2015

WYOMING DEPARTMENT OF TRANSPORTATION: RESEARCH WORK PROGRAM

WYDOT Research Center

5300 Bishop Blvd – Cheyenne, WY 82009-3340

11/14/2015

INTRODUCTION

The basic principles governing transportation research and technology investments are outline in *Title 23 of the United States Code, Chapter 5*: Research, Technology, and Education, and reinforced in Division E of the *Moving Ahead for Progress in the 21st Century Act* (MAP-21), the latest surface transportation authorization bill. *Title 23 of the United States Code, 505(a*), and *the Planning and Research Program Administration* Federal Rules, as set out in *23 C.F.R. 420.103(a)(1)* require that two percent of "the sums apportioned to a State … shall be available for expenditures by the State …" for various surveys, investigations projects, planning, development, implementation, studies, research, technology transfer activities, and training. *Title 23 of the United States Code, 505(a*) further requires "not less than 25 percent of [the 2 percent]… be expended by the State for research, development, and technology transfer activities…" and that the Federal share for state planning and research (SP&R) shall be 80 percent.

Title 23 of the Code of Federal Regulations, Sec. 420.209(a) sets out that state DOTs must:

1. Implement a research, development and technology (RD&T) work program;
2. Use all Federal Highway Administration (FHWA) planning and research funds to the maximum extent possible;
3. Implement a procedure for tracking program activities, schedules, accomplishments, and fiscal commitments;
4. Support, use, and report to the transportation research information system (TRIS) database;
5. Implement procedures to determine effectiveness of the state's DOT RD&T outputs, and facilitate peer exchanges;
6. Produce final reports which include data collection, analyses performed, conclusions and recommendations; and
7. Participate in peer exchange programs.

Subpart (c), of Title 23 of the Code of Federal Regulations, Section 420.209, requires research programs certify that their program conforms to management processes. (See Certificate attached hereto.)

Research projects which use research funds must adhere to the Wyoming Department of Transportation's (WYDOT) Mission Statement and Goals. The Mission Statement sets out that WYDOT works to "provide a safe, high quality and efficient transportation system".

WYDOT Goals are as follows:

1. Improve safety on the state transportation system.
2. Serve our customers.
3. Take care of all physical aspects of the state transportation system.
4. Improve agency efficiency and effectiveness.
5. Develop and care for our people.
6. Exercise good stewardship of our resources.

To accomplish WYDOT's mission and goals, and to remain complaint with the federal rules and regulations, the WYDOT Research Center (Center) strongly emphasizes applied research designed to solve practical problems, and assist stakeholders by taking full advantage of new technologies. The Center's staff continues to provide direction in the national research community through its participation in the Transportation Research Board (TRB), the AASHTO Research Advisory Committee (AASHTO RAC), and other technical organizations.

This report details the diversity of the Center's research involvement including the following:

Research and Development Studies

- Transportation Pooled Fund Studies - Studies which are generally 100 percent Federally funded and provided with technical input by WYDOT.
- WYDOT Studies - studies funded, directed, and sometimes performed by WYDOT personnel.
- SP&R Research – studies performed by outside entities and the funding for these projects are at an 80% Federal, 20% state mix.

Technology Transfer Activities

- Research Information Services - The Center acts as WYDOT's central location for facilitating, acquisition and distribution of technical information (publications, videos, technical expertise, etc.), through its library, electronic database and sharing capabilities with state and Federal repositories.
- Local Technology Assistance Program (LTAP) - Providing technical training and information resources for local governments and organizations through the Wyoming Technology Transfer (T^2) Center located at the University of Wyoming.

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1. 2015 Budget Summary[1]

1. SP&R Funds	$4,892,606
REVENUE	
2. SP&R RES Funds	$1,198,152
3. LTAP Special Allocation (Fund 438)	$140,000
4. FY2014 unobligated funds	$23,977
5. Carry Over Funds RES2213	$63,253
6. Total Revenues	$1,425,382
EXPENSES	
7. NCHRP	$258,329
8. TRB Correlation Service (est.)	$85,000
9. SHRP II	$97,853
10. Technology Transfer to U.W. Fund 438	$125,000
11. LTAP Funds RS01214	$22,500
12. Administrative Costs (est.)	$138,837
13. Pooled Fund	$8,000
14. State Research Projects (80% federal)	$232,062
15. ICAP funds (80% federal) (est.)	$50,000
16. Total Expenses	$1,017,581
TOTAL FY2015 FEDERAL FUNDS AVAILABLE	$407,801

LINE NUMBER EXPLANATIONS:

1. Total estimated 2015 SP&R funds.

REVENUE

2. Under *23 U.S.C. 505(b)(1),* at least 25 percent of the SPR 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, i.e., 25 percent of line 1.
3. Federal program requiring 100 percent state funding match. See Local Technical Assistance Program (LTAP) & Technology Transfer (T^2) Center summary for a complete financial breakdown.
4. Un-obligated Federal funds from previous fiscal year apportionments.
5. Carry-over funds from fiscal year 2013.
6. Summation of lines 2 through 5.

EXPENSES

7. Under *Section 124 of the 1987 Surface Transportation and Uniform Relocation Assistance Act (STURAA),* 5.5 percent of SP&R funds can be contributed to NCHRP.

1 The Wyoming Department of Transportation is under a continuing resolution and the funds set out in this budget summary are a guesstimate of the funds which will be available in fiscal year 2015.

WYDOT presently contributes the full 5.5 percent which is made up of 100 percent Federal funds. TPF-5(415).

8. The TRB Correlation Service is a pooled fund and obligated annually using 100 percent Federal funds. TRB-5(277).
9. SHRP II funds are authorized under *23 U.S.C. 510*. The planning department pays half of the amount (est. $98,000) and the Center is responsible for the other half (est. $98,000). SHR-2(015).
10. The Technology Transfer Center's funding (located at the University of Wyoming), is contracted for and obligated annually. See Technology Transfer (T^2) Center summary for financial breakdown.
11. LTAP funding, is contracted and obligated annually. See Local Technical Assistance Program (LTAP) for financial breakdown.
12. Administrative Cost summary for financial breakdown.
13. Transportation Pooled Fund Projects summary for financial breakdown.
14. Federal funds only (80% of the contracted amount). See State Research Projects summary for financial breakdown.
15. Indirect Cost Allocation Plan (ICAP) funds (an additional 8.23% added on to each contract (80 federal/20 state split).
16. Summation of lines 6 through 11.

