

Estimated State Planning & Research Program Part II – Research

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In cooperation with:

U.S. Department of Transportation
Federal Highway Administration

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Table of Contents

Glossary of Acronyms and Abbreviations	v
Overview	1
Research Projects	6
PROJECT DESCRIPTIONS	
SPR-396, <i>LTPP and Other Test Section Management and Evaluation</i>	7
SPR-500, <i>Aggregate Sources for Construction and Maintenance in Northern Arizona</i>	9
SPR-577, <i>Pavement Noise Study</i>	11
SPR-606, <i>Implementation of the Mechanistic-Empirical Design Guide for Arizona</i>	13
SPR-617, <i>Evaluate Effects of Snowplows and De-icing Chemicals on Rubberized Asphalt Pavements</i>	15
SPR-628, <i>Evaluation of Maintenance Strategies for ADOT</i>	17
SPR-631, <i>Evaluate Warm Mix Technology for Use in Asphalt Rubber – Asphaltic Concrete Friction Courses (AR-ACFC)</i>	19
SPR-634, <i>A Platform for Evaluating Emergency Evacuation Strategies</i>	21
SPR-651, <i>Incorporating Safety Performance into Project Design Decision Making for Cost-effective Safety Enhancements</i>	23
SPR-671, <i>Data Analysis to Measure the Effect of Socio-economic Factors and Injury Crashes in Arizona</i>	25
SPR-672, <i>Development of a Traffic Data Input System in Arizona for the Mechanistic Empirical Pavement Design Guide</i>	27
SPR-673, <i>Performing Lifecycle Cost Analysis of HPC and Developing HPC Specifications for ADOT Bridge Projects</i>	29
SPR-675, <i>Effectiveness of Young Driver Training and Graduated Licensing Laws</i>	31
SPR-677, <i>Evaluation of Measures to Promote Desert Bighorn Sheep Highway Permeability: U.S.Route 93</i>	33
SPR-679, <i>Platform for Evaluating Emergency Evacuation Strategies – Phase II</i>	35
SPR-680, <i>Development of Intersection Performance Measures for Timing Plan Maintenance Using an Actuated Controller – Phase II: Data Collection</i>	37
SPR-681, <i>Work Zone Instant Driver Warnings: Speed or Penalty Messages</i>	39
SPR-687, <i>Analysis of the State of the Art of Precast Concrete Bridge Substructure Systems</i>	41
SPR-689, <i>Performance Evaluation of a Highway Fencing Retrofit for Wildlife: Interstate 17 Munds Park to Woods Canyon</i>	43
SPR-691, <i>Development of Application Rate Guidelines for Winter Storm Management Chemical Additives in Use by ADOT through an Ambient Monitoring System</i>	45
SPR-692, <i>Development of a Comprehensive Plan to Enhance ADOT’s Pavement Management Forecasting and Decision-Making Capability</i>	47
SPR-693, <i>A Feasibility Study for Arizona’s Roadway Safety Management Process Using the Highway Safety Manual and SafetyAnalyst</i>	49
SPR-699, <i>Materials Properties and Optimum Geometries for the Design of Noise Walls</i>	51
SPR-704, <i>State-Specific Crash Prediction Models: An Arizona Needs Study</i>	53

SPR-705, <i>Specifications and Design Guide for Structural Applications of Fiber Reinforced Concrete</i>	55
SPR-706, <i>Wildlife Vehicle Collision Mitigation Study: State Route 260 – Rim to Show Low</i>	57
SPR-707, <i>Driver Attitudes on Managed Lanes/Toll Roads</i>	59
SPR-709, <i>Field Evaluation of Pilot Programs for Bridge Scour</i>	61
SPR-710, <i>Evaluation of Bighorn Sheep Overpass Effectiveness: U.S. Route 93 Long Term Monitoring</i>	63
SPR-716, <i>Evaluation of the Planning Assistance for Rural Areas (PARA) and Small Area Transportation Study (SATS) Programs</i>	65
SPR-717, <i>Impact of Arizona Highways Magazine’s Facebook Page on Tourism</i>	67
SPR-718, <i>The Role of Arizona Tribes in Transportation Decision Making</i>	69
SPR-720, <i>Addressing Work Zone Traffic Safety Issues in Arizona</i>	71
SPR-721, <i>Data Needs for Tree Removal Crash Modification Factor on Arizona State Highways</i>	73
SPR-722, <i>Geosynthetics: Specifications and Applications</i>	75
SPR-723, <i>Communication Plan for Windblown Dust</i>	77
SPR-724, <i>Arizona-specific Data for EPA’s “MOVES” Model</i>	79
SPR-725, <i>Recycled Construction Waste for Mutual Beneficial Use</i>	81
SPR-727, <i>The Impact of Research: Implementation at the Arizona Department of Transportation</i>	83
Research Support Programs	85
Current Pooled Fund Projects	89

Glossary of Acronyms and Abbreviations

Most of the acronyms and abbreviations shown in the following table are not defined in the main text of this publication. Please use this table as a reference for defining these terms.

