluate mix designs for (1) fiber reinforced cement treated base, (2) fiber reinforced clay, and (3) fiber reinforced sandy soil. In addition, this study will provide assistances to Receiving Agency Districts to develop optimum fiber application rates and establish specifications and construction QC/QA plans for uniform mixing. The Performing Agency shall conduct laboratory tests to determine optimum fiber application rates for cement treated base and 6 different subgrade soils: (1) PI < 15, (2) 15 ≤ PI < 35, (3) PI ≥ 35, (4) sulfate concentration > 3000 ppm but ≤ 8000 ppm, (5) sulfate concentration > 8000 ppm, and (6) organics content exceeds 1%. Over the last few years, the Receiving Agency has successfully constructed several Full Depth Recycling (FDR) sections with foamed asphalt using innovative reclaiming equipment. One key issue that the Performing Agency shall address in this study is an evaluation of the mix technologies that ensure fibers are mixed uniformly in the field. The Performing Agency shall use the Wirtgen Reclaimer as the initial device for mixing fibers into the material being stabilized. The Performing Agency shall progress to other common construction equipment and processes to achieve the optimum mixing results. This study shall investigate innovative Nondestructive Testing (NDT) tools to (1) assist site characterization, (2) select candidate test sections, (3) identify sampling locations, (4) provide input on mix design process, (5) provide Input during QC/QA process, and (6) monitor field performance of the test section. The Performing Agency shall document the optimal construction techniques and identify time and cost savings.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #4:

Amend the contract to revise the budget to postone the fiber purchase until FY24 due to construction delays. The FY19-FY22 Budgets remain the same. The FY 2023 budget is decreased by $85,000.00 from $401,623.75 to $316,623.75. The FY 2024 budget is increased by $85,000.00 from $397,898.75 to $482,898.75. The Itemized Project Budget Estimate remains $1,730,912.75.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7006

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7013	Performance and Improvement of Texas Poor Boy Continuous Bridge Deck Details	Closed

Project Start Date: 06/28/2019
Lead University: TTI
Project Status: Closed
TTI Total Budget: $727,298.00
TTI Total Project Spend: $696,652.49

Completion Date: 08/31/2023
University #2:
Total Project Budget: $727,298.00
TTI FY23 Budget: $162,466.00
TTI FY23 Spend: $128,560.42

Project Description: The majority of bridges in Texas are constructed with girders as simple spans. A simple-span deck requires expansion joints which are sources for maintenance and durability issues. To avoid this, continuous decks are an attractive option, however cracks may develop. The Receiving Agency uses a detail that intentionally forms cracks, referred to as the "Texas Poor Boy" detail. Despite a four decade history of such detailing, a comprehensive evaluation of performance of this detailing has not been conducted. The Performing Agency shall conduct a multi-tiered survey to identify the performance of the current "Poor Boy" continuous bridge deck details within different environments (high ADT, high rainfall, or high deicing salt zones), as well as a literature and state-of-the practice survey to establish the detailing and expected performance of alternative connection designs. Using the results of these surveys, the Performing Agency shall develop candidate modifications to the current poor-boy details for new construction and candidate details for rehabilitation of existing bridges. The Performing Agency shall use modeling and full-scale experimental tests to assess the performance of the recommended details. The Performing Agency shall use the results of modeling and experimental to make final recommendations for design methodologies and details.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7013
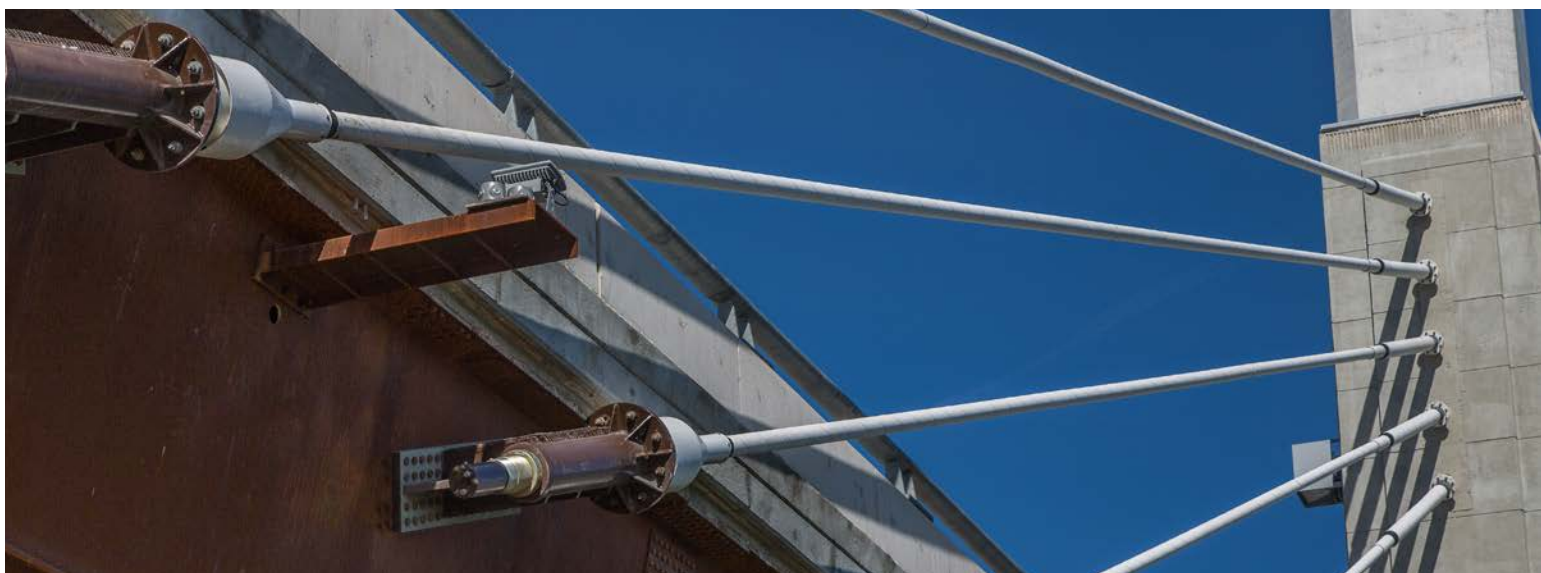
TTI Safety and Operations

Project Number	Project Name	Status
0-7021-01	Develop Enhanced Protection of Median Openings Between Parallel Bridge Structures	Closed

Project Start Date: 12/14/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $159,729.50
TTI Total Project Spend: $41,534.48

Completion Date: 08/31/2023
University #2:
Total Project Budget: $159,729.50
TTI FY23 Budget: $126,999.25
TTI FY23 Spend: $8,826.29

Project Description: When divided highways span a hazard, engineers often design two separate bridges with the bridge rail ends protected by guardrail installations, leaving an opening between the parallel bridge structures possibly resulting in a gap in roadside protection. The combination of the sloped median ditch and the approach guardrail can direct errant motorists between the two bridge structures and into the underlying hazard. The risk increases when the spanned hazard is another roadway with motorists traveling below the parallel bridges. Unfortunately, these median openings have fatal crashes in Texas and across the country. The original project, 0-7021, developed the Median Opening Protection System (MOPS) and began the crash testing. The Performing Agency shall address this safety issue as follows:

- Identify characteristics of high-risk locations that can benefit from implementation of a MOPS.

- Evaluate the MOPS with full-scale crash testing.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #2:
Amend the contract to extend the term and to revise the budget, the Work Plan and the Project Schedule to include the additional evaluation and testing of the Median Opening Protection System. The FY 2022 budget remains $32,730.25. The FY 2023 budget is increased by $109,999.25 from $17,000.00 to $126,999.25. The Itemized Project Budget Estimate is increased by $109,999.25 from $49,730.25 to $159,729.50.

Amendment #1:
Amend the contract to extend the term, to amend the budget, and to amend the project schedule to comply with the federal requirement by making the deliverables Section 508 compliant. The FY22 budget is decreased by $17,000.00 from $49,730.25 to $32,730.25. The FY 2023 budget is established at $17,000.00. The Total Project Budget remains $49,730.25.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7021-01

TTI Planning and Environmental

Project Number	Project Name	Status
0-7022-01	Monarch Conservation Strategies for Texas Roadways	Active

Project Start Date: 02/17/2023
Lead University: TTI
Project Status: Active
TTI Total Budget: $400,974.50
TTI Total Project Spend: $134,296.16

Completion Date: 08/31/2025
University #2: TAR
Total Project Budget: $580,659.50
TTI FY23 Budget: $171,962.00
TTI FY23 Spend: $125,588.17

Project Description: The US Fish and Wildlife Service (USFWS) supported federal listing of the monarch butterfly (Danaus plexippus) in December 2020, but listing is currently delayed due to other higher priority listing actions. Texas roadways play a critical role in the successful spring and fall migrations of the eastern monarch butterfly population. Receiving Agency project 0-7022, "Evaluating Fall Monarch Butterfly Roadkill Hotspot Incidence and Potential Roadkill Mitigation" has revealed perennial hotspots for fall monarch butterfly roadkill in Texas. Yearly roadkill can comprise up to 2.5% of the Mexican overwintering population. Spring and fall roadside milkweed and monarch-preferred nectar plant hotspots have also been identified which provide critical resources to monarchs in terms of both milkweed larval food and flower nectar for adults.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6872-01

TTI Planning and Environmental

Project Number	Project Name	Status
0-7024	Assessing Ozone Impacts on Electric Vehicle (EV) Adoption in Texas	Closed

Project Start Date: 11/01/2019
Lead University: TTI
Project Status: Closed
TTI Total Budget: $510,772.00
TTI Total Project Spend: $519,683.16

Completion Date: 08/31/2023
University #2:
Total Project Budget: $510,772.00
TTI FY23 Budget: $77,264.50
TTI FY23 Spend: $77,939.52

Project Description: Plug-in Electric vehicles (PEVs) are expected to overtake conventional vehicles by mid-2030s. PEVs have considerably lower tailpipe pollutant emissions which react with each other and form ground-level ozone, a criteria pollutant known to be harmful to human health and the environment. However, when the overall wheel-to-well emissions are considered, characterizing the net impact of PEVs on ozone is a complex task that involves capturing the influence of factors such as PEV technology, energy sources of electricity generation, and location and time of electricity generation. The Performing Agency shall use the most recent available data and methods to develop forecasts of changes in ground-level-ozone as a result of PEV activities in three non-attainment areas of Texas (Houston, Dallas-Fort Worth, and San Antonio) for multiple scenarios representing different plausible changes in key influence factors by years 2023 and 2028. The Performing Agency shall develop a series of scenarios for PEV activity levels, energy sources, and charging profiles. The Performing Agency shall then estimate the changes in emissions from PEVs and power generation by location and time. The Performing Agency shall use the Environmental Protection Agency's (EPA) Community Multi-scale Air Quality Model (CMAQ) photochemical modeling along with Texas-specific emission inputs prepared and used by the Texas Commission on Environmental Quality (TCEQ) to estimate hourly levels of ground-level ozone in the study areas.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7024

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7027	Accelerating Mix Designs for Base Materials	Active

Project Start Date: 07/10/2019
Lead University: TTI
Project Status: Active
TTI Total Budget: $689,885.00
TTI Total Project Spend: $573,407.37

Completion Date: 10/31/2023
University #2:
Total Project Budget: $689,885.00
TTI FY23 Budget: $222,496.75
TTI FY23 Spend: $179,980.75

Project Description: Stabilization of roadway or stockpile materials allows for enhancing strength and stiffness properties of pavement base layers to meet structural requirements in a cost-effective and sustainable manner. Historically, stabilization mixture design criteria relied on compressive strength results and, depending on the treatment and test method, could take nearly a month to complete. Additionally, the different treatments currently require different preparation, curing, and acceptance criteria. This project will develop a harmonized accelerated design procedure for base materials with the objective of producing an acceptable design recommendation within seven (7) days. This project will include stabilizer types such as cement, lime, lime-fly-ash, asphalt emulsion, and foamed asphalt, and will focus on rapid test turnaround time, lab curing techniques to rapidly simulate cured field conditions, inclusion of moisture susceptibility in the mix design, and performance-related design criteria. This project will develop recommended harmonized test procedures, suggested specification modifications as applicable, and perform training workshops.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7027

TTI Planning and Environmental

Project Number	Project Name	Status
0-7037	Develop Models for Freight Flows and Commercial Travel Patterns within Texas Urban Regions	Active

Project Start Date: 03/03/2020
Lead University: TTI
Project Status: Active
TTI Total Budget: $1,654,330.00
TTI Total Project Spend: $1,291,113.42

Completion Date: 08/31/2024
University #2:
Total Project Budget: $1,654,330.00
TTI FY23 Budget: $344,664.75
TTI FY23 Spend: $361,475.77

Project Description: This project will use a phased work plan to develop a freight model within one or more urban areas of the state of Texas using the most current state of the practice methods and data sources. The Performing Agency shall produce a freight model through an interactive and iterative process by the Performing Agency, Receiving Agency, and Metropolitan Planning Organizations (MPO) partners using the concept of first creating a "minimum viable product" as used in commercial software development. Key initial steps to this process will be investigation of similar recent freight modeling efforts in the United States (U.S.), early identification of freight model requirements for both Receiving Agency and local/regional planning efforts, selection of the type/function of model that will address those requirements, and an assessment of data availability and of any fatal flaws that might be encountered. The Performing Agency shall then work cooperatively with the selected MPO partner to build and implement a state-of -the practice model that can be iteratively improved over time as additional data or methods emerge. Training for model users and an ongoing, web-based forum for users to share insights and questions are also part of the work plan. Reporting of results and transferability to diverse MPOs are other key features of the project.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #4:
Amend the contract to extend the termination date, revise the budget, and the Project Schedule due to delays completing Tasks 6-8. The FY 2020 budget remains $190,726.00. The FY 2021 budget remains $453,582.00. The FY 2022 budget remains $315,353.00. The FY 2023 budget is decreased by $350,004.25 from $694,669.00 to $344,664.75. The FY 2024 budget is established at $350,004.25. The Total Project Budget remains $1,654,330.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7037

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7038	Develop Bridge Weigh-in-Motion Approach to Measure Live Loads on Texas Highways	Closed

Project Start Date: 10/21/2019
Lead University: TTI
Project Status: Closed
TTI Total Budget: $414,611.00
TTI Total Project Spend: $387,294.36

Completion Date: 10/31/2022
University #2:
Total Project Budget: $414,611.00
TTI FY23 Budget: $9,999.00
TTI FY23 Spend: $5,903.33

Project Description: The primary objective for bridge weigh-in-motion (B-WIM) systems is to characterize the truck loading on a given corridor. B-WIM (compared to pavement weigh-in-motion) is potentially less disruptive to traffic, more durable, more economical, safer to install and able to produce accurate traffic data. This project aims to realize these potential advantages through the development of a B-WIM system that includes extensive experimental testing. The system shall identify the truck gross weight, axles (weights, number and spacing), speed and vehicle classification. A secondary objective of B-WIM is to evaluate the bridge itself. The Performing Agency shall develop an approach to identify bridge parameters such as distribution factors, percent composite action, dynamic impact factor, and stress cycles from B-WIM data. The Performing Agency shall include site-specific load ratings on the final bridge evaluations. The overall purpose of B-WIM is to aid the Receiving Agency with future decisions. The major technical objectives of this research are to:

1) Develop and finalize the B-WIM approach through preliminary experimental testing.

2) Select three (3) bridges to install B-WIM systems along crucial corridors.

3) Install the B-WIM system along three (3) in-service bridges, which includes calibration of each setup.

4) Conduct traffic data analysis and a validation study.

5) Perform an evaluation of each in-service bridge.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7038

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7040	Evaluation of Corrosion Prevention and Mitigation Approaches Used on Texas Bridges	Active

Project Start Date: 12/01/2019
Lead University: TTI
Project Status: Active
TTI Total Budget: $856,909.50
TTI Total Project Spend: $792,244.71

Completion Date: 11/30/2023
University #2:
Total Project Budget: $856,909.50
TTI FY23 Budget: $226,095.50
TTI FY23 Spend: $172,995.71

Project Description: Corrosion of steel has been causing millions of dollars of loss in infrastructure to the state of Texas. The use of corrosion-resistant reinforcement in concrete structures and painting of steel elements have been the most common mitigation strategies. In addition, the use of weathering steel, metalizing on steel and concrete elements, and cathodic protection (sacrificial anode) have also been applied on the Receiving Agency bridges. The performances of different approaches vary with different bridges in different geographic areas; i.e., cold, arid, and humid districts. It is imperative for the Receiving Agency to have a decision tool to conduct effective corrosion prevention for new construction and corrosion mitigation for effective maintenance. The project objectives are to (1) conduct a synthesis of worldwide field investigations of the performance of corrosion mitigation, (2) perform field evaluations statewide to investigate the effectiveness of corrosion mitigation instrumented in the past, and to (3) perform lab tests, as necessary, to verify findings and to obtain a better understanding of corrosion mitigation approaches.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7040

TTI Safety and Operations

Project Number	Project Name	Status
0-7047	Establish Guidelines for Designing Auxiliary Lanes on Frontage Roads	Closed

Project Start Date: 12/01/2019
Lead University: TTI
Project Status: Closed
TTI Total Budget: $330,627.00
TTI Total Project Spend: $336,724.32

Completion Date: 12/31/2022
University #2:
Total Project Budget: $330,627.00
TTI FY23 Budget: $11,972.25
TTI FY23 Spend: $12,500.25

Project Description: Auxiliary Lanes (ALs) are used on frontage roads to help facilitate safe weaving, merging, and diverging traffic movements to and from the frontage roads at and between freeway ramp terminals. They help balance the traffic load and provide transitions, vehicle storage, acceleration/ deceleration to and from driveways, turnaround lanes, and interchange approaches and departures. Acceleration and deceleration lanes, climbing lanes, and right and left-turn lanes are examples of AL types that can serve different purposes. There is limited guidance for designing ALs on frontage roads at and between freeway ramp terminals. The goal of this project is to identify gaps in existing guidelines and develop design criteria for ALson frontage roads. To address this goal the Performing Agency shall:

a) review the literature and the state of practice in Texas.

b) determine the conditions under which a certain type of AL design improves traffic operations.

c) conduct safety analyses to identify influential factors and develop crash prediction models that practitioners can use to determine how the addition of an AL with certain characteristics can affect safety.

Approved Work Program Revisions
No. of FY23 Amendments: 0
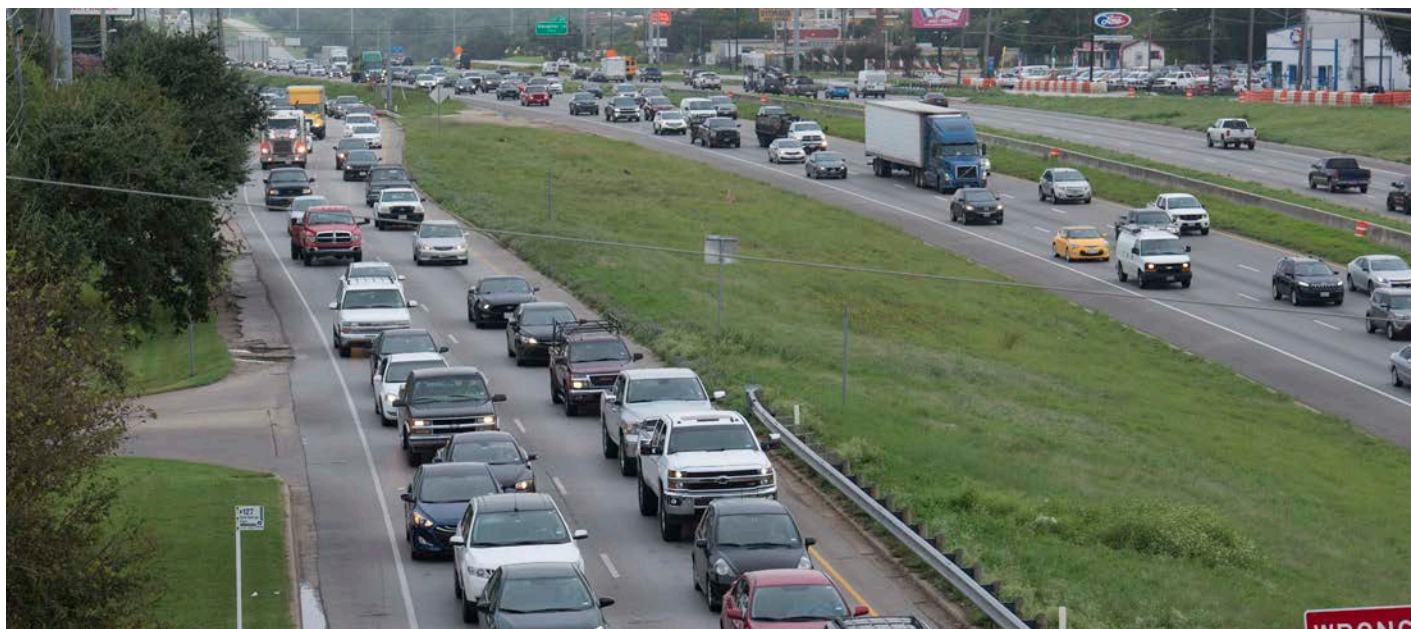
CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7047

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7073	Improving Testing Requirements in Item 300 Of TxDOT Standard Specifications	Active

Project Start Date: 09/01/2020

Lead University: CTR

Project Status: Active

TTI Total Budget: $662,548.83

TTI Total Project Spend: $286,169.65

Completion Date: 08/31/2025

University #2: TTI

Total Project Budget: $1,130,000.00

TTI FY23 Budget: $90,000.00

TTI FY23 Spend: $87,306.48

Project Description: The Receiving Agency's standard specification Item 300, Asphalts, Oils, and Emulsions, includes more than 48 different test procedures or conditioning procedures for asphalt concrete (AC) graded binders (12), cutbacks (8), emulsified binders (17), and performance-graded (PG) binders (11) used in different pavement construction and maintenance applications. This does not include testing requirements for recycling agents, crack sealants, or asphalt rubber binder. The Receiving Agency regularly performs many of these tests for quality management or quality assurance purposes. This test schedule presents a challenge for the binder lab in terms of maintaining test procedures, acquiring and maintaining test equipment, calibrating equipment, and training personnel. Some specification tests are legacy tests that once were the state-of-the-art and thought to be related to asphalt binder performance. Many of these legacy tests are not used in more recently developed specifications, as other tests are now available and may be more indicative of performance. This project seeks to review the Receiving Agency's Item 300 binder specifications and tests for relevance; determine whether they assess safety, performance, or constructability; and take into account accuracy, efficiency, and environmental considerations. The project shall also make recommendations for changes.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:

Amend the contract to extend the termination date, revise the Work Plan to correct task numbering and add additional tasks, add the FY 2024 and FY 2025 budgets, and extend the Project Schedule to advance the impact of the project with incorporating findings from other national research studies which were recently completed. Performing Agency 1: The FY 2021 budget remains $97,548.83. The FY 2022 budget remains $89,447.08. The FY 2023 budget remains $103,004.09. The FY 2024 budget is established at $134,889.57. The FY 2025 budget is established at $ $140,110.43. Total Project Budget is increased by $275,000.00 from $290,000.00 to $565,000.00. Performing Agency 2: The FY 2021 budget remains $100,000.00. The FY 2022 budget remains $100,000.00. The FY 2023 budget remains $90,000.00. The FY 2024 budget is established at $125,000.00. The FY 2025 budget is established at $150,000.00. Total Project Budget is increased by $275,000.00 from $290,000.00 to $565,000.00. The Itemized Project Budget Estimate is increased by $550,000.00 from $580,000.00 to $1,130,000.00.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7073

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7075	Determine the Influence of Thermal Segregation on Current Asphalt Mixtures	Closed

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Closed
TTI Total Budget: $439,970.00
TTI Total Project Spend: $323,060.90

Completion Date: 08/31/2023
University #2:
Total Project Budget: $439,970.00
TTI FY23 Budget: $169,590.25
TTI FY23 Spend: $131,719.85

Project Description: Thermal segregation during asphalt mixture construction can identify areas that become low density. These low-density areas generally exhibit reduced pavement life. While the general methods for measuring thermal segregation remained relatively unchanged since their implementation, the asphalt mixture types and design methods underwent significant modifications in the last 10 years. The Performing Agency shall evaluate the significance of thermal segregation with current generation asphalt mixes. The Performing Agency shall perform validation and, if appropriate, develop modified thermal segregation criteria based on the consequences of thermal segregation on current asphalt mixes. The Performing Agency shall provide guidance on what frequency of thermal segregation constitutes a recurring issue. The Performing Agency shall make sure current thermal profile requirements properly align with current generation asphalt mixes and construction practices.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7075

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7076	Develop Laboratory Mix Design of Full Depth Reclamation (FDR) Projects Using Foamed Asphalt Binder and Emulsified Asphalt	Active

Project Start Date: 09/01/2020

Lead University: TTI

Project Status: Active

TTI Total Budget: $885,286.25

TTI Total Project Spend: $461,781.12

Completion Date: 08/31/2024

University #2:

Total Project Budget: $885,286.25

TTI FY23 Budget: $246,033.75

TTI FY23 Spend: $121,421.78

Project Description: Full depth reclamation (FDR) is a cost-effective recycling strategy that reuses both asphalt bound and unbound granular materials. FDR was implemented in Texas in the early 1990s in the Bryan and Lubbock Districts. In the past five years, the Receiving Agency has implemented FDR using either foamed asphalt or emulsions. The current specification allows for 4-inch diameter by 2-inch height specimens or 6-inch diameter by 3.75-inch height specimens to be tested, with identical acceptance criteria for both sample sizes. This practice has raised concern regarding the effect of sample size on the indirect tensile (IDT) strength because larger specimens have shown lower IDT strength compared to 4-inch diameter specimens regardless of material source, binder type, binder content, or conditioning procedure. The Performing Agency shall evaluate the strength differences between the two specimen sizes and provide acceptance criteria revisions, as appropriate. In addition, the effect of testing temperature is critical with regard to IDT strength of FDR specimens. Therefore, the Performing Agency shall evaluate the specimens at various testing temperatures and recommend a target temperature to substitute the more general test conditions currently specified. The Performing Agency shall validate the revised criteria by evaluating the performance of selected field projects.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7076

TTI Safety and Operations

Project Number	Project Name	Status
0-7082	Evaluate Attachments to Concrete Barrier Systems to Deter Pedestrians	Closed

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Closed
TTI Total Budget: $436,762.25
TTI Total Project Spend: $407,294.98

Completion Date: 11/30/2022
University #2:
Total Project Budget: $436,762.25
TTI FY23 Budget: $35,233.00
TTI FY23 Spend: $26,906.46

Project Description: Concrete rigid barriers are used in medians to separate traffic, and on the roadside to shield hazards from motorists and motorists from hazards. These barriers need to demonstrate crashworthiness through full-scale testing per American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH). Attachments may be deployed on top of concrete barriers due to various reasons, including deterring pedestrians from crossing highways. Such hardware attachments, however, have not been investigated to MASH standards. Previous crash tests under MASH high-speed impact conditions highlighting the propensity for vehicles to climb and intrude into the area where these attachments might be deployed. Therefore, the Performing Agency suspects that impacting vehicles will likely interact with hardware attached to concrete barriers. The AASHTO Roadside Design Guide (RDG) does not provide guidance for attaching hardware on top of barriers. Although limited research has investigated the crashworthiness of sign supports on top of concrete barriers, continuous systems that could be used to deter pedestrian crossings have not been investigated to MASH standards. The Performing Agency shall evaluate attachment to the top of concrete barriers to determine if devices suitable for deterring pedestrian crossing are MASH compliant. Additionally, guidance will be provided for the selection and attachment of these systems on top of concrete barriers.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7082

TTI Safety and Operations

Project Number	Project Name	Status
0-7086	Roadside Safety Device Analysis, Testing, and Evaluation Program	Active

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Active
TTI Total Budget: $2,307,324.75
TTI Total Project Spend: $1,799,061.39

Completion Date: 10/31/2023
University #2:
Total Project Budget: $2,307,324.75
TTI FY23 Budget: $760,619.75
TTI FY23 Spend: $553,194.67

Project Description: Roadway departure crashes are the most common type of crash in Texas. These crashes represent over 45 percent of all fatal crashes and 34 percent of all serious injury crashes. Texas data shows that there were 9,560 fatal and 30,766 serious injury roadway departure crashes from 2010-2016. Roadside safety devices shield motorists from roadside hazards such as non-traversable terrain and fixed objects, thereby reducing injuries and fatalities associated with roadway departure crashes. To improve the safety of the motoring public, there is a need to develop new or improved safety devices that accommodate a variety of site conditions, placement locations, and a changing vehicle fleet. The Performing Agency shall provide the Receiving Agency with a mechanism to quickly and effectively address high priority issues related to roadside safety devices. The Performing Agency shall provide results in new and improved safety features that minimize the consequences of vehicles leaving the road and reduce injuries and fatalities associated with roadway departure crashes. The Performing Agency shall develop roadside safety devices to meet the 2016 edition of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) roadside safety criteria, to address the continuing trend of larger vehicles in the statewide vehicle fleet.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7086

TTI Safety and Operations

Project Number	Project Name	Status
0-7087	Develop Standards for Temporary Concrete Median Barrier in Flood-Prone Areas	Active

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Active
TTI Total Budget: $433,815.75
TTI Total Project Spend: $334,140.96

Completion Date: 10/31/2023
University #2: CTR
Total Project Budget: $638,887.25
TTI FY23 Budget: $216,118.75
TTI FY23 Spend: $174,488.21

Project Description: Portable concrete median barriers are used in work zones to prevent serious cross-median crashes and vehicle penetration in work zones. These barriers are used on highways to provide positive containment of vehicles and to reduce maintenance and repair needs. When implemented in flood-prone areas, portable concrete median barriers can act as a dam for flood waters until the damming of water causes the barrier to displace and break, as recently occurred in the Houston and Beaumont Districts during severe storms. These situations required significant repair before the highways could be reopened and the level of safety for motorists restored. Any required barrier maintenance or repair increases risk to maintenance personnel and can result in significant congestion if a lane closure is required. There is a need to develop and evaluate an appropriate portable concrete median barrier in compliance with the 2016 edition of the American Association of State Highway and Transportation (AASHTO) Manual for Assessing Safety Hardware (MASH) Test Level (TL-3) for implementation in flood-prone areas. To meet this objective, the Performing Agencies shall design such a barrier to accommodate passage of flood water, to decrease risk to motorists, and to reduce level of damage to the highway.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #2:
Amend the contract to extend the termination date and to update the Project Schedule due to delays in the construction of the barriers needed for testing and to allow time for full-scale crash testing and project documentation.