TOTAL

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

2. National Cooperative Highway Research Program (NCHRP)

Identification: *TPF-5(415)*

Contacts: WYDOT Representative:
Tim McDowell, P.E.
307-777-4177
WYDOT Programming

Funding: $258,329.60

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), the National Cooperative Highway Research Program (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 the NCHRP. Support is voluntary and funds are drawn from the states' Federal-Aid Highway apportionment of State Planning and Research (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.

The National Cooperative Highway Research Program is 100% federally funded, requiring no state match.

3. Transportation Research Board Correlation Service (TRB)

Also known as the Core Program Services for a Highway Research, Development, and Technology Program, 2014.

Identification: TPF-5(277)

Contacts: WYDOT Representative:
Tim McDowell, P.E.
307-777-4177
WYDOT Programming

Funding: $85,000 (est.)

Scope: The Research Correlation Service of the Transportation Research Board (TRB) 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 the FHWA authorized yearly payment of the TRB Correlation Service using the FHWA-administered pooled fund mechanism. Starting in FY1995, the FHWA allowed the TRB correlation service charge to be paid at 100% federal funding, requiring no state match.

4. Strategic Highway Research Program (SHRP II)

Identification: SHR-2(015)

Contacts: WYDOT Representative:
Tim McDowell, P.E.
307-777-4177
WYDOT Programming

Funding: $97,852.12

Scope: The second Strategic Highway Research Program (SHRP 2) was authorized by Congress to address some of the most pressing needs related to the nation's highway system: the high toll taken by highway deaths and injuries; aging infrastructure that must be rehabilitated with minimum disruption to users; and congestion stemming both from inadequate physical capacity and from events that reduce the effective capacity of a highway facility. These needs define the four research focus areas in SHRP 2:

- The Safety area is conducting the largest ever naturalistic driving study to better understand the interaction among various factors involved in highway crashes—driver, vehicle, and infrastructure—so that better safety countermeasures can be developed and applied to save lives.
- The Renewal area is developing technologies and institutional solutions to support systematic rehabilitation of highway infrastructure in a way that is rapid, presents minimal disruption to users, and results in long-lasting facilities.
- The Reliability area is developing basic analytical techniques, design procedures, and institutional approaches to address the events—such as crashes, work zones, special events, and inclement weather—that result in the unpredictable congestion that makes travel times unreliable.
- The Capacity area is developing a web-based tool to provide more accurate data and collaborative decision-making in the development of new highway capacity in order to expedite the provision of that capacity while simultaneously addressing economic, community, and environmental objectives associated with new construction.

SHRP 2 is administered by the Transportation Research Board of the National Academies under a Memorandum of Understanding with the Federal Highway Administration and the America Association of State Highway and Transportation Officials.

5. Technology Transfer Center (T2) at University of Wyoming

Identification: *LTAP(015)*
LTAP(016)
FUND 438

Contacts:	Principal Investigator:	WYDOT Representative:
	Khaled Ksaibati, P.E., Ph.D	Tim McDowell, P.E.
	307-766-6230	307-777-4177
	University of Wyoming	WYDOT Planning

Funding Summary:

Code	*Funds*	*State Portion*	*Federal Portion*	*Budgeted 2014*
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 (T^2) Centers to transfer research findings and new technology to the local-level end-user. T^2 Centers have been established in each state to provide information, advice, and training to local agencies, with Wyoming's T^2 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; counties (Wyo. Stat. 24-2-110); cities and towns (Wyo. Stat. 39-17-111(d)(iii)(A)); and the University of Wyoming in an annual amount no 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.

6. Local Technical Assistance Program (LTAP) at University of Wyoming

Identification: *RS01(215)*

Contacts:	Principal Investigator:	WYDOT Representative:
	Khaled Ksaibati, P.E., Ph.D	Tim McDowell, P.E.
	307-766-6230	307-777-4177
	University of Wyoming	WYDOT Planning

Funding Summary:

Code	*Funds*	*State Portion*	*Federal Portion*	*Budgeted 2014*
RS01(215)	Federal		$30,000	
	State Match	$7,500		
Total		$7,500	$30,000	$37,500

Scope: The Technology Transfer Center (T^2) is part of the Federal Highway Administration's Technology Transfer Program. The T^2 Center transfers research findings and new technology to the local-level end-user. T^2 Centers have been established in each state to provide information, advice, and training to local agencies, with Wyoming's T^2 Center being established in 1985 at the University of Wyoming.

7. Administration of Research

Identification: *RES2215*

Contacts: WYDOT Representative:
Enid White, Research Manager
307-777-4182
WYDOT Research Center

Funding Summary: *(Project RES2215, Activity RES0)*

Title	*State Portion*	*Federal Portion*	*Budgeted 2015*
Research Proposal Development	$1,000	$4,000	$5,000
Research Printing	$100	$400	$500
Research Office Supplies	$100	$400	$500
Vehicle Usage	$150	$600	$750
Research Library Materials	$200	$800	$1,000
RAC Administration	$100	$400	$500
Research Presentation	$10,000	$40,000	$50,000
Travel	$854	$3,416	$4,270
National RAC Meeting	$70	$280	$350
Employee Time Charges and Leave	$14,107	$56,427	$70,534
Contract Management and Misc Professional Fees	$800	$3,200	$4,000
TOTAL	$27,480	$109,923	$137,404

8 - Pooled Fund Projects Funding Summary

	Obligated 1995-2010	Obligated 2011	Obligated 2012	Obligated 2013	Obligated 2014	Obligated 2015	Total Obligated
TPF-5(054) Development of Maintenance Decision Support System (Closed)	**$200,000**		**$25,000**		**$25,000**		**$250,000**
TPF-5(145)Western Maintenance Partnership (Closed)	**$10,000**						**$10,000**
TPF-5(177) Improving Resilient Modulus Test Procedures for Unbound Materials	**$40,000**						**$40,000**
TPF-5(189) Enhancement of Welded Steel Bridge Girders Susceptible to Distortion-Induced Fatigue	**$75,000**						**$75,000**
TPF-5(193) Midwest States Regional Pooled Fund Project	**$295,000**	**$65,000**					**$360,000**
TPF-5(218) Clear Roads Winter Highway Operations Pooled Fund (continued from TPF-5(092)	**$50,000**	**$75,000**					**$125,000**
TPF-5(253) Member-level Redundancy in Built-up Steel Members		**$75,000**					**$75,000**
Solicitation 1265 Testing Unmanned Aircraft for Roadside Avalanche Control							**$0.00**
Solicitation 1378 – 11th Annual International Conference on Low Volume Roads and Peer Exchange						**$8,000**	**$8,000**
Total	**$670,000**	**$215,000**	**$25,000**		**$25,000**	**$0.00**	**$935,000**

Notes: Pooled Fund research projects are generally100% federal funds.