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphaltic Concrete
ACFC	Asphalt Concrete Friction Course
ACMS	Advanced Construction and Maintenance Systems
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AHRRRC	Arizona Hospitality Research and Resource Center
AHS	Automated Highway Systems
ALISS	Accident Location Identification Surveillance System
APL	Approved Products List
AR-AC	Asphalt-Rubber Asphalt Concrete
AR-ACFC	Asphalt-Rubber/Asphalt-Concrete Friction Course
ARS	Arizona Revised Statutes
ASU	Arizona State University
ATC	Automatic Traffic Counter
ATIS	Advanced Traveler Information System
AVL	Automatic Vehicle Location: GPS-enabled technologies
BYU	Brigham Young University
Caltrans	California Department of Transportation
CCP	Communication and Community Partnerships
CCTV	Closed-Circuit TV
CIE	<i>Commission Internationale de L'Eclairage</i>
CRM	Crumb Rubber Modifier
CVISN	Commercial Vehicle Information Systems Network
DOT	Department of Transportation
DPS	Department of Public Safety
ENTERPRISE	Evaluation of New Technologies for Roads Program Initiatives in Safety and Efficiency
FHWA	Federal Highway Administration
FM	Frequency modulation
FWD	Falling Weight Deflectometer
FY	Fiscal Year
G4	A type of guard rail
GCNP	Grand Canyon National Park
GIS	Geographic Information System
GOHS	Governor's Office of Highway Safety
GPS	General Pavement Studies
GPS	Global Positioning Satellite
GTSAC	Governor's Traffic Safety Advisory Council
HAR	Highway Advisory Radio

HCRS	Highway Condition Reporting System
HMA	Hot Mix Asphalt
HMAC	Hot Mix Asphaltic Concrete
HOV	High Occupancy Vehicle
HPC	High Performance Concrete
HPS	High-Pressure Sodium
IDMS	Integrated Document Management System
IES	Illuminating Engineering Society
ISPMMS	Integrated Sign and Pavement Marking Management System
ITD	Intermodal Transportation Division
ITG	Information Technology Group
ITS	Intelligent Transportation System
IV	Intelligent Vehicle
JLBC	Joint Legislative Budget Committee
JPA	Joint Project Agreement
LOS	Level of Service
LPS	Low-Pressure Sodium
LTAP	Local Technical Assistance Program
LTPP	Long Term Pavement Performance
MAG	Maricopa Association of Governments
MH	Metal Halide
MOE	Measures of Effectiveness
MP	Milepost
MSE	Mechanically-Stabilized Earth
MPD	Multimodal Planning Division
MUTCD	Manual on Uniform Traffic Control Devices
MVD	Motor Vehicle Division
N/A	Not Applicable
NAU	Northern Arizona University
NCAT	National Center for Asphalt Technology
NCHRP	National Cooperative Highway Research Program
NOAA	National Oceanographic and Atmospheric Administration
NTCIP	National Transportation Communications for Intelligent Transportation Systems Protocol
NTPEP	National Transportation Product Evaluation Program
OGFC	Open-Graded Friction Courses
P3	Pollution Prevention Plan
PC	Personal Computer
PIJ	Project Investment Justification
PM10	Particulate Matter less than 10 microns in diameter
PM2.5	Particulate Matter less than 2.5 microns in diameter
PMS	Pavement Management System
PRIDE	Product Resource Investment Deployment and Evaluation
R&D	Research and Development
R/W	Right-of-Way
RFP	Request for Proposal

RV	Recreational Vehicle
RWIS	Roadway Weather Information System
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SGC	Sand-Gravel-Cobbles
SHRP	Strategic Highway Research Program
SHSP	Strategic Highway Safety Plan
SPR	State Planning and Research
SPS	Specific Pavement Studies
SPUI	Single-Point Urban Interchange
SR	State Route
TAC	Technical Advisory Committee
TBD	To Be Determined
TEA-21	Transportation Equity Act for the 21 st Century
TI	Traffic Interchange
TNM	Traffic Noise Model
TRB	Transportation Research Board
TTI	Texas Transportation Institute
UDOT	Utah Department of Transportation
U of A	University of Arizona
VMS	Variable Message Sign
VOC	Volatile Organic Compound
VSL	Variable Speed Limit
WASHTO	Western Association of State Highway and Transportation Officials
WIM	Weigh-in-Motion
WSDOT	Washington State Department of Transportation

Overview

The Arizona Department of Transportation (ADOT) Research Center administers all research activities associated with State Planning and Research (SPR), Part II program funding.

Research Center MISSION — To create, share, and apply knowledge in transportation systems and programs.

Research Center VISION — To excel in service to the state as a trusted information resource.

In addition to research support, the research program addresses four focus areas:

- Planning and environmental stewardship
- Safety and efficiency in operations
- Preservation and renewal of infrastructure
- Service and mobility choices

The focus areas are further defined by seven existing topic areas:

- Environment
- Intelligent Transportation Systems
- Maintenance
- Materials and Construction
- Planning and Administration
- Structures
- Traffic and Safety

The Research Center also operates the ADOT Product Evaluation Program. The review and acceptance of new products for possible use by ADOT is coordinated through this program. The Approved Products List (APL) is maintained under the Product Evaluation Program.

The Research Center houses and operates the ADOT library. The library is maintained by a full-time librarian. The library is open to ADOT employees, transportation faculty in Arizona universities, Arizona local and county transportation staff, and the public. The library catalog is available on the Internet; its collection currently includes over 33,000 entries, including over 60 journal and magazine subscriptions.