Amendment #3:
Amend the contract to extend the termination date, to update the Project Schedule, and to revise Work Plan to perform additional testing. TTI: The FY 2021 budget remains $109,897.00; the FY 2022 budget remains $91,587.50; the FY 2023 budget increases by $65,885.00 from $150,233.75 to $216,118.75; the FY 2024 budget is established at $16,212.50; TTI's Total Project Budget increases by $82,097.50 from $351,718.25 to $433,815.75. CTR: The FY 2021 budget remains $105,554.50; the FY 2022 budget remains $80,493.59; the FY 2023 budget increases by $4,798.00 from 12,275.16 to $17,073.16; the FY 2024 budget is established at $1,950.25; CTR's Total Project Budget increases by $6,748.25 from $198,323.25 to $205,071.50. The Itemized Project Budget Estimate increases by $88,845.75 from $550,041.50 to $638,887.25.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7087

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7093	Develop Refined Design Methods for Lean-On Bracing	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
TTI Total Budget: $380,000.00
TTI Total Project Spend: $326,969.63

Completion Date: 01/31/2024
University #2: TTI
Total Project Budget: $980,000.00
TTI FY23 Budget: $108,733.00
TTI FY23 Spend: $109,817.15

Project Description: The Performing Agencies shall instrument and conduct field monitoring of bridges with lean-on bracing identified in Task 3. The monitoring shall include bridges under construction and also completed bridges subjected to controlled loading using trucks to better understand the behavior described in Tasks 2, 4 and 7. The Performing Agencies shall carry out parametric Finite Element Analyses (FEA) along with the field monitoring and develop improved guidelines to facilitate widespread use of lean-on bracing applications in Texas bridges.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to revise the work plan and the budget to add a subcontractor due to the transfer of a research team member and student for Performing Agency 2. Performing Agency 1: The FY 2023 Budget remains $225,000.00. The Performing Agency 1 Total Project Budget remains $600,000.00. Performing Agency 2: The FY 2023 Budget remains $142,500.00. The Performing Agency 2 Total Project Budget remains $380,000.00. The Itemized Project Budget Estimate remains $980,000.00.

Amendment #2:
Amend the contract to to revise the term date, the FY23 and FY24 budgets and schedule to allow the research team to complete the parametric finite element analyses and to develop suitable design recommendations. Decrease CTR's FY23 budget by $39,062.00 from $225,000.00 to $185,938.00. Establish a FY24 budget for CTR of $39,062.00. CTR's Total Project Budget remains $600,000.00 Decrease TTI's FY23 budget by $33,767.00 from $142,500.00 to $108,733.00. Establish a FY24 budget for TTI of $33,767.00. TTI's Total Project Budget remains $380,000.00. The Itemized Project Budget Estimate remains the same.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7093

TTI Safety and Operations

Project Number	Project Name	Status
0-7096	Traffic Control Device Analysis, Testing and Evaluation Program	Closed

Project Start Date: 09/01/2020
Lead University: TTI
Project Status: Closed
TTI Total Budget: $1,585,988.75
TTI Total Project Spend: $1,243,154.20

Completion Date: 08/31/2023
University #2:
Total Project Budget: $1,585,988.75
TTI FY23 Budget: $541,650.00
TTI FY23 Spend: $453,977.08

Project Description: Traffic control devices (TCDs) are the primary means of communicating highway information to road users. The design, application, and maintenance of TCDs are under constant transformation as new technologies, methodologies, and policies are introduced. The Performing Agency shall provide the Receiving Agency a mechanism to quickly and effectively conduct high priority evaluations of issues related to TCDs. The TCD issues to be evaluated in this project could represent new devices or technologies, new applications of an existing device or technology, TCD material performance, changes in the Receiving Agency's practices regarding a TCD, or other TCD related needs. Examples of various evaluations include human factors, machine vision performance, safety and operational effects, visibility assessments, and cost effectiveness analyses. The activities conducted through this project shall support the development of TCD related policy, specifications, guidelines, handbooks, and training.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.
aspx?q=0-6872-01

TTI Planning and Environmental

Project Number	Project Name	Status
0-7100	Sediment Control Approved Products List	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $283,206.75
TTI Total Project Spend: $268,102.59

Completion Date: 10/31/2023
University #2: SFASU
Total Project Budget: $293,890.57
TTI FY23 Budget: $186,040.00
TTI FY23 Spend: $176,688.16

Project Description: The Environmental Protection Agency (EPA) guidance document National Management Measure to Control Nonpoint Source Pollution from Urban Areas (November 2005, EPA-841-B-05-004) requires all construction site activities to reduce the amount of sediment generated (erosion control) and reduce the off-site transport of sediment and construction-related chemicals (sediment and chemical control). While there are several pollutants of concern (oils, gasoline, degreasers, paints, etc.), sediment from construction sites is by far the largest pollutant source (Canning, 1988). Eroded sediment from construction sites causes many problems, including adverse impacts on water quality as well as decreased capacity of reservoirs and streams, resulting in possible flooding. Sediment control devices (SCDs) are used on construction sites to retain sediment and prevent stormwater from adversely affecting adjacent waterways. SCDs include silt fences, wattles, sediment logs and basins, filter dams, and inlet protection devices. These products are designed to be installed for specific applications (curb inlets, drop inlets, perimeter protection, etc.) However, there is no scientifically sound, repeatable testing methodology that replicates field conditions to test and determine SCD performance. This project shall develop a formal testing protocol, test apparatus and propose thresholds for a performance-based sediment control device testing program that will assist the designer/engineer in selecting the most effective sediment control best management practice.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #1:

Amend the contract to update the project budget for Performing Agency 1 due to increased construction material/labor costs for additional work determined at the construction pre-bid meeting. TTI Budget: The FY 2022 budget remains $92,167.00. The FY 2023 budget is increased by $31,250.00 from $159,789.75 to $191,039.75. TTI's Total Project Budget is increased by $31,250.00 from $251,956.75 to $283,206.75. SFASU: Project Budget remains $10,683.82. The Itemized Project Budget Estimate is increased by $31,250.00 from $262,640.57 to $293,890.57.

Amendment #2:
Amend the contract to revise the budget for Performing Agency 1 (TTI) and Project Schedule to allow time to collect required performance data on the sediment control devices. TTI's FY 2022 budget remains $92,167.00; the FY 2023 budget is decreased by $4,999.75 from $191,039.75 to $186,040.00; the FY 2024 budget is established at $4,999.75. TTI's Total Project Budget remains $283,206.75. Performing Agency 2's (SFASU) FY 2022 budget remains $5,341.91; the FY 2023 budget remains $5,341.91; SFASU's Total Project Budget remains $10,683.82. The Itemized Project Budget Estimate remains 293,890.57.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7100

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7103	Investigating Prime versus Curing: Where, When and Why	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $525,000.25
TTI Total Project Spend: $226,384.22

Completion Date: 11/30/2024
University #2:
Total Project Budget: $525,000.25
TTI FY23 Budget: $184,449.25
TTI FY23 Spend: $131,396.99

Project Description: The objective of this research project is to determine where, when, and why a prime or cure is needed for a pavement layer. Materials such as prime coats, curing materials, seal coats, and tack coat are typically considered non-structural, but integral to the pavement structure. Some materials can be used for multiple purposes: prime, bond or help cure; however, the rates and timing of use may change depending on why the material is being used. Guidance is needed to help designers, inspectors and construction personnel understand the materials and where, when, and why to use them. The Performing Agency shall develop guidelines for prime and curing through a series of laboratory and field testing and develop tests and procedures to determine the best materials for a prime, cure or a combination. These guidelines shall aid decision makers in determining whether a prime, cure or bonding material is needed, and where, when and why to design and use the appropriate materials.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.
aspx?q=0-7103

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7104	Establish Performance-Based Acceptable Lab-Molded Density Range for Mix Design and QC/QA	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $469,999.25
TTI Total Project Spend: $257,548.49

Completion Date: 04/30/2025
University #2: UTEP
Total Project Budget: $829,999.25
TTI FY23 Budget: $133,357.75
TTI FY23 Spend: $133,182.72

Project Description: Lab-molded density of asphalt mixes is a critical factor for laboratory mix design, plant production, and field performance. Current mix design and production quality control and quality assurance (QC/QA) are developed around a fixed lab-molded density of 96 percent. Adherence to a fixed lab-molded density is not only one of the main factors leading to drier, more crack susceptible mixes where low asphalt binder content is often caused by balancing high lab-molded density values at plant production, but it also impacts the implementation of the Balanced Mix Design approach. Furthermore, various field test sections designed with densities ranging from 96.5 to 98 percent were previously constructed in different areas of Texas, and they performed well in the field with no observed rutting problems. Thus, the objective of this project is to establish an acceptable range of lab-molded densities for laboratory mix design and production QC/QA testing. To achieve the objective, the Performing Agencies shall review the literature, conduct extensive laboratory performance tests, construct test sections and monitor their performance, and finally recommend an acceptable range of lab-molded density based on all the information and data collected.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7104

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7105	Measuring Seal Coat Rate Field Adjustments	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $415,453.75
TTI Total Project Spend: $269,776.45

Completion Date: 11/30/2024
University #2: UT-TYLER
Total Project Budget: $450,000.00
TTI FY23 Budget: $140,792.00
TTI FY23 Spend: $143,759.54

Project Description: The objective of this research project is to develop measurable and repeatable adjustment criteria for seal coat application rates based on pavement condition, traffic and material properties for the design method developed in research project 0-6989 Update Seal Coat Application Rate Design Method (TxDM6989). Current practice requires experienced personnel to understand the adjustments needed for application rates, including changing the adjustments as conditions on the pavement change. The adjustments in the TxDM6989 combine multiple pavement conditions into one description. By measuring the conditions, a combined adjustment based upon measured parameters will remove subjectivity from the procedure. This will lead to more consistently constructed projects that meet the objectives of designing the rates so that the resulting seal will not have too much binder so that it flushes or bleeds in the summer; but there is enough binder to prevent rock loss over the winter. This research project will produce measurable methods for adjustments to the rate design procedures that will help engineers and inspectors make better decisions resulting in successful projects.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7105

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7106	Quantify Maximum Accumulated Seal Coat Layers for Stability	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $439,017.25
TTI Total Project Spend: $302,228.72

Completion Date: 11/30/2024
University #2: UT-TYLER
Total Project Budget: $449,211.00
TTI FY23 Budget: $137,626.00
TTI FY23 Spend: $151,066.04

Project Description: The Receiving Agency invests over $250 million annually on seal coats, it is therefore critical to apply the right treatment to the right road at the right time. Projects are typically selected based on the time since the last seal coat (an average of 7 years) with little to no testing performed to ensure that the section is a good candidate for seal coat and how many seal coats to apply. The objective of this research is to determine the maximum number of seal coats that can be applied to a pavement surface before the accumulated layers of seal coats become unstable. The Performing Agencies shall evaluate the stability of existing accumulated seal coat substrate layers through a series of laboratory and field testing and develop tests and procedures to determine when an additional seal coat may not perform well. The Performing Agencies shall develop guidelines to select candidate seal coat projects with multiple seal coat layers ensuring that a new seal coat is used on a good candidate pavement will lower risk to the Receiving Agency, improve life cycle costs and lead to better performing sections of pavement.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7106

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7107	Determine Feasibility and Methodologies of Using Structural Data From Traffic Speed Deflection Devices in Network-Level Treatment Decision Making	Active

Project Start Date: 09/01/2021

Lead University: TTI

Project Status: Active

TTI Total Budget: $449,941.00

TTI Total Project Spend: $283,839.81

Completion Date: 08/31/2024

University #2:

Total Project Budget: $449,941.00

TTI FY23 Budget: $149,254.00

TTI FY23 Spend: $158,533.95

Project Description: Traffic Speed Deflection Devices (TSDD) non-destructively measure structural condition while traveling at traffic speeds. Advancements in TSDD's have enabled these evaluations to be made with the benefit of reducing safety hazards associated with traditional stop and go Falling Weight Deflectometer (FWD) devices. The Receiving Agency is an active participant in the Transportation Pooled Fund TPF-5(385) "Pavement Structural Evaluation with Traffic Speed Deflection Devices". As a participant, the Receiving Agency has collected more than 1000 miles of TSDD data in several Receiving Agency Districts and is expected to continue to collect TSDD data for the next three (3) years. Recent interest from Receiving Agency Districts on using continuous structural data in network level treatment decisions has necessitated the need to verify TSDD measurements and provide guidelines and analysis methodologies to implement structural condition data for both network and project level pavement management applications. Incorporating a structural condition index into network level decisions has been a goal of the Receiving Agency's for over 30 years with the objective of providing Receiving Agency Districts a comprehensive integrated assessment of both visual and structural condition. Use of this tool shall provide Receiving Agency Districts with what level of pavement rehabilitation treatment is required as they develop their 4-year plans.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7107

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7110	Develop Cost Effective Design and Rehabilitation Strategies for Permeable Friction Courses	Closed

Project Start Date: 09/01/2021

Lead University: TTI

Project Status: Closed

TTI Total Budget: $399,957.00

TTI Total Project Spend: $367,355.48

Completion Date: 08/31/2023

University #2:

Total Project Budget: $399,957.00

TTI FY23 Budget: $200,812.50

TTI FY23 Spend: $207,495.74

Project Description: Thousands of miles of permeable friction course (PFC) pavements have performed well for the last ten (10) to fifteen (15) years on Texas highways. PFC pavement reduces hydroplaning, splash and spray, pavement noise, and improves ride quality and safety in wet weather. Hundreds of miles of PFC pavements are now at the end of their service life and need rehabilitation. The most common distress observed is raveling. To date, the most widely used method of rehabilitating PFC pavement is to mill the existing layer and replace it with a new wearing layer. This is also the most conservative and most expensive rehabilitation strategy. The Performing Agency shall determine if there are less expensive resurfacing options which do not include milling. The Performing Agency shall review the current PFC pavement design procedures to determine if improvements can be made to achieve longer initial life. PFC pavements have many safety related advantages, but their use is on the decline because of the high cost of rehabilitation.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7110

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7111	Determine Impact of Field Sands on Workability and Engineering Properties of Superpave Mixtures in Texas	Active

Project Start Date: 09/01/2021

Lead University: UTEP

Project Status: Active

TTI Total Budget: $105,001.50

TTI Total Project Spend: $72,471.64

Completion Date: 08/31/2024

University #2: TTI

Total Project Budget: $500,001.50

TTI FY23 Budget: $35,000.25

TTI FY23 Spend: $36,203.23

Project Description: Field sands have been used in hot mix asphalt (HMA) pavements to reduce binder requirement since they are readily available and are less expensive than crushed materials. Considering their adverse effects on the performance, field sands are limited to 10% to 15% of the aggregates. The most common feature of field sand that can have a significant detrimental effect on the Asphalt Concrete (AC) performance is the presence of harmful clay particles. Understanding the impact of these clay particles on AC performance is the subject of this research. The upper limit of specific field sand, given the amount of active clay present in it, the process to determine the clay content, and how they affect the performance of AC mixes shall be evaluated. Since field sands are more round compared to the crushed aggregates, mixes containing more field sands can be compacted to a given density at lower binder contents. Given the less particle to particle interlocking of such mixes, however, they are more suspect to excessive rutting. Thus, this research shall investigate the effect of clay minerals as well as the sand properties independently on the performance of AC mixes (with a focus on Superpave mixtures) and evaluate their combined/interactive effects, as the natural sands are a combination of both. To that end, the Performing Agency shall provide interaction plots and/or charts that can be used to select the maximum allowable percentage of a given field sand.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7111

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7112	Development of a Continuous for Live Load Prefabricated Steel Accelerated Bridge Construction (ABC) Unit for Texas Bridges	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $570,375.75
TTI Total Project Spend: $354,333.24

Completion Date: 08/31/2024
University #2: UTEP
Total Project Budget: $689,994.50
TTI FY23 Budget: $275,527.75
TTI FY23 Spend: $259,128.18

Project Description: The overall goal is to develop a system where prefabricated steel ABC unit perform continuous for live load. The system must be: easily constructible, fast to assemble, durable long-term, safe, and cost-effective. The Performing Agencies shall conduct a literature review to first synthesize what has been done by state departments of transportation and other agencies. The Performing Agencies shall also evaluate the behavior of related Receiving Agency bridges through visual inspection and monitoring. The Performing Agencies shall perform a system development program utilizing this information in conjunction with expert feedback from an Industry Review Panel (IRP) workshop (including the Receiving Agency Panel). The three (3) best system designs shall be selected for full-scale laboratory testing followed by an analytical parametric study. The Performing Agencies shall compile and present the results at an IRP meeting with the Receiving Agency, where the final system shall be selected. The Performing Agencies shall develop full Microstation details and specifications along with a user-friendly design guide. The guide shall identify the following:

- Span length capabilities for girder sizes/depths/spacings
- General details for establishing live load continuity
- Closure pour details at interior bents and how to achieve acceptable deck stresses
- Structural steel splice details and acceptable tolerances
- Bearing layout to meet the Receiving Agency substructure details.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:

Amend the contract to replace the Project Supervisor, and to revise the work plan and budget to add a subcontractor due to the transfer of the Project Supervisor from Performing Agency 1 to the subcontractor. TTI: The FY 2022 Budget remains $103,593.50. The FY 2023 Budget remains $275,527.75. The FY 2024 Budget remains $191,254.50. Total Project Budget remains $570,375.75. UTEP: The FY 2022 Budget remains $20,845.00. The FY 2023 Budget remains $48,796.25. The FY 2024 Budget remains $49,977.50. Total Project Budget remains $119,618.75. The Itemized Project Budget Estimate remains $689,994.50.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7112

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7114	Re-Examine Minimum Reinforcement Requirements for Shear Design	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $930,904.25
TTI Total Project Spend: $630,840.26

Completion Date: 08/31/2024
University #2:
Total Project Budget: $930,904.25
TTI FY23 Budget: $362,827.50
TTI FY23 Spend: $308,573.29

Project Description: Minimum shear reinforcement requirements in the Association of State Highway Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications are based on tests conducted on reinforced concrete panels and beams. The extension of these requirements to prestressed concrete beams introduced significant conservatism in the current LRFD provisions for shear design. More accurate provisions are necessary to better predict the shear strength of prestressed beams. The objective of this project is to investigate the validity of the minimum shear reinforcement requirements and develop new/revised guideline specifications. The Performing Agency shall:

- Perform a literature review and outreach in order to synthesize a unique database of load tests for prestressed concrete beams, which the Performing Agency shall analyze using data driven methods to identify major design parameters and missing information that will inform an experimental program.

- Perform twenty (20) full scale tests on ten (10) commonly used prestressed girders combining a range of identified design parameters to comprehensively re-examine the minimum reinforcement requirements of AASHTO LRFD Bridge Design Specifications accounting for reserve strength and ductility and as well as performance under service conditions. The Performing Agency shall complement the experimental program by analytical modelling to expand its impact.

- Develop design guidelines for the minimum reinforcement requirements based on the synthesized comprehensive dataset complemented by the full-scale tests and analytical modeling. The Performing Agency shall also pursue integration of these guidelines in the AASHTO LRFD Bridge Design Specifications.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7114

TTI Safety and Operations

Project Number	Project Name	Status
0-7118	Improving the Utilization and Effectiveness of Smart Work Zone Deployments	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $199,977.50
TTI Total Project Spend: $186,844.90

Completion Date: 02/28/2023
University #2:
Total Project Budget: $199,977.50
TTI FY23 Budget: $59,345.00
TTI FY23 Spend: $58,313.33

Project Description: Smart work zones (SWZs) have been shown to have traffic safety and mobility benefits when and where they are truly needed, properly designed, implemented, and maintained. The use of SWZ deployments has become more common on projects across the state. As defined in Receiving Agency guidance: Smart Work Zone Guidelines dated October 2018, these technologies typically produce data and/or images that are processed to become actionable information. Although guidance exists to assist with designing and implementing these systems, research is needed to understand why some deployments have been more effective than others. Research is also needed to determine how the Receiving Agency's SWZ selection, procurement, implementation, and maintenance processes should be improved. To achieve these research objectives. The work to be performed with this project includes:

- Identifying a sample of projects across the state where SWZs have been deployed.

- Reviewing any information available on best practices from other state departments of transportation.

- Interviewing the Receiving Agency, contractor, and SWZ vendor staff to determine the decision-making processes of those SWZ deployments, challenges encountered, and perceptions about their effectiveness.

- Where data is available, conducting operational and safety analyses to determine actual effects of the systems.

- Reviewing contract management documentation related to those SWZ deployments.

- Identifying potential improvements to the Receiving Agency's project development and construction management workflows, bid specifications, and methods of payment to increase likelihood of successful smart work zones on future projects.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7118

Approved Work Program Revisions

No. of FY23 Amendments: 0

TTI Safety and Operations

Project Number	Project Name	Status
0-7119	Develop Standardized Operational Evaluation of Wrong-Way Driving Detection Technologies	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $413,513.25
TTI Total Project Spend: $380,775.74

Completion Date: 08/31/2023
University #2:
Total Project Budget: $413,513.25
TTI FY23 Budget: $177,198.25
TTI FY23 Spend: $177,350.77

Project Description: To reduce the number of wrong-way maneuvers and associated crashes on Texas freeways, several Receiving Agency Districts have purchased and installed Intelligent Transportation Systems (ITS) that can detect wrong-way drivers, alert the wrong-way drivers of their error, and notify the traffic management center. However, system performance and limitations are typically not known until after the systems are purchased and activated in the field. This results in systems not functioning as expected, highfalse-alarm ratesand increased workload for agency staff. The Performing Agency shall determine the state-of-the-practice through a review of literature, assessment of current practice in Texas, review of other state agency testing procedures, and identification of readily available Wrong-Way Driving (WWD)ITSand detection technology. The Performing Agency shall develop a standardized testing mechanism to assess performance of WWD detection technologies, evaluate existing technologies, and identify the benefits and limitations of each technology tested. Based on the findings, the Performing Agency shall develop implementation guidance for the technologies tested and a draft WWD Detection Technology Specification.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7119

TTI Safety and Operations

Project Number	Project Name	Status
0-7120	Develop Transition for MASH Test Level 4 (TL-4) Compliant Guardrail System	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $239,130.75
TTI Total Project Spend: $175,301.72

Completion Date: 05/31/2023
University #2:
Total Project Budget: $239,130.75
TTI FY23 Budget: $107,367.00
TTI FY23 Spend: $112,672.72

Project Description: Under project 0-7019, Development of a MASH Test-Level 4 (TL-4) Compliant Guardrail, the Performing Agency developed a guardrail system capable of safely containing and redirecting a single unit truck on impact. The guardrail was tested under the second edition of the Manual for Assessing Safety Hardware (MASH)TL-4 criteria. The end-transition of the guardrail was not tested under project 0-7019. The Performing Agency shall design and test an end-transition of the TL-4 guardrail system. The transition shall allow the TL-4 guardrail to be attached to a standard W-beam guardrail with MASH compliant guardrail end-terminals. The transition shall meet MASH TL-3 criteria. Use of this end-transition shall allow fullimplementation of the TL-4 guardrail system.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7120

TTI Safety and Operations

Project Number	Project Name	Status
0-7121	Determine Adequacy of Installation of Existing Roadside Barriers on High-Speed Roadways	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $269,997.75
TTI Total Project Spend: $232,781.52

Completion Date: 08/31/2023
University #2:
Total Project Budget: $269,997.75
TTI FY23 Budget: $154,281.00
TTI FY23 Spend: $119,984.55

Project Description: The American Association of State Highway and Transportation Official (AASHTO)Manual for Assessing Safety Hardware (MASH) specifiesthe highest impact speed for crash testing of barrier systems with passenger vehicles is 62 miles per hour (mph). Thisimpact speed was derived from analyses of reconstructed crash data,which isnearly 20 years old. Preliminary crash data from National Cooperative Highway Research Program (NCHRP)17-43, Long-Term Roadside Crash Data Collection Program,under which a new database of reconstructed run-off-road crashes is being developed, indicatesthatfor highways with a posted speed limit greater than 70 mph, the 85th percentile impact speed is 67.7 mph. This means there is a need for a higher design impact speed for barriers used on these higher speed roadways.Increased impact speeds will place more demand on barrier systems. Observations of guardrail systems developing partial rail tears when tested under MASH impact conditions indicatethat these systems are near their containment capacity.The Receiving Agency has over 3,500 milesof roadways with posted speeds of 75 mph or higher.The Performing Agency shall assess performance limits of identified commonly used barrier systems for higher impact speeds using engineering analysis and finite element(FE)simulations and shall provide design guidance for selection and installation of such barriers at higher posted speed limit highways, while maintaining MASH compliance.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to replace the Principal Investigator due to the departure of the Project Supervisor.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7121

TTI Safety and Operations

Project Number	Project Name	Status
0-7122	Evaluate Alternative Methods to Examine Visibility of Pavement Markings	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $394,712.00
TTI Total Project Spend: $151,419.72

Completion Date: 08/31/2024
University #2: UTSA
Total Project Budget: $467,604.25
TTI FY23 Budget: $158,058.50
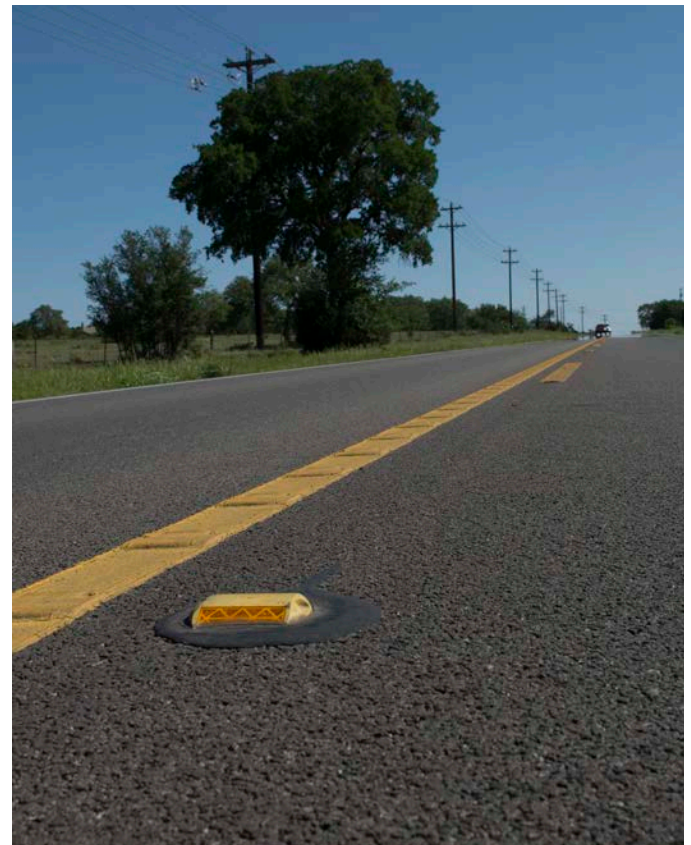**TTI FY23 Spend:** $82,049.18

Project Description: Pavement markings are the primary means for an agency to provide longitudinal guidance to drivers. Effective pavement markings can improve safety, improve driver comfort, and increase functionality/reliability of automated driving systems and Advanced Driver Assistance Systems (ADAS). To be effective, markings must be visible during all driving conditions, day and night. Markings are typically characterized by their retroreflectivity which is a surrogate measure for how visible the marking is at night. Retroreflectivity does not consider other factors that will impact the actual visibility of the markings such as the color or retroreflectivity of the pavement that the marking is applied to, the color or width of the marking, or the viewing conditions (i.e., observation vehicle, observer characteristics, weather conditions). Retroreflectivity is also a metric for nighttime visibility that may not relate to the marking visibility during the day. The objective of this project is to improve current pavement marking installation and maintenance practices, such that effective markings are continuously maintained. The Performing Agencies shall develop a tool to effectively assess the visibility of pavement markings and to make suggestions/recommendations for maintenance of markings. The Performing Agencies shall evaluate marking visibility for both human and automated drivers across a range of conditions. These evaluations shall be used to make recommendations to improve new marking installation specifications and techniques, improve marking maintenance practices, and evaluate other technologies that should be considered to improve pavement marking delineation.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7122

TTI Planning and Environmental

Project Number	Project Name	Status
0-7124	Develop A New Tool for Evaluating Infrastructure and Planning Impacts from Changes in Truck Traffic and Truck Technologies	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $510,652.50
TTI Total Project Spend: $385,514.43

Completion Date: 12/31/2023
University #2:
Total Project Budget: $510,652.50
TTI FY23 Budget: $264,484.50
TTI FY23 Spend: $221,659.93

Project Description: : The overall project goal shall further improve freight planning and strategy tools used in Receiving Agency Research Project 0-6984, Evaluate Potential Impacts, Impediments, and Solutions of Automated Trucks and Truck Platooning on Texas Highway Infrastructure to better assess the operational and physical impacts of freight traffic on the Texas Highway Freight Network. The Performing Agency's tool enhancements shall allow for better evaluation of specific infrastructure impacts and resiliency considerations (bridges and pavements) from new truck automation and platooning technologies, as well as changes in truck loads, all of which are expected to increase over time, thus also allowing for analysis of alternative routes. The Performing Agency shall tailor the tool to perform detailed analysis of the heavy freight corridors designated for early adoption of autonomous and platooned truck traffic in Texas, such as IH-10, IH-35, and IH-45. The Performing Agency shall build a user interface allowing input of various planning strategies and scenarios giving planners a means to identify and evaluate potential design, operational, and physical hardening modifications that can minimize any negative impacts of new trucking technologies. The tool shall incorporate real-world condition histories from pavement and bridge asset management databases to identify infrastructure vulnerabilities due to changes in freight traffic and better prioritize future roadway maintenance project selection. Additionally, the Performing Agency shall perform targeted modeling to identify best lane use options for automated and platooned trucks under a variety of operational scenarios and at varying traffic levels.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:

Amend the contract to add a new task and revise the budget and the Project Schedule due to Task 5 delays and the addition of Task 6. The FY 2023 budget is decreased by $19,402.00 from $283,886.50 to $264,484.50; the FY 2024 budget is established at $59,964.00; the Itemized Project Budget Estimate is increased by $40,562.00 from $470,090.50 to $510,652.50.

