WYOMING DEPARTMENT OF TRANSPORTATION REVISED 2025 STATE RESEARCH CENTER WORK PROGRAM REPORT

August 2024

Enid White, Research Manager
WYDOT Research Center
Cheyenne, WY 82009

INTRODUCTION

The Wyoming Department of Transportation 2025 State Planning and Research Work Program Report (Work Program) is prepared in accordance with Federal statutes, rules and regulations, and FHWA requirements. Work Program is defined in *Title* *23 C.F.R Part 420, Sec. 103 (5)* as:

> …a periodic statement of proposed work, covering no less than one year, and estimated costs that document eligible activities to be undertaken by State DOTs and/or their subrecipients with FHWA planning and research funds.

Title 23 C.F.R Part 420, Sections 111, 207 and 209 sets out that the Work Program should consist of a) a list of and description of the work and/or activities to be accomplished during the program period; b) an estimated cost for each eligible activity; c) a description of any cooperatively funded activities that are part of a national or regional pooled study, including the NCHRP contributions; and d) financial summaries that show the funding levels for each activity, which should include the Federal and state share, and any matching funds for each individual project. Further, *Subpart (c), of Title 23 of the Code of Federal Regulations, Section 420.209*, requires research programs certify that their program is in full compliance with the requirements set out in Subpart B, of Part 420.

Research to be performed Principal Investigators during fiscal year 2025 will be included in this report. The Work Program shall be updated as new projects are authorized during fiscal year 2025. All proposed projects go through the WYDOT proposal process and fall under the above statutory requirements. The Research Advisory Committee (RAC) reviews each proposal to determine whether it offers a cost benefit to WYDOT, and whether the proposal is in line with the WYDOT mission statement and goals.

The selected projects by the RAC are forwarded to the WYDOT Executive Staff and FHWA for final approval on project funding using State Planning and Research Funds. All new projects must have written approval from both the Executive Staff and FHWA prior to execution.

Proposals for current/active research projects can be found on the WYDOT Research Center website. Final reports for all closed research projects from 2009 forward are archived on the WYDOT Research Center website. Research reports for projects between the years of 1969 to 2009 can be obtained by contacting the Research Center.

Title 23 C.F.R. Sec 420.209

Certificate of Compliance

I, Keith R. Fulton, P.E., Assistant Chief Engineer for the Engineering and Planning Division, do hereby certify that the State is in compliance with the requirements of *23 C.F.R. 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.

Keith Fulton (Aug 9, 2024 16:48 MDT)

Keith R. Fulton, P.E.
Assistant Chief Engineer for Engineering and Planning

Aug 9, 2024

Date

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Chapter 1. 2025 Budget Summary

This chapter sets out the proposed budget for fiscal year (FY) 2025[1].

Description	Amount
1. State Planning & Research (SP&R) Funds (est)	Unknown
REVENUE	
2. SP&R RES Funds (est.)	$1,625,573
3. LTAP Special Allocation (Fund 438)	$195,000
4. FY2024 unobligated funds (est)	$0.00
5. Total Revenues	$1,820,573
EXPENSES	
6. NCHRP	$357,626
7. TRB Correlation Services	$102,965
8. Technology Transfer to UW Fund 438	$125,000
9. LTAP Funds RS01225 Fund 438	$25,000
10. Administrative Costs (est)	$111,167
11. Pooled Funds	$0.00
12. State Research Projects (80 percent Federal)	$0.00
13. ICAP (80 percent Federal) (est)	$221,837
14. NTPEP	$25,000
15. Total Expenses	$1,058,595
TOTAL FY2025 FEDERAL FUNDS AVAILABLE	**$761,978**

LINE NUMBER EXPLANATIONS:

1. Total *estimated* 2024 SP&R funds.

REVENUE

2. Pursuant to *23 U.S.C. 505(b)(1)*, not less than 25 percent of the state planning and research (SP&R) funds must be used for research, development, and technology transfer activities. WYDOT presently obligates the minimum amount, which is made up of 100 percent Federal funds.
3. See Local Technical Assistance Program (LTAP) and Technology Transfer (T^2) Center summary for a complete financial breakdown.
4. Un-obligated Federal funds from previous fiscal year apportionments.
5. Summation of lines 2 through 4.

EXPENSES

6. The National Cooperative Highway Research Program (NCHRP) contribution is 5.5 percent of the SP&R RES Funds. This obligation is 100 percent Federal funds.
7. The TRB Correlation Service is a pooled fund and obligated annually using 100 percent Federal funds.