The ADOT Research Center provides descriptions and progress updates for new and ongoing projects in the Fiscal Year (FY) 2014 *Estimated State Planning and Research (SPR) Program, Part II*. There are 39 research projects and 19 research support programs in this year's work program.

The Research Support section of this document provides a brief overview of budgets outside the program of research studies.

The Research Center completed 14 final reports in FY 2013, as shown in Table 1.

TABLE 1
Fiscal Year 2013 Completed Research Projects

ID #	Title	Project Manager
SPR-577	Quiet Pavement Pilot Program: Progress Report 3	Dimitroplos
SPR-587	Evaluation of Salvage and Replanted Native Plants on ADOT Projects	Kombe
SPR-589	Determination of Section 404 Permit and Habitat Mitigation Requirements	Kombe
SPR-605-2	Investigations of Environmental Effects on Freeway Acoustics	Dimitroplos
SPR-603	Wildlife-Vehicle Collision Mitigation for Safer Wildlife Movement across Highways: State Route 260	Kombe
SPR-613	Quantifying the Impact of New Freeway Segments	Di Bugnara
SPR-626	Wildlife Accident Reduction Study and Monitoring: Arizona State Route 64	Kombe
SPR-633	Economical Concrete Mix Design Utilizing Blended Cements, Performance-based Specifications, and Pay Factors	Dimitroplos
SPR-647	Elk Movements Associated with a High-traffic Highway: Interstate 17	Kombe
SPR-650	Assessment of Desert Tortoise Movement, Permeability, and Habitat along the Proposed State Route 95 Realignment	Kombe
SPR-663	Development of Intersection Performance Measures for Timing Plan Maintenance Using an Actuated Controller – Phase I	Di Bugnara
SPR-696	A Preliminary Study of Climate Adaptation Issues for the Statewide Transportation System in Arizona	Kombe
SPR-697	Wrong-way Freeway Ramp Vehicle Detection	Ellis
TRQS-8	Assessing Leadership Influences within Public Involvement Programs for Transportation Projects: A Mixed-methods Study	Tait

Fourteen projects were cancelled during FY 2013. These projects are listed below:

SPR-604 *Real-time Adaptive Ramp Metering: Phase 2 – Implementation and Enhancement.*

SPR-648 *Crash-related Education, Enforcement, and Engineering Factors.*

SPR-653 *Arizona VII Initiative: Proof of Concept/Operational Testing.*

SPR-678 *Dynamic Routing for Incident Management.*

SPR-682 *Analysis of Freeway Bottlenecks: Capacity Reduction and Temporal Variations.*

SPR-690 *Automatic Vehicle Location (AVL) for Maintenance Work Effort Tracking: Phase 2 Integration.*

SPR-694 *Evaluation of Rural Traffic Operations Center Capabilities and Needs.*

SPR-698 *An Analysis and Optimization of Diamond Interchange Phasing.*

SPR-700 *Stormwater Enhancement Study: Upper Granite Creek, Prescott, Arizona.*

SPR-708 *Design and Implementation of an ADOT Test Intersection for New Traffic Signal Technology Evaluation — Phase 1.*

SPR-711 *An Evaluation of the Safety Effectiveness of Pavement Markings.*

SPR-712 *Quiet Pavement Pilot Project — Policy Report.*

SPR-719 *Needs-based Maintenance Budget Allocation Model.*

SPR-726 *Wrong-way Driver Notification.*

Publications

In addition to research reports, the Research Center publishes the following:

- Research Notes—Four-page summaries of select individual research reports.
- Research Center newsletter.
- Transportation Research Quick Studies—Low-cost research conducted on a compact schedule.
- Annual Implementation Report—Presentation of application of research.
- Research Program Manual—Policies and procedures governing State Planning and Research projects at the ADOT Research Center.

- Annual SPR Work Program—Annual report on research projects under way at the Research Center.
- Product Evaluation Program Annual Report—Annual report of ADOT’s Product Evaluation Program.
- Peer Exchange Reports—Reports produced as a result peer exchanges conducted at the Research Center in conjunction with the FHWA Peer-to-Peer program.

Further information on completed projects may be obtained from the project managers. Copies of the published reports and other materials may be obtained from the librarian. Reports are also available on the Internet at www.azdot.gov/research.

Telephone numbers and e-mail addresses for Research Center staff are shown in Table 2.

TABLE 2
RESEARCH CENTER CONTACT INFORMATION

Research Center Staff	Telephone	E-mail
Research Director Anne Ellis, Ph.D.	(602) 712-6910	aellis@azdot.gov
Research Project Managers Frank Di Bugnara, PE Christ Dimitroplos, PE Javier Gurrola, PE Estomih (Tom) Kombe, Ph.D., PE Dianne Kresich	(602) 712-3137 (602) 712-7850 (602) 712-6927 (602) 712-3135 (602) 712-3134	fDiBugnara@azdot.gov cdimitroplos@azdot.gov jgurrola@azdot.gov ekombe@azdot.gov dkresich@azdot.gov
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Technical Editor Evelyn Howell	(602) 712-6346	ehowell@azdot.gov
Product Evaluation Program Manager Stephanie Huang, PE	(602) 712-6430	shuang@azdot.gov
Student Intern Gwendolyn Torrens	(602) 712-3589	gtorrens@azdot.gov
Librarian Dale Steele	(602) 712-3138	dsteeler@azdot.gov

Project Descriptions

Research Projects

The *Annual Work Program* includes a description of each active project on the following pages.