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7124

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7125	Expand Applications for Texas Connected Freight Corridor	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $100,000.00
TTI Total Project Spend: $98,064.49

Completion Date: 10/31/2022
University #2:
Total Project Budget: $100,000.00
TTI FY23 Budget: $1,780.50
TTI FY23 Spend: $1,121.67

Project Description: The Texas Connected Freight Corridors (TCFC) system is a connected and automated vehicle (CAV) environment that seeks to improve safety and mobility for the Texas Triangle – consisting of the Austin, Dallas/Fort Worth, Houston, San Antonio, and Laredo metropolitan regions. The TCFC project is a baseline effort to develop and deliver six initial applications for use by vehicle fleets. The deployed applications include advanced travel information systems (ATIS), queue warning, work zone warning, wrong-way driving, road weather warning, and freight signal priority. The Performing Agency shall expand the initial TCFC system by considering additional CAV applications for inclusion and consideration. The Performing Agency shall review existing CAV efforts and pursuits, survey key stakeholders, assess the effectiveness and financial feasibility, and outline the next steps for procurement and implementation. The project goal is to develop an implementation framework that expands the TCFC system through additional applications and extended geographic reach. The effort will help to incentivize participation, as having more vehicles improves the overall effectiveness of the CAV environment in Texas.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7125

TTI Planning and Environmental

Project Number	Project Name	Status
0-7127	Examine Reconnaissance Scanning of Underground Utilities in the ROW	Active

Project Start Date: 09/21/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $1,003,865.75
TTI Total Project Spend: $597,673.28

Completion Date: 08/31/2024
University #2: TAMUCC
Total Project Budget: $1,135,880.75
TTI FY23 Budget: $237,116.25
TTI FY23 Spend: $225,050.89

Project Description: Mapping of buried utilities using rigorous subsurface utility engineering (SUE) quality level B (QLB), as is frequently performed or recommended, can be costly. It can also be ineffective for unknown utilities (i.e., utilities that exist but for which no information is available). This is particularly common and problematic in areas of oil and gas operations. When undiscovered until construction, these unknown utilities may cause serious scheduling disruptions as well as higher construction costs, along with safety and environmental risks. There is a need for a faster, less expensive method of scanning the right of way (ROW) for these unknown utilities. This research shall evaluate, select and test the application of newly available geophysical measurement systems. These systems would allow quickly and cheaply detecting and mapping unknown pipelines or other utilities in the ROW. It compares the effectiveness and cost of deployment to standard QLB SUE and reports on technologies that are both technically and cost effective for identifying unknown utilities.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #2:
Amend the contract to extend the termination date, update the Project Schedule and Work Plan to revise Tasks 3-8 and revise the budget for the purpose of using the newly developed artificial intelligence data processing capability, gather data at new sites to complete the testing and evaluation of the technologies. TTI: The FY 2022 budget remains $364,873.75; the FY 2023 budget is decreased by $62,504.00 from $299,620.25 to $237,116.25; the FY 2024 budget is established at $401,875.75; TTI's Total Project Budget is increased by $339,371.75 from $664,494.00 to $1,003,865.75. TAMUCC: The FY 2022 budget remains $55,856.25; the FY 2023 budget remains $26,548.75; the FY 2024 budget is established at $49,610.00; TAMUCC's total Project Budget is increased by $49,610.00 from $82,405.00 to $132,015.00. The Itemized Project Budget Estimate is increased by $388,981.75 from $746,899.00 to $1,135,880.75.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7127

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7128	Digitizing Traffic Control Infrastructure for Autonomous Vehicles (AV)	Closed

Project Start Date: 09/01/2017
Lead University: TTI
Project Status: Closed
TTI Total Budget: $258,240.50
TTI Total Project Spend: $259,629.78

Completion Date: 08/31/2023
University #2: UT-Dallas
Total Project Budget: $359,394.00
TTI FY23 Budget: $131,311.00
TTI FY23 Spend: $131,948.49

Project Description: High precision road maps are a crucial component to facilitating autonomous driving techniques. Autonomous vehicles (AVs) are experiencing exponential growth. According to the latest forecast from IHS Markit, over 33 million AVs will be on the road globally by 2040, posing a higher requirement to ensure AVs' driving safety. Although current AVs rely on vehicular sensing techniques (e.g., Camera, Lidar, Radar), studies have suggested that creating high-quality road maps with traffic control infrastructures (TCIs) (e.g., traffic signs, signals, intersections) precisely digitized is necessary to enhance safe-driving operations of AVs. Meanwhile, digitizing TCIs is also of great importance for road assets planning and management. However, a readily available database with precisely digitized TCIs is still missing in most areas. Traditionally, TCIs are manually digitized by conducting field studies, which is time-consuming and labor-intensive. With the advancement of data collection and processing techniques, numerous emerging data sources are becoming available, posing great potential to capture and digitize TCIs more efficiently. The Performing Agencies shall recommend an effective framework for the digitization, maintenance, and sharing of Receiving Agency roadway assets, especially for TCIs. The Performing Agencies shall evaluate commercially available solutions and propose new approaches by leveraging emerging data sources and techniques.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to replace the Principal Investigator to Jason Wu and revise the Project Schedule due to the departure of the Project Supervisor, Xiao Li.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7128

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7130	Investigate Potential Connected and Automated Vehicle (CAV) Liability Issues Within TxDOT	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $299,476.00
TTI Total Project Spend: $277,207.73

Completion Date: 08/31/2023
University #2:
Total Project Budget: $299,476.00
TTI FY23 Budget: $175,392.50
TTI FY23 Spend: $155,664.42

Project Description: De-icing using geothermal energy can provide the Receiving Agency with a better alternative than the existing method of using deicing with sands and/or salts. This research project shall explore the potential for retrofitting bridges with a hydronic pipe geothermal heating system and achieve Technology Readiness Levels (TRL) level 6 through prototype demonstration in a relevant environment. At the end of the project, the geothermal deicing technology shall be ready for prototype demonstration in an operational environment (TRL level 7).

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7130

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7131	Leveraging Artificial Intelligence (AI) Techniques to Detect, Forecast, and Manage Freeway Congestion	Closed

Project Start Date: 09/14/2021
Lead University: TTI
Project Status: Closed
TTI Total Budget: $157,256.50
TTI Total Project Spend: $162,651.81

Completion Date: 08/31/2023
University #2: TSU, TXST
Total Project Budget: $297,203.76
TTI FY23 Budget: $54,069.00
TTI FY23 Spend: $54,679.63

Project Description: To improve the quality and effectiveness of the Texas surface transportation system, it is important to be able to predict where and when prolonged congestion will start and how it will spread, as well as to track atypical events and estimate their evolution. Artificial intelligence (AI) approaches provide a unique opportunity to estimate precise congestion measures by utilizing data from agency-owned sensors, third-party providers, and big enterprise data. This project envisions to mitigate the current research gap by conducting two major project phases. The first phase can confirm the validity of commercial data sources for planning and operations, while the second involves understanding which AI models/ algorithm are the most suitable for addressing Receiving Agency needs based on desirable use cases and data availability. Furthermore, it is important to analyze the required data models and workflows to determine whether it is sustainable to train, test, and validate the proposed AI techniques. The Performing Agencies understand that achieving the research goals requires a comprehensive analysis and documentation of commercial big data platforms and datasets, appropriate AI algorithms, and robust prototype tool to foster return on investment (ROI) and reduce freeway congestion.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:
Performing Agency 1 (TTI): The FY 2022 budget remains $103,187.50. The FY 2023 budget is decreased by $84,637.50 from $138,706.50 to $54,069.00. The Performing Agency 1 Total Project Budget is decreased by $84,637.50 from $241,894.00 to $157,256.50. Performing Agency 2 (TSU): No revisions to budget. The Performing Agency 2 Total Project Budget remains $55,309.76. Performing Agency 3 (TXST): The FY 2023 budget is added for $84,637.50. The Performing Agency 3 Total Project Budget is established at $84,637.50. The Itemized Project Budget Estimate Project Budget remains $297,203.76.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7131

TTI Planning and Environmental

Project Number	Project Name	Status
0-7132	Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentrations	Active

Project Start Date: 09/07/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $432,254.75
TTI Total Project Spend: $341,165.37

Completion Date: 07/31/2024
University #2: UTEP
Total Project Budget: $537,321.00
TTI FY23 Budget: $196,482.25
TTI FY23 Spend: $201,114.97

Project Description: The Receiving Agency and its partner agencies are required to comply with the requirements of the transportation conformity requirement. Transportation conformity is an emissions control-centric process built on the assumption that reducing emissions from transportation activities would lead to better air quality. However, the air quality observations collected since the onset of the COVID-19 pandemic shows ambient ozone and particulate matter of less than 2.5 micrometer in aerodynamic diameter (PM2.5), concentrations have a mixed response to the significant changes in traffic activities and emissions. This trend has raised questions regarding the extent of the transportation's impacts on air quality. This study will bridge the gap in the understanding of the actual extent of transportation activities' impacts on regional and near-road air quality. The Performing Agency shall study three major activities for selected case study areas:

- Analysis of before- and during-pandemic traffic activity and air quality monitoring data.

- Evaluate the performance of air dispersion modeling in capturing the changes of near-road PM2.5 concentrations in near-road environment resulting from traffic activity variations.

- Evaluate the performance of photochemical modeling in capturing the changes of regional ozone in response to changes of traffic activities. The study will also result in a characterization of COVID-19 restrictions' impacts on traffic activities and air quality.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7132

TTI Planning and Environmental

Project Number	Project Name	Status
0-7133	Develop Guidebook for Managing System Costs: Operational and Capital Cost Management at Rural and Small Urban Public Transit Systems	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $198,565.00
TTI Total Project Spend: $141,093.30

Completion Date: 03/31/2024
University #2: TAMUK
Total Project Budget: $213,562.50
TTI FY23 Budget: $84,961.75
TTI FY23 Spend: $63,124.52

Project Description: Rural and small urban transit systems across the United States face fiscal challenges caused by the growing gap between the cost of providing transit service and available federal, state, and local funding. In Texas, the fiscal challenges facing rural and small urban transit systems are compounded by not only an increasing population but also revenue and ridership impacts related to COVID-19. Rural and small urban transit systems also often face high levels of staff turnover and a lack of knowledge management procedures to sustain cost management practices over time. The Performing Agencies shall equip the Receiving Agency's transit systems to understand, predict, and manage operational/capital costs and provide a reliable go-to-resource for cost management best practices.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7133

TTI Safety and Operations

Project Number	Project Name	Status
0-7136	Texas Guidelines for Optimizing Roadway Cross-Section	Closed

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Closed
TTI Total Budget: $200,000.00
TTI Total Project Spend: $180,101.62

Completion Date: 08/31/2023
University #2:
Total Project Budget: $200,000.00
TTI FY23 Budget: $200,000.00
TTI FY23 Spend: $180,101.62

Project Description: Highways and streets in Texas contain a wide variety of cross-sections, with through lanes, turning lanes, medians, shoulders, parking, and bicycle lanes as common components. Providing an appropriate cross-section is important for both operational and safety performance. It is useful to periodically evaluate whether a given cross-section is the most appropriate based on expected road users and related contextual application. One alternative cross-section treatment has been called the "road diet", in which existing through lanes or shoulders may be reduced and that cross-section width reassigned for other purposes. There is currently no statewide guidance for this type of roadway optimization. The Performing Agency shall compile and review existing road cross-section ("diet") guidance on urban, suburban and rural environments from across the United States, along with research findings, to identify content that would be appropriate for inclusion in Texas-based guidelines for road cross section optimization. The Performing Agency shall also consider the data needs for assessing a proposed cross section treatment. The Performing Agency shall use the results from these efforts to determine if existing guidance and data are sufficient to develop cross section optimization guidelines. The Performing Agency shall provide recommendations for further evaluation and adoption.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7136

TTI Planning and Environmental

Project Number	Project Name	Status
0-7138	Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $333,074.25
TTI Total Project Spend: $152,396.12

Completion Date: 08/31/2024
University #2: CTR
Total Project Budget: $404,050.89
TTI FY23 Budget: $155,276.00
TTI FY23 Spend: $132,350.83

Project Description: Outdoor advertising signs impact millions of travelers around the world every day. These signs are designed to attract driver attention thus taking it away from the driving task. Driver inattention and distraction are two of the most critical factors for road safety. Receiving Agency regulation of outdoor advertising signs must deal with changing technologies, including digital billboards, which allow for modifications to sign illumination, motion, and content. Regulations are not keeping pace with changing sign trends and must be updated to address potential impacts on road user safety. This research project focuses on the degree of driver distraction caused by typical and digital advertising sign contents. The project includes a comprehensive state-of-the-practice review, crash investigation, and an on road human factors evaluation. The illumination levels and content (including motion) during daytime and nighttime travel for dry and wet-weather conditions are considered. This research project shall provide the Receiving Agency with tools and resources to help manage outdoor digital advertising billboards by establishing practical criteria for sign illumination and content. These resources shall allow the Receiving Agency to manage the advertising signs such that road user safety is accounted for while maintaining the ability of sign owners to develop effective means of communicating with the public.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7138

TTI Safety and Operations

Project Number	Project Name	Status
0-7140	Develop Improved Queue Warning System Com-bining Multiple Data Sources	Active

Project Start Date: 09/06/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $379,728.75
TTI Total Project Spend: $201,408.39

Completion Date: 08/31/2024
University #2:
Total Project Budget: $379,728.75
TTI FY23 Budget: $192,143.25
TTI FY23 Spend: $192,413.76

Project Description: Existing queue warning (QW) systems predominantly use infrastructure-based sensors to detect the formation of queues and use dynamic message signs (DMS) to warn drivers. These QW systems, may be inadequate where the required number or density of sensors are not available. Research has shown that crowd sourced probe and connected vehicle (CV) trajectory data used in combination with sensor data can significantly improve the accuracy and latency of queue detection. Furthermore, because of gaps between fixed location of DMSs a subset of drivers can encounter a queue without seeing any warning. Sharing queue information through third-party providers and providing vehicle-specific queue warning in CVs can ensure provision of queue warning to a broader audience in a timely manner. The Performing Agency shall:

1) Develop detailed design of an enhanced queue detection and warning system that combine point-, probe-, and vehicle trajectory data.

2) Test and fine-tune the queue detection algorithm design using computer simulation.

3) Conduct a proof of concept, prototype deployment and field evaluation of the new QW system design on a freeway segment where vehicle queues frequently form.

4) Document the systems engineering and algorithm for the QW system as a potential enhancement to the Lonestar™ advanced traffic management system software application.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7140

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7142	Develop Safety Scoring Tool for the Wet Surface Crash Reduction Program	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $200,001.75
TTI Total Project Spend: $101,171.82

Completion Date: 08/31/2024
University #2:
Total Project Budget: $200,001.75
TTI FY23 Budget: $124,891.00
TTI FY23 Spend: $86,432.98

Project Description: The Performing Agency shall develop a risk assessment procedure related to the reduction of wet weather crashes that incorporates pavement surface type and aggregate selection and will be integrated into the Safety Scoring Tool (SST). The developed scoring tool will bridge the gap between the approaches in the two current tools, the SST and Receiving Agency Form 2088. The Performing Agency shall leverage the inputs and framework of the SST and the communalities with Receiving Agency Form 2088 to improve the SST and the wet surface crash reduction program (WSCRP). Integration of the SST and Receiving Agency Form 2088 will provide the benefits of streamlining the data inputs already required for the SST to avoid duplication of efforts and will effectively improve the quality of the assessment of pavement friction safety.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7142

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7143	Develop Methodologies for Reducing Costs in Full Depth Reclamation (FDR) Construction	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $679,483.50
TTI Total Project Spend: $166,162.46

Completion Date: 11/30/2025
University #2:
Total Project Budget: $679,483.50
TTI FY23 Budget: $182,724.75
TTI FY23 Spend: $150,549.22

Project Description: Full depth reclamation (FDR) using emulsified asphalt or foamed asphalt continues to grow in usage throughout Texas. To date, almost all mixtures use a cement additive in the mix design. The cement additive reportedly contributes to early strength gain which can be particularly important for projects that require daily opening to heavy traffic. However, not all construction projects require daily opening to traffic, and some materials may provide adequate performance without the cement additive. Additionally, with potential cement supply shortages, design and construction of FDR layers using only the asphalt treatments could save materials cost, reduce schedule risk, and increase daily productivity since one less step would be required in the treatment process. The Performing Agency shall analyze the performance of asphalt-based FDR materials with and without the cement additive and evaluate the strength and stiffness properties of those mixes in the early, intermediate, and final curing stages. The Performing Agency shall leverage those results to determine the operational benefits and acceptability of placing traffic on the section for traffic control and construction staging, evaluate how the long-term performance of the layer may be impacted for pavement design, and make recommendations for mix design and construction specification updates.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7143

TTI Safety and Operations

Project Number	Project Name	Status
0-7144	Develop a Real-time Decision Support Tool for Urban Roadway Safety Improvement	Active

Project Start Date: 01/09/2023
Lead University: TXST
Project Status: Active
TTI Total Budget: $105,991.50
TTI Total Project Spend: $26,311.84

Completion Date: 12/31/2024
University #2: TTI
Total Project Budget: $465,010.00
TTI FY23 Budget: $23,499.25
TTI FY23 Spend: $24,210.21

Project Description: Due to the complex nature of urban roadways, conventional crash prediction models are limited as these models omit operating speed, short-duration volume, and weather data. To mitigate this research gap, the following three national databases can be utilized:

1) National Performance Management Research Data Set (NPMRDS) with passenger and freight speed data.

2) Travel Monitoring Analysis System (TMAS) data with both temporary traffic counting and continuous traffic counting programs.

3) Real-time weather data from the National Oceanic and Atmospheric Administration (NOAA).

The fatality rate on Texas roadways for 2020 was 1.50 deaths per hundred million vehicle miles traveled, which is an 18.94% increase from 1.26 in 2019. From 2011 to 2020, the fatalities on rural roadways increased by 19%, and this increase on urban roadways is disproportionately high (31%). Research and a supporting decision support tool are necessary to improve urban safety. The Performing Agencies shall leverage ongoing staff leadership and engagement in several national and state Department of Transportation (DOT) speed-safety projects. The Performing Agencies shall provide updated safety performance functions (SPFs) for urban roadways and a real-time decision support tool on risk scoring with the applicability of new data input and model updating pipeline.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
The Project has been cancelled and is being re-RFP'd due to the departure of the lead University Project Supervisor, Subasish Das.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7144

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7145	Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $372,058.00
TTI Total Project Spend: $187,565.29

Completion Date: 10/31/2024
University #2: CTR
Total Project Budget: $635,610.78
TTI FY23 Budget: $174,880.50
TTI FY23 Spend: $174,989.23

Project Description: Asphalt binders are one of the most expensive and critical materials used in the construction of the roadways in Texas, costing taxpayers hundreds of millions of dollars annually. It has been widely recognized that asphalt binders with the same performance grade (PG) can perform very differently due to changes in crude source, refining processes used, modification technique, and other factors. Several districts recently reported early cracking issues with some mixes which had historically performed well, while other districts had mix design and quality assurance (QA) problems when the binder source was switched and/or a different recycled asphalt pavement (RAP) stockpile was used. Thus, the objective of this project is to develop rapid new tests for detecting poor quality binders and RAP materials. To achieve this objective, the Performing Agencies shall review the literature to identify candidate tests that can be used for screening binders and RAP materials. The Performing Agencies shall further refine the most promising tests using laboratory mixture performance tests as a benchmark. The Performing Agencies shall also provide a standard test method and specification limit for each of the final test methods.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7145

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7148	Develop Design Details for CRCP Whitetopping at Intersections	Active

Project Start Date: 09/01/2022
Lead University: TECH
Project Status: Active
TTI Total Budget: $299,972.00
TTI Total Project Spend: $77,467.97

Completion Date: 08/31/2025
University #2: TTI
Total Project Budget: $599,563.25
TTI FY23 Budget: $103,127.25
TTI FY23 Spend: $71,053.99

Project Description: The Performing Agencies shall establish a method to evaluate the existing pavement structural condition and design continuously reinforced concrete pavement (CRCP) overlays, both thin and thick. The design methods will include non-destructive (NDT) pavement evaluation techniques and tools, deflection based CRCP slab thickness design procedures, and CRCP reinforcing design details. The Performing Agencies shall identify state-of-the-art practices that can be implemented as well as areas that need additional research. The findings from this research will result in procedures that will be used to design CRCP overlays, both thin and thick.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7148

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7151	Develop Recommendations for Evaluating Surface Types and Aggregate Properties to Minimize Wet Weather Crashes	Active

Project Start Date: 11/10/2022

Lead University: TTI

Project Status: Active

TTI Total Budget: $554,716.00

TTI Total Project Spend: $156,717.30

Completion Date: 02/28/2026

University #2: UT-TYLER

Total Project Budget: $599,992.25

TTI FY23 Budget: $156,922.25

TTI FY23 Spend: $139,042.76

Project Description: The current design methodology for asphalt and seal coat surfaces is limited when considering safety aspects like friction and surface texture, also known as skid resistance. The only requirement for asphalt or seal coats placed on high demand areas is that they use surface aggregate classification (SAC) A coarse aggregates. This approach has several shortcomings:

- Does not consider the friction and texture of the final surface.

- Does not consider the change in skid resistance versus trafficking.

- SAC system is defined by the acid insolubility test, not a direct measurement of aggregate properties that mechanically generate skid resistance.

- SAC categories are very broad with no distinction of the best and worst performing aggregates in each class. Consequently, some recent resurfacing projects have resulted in unacceptable skid resistance shortly after construction, even when SAC A aggregates were used. As such, there is a serious need to improve the current design process for asphalt and seal coat to ensure that the surfaces will have acceptable long-term skid resistance.

The Performing Agencies shall develop a laboratory-based system to select the pavement surface type and coarse aggregate types that will provide adequate skid resistance over the life of the pavement surface.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7151

TTI Planning and Environmental

Project Number	Project Name	Status
0-7152	Estimating Latent Bicyclist and Pedestrian Demand for Shared Use Path Design	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $250,173.75
TTI Total Project Spend: $125,472.97

Completion Date: 12/31/2024
University #2:
Total Project Budget: $250,173.25
TTI FY23 Budget: $120,252.00
TTI FY23 Spend: $119,401.27

Project Description: The Receiving Agency's Roadway Design Manual was updated in July 2020 and incorporates considerations for and accommodations of bicyclists and pedestrians, including preferred design order toward Shared Use Paths (SUPs) compared to bicycle lanes and shared lanes. However, the Guidance does not include specific procedures to estimate the anticipated volumes of non-motorized path users. The Receiving Agency's Bicycle Accommodation Design Guidance makes it clear that anticipated user volumes should be considered when designing facilities. Performing Agency shall develop a simple sketch planning-level demand estimation tool that provides anticipated user volumes for SUPs. The project shall also incorporate the results into the future editions of The Receiving Agency's design guidance/manuals. Given the uncertainty in resources, Performing Agency shall not use an overly complicated method or a method that requires complex data or data architecture. The project shall benefit from existing data sources, including The Receiving Agency's Texas Bicycle and Pedestrian Count Exchange and other count data resources in the State as well as other secondary and spatial data sources. Performing Agency shall develop an easy-to-use tool responding to the needs and requirements of the intended audience while incorporating advancements to improve the accuracy of the demand estimation.

Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #1:
Amend the contract to revise the budget, Work Plan to add TASK 5 and TASK 6 and Project Schedule to determine the benefit of obtaining a tool based on a model and additional data visualization. The FY 2023 budget is decreased by $67,265.00 from $187,517.00 to $120,252.00. The FY 2024 budget is increased by $49,732.00 from $62,656.25 to $112,388.25. The FY 2025 budget is established at $17,533.50. The Itemized Project Budget Estimate remains $250,173.25.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7152

TTI Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7153	Develop Design of Hot-Mix Cold-Laid (HMCL) Mixtures with the Superpave Gyratory Compactor	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $210,004.25
TTI Total Project Spend: $179,022.07

Completion Date: 11/30/2023
University #2:
Total Project Budget: $210,004.25
TTI FY23 Budget: $164,563.50
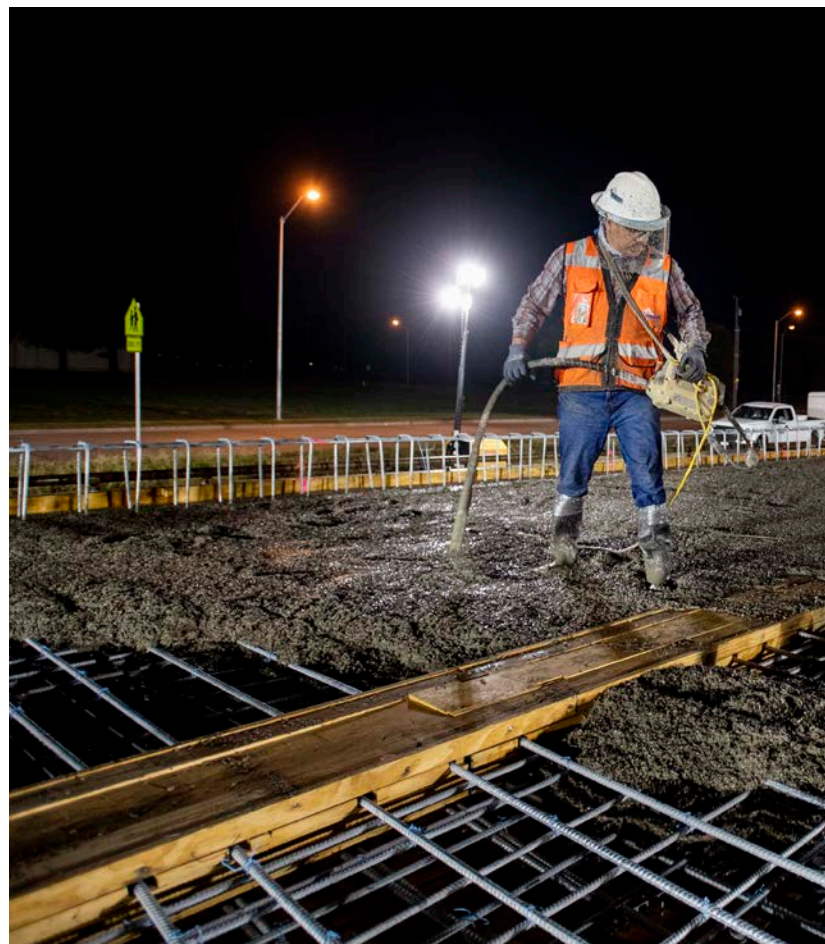**TTI FY23 Spend:** $165,644.06

Project Description: Different from patching materials, hot-mix cold-laid (HMCL) asphalt mixes are often used as a blade-on/level up material in Texas. Currently, the HMCL asphalt mixes are designed with a Texas Gyratory Compactor (TGC) and checked with the Hveem stability test. The Materials and Tests Division (MTD) of the Receiving Agency is undertaking an initiative to design all asphalt mixes with the Superpave Gyratory Compactor (SGC) and officially phase out the TGC in the upcoming Standard Specifications Book update in 2024. As a result, there is an urgent need to study HMCL mix design with the SGC and replace the Hveem stability test with a new performance related test. The objective of this project is to establish a new HMCL mix design method with the SGC and new performance tests ensuring high quality and long-lasting HMCL mixes which will save millions of dollars of taxpayer money annually. To achieve this objective, the Performing Agency shall review the literature and conduct extensive laboratory TGC, SGC, and performance tests; then develop the SGC-based HMCL mix design method including performance tests and associated criteria; and finally recommend specifications changes.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7153

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7155	Develop/Refine Design Provisions for Headed and Hooked Reinforcement	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $680,187.50
TTI Total Project Spend: $184,059.15

Completion Date: 02/28/2026
University #2: UTSA
Total Project Budget: $999,401.25
TTI FY23 Budget: $238,988.00
TTI FY23 Spend: $107,724.16

Project Description: The usefulness of reinforced concrete is dependent on sufficient anchorage between concrete and reinforcing steel. Sufficient anchorage occurs when reinforcing steel is embedded into the concrete a distance referred to as the development length. When this length of embedment is achieved, the reinforcing steel is expected to reach or exceed stresses beyond yield. Geometric constraints within structural members may prevent straight lengths of reinforcement from developing their yield strength, such as straight bars being terminated within a beam-column joint. In these cases, the addition of a hook or headed bar attachment provides a more efficient anchorage mechanism compared to straight bars. Both hooked and headed bars have shorter development lengths than straight bars. However, the current American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design Bridge Design Specifications (LRFD) Bridge Design Specification (9th edition) has not developed standard details for headed reinforcement in bridge structures. In addition, current AASHTO LRFD design provisions for hooked bars are adapted from the American Concrete Institute (ACI) 318-14 Building Code Requirements for Structural Concrete. Considerable revisions to the current ACI 318-19 specification for the design of hooked reinforcement, which require increased lengths (50 to 70 percent longer) relative to previous code cycles, necessitates the Receiving Agency to revisit its current design practice for hooked reinforcement. This research seeks to provide the Receiving Agency with clear and concise design guidance for engineers to use both hooked and headed bar attachments in Receiving Agency bridge structures. The Performing Agencies shall accomplish this through large-scale experimental testing of specimens with hooked and headed bars representative of Receiving Agency bridge structures and current design practice.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7155

TTI Safety and Operations

Project Number	Project Name	Status
0-7156	Using Vehicle Probe Data to Evaluate Speed Limits on Texas Highways	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $399,981.75
TTI Total Project Spend: $177,508.89

Completion Date: 08/31/2024
University #2:
Total Project Budget: $399,981.75
TTI FY23 Budget: $195,406.00
TTI FY23 Spend: $165,539.36

Project Description: The Receiving Agency's current practice is to conduct numerous speed studies throughout the year to determine if the speed limits should be changed due to new traffic patterns, development, crash history, and other factors. These studies are driven by stakeholder requests or as part of routine annual reviews. The number of studies performed at any given time is limited by staff and consultant resources, resulting in a process that can take several months to complete. Can the increasing availability of vehicle probe data, along with other big datasets, be used to reduce the level of effort and time needed to collect speed data? If so, what data can be readily obtained from big data sources and what procedure would be needed to refine the use of probe speed information and produce speed limit recommendations that are consistent with the sound engineering practices currently used by Receiving Agency staff? This project will explore if there are more efficient methods for conducting Texas speed limit studies that would allow Receiving Agency districts to be more pro-active and responsive with their speed zone program. Such a program would also provide a much safer method of collecting speed data, especially on high-speed and controlled access highways.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7156

TTI Safety and Operations

Project Number	Project Name	Status
0-7157	Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities	Active

Project Start Date: 09/01/2022

Lead University: TAMUCC

Project Status: Active

TTI Total Budget: $179,215.50

TTI Total Project Spend: $63,883.86

Completion Date: 08/31/2024

University #2: TTI

Total Project Budget: $499,992.00

TTI FY23 Budget: $66,931.25

TTI FY23 Spend: $60,866.22

Project Description: Unmanned aircraft systems (UASs) equipped with digital cameras, light detection and ranging (LiDAR) sensors, or both enable the collection of high spatial resolution three-dimensional (3D) quantitative geospatial data. This data may be used to support a variety of surveying and mapping activities, potentially with lower costs and greater safety than traditional survey methods. When using a camera, the technique is called Structure-from-Motion photogrammetry or UAS-SfM. In practice, there are important differences between UAS-SfM and UAS-LiDAR including measurement fidelity, operational considerations, post-processing workflows, and cost-effectiveness. With a lack of clear guidance on when UAS-SfM versus UAS-LiDAR is the best fit for a specific task, there is a need to evaluate the real-world performance capabilities and limitations of both technologies.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7157

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7159	Develop Guidelines for the Use of Unmanned Aerial Systems (UASs) and Smartphones for Construction and Utility Inspections	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $381,816.75
TTI Total Project Spend: $210,675.26

Completion Date: 08/31/2024
University #2: TAMUCC
Total Project Budget: $482,278.00
TTI FY23 Budget: $203,697.25
TTI FY23 Spend: $203,698.11

Project Description: Unmanned aircraft systems (UASs) equipped with miniaturized cameras enable the collection of high resolution, three-dimensional (3D) geospatial data at lower costs than traditional techniques. New technologies also make it possible to gather pictures and video using smartphones, which can be fed to Structure from Motion (SfM) software to develop highly accurate 3D products. Operating UASs requires trained pilots and observers, but smartphones do not. There is a need to test whether construction contractor crews in the field can gather data using either of these technologies and upload the imagery and video to a server to enable inspectors to conduct inspections remotely. The Performing Agencies shall conduct a literature review of UAS-SfM and smartphone technologies; prepare a list of use cases and case studies to test relevant technologies; conduct field tests to document advantages, disadvantages, complementary capabilities, and potential implementation scenarios and costs; prepare recommended settings, procedures, use cases, and operational workflows to ensure repeatable data collection and processing; and prepare guidelines for quality assurance and control of inspections conducted with UAS- and smartphone-based SfM photogrammetry, as well as identify project suitability for the adoption of these technologies to support construction and utility inspection activities at the Receiving Agency.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7159

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7163	Synthesis of Lacustrine Wave Scour Evaluation Methods	Closed

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Closed
TTI Total Budget: $65,000.00
TTI Total Project Spend: $74,774.92

Completion Date: 08/31/2023
University #2:
Total Project Budget: $65,000.00
TTI FY23 Budget: $65,000.00
TTI FY23 Spend: $74,774.92

Project Description: A scour analysis is required for all new bridges over water, including bridges through lakes and reservoirs. Wave action may be the primary driver of erosion in these lacustrine environments; however, Federal Highway Administration (FHWA) provides no guidance on predicting scour depths caused by wave action in still waters. In the Receiving Agency's normal course of work, it would perform a scour evaluation for all bridges over water but currently there is not guidance on how to do so for bridges in lakes and reservoirs. This synthesis will develop guidance for conducting scour analyses for bridges in lacustrine environments, where wave action may be the primary driver of erosion.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7163

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7166	Leveraging Probe-Based Data to Enhance Long-Term Planning Models	Active

Project Start Date: 09/06/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $176,271.75
TTI Total Project Spend: $120,074.51

Completion Date: 08/31/2024
University #2: UTSA
Total Project Budget: $346,904.25
TTI FY23 Budget: $101,449.00
TTI FY23 Spend: $95,517.10

Project Description: Long-range transportation planning (LRTP) and travel demand models (TDMs) play an important role in the planning process, which assists transportation agencies with prioritizing future transportation investments. Improved LRTP and TDMs can bring direct benefits to transportation planning in the state. Effective transportation planning and investment decision making depends on timely, comprehensive, and accurate data. However, traditional data collection methods only provide a "snapshot" of the travel information, which limits the performance of conventional LRTP and TDMs. In this regard, while these sources are still used, transportation planners at the state, metropolitan, and local levels are beginning to incorporate third-party traffic data into their planning processes. Planners also start to look at the opportunities afforded through third-party data and provide guidance on how to take advantage of that data to expand and improve planning practices. This project aims to utilize probe-based data to improve the LRTP process and TDMs used by the Receiving Agency, MPOs and other planning agencies in the state. The Performing Agencies shall study how probe-based and location-based data may be leveraged to facilitate the validation and calibration of existing planning models, enhance existing modeling tools, and incorporate advanced modeling techniques.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7166

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7167	Evaluate Performance of Sealers and Coatings Applied to TxDOT Bridge Substructures	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $499,972.00
TTI Total Project Spend: $278,340.72

Completion Date: 08/31/2024
University #2:
Total Project Budget: $499,972.00
TTI FY23 Budget: $249,983.50
TTI FY23 Spend: $261,145.04

Project Description: The Performing Agency shall perform a comprehensive evaluation of concrete sealers and coatings applied to bridge substructure in the state of Texas. The Performing Agency shall investigate the need for and extent of surface preparation on both new and existing concrete surfaces including those with previously applied coatings. A focus is placed on material testing to evaluate the performance of coatings applied with various surface preparation methods and exposed to environmental conditions. The potential benefits are the development of recommendations for the level of surface preparation required for various sealer or coating systems and for the optimal coating type for the Receiving Agency's substructures with or without previously applied coatings.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7167

TTI Strategy and Innovation

Project Number	Project Name	Status
0-7169	Post-NEVI Electric Vehicle Infrastructure Research (Freight, Fleet, and Multi-family Housing	Active

Project Start Date: 09/12/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $399,347.00
TTI Total Project Spend: $187,062.49

Completion Date: 08/31/2024
University #2:
Total Project Budget: $399,347.00
TTI FY23 Budget: $198,574.75
TTI FY23 Spend: $187,062.49

Project Description: With the growing adoption of electric vehicles (EVs) in the United States and by Texans, Texas has a need for adequate and comprehensive coverage of EV charging infrastructure. While currently comprising less than one percent of all registered vehicles in Texas, projections forecast that EVs could comprise up to 55 percent of all vehicles by the year 2040. This significant industry shift will require considerable and proactive efforts to support this transition, focusing on infrastructure readiness; customer experience; interregional connectivity, equity, and economic impacts; and other consequences related to the closure or repurposing of gas stations. Texas needs to identify optimal places where infrastructure will be needed in advance of federal and local funding that will be available to build out EV charging infrastructure. Since implementation of EV charging infrastructure will occur in phases over multiple years, a long-term strategic plan is necessary to guide the development of EV infrastructure, ensure that the Receiving Agency meets the needs of EV stakeholders, and maximize financial opportunities available to the state. The long-term strategic plan will guide infrastructure investment across the state, with a goal of a stable and consistent EV charging network. The project will also help guide future charging infrastructure funding opportunities and provide guidance to effectively and equitably distribute available funding. The Performing Agency shall review the existing EV charging infrastructure state of practice to understand needs and challenges in EV infrastructure, including deployment models, grid connectivity and upgrades, and evolving technologies such as in-road charging, swappable batteries, and future-proofing existing technology; assess tools available to guide statewide EV planning analysis, such as EVI-Pro and other platforms; develop an analysis of projected EV charging demand based on adoption trends and projections; develop a policy analysis of the local, state, and federal statutory landscape to identify barriers and opportunities in comparison to peer states; analyze funding opportunities and develop frameworks for funding models, including private-public partnerships, that will consider the state of practice, federal funding opportunities, and alternative funding sources; and develop strategies to improve the EV charging infrastructure system in Texas over the course of 5 to 10 years, including an evaluation of variables that affect the placement of new EV charging locations and the necessity and viability of battery storage and off-grid capabilities. These efforts will result in an assessment of EV planning analysis tools, a policy analysis framework, and long-term statewide EV infrastructure strategies.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to revise the project title from "Develop Texas Electric Vehicle Charging Infrastructure Readiness Plan" to "Post-NEVI Electric Vehicle Infrastructure Research (Freight, Fleet, and Multi-family Housing)".

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7169

TTI Structures and Hydraulics

Project Number	Project Name	Status
0-7170	Evaluate Bridge Deck Condition and Replacement Methods	Active

Project Start Date: 01/01/2023
Lead University: TTI
Project Status: Active
TTI Total Budget: $734,786.00
TTI Total Project Spend: $129,006.29

Completion Date: 03/31/2026
University #2:
Total Project Budget: $734,786.00
TTI FY23 Budget: $132,061.25
TTI FY23 Spend: $122,568.20

Project Description: Bridge decks usually have a minimum service life of 50 years but many bridge decks in Texas far exceed that value and are showing concerning signs of deck soffit cracking. Deck replacement is performed to take advantage of the good existing condition of the super- and sub-structures; however, since replacement is expensive (up to 40% of the cost of a new bridge), especially over concrete girders, it is critical to have sound decision and appropriate design and construction methods for this work to protect public safety and use bridge preservation funds wisely. While life-cycle cost analysis can be beneficial when assessing the overall deck condition relative to the condition of the rest of the deck, it does not address the risk of a punch through failure. The outcomes of this project will aid the Receiving Agency's Bridge Division and districts to have accurate assessments of cast-in-place (CIP) bridge deck conditions to make sound decisions about emergency repairs, regular repairs, deck overlay, and deck replacement to preserve bridge assets while minimizing the risk of punch through.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7170

TTI Strategy and Innovation

Project Number	Project Name	Status
0-9908-22	Planning Innovation and Technology Deployments at TxDOT	Active

Project Start Date: 03/10/2022
Lead University: TTI
Project Status: Active
TTI Total Budget: $3,152,815.00
TTI Total Project Spend: $1,411,205.93

Completion Date: 12/31/2023
University #2:
Total Project Budget: $3,152,815.00
TTI FY23 Budget: $2,244,682.00
TTI FY23 Spend: $1,411,205.93

Project Description: From time to time, TxDOT districts produce ITS and other technology innovations that improve roadway and/or worker safety, roadway efficiency and/or produce cost savings. By failing to recognize and scale these innovations across the state, TxDOT does not receive the full benefit of 25 diverse centers of excellence. This contract utilizes TTI, which is an organization that excels at innovation in and of itself, to investigate innovative district practices and to develop plans at a district and statewide level to share and scale innovation across the state. By harvesting the knowledge already contained within TxDOT, new avenues will open to improve roadway safety, efficiency and produce cost savings. Due to the breadth of TxDOT, these innovations may have very large impacts on the millions of Texans across the state and their visitors. Additionally, by cataloging and bringing together these innovations, divisions and districts can work together to make sure that solutions are developed in such a way that unified systems and interoperability occur throughout the state. This project also complements a wider effort to catalog, share and grow innovation at TxDOT. The end result for Planning for Innovation and Technology Deployments at TxDOT is a programmatic set of documents that compile and recommend innovative ITS and advanced technology roadway projects and system improvements that TxDOT districts can execute, customized to each district. To arrive at this, the consultant team will interact with districts and industry professionals as unique stakeholders across the state and the nation to compile insights of innovative projects that may include data analysis, operational improvements or deployment of advanced technologies along the roadway, among others. The consultant team will develop high level scope and cost estimates for each offered transportation project. The consultant may also be directed to develop a strategy blueprint (goal, purpose, scope, timeline, responsibilities) for how innovation and technology deployment can be progressed as an integral part of the Receiving Agency's functions and to develop evaluation plans and/or templates for Department innovation and technology deployment projects.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to revise the budget and the deliverables due dates due to start date being postponed as a result of funding complications. The FY23 budget is decreasing by $224,468.20 from $2,469.150.20 to $2,244,682.00. The FY24 budget remains the same at $481,339.00. The total amount of this contract remains unchanged at $3,152,815.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-9908-22

TTI Safety and Operations

Project Number	Project Name	Status
5-7049-01	Implementation of Improving and Communicating Speed Management Practices	Active

Project Start Date: 03/24/2023
Lead University: TTI
Project Status: Active
TTI Total Budget: $95,608.00
TTI Total Project Spend: $34,776.38

Completion Date: 08/31/2024
University #2:
Total Project Budget: $95,608.00
TTI FY23 Budget: $60,823.00
TTI FY23 Spend: $30,070.54

Project Description: This project shall increase the Receiving Agency's understanding of the fundamental relationships between posted and operating speed along with providing content to support external and internal Receiving Agency dialog about speed limits and their development for all roadway environments. This project shall include three (3) workshops along with developing Spanish versions of previously delivered materials (to include pamphlets and a short video) on speed limit setting practices oriented to the general public to meet the diverse needs of Texans.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7049-01

TTI Safety and Operations

Project Number	Project Name	Status
5-7083-01	Implementation of Safety Prediction Methods Developed for Texas Highways	Active

Project Start Date: 02/28/2023
Lead University: TTI
Project Status: Active
TTI Total Budget: $67,365.00
TTI Total Project Spend: $42,386.59

Completion Date: 02/29/2024
University #2:
Total Project Budget: $67,365.00
TTI FY23 Budget: $37,122.50
TTI FY23 Spend: $36,412.03

Project Description: The Receiving Agency Research Projects 0-7083 Develop Highway Safety Manual (HSM) Safety Performance Functions (SPFs) and Calibration Factors for Texas and 0-7067 Enhancing Freeway Safety Prediction Models developed safety prediction methods for all Texas highways. These methods are used to predict safety performance and help with the complex trade-offs between safety, operations, community impacts, and costs that are often necessary when planning and designing highway projects. These resources shall form a powerful tool for selecting Highway Safety Improvement Program projects and will support and defend safety decisions made by the Design Division and districts. The Performing Agency incorporated these methods into spreadsheet tools to implement the new models and facilitate analysis of all rural and urban roadway segments and intersections. The Performing Agency shall develop and present webinars and workshops for Receiving Agency personnel who are responsible for traffic safety analysis. The webinars and workshops will familiarize personnel with the safety prediction methods and the analysis tools.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7083-01

TTI Safety and Operations

Project Number	Project Name	Status
5-9050-02	Provision of Select Computer-Aided Dispatch Data to Traffic Management Centers for Enhanced Incident Detection and Tracking	Active

Project Start Date: 11/09/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $125,000.00
TTI Total Project Spend: $107,086.08

Completion Date: 12/31/2023
University #2:
Total Project Budget: $125,000.00
TTI FY23 Budget: $73,725.00
TTI FY23 Spend: $73,571.24

Project Description: The Receiving Agency's Traffic Management Centers (TMCs) are responsible for monitoring freeways within their respective metropolitan areas for crashes, stalls, and other incident impacting traffic flow, contacting the appropriate responding agencies (police/fire/emergency medical services/tow), and tracking incident progress. TMC staff predominantly use Closed Circuit television (CCTV) camera feeds to find incidents, as well as volume/speed detectors on the Receiving Agency Intelligent Transportation Systems (ITS) map, and the traffic layer on Google Maps. While these methods help to some degree, they are not always effective or efficient. CCTV tours (which show 5-10 second feeds of a freeway segment) can miss an incident if the camera is pointing in a different direction. TMC staff focusing on one freeway may miss an event on another freeway. Google traffic indicators only show the level of traffic but not incidents that caused the traffic. Often, those involved in incidents immediately contact 9-1-1 for assistance. The Performing Agency shall develop a system that collects essential incident management information from 9-1-1 systems and transmits said information to regional TMCs to speed up the identification and response to an incident, and collect needed incident management data to better assess incident management programs in the region.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #1:
Amend the contract to extend the contract and to revise the budget and project schedule due to delays in the law enforcement recruiting process between the Receiving Agency and local law enforcement agencies. Additional time is needed to address data transfer arrangements and concerns of all participating agencies. The FY 2022 budget is decreased by $46,395.75 from $79,030.75 to $32,635.00. The FY 2023 budget is increased by $46,395.75 from $45,969.25 to $92,365.00. The Itemized Project Budget Estimate remains $125,000.00.

Amendment #2:
Amend the contract to extend the contract and to revise the budget and project schedule due to delays in developing an Interlocal Agreement between the Receiving Agency and participating law enforcement entities, and subsequently, additional delays in the law enforcement recruiting process between the Receiving Agency and local law enforcement agencies. Additional time is needed to solidify agreements with law enforcement agencies to participate in the data provision. The FY 2023 budget is decreased by $18,640.00 from $92,365.00 to $73,725.00; the FY 2024 budget is established at $18,640.00; the Itemized Project Budget Estimate remains $125,000.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-9050-02

TTI Safety and Operations

Project Number	Project Name	Status
9-1531	Development and Evaluation of Roadside Safety Systems for Motorcyclists	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
TTI Total Budget: $780,000.00
TTI Total Project Spend: $299,039.36

Completion Date: 08/31/2024
University #2:
Total Project Budget: $780,000.00
TTI FY23 Budget: $292,259.00
TTI FY23 Spend: $213,901.94

Project Description: This pooled fund study shall provide a cooperative approach to conducting research addressing roadside safety issues specifically related to improving motorcyclist safety. The study shall provide participating states an opportunity to collaborate on best practices, new regulatory issues, risk management strategies, and other research pertaining to roadside safety improvements for motorcyclists. The research activities shall include the identification, development, and evaluation of strategies and devices for mitigating the frequency and severity of roadway departure motorcyclist crashes.

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #4:
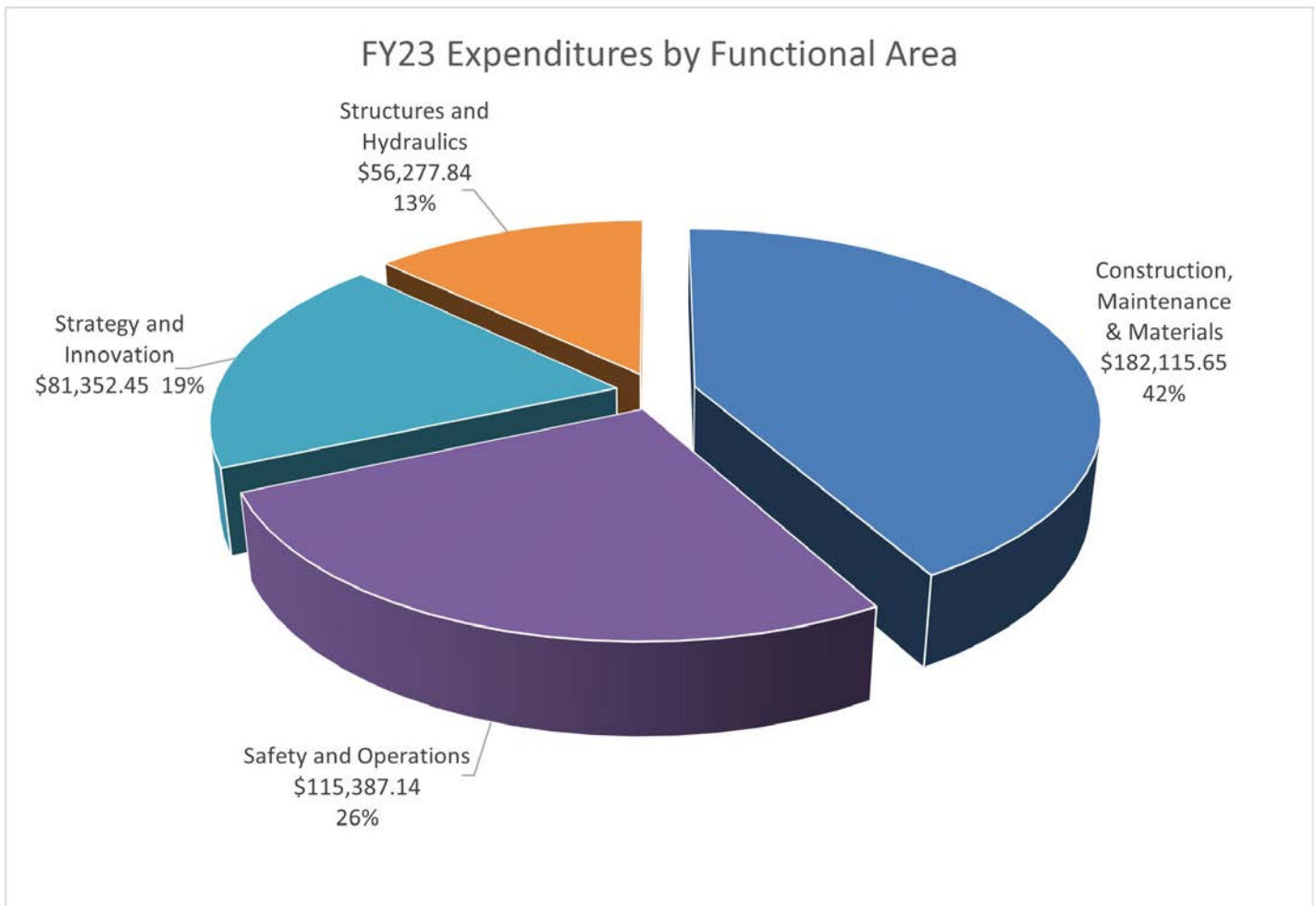Amend the contract to replace the Principal Investigator due to the departure of the Project Supervisor.

Amendment #5:
Amend the contract to contract to revise the budget and update project schedule to modify Deliverables R2 to R2A and R2B. The FY 2022 budget remains $72,654.25; the FY 2023 budget is decreased by $121,028.50 from $413,287.50 to $292,259.00; the FY 2024 budget is increased by $121,028.50 from $294,058.25 to $415,086.75; the Total Project Budget remains at $780,000.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=9-1531

2.11 TXST - Texas State University - San Marcos

FY23 Expenditures by Functional Area

- Structures and Hydraulics $56,277.84 13%
- Strategy and Innovation $81,352.45 19%
- Construction, Maintenance & Materials $182,115.65 42%
- Safety and Operations $115,387.14 26%

Project Number	Project Name	Status
0-7017	Use of Rapid Setting Hydraulic Cement (RSHC) for Structural Applications	Active
0-7072	Improve Data Quality for Automated Pavement Dis-tress Data Collection	Active
0-7131	Leveraging Artificial Intelligence (AI) Techniques to Detect, Forecast, and Manage Freeway Congestion	Closed
0-7144	Develop a Real-time Decision Support Tool for Ur-ban Roadway Safety Improvement	Active
0-7150	Artificial Intelligence for Pavement Condition As-sessment from 2D/3D Surface Images	Active

TXST Structures and Hydraulics

Project Number	Project Name	Status
0-7017	Use of Rapid Setting Hydraulic Cement (RSHC) for Structural Applications	Active

Project Start Date: 07/03/2019
Lead University: TXST
Project Status: Active
TXST Total Budget: $572,509.00
TXST Total Project Spend: $503,051.29

Completion Date: 12/31/2023
University #2:
Total Project Budget: $572,509.00
TXST FY23 Budget: $83,719.12
TXST FY23 Spend: $56,277.84

Project Description: The goal of this project is to determine feasibility of using rapid setting cements as a cost effective solution for structural applications in Texas, specifically in bridge structural components and decks. The PERFORMING AGENCY, or "research team", will:

1) synthesize relevant information available on rapid cements in published (and unpublished) literature.

2) conduct a survey of domestically available and structurally feasible rapid setting cements for use in TxDOT bridge deck construction.

3) perform a comprehensive experimental evaluation covering a range of fresh and hardened material properties for calcium suflo aluminate (CSA) cement, calcium aluminate cement (CAC), Type III cement, and combinations of all three.

4) verify and demonstrate adequate performance characteristic and durability performance based on laboratory testing.