8.1 – TPF-5(054)

Development of Maintenance Decision Support System

Contacts:

Lead Agency Contacts:
Dave Huft
South Dakota DOT
605-773-3358

Investigator:
Leono@meridan-enviro.com

WYDOT Representative:
Jeff Frazier, P.E.
Field Operations, WYDOT
5300 Bishop Blvd.
Cheyenne WY 82002
307-777-4052

Period of Study: Proposal Approved: July 2005
Estimated Completion: September 2013

Scope: The purpose of this study was to develop a system capable of integrating accurate weather forecasts, road condition reports, and maintenance resource information so proactive maintenance decisions can be made before and during adverse weather events, resulting in a higher level of service, reduced operational costs, and safer highway conditions.

Status: Each district in Wyoming has several roads with MDSS sites and is using the information gathered as a tool in determining snow removal procedures. The software being developed for commercial use has many variables allowing each user state to input equipment and chemical parameters available for each road condition and the software will generate snow removal recommendations for that condition. Unfortunately, due to the lack of funding only a few roads in Wyoming are currently benefitting from this study. Additional funding of $25,000 was approved for 2012 but was never obligated. These funds will come from the 2014 budget.

This Project is closed.

8.2 – TPF-5(145)

Western Maintenance Partnership

Contacts:

Lead Agency Contacts:
Michael Fazio
Utah DOT
Mfazio@utah.gov
801-957-8595

Daniel Hsiao
dhsiao@utah.gov
801-386-4929

WYDOT Representative:
Jeff Frazier, P.E.
Field Operations, WYDOT
5300 Bishop Blvd.
Cheyenne WY 82002
307-777-4052

Period of Study: Proposal Approved: 2006
Estimated Unknown

Scope: In the 1980's, the Rocky Mountain Maintenance Tour established a highly effective forum for the exchange of information, techniques, policies and strategies for the maintenance of the highway system. Since that time, the role of maintenance as a critical element in the overall management of the state highway infrastructure has increased. Most maintenance managers have been completely replaced since the discontinuance of the Rocky Mountain Maintenance Tour. The primary focus has also shifted from new construction and major rehabilitation to more attention to infrastructure preservation and asset management via cost effective maintenance. Reactive maintenance alone is not adequate to overcome the challenges of rapid deterioration of roads, considering aging of the infrastructure and growing economic constraints.

The Western Maintenance Partnership (WMP) will pool the efforts of the participating agencies to provide a focused look at maintenance, and will partner with the Western Associate of State Highway and Transportation Officials (WAASHTO) states to share experiences, innovations, expertise and solutions to the complex management of highway assets. Maintenance issues include policies, practices, specifications, field investigations, applied research, materials, and training. It is expected that a roundtable and a sharing of field experience via hands on demonstration of features will be key elements of the annual meetings.

Status: The final report was filed in May of 2014.

8.3 – TPF-5(177)

Improving Resilient Modulus Test Procedures for Unbound Materials

Contacts:

Lead Agency Contacts:
Mike Moravec
FHWA
Office of Pavement Technology
202-366-3982
Mike.Moravec@FHWA.dot.gov

WYDOT Representative:
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5300 Bishop Blvd.
Cheyenne WY 82002
307-777-4070

WYO TAC Member:
Louis Maillet
Materials Lab, WYDOT
5300 Bishop Blvd.
Cheyenne WY 82002

Period of Study: Proposal Approved: January 2007
Estimated Completion: Unknown

Scope: To reduce the variability currently associated with resilient modulus testing of unbound materials; to conduct a precision and bias study of the test procedure; and, to provide assistance to states to properly equip and setup a laboratory for successful MR testing.

This pooled fund study has three primary goals:

1. To reduce the variability currently associated with resilient modulus testing of unbound materials.
2. To conduct a precision and bias study of the test procedure.
3. Provide assistance to states to properly equip and setup a laboratory for successful MR testing.

Status: The E-Portal for this project can be found at www.resilientmodulus.com. Webinars for this project have been developed. No work was completed in FY2014.

8.4 – TPF-5(189)

Enhancement of Welded Steel Bridge Girders Susceptible to Distortion-Induced Fatigue

Contacts:

Lead Agency Contact:
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785-291-3844

Investigator:
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WYDOT Representative:
Keith Fulton, P.E.
WYDOT Bridge
5300 Bishop Blvd.
Cheyenne WY 82002
307-777-4427

Period of Study: Proposal Approved: April 2008
Estimated Completion: August 2013

Scope: A large number of steel bridges within the national inventory are affected by distortion-induced fatigue cracks. Repairs for this type of failure can be very costly, both in terms of direct construction costs and indirect costs due to disruption of traffic. Furthermore, physical constraints inherent to connection repairs conducted in the field sometimes limit the type of technique that may be employed. The goal of the proposed research is to investigate the relative merit of novel repair techniques for distortion-induced fatigue cracks.

Status: Weekly research group meetings have continued to take place. The contract is in force, and operating on an end date of August 31, 2013. The angles with backing plate retrofit are performing well under demanding fatigue loading in the 30 foot bridge setup. Some crack propagation has been noted while the retrofit is in place, however, it should be noted that the retrofit thus far has been applied over cracks that either had no crack-arrest holes, or very small crack-arrest holes (1/4 inch diameter). Testing taking place this quarter will include slightly larger crack-arrest holes (1/2 inch diameter) for the cracks that did reinitiate through the 1/4 inch diameter crack arrest holes. Additionally, a crack was found to have formed in a cross-frame tab plate, indicating that the angles with backing plate retrofit was capable of protecting the web gap to the extent that a significant crack was forced to a less sensitive region.