Project Descriptions

SPR-396, LTPP and Other Test Section Management and Evaluation

ADVANTAGE No./Name	R0396 18P	LTPP	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Kevin Senn	Nichols Consulting	
Program Budget	\$246,000	FY Authorization	1995
Contract Amount	\$243,700	Contract Date	10/28/2005
Expenditures to date	\$146,653	Est. Completion Date	12/30/2014
Available Amount	\$99,347	Project Manager	Christ Dimitroplos
Percent complete	75%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

Since 1989, in support of the Strategic Highway Research Program, ADOT has constructed more Special Pavement Study (SPS) Test Sections than any other highway agency in the United States. In 2006, most SPS test sections were covered up with new construction or pavement preservation. Although this completed the end of the 15-20 year life cycle, all data collection was completed prior to construction or rehabilitation. This study completes the analysis portion of the collected data and finalizes it into a research quality report. A final report documenting SPS-1 has been published. A draft report analyzing the data for SPS-6 is currently being reviewed. Scheduled publication dates for the remaining sections are as follows:

SPS-6	May 2013
SPS-9B	August 2013
SPS-9A	September 2013
SPS-5	October 2013
SPS-3	January 2014
SPS-2	May 2014

RESEARCH OBJECTIVES

The objective is to complete a forensic analysis on all LTPP data to include profile analysis, falling weight deflectometer, and distress analysis. The forensic analysis will document the performance range of various pavements.

EXPECTED IMPLEMENTATION

LTPP data will be combined with ADOT's Pavement Management Services (PMS) data and then compared to pavement prediction models to better correlate pavement design. The performance results will help calibrate the new National Mechanistic Empirical pavement design method to local Arizona conditions.

Project Descriptions

STATUS OF THE RESEARCH

In June 2007, the Research Council approved the final \$150,000 to conduct full data testing and analysis of the now out-of-study sections. Evaluation reports on the SPS profiles are under way by Nichols Consulting, Inc. Final reports for all SPS profiles are due within the next 18 months.

TECHNICAL ADVISORY COMMITTEE (TAC)

Dallas Hammit	ADOT State Engineer's Office
William Hurguy	ADOT Materials Group (Sponsor)
Paul Burch	ADOT Materials Group (Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Julie Kliewer	ADOT Phoenix Construction District
Murari M. Pradhan	ADOT Regional Materials Engineer
David Burbank	ADOT Regional Materials Engineer
Chad Auker	ADOT Regional Materials Engineer
Tom Deitering	FHWA

Project Descriptions

SPR-500, Aggregate Sources for Construction and Maintenance in Northern Arizona

ADVANTAGE No./Name	R0500 20P	Aggregate Sources – Northern Arizona	
Topic/Focus	Maintenance	Safety and Efficiency in Operations	
Investigator/Agency	Jeff Swan	Swan Consulting	
Program Budget	\$112,961	FY Authorization	2005
Contract Amount	\$95,000	Contract Date	5/14/2010
Expenditures to date	\$53,766	Est. Completion Date	5/30/2013
Available Amount	\$0	Project Manager	Javier Gurrola
Percent complete	100%	Project Sponsor	J.J. Liu

PROBLEM STATEMENT

For the greater part of the interstate construction program, the Arizona Department of Transportation (ADOT) maintained the responsibility to locate acceptable aggregate sources for construction purposes. ADOT would locate sources of material, obtain all clearances and permits and perform the geotechnical analysis of the pit composition. At one time, ADOT maintained a database of over 8,000 material pits located around the state. This process made ADOT liable for material acceptability and often times resulted in claims from the contracting industry based upon misrepresentation of the character or quantity of material involved.

In more recent times ADOT turned over the material source issue to the contracting sector. The contractor currently is responsible for locating and obtaining pits for each individual construction project. This makes the contractor entirely responsible for his quality and quantity of material obtained.

Recently, material sources are becoming increasingly more difficult to find and use, even for the private sector. Many of the material sources in northern Arizona are located within reservations and the Indian nations have been less willing to allow access and use.

The lack of material availability is even affecting aggregate sources for maintenance use. There is a need to provide reliable aggregate sources for construction and maintenance activities.

RESEARCH OBJECTIVES

The objective of this research is to identify the aggregate sources available for construction and maintenance in northern Arizona and to determine by which means these sources will be used.

The following minimum tasks will be performed:

1. Conduct a literature search relevant to available aggregate sources in Arizona.
2. Canvass the construction industry and other governmental agencies to establish additional pit sources and potential options for providing aggregate sources such as regionally located designated sources and or designated locations where materials are transported to or where large aggregate crushing contracts are established to provide material sources for many projects.