5) correlate performance characteristics with material and placement costs (6) and develop guidelines and specification for implementation of rapid setting cements for bridge structures and decks in Texas.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the contract to extend the termination date, and to revise the budget and the project schedule due to additional time needed for testing and final reporting of those results. The update to the project schedule will be done at no additional cost and support an extension to the project period. The FY19 Budget remains at $16,640.00; the FY20 Budget remains at $160,227.00; the FY21 Budget remains at $186,337.00; the FY22 Budget remains at $101,796.00; the FY23 Budget of $107,509.00 is decreased by $32,790.00 from $107,509.00 to $74,719.00; the FY24 Budget is established in the amount of $32,790.00; the Total project budget remains at $572,509.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7017

TXST Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7072	Improve Data Quality for Automated Pavement Distress Data Collection	Active

Project Start Date: 09/08/2020
Lead University: TXST
Project Status: Active
TXST Total Budget: $449,720.00
TXST Total Project Spend: $261,542.10

Completion Date: 08/31/2024
University #2:
Total Project Budget: $449,720.00
TXST FY23 Budget: $134,649.38
TXST FY23 Spend: $83,964.70

Project Description: Accuracy and precision issues associated with the reliability of the existing automated and semi-automated pavement condition data collection methods have existed since inception with the Receiving Agency. This research shall develop data quality assurance guidelines for the Receiving Agency to improve the quality of automated pavement condition data. The three components in the research are the development of an audit sampling method, a set of consistency check criteria for pre-analysis of new data, and data quality criteria in acceptance of new data. A pilot study for a selected Receiving Agency District shall be completed with the developed guidelines to evaluate the effectiveness of the proposed data quality assurance procedures for data quality improvement.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #3:
Amend the contract to extend the termination date, update the project schedule and revise the project budget due to Covid-19 impacts and the amount of unforeseen work and iterative nature of the work in the research for Tasks 6 and 7. The FY21 Budget remains at $36,009.43; the FY22 Budget remains at $166,318.71; the FY23 Budget is decreased by $112,742.48 from $247,391.86 to $134,649.38; the FY24 Budget is established at $112,742.48; The Itemized Project Budget Estimate remains at $449,720.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7072
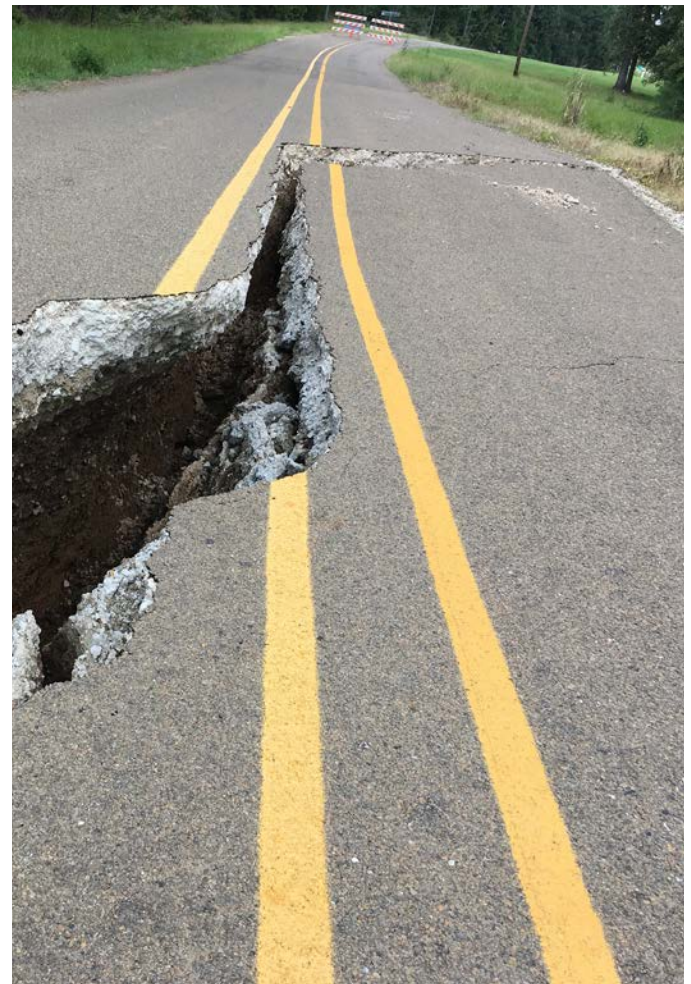
TXST Strategy and Innovation

Project Number	Project Name	Status
0-7131	Leveraging Artificial Intelligence (AI) Techniques to Detect, Forecast, and Manage Freeway Congestion	Closed

Project Start Date: 09/14/2021
Lead University: TTI
Project Status: Closed
TXST Total Budget: $84,637.50
TXST Total Project Spend: $81,352.45

Completion Date: 08/31/2023
University #2: TSU, TXST
Total Project Budget: $297,203.76
TXST FY23 Budget: $84,637.50
TXST FY23 Spend: $81,352.45

Project Description: To improve the quality and effectiveness of the Texas surface transportation system, it is important to be able to predict where and when prolonged congestion will start and how it will spread, as well as to track atypical events and estimate their evolution. Artificial intelligence (AI) approaches provide a unique opportunity to estimate precise congestion measures by utilizing data from agency-owned sensors, third-party providers, and big enterprise data. This project envisions to mitigate the current research gap by conducting two major project phases. The first phase can confirm the validity of commercial data sources for planning and operations, while the second involves understanding which AI models/ algorithm are the most suitable for addressing Receiving Agency needs based on desirable use cases and data availability. Furthermore, it is important to analyze the required data models and workflows to determine whether it is sustainable to train, test, and validate the proposed AI techniques. The Performing Agencies understand that achieving the research goals requires a comprehensive analysis and documentation of commercial big data platforms and datasets, appropriate AI algorithms, and robust prototype tool to foster return on investment (ROI) and reduce freeway congestion.
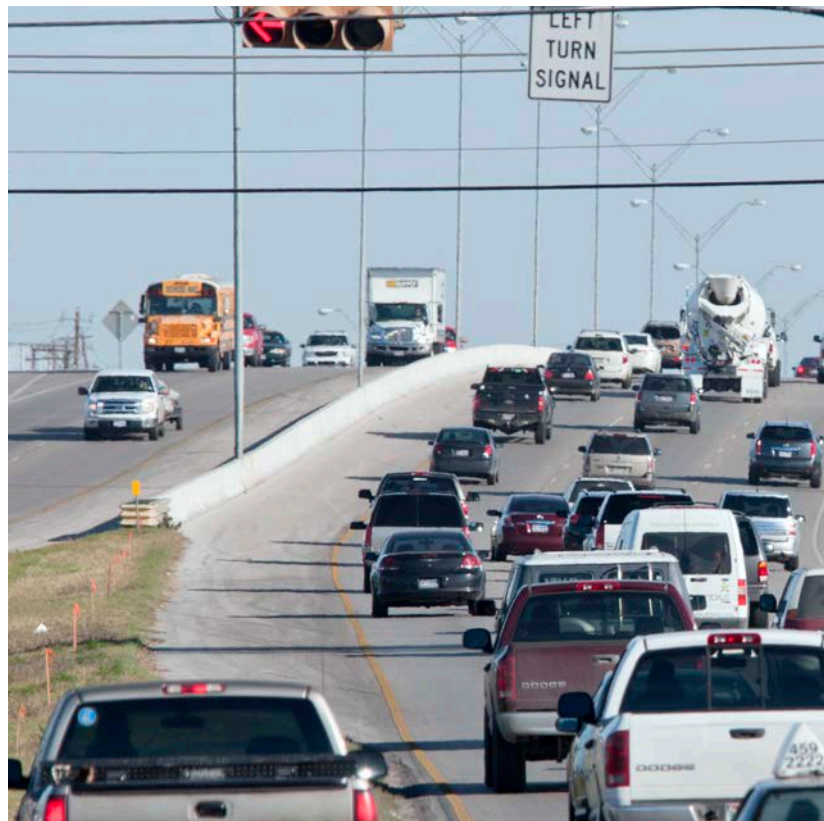
Approved Work Program Revisions

No. of FY23 Amendments: One

Amendment #2:
Performing Agency 1 (TTI): The FY 2022 budget remains $103,187.50. The FY 2023 budget is decreased by $84,637.50 from $138,706.50 to $54,069.00. The Performing Agency 1 Total Project Budget is decreased by $84,637.50 from $241,894.00 to $157,256.50. Performing Agency 2 (TSU): No revisions to budget. The Performing Agency 2 Total Project Budget remains $55,309.76. Performing Agency 3 (TXST): The FY 2023 budget is added for $84,637.50. The Performing Agency 3 Total Project Budget is established at $84,637.50. The Itemized Project Budget Estimate Project Budget remains $297,203.76.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7131

TXST Safety and Operations

Project Number	Project Name	Status
0-7144	Develop a Real-time Decision Support Tool for Urban Roadway Safety Improvement	Active

Project Start Date: 01/09/2023
Lead University: TXST
Project Status: Active
TXST Total Budget: $359,018.50
TXST Total Project Spend: $126,729.48

Completion Date: 12/31/2024
University #2: TTI
Total Project Budget: $465,010.00
TXST FY23 Budget: $118,897.50
TXST FY23 Spend: $115,387.14

Project Description: Due to the complex nature of urban roadways, conventional crash prediction models are limited as these models omit operating speed, short-duration volume, and weather data. To mitigate this research gap, the following three national databases can be utilized: (1) National Performance Management Research Data Set (NPMRDS) with passenger and freight speed data, (2) Travel Monitoring Analysis System (TMAS) data with both temporary traffic counting and continuous traffic counting programs, and (3) real-time weather data from the National Oceanic and Atmospheric Administration (NOAA). The fatality rate on Texas roadways for 2020 was 1.50 deaths per hundred million vehicle miles traveled, which is an 18.94% increase from 1.26 in 2019. From 2011 to 2020, the fatalities on rural roadways increased by 19%, and this increase on urban roadways is disproportionately high (31%). Research and a supporting decision support tool are necessary to improve urban safety. The Performing Agencies shall leverage ongoing staff leadership and engagement in several national and state Department of Transportation (DOT) speed-safety projects. The Performing Agencies shall provide updated safety performance functions (SPFs) for urban roadways and a real-time decision support tool on risk scoring with the applicability of new data input and model updating pipeline.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
The Project has been cancelled and is being re-RFP'd due to the departure of the lead University Project Supervisor, Subasish Das.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7144

TXTS Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7150	Artificial Intelligence for Pavement Condition Assessment from 2D/3D Surface Images	Active

Project Start Date: 09/01/2022
Lead University: TXST
Project Status: Active
TXST Total Budget: $451,875.00
TXST Total Project Spend: $113,343.49

Completion Date: 08/31/2025
University #2:
Total Project Budget: $451,875.00
TXST FY23 Budget: $150,625.00
TXST FY23 Spend: $98,150.95

Project Description: While manual quality assurance is inefficient and expensive, the proprietary data storing and processing methods have prevented the Receiving Agency from developing automated methods for data validation. Recently, with the national initialization of standard format for two-dimensional/three-dimensional (2D/3D) pavement surface images and the development of Artificial Intelligence (AI)/Machine Learning (ML) in Computer Vision, the Receiving Agency sees the opportunity of developing new methods for automated pavement condition assessment, with more independence from vendors and their equipment. The main objective of this research is to develop ML-based application software to assess pavement conditions using the standard format 2D/3D pavement surface images. The three main components of this research include the development of a standard format 2D/3D pavement surface image library, a set of ML models for pavement distress measurement, and application software for pavement condition evaluation. The proposed project will assist the Receiving Agency to enhance the quality of the automated pavement condition data, which would eventually help the State of Texas improve its pavement performance.
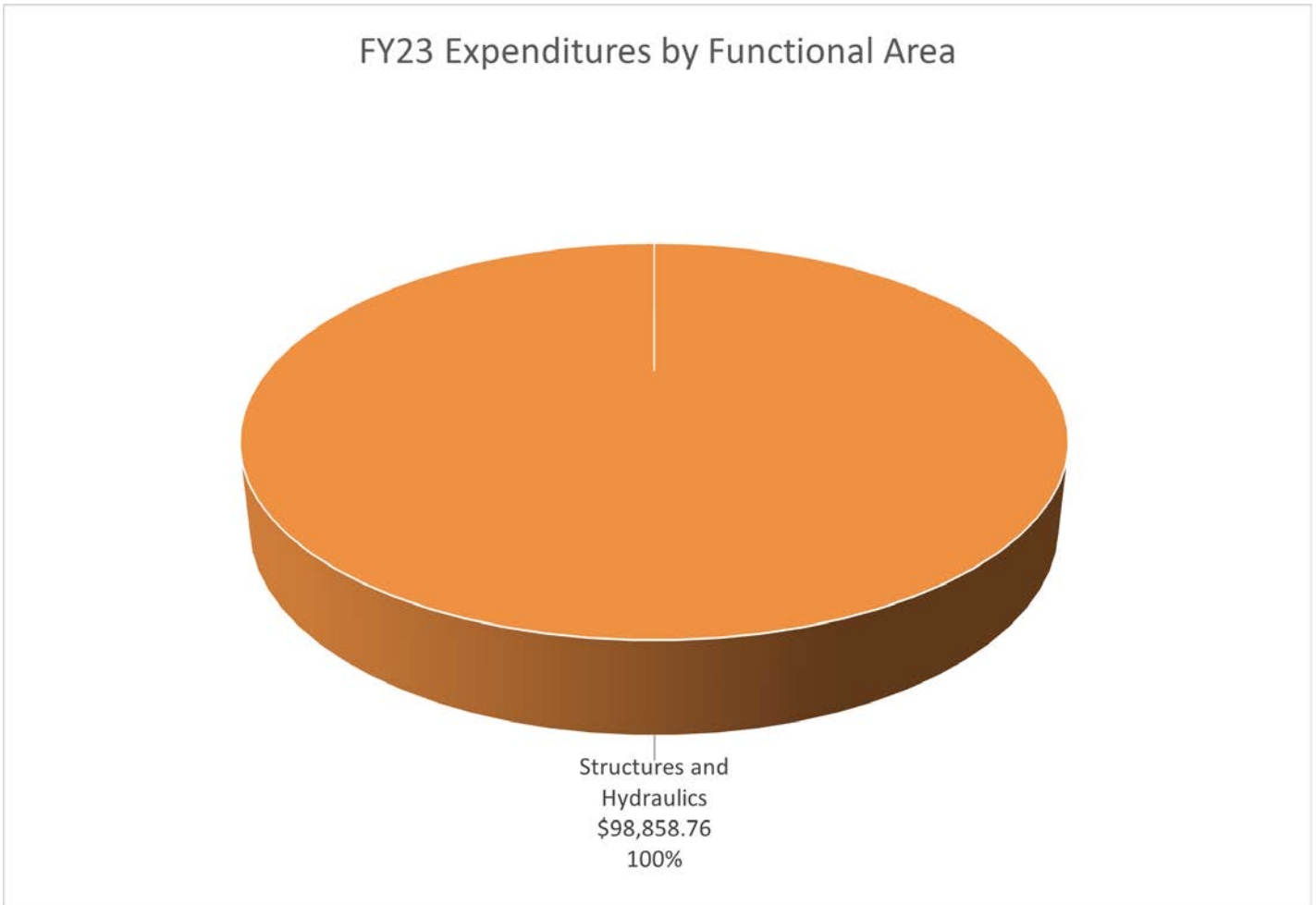
Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7150

2.12 UH - University of Houston

FY23 Expenditures by Functional Area

Structures and
Hydraulics
$98,858.76
100%

Project Number	Project Name	Status
0-6905-01	Performance of skewed reinforcing in Inverted-T bridge caps	Closed
0-7094-01	Determine Evacuation Planning Design for Disaster Resilience	Closed

UH Structures and Hydraulics

Project Number	Project Name	Status
0-6905-01	Performance of skewed reinforcing in Inverted-T bridge caps	Closed

Project Start Date: 09/17/2021
Lead University: UH
Project Status: Closed
UH Total Budget: $269,760.00
UH Total Project Spend: $269,760.00

Completion Date: 08/31/2023
University #2:
Total Project Budget: $269,760.00
UH FY23 Budget: $98,858.75
UH FY23 Spend: $98,858.76

Project Description: Reinforced concrete inverted-T bridge caps (ITBCs) are used extensively in Texas bridges. Many of these bridge structures must be skewed. The Performing Agency shall continue the Receiving Agency's Research Project 0-6905 "Performance of skewed reinforcing in Inverted-T bridge caps" for the load testing, as reported in R1A and R1B in Donigan Road bridge. In report R1A, The peak load-carrying capacity of inverted-T bridge caps (ITBC) with skew reinforcing is almost equal to the traditional one that is presently used by the Receiving Agency; the number of cracks observed is fewer in the case of ITBC with skew reinforcing; the observed maximum crack width is smaller in the case of skew reinforcing; the design and construction complexities can be significantly reduced and a faster and easier construction process can be achieved when skew reinforcing is used. In report R1B , a preliminary finite element (FE) model was developed for full-scale ITBCs, three cases of reinforcement design for ITBCs were investigated to cover the majority of the design detailing in Texas bridges and four design examples of ITBCs with various skew angles. In this phase 2 of the continued project, the goal is to perform the load tests on the bridge. The Performing Agency shall study the FE analysis results of the bent caps, review sensor installation techniques, and train research assistants for the usage of data acquisition systems and data collection. Subsequently, the Performing Agency shall complete the Instrumentation of the critical skewed ITBCs and the load tests . Finally, the Performing Agency shall analyze the test results to calibrate the FE models and shall recommend a set of design guidelines.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to revise the termination date and the project schedule due to the delay of bridge construction by Receiving Agency.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6905-01

UH Safety and Operations

Project Number	Project Name	Status
0-7094-01	Determine Evacuation Planning Design for Disaster Resilience	Closed

Project Start Date: 02/22/2023
Lead University: UH
Project Status: Closed
UH Total Budget: $29,425.00
UH Total Project Spend: $0.00

Completion Date: 08/31/2023
University #2:
Total Project Budget: $29,425.00
UH FY23 Budget: $29,425.00
UH FY23 Spend: $0.00

Project Description: When a disaster occurs, the victims in the affected area will evacuate to the shelters of nearby cities. There are interactions between transportation network services and evacuation capabilities between different cities in Texas, especially in the mega-regions of the Texas Triangle and the Gulf Coast. The evacuation demands of vulnerable populations are not considered, and the vulnerability analysis of the regional transportation infrastructure network is not considered to optimize evacuation strategies. This project takes advantage of social media data to analyze the movement behavior of different types of evacuees in detail and combines multiple data sources to identify the evacuation origin and destination distribution of vulnerable populations in these mega-regions. The Performing Agency shall analyze the vulnerability of the transportation infrastructure network in the study areas and identify critical road segments that are significantly affected during the evacuation process. From the perspective of the evacuation destinations, the Performing Agency shall optimize evacuation route plans and design traffic control strategies for different types of evacuees.

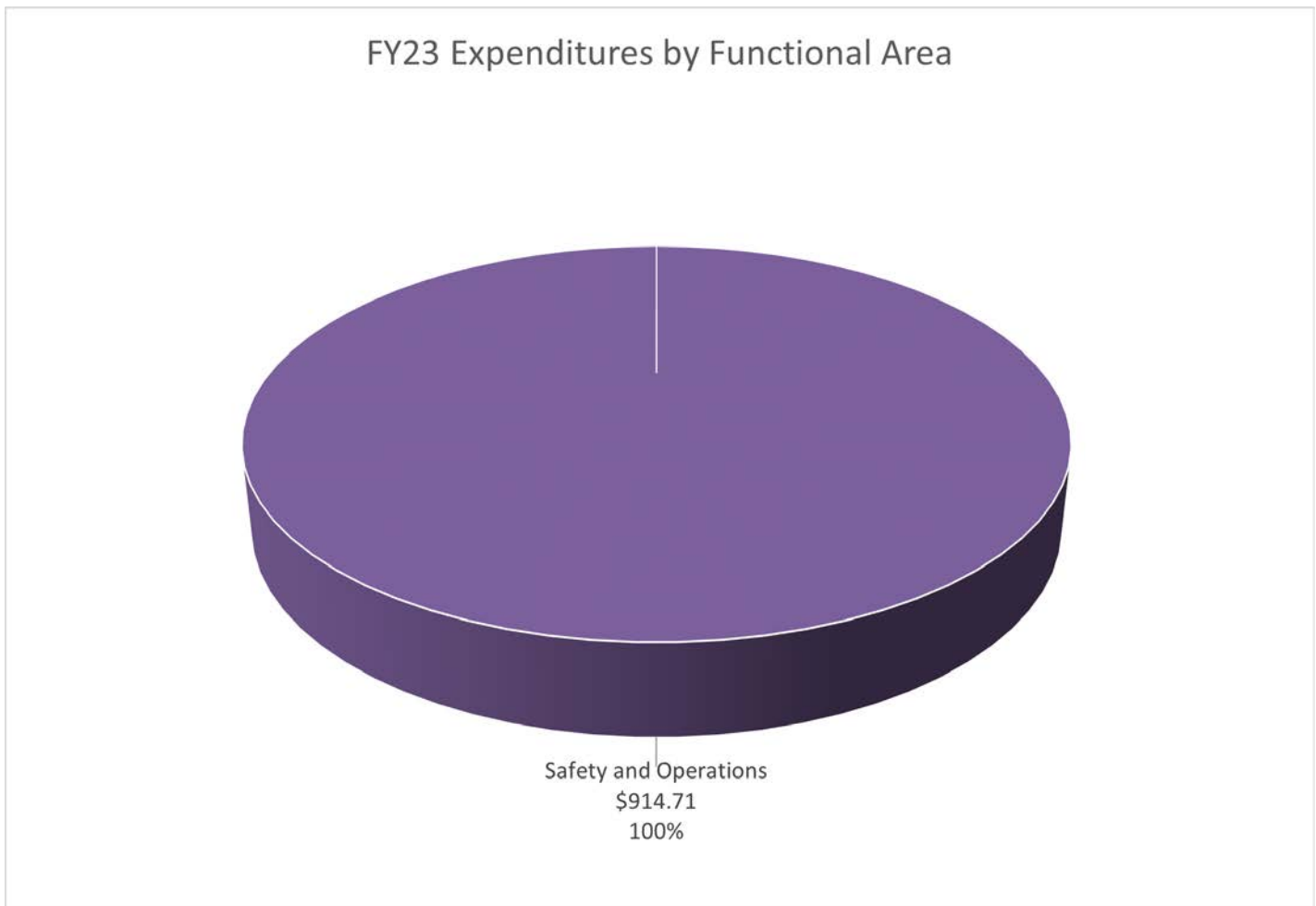**Approved Work Program Revisions**

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.
aspx?q=0-7094-01

FY23 Expenditures by Functional Area

Safety and Operations
$914.71
100%

UNT Safety and Operations

Project Number	Project Name	Status
0-7084	Develop Improved Methods for Eliminating Striping on Roadway Surfaces	Closed

Project Start Date: 09/01/2020
Lead University: UNT
Project Status: Closed
UNT Total Budget: $288,000.75
UNT Total Project Spend: $228,117.47

Completion Date: 08/31/2023
University #2:
Total Project Budget: $288,000.75
UNT FY23 Budget: $21,927.50
UNT FY23 Spend: $914.71

Project Description: The Performing Agency shall evaluate the most effective methods for stripe removal to include but not limited to a fully working prototype laser system to remove pavement marking stripes from roadways. A vehicle used for the routine road striping job shall be adapted to host a diode-pumped YAG laser at 1064 nm wavelength and beam delivery together with a passive insulation system. Preliminary laboratory testing shall be made to adjust laser' parameters such as laser fluence, pulse width, and repetition rate on specimens marked with current standard materials: thermoplastics, water-based paint, and preformed tape. Surface integrity after the use of the laser system shall be checked with methods including but not limited to Raman spectroscopy technique and photographs taken at different angles (to check for scarring) in a laboratory setting before the in-situ testing. The laser system shall be deployed and used on various marked pavements to collect data (photogrammetry) which shall be documented in a geodatabase, analyzed via Matlab Image Processing Toolbox. In addition, this project shall explore a synthesis study on the existing methods of removing striping from roadways used in Texas and elsewhere, and examine and compare these removal methods with the proposed laser technique on different roadway surfaces to determine the most effective methods for pavement marking removals.

Approved Work Program Revisions
No. of FY23 Amendments: 0
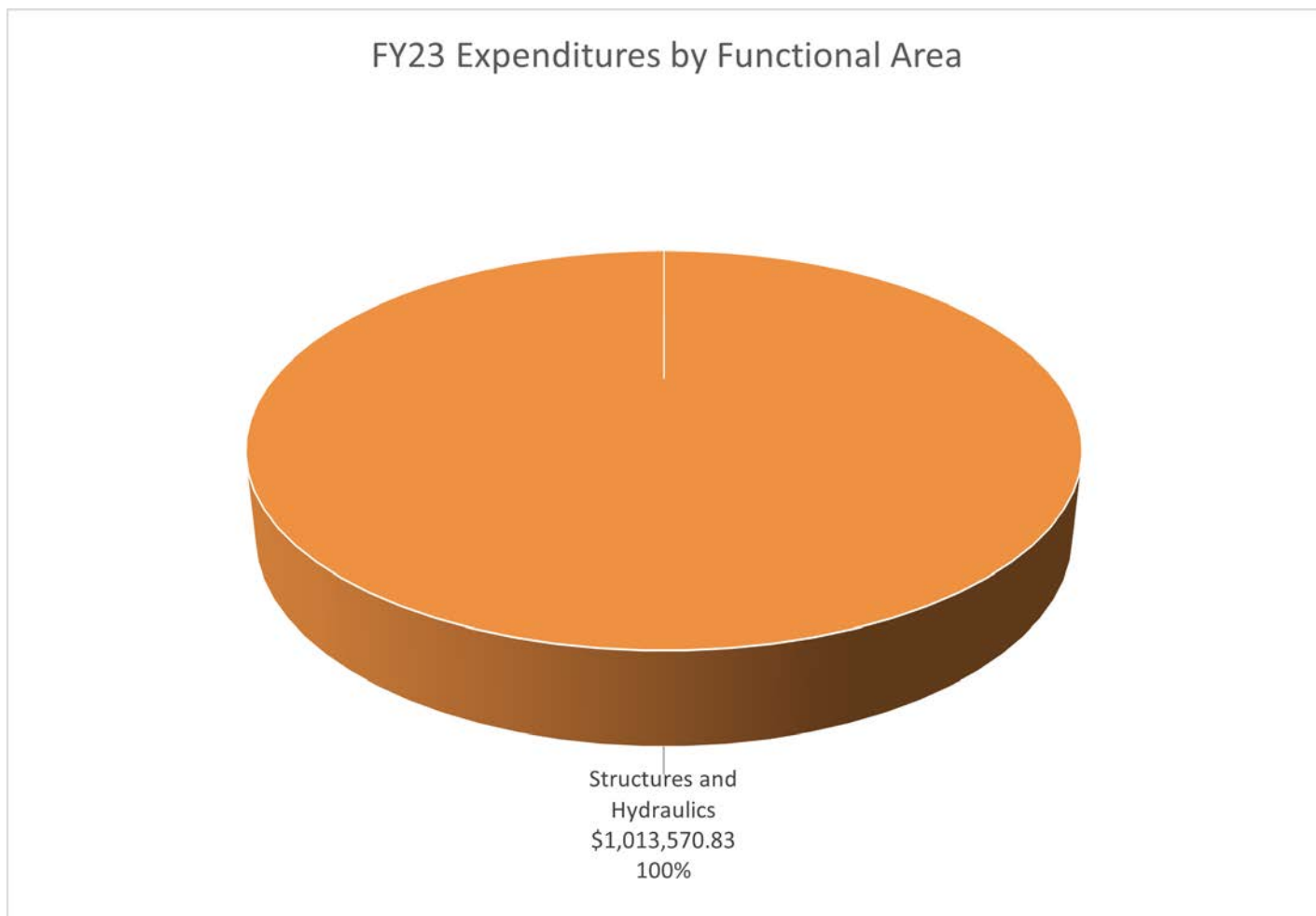
CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7084

2.14 USGS - United States Geological Survey

FY23 Expenditures by Functional Area

Structures and
Hydraulics
$1,013,570.83
100%

USGS Structures and Hydraulics

Project Number	Project Name	Status
0-7095	Evaluate Improved Streamflow Measurement at TxDOT Bridges	Active

Project Start Date: 09/01/2020
Lead University: CTR
Project Status: Active
USGS Total Budget: $3,545,150.00
USGS Total Project Spend: $3,224,720.83

Completion Date: 10/31/2023
University #2: USGS
Total Project Budget: $6,602,641.36
USGS FY23 Budget: $1,022,186.00
USGS FY23 Spend: $1,013,570.83