1 *The funds set out in this budget summary are a guesstimate of the funds that will be available in FY 2022.*

8. The University of Wyoming Technology Transfer Center's funding is contracted for and obligated annually. See Technology Transfer (T^2) Center summary for financial breakdown.
9. LTAP funding is contracted and obligated annually. See Local Technical Assistance Program (LTAP) for financial breakdown.
10. See Administrative Cost summary for financial breakdown.
11. See Transportation Pooled Fund Projects summary for financial breakdown.
12. See State Research Projects summary for financial breakdown. State research projects use 80 percent Federal funds.
13. Indirect Cost Allocation Plan (ICAP) funds (an additional 11 percent for projects begun in FY2017) added on to each contract (80 Federal/20 state split).
14. NTPEP funding is for membership in the national transportation product evaluation program (NTPEP).
15. Summation of lines 6 through 14.

TOTAL

16. Total amount available for new research (revenue, less expenses).

Chapter 2. 2025 Funding

2.1 National Cooperative Highway Research Program (NCHRP) Contribution

Identification: TPF-5(XXX)

Contacts: WYDOT Representatives
Enid White
307-777-4182
Cheyenne WY

Funding: $357,626 (est.)

Scope: Administered by the Transportation Research Board (TRB), and sponsored by the member departments (i.e., individual state departments of transportation) of the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration (FHWA), NCHRP was created in 1962 as a means to conduct research in acute problem areas that affect highway planning, design, construction, operation, and maintenance nationwide.

The state departments of transportation are the sole sponsors of NCHRP. Support is voluntary and funds are drawn from the state's Federal-Aid Highway apportionment of SP&R funds. Furthermore, the funds can be spent only for the administration of problems approved on ballot by at least two-thirds of the states. Each state's allocation amounts to 5.5 percent of its SP&R apportionment and is set forth in supplementary tables issued with each year's Federal Aid Highway apportionments.

NCHRP is 100 percent federally funded, requiring no state match.

2.2 Transportation Research Board Correlation Service (TRB) Contribution

Also known as the Core Program Services for a Highway Research, Development, and Technology Program, 2025.

Identification: TPF-5(XXX)

Contacts: WYDOT Representatives
Enid White
307-777-4182
Cheyenne WY

Funding: $102,965

Scope: The Research Correlation Service of the Transportation Research Board of the National Academy of Sciences is subscribed to annually by WYDOT. Membership allows receipt of all major publications and input to various national research programs including NCHRP. In 2002, FHWA authorized the yearly payment of the TRB Correlation Service using the FHWA-administered pooled fund mechanism. Starting in FY1995, FHWA allowed the TRB correlation service charge to be paid with 100 percent Federal funding, requiring no state match.

2.3 Technology Transfer (T2) Center at the University of Wyoming

Identification: LTAP024
LTAP025
FUND 438

CONTACTS:

Principal Investigator:	Project Champion:
Khaled Ksaibati	Enid White
307-766-6230	307-777-4182
University of Wyoming	WYDOT
Laramie WY	Cheyenne WY

Funding Summary:

Code	*Funds*	*State Portion*	*Federal Portion*	*Budgeted*
LTAP (0438)	Local Tech. Assistance		$125,000	$125,000
HPRF	(WYDOT) SP&R RES	$31,250		$31,250
SCFM	SC Fund (4 cent)	$31,250		$31,250
CCOF	Municipal & County	$31,250		$31,250
CCOF	University of Wyoming	$31,250		$31,250
Total		$125,000	$125,000	$250,000

Scope: The Local Technical Assistance Program (LTAP) is part of the Federal Highway Administration's Technology Transfer Program. LTAP creates a process using Technology Transfer Centers to transfer research findings and new technology to the local-level end-user. Technology Transfer Centers have been established in each state to provide information, advice, and training to local agencies, with Wyoming's Technology Transfer Center being established in 1985 at the University of Wyoming.

Wyoming Statute §21-17-115 states that:

> The University of Wyoming may operate a technology transfer center and provide training to Wyoming County and municipality employees regarding current trends in transportation technology.

The state portion of the funding comes from equal contributions from WYDOT (Wyo. Stat. §39-17-111(d)(ii)); Wyoming counties (Wyo. Stat. §24-2-110(a)(i)); Wyoming cities and towns (Wyo. Stat. §39-17-111(d)(iii)(A)); and the University of Wyoming (Wyo. Stat. §21-17-115), in an annual amount not less than $25,000 and a maximum of $31,250. The Federal government or other non-state contribution must equal that of the total state portion.