Project Descriptions

3. Canvass ADOT construction and maintenance personnel for problem identification and potential solutions.
4. Determine the locations/potential locations of all available material sources in northern Arizona for use by the highway community.
5. Prepare a working paper summarizing the recommendations for providing aggregate sources for construction and maintenance purposes in northern Arizona for the next 10 years. The working paper will provide all the justification and supplemental information necessary to support the recommendations.
6. Upon approval of the recommendations submitted in Task 5, develop an implementation plan that will provide the material sources necessary for construction and maintenance operations in northern Arizona for the next ten years. The plan will specify each location, the plan for developing the site(s) and any process changes necessary to use the sources.
7. Prepare a final report documenting the efforts of the study and the conclusions and recommendations.
8. Prepare a Research Note in accordance with the Arizona Department of Transportation Research Center procedures.
9. Conduct an executive presentation to the Research Council.

EXPECTED IMPLEMENTATION

The results from this research project will establish the aggregate sources for construction and maintenance activities in northern Arizona.

STATUS OF THE RESEARCH

The remaining tasks include editing and publishing a final report.

TECHNICAL ADVISORY COMMITTEE (TAC)

Bill Hurguy	ADOT Materials Group (Champion)
J.J. Liu	ADOT Materials Group (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Allan Samuels	ADOT Construction Section
Randy Pair	ADOT Holbrook District
Chad Auker	ADOT Flagstaff District
Dale Choyeski	ADOT Materials Group
Joe Dixon	Arizona State Land Department
Mike Dennis	Arizona State Land Department
Keenan Murray	Arizona State Land Department
Tom Deitering	FHWA
Stan Robbins	Apache County DOT
Ermalinda Gene	Navajo DOT

Project Descriptions

SPR-577, Pavement Noise Study

ADVANTAGE No./Name	R0577 17P	Pavement Noise Studies	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure Planning and Environment	
Investigator/Agency	Dr. Paul Donovan	Illingworth and Rodkin	
Program Budget	\$780,000	FY Authorization	2004
Contract Amount	\$360,000	Contract Date	10/28/09
Expenditures to date	\$420,000	Est. Completion Date	6/30/2015
Available Amount	\$360,000	Project Manager	Christ Dimitroplos
Percent complete	75%	Project Sponsor	Floyd Roehrich

PROBLEM STATEMENT

Historically, noise mitigation measures used in the U.S. transportation industry have included use of barriers, walls, and separation (e.g., distance). These methods have been the only acceptable solutions for federally funded projects. Quiet pavements can also be used to mitigate noise but are not currently permitted because the Federal Highway Administration (FHWA) does not view them as a permanent solution.

In Arizona, like other states, berms and walls are the primary noise mitigation measures in the urban corridors. In April 2003, ADOT received approval from FHWA to allow the use of pavement surface type as a noise mitigation strategy. This approval allowed the use of Asphalt Rubber Friction Course (ARFC) overlays as a noise mitigation strategy when used on existing and newly constructed concrete pavements. Where this surfacing is used, ADOT receives a four-decibel reduction for the design of walls and berms. This credit equates to a six- to eight- foot reduction in wall or barrier height. Perhaps a more meaningful analogy is that if just a three-decibel reduction were achieved through the use of a quiet pavement, it would have a noise impact of about half of the actual traffic volume.

The FHWA approval was granted with the condition that Arizona be a pilot program, with specific research objectives and requirements. The required research is intended to validate the efficacy of using ARFC as a noise mitigation strategy. Since the FHWA was concerned that a pavement solution is not a permanent solution, they requested a pilot program to study the long-term performance of the ARFC overlay. ADOT committed to a long-range study for up to 10 years, the estimated minimum life cycle of the ARFC pavement.

ADOT is currently conducting research which focuses on Type 1 (source noise), Type 2 (residential neighborhood), and Type 3 (wayside noise measurement) sites.

Project Descriptions

RESEARCH OBJECTIVES

The objective of the research is to measure and compare noise generated from different pavement types over time. The effects of pavement design and pavement age will be monitored as they affect noise generation from vehicle traffic.

EXPECTED IMPLEMENTATION

The results of the research will be used in the design of future road construction projects.

STATUS OF THE RESEARCH

The project is in the second half of the 10-year study. An interim report was published in 2012. Funding will occur for the remaining years at a rate of \$140,000 per year for years 6-8 and at a rate of \$180,000 per year for years 9 and 10. A final report will be submitted when the study is complete.

TECHNICAL ADVISORY COMMITTEE (TAC)

Floyd Roehrich	ADOT State Engineer's Office (Sponsor)
Barney Remington	ADOT Environmental Planning Group
Fred Garcia	ADOT Environmental Planning Group
Thor Anderson	ADOT Environmental Planning Group(Champion)
Ali Zareh	ADOT Pavement Design
Christ Dimitroplos	ADOT Research Center (Project Manager)
Mary Frye	FHWA
Thomas Deitering	FHWA

Project Descriptions

SPR-606, Implementation of the Mechanistic-Empirical Design Guide for Arizona

ADVANTAGE No./Name	R0606 18P	Mechanistic Empirical	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Dr. Michael Darter	Applied Research Associates	
Program Budget	\$350,000	FY Authorization	2006
Contract Amount	\$255,000	Contract Date	4/22/2010
Expenditures to date	\$324,000	Est. Completion Date	3/30/2013
Available Amount	\$26,000	Project Manager	Christ Dimitroplos
Percent complete	90%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

To complete the calibration and implementation of the Mechanistic-Empirical (M-E) Design Guide for Arizona.