8.5 – TPF-5(193)

Midwest States Regional Pooled Fund Project

Contacts:

Lead Agency Contact:
Jodi Gibson
Nebraska Department of Roads
402-479-3687

WYDOT Representatives:
Keith Fulton, P.E.,
WYDOT Bridge
307-777-4427

Bill Wilson, P.E.
WYDOT Engineering Services
5300 Bishop Blvd.
Cheyenne WY 82001
307-777-4216

Period of Study: Start Date: October 17, 2006
Estimated Completion: June 2016

Scope: To crash test highway roadside appurtenances to assure that they meet criteria established nationally.

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 Webpage (http://www.pooledfund.org/Details/Study/418).

8.6 – TPF-5(218)

Clear Roads Winter Highway Operations Pooled Fund (continued from TPF-5(092))

Contacts:

Lead Agency Contact:
Debra Fick
Minnesota Department of Transportation
deb.fick@dot.state.mn.us
Phone: 651-366-3759

WYDOT Representative:
Cliff Spoonemore, P.E.
WYDOT Maintenance
5300 Bishop Blvd.
Cheyenne WY 82001
307-777-6377

Period of Study: Proposal Approved: October 2006
Estimated Completion: Ongoing

Scope: The Clear Roads pooled fund project began in 2004 with four members and a focus on real world testing of winter maintenance materials, methods and equipment. During its five years of funding and overseeing research projects, the pooled fund grew to include fourteen member states funding two or three research projects annually. As the group grew, however, there was much interest in expanding the project scope to include more technology transfer and direct support for staff in the field. The group proposes to close the original pooled fund project (TPF-5-092) and requested funding and support for a new Clear Roads project with this solicitation. See the Clear Roads Web site at www.clearroads.org for both the history and latest information on this project.

This new Clear Roads pooled fund project will maintain its focus on advancing winter highway operations nationally but will include a more pronounced emphasis on state agency needs, technology transfer and implementation. State departments of transportation are aggressively pursuing new technologies, practices, tools and programs to improve winter highway operations and safety while maintaining fiscal responsibility. This pooled fund is needed to evaluate these new tools and practices in both lab and field settings, to develop industry standards and performance measures, to provide technology transfer and cost benefit analysis and to support winter highway safety. This project responds to research and technology transfer needs not currently met by other pooled fund projects. Existing partners make every effort to coordinate with other agencies to avoid duplication of efforts and to encourage implementation of results.

Status: The WYDOT RAC voted to not fund this project in 2015.

8.7 – TPF-5(253)

Member Level Redundancy in Built-up Steel Members

Contacts:

Lead Agency Contact:	WYDOT Representative:
Indiana DOT	Keith Fulton, P.E.
Division of Research	WYDOT Bridge
Tommy Nantung	5300 Bishop Blvd
tnantung@indot.in.gov	Cheyenne WY 82002
Phone: 765-463-1521 ext 248	307-777-4427

Period of Study: Proposal Approved: January 2011
Estimated Completion: Unknown

Scope: The objective of this research project is to quantify the redundancy possessed by built-up members. For example, a riveted built-up member will not typically "fail" if one of the components fractures. However, there is very little experimental data which is available to quantify the remaining fatigue life or strength of a member in which one of the components has failed. Furthermore, if built-up members are located in bridges classified as fracture critical, when significant member redundancy can be shown the bridge may not need to be classified as FC. However, doing so would release these members from the more rigorous arms-length inspection currently required. As a result, should a component fail, it may go undetected for an extended interval. Thus, a portion of the project is devoted to setting rational inspection intervals for these members. Lastly, the advantages of using built-up members fabricated with HPS components fastened using HS bolts in new construction will also be explored.

Status: Received repaired actuator; assembled second test setup - actuators mounted, and calibrated; received first set of bolted built-up specimens; material tests completed for specimen component material; completed fatigue testing of the following specimens; ordered and received additional flange angle and cover plate material for 46 inch specimen; assembled specimen 46-3 using new cover plate and flange angle in conjunction with welded top flange and web from specimen 46-1; prepared for interim progress meeting in October; and continued work on FE analysis. FE Models using built-up riveted plates have been created and are being compared with experimental data.

9 - State Research Projects Funding Summary (Obligated)

Project Number	*Title*	Contract Amount	Obligated 1995-2012 80% Fed/ 20% State	Obligated 2013 80% Fed/ 20% State	Obligated 2014-2015 80% Fed/ 20% State	Estimated ICAP Funds (8.23% total contract) 80% Fed/ 20% State
RS03(209)	Implementation of the Mechanistic-Empirical Pavement Design Guide in the Wyoming Department of Transportation	$404,972	$279,000	$125,972		$33,329
RS04(211)	Investigation of Silica Fume Concrete Bridge Deck Overlay Failures	$129,500	$137,689			$10,658
RS06(211)	Comprehensive Technology Assessment for Avalanche Hazard Management: Developing and applying an avalanche hazard technology optimization process to a case study on U.S. Route 189-191, in Hoback Canyon, Wyoming	$344,428		$318,660	$54,115	$28,347
RS11(211)	Trapper's Point Wildlife Crossing Study	$139,887	$151,396			$11,509
RS03(212)	Structural Health Monitoring of Highway Bridges Subjected to Overweight Trucks, Phase I – Instrumentation and Validation	$151,923		$143,453	$21,992	$12,503
RS04(212)	Evaluation of a Mitigation Site: Amphibian Population	$86,562	$93,686			$7,124
RS05(212)	Evaluating the Effects of Deer Delineators on Wildlife-Vehicle Collisions in Northwest Wyoming	$234,303	$91,456	$162,131		$19,283
RS06(212)	Evaluating the Risk of Alkali-Silica Reaction in Wyoming: Continued Evaluation of Field Specimens, Proposed Mitigation Strategies and Improving Existing ASTM Standards	$103,283	$111,783			$8,500
RS07(212)	Jackson South Snow Supporting Structures Proposed Performance and Health Monitoring of WYDOT Project No. N104085, Teton County, Jackson, Wyoming	$104,566		$113,172		$8,606
RS08(212)	Multi-Measure Performance Assessment and Benchmarking of the Divisions of the Wyoming Highway Patrol	$173,452	$71,639	$116,089		$14,275
RS01(213)	Developing a Database and Web Viewing Tool for Ungulate Migration in Wyoming	$152,677		$165,242	$112,384	$12,565
RS04(213)	Characterization of Material Properties for Mechanistic Empirical Pavement Design in Wyoming	$317,759		$149,881	*$194,252	$26,374