2.4 Local Technical Assistance Program (LTAP) at University of Wyoming

Identification: RS01225

CONTACTS:

Principal Investigator:	Project Champion:
Khaled Ksaibati	Enid White
307-766-6230	307-777-4182
University of Wyoming	WYDOT
Laramie WY	Cheyenne WY

Funding Summary:

Code	*Funds*	*State Portion*	*County/ City/other outside source*	*Federal Portion*	*UW Match*	*Budgeted*
RS01225	Federal			$25,000		$50,000
	State Match	$12,500	0.00			
	University of Wyoming Match				$12,500	
Total		$12,500	0.00	$25,000	$12,500	$50,000

Scope: The Technology Transfer Center (T^2) is part of the Federal Highway Administration's Technology Transfer Program. The Technology Transfer Center transfers research findings and new technology to the local-level end-user. Technology Transfer Centers have been established in each state to provide information, advice, and training to local entities.

2.5 Administration of Research

Identification: RES2225

Contacts: WYDOT Representatives
Enid White
307-777-4182
Cheyenne WY

Funding Summary:

Title	State Portion	Federal Portion	Budgeted 2025
Research Proposal Development	$1,000	$4,000	$5,000
Research Printing	$100	$400	$500
Research Office Supplies	$150	$600	$750
Vehicle Usage	$100	$400	$500
Research Library Materials	$200	$800	$1,000
RAC Administration	$9,100	$36,400	$45,500
Research Presentation	$1,000	$4,000	$5,000
Travel	$1,100	$4,400	$5,500
National RAC Meeting	$70	$280	$350
Employee Time Charges and Leave	$14,107	$56,427	$70,534
Contract Management and Misc.	$800	$3,200	$4,000
Professional Fees	$65	$260	$325
TOTAL	$27,792	$111,167	$138,959

2.6 - Pooled Fund Projects Funding Summary

	1995-2021	2022	2023	2024	2025	Total Obligations
TPF-5(193) Midwest States Regional Pooled Fund Project	**$750,000**					**$750,000**
TPF-5(337)Avalanche Research Pooled Fund	**$150,000**	**$75,000**				**$225,000**
TPF-5(391) RS05219 Comprehensive Field Load Test and Geotechnical Investigation Program	**$150,000**					**$150,000**
TPF-5(393) RS04219 Pooled Fund for the Design, Development and Testing of a Box Beam Approach Guardrail Transition and an MSG Approach Guardrail Transition to a MASH TL-4 Three Steel Tube Bridge Rail	**$195,576**	**$190,649**				**$386,225**
TPF-5(442) Transportation Research and Connectivity	**$45,000**					**$45,000**
TPF-5(437) Technology Transfer Concrete Consortium		**$24,000**				**$24,000**
TPF-5(430) Midwest States Pooled Fund to Advance Roadside Safety Research and Assist in WYDOT's Implementation of MASH			**$195,000**			**$195,000**
TPF-5(520) Improving Traffic Detection through New Innovative i-LST Technology Demonstration			**$30,000**			**$30,000**
TPF-5(526) Western Transportation Research Consortium				**15,000**		
TPF-5(536) Ahead of the Curve				**20,000**		

Notes: Pooled Fund research projects are generally 100 percent Federal funds.

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

Contacts:

Lead Agency Contact	Lead State Contact
Jodi Gibson	Bill Wilson
Nebraska Department of Roads	WYDOT
402-479-3687	307-777-4216

Period of Study: Start Date: July 1, 2012
Estimated Completion: Unknown
Cleared by FHWA

Scope: To crash test highway roadside appurtenances to assure that they meet criteria established nationally. At this time there are 19 states tied to this pooled fund.

Status: Information gained from the various projects within this pooled fund has proven beneficial to WYDOT. All quarterly reports for this project can be found on the Pooled Fund website. WTDOT's commitment for this project has been extended to an unknown date.

2.6.2 - TPF-5(497) Avalanche Research Pool

*This pooled fund has been reassigned from TPF5-(337)

Contacts:	Lead Agency Contact David Reeves Colorado DOT 303-757-9518	Lead State Contact Brenden Cronin WYDOT 307-732-9620

Period of Study: Start Date: Additional funding approved June of 2022
Estimated Completion: Unknown
Cleared by FHWA

Scope: The study's mission is to support collaborative research efforts in the field of avalanche hazard assessment and mitigation, with the goal of improving the safety, efficiency, and quality of control efforts, along with providing better information gathering and analysis techniques and seamless integration of new technologies to further these goals. The participation of many transportation related agencies in this study will also further cooperation in this industry, leading to improved future development of beneficial technologies and improved sharing of information and avalanche data, greatly furthering the safety, efficiency, and quality of the work done in this field for all relevant agencies.