Task 1- Accurately calibrate the pavement performance models to local field conditions.

Task 2 - How to implement the Mechanistic-Empirical Design Guide for pavement design and performance prediction in Arizona.

Task 3- Develop a framework for performance-related specifications for Arizona.

RESEARCH OBJECTIVES

To calibrate pavement performance models to local conditions using Arizona field data. The result will enable ADOT to utilize the M-E Pavement Design Guide and develop a framework for Pavement Performance related specifications.

EXPECTED IMPLEMENTATION

The overall assessment of the utility of the Mechanistic-Empirical Design Guide calibrated for Arizona materials and conditions. Framework for pavement performance related specifications for Arizona.

STATUS OF THE RESEARCH

A draft report has been approved by the FHWA and is currently being edited for final publication.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Paul Burch	ADOT Materials (Champion)
William Hurguy	ADOT Materials (Sponsor)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Thomas Deitering	FHWA
Joe Phillips	AMEC
Scott Weinland	ADOT Materials

Project Descriptions

SPR-617, Evaluate Effects of Snowplows and De-icing Chemicals on Rubberized Asphalt Pavements

ADVANTAGE No./Name	R0617 18P	Snowplow and De-icing	
Topic/Focus	Maintenance	Safety and Efficiency in Operations	
Investigator/Agency	Kevin Senn	Nichols Consulting Engineers, Chtd.	
Program Budget	\$116,740	FY Authorization	2006
Contract Amount	\$116,740	Contract Date	3/16/07
Expenditures to date	\$80,826	Est. Completion Date	12/31/2013
Available Amount	\$35,914	Project Manager	Javier Gurrola
Percent complete	95%	Project Sponsor	Julie Klierer

PROBLEM STATEMENT

The application of de-icing chemicals to roads is a required winter maintenance method in order to maintain traffic safety. However, de-icing chemicals may have potential adverse impact on pavement surface. Most pavement surface damage results from a natural process called the freeze-thaw cycle. The freeze-thaw cycle involves moisture seeping into the cracks and surface pores and freezing. As the moisture changes to ice, it expands, which puts stress on surfaces. De-icing chemicals increase the number of freeze-thaw cycles and can also double the rate of expansion during freezing. Weak pavements may crack or pit under this added stress. There is also a question as to whether the chemicals (chlorides and anti-corrosive agents) have an effect on the asphalt and rubber in the rubberized friction course. The chemicals may speed up the natural oxidation process and shorten the pavement life. To avoid pavement damage, using a pure traction aid such as garnet sand, rather than ice melting chemicals may be an option. However, if the maintenance of a clear highway is critical, the risk of surface damage against the potential liability must be considered. In Arizona, almost all the interstate highway pavement and most of the other pavement is surfaced with a rubberized friction course. The impact of the application of de-icing chemicals on rubberized pavements is not fully understood.

RESEARCH OBJECTIVES

The objectives include: (1) using field and laboratory experiments, evaluate the effect of the application of various ice and snow melting chemicals on rubberized pavements; and (2) select the most cost-effective ice and snow melting chemical blends, and application rate and procedure, and other accompanying pavement maintenance strategies for rubberized pavements to meet the goals of both traffic safety and reducing pavement damages related to the application of de-icing.

EXPECTED IMPLEMENTATION

District maintenance groups will implement the suggestions regarding applying de-icing chemicals. Materials group can implement the new findings regarding asphalt mix.

Project Descriptions

STATUS OF THE RESEARCH

The draft report is under review prior to editing.

TECHNICAL ADVISORY COMMITTEE (TAC)

Julie Kliewer	ADOT Phoenix District (Champion/Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Chad Auker	ADOT Flagstaff District
Tom Deitering	FHWA

Project Descriptions

SPR-628, Evaluation of Maintenance Strategies for ADOT

ADVANTAGE No./Name	R0628 19P	Maintenance Strategies	
Topic/Focus	Maintenance	Safety and Efficiency in Operations	
Investigator/Agency	Steve Seeds	Applied Pavement Technology, Inc.	
Program Budget	\$115,000	FY Authorization	2007
Contract Amount	\$115,000	Contract Date	8/01/07
Expenditures to date	\$95,000	Est. Completion Date	12/31/2013
Available Amount	\$20,000	Project Manager	Christ Dimitroplos
Percent complete	95%	Project Sponsor	Bill Hurguy

PROBLEM STATEMENT

ADOT research project SPR-371, *Maintenance Cost Effectiveness Study*, studied several hundred test sections throughout Arizona in three project phases. The study phases are wearing courses (Phase I), surface treatments (Phase II), and sealer-rejuvenators (Phase III). While the project came to an end by 2005, the maintenance strategies applied still have their anticipated remaining life ranging from four to nine years. As a result, some of the goals of the SPR-371 project could not be met. Through further monitoring of those test sections, overall performance of the maintenance strategies related to environment, location, cost, availability etc. can be identified.

RESEARCH OBJECTIVES

1. Review ADOT's current maintenance strategies.
2. Document the materials (binder, admixture, aggregates etc.), gradation and volumetrics etc., used in each of the test treatment of the maintenance research project SPR-371.
3. Fully monitor the test sections constructed under maintenance research project SPR-371.
4. Evaluate performance of the maintenance strategies done in those sections.
5. Identify the effectiveness of maintenance treatments based on a matrix of cost, type of distress, location, constructability, service life, etc.
6. Develop a specific provisional guideline of effective maintenance strategies for ADOT to follow.