Project Number	*Title*	Contract Amount	Obligated 1995-2012 80% Fed/ 20% State	Obligated 2013 80% Fed/ 20% State	Obligated 2014-2015 80% Fed/ 20% State	Estimated ICAP Funds (8.23% total contract) 80% Fed/ 20% State
RS05(213)	A Literature Review of Approach Slab and Its Settlement for Roads and Bridges in Wyoming	$69,466		$52,509	$22,675	$5,717
RS06(213)	Wyoming Low Volume Roads Traffic Volume Estimation	$148,945		$54,155	$107,049	$12,258
RS02(214)	Developing an Effective Shoulder and Centerline Rumble Strips/Stripes Policy to Accommodate All Roadway Users	$89,672			$97,052	$7,380
RS03(214)	Assessment and Evaluations of I-80 Truck Loads and Their Load Effects	$206,931			$223,962	$17,031
RS04(214)	Developing Wyoming Specific Bridge Deterioration Models for Bridge Management	$82,973			82,973	$6,829
RS05(214)	Safety Effectiveness of Regulatory Headlights Signs in Wyoming	$95,592			$95,592	$7,868
RS02(215)	Evaluating Effectiveness of Fly Ashes to Mitigate ASR	$65,975			$65,975	$5,430
RS03(215)	Planning-supporting for Mitigation of WVC and Highway Impact	$29,201			$29,201	$2,403
RS04(215)	SHRPII – Safety IAP	$126,835			$126,835	$10,439
TOTAL		$3,258,902	$71,639	$651,048	$851,314	$268,428
	Federal	$2,607,122	$57,311	$520,838	$681,051	$214,742
	State	$651,780	$14,328	$130,210	$170,263	$53,685

9.1 – RS03(209)

Implementation of the Mechanistic-Empirical Pavement Design Guide in the Wyoming Department of Transportation

Contacts:

Principal Investigator:
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Champaign, IL 61820
207-356-4500

WYDOT Representative:
Bob Rothwell. P.E.
WYDOT Materials Lab
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4071

Period of Study: Proposal Approved: January 2009
Estimated Completion: March 2013
Revised Completion Date: August 2014
Second Revised Completion Date: September 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$404,972	2009-2012 2013	$223,200 $100,778	$80,994.40	$33,329.20	$0.00

Scope: Implement the Interim AASHTO Mechanistic-Empirical Pavement Design Guide and prepare a design manual of recommended procedures for WYDOT.

Status: A project meeting was held to exchange information between the project team and the Wyoming DOT to review the principles of the Mechanistic-Empirical Pavement Design Guide, its input requirements and model calibration data needs, and the resources required to implementing and using it on a day-to-day basis in Wyoming. A no cost time extension was approved until November 2011. A second time extension was granted until September 30, 2014. Additional funding was provided for this project in FY2013. A final time extension was granted in 2014, which granted the project an additional year to complete the project.

9.2 – RS04(211)
Investigation of Silica Fume Concrete Bridge Deck Overlay Failures

Contacts:

Principal Investigator:
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KB Engineering
1716 Capital Avenue
Cheyenne, WY 82001

WYDOT Representative:
Robert Rothwell, P.E.,
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5300 Bishop Blvd
Cheyenne WY 82001
307-777-4071

Period of Study: Proposal Approved: April 2011
Estimated Completion: August 2012
Revised Contract: April 2014

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$127,856	2011	$102,284.80	$25,571.20	$10,522.55	$0.00

Scope: Identify the failure mechanisms and root causes of Silica Fume Concrete (SFC) overlay distress and failures. Make design, materials, and construction recommendations to improve SFC overlay designs.

Status: The lab testing portion was behind schedule due to delays in construction and debugging of the specialized testing equipment. The equipment has been debugged and lab testing of concrete bridge deck overlay mixture has begun. Due to the delay and personal issues, the contract was extended to April 30, 2015.

9.3 - RS06(211)

A Comprehensive Technology Assessment for Avalanche Hazard Management: Developing and applying an avalanche hazard technology optimization process to a case study on US Route 189-191 in Hoback Canyon, Wyoming

Contacts:

Principal Investigator:
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83 El Camino Tesoros
Sedona, Arizona 86336
928-202-8156

WYDOT Representative:
John Eddins, P.E.,
District 3, District Engineer
Rock Springs, WY 82902-1260
307-352-3031

Period of Study: Proposal Approved: October 2012
Estimated Completion: September 2015
First Revised Contract: September 2016

Funding Summary:

Total Contract, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$344,428	2013 2014	$254,928.00 $20,614.40	$68,885.60	$28,346.42	$0.00

Scope: Develop a generic, broadly applicable, structured process to optimize the choice of avalanche hazard management methods and technology for a given roadway application, including an assessment of the state-of-the-art TAS O'BELLX portable, remotely operable gas blaster for active avalanche control.

Status: The Buy America Waiver, which approved Federal funds to be used to purchase the TAS O'BELLX gas blaster, took over a year to be finalized and delayed the project. The TAS OBELLX has been installed and test fired. The project was extended to 2015.

9.4 – RS11(211)
Trapper's Point Wildlife Crossing Study

Contacts:

Principal Investigator:
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Chad LeBeau
Western Ecosystems Tech, Inc
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Laramie, WY 82070

WYDOT Representative:
John Eddins, P.E., DE,
District 3;
Rock Springs
307-352-3031

Thomas Hart
Environmental Services
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4495

Period of Study: Proposal Approved: August 2011
Estimated Completion: September 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$139,883	2011	$111,906	$27,976.60	$11,512.37	$5,000

Scope: Determine how mule deer and pronghorn respond to newly-constructed underpasses and overpasses; and how many animals use each type of structure.

Status: The cameras are operational and data is being collected; all photos have been entered into the Access Database, and the winter and migration databases have been merged.

9.5 – RS03(212)

Structural Health Monitoring of Highway Bridges Subjected to Overweight Trucks, Phase I – Instrumentation and Validation

Contacts:

Principal Investigator:
Richard J. Schmidt, Ph.D.
University of Wyoming
Laramie, WY 82071

WYDOT Representative:
Keith Fulton, P.E.
WYDOT Bridge
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4427

Period of Study: Proposal Approved: June 2012
Estimated Completion: July 2014
Revised Contract: December 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$152,863	2012 2012	$54,074 $68,216.40	$30,572.60	$12,580.62	$0.00

Scope: Develop, install, and operate a field instrumentation package for structural health monitoring (SHM) of bridges subjected to overweight trucks and to correlate field performance data to the behavior of the bridges predicted by analysis and rating software.