Status: The TARP met three times in 2022 for planning the next group of research projects. The annual meeting was held in Washington DC on May 17, 2022. The next proposed project revolves around LIDAR Phase 2 and CDOT is working on the procurement to get the project under contract. All reports for this project can be found on the Pooled Fund website.

2.6.3 - TPF-5(391). RS05219 Comprehensive Field Load Test and Geotechnical Investigation Program for Development of LRFD Recommendations of Driven Piles on Intermediate Geomaterials

Contacts:	Lead Agency Principal Investigator	Lead State Contact
	Kam Ng	Todd Sullivan
	University of Wyoming	WYDOT
	Laramie WY	Cheyenne WY
	307-766-4388	307-777-4783

Period of Study: Start Date: January 9, 2019
Estimated Completion: December 31, 2024
Cleared by FHWA

Scope: The overall goal of the proposed research project is to develop LRFD recommendations for driven piles on IGM.

Status: The advisory board holds quarterly meeting with all parties. The research project will have several direct benefits to state DOTs, deep foundations industries, and other relevant stakeholders. Bridges are being selected in the various states. All reports for this project can be found on the Pooled Fund website. It outlines the work for each of the states involved in this project.

2.6.4 - TPF-5(393) RS04219 Pooled Fund for the Design, Development and Testing of a Box Beam Approach Guardrail Transition and an MSG Approach Guardrail Transition to a MASH TL-4 Three Steel Tube Bridge Rail

Contacts:

Lead Agency Contact	Lead State Contact
Roger Bligh	Bill Wilson
Texas A&M	WYDOT
College Station TX	Cheyenne WY
979-845-4377	307-777-4216

Period of Study: Start Date: February 14, 2019
Estimated Completion: December 14, 2024
Cleared by FHWA

Scope: Wyoming Department of Transportation (WYDOT) formulated a strategy for meeting the MASH compliance timeline and implementing standards and policies that offer to improve roadside safety in Wyoming. While many of WYDOT's roadside safety devices are considered MASH compliant, some barrier systems have yet to be updated to MASH. The compliance date for transitions, which is the roadside safety hardware category that is the focus of the proposed project, is December 31, 2019. This research is needed to provide crashworthy transitions systems for connection of common barrier types that are MASH compliant.

Status: The progress report for this project can be found on the Pooled Fund website.

2.6.5 - TPF-5(442) Pooled Fund for the Transportation Research and Connectivity Project

Contacts:

Lead Agency Contact	Lead State Contact
Michael Molina	Enid White
Oklahoma Transportation Library	WYDOT
405-420-1003	307-777-4182

Period of Study: Start Date: August 12, 2019
Estimated Completion: February 28, 2023 (Time extended to December 2025)
Cleared by FHWA

Scope: The project is set up to support coordinated development of transportation libraries as well as research organizations without dedicated libraries, the following objectives will be undertaken. These objectives will be accomplished through member activities and partnerships with professional groups such as the Transportation Research Board (TRB) Library and Information Science for Transportation Committee (LIST), the Special Libraries Association (SLA) Transportation Division, and the National Transportation Knowledge Network (NTKN). Completed projects will be stored permanently at the NTKN and the National Transportation Library (NTL) for public use and will be completed within the three-year span of the pooled fund study.

Status: Numerous meetings have been conducted regarding digitization, toolkits, Section 508 compliance, and the direction of the project. The progress report for this project can be found on the Pooled Fund website.

2.6.6 - TPF-5(437) Technology Transfer Concrete Consortium

Contacts: Lead Agency Contact
Khyle Clute
Iowa Department of Transportation
515-239-1646

Lead State Contact
Whitney Wise
Wesley Bybee
Greg Milburn
WYDOT
307-777-4075

Period of Study: Start Date: January 2022
Estimated Completion: February 2024 (Extended to December 2025)
Cleared by FHWA

Scope: WYDOT's objective for this project is to acquire knowledge of concrete technology through interaction, presentations, and publications. Participating in the consortium allows WYDOT the opportunity to provide input on proposed research projects.