EXPECTED IMPLEMENTATION

ADOT maintenance groups will use the resulting information to improve their practices.

STATUS OF THE RESEARCH

The final report is being edited for publication.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Lonnie Hendrix	ADOT Central Maintenance (Champion)
Bill Hurguy	ADOT Materials Group (Sponsor)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Paul Burch	ADOT Materials Group
Sharon Gordon	FHWA

Project Descriptions

SPR-631, Evaluate Warm Mix Technology for Use in Asphalt Rubber – Asphaltic Concrete Friction Courses (AR-ACFC)

ADVANTAGE No./Name	R0631 19P	Warm Mix	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Doug Hanson	AMEC	
Program Budget	\$135,000	FY Authorization	2007
Contract Amount		Contract Date	(est. 32 months)
Expenditures to date	\$0	Est. Completion Date	6/30/2015
Available Amount	\$135,000	Project Manager	Christ Dimitroplos
Percent complete	45%	Project Sponsor	Bill Hurguy

PROBLEM STATEMENT

Many agencies are using technologies that allow a reduction in the temperatures at which asphalt mixes are produced and placed. These technologies have been labeled Warm Mix Asphalt (WMA). The immediate benefit to producing WMA is the reduction in energy consumption required by burning fuels to heat traditional hot mix asphalt (HMA) to temperatures in excess of 300° F at the production plant. With the decreased production temperature comes the additional benefit of reduced emissions from burning fuels, fumes, and odors generated at the plant and the paving site. The technology allows the production of WMA by reducing the viscosity of the asphalt binder at a given temperature. This reduced viscosity allows the aggregate to be fully coated, and compaction achieved, at a lower temperature than what is traditionally required in HMA production. There have been a number of demonstration projects in the US with a variety of mixes and binders, but little with asphalt rubber.

RESEARCH OBJECTIVES

Conduct a two-phase project to evaluate the applicability of warm mix asphalt technology to ADOT's AR-ACFC mixes.

The first phase would be principally a laboratory evaluation and review of relevant literature designed to answer the following questions:

1. Are the existing WMA technologies compatible with the asphalt rubber binders used in ADOT's AR-ACFC mixes?
2. How does ADOT's design procedure for AR-ACFC mixtures need to be modified to accommodate WMA technologies?

The second phase would be primarily a field trial with the following research objectives:

- Characterize (quantify) the potential plant production / mix lay-down savings that can be generated by using WMA technologies in AR-ACFC (e.g. energy cost reduction, reduced emissions, etc.)

Project Descriptions

- Characterize the impact of incorporation WMA technologies into AR-ACFC mixes on the surface characteristics of the mix (e.g. noise reduction capabilities, frictional characteristics, and smoothness)
- Evaluate the potential for extension of the paving window for AR-ACFC resulting from reduced paving temperatures (e.g. minimum surface temperature, paving season)

EXPECTED IMPLEMENTATION

This research has the potential to significantly reduce the plant production and placement costs due to decreases in energy costs. Materials Group will implement the findings in the form of revised specifications and test methods on future projects. Materials Group will implement any recommended changes to the AR-ACFC paving window (temperature and season).

STATUS OF THE RESEARCH

The project launching meeting was held on December 3, 2012.

TECHNICAL ADVISORY COMMITTEE (TAC)

Janet Doerstling	ADOT (Champion)
Bill Hurguy	ADOT (Sponsor)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Bob McGennis	Holly Asphalt
Joe Phillips	AMEC
Don Green	Cemex
Thomas Deitering	FHWA
John Shi	Maricopa County DOT

Project Descriptions

SPR-634, A Platform for Evaluating Emergency Evacuation Strategies

ADVANTAGE No./Name	R0634 19P	Emergency Evacuation Strategies	
Topic/Focus	Intelligent Transportation Systems (ITS)	Safety and Efficiency in Operations	
Investigator/Agency	Drs. Yi-Chang Chiu & Larry Head	University of Arizona	
Program Budget	\$100,000	FY Authorization	2007
Contract Amount	\$100,000	Contract Date	3/9/2007
Expenditures to date	\$97,824	Est. Completion Date	12/31/2013
Available Amount	\$2,176	Project Manager	Frank Di Bugnara
Percent complete	96%	Project Sponsor	Scott Nodes

PROBLEM STATEMENT

The importance of transportation resources in emergency planning and response was proven in late 2005, with Hurricanes Katrina and Rita. During these events, deficiencies in the planning and execution of evacuation strategies were apparent. The real scenarios that occurred were far from the anticipated potential scenarios. Moreover, it is clear that existing public agency tools are limited in how well they can support real-time evacuation management.

A more comprehensive resource is needed that includes network and transportation services data and simulation tools to evaluate evacuation strategies and evacuee response. It would be a tool for emergency management personnel to better plan and execute evacuation procedures.