Status: Developed packaging, protection and repair mechanism; developed instrumentation package; working on data collection, processing, and transmission capabilities; and studying the behavior of the FBG sensor.

9.6 – RS04(212)

Evaluation of a Mitigation Site: Amphibian Population

Contacts:

Principal Investigator:
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Fort Collins, CO 80526
970-226-9474

WYDOT Representative:
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Environmental Coordinator
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4364

Period of Study: Proposal Approved: May 2012
Estimated Completion: May 2014

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$86,562	2012	$69,249.60	$17,312.40	$7,124.05	$0.00

Scope: Quantify the success of a successful mitigation site for amphibian species and compare the results between other wetland mitigation sites. The results will provide information for future mitigation efforts in this and similar types of habitat and provide evidence of successful wetland mitigation efforts.

Status: Field crews were deployed in April of 2013 to catch early spring breeding activity. Photo points were established at 10 identified sites; automated recording units were placed at 4 focal sites; and auditory records were made throughout the season of frog and bat calls. Capture and recapture data was taken. The contract has been extended until May of 2015.

9.7 – RS05(212)

Evaluating the Effects of Deer Delineators on Wildlife-Vehicle Collisions in Northwest Wyoming

Contacts:

Principal Investigator:
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Teton Science Schools
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Jackson, WY 83001
307-734-3740

WYDOT Representative:
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WYDOT District 5
Basin WY
307-568-3425

Period of Study: Proposal Approved: August 2012
Estimated Completion: June 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$234,303	2013 2014	$73.164 $14,278.40	$46,806.60	$19,283.14	$0.00

Scope: This study will provide much needed data on deer delineator efficacy as a Wildlife-Vehicle Crash mitigation tool.

Status: Identified mule deer migration corridors and seasonal ranges; analyzed deer behavior in relation to roadways; identified mule deer road crossing hotspots and environmental variables associated with high likelihood of crossing; and analyzed mule deer habitat use in relation to roadways and other environmental variables.

9.8 – RS06(212)

Evaluating the Risk of Alkali-Silica Reaction in Wyoming: Continued Evaluation of Field Specimens, Proposed Mitigation Strategies and Improving Existing ASTM Standards

Contacts:

Principal Investigator:
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Associate Professor
University of Wyoming
Laramie, WY 82071
307-766-2073

WYDOT Representative:
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WYDOT Materials Lab
Cheyenne WY 82002
307-777-4071

Period of Study: Proposal Approved: September 2012
Estimated Completion: August 2014

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$103,283	2012	$82,626.40	$20,656.60	$8,500.19	$0.00

Scope: This study builds on a comprehensive test program of a suite of eight aggregate types from pits around Wyoming, with primary focus in the Big Horn Basin. A second phase of the research evaluates the effectiveness of using fly ash as a mitigation tool in new construction. A third phase of this research repeats the C1293 testing for one inconclusive aggregate as well as considering a more rapid testing method.

Status: The contractor has begun the autoclave test results and has continued monitoring of the mitigation results. C1567 and C1260 testing has begun.

9.9 – RS07(212)

Jackson South Snow Supporting Structures Proposed Performance and Health Monitoring of WYDOT Project No. N104085, Teton County, Jackson, Wyoming

Contacts:

Principal Investigator:
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83 El Camino Tesoros
Sedona, AZ 86336

WYDOT Representative:
John Eddins, P.E.
District 3 District Engineer
307-352-3031

Period of Study: Proposal Approved: September 2012
Estimated Completion: September 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$104,566.60	2013	$83,652.80	$20,913.20	$8,605.78	$0.00

Scope: Evaluate the performance of the milepost 151 snow supporting structure installation, and provide an initial basis for development of design guidelines for future constructed snow defense measures at other locations within the western United States. The project will also design parameters and establish domestic guidance documents.

Status: After a delay due to foundation issues, the instrumentation has been placed and the project is moving forward. The instrument array is now 100% complete and functioning as intended. The project is currently on schedule.

9.10 – RS08(212)

Multi-Measure Performance Assessment and Benchmarking of the Divisions of the Wyoming Highway Patrol

Contacts:

Principal Investigator:
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Fort Collins, CO 80523-1584
970-491-4101

WYDOT Representative:
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Safety, Training and Records
Wyoming Highway Patrol
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4310

Period of Study: Proposal Approved: August 2012
Estimated Completion: February 2015

Funding Summary:

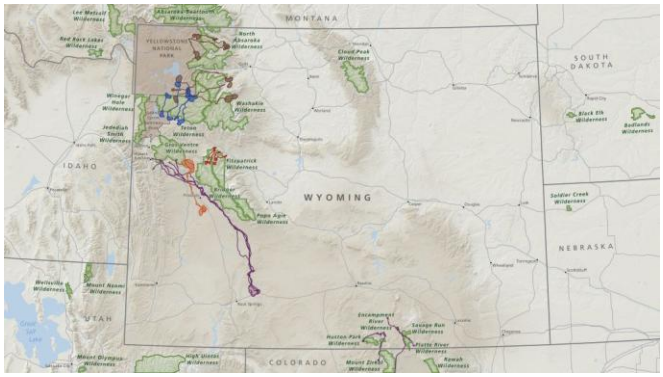
Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$173,452	2012 2013	$57,311 $81,450	$34,690.40	$14,275.10	$0.00

Scope: The research objective is to develop a Data Envelopment Analysis (DEA) based multi-measure performance assessment system that will result in the identification of the best-performing (i.e., most efficient) divisions of the Wyoming Highway Patrol. These best performing divisions can then be used as peers/benchmarks for other divisions. This should then leads to greater cost savings, greater safety benefits, and better public performance.

Status: Worked with Joe McCarthy, Captain Derek Mickelson, Captain Shawn Dickerson, and Lieutenant Tom Prichard to get answers related to data; completed the preparation of the data to be used in the first set of models; presented research at the 2013 INFORMS Annual Meeting; and continued with literature review. Due to some issues with the data, the contract was extended until March of 2015.