Participation in the consortium provides WYDOT with the following benefits: improved materials, improved cost effectiveness, and improved safety. During WYDOT's brief involvement thus far, work has begun internally with specification changes from knowledge gained through participation.

Status: There are no updates at this time.

2.6.7 - TPF-5(430) Midwest States Pooled Fund to Advance Roadside Safety Research and Assist in WYDOT's Implementation of MASH

Contacts:

Lead Agency Contact	Lead State Contact
Mark Fischer	Bill Wilson
Nebraska DOT	WYDOT
402-479-3163	307-777-4216

Period of Study: Start Date: February 2022
Estimated Completion: Unknown
Cleared by FHWA

Scope: The Midwest Roadside Safety Pooled Fund Program is a collaborative program between state DOTs and the Midwest Roadside Safety Facility (MwRSF). The goal of this program is to address the roadside safety needs of state DOTs.

Status: There are no updates at this time.

2.6.8 – TPF-5(520) – Improving Traffic Detection through New Innovative i-LST Technology Demonstration Pilot (2023)

Contacts:

Lead Agency Contact	Lead State Contact
Steven Jessberger	Chad Matthews
FHWA	Mark Wingate
202-366-5052	Brenden Schaefer
	307-777-4411

Period of Study: Start Date: Unknown
Estimated Completion: Unknown
Cleared by FHWA

Scope: The objective of this project is to demonstrate the loop signature technology over various corridors across the US to demonstrate application of new effective and comprehensive data collection methods.

Status: There are no updates at this time.

2.6.9 – TPF-5(536) –Ahead of the Curve – Migration from NC

Contacts:	Lead Agency Contact	Lead State Contact
	Tyson Rupnow	Enid White
	Louisiana Dept Transportation	WYDOT

Period of Study: Start Date: 6-25-2024
Estimated Completion: To be determined
Cleared by FHWA

Scope: The mission of the initiative was ‘to develop and deliver a TRB program that enhances the knowledge, skills and abilities of managers of transportation research programs and those responsible for innovation in a coordinated manner and on a continuing basis.

Status: There are no updates at this time.

2.6.10 – TPF-5(526) –Western Transportation Research Consortium

Contacts:	Lead Agency Contact	Lead State Contact
	David Sterns	Enid White
	Utah Dept Transportation	WYDOT

Period of Study: Start Date: 11-8-2023
Estimated Completion: To be determined
Cleared by FHWA

Scope: The pooled funds purpose is to pool the financial, professional, and academic resources of the region to develop improved methods of dealing with common problems in the planning, design, construction, maintenance, management and operation of transportation systems.

The consortium will gather DOT research and innovation professionals, virtually or in-person, to prioritize transportation needs and allocate resources. It will also address high priority transportation research topics of common interest to RAC IV states. The lead state will manage contracted services and adhere to the consortium charter.

Status: There are no updates at this time.

2.7 – Research Projects

2.7.1 – RS02221 Reducing Shrinkage in Concrete Bridge Decks using Single and Double Ring Test Methods

Contacts:	Principal Investigators:	Project Champions:
	Jennifer Tanner`	Whitney Wise
	University of Wyoming	Greg Milburn
	Laramie, WY	WYDOT
		Cheyenne, WY

Period of Study: Proposal Approved: March 20, 2021
Estimated Completion: May 31, 2025
Extension to: August 31, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2021	$116,306	$12,794		**$129,100**	$103,280	$25,820

Scope: The overall goal of the proposed research project is to set forth the terms and conditions by which the Principle Investigator shall evaluate critical factors relating to early age shrinkage and to review multiple methods to reduce the factor that contributes to early degradation.

Status: This project is fifty-five percent completed. During the second quarter, the Principal Investigator evaluated the effects of single methods of mitigation shrinkage; quantified the beneficial effects of multiple methods to mitigate shrinkage; proposed solutions for WYDOT using standard mix designs for two types of aggregates; and provided guidance on the use of internal curing for concrete mix designs.

2.7.2 – RS08221 Developing a Collision Warning and Collision Avoidance System for WYDOT Snowplows

Contacts: Principal Investigators:
Muhammad Tahmidul Hag
Khaled Ksaibati
University of Wyoming
Laramie, WY

Project Champions:
Cliff Spoonemore
WYDOT
Cheyenne, WY

Period of Study: Proposal Approved: November 15, 2021
Estimated Completion: May 15, 2024
Extension to July 1, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds MPC	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2021	$170,046	$18,705	$89,210	**$188,751**	$151,001	$37,750

Scope: The main goal of this study is to develop a collision warning and collision avoidance system for WYDOT snowplow trucks and other maintenance vehicles, and to maximize the capability of preventing crashes in order to minimize the severity of crashes.