Project Description: The Receiving Agency maintains 30,000 bridges, some of which have been threatened by flooding, especially during the past four years. Better information on forecast flood inundation would help anticipate bridge and road flooding; inform decisions before, during, and after flooding; and help deploy resources for bridge inspection after flooding is over. The National Weather Service began in August 2016 operating a National Water Model, continually providing real-time forecasting on 190,000 miles of Texas streams and rivers. This project shall establish and maintain a Receiving Agency Flood Monitoring Network that consists of 80 gauges—60 new gauges installed as part of this project and 20 existing gauges installed as part of a previous Receiving Agency project. The new gauges shall be located in watersheds as defined by the USGS or TWDB, selected to provide a range of observation on main stem and tributary rivers and on soil and slope conditions in Texas river and coastal basins, and shall be complementary to existing observation networks. Observational data from the gauges and flood forecast information shall be made accessible through a Receiving Agency Flood Forecast System and Operational Data Website.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #3:
Amend the contract to revise the budget, scope, and project schedule and add a subcontractor due to roadway locations to accurately depict on-system roadways on flood related mapping tools during the flood emergency response exercises. Performing Agency 1 (CTR): The FY23 budget is increased by $78,250.00 from $542,495.01 to $620,745.01. The Performing Agency 1 Total Project Budget shall increase by $78.250.00 from $2,836,439.00 to $2,914,689.00. Performing Agency 2 (USGS): The FY2023 budget remains $1,334,000.00. The Total Budget for Performing Agency 2 remains $3,545,150.00. The Itemized Project Budget Estimate increased by $78,250.00 from $6,381,589.00 to $6,459,839.00.
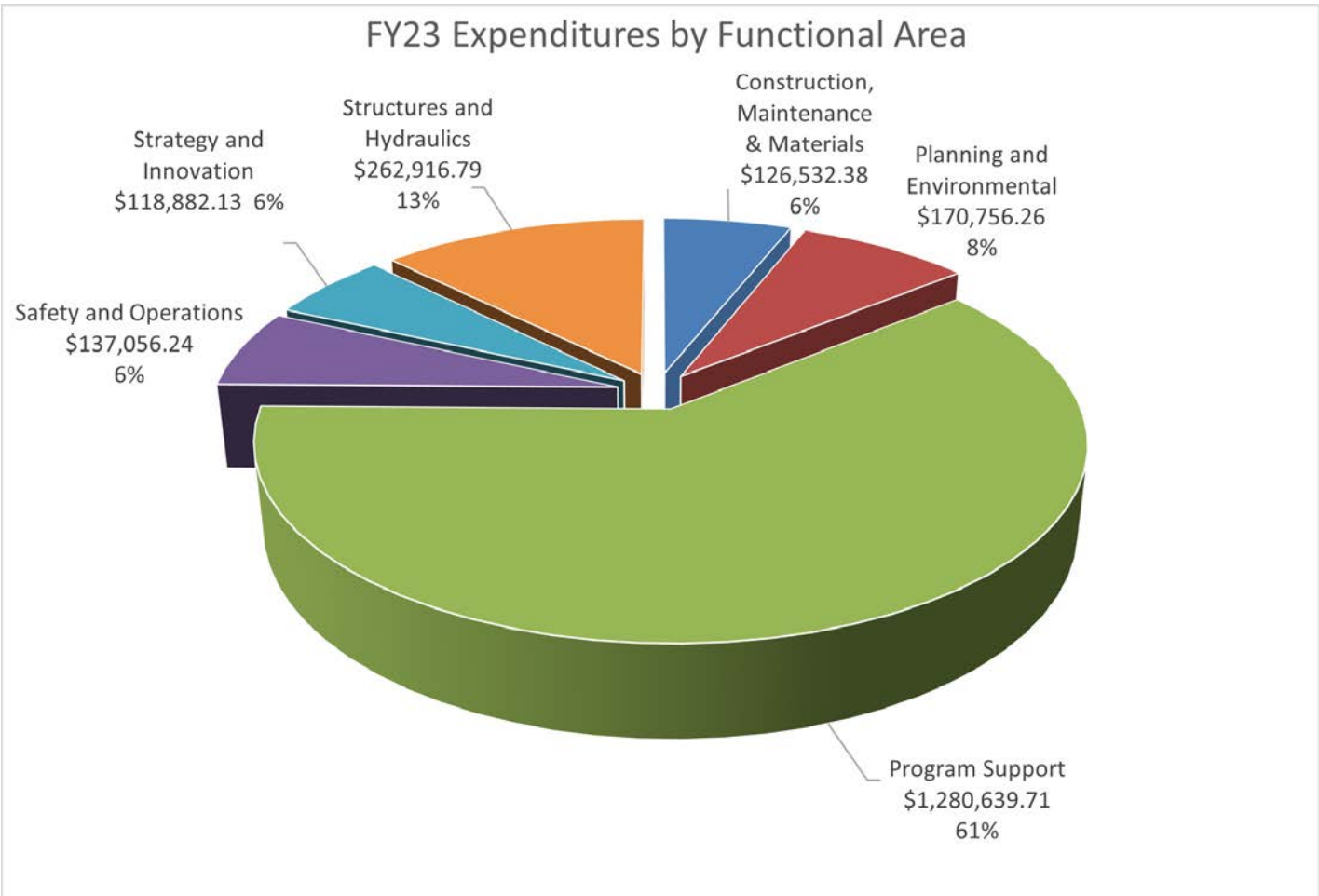
Amendment #4:
Amend the contract to extend the termination date, add scope, revise the budget, and update the project schedule to complete the Streamflow II deliverables. CTR budget: The FY2021 budget remains $1,728,999.21; The FY2022 budget remains $564,944.78; The FY2023 budget remains $620,745.01; The FY2024 budget is established for $142,802.36; CTR's Total Project Budget shall increase by $142,802.36 from $2,914,689.00 to $3,057,491.36. USGS budget: The FY2021 budget remains $893,350.00; The FY2022 budget remains $1,316,800.00; The FY2023 budget is decreased by $311,814.00 from $1,334,000.00 to $1,022,186.00; The FY2024 budget is established for $311,814.00. USGS's Total Project Budget remains $3,545,150.00. The Itemized Project Budget Estimate increased by $142,802.36 from $6,459,839.00 to $6,602,641.36.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7095

2.15 UTA - University of Texas - Arlington

FY23 Expenditures by Functional Area

Strategy and Innovation $118,882.13 6%

Structures and Hydraulics $262,916.79 13%

Construction, Maintenance & Materials $126,532.38 6%

Planning and Environmental $170,756.26 8%

Safety and Operations $137,056.24 6%

Program Support $1,280,639.71 61%

Project Number	Project Name	Status
0-6872-01	Use of Geothermal Energy for De-icing Approach Pavement Slabs and Bridge Decks - Phase II	Active
0-7023-01	Ecological Impacts of Sediment Derived from Bridge Construction	Active
0-7045	Analyze the Use of Green Pavement Markings – In-tersection Safety for Non-Motorized Users	Active
0-7146	Synthesis: Develop Guidance for Local Government Building Codes for Bridges	Closed
0-7160	Improving Traffic Signal System Planning, Design and Management with Big-data-enhanced Automat-ed Traffic Signal Performance Metrics (ATSPM) Sys-tem	Active
0-7162	Quantifying Benefits of Roadside Vegetation	Active
5-7008-01	Implementation of Electrical Resistivity Imaging Manual	Closed
5-7097-21	Texas Local Technical Assistance Program (LTAP)	Closed
5-9055-01	Workforce Development Lifecycle for Road and Bridge Agencies	Active

UTA Structures and Hydraulics

Project Number	Project Name	Status
0-6872-01	Use of Geothermal Energy for De-icing Approach Pavement Slabs and Bridge Decks - Phase II	Active

Project Start Date: 10/09/2020
Lead University: UTA
Project Status: Active
UTA Total Budget: $691,325.73
UTA Total Project Spend: $536,470.26

Completion Date: 08/31/2024
University #2: TTI
Total Project Budget: $1,219,936.89
UTA FY23 Budget: $220,549.72
UTA FY23 Spend: $227,514.02

Project Description: De-icing using geothermal energy can provide the Receiving Agency with a better alternative than the existing method of using deicing with sands and/or salts. This research project shall explore the potential for retrofitting bridges with a hydronic pipe geothermal heating system and achieve Technology Readiness Levels (TRL) level 6 through prototype demonstration in a relevant environment. At the end of the project, the geothermal deicing technology shall be ready for prototype demonstration in an operational environment (TRL level 7).

Approved Work Program Revisions
No. of FY23 Amendments: Two

Amendment #2:
Due to construction delay and increase material and labor costs, it has become necessary to amend the contract to extend the termination date, increase the total project cost for the completion of the pilot geothermal bridge, amend the scope to allow for installation and test a new geofoam insulation panel in comparison with the spray foam panel and update the Project Schedule. For UTA FY 2021 remains $96,259.27; FY 2022 remains $239,577.42; FY 2023 budget is increased by $151,767.93 from $68,781.80 to $220,549.72; UTA's total project budget is $556,386.42. For TTI FY 2021 remains $70,169.60; FY 2022 remains $165,020.90; FY 2023 budget is increased by $60,921.45 from $98,057.70 to $158,979.15; TTI's total project budget is $394,148.05. The Itemized Project Budget Estimate for the project is increased by $212,689.38 from $737,866.69 to $950,556.07.

Amendment #3:
Amend the contract to extend the termination, to revise the Project Schedule and the Project Work Plan to move testing the newly completed pilot geothermal bridge over one winter and add a new Task 11, Develop an Automatic and Optimized De-Icing Operation Control Strategy. The FY 2023 budget for CTR remains $220,549.73; an FY 2024 budget for CTR is established in the amount of $134,939.32; the Total Project Cost for CTR is increased by $134,939.32 from $556,386.42 to $691,325.74. The FY 2023 budget for TTI remains $158,979.15; an FY 2024 budget for TTI is established in the amount of $134,441.50; the Total Project Cost for Performing Agency 2 is increased by $134,441.50 from $394,169.65 to $528,611.15. The Total Itemized Project Budget Estimate is increased by $269,380.82 from $950,556.07 to $1,219,936.89.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6872-01

UTA Planning and Environmental

Project Number	Project Name	Status
0-7023-01	Ecological Impacts of Sediment Derived from Bridge Construction	Active

Project Start Date: 11/10/2022
Lead University: UTA
Project Status: Active
UTA Total Budget: $392,000.00
UTA Total Project Spend: $82,110.68

Completion Date: 12/31/2025
University #2:
Total Project Budget: $392,000.00
UTA FY23 Budget: $81,772.00
UTA FY23 Spend: $82,110.68

Project Description: The release of sediment due to bridge construction may change the sediment regime and geomorphology of receiving streams causing short- and long-term effects on aquatic habitat. A GIS-based Predictive Sediment Toolbar is already developed and coupled with the Hydraulic Engineering Center's River Analysis System (HEC-RAS) 2D to determine the potential depositional area and suspended sediment concentration at bridge construction sites. The toolbar was submitted to the Receiving Agency in Phase I. The performance of the toolbar was assessed using field data and observations at a bridge construction site. The toolbar showed a promising performance; however, to reduce modeling uncertainties and develop an understanding of the uncertainties, and increase the accuracy of the approaches and model capabilities, the Performing Agency shall perform following tasks:

1) Develop a guideline for selecting stream flow events to be used in HEC-RAS 1D model and for determining the extent of modeling downstream of the bridge.

2) Develop a new 1D sediment transport model coupled with HEC-RAS 1D and add to the current GIS toolbar.

3) Investigate alternative methods for defining eroded sediment characteristics from a typical bridge replacement site and incorporate into the model.

4) Examine the performance of the new tool using field data collected from a number of bridge sites with a wide range of flow and sediment characteristics.

In this Phase II of the project, the Performing Agency shall conduct this research at a Technology Readiness Level (TRL) of 7.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to extend the termination date, revise the budget and update the project schedule due to delays in executing the agreement and additional time needed for field monitoring. The FY 2023 budget is decreased by $70,728.00 from $152,000.00 to $81,772.00. The FY 2024 budget is increased by $16,353.00 from $136,125.00 to $152,478.00. The FY 2025 budget is increased by $12,500.00 from $103,375.00 to $115,875.00. The FY 2026 budget is established at $33,125.00. The Total Itemized Project Budget Estimate is $392,000.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7023-01

UTA Safety and Operations

Project Number	Project Name	Status
0-7045	Analyze the Use of Green Pavement Markings – Intersection Safety for Non-Motorized Users	Active

Project Start Date: 05/26/2020
Lead University: UTA
Project Status: Active
UTA Total Budget: $596,258.63
UTA Total Project Spend: $401,727.96

Completion Date: 08/31/2024
University #2:
Total Project Budget: $596,258.63
UTA FY23 Budget: $171,755.00
UTA FY23 Spend: $137,056.24

Project Description: More communities are using green to delineate at intersections where cyclists should wait at a traffic signal, start a left turn, or cross the roadway. In 2011, the Federal Highway Administration issued a memo giving interim approval (IA-14) for the optional use of green colored pavement for bike lanes as a traffic control device for inclusion in the Manual on Uniform Traffic Control Devices (MUTCD). The FHWA indicated that they found the green to be successful for bicycle applications because cyclists felt safer and drivers felt more aware that cyclists may be present. In addition, the National Association of City Transportation Officials (NACTO) included green pavement in their Bikeway Design Guide. The Receiving Agency has requested research into the safety and behavioral implications of using green colored pavement and their performance to help inform an agency opinion on their use in Texas communities and possible inclusion in the Texas MUTCD.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7045

UTA Structures and Hydraulics

Project Number	Project Name	Status
0-7146	Synthesis: Develop Guidance for Local Government Building Codes for Bridges	Closed

Project Start Date: 09/15/2022
Lead University: UTA
Project Status: Closed
UTA Total Budget: $49,997.00
UTA Total Project Spend: $35,402.77

Completion Date: 08/31/2023
University #2:
Total Project Budget: $49,997.00
UTA FY23 Budget: $49,997.00
UTA FY23 Spend: $35,402.77

Project Description: Current bridge codes or standards put in place by local governments have not been synthesized and well-documented, making it challenging for the Performing Agency divisions and districts to provide the necessary guidance in their continued partnerships with cities and counties. The Performing Agency guidance can improve the design, construction, and maintenance of off-system bridges considering Performing Agency engineers' extensive related experience. The Performing Agency shall compile practical recommendations from an integrated bridge design, construction, and maintenance perspective to work with local governments.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7146

UTA Strategy and Innovation

Project Number	Project Name	Status
0-7160	Improving Traffic Signal System Planning, Design and Management with Big-data-enhanced Automated Traffic Signal Performance Metrics (ATSPM) System	Active

Project Start Date: 11/14/2022
Lead University: UTA
Project Status: Active
UTA Total Budget: $292,010.25
UTA Total Project Spend: $118,882.13

Completion Date: 08/31/2024
University #2:
Total Project Budget: $292,010.25
UTA FY23 Budget: $133,852.50
UTA FY23 Spend: $118,882.13

Project Description: This project provides a guideline accompanied with the necessary software tools for the Receiving Agency and local agencies to better use the Automated Traffic Signal Performance Metrics System (ATSPM) in arterial traffic management. The ATSPM system came to traffic signal operations years ago and it can help agencies better understand arterial traffic signal performance. Many agencies are considering adopting the ATSPM systems because the ATSPM system(s) focuses on monitoring the traffic signal performance in the field. However, most traffic signal planning and design activities at present still rely on the traditional methods, such as Synchro, Highway Capacity Manual, etc. If agencies adopt different criteria between the planning/design stage and implementation stage, confusion will form and grow with the increase of ATSPM adoptions. To fill this gap, the Performing Agency plans to take a systematic approach to introduce the ATSPM concepts into all stages of traffic signal management. The Performing Agency shall develop a series of software tools to establish a new "ATSPM-In-The-Loop" traffic signal simulation framework, accompanied by case studies that public agents or consultants can use to evaluate their future traffic signal timing plans in simulation before deployment. The outcomes of this project will nationally be the first of its kind.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7160

UTA Planning and Environmental

Project Number	Project Name	Status
0-7162	Quantifying Benefits of Roadside Vegetation	Active

Project Start Date: 10/12/2022
Lead University: UTA
Project Status: Active
UTA Total Budget: $242,284.76
UTA Total Project Spend: $104,535.42

Completion Date: 08/31/2024
University #2:
Total Project Budget: $242,284.76
UTA FY23 Budget: $128,592.13
UTA FY23 Spend: $88,645.58

Project Description: The Performing Agency shall develop a roadside vegetation evaluation toolkit for the sustainability, use, community, cost-effectiveness, and safety (RVET-SUCCES). The Performing Agency shall coordinate with the Receiving Agency districts to analyze a total of 6 pilot studies in 1 urban and 1 rural sites in 3 different ecoregions. The Performing Agency shall particularly perform and combine real-world measurements of air quality, thermal environment, visibility, and safety in the pilot studies using sensors and drone in the analysis. For the evaluation of pre- and post-impacts of roadside vegetation, the Performing Agency shall employ five evaluation modules: environmental sustainability, visibility and safety, operations and maintenance, aesthetics, and life cycle costs. The project shall provide the roadside vegetation evaluation toolkit consisting of 1) web-based and spreadsheet-based worksheets and 2) a user guidebook describing the best practices for the evaluation and comparison, the evaluation procedures, a summary of the pilot studies as a sample and/or best practices, and fact sheets, to promote knowledge and skills for sustainable and cost-effective roadside vegetation.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-6905-01

UTA Construction, Maintenance & Materials

Project Number	Project Name	Status
5-7008-01	Implementation of Electrical Resistivity Imaging Manual	Closed

Project Start Date: 09/01/2021
Lead University: UTA
Project Status: Closed
UTA Total Budget: $274,484.00
UTA Total Project Spend: $263,773.05

Completion Date: 08/31/2023
University #2:
Total Project Budget: $274,484.00
UTA FY23 Budget: $137,242.00
UTA FY23 Spend: $126,532.38

Project Description: The overall objective of this project is to implement the electrical resistivity imaging manual developed in TxDOT Project 0-7008 on 10-15 projects in the Fort Worth and Dallas districts. Five case studies shall be developed to illustrate the successful implementation of electrical resistivity imaging for different types of projects and distributed to all 25 Receiving Agency's districts in order to achieve TRL 9. The Performing Agency shall also prepare and present a cost analysis for implementing the electrical resistivity imaging manual beyond the Fort Worth and Dallas districts. The Performing Agency shall validate and refine the electrical resistivity imaging manual, if needed.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7008-01

UTA Program Support

Project Number	Project Name	Status
5-7097-21	Texas Local Technical Assistance Program (LTAP)	Closed

Project Start Date: 09/30/2020
Lead University: UTA
Project Status: Closed
UTA Total Budget: $3,823,487.48
UTA Total Project Spend: $3,537,020.78

Completion Date: 08/31/2023
University #2:
Total Project Budget: $3,823,487.48
UTA FY23 Budget: $1,270,745.82
UTA FY23 Spend: $1,280,639.71

Project Description: The Local Technical Assistance Program (LTAP) is a nationwide effort financed by the Federal Highway Administration and individual state departments of transportation. Its purpose is to translate into understandable terms the best available technology and practices for roadways, bridges, bicycle and pedestrian facilities, and public transportation for city and county roadway and transportation personnel. The Texas Local Technical Assistance Program (TxLTAP) operated by the Performing Agency and is sponsored by the Receiving Agency and the Federal Highway Administration (FHWA). TxLTAP is focused on preserving and enhancing the local road system by delivering quality training and technical assistance to local city and county road agencies in Texas. The training provided through this program shall increase the performance of the transportation workers in Texas by ensuring they conduct their duties in a safe, efficient, environmentally sound and cost-effective manner. This program shall also allow city and county agencies to maximize benefits from their often limited fiscal and staffing resources. Through training geared to local government circumstances, customized technical assistance, advice provided at events, and a library of resources, TxLTAP provides relevant and impactful information focused on road and bridge/culvert maintenance, the use of traffic control devices, and other techniques to promote traffic safety.

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
The Prime Interagency Agreement inadvertently did not contain all final total project cost amounts for each FY below the Indirect Cost budget line. FY21 Budget is $1,280,745.83. FY22 Budget is $1,271,995.83. FY23 budget is increased by $11,218.68 from $1,259,527.14 to $1,270,745.82. Total Project Amount is not changed at $3,823,487.48.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7097-21

UTA Construction, Maintenance & Materials

Project Number	Project Name	Status
5-9055-01	Workforce Development Lifecycle for Road and Bridge Agencies	Active

Project Start Date: 07/21/2023
Lead University: UTA
Project Status: Active
UTA Total Budget: $125,000.00
UTA Total Project Spend: $12,977.84

Completion Date: 08/31/2024
University #2:
Total Project Budget: $125,000.00
UTA FY23 Budget: $56,107.50
UTA FY23 Spend: $0.00

Project Description: The Workforce Development Lifecycle for Road and Bridge Agencies project proposes a multi-faceted approach to educate Texas Local Public Agencies (LPAs) about FHWA's Every Day Counts, Round 6 and Round 7 Strategic Workforce Development innovation, implementation methods, and valuable resources as well as encourage the adoption and implementation of recommended best practices at the local level. LPAs across the state are faced with the critical challenge of attracting and retaining Road and Bridge (R&B) personnel to maintain Texas local roadways. The proposed project builds on the successful FY21 Texas Local Technical Assistance Program (TxLTAP) Strategic Workforce Development, Texas State Transportation Innovation Council (TxSTIC) Incentive Program, project entitled Texas Transportation Workforce Development for Cities and Counties that reached 25 Texas counties who had not previously utilized TxLTAP's services. The project achieved an 87% statewide adoption rate of deliverables, products, and services.
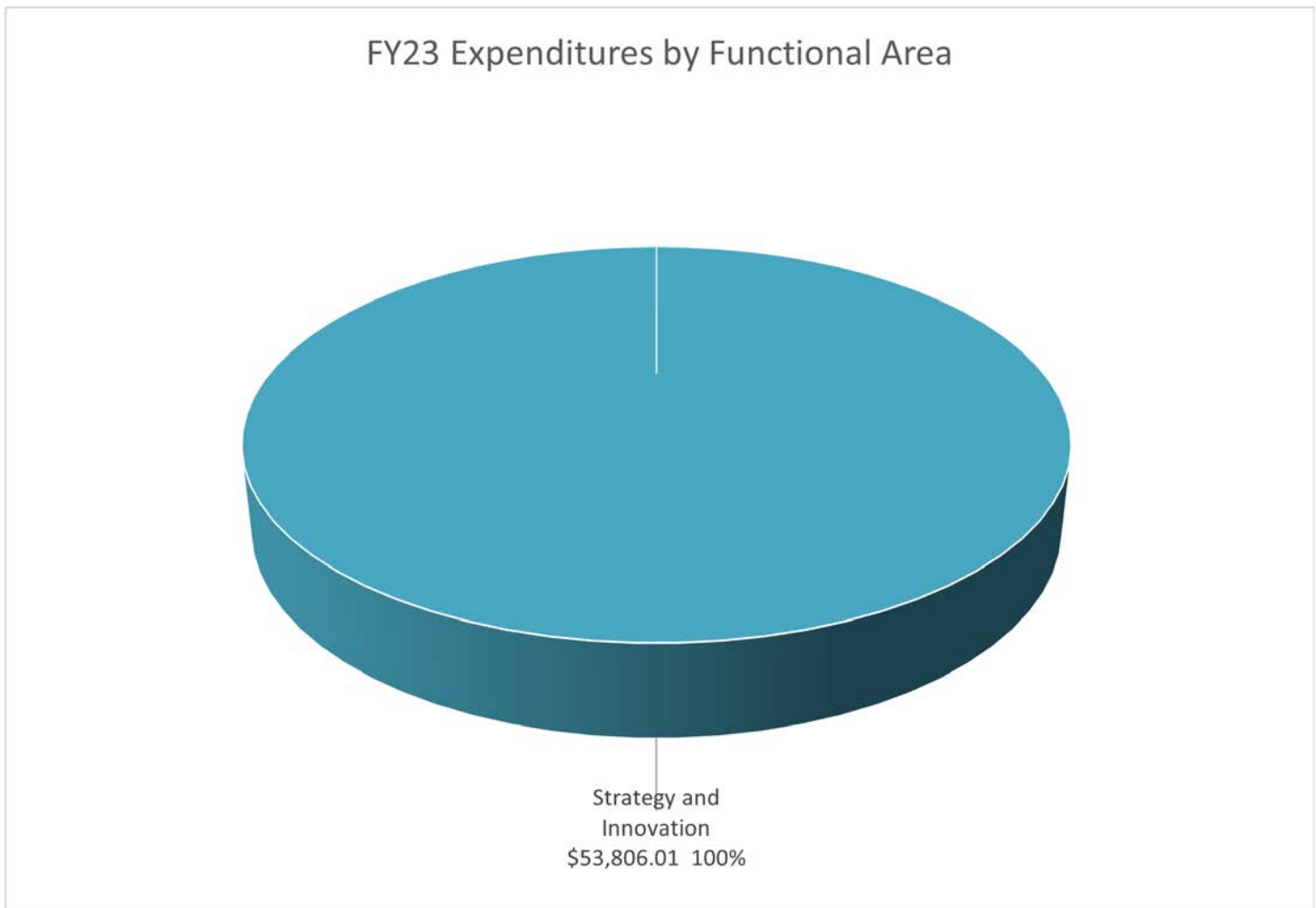
Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-9055-01

FY23 Expenditures by Functional Area

Strategy and
Innovation
$53,806.01 100%

UT-Dallas Strategy and Innovation

Project Number	Project Name	Status
0-7128	Digitizing Traffic Control Infrastructure for Autonomous Vehicles (AV)	Closed

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Closed
UNT Total Budget: $101,153.50
UNT Total Project Spend: $90,853.57

Completion Date: 08/31/2023
University #2: UT-Dallas
Total Project Budget: $359,394.00
UNT FY23 Budget: $51,506.25
UNT FY23 Spend: $53,806.01

Project Description: High precision road maps are a crucial component to facilitating autonomous driving techniques. Autonomous vehicles (AVs) are experiencing exponential growth. According to the latest forecast from IHS Markit, over 33 million AVs will be on the road globally by 2040, posing a higher requirement to ensure AVs' driving safety. Although current AVs rely on vehicular sensing techniques (e.g., Camera, Lidar, Radar), studies have suggested that creating high-quality road maps with traffic control infrastructures (TCIs) (e.g., traffic signs, signals, intersections) precisely digitized is necessary to enhance safe-driving operations of AVs. Meanwhile, digitizing TCIs is also of great importance for road assets planning and management. However, a readily available database with precisely digitized TCIs is still missing in most areas. Traditionally, TCIs are manually digitized by conducting field studies, which is time-consuming and labor-intensive. With the advancement of data collection and processing techniques, numerous emerging data sources are becoming available, posing great potential to capture and digitize TCIs more efficiently. The Performing Agencies shall recommend an effective framework for the digitization, maintenance, and sharing of Receiving Agency roadway assets, especially for TCIs. The Performing Agencies shall evaluate commercially available solutions and propose new approaches by leveraging emerging data sources and techniques.