9.11 – RS01(213)

Developing a Database and Web Viewing Tool for Ungulate Migration in Wyoming



Contacts:

Principal Investigator:
Bill Rudd, Project Director
Wyoming Migration Initiative
Wyoming Cooperative Fish and Wildlife Research Unit
University of Wyoming
Laramie Wyoming 82071
307-369-2776

WYDOT Representative:
John Eddins, P.E.
WYDOT District 3
Rock Springs Wyoming
307-352-3031

Period of Study: Proposal Approved: November 2012
Estimated Completion: December 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$152,617	2013	$122,141.60	$30,335.40	$12,565.32	$0.00
$112,384	2015	$89,907	$22,477	$9,249	$0.00

Scope: Develop an ungulate movement database that will contain the combined research results of animal ungulate movements and develop a framework for the long term partnership and maintenance of the database for use as a decision support tool.

Status: Phase 2 of the project has begun. An additional year and $112,384 was added to the original contract. .

9.12 – RS04(213)

Characterization of Material Properties for Mechanistic-Empirical Pavement Design in Wyoming

Contacts:

Principal Investigator:
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Dr. Khaled Ksaibati, Professor
University of Wyoming
Laramie Wyoming 82071
307-766-4333
307-766-6220

WYDOT Representative:
Bob Rothwell
WYDOT Materials Program
5300 Bishop Blvd
Cheyenne WY 82009

Period of Study: Proposal Approved: March 2013
Estimated Completion: December 2016

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$317,759	2013 2014 2015	$119,905 $80,000 $54,302	$63,551.80	$26,151.57	$50,010

Scope: The project is set up to characterize representative, local material properties for unbound base and subgrade layers for the mechanistic-empirical pavement design in Wyoming

Status: This project is moving along and is ahead of schedule.

9.13 – RS05(213)

A Literature Review of Approach Slab and Its Settlement for Roads and Bridges in Wyoming

Contacts:

Principal Investigator:
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Dr. Thomas Edgar
Associate Professor
University of Wyoming
Laramie Wyoming 82071
307-766-4333
307-766-6220

WYDOT Representative:
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307-777-4427

Period of Study: Proposal Approved: March 2013
Estimated Completion: December 2014

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$69,446	2013 2014	$42,007 $13,565.80	$13,893.20	$5,717.05	$0.00

Scope: Perform a literature review of the approach slab and the associated settlement problems at bridge approaches.

Status: The final report is being reviewed and this project should be finalized in 2015.

9.14 – RS06(213)
Wyoming Low Volume Roads Traffic Volume Estimation

Contacts:

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George Huntington, P.E.
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307-766-6230
307-766-6783

WYDOT Representative:
Martin Kidner
State Planning Engineer

Mark Wingate
Systems Planning Engineer
5300 Bishop Blvd.
Cheyenne WY 82009
307-777-4411
307-777-4180

Period of Study: Proposal Approved: June 2013
Estimated Completion: December 2015

Funding Summary:

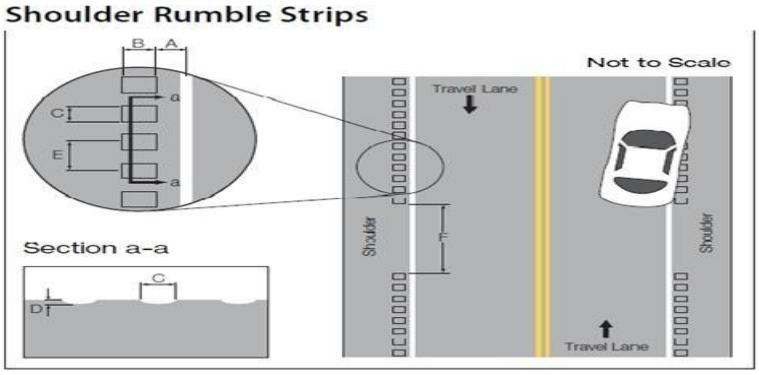
Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$148,945	2013 2013	$43,324 $75,832	$29,789	$12,285.17	$0.00

Scope: This project will develop models for estimating traffic volumes on Wyoming's rural low-volume roads.

Status: This project is in the early stages and about 10% of the tasks have been completed.

9.15 – RS02(214)

Developing an Effective Shoulder and Centerline Rumble Strip Policies to Accommodate all Roadway Users.



Contacts:

Principal Investigator:
Dr. Mohamed M. Ahmed
Dr. Khaled Ksaibati, P.E.
University of Wyoming
Laramie Wyoming 82072
307-766-6230

WYDOT Representative:
Matt Carlson
State Highway Safety Engineer
Wyoming Safety Management System Committee
5300 Bishop Blvd.
Cheyenne WY 82009

Period of Study: Proposal Approved: October 2013
Estimated Completion: December 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$89,672	2014	$70,262	$19,410	$7,380	$0.00

Scope: This project will develop recommendations, guidelines and policies for the implementation of rumble strips/stripes that ensure that there is a significant reduction of negative impact to all roadway users.

Status: The surveys in this matter have been sent out. The findings, recommendations and guidelines will be presented to the Safety Management System Committee.

9.16 – RS03(214)

Assessment and Evaluations of I-80 Truck Loads and Their Load Effects

Contacts:

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Laramie WY 82070
307-721-5070

WYDOT Representative:
Keith Fulton, P.E.
WYDOT Bridge
5300 Bishop Blvd
Cheyenne WY 82002
307-777-4427

Period of Study: Proposal Approved: October 2013
Estimated Completion: December 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$206,931	2014	$179,169.14	$41,386.20	$17,030.42	$0.00

Scope: Determine whether the FHWA requirements outlined in the September 29, 2011 memorandum are being met; the current legal loads compare to Wyoming weigh-in-motion (WIM) data and vehicles allowed by state statute; the WIM and current legal loads compare to the AASHTO LRFR Legal/Raging Loads; and the accumulative damage effects of large loads on I-80 begin to be qualified.

Status: WIM data was requested and 10 years of data was collected. Work began on the BRASS-GIRDER XML data files.

9.17 – RS04(214)

Developing Wyoming Specific Bridge Deterioration Models for Bridge Management

Contacts:

Principal Investigator:
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4110 Old Main
Logan UT
435-797-1139

WYDOT Representative:
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WYDOT Bridge
5300 Bishop Blvd
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307-777-4427

Period of Study: Proposal Approved: May 27, 2014
Estimated Completion: May 30, 2016

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$82,973	2014	$66,378.40	16594.6	$6,829	

Scope: The purpose of this study is to develop deterministic Markov based deterioration models for WYDOT bridges.