Status: The research team accumulated historical crashes involving snowplows throughout the state. A comprehensive crash database were prepared to gather the level of details associated with each crash. Descriptive statistics were prepared indicating the trends of the crashes involving snowplows. Several advance statistical models were developed to identify the significant contributing factors related to the crashes involving snowplows. A special analysis were conducted to determine if the snowplows crashes are taking place near the turnarounds where the snowplow drivers need to slow down considerably to turn around. In addition to this, a GIS map were developed for snowplows crash locations.

2.7.3 – RS02222 Utilization of Transportation Structures by Bats in Wyoming: A comprehensive investigation

Contacts:

Principal Investigators:	Project Champions:
Riley Fehr Bernard	Scott Gamo
Heather O’Brien	Jeff Booher
Laura Beard Bat	WYDOT
University of Wyoming	Cheyenne, WY
Laramie, WY	

Period of Study: Proposal Approved: March 14, 2022
Estimated Completion: March 14, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds University of Wyoming, Wyoming Game and Fish, Wyoming Governor’s Big Game License Coalition Grant	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2022	$34,539	$3,799	$102,663	$38,338	$30,671	$7,668

Scope: The purpose of this study is to collect bat use data on bridges to aid WYDOT and agency partners in determining what bridge types are attractive to bats and to develop means of mitigation to minimize impacts to bridge maintenance and reconstruction timelines.

Status: Field seasons for the Wyoming bat and bridge project were conducted over summers 2021 (year 1) and 2022 (year 2). Year 1 began 01 June 2021 and ended on 09 August 2021. We surveyed 297 Wyoming Department of Transportation (WYDOT) managed bridges across 9 counties (Table 1). The project resumed in year 2 on 06 June 2022 and was completed on 02 August 2022. During year 2, we surveyed 215 WYDOT managed bridges across 17 counties (Table 1). During both years, bridges were surveyed on I-25, I-80, I-90, as well as principal arterial, minor arterial, major collector, and local roadways.

2.7.4 – RS03222 Wyoming Transportation Asset Management Plan (TAMP)

Contacts:

Principal Investigators:
Muhammad Tahmidul Hag
Marwan Hafez
Omar Albatayneh
Khaled Ksaibati
University of Wyoming
Laramie WY

Project Champions:
Greg Milburn
Michael Menghini
WYDOT
Cheyenne WY

Period of Study: Proposal Approved: March 14, 2022
Estimated Completion: March 14, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2022	$179,877	$19,786		$199,663	$159,731	$39,933

Scope: The project will only consider pavement and bridge assets to investigate the supportive techniques of central funding allocation and district practices at the network level.

Status: This project is on time and within budget. An advisory group from WYDOT was established; a comprehensive literature study was conducted; two surveys were prepared and disseminated to professions in department of transportation; a journal article was submitted; developed optimization models based on the historical central funding allocations; and a statewide strategic goals and objectives among the different assets are being designed.

2.7.5 – RS02223 Developing Tools to Mitigate the Impact of Design Errors and Omissions

Contacts:

Principal Investigators:	Project Champions:
Ahmed Abdelaty	Christina Spindler
University of Wyoming	WYDOT
Laramie WY	Cheyenne WY

Period of Study: Proposal Approved: April 10, 2023
Estimated Completion: July 10, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2023	$167,251	$18,398		$185,649	$148,519	$37,130

Scope: There are several benefits of conducting this research. First, WYDOT will have quantitative and qualitative data regarding the impact of design E&O and rework on transportation projects' schedules and cost performance. Second, the research team will develop DQC tools and guidelines based on the analysis of the impact of design E&O. These tools and guidelines will help WYDOT staff ensure the quality and constructability of the project's design based on past historical E&O.

Status: This project is on time and within budget.

2.7.6 – RS03223 Construction Cost Inflation Model

Contacts:

Principal Investigators:	Project Champions:
Nick Colsch	Chris Pivik
Laramie County	Wes Bybee
Community College	WYDOT
Cheyenne, Wyoming	Cheyenne, Wyoming

Period of Study: Proposal Approved: May 1, 2023
Estimated Completion: May 1, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2023	$26,640	$2,930		$29,570	$23,656	$5,914

Scope: There are three objectives for this project.