Approved Work Program Revisions
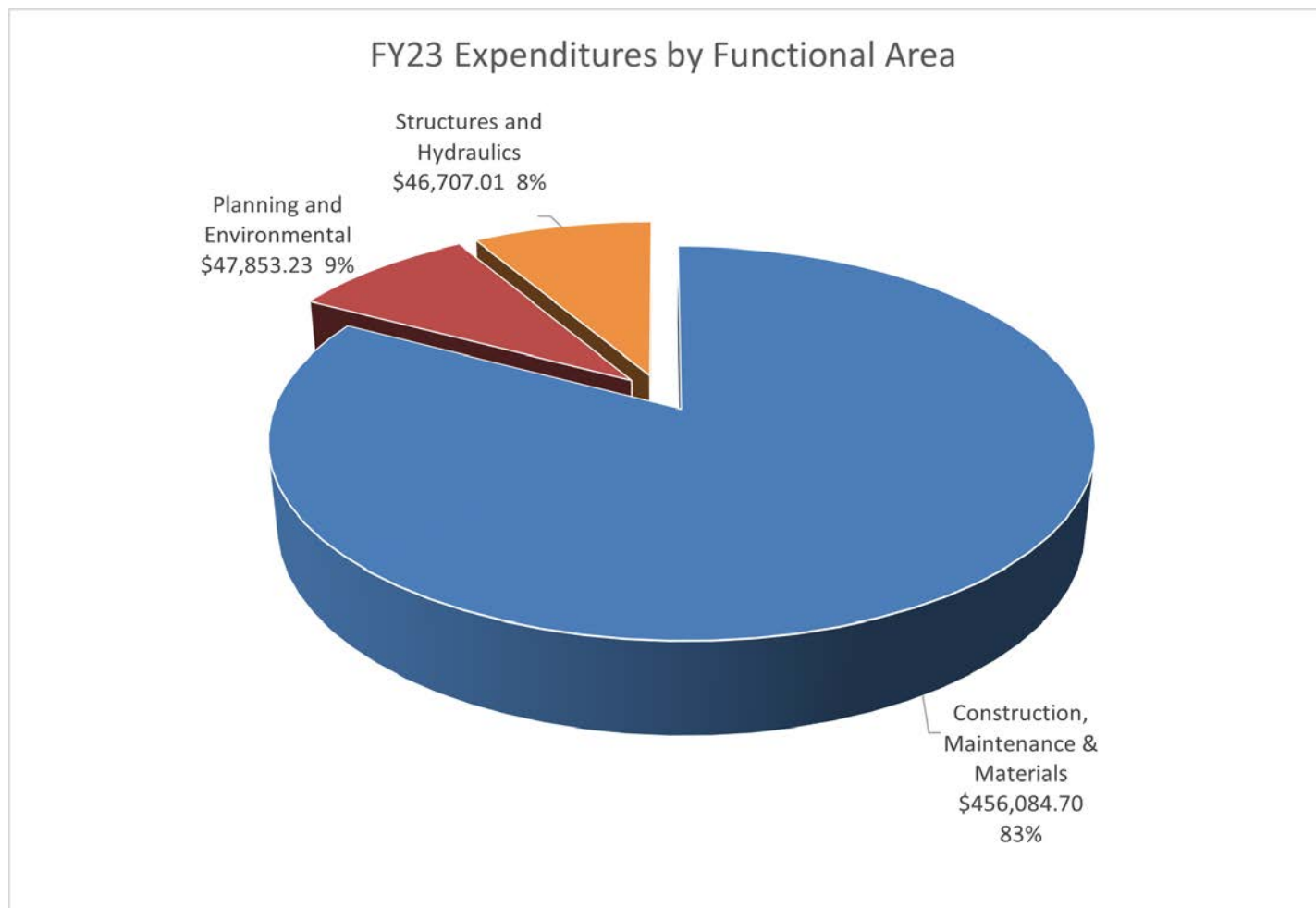No. of FY23 Amendments: One

Amendment #1:
Amend the contract to replace the Principal Investigator to Jason Wu and revise the Project Schedule due to the departure of the Project Supervisor, Xiao Li.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7128

2.17 UTEP - University of Texas - El Paso

FY23 Expenditures by Functional Area

Structures and Hydraulics $46,707.01 8%

Planning and Environmental $47,853.23 9%

Construction, Maintenance & Materials $456,084.70 83%

	Project Number	Project Name	Status
	0-7061	Optimizing Laboratory Curing Conditions for Hot Mix Asphalt to Better Simulate Field Behavior	Closed
	0-7104	Establish Performance-Based Acceptable Lab-Molded Density Range for Mix Design and QC/QA	Active
	0-7108	Evaluate the Importance of Fine Aggregates in Achieving Adequate Skid Resistance in TxDOT Hot Mix Asphalt Mixtures	Active
	0-7111	Determine Impact of Field Sands on Workability and Engineering Properties of Superpave Mixtures in Texas	Active
	0-7112	Development of a Continuous for Live Load Prefab-ricated Steel Accelerated Bridge Construction (ABC) Unit for Texas Bridges	Active
	0-7132	Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentra-tions	Active

Project Number	Project Name	Status
0-7061	Optimizing Laboratory Curing Conditions for Hot Mix Asphalt to Better Simulate Field Behavior	Closed

Project Start Date: 12/09/2019
Lead University: UTEP
Project Status: Closed
UTEP Total Budget: $494,000.00
UTEP Total Project Spend: $441,642.26

Completion Date: 01/31/2023
University #2: CTR
Total Project Budget: $900,498.56
UTEP FY23 Budget: $53,000.00
UTEP FY23 Spend: $52,214.15

Project Description: The Performing Agencies shall investigate existing and novel laboratory methods to determine protocols that simulate the two critical aging states needed to design an asphalt mixture to resist rutting and cracking, and provide information on how curing effects the physical and engineering performance of binders and mixtures.The Performing Agencies shall provide findings that can be used to cure asphalt mixtures as their rutting and cracking resistance is being evaluated as a part of a mix design process (e.g.,as in the case of a balanced mix design).

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=5-7097-21

UTEP Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7104	Establish Performance-Based Acceptable Lab-Molded Density Range for Mix Design and QC/QA	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
UTEP Total Budget: $360,000.00
UTEP Total Project Spend: $191,560.49

Completion Date: 04/30/2025
University #2: UTEP
Total Project Budget: $829,999.25
UTEP FY23 Budget: $132,000.00
UTEP FY23 Spend: $119,659.37

Project Description: Lab-molded density of asphalt mixes is a critical factor for laboratory mix design, plant production, and field performance. Current mix design and production quality control and quality assurance (QC/QA) are developed around a fixed lab-molded density of 96 percent. Adherence to a fixed lab-molded density is not only one of the main factors leading to drier, more crack susceptible mixes where low asphalt binder content is often caused by balancing high lab-molded density values at plant production, but it also impacts the implementation of the Balanced Mix Design approach. Furthermore, various field test sections designed with densities ranging from 96.5 to 98 percent were previously constructed in different areas of Texas, and they performed well in the field with no observed rutting problems. Thus, the objective of this project is to establish an acceptable range of lab-molded densities for laboratory mix design and production QC/QA testing. To achieve the objective, the Performing Agencies shall review the literature, conduct extensive laboratory performance tests, construct test sections and monitor their performance, and finally recommend an acceptable range of lab-molded density based on all the information and data collected.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7104

UTEP Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7108	Evaluate the Importance of Fine Aggregates in Achieving Adequate Skid Resistance in TxDOT Hot Mix Asphalt Mixturess	Active

Project Start Date: 09/01/2021
Lead University: UTEP
Project Status: Active
UTEP Total Budget: $477,000.00
UTEP Total Project Spend: $294,585.45

Completion Date: 08/31/2024
University #2:
Total Project Budget: $477,000.00
UTEP FY23 Budget: $159,500.00
UTEP FY23 Spend: $155,898.46

Project Description: The lack of skid resistance has been an important issue for Receiving Agency pavement as many of them cannot hold adequate skid resistance in the long run, and even some newly constructed roads are observed to have poor skid resistance. Skid resistance is a function of the quality of the aggregate as well as the micro-and macro-texture of the surface. Those textures can be modified by using the appropriate type and amount of fine aggregates and fines in asphalt concrete. The main focus of the research is understanding the effects of fine aggregates and fines on the skid resistance of asphalt concrete since their impacts on the skid resistance and performance. The Performing Agency shall evaluate the current practices and research studies commissioned by Receiving Agency (in particular) and other states (in general) on the use of fine aggregates and fines in asphalt concrete to improve skid resistance. The major objective of this project shall be critical to evaluate the influence of fine aggregates and high-quality fines on the skid resistance of asphalt concrete.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7108

UTEP Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7111	Determine Impact of Field Sands on Workability and Engineering Properties of Superpave Mixtures in Texas	Active

Project Start Date: 09/01/2021
Lead University: UTEP
Project Status: Active
UTEP Total Budget: $395,000.00
UTEP Total Project Spend: $230,506.44

Completion Date: 08/31/2024
University #2: TTI
Total Project Budget: $500,001.50
UTEP FY23 Budget: $135,000.00
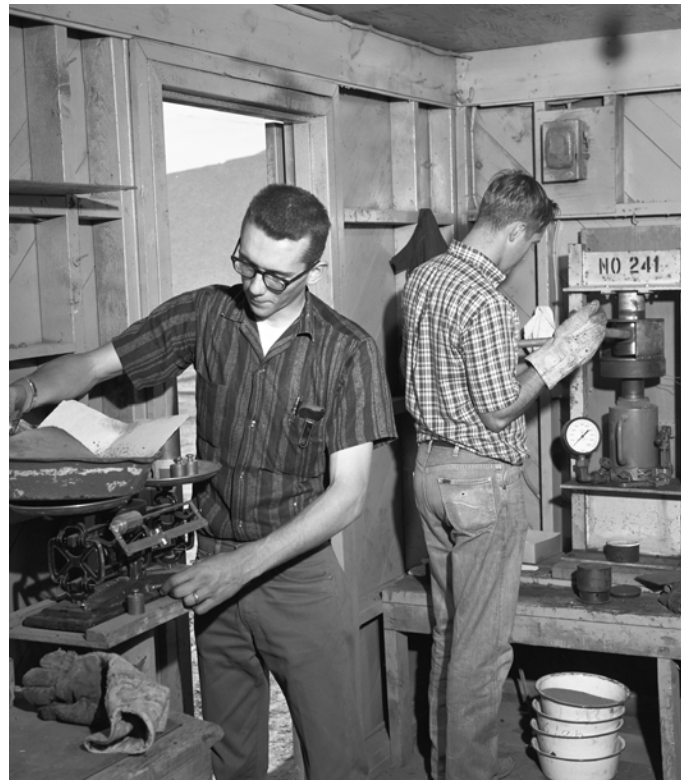**UTEP FY23 Spend:** $128,312.72

Project Description: Field sands have been used in hot mix asphalt (HMA) pavements to reduce binder requirement since they are readily available and are less expensive than crushed materials. Considering their adverse effects on the performance, field sands are limited to 10% to 15% of the aggregates. The most common feature of field sand that can have a significant detrimental effect on the Asphalt Concrete (AC) performance is the presence of harmful clay particles. Understanding the impact of these clay particles on AC performance is the subject of this research. The upper limit of specific field sand, given the amount of active clay present in it, the process to determine the clay content, and how they affect the performance of AC mixes shall be evaluated. Since field sands are more round compared to the crushed aggregates, mixes containing more field sands can be compacted to a given density at lower binder contents. Given the less particle to particle interlocking of such mixes, however, they are more suspect to excessive rutting. Thus, this research shall investigate the effect of clay minerals as well as the sand properties independently on the performance of AC mixes (with a focus on Superpave mixtures) and evaluate their combined/interactive effects, as the natural sands are a combination of both. To that end, the Performing Agency shall provide interaction plots and/or charts that can be used to select the maximum allowable percentage of a given field sand.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7111

UTEP Structures and Hydraulics

Project Number	Project Name	Status
0-7112	Development of a Continuous for Live Load Prefabricated Steel Accelerated Bridge Construction (ABC) Unit for Texas Bridges	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
UTEP Total Budget: $119,618.75
UTEP Total Project Spend: $62,112.90

Completion Date: 08/31/2024
University #2: UTEP
Total Project Budget: $689,994.50
UTEP FY23 Budget: $48,796.25
UTEP FY23 Spend: $46,707.01

Project Description: The overall goal is to develop a system where prefabricated steel ABC unit performs continuous for live load. The system must be easily constructible, fast to assemble, durable long-term, safe, and cost-effective. The Performing Agencies shall conduct a literature review to first synthesize what has been done by state departments of transportation and other agencies. The Performing Agencies shall also evaluate the behavior of related Receiving Agency bridges through visual inspection and monitoring. The Performing Agencies shall perform a system development program utilizing this information in conjunction with expert feedback from an Industry Review Panel (IRP) workshop (including the Receiving Agency Panel). The three (3) best system designs shall be selected for full-scale laboratory testing followed by an analytical parametric study. The Performing Agencies shall compile and present the results at an IRP meeting with the Receiving Agency, where the final system shall be selected. The Performing Agencies shall develop full Microstation details and specifications along with a user-friendly design guide. The guide shall identify the following:

- Span length capabilities for girder sizes/depths/spacings.

- General details for establishing live load continuity.

- Closure pour details at interior bents and how to achieve acceptable deck stresses.

- Structural steel splice details and acceptable tolerances.

- Bearing layout to meet the Receiving Agency substructure details.

CTR Library Project Link
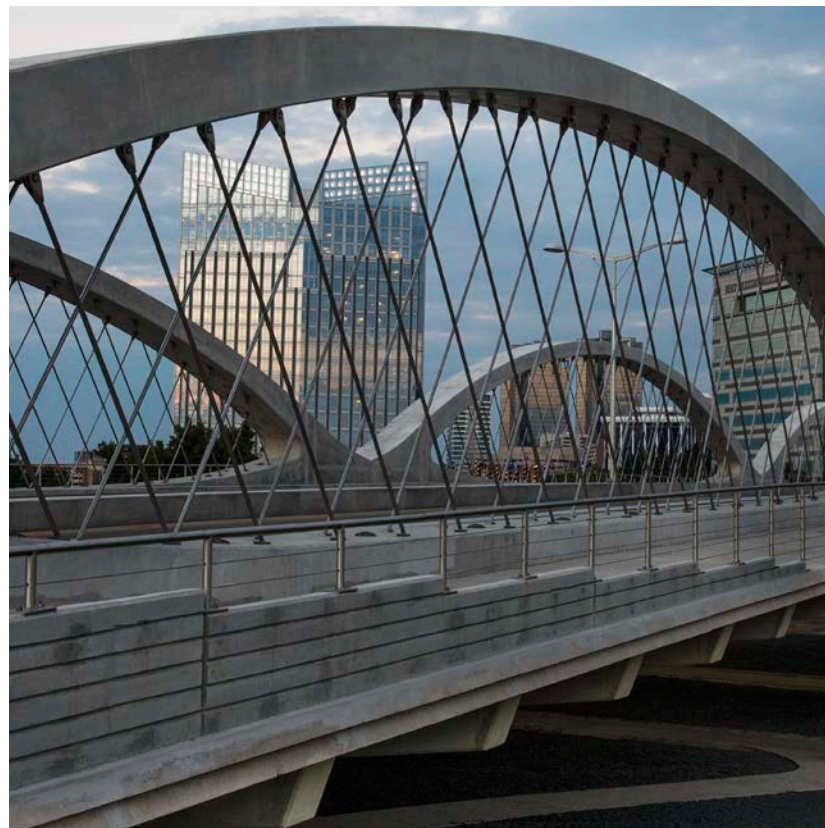https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7112

Approved Work Program Revisions
No. of FY23 Amendments: One

Amendment #1:
Amend the contract to replace the Project Supervisor, and to revise the work plan and budget to add a subcontractor due to the transfer of the Project Supervisor from Performing Agency 1 to the subcontractor. TTI: The FY 2022 Budget remains $103,593.50. The FY 2023 Budget remains $275,527.75. The FY 2024 Budget remains $191,254.50. Total Project Budget remains $570,375.75. UTEP: The FY 2022 Budget remains $20,845.00. The FY 2023 Budget remains $48,796.25. The FY 2024 Budget remains $49,977.50. Total Project Budget remains $119,618.75. The Itemized Project Budget Estimate remains $689,994.50.

UTEP Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7132	Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentrations	Active

Project Start Date: 09/07/2021
Lead University: TTI
Project Status: Active
UTEP Total Budget: $105,066.25
UTEP Total Project Spend: $76,409.36

Completion Date: 07/31/2024
University #2: UTEP
Total Project Budget: $537,321.00
UTEP FY23 Budget: $49,250.00
UTEP FY23 Spend: $47,853.23

Project Description: The Receiving Agency and its partner agencies are required to comply with the requirements of the transportation conformity requirement. Transportation conformity is an emissions control-centric process built on the assumption that reducing emissions from transportation activities would lead to better air quality. However, the air quality observations collected since the onset of the COVID-19 pandemic shows ambient ozone and particulate matter of less than 2.5 micrometer in aerodynamic diameter (PM2.5), concentrations have a mixed response to the significant changes in traffic activities and emissions. This trend has raised questions regarding the extent of the transportation's impacts on air quality. This study will bridge the gap in the understanding of the actual extent of transportation activities' impacts on regional and near-road air quality. The Performing Agency shall study three major activities for selected case study areas:

- Analysis of before- and during-pandemic traffic activity and air quality monitoring data.

- Evaluate the performance of air dispersion modeling in capturing the changes of near-road PM2.5 concentrations in near-road environment resulting from traffic activity variations.

- Evaluate the performance of photochemical modeling in capturing the changes of regional ozone in response to changes of traffic activities. The study will also result in a characterization of COVID-19 restrictions' impacts on traffic activities and air quality.
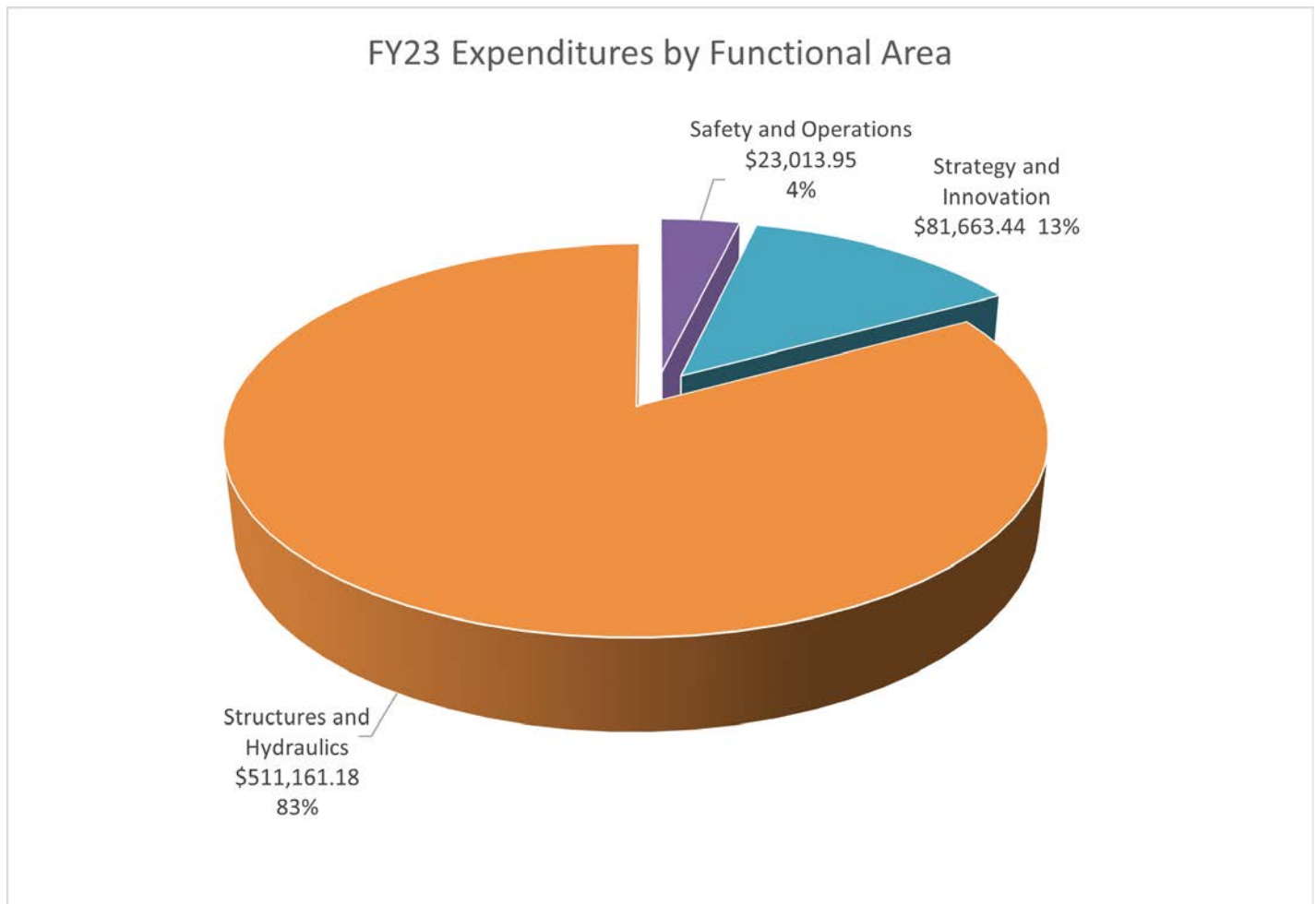
Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7132

2.18 UTSA - University of Texas at San Antonio

FY23 Expenditures by Functional Area

Safety and Operations
$23,013.95
4%

Strategy and Innovation
$81,663.44 13%

Structures and Hydraulics
$511,161.18
83%

	Project Number	Project Name	Status
	0-7080	Develop Roadway and Parking Design Criteria to Ac-commodate Automated and Autonomous Vehicles	Closed
	0-7122	Evaluate Alternative Methods to Examine Visibility of Pavement Markings	Active
	0-7154	Evaluate Use of 300ksi Strands for TxDOT Pre-stressed Girders	Active
	0-7155	Develop/Refine Design Provisions for Headed and Hooked Reinforcement	Active
	0-7158	Calibration of Bridge Performance Models Using Element Data	Active
	0-7161	Settlement Criteria and Design Approach for Em-bankments and Retaining Walls Built on Compressi-ble Soils	Active
	0-7166	Leveraging Probe-Based Data to Enhance Long-Term Planning Models	Active

UTSA Strategy and Innovation

Project Number	Project Name	Status
0-7080	Develop Roadway and Parking Design Criteria to Accommodate Automated and Autonomous Vehicles	Closed

Project Start Date: 09/01/2020
Lead University: UTSA
Project Status: Closed
UTSA Total Budget: $344,148.86
UTSA Total Project Spend: $208,632.10

Completion Date: 01/31/2023
University #2:
Total Project Budget: $344,148.86
UTSA FY23 Budget: $37,870.00
UTSA FY23 Spend: $24,965.99

Project Description: Automated vehicles (AVs) are predicted to be available for public use within a decade or so. Adequate planning is needed for optimally designing infrastructure to accommodate autonomous vehicles. This includes pick-up/drop-off lanes, changes in parking infrastructure, and changes in roadway design that should be cost-efficient and accommodate vehicles that will drive themselves safely. This study shall conduct research into the best practices for accommodating AVs in the scenario of a mix of AVs and traditional vehicles on the roadway until the state of full automation in all vehicles. This research has two important objectives:

1) Propose updates to the Receiving Agency's roadway design standards, given the emerging landscape of autonomous vehicles.

2) research and model changes in standards of lane widths, parking requirements (including new types of parking infrastructure), lane designations, and other roadway design elements to determine the most efficient outcomes.

The two goals will help make Texas ready for the transition phase from human driven vehicles to automated future.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7112

UTSA Safety and Operations

Project Number	Project Name	Status
0-7122	Evaluate Alternative Methods to Examine Visibility of Pavement Markings	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
UTSA Total Budget: $72,892.25
UTSA Total Project Spend: $46,886.95

Completion Date: 08/31/2024
University #2: UTSA
Total Project Budget: $467,604.25
UTSA FY23 Budget: $24,293.00
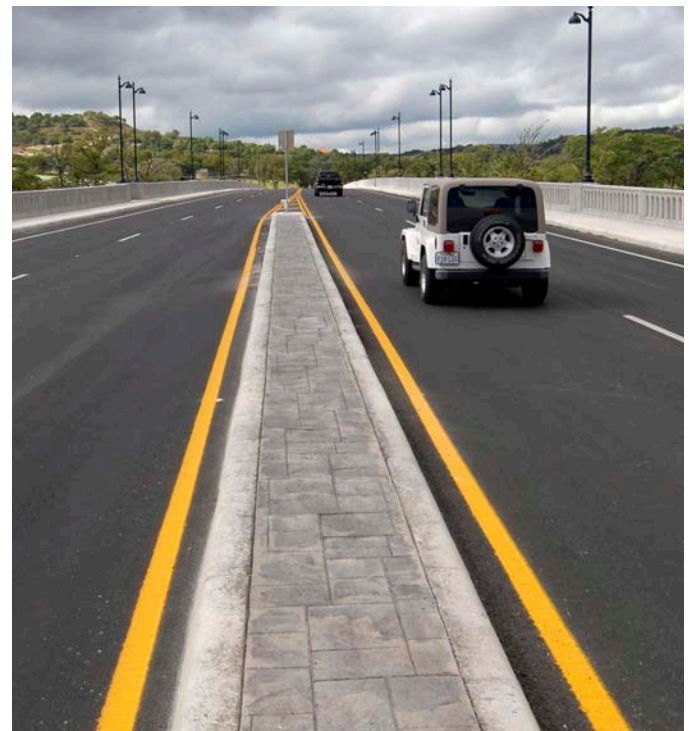**UTSA FY23 Spend:** $23,013.95

Project Description: Pavement markings are the primary means for an agency to provide longitudinal guidance to drivers. Effective pavement markings can improve safety, improve driver comfort, and increase functionality/reliability of automated driving systems and Advanced Driver Assistance Systems (ADAS). To be effective, markings must be visible during all driving conditions, day and night. Markings are typically characterized by their retroreflectivity which is a surrogate measure for how visible the marking is at night. Retroreflectivity does not consider other factors that will impact the actual visibility of the markings such as the color or retroreflectivity of the pavement that the marking is applied to, the color or width of the marking, or the viewing conditions (i.e., observation vehicle, observer characteristics, weather conditions). Retroreflectivity is also a metric for nighttime visibility that may not relate to the marking visibility during the day. The objective of this project is to improve current pavement marking installation and maintenance practices, such that effective markings are continuously maintained. The Performing Agencies shall develop a tool to effectively assess the visibility of pavement markings and to make suggestions/recommendations for maintenance of markings. The Performing Agencies shall evaluate marking visibility for both human and automated drivers across a range of conditions. These evaluations shall be used to make recommendations to improve new marking installation specifications and techniques, improve marking maintenance practices, and evaluate other technologies that should be considered to improve pavement marking delineation.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7122

UTSA Structures and Hydraulics

Project Number	Project Name	Status
0-7154	Evaluate Use of 300ksi Strands for TxDOT Prestressed Girders	Active

Project Start Date: 09/19/2022
Lead University: UTSA
Project Status: Active
UTSA Total Budget: $849,245.00
UTSA Total Project Spend: $216,002.16

Completion Date: 08/31/2025
University #2:
Total Project Budget: $849,245.00
UTSA FY23 Budget: $211,206.14
UTSA FY23 Spend: $210,997.90

Project Description: Advances in material and fabrication processes have allowed the prestressing-strand industry to increase the strength of strands from 270 ksi to 300 ksi. Several state DOTs around the nation are already considering incorporating higher strength strands into their designs. The impetus is to obtain longer bridge span lengths for a given section depth. The main goal of this research project is to update the designs of standard Texas DOT prestress girders to incorporate 300 ksi 0.6 inch diameter strands. The main concern for upgrading to 300 ksi strands revolves around the increased spalling and bursting stresses associated with higher prestressing forces. Such increases in stresses can cause increased cracking in girders at prestress transfer. The Performing Agency will conduct tests on full-scale prestressed girders for all standard TX girder section sizes. These tests will allow the research team to hone in on optimal detailing for girders using 300 ksi strands. As a result, new designs for all TX girder sections shall be produced for 300 ksi strands. Updates to design specifications shall also be proposed to reflect research findings. The expected benefits are more economical bridges that can span longer distances for a given section depth.

Approved Work Program Revisions

No. of FY23 Amendments: Two

Amendment #2:
Amend the contract to revise the project budget due to regulatory delays and sourcing issues which have impacted the ability to purchase the 300ksi strands needed for tests. FY23 budget is decreased by $64,047.61 from $275,253.75 to $211,206.14. FY24 budget is increased by $64,047.61 from $308,900 to $372,947.61. FY25 budget remains $265,091.25. The Itemized Project Budget Estimate remains $849,245.00.

Amendment #1:
Amend the contract to correct references to prior fiscal years in the budget and project schedule to align with the Project Agreement period of performance since the agreement start date is in Fiscal Year 2023. FY22 budget is decreased from $275,253.75 to $0.00. FY23 budget is decreased by $33,646.25 from $308,900 to $275,253.75. FY24 budget is increased by $43,809.00 from $265,091.25 to $308,900.00. FY25 is established at $265,091.25. The Total Project Cost Estimate will remain at $849,245.00.