Status: This project is in the early stages and no reports have been received.

9.18 – RS05(214)

Safety Effectiveness of Regulatory Headlights Signs in Wyoming

Contacts:

Principal Investigator:
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Laramie Wyoming 82072
307-766-6230

WYDOT Representative:
Matt Carlson
WYDOT
5300 Bishop Blvd
Cheyenne WY
307-777-4195

Period of Study: Proposal Approved: July 9, 2014
Estimated Completion: June 30, 2019

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$95,592	2014	$76,473.60	$19,118.40	$7,867.22	

Scope: U.W. shall perform a synthesis of existing research studies of the dynamic message signs (DMS) safety benefits; identify and rank hotspot locations of lane departure crashes, head-on and opposite sideswipe crashes on Wyoming roadways; evaluate the safety effectiveness of daytime running lights (DRL) using Wyoming crash data for DRL-equipped and non-DRL vehicles, and motorcycles; conduct a field study on current headlight signed hotspot locations to collect data about the compliance of DRL use and the newly 24-hour low beam lights in newer vehicles; develop a plan for state wide sign implementation; conduct a cost/benefit analysis; conduct a driving simulation experiment; field test the experiment; and finalize state wide implementation and cost/benefit analysis.

Status: This project is in the early stages and no reports have been received.

9.19 – RS02(215)

Evaluating the Effectiveness of Fly Ashes to Mitigate ASR and Using Recycled Concrete Aggregate in New Construction

Contacts:

Principal Investigator:
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Laramie Wyoming 82072
307-766-2073

WYDOT Representative:
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WYDOT
5300 Bishop Blvd
Cheyenne WY
307-777-4074

Period of Study: Proposal Approved: Nov. 19, 2014
Estimated Completion: Sept. 30, 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$65,975	2015	$52,780	$13,195	$5,430	

Scope: U.W. shall conduct tests on fly ashes; evaluate moderately reactive, reactive and very highly reactive aggregates; conduct concrete prism testing; demolish blocks and make recycled concrete aggregate; and continue monitoring field specimens.

Status: This project is in the early stages and no reports have been received.

9.20 – RS03(215)

Planning-Support for Mitigation of Wildlife-Vehicle Collisions and Highway Impacts on Migration Routes in Wyoming

Contacts:

Principal Investigator:
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Morgan Graham
Holly Copeland
Teton Science Schools
Jackson Wyoming

WYDOT Representative:
Thomas Hart
5300 Bishop Blvd
Cheyenne WY 82009
307-777-4495

Period of Study: Proposal Approved: Nov. 17, 2014
Estimated Completion: Dec. 31, 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
$29,201	2015	$23,361	$5,840	$2,403	

Scope: Principal Investigators shall define ways to provide transportation planners, conservation planners, and wildlife managers with statewide information that will help them evaluate the placement of current and future wildlife vehicle mitigation measures.

Status: This project is in the early stages and no reports have been received.

10 - Completed/Closed Research Projects

Listings on the following pages are

Research Projects and Pooled Fund Projects

Completed within the last three years

COMPLETED RESEARCH PROJECTS

RS07(210) Utilizing Road Profiler Measurements in Determining the Fore Slopes of Shoulders Completion: January 2011

RS09(210) Wyoming County Road Fund Manual – Update Research Funding Proposal – Phase 2 Completion: June 2011.

RS08(210)-Comparing Crash Trends and Severity in the Northern Rocky Mountain Region

RS07(207) Performance of Reclaimed Asphalt Pavement On Unpaved Roads

RS04(209) Bridge Deck Evaluation using Non-destructive Test Methods

RS01(211) Wyoming LTAP Center 2011

RS03(211) Evaluation of the WYDOT Research Center and Research Program (Phase II)

RS08(200) Control and Prevention of Alkali-Silica Reaction in Recycled Portland Cement Concrete Pavement Using Lithium Nitrate

RS01(209) Evaluating the Effectiveness of Mule Deer Crossing Structures in Nugget Canyon

RS05(209) (DARWin-ME) Development of Software for the Design and Analysis of New and Rehabilitated Pavements Using Mechanistic-Empirical Methods

RS02(211) Preparation of Samples for the Asphalt Mixture Performance Tester (AMPT)

RS10(211) Criteria for a WYDOT Culvert Selection Policy

RS09(206) Evaluating the Risk of Alkali-Silica Reaction in Wyoming

RS03(310) Understanding Mule Deer Movement and Habitat use Patterns in Relation to Roadways in Northwest Wyoming

RS04(210) Rural Variable Speed Limit system: Phase II

RS06(210) Statewide Mesoscopic Traffic Simulation for Wyoming

RS05(211) Instrumentation and Analysis of Frost Heave Mitigation on WY-70

RS09(211) Developing a Roadway Safety Improvement Program for Indian REservations

RS02(212) Managing Risks in the Project Pipeline: Minimizing the Impacts of Highway funding Uncertainties

COMPLETED POOLED FUND PROJECTS

TPF-5(116) Investigation of the Fatigue Life of Steel Base Plate to Pole Connections for Traffic Structures Completion: August 2011

TPF-5(051) Construction of Crack Free Concrete Bridge Decks Completion: March 2010

SPR-3(072) Strength and Deformation of Mechanically Stabilized Earth (MSE) Walls

TPF-5(001) Soil Mixing Methods for Highway Applications

TPF-5(002) Updating "A Guide to Standardized Highway Lighting Pole Hardware"

TPF-5(016) Micropile Systems for Highway Bridges

TPF-5(068) Long-Term Maintenance of Load and Resistance Factor Design

TPF-5(116) Investigation of the Fatigue Life of Steel Base Plate to Pole Connections for Traffic Structures

TPF-5(151) Subsurface Drainage for Landslide and Slope Stabilization

TPF-5(002) Update to a Guide to Standardized Highway Lighting Pole Hardware

TPF-5(005) Study of Erection Issues and Composite System Behavior of the Full-Scale Curved Girder Bridge Currently Under Construction at the Turner-Fairbank Highway Research Center

TPF-5(192) Loop and Length Based Classification Pooled Fund

TPF-5(178) Implementation of the Simple Performance Tester for Superpave Validation

TPF-5(251) Relative Operational Performance of Geosynthetics used as Stabilization

2015

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