1. Identify the current inflation estimation practices, past estimates, and past actuals to develop a baseline of estimation performance.
2. Use the Producer Price Indices (PPI) for the nine common categories in the Highway Construction Cost Index (HCCI) to create material-specific inflation for those nine areas.
3. Create a model to project inflation rates several years into the future as highway construction projects may last several years.

Status: The project has hit its primary objective in developing inflation models for predicting inflation one to five years into the future. There are visual aids presented to help describe how well the models work or do not work. There are also estimations on inflation for the next five years.

2.7.7 – RS04223 Deterring Wildlife Use of Road Right of Ways in Wyoming

Contacts:

Principal Investigators:
Joshua Millspaugh
University of Montana
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Project Champions:
Scott Gamo
Tom Hart
WYDOT
Cheyenne, Wyoming

Period of Study: Proposal Approved: January 19, 2023
Estimated Completion: August 21, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2023	$301,514	$33,167		$334,681	$267,744	$66,936

Scope: This project is set up to help document the wildlife use of highway right-of-ways (ROW), and determine factors affecting wildlife use of ROWs.

Status: This project is on time and within budget.

2.7.8 – RS05223 Development of New Char-based Aggregate for Concrete with Potential Mitigation of Alkali-Aggregate Reaction

Contacts:	Principal Investigators:	Project Champions:
	Kam Ng	Kahal Lattin
	University of Wyoming	WYDOT
	Laramie, Wyoming	Cheyenne, Wyoming

Period of Study: Proposal Approved: January 19, 2023
Estimated Completion: August 14, 2025

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2023	$179,820	$19,780		$199,600	$159,680	$39,920

Scope: The overall goal of the proposed research is to improve the performance of our transportation infrastructure in Wyoming. Recognizing the current design and construction challenges attributed to current supply of superior quality and cost effective aggregates and concrete cracking due to ASR. The proposed research project will directly benefit WYDOT, civil engineering consultants and contractors, mining industry, the State of Wyoming, and other relevant stakeholders.

Status: Char derived from PRB coal has been acquired, blocks have been manufactured, additives have been used to determine effect on unconfined compressive strength, rock crusher from WYDOT has been installed at UW, Char-based aggregates have been tested for graduation, bulk density, relative density, true density, LA abrasion, and water absorption, soundness tests are being conducted, concrete design mixes have been developed, air content and slump of each concrete cast were measured, and test results of the Char-based blocks are being analyzed.

2.7.9 – RS06223 Development and Evaluation of Box Beam Barrier Configuration for Shielding Fixed Objects and Bridge Ends in Medians

Contacts:	Principal Investigators:	Project Champions:
	Brandon Perry	Bill Wilson
	University of Nebraska	WYDOT
	Omaha, Nebraska	Cheyenne, Wyoming

Period of Study: Proposal Approved: January 19, 2024
Estimated Completion: August 14, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2023	$799,998	$88,000		$887,998	$710,398	$177,600

Scope: The objective of this research effort is to develop, crash test, and evaluate the WYDOT narrow-median box-beam guardrail system according to the TL-3 safety performance criteria found in MASH. The successful testing and evaluation of the WYDOT narrow-median box-beam guardrail would provide Wyoming and other state DOTs with a MASH-tested option for shielding hazards in narrow medians.

Status: This project is on time and within budget.

2.7.10 – RS02224 Evaluation of Blow-over Risk Reduction By Wind Fences using Wind Profile Measurements

Contacts:

Principal Investigators:
Noriaki Ohara
University of Wyoming
Laramie, WY

Project Champions:
Kevin Cox
Vince Garcia
WYDOT
Cheyenne WY

Period of Study: Proposal Approved: November 3, 2023
Estimated Completion: June 18, 2027

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$164,138	$18,055		$182,193	$145,754	$36,439

Scope: The objectives of this project are to characterize the mean and gust wind profiles based on field monitoring around an existing snow fence, quantify the local wind momentum loss due to the fence for both mean and gust winds at different downstream distances in response to various wind directions, quantify the blow-over risk reduction by the fence using the existing UW blow-over risk model, and develop recommendations for potential wind fence installation design and anticipated blow-over risk reduction.

Status: This project has completed the following: a) field visit I-80 MP 332, Tree in the Rock site; b) acquired equipment; and c) began field wind monitoring systems.