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7154

UTSA Structures and Hydraulics

Project Number	Project Name	Status
0-7155	Develop/Refine Design Provisions for Headed and Hooked Reinforcement	Active

Project Start Date: 09/01/2022
Lead University: TTI
Project Status: Active
UTSA Total Budget: $319,213.75
UTSA Total Project Spend: $82,203.13

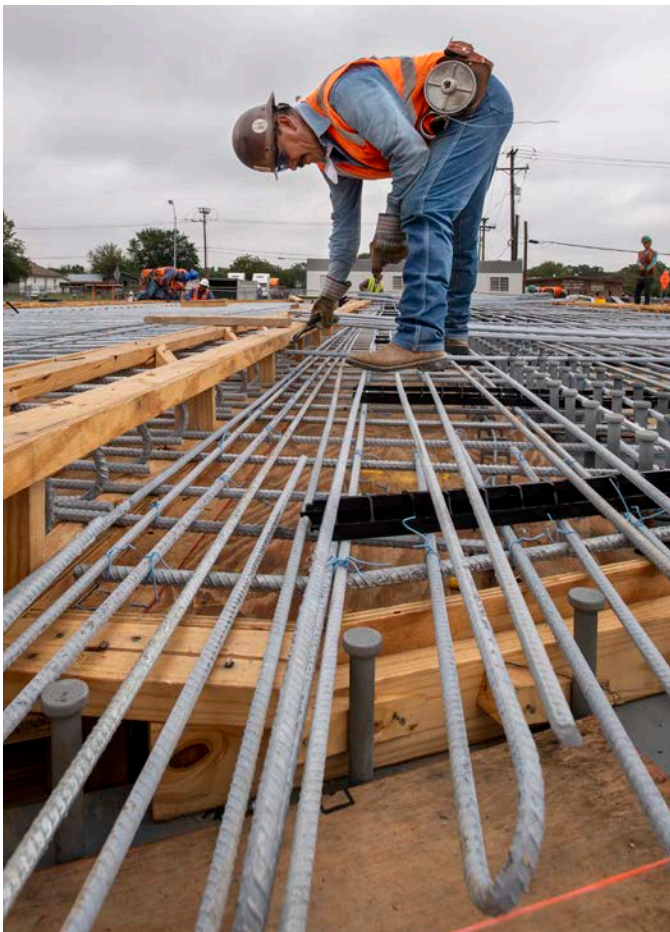**Completion Date:** 02/28/2026
University #2: UTSA
Total Project Budget: $999,401.25
UTSA FY23 Budget: $113,260.00
UTSA FY23 Spend: $81,701.44

Project Description: The usefulness of reinforced concrete is dependent on sufficient anchorage between concrete and reinforcing steel. Sufficient anchorage occurs when reinforcing steel is embedded into the concrete a distance referred to as the development length. When this length of embedment is achieved the reinforcing steel is expected to reach or exceed stresses beyond yield. Geometric constraints within structural members may prevent straight lengths of reinforcement from developing their yield strength, such as straight bars being terminated within a beam-column joint. In these cases, the addition of a hook or headed bar attachment provides a more efficient anchorage mechanism compared to straight bars. Both hooked and headed bars have shorter development lengths than straight bars. However, the current American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design Bridge Design Specifications (LRFD) Bridge Design Specification (9th edition) has not developed standard details for headed reinforcement in bridge structures. In addition, current AASHTO LRFD design provisions for hooked bars are adapted from the American Concrete Institute (ACI) 318-14 Building Code Requirements for Structural Concrete. Considerable revisions to the current ACI 318-19 specification for the design of hooked reinforcement, which require increased lengths (50 to 70 percent longer) relative to previous code cycles, necessitates the Receiving Agency to revisit its current design practice for hooked reinforcement. This research seeks to provide the Receiving Agency with clear and concise design guidance for engineers to use both hooked and headed bar attachments in Receiving Agency bridge structures. The Performing Agencies shall accomplish this through large-scale experimental testing of specimens with hooked and headed bars representative of Receiving Agency bridge structures and current design practice.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7155

UTSA Structures and Hydraulics

Project Number	Project Name	Status
0-7158	Calibration of Bridge Performance Models Using Element Data	Active

Project Start Date: 09/02/2022
Lead University: UTSA
Project Status: Active
UTSA Total Budget: $393,835.00
UTSA Total Project Spend: $169,157.62

Completion Date: 08/31/2024
University #2:
Total Project Budget: $393,835.00
UTSA FY23 Budget: $198,205.00
UTSA FY23 Spend: $151,689.15

Project Description: The Performing Agency shall develop element deterioration models covering all bridge elements, including culverts, known as National Bridge Elements (NBEs) and Bridge Management Elements (BMEs), which shall forecast the probabilities that each statistically validated family of bridge elements and culverts will deteriorate to lower condition states within certain time frames. The Performing Agency shall also develop, test and validate Element Health Indices (EHIs), and aggregate them into a Texas Bridge Health Index (TxBHI) representing the entire bridge or culvert, ensuring that it prioritizes at-risk structures while balancing overall maintenance needs. These products shall have a Technology Readiness Level (TRL) of 8 or higher, and be easily implementable into AASHTOWare BrM software and/or other desired Receiving Agency software. The project shall also use the deterioration forecasts in conjunction with the historical inspection database to identify and recommend structural details that warrant further improvements on design and construction specifications at TRL 2 or 3. All products shall be based on statistical analyses of a historical database with combined NBE, CoRe, NBI, climatic and environmental data.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7158

UTSA Structures and Hydraulics

Project Number	Project Name	Status
0-7161	Settlement Criteria and Design Approach for Embankments and Retaining Walls Built on Compressible Soils	Active

Project Start Date: 09/12/2022
Lead University: UTSA
Project Status: Active
UTSA Total Budget: $168,455.00
UTSA Total Project Spend: $69,525.03

Completion Date: 08/31/2024
University #2: TARL
Total Project Budget: $218,455.00
UTSA FY23 Budget: $87,722.50
UTSA FY23 Spend: $66,772.69

Project Description: Soil improvement is essential for construction of embankments and retaining walls over highly compressible soils. However, due to diversity of soil improvement technologies, selection of suitable technology is an important and demanding task. Especially, if more than one soil improvement methods need to be used jointly to meet settlement, cost, and time requirements. To facilitate the selection process, this project shall:

1) Collect and compile performance data of constructed embankments and retaining walls to establish settlement criteria based on their functionality and relative locations to a bridge.

2) Analyze most commonly-used soil improvement methods in Texas to generate cost vs. construction time charts that can be used for preliminary screening.

3) Develop a calculator that can calculate cost and time based on the determined settlement criteria for various soil improvement methods as well as their combinations so cost and benefit can be assessed.

4) identify optimal combination of preloading with other methods under different Texas soil conditions.

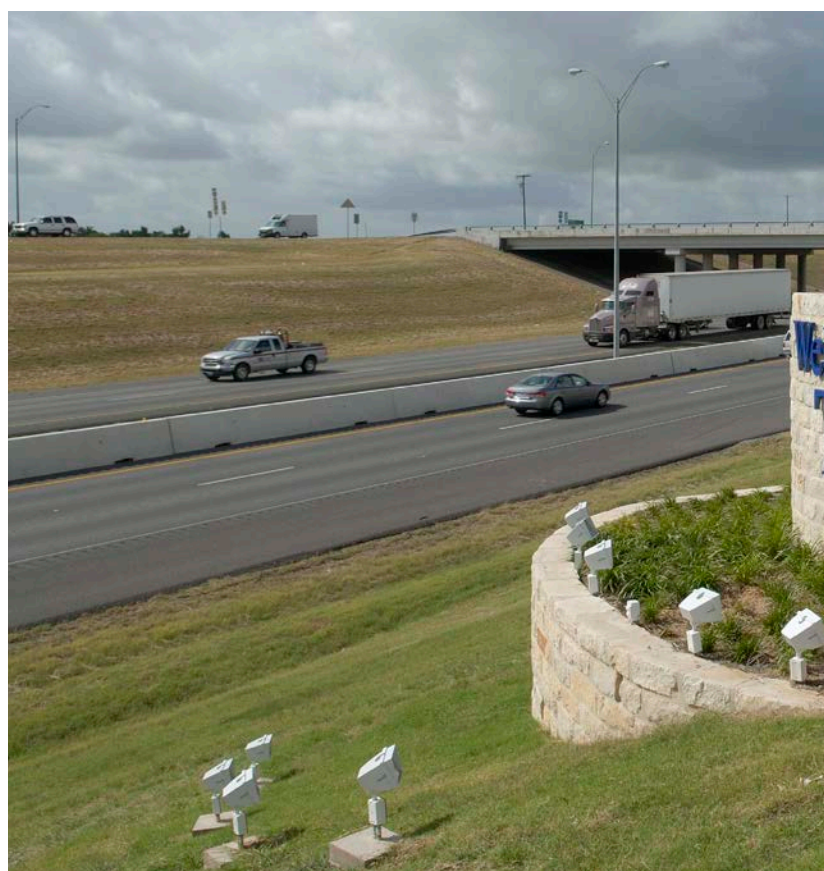The focus of this project shall be preloading with/without wick drain, pile/columns supported embankment and lightweight fills. This project shall provide not only charts and tables that are ready to use in design but also design tools to analyze complicated situations.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7161

UTSA Strategy and Innovation

Project Number	Project Name	Status
0-7166	Leveraging Probe-Based Data to Enhance Long-Term Planning Models	Active

Project Start Date: 09/06/2022
Lead University: TTI
Project Status: Active
UTSA Total Budget: $170,632.50
UTSA Total Project Spend: $56,697.45

Completion Date: 08/31/2024
University #2: UTSA
Total Project Budget: $346,904.25
UTSA FY23 Budget: $88,121.25
UTSA FY23 Spend: $56,697.45

Project Description: Long-range transportation planning (LRTP) and travel demand models (TDMs) play an important role in the planning process, which assists transportation agencies with prioritizing future transportation investments. Improved LRTP and TDMs can bring direct benefits to transportation planning in the state. Effective transportation planning and investment decision making depends on timely, comprehensive, and accurate data. However, traditional data collection methods only provide a "snapshot" of the travel information, which limits the performance of conventional LRTP and TDMs. In this regard, while these sources are still used, transportation planners at the state, metropolitan, and local levels are beginning to incorporate third-party traffic data into their planning processes. Planners also start to look at the opportunities afforded through third-party data and provide guidance on how to take advantage of that data to expand and improve planning practices. This project aims to utilize probe-based data to improve the LRTP process and TDMs used by the Receiving Agency, MPOs and other planning agencies in the state. The Performing Agencies shall study how probe-based and location-based data may be leveraged to facilitate the validation and calibration of existing planning models, enhance existing modeling tools, and incorporate advanced modeling techniques.

Approved Work Program Revisions
No. of FY23 Amendments: 0

CTR Library Project Link
https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7166

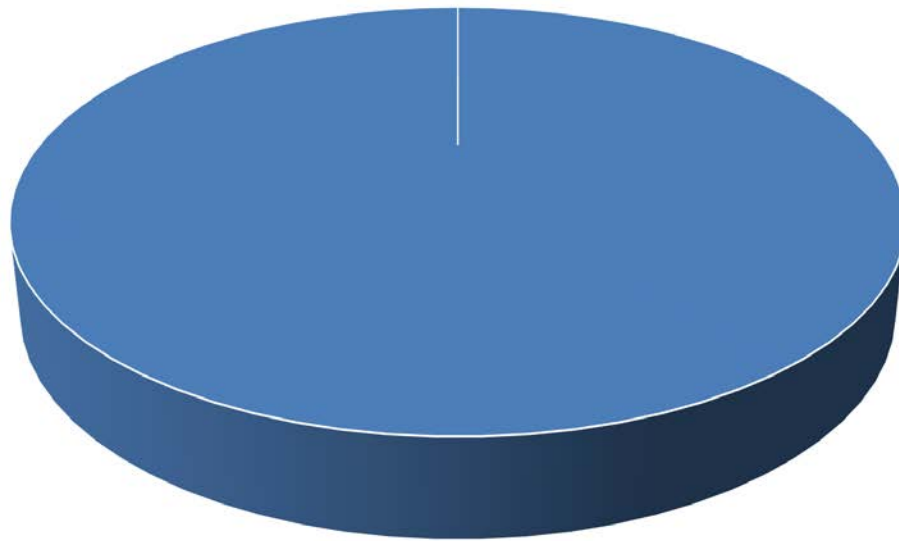## 2.19   UT-TYLER - University of Texas - Tyler

FY23 Expenditures by Functional Area

Construction,
Maintenance
& Materials
$26,918.99
100%

Project Number	Project Name	Status
0-7105	Measuring Seal Coat Rate Field Adjustments	Active
0-7151	Develop Recommendations for Evaluating Surface Types and Aggregate Properties to Minimize Wet Weather Crashes	Active

UT-TYLER Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7105	Measuring Seal Coat Rate Field Adjustments	Active

Project Start Date: 09/01/2021
Lead University: TTI
Project Status: Active
UT-TYLER Total Budget: $34,546.25
UT-TYLER Total Project Spend: $32,523.10

Completion Date: 11/30/2024
University #2: UT-TYLER
Total Project Budget: $450,000.00
UT-TYLER FY23 Budget: $20,742.50
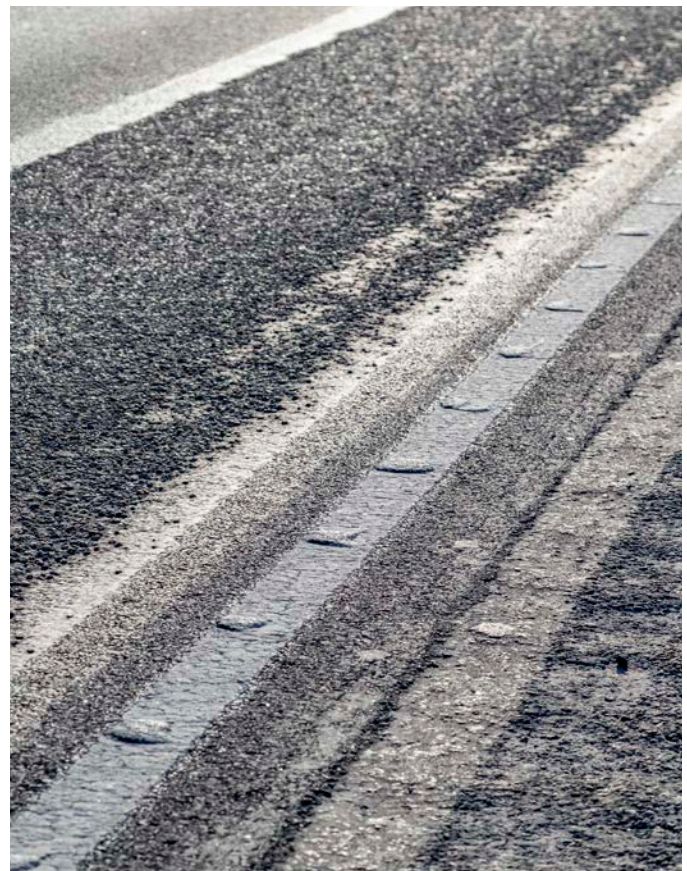**UT-TYLER FY23 Spend:** $18,518.99

Project Description: The objective of this research project is to develop measurable and repeatable adjustment criteria for seal coat application rates based on pavement condition, traffic and material properties for the design method developed in research project 0-6989 Update Seal Coat Application Rate Design Method (TxDM6989). Current practice requires experienced personnel to understand the adjustments needed for application rates, including changing the adjustments as conditions on the pavement change. The adjustments in the TxDM6989 combine multiple pavement conditions into one description. By measuring the conditions, a combined adjustment based upon measured parameters will remove subjectivity from the procedure. This will lead to more consistently constructed projects that meet the objectives of designing the rates so that the resulting seal will not have too much binder so that it flushes or bleeds in the summer; but there is enough binder to prevent rock loss over the winter. This research project will produce measurable methods for adjustments to the rate design procedures that will help engineers and inspectors make better decisions resulting in successful projects.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.aspx?q=0-7105

UT-TYLER Construction, Maintenance & Materials

Project Number	Project Name	Status
0-7151	Develop Recommendations for Evaluating Surface Types and Aggregate Properties to Minimize Wet Weather Crashes	Active

Project Start Date: 11/10/2022
Lead University: TTI
Project Status: Active
UT-TYLER Total Budget: $45,276.25
UT-TYLER Total Project Spend: $8,399.69

Completion Date: 02/28/2026
University #2: UT-TYLER
Total Project Budget: $599,992.25
UT-TYLER FY23 Budget: $15,985.00
UT-TYLER FY23 Spend: $8,399.69

Project Description: The current design methodology for asphalt and seal coat surfaces is limited when considering safety aspects like friction and surface texture, also known as skid resistance. The only requirement for asphalt or seal coats placed on high demand areas is that they use surface aggregate classification (SAC) A coarse aggregates. This approach has several shortcomings:

- Does not consider the friction and texture of the final surface.

- Does not consider the change in skid resistance versus trafficking.

- SAC system is defined by the acid insolubility test, not a direct measurement of aggregate properties that mechanically generate skid resistance.

- SAC categories are very broad with no distinction of the best and worst performing aggregates in each class. Consequently, some recent resurfacing projects have resulted in unacceptable skid resistance shortly after construction, even when SAC A aggregates were used. As such, there is a serious need to improve the current design process for asphalt and seal coat to ensure that the surfaces will have acceptable long-term skid resistance.

The Performing Agencies shall develop a laboratory-based system to select the pavement surface type and coarse aggregate types that will provide adequate skid resistance over the life of the pavement surface.

Approved Work Program Revisions

No. of FY23 Amendments: 0

CTR Library Project Link

https://library.ctr.utexas.edu/Presto/search/SearchResults.
aspx?q=0-7151

Pooled Fund Projects

Pooled-fund projects are for planning, research, development, or technology transfer project activities administered by FHWA and are supported by two or more participants. These projects address an issue of significant or widespread interest related to highway, public, or intermodal transportation. The research is intended to address a new area or provide information that will complement or advance previous investigations of the subject matter.

As 23 CFR 420.205 describes, "To promote effective use of available resources, the State DOTs are encouraged to cooperate with other State DOTs, the FHWA, and other appropriate agencies to achieve RD&T objectives established at the national level and to develop a technology transfer program to promote and use those results. This includes contributing to cooperative RD&T programs such as the NCHRP, the TRB, and transportation pooled fund studies as a means of addressing national and regional issues and as a means of leveraging funds."

Pooled-fund projects are a very effective means of leveraging precious research funds. Table 8. shows the pooled-fund projects that Texas participates in.

The following are project descriptions of the pooled-fund projects where Texas is contributing funds:

Table 8.

Project	Title	Study No.	Lead Agency	Start/End Date	FY23 Commitment
8-8515	Development and Evaluation of Road-side Safety Systems for Motorcyclists (TxDOT-Led)	TPF-5(482)	Texas Department of Transportation	2022-2024	$40,000.00
8-8531	Concrete Bridge Engineering Institute (CBEI)	TPF-5(508)	Texas Department of Transportation	2023-2026	$350,000.00
8-8458	Connecting the DOTs: Implementing ShakeCast Across Multiple State Departments of Transportation for Rapid Post-Earthquake Response	TPF-5(357)	California Department of Transportation	2017-2024	$15,000.00
8-8463	Building Information Modeling (BIM) for Bridges and Structures	TPF-5(372)	Iowa Department of Transportation	2018-2023	$25,000.00
8-8470	Improve pavement surface distress and transverse profile data collection and analysis, Phase II	TPF-5(399)	FHWA	2019-2024	$20,000.00

Project	Title	Study No.	Lead Agency	Start/End Date	FY23 Commitment
8-8471	National Partnership to Determine the Life Extending Benefit Curves of Pavement Preservation Techniques (MnROAD/NCAT Joint Study – Phase II)	TPF-5(375)	Minnesota Department of Transportation	2018-2023	$50,000.00
8-8473	Pavement Structural Evaluation with Traffic Speed Deflection Devices (TSDDs)	TPF-5(385)	Virginia	2019-2023	$149,000.00
8-8475	Institute for Trade and Transportation Studies (ITTS)	TPF-5(390)	Mississippi Department of Transportation	2018-2023	$39,800.00
8-8482	Smart Work Zone Deployment Initiative (FY20-FY24)	TPF-5(438)	Iowa Department of Transportation	2020-2024	$25,000.00
8-8484	EconWorks - Improved Economic Insight	TPF-5(456)	Arkansas Department of Transportation	2020-2024	$4,000.00
8-8486	Technology Transfer Concrete Consortium (FY20-FY24)	TPF-5(437)	Iowa Department of Transportation	2020-2024	$8,000.00
8-8487	No Boundaries Transportation Maintenance Innovations	TPF-5(441)	Colorado Department of Transportation	2020-2025	$10,000.00
8-8490	Traffic Safety Culture - Phase 2	TPF-5(444)	Montana Department of Transportation	2020-2024	$50,000.00
8-8491	National Accessibility Evaluation Phase II Access Across America	TPF-5(455)	Minnesota Department of Transportation	2021-2025	$40,000.00
8-8492	Automated Vehicle Research Program	TPF-5(453)	Ohio Department of Transportation	2021-2025	$50,000.00
8-8493	Developing and Calibrating Fragmental Rockfall Models using Physics Engines	TPF-5(459)	Washington State Department of Transportation	2020-2023	$30,000.00
8-8495	Traffic Analysis, Modeling, and Simulation	TPF-5(458)	FHWA	2020-2023	$20,000.00

Project	Title	Study No.	Lead Agency	Start/End Date	FY23 Commitment
8-8497	High Performance Computational Fluid Dynamics (CFD) Modeling Services for Highway Hydraulics	TPF-5(446)	FHWA	2020-2023	$15,000.00
8-8499	Road Usage Charge West	TPF-5(451)	Oregon Department of Transportation	2020-2025	$25,000.00
8-8501	Infrastructure to Support Advanced Autonomous Aircraft Technologies		Ohio Department of Transportation	2021-2024	$175,000.00
8-8502	Hydrologic and Hydraulic Software Enhancements (SMS, WMS, Hydraulic Toolbox, and HY-8)	TPF-5(464)	FHWA	2020-2024	$10,000.00
8-8504	Traffic Control Device (TCD) Consortium (3)	TPF-5(447)	FHWA	2020-2025	$25,000.00
8-8505	Determining the in-place strength of concrete using piezoelectric based sensors	TPF-5(471)	Indiana Department of Transportation	2021-2023	$25,000.00
8-8506	Pavement Surface Properties Consortium: Phase III - Managing the Pavement Properties for Improved Safety	TPF-5(463)	Virginia Department of Transportation	2021-2025	$20,000.00
8-8508	Soil and Erosion Testing Services for Bridge Scour Evaluations	TPF-5(461)	FHWA	2021-2025	$15,000.00
8-8510	Demonstration to Advance New Pavement	TPF-5(478)	FHWA	2021-2025	$10,000.00
8-8511	Integration of New Traffic Signal Actuation Concepts using Enhanced Detector Information	TPF-5(483)	Iowa Department of Transportation	2021-2023	$33,000.00
8-8512	Accelerated Performance Testing on the 2021 NCAT Pavement Test Track with MnROAD Research Partnership	TPF-5(469)	Alabama Department of Transportation	2021-2023	$633,334.00
8-8513	Building Information Modeling (BIM) for Infrastructure	TPF-5(480)	Iowa Department of Transportation	2021-2025	$30,000.00

Project	Title	Study No.	Lead Agency	Start/End Date	FY23 Commitment
8-8514	Collaborative In-Service Performance Evaluation (ISPE) of Roadway Safety Features	TPF-5(481)	Arizona Department of Transportation	2022-2024	$30,000.00
8-8516	Clear Roads Winter Highway Operations Phase III Pooled Fund	TPF-5(479)	Minnesota Department of Transportation	2022-2026	$25,000.00
8-8517	Center for the Aging Infrastructure: Steel Bridge Research, Inspection, Training and Education Engineering Center - SBRITE (Continuation)	TPF-5(486)	Indiana Department of Transportation	2022-2024	$50,000.00
8-8518	LTPP Forensic Investigations - Stage 2	TPF-5(500)	Washington State Department of Transportation	2021-2025	$20,000.00
8-8519	ENTERPRISE- PHASE III (Phase II Continuation)	TPF-5(490)	Michigan Department of Transportation	2022-2026	$30,000.00
8-8520	Safety Service Patrol Standardization and Management Practices	TPF-5(489)	FHWA	2021-2025	$25,000.00
8-8522	Transportation Management Centers Pooled Fund Study Phase II	TPF-5(487)	FHWA	2022-2027	$50,000.00
8-8523	Roadside Safety Pooled Fund Phase 3	TPF-5(501)	Washington State Department of Transportation	2023-2027	$65,000.00
8-8525	International Conference on Ecology & Transportation Pooled Fund	TPF-5(499)	Washington State Department of Transportation	2022-2023	$6,000.00
8-8526	Continuous Bituminous Pavement Stripping Assessment Through Non-destructive Testing	TPF-5(504)	Minnesota Department of Transportation	2023-2027	$25,000.00
8-8527	Emerging Data Streams for Pave-ment (Asset) Health Monitoring and Man-agement	TPF-5(513)	Virginia Department of Transportation	2023-2028	$30,000.00
8-8528	2023 through 2025 Innovations in Freight Data Workshop	TPF-5(510)	Iowa Depart-ment of Trans-portation	2022-2025	$14,000.00

Project	Title	Study No.	Lead Agency	Start/End Date	FY23 Commitment
8-8529	Standardizing Rigid Inclusions for Transportation Projects – Phase I	TPF-5(503)	Kansas Department of Transportation	2023-2025	$30,000.00
8-8530	Highway Safety Manual 2nd Edition (HSM2) Implementation	TPF-5(516)	FHWA	2023-2028	$16,000.00
8-8532	National Partnership to Improve the Quality of Preventive Maintenance Treatment Construction & Data Collection Practices (PG Phase III)	TPF-5(522)	Minnesota Department of Transportation	2023-2027	$50,000.00
8-8533	National Hydraulic Engineering Conference	TPF-5(507)	Federal Highway Administration	2022-2027	$1,000.00
8-8534	Building Information Modeling (BIM) for Bridges and Structures - Phase II	TPF-5(523)	Iowa Department of Transportation	2023-2027	$20,000.00
8-8535	New Performance Approach to Evaluate ASR in Concrete	TPF-5(521)	Federal Highway Administration	2023-2027	$5,000.00
8-8536	Consortium for Asphalt Pavement Research and Implementation (CAPRI)	TPF-5(465)	Alabama Department of Transportation	2021-2025	$10,000.00
8-8537	Expansion: Enhanced Traffic Signal Performance Measures	TPF-5(519)	Indiana Department of Transportation	2023-2025	$40,000.00
8-8538	Resilience Approaches for Pavements and Geotechnical Assets	TPF-5(512)	Virginia Department of Transportation	2023-2027	$20,000.00
8-8539	2nd International Roadside Safety Conf. and Peer Exchange		Florida Department of Transportation	2023	$5,000.00
8-8540	Work Zone Analytics	TPF-5(514)	Indiana Department of Transportation	2023-2025	$30,000.00
8-8541	Evaluation of Low-Cost Safety Improvements (ELCSI-PFS)	TPF-5(515)	Federal Highway Administration	2023-2027	$10,000.00
8-8544	Improving Traffic Detection Through New Innovative i-LST Technology Demonstration Pilot	TPF-5(520)	Federal Highway Administration	2023-2024	$15,000.00

Research Management and Administration

RTI performs the following management and administrative activities.

Project Number: 0-50

Project Title: Research Management and Administration

Project Objectives: RTI provides administrative oversight for support functions including budgeting, purchasing, contract administration, legislative analysis, mapping, and the SPR Work Program.

Planned Activities: Develop, implement, and monitor the division's biennium budget.

1. Develop, implement, and monitor the SPR Part II Work Program, ensuring that all requirements of 23 CFR 420, 2 CFR 200, and other applicable federal and state statutes and regulations are followed.
     a. Prepare and submit the proposed 2023 SPR Part II Work Program to FHWA.
     b. Prepare and submit the 2022 Annual Performance and Expenditures Report (APER) to FHWA.
     c. Hold quarterly status meetings with FHWA to report on the 2023 SPR Part II Work Program.
     d. Prepare and submit amendments to the 2023 SPR Part II Work Program as needed.
2. Administer and ensure that all the division's agreements/contracts are approved, procured, monitored, and closed out in accordance with the provisions of 2 CFR 200. In addition, this function ensures that program monitoring and reporting requirements of FHWA planning and research funds are in compliance with 23 CFR 420.117.

Financials	Budget	Expended	Balance
Division Travel	$87,808.00	$34,261.39	$53,546.61
Salary	$1,710,768.77	$1,799,956.32	$(89,187.55)
Total RTI Division Program Management	$1,798,576.77	$1,834,217.71	$(35,640.94)

Summary Statement

The Texas State Planning and Research (SPR) Part II activities identified within the work program demonstrates the states commitment to addressing transportation challenges within the state and those common across the nation. The innovative ideas for meeting those challenges have been thoroughly vetted by the research committees within TxDOT to ensure only the best ideas are submitted with success in mind.

Our continued partnership and collaboration with FHWA Texas Division, university researchers, Metropolitan Planning Organizations, and other state DOTs, positions Texas to remain at the forefront for advancing new and innovative technologies and solutions. Many of the solutions will meet both near term and future surface transportation challenges and aid with meeting the aim of the Infrastructure Investment and Jobs Act.

TxDOT Research and Technology Implementation (RTI) Division will continue to manage and foster good stewardship of the federal State Planning and Research (SPR) Part II, Subpart B - Research, Development and Technology Transfer Program, for the state of Texas. RTI will submit amendments to this work program by way of Round Templates throughout the fiscal year to address new project start dates, project modifications, and any cancelled projects as needed.