2.7.11 – RS03224 Engineering Assessment of Drive Point Data for Improving the Prediction of Geomaterial Properties and Design and Construction of Pile Foundations

Contacts:	Principal Investigators:	Project Champions:
	Kam Ng	Taylor Ree
	University of Wyoming	WYDOT
	Laramie, WY	Cheyenne, WY

Period of Study: Proposal Approved: November 3, 2023
Estimated Completion: January 22, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$122,436	$13,468		$135,904	$108,723	$27,181

Scope: The overall goal of the proposed research is to improve the performance of transportation infrastructures in Wyoming. The research objectives are 1) improve the understanding of subsurface profiles and conditions, 2) scientifically and statistically develop relationships between the drive point (DP) and geomaterial properties, and 3) improve the design and construction of driven piles using the DP method.

Status: This project has completed the following: a) obtained access to WYDOT's iPD Construction Management System; b) downloaded log sheets and driven pile information; c) collected additional project data and documents from WYDOT; and digitized drive point plots on construction plans.

2.7.12 – RS04224 Feasibility of Employing AI Computer Vision and Distributing Fiber Optic Sensing for Traffic and Weather Monitoring

Contacts:

Principal Investigators:	Project Champions:
Milan Zlatkovic	Vince Garcia
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Laramie, WY	Cheyenne WY

Period of Study: Proposal Approved: January, 2024
Estimated Completion: January 18, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$195,052	$21,456		$216,508	$173,206	$43,302

Scope: The primary goal of this study is to assess the feasibility and practical utility of implementing computer vision and DAS technologies for traffic monitoring and weather applications in Wyoming.

Status: This project is on time and within budget.

2.7.13 – RS05224 Asphalt Binder Production from Powder River Basin Coal using Solvent Extraction

Contacts:	Principal Investigator:	Project Champions:
	Trina Igelsrud Pfeiffer	Greg Milburn
	University of Wyoming	WYDOT
	Laramie, WY	Cheyenne WY

Period of Study: Proposal Approved: January, 2024
Estimated Completion: September 17, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$150,000	$16,500		$166,500	$133,200	$33,300

Scope: The primary goal of this study is to:

- Prove operational system parameters to enable design of large-scale facility in Gillette (Phase 4).
- Determine range of extract properties based on differing process conditions.
- Produce extract for various stakeholders, particularly WYDOT.
- Optimize operations of solvent recycle system to minimize solvent usage and costs.
- Drive unit cost of extract down to commercially viable point.
- Find commercialization partnerships to assist with bringing products to market.

Status: This project is on time and within budget.

2.7.14 – RS06224 MASH Transitions for Box Beam and MGS Guardrail to Wyoming's 2-steel tube, 20-inch-tall Bridge Rail

Contacts:	Principal Investigator:	Project Champions:
	Roger Bligh	Bill Wilson
	Texas A&M Transportation	WYDOT
	College Station TX	Cheyenne WY

Period of Study: Proposal Approved: January 25, 2024
Estimated Completion: April 26, 2026

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$620,417	$68,246		$688,663	$550,930	$137,733

Scope: The research objective is to develop two non-proprietary approach guardrail transition systems from box beam and MGS guardrail that are MASH Test Level 3 (TL-3) compliant. The transitions will be designed to connect the guardrail systems to the Wyoming 29-inch, 2-steel tube bridge rail system. Direct connection between the transition section and bridge rail is desired to avoid use of a solid concrete parapet end that could hinder snow clearing operations. The impact performance of the transitions will be evaluated through full-scale crash testing to assess MASH compliance. Implementation of MASH compliant transition will enhance safety on Wyoming roads.

Status: This project is on time and within budget.

2.7.15 – RS07224 Developing a Prototype System for Measuring Intersection Sight Distances

Contacts:

Principal Investigator:	Project Champions:
Ahmed Farid	Jeff Mellor
Khaled Ksaibati	WYDOT
University of Wyoming	Cheyenne WY
Laramie WY	

Period of Study: Proposal Approved: April 16, 2024
Estimated Completion: July 8, 2027

Funding Summary:

Fiscal Year	Total Contract, Amendment and/or revision Amount	ICAP (11% above Total Contract Amount)	Other Funds	**Total Funds** (Total Contract Amount, state match, and ICAP Funding)	Breakdown of the Total Funds	
					Total Federal SP&R (80% of total contract amount)	Total State Match (20% of total contract amount)
2024	$186,048	$20,465		$206,513	$165,210	$41,303

Scope: The objective of this research is to develop a vehicle boardable prototype for WYDOT that measures ISDs in real-time.

Status: This project is on time and within budget.