RESEARCH OBJECTIVES

This study will develop a robust platform to create evacuation strategies for Arizona. This resource will evolve through extensive regional data collection, supporting the development of viable simulation tools. The platform will be tested with diverse scenarios, and evacuation strategies will be developed, evaluated, and validated for each scenario. Key resources for the study include a Transportation Research Board web link for transportation security and evacuation research topics, and an FHWA website on emergency operations.

EXPECTED IMPLEMENTATION

This study will develop a platform to analyze and identify the best emergency response and transportation system management strategies for a variety of crisis evacuation scenarios that are directly relevant to Arizona.

The result will be a toolkit for development of operational and effective crisis evacuation plans and management strategies as required by ADOT, and for other partner agencies across the state. It will support internal and joint exercises and planning for critical situations — both those presently anticipated, and those that may evolve in the future.

Project Descriptions

STATUS OF THE RESEARCH

The report is in final editing by the on-call editing consultant.

TECHNICAL ADVISORY COMMITTEE (TAC)

Scott E. Nodes	ADOT Traffic Group (Sponsor)
Frank Di Bugnara	ADOT Research Center (Project Manager)
Bill Hahn	Maricopa County DOT
Faisal Saleem	Maricopa County DOT
Leo Luo	Maricopa Association of Governments (MAG)
Sarath Joshua	Maricopa Association of Governments (MAG)
Gabe Thum	Pima Association of Governments (PAG)
Paul Casertano	Pima Association of Governments (PAG)
Debbie Albert	City of Glendale
Lydia Warnick	ADOT Transportation Technology Group – TOC
Romare Truely	FHWA

Project Descriptions

SPR-651, Incorporating Safety Performance into Project Design Decision Making for Cost-effective Safety Enhancements

ADVANTAGE No./Name	R0651 20P	Cost Effective Safety Enhancements	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$50,000	FY Authorization	2008
Contract Amount		Contract Date	(est. 21 months)
Expenditures to date	0	Est. Completion Date	12/31/2014
Available Amount	\$50,000	Project Manager	Javier Gurrola
Percent complete	0%	Project Sponsor	Steve Boschen

PROBLEM STATEMENT

Rigid conformity to existing policies, standards and guidelines, does not guarantee safety for the traveling public utilizing the state highway system. ADOT standards for a highway posted at 65 mph indicate a clear zone distance of 30 feet from the edge of the travel lane on level terrain with 6:1 side slopes. Typically the right of way line may be found 30 feet or more past the clear zone boundary. Within the area found between the clear zone boundary and the right of way line, a myriad of hazardous fixed objects (trees, rocks, poles, electrical boxes, etc.) are frequently struck by errant vehicles that run off the pavement edge. Preliminary Traffic HES study results indicate that a majority of Run-Off-Road accidents occur at a distance of well over 30 feet from the pavement edge. As a result, it appears that wider clear zones need to be accommodated into the expansion of the clear zone distances that ADOT uses. In addition, there may be other standards, guidelines and “rules-of-thumb” that ADOT currently uses, which need some additional evaluation as well.

RESEARCH OBJECTIVES

Research each of the existing policies, standards, and guidelines that ADOT currently uses during project development to determine whether any low-cost safety enhancements could be incorporated into any existing standards, guidelines, procedures, or policies.

EXPECTED IMPLEMENTATION

Traffic Engineering working in conjunction with other ADOT organizations will lead the search for information, results, and implementation.

STATUS OF THE RESEARCH

The project is not yet under way.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Mark Poppe	ADOT Traffic Group (Champion)
Reed Henry	ADOT Roadway Group (Champion)
Steve Boschen	ADOT State Engineer's Office (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Terry Otterness	ADOT Roadway Engineering Group
Tim Wolf	ADOT Phoenix Maintenance District
Sue Olson	ADOT Safety and Health
Mike Kies	ADOT Systems Planning and Programming
Kohinoor Kar	ADOT Traffic Group
Richard Moeur	ADOT Traffic Group
Jim Redpath	Arizona Attorney General's Office
Kelly LaRosa	FHWA

Project Descriptions

SPR-671, Data Analysis to Measure the Effect of Socio-economic Factors and Injury Crashes in Arizona

ADVANTAGE No./Name	R0671 21P	Reducing Fatalities	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$100,000	FY Authorization	2009
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	0	Est. Completion Date	12/31/2014
Available Amount	\$100,000	Project Manager	Javier Gurrola
Percent complete	0%	Project Sponsor	Mark Poppe

PROBLEM STATEMENT

In Arizona, traffic crash data is available for jurisdictions statewide; however, correlated with exposure data, such as, traffic volume data, for all segments and intersections within the State is very difficult. Therefore, some of the scientific methods of identifying candidate locations, areas, and methods cannot be utilized until the data needs are met. The problem is to analytically identify specific safety issues at various locations/areas within the State using best available data resources. This research will enable each of the five technical emphasis area teams and the communications subcommittee of the Arizona Strategic Highway Safety Plan (SHSP) in developing candidate locations/areas and to identify most effective implementation projects or programs to address the issues. The technical emphasis areas are as follows: (1) Restraint Usage, (2) Speeding, (3) Young Drivers, (4) Impaired Driving, and (5) Roadway/Roadside.

RESEARCH OBJECTIVES

The objective is to develop a data analysis methodology that will track progress and target efforts in the SHSP emphasis areas and communication outreach where they will be most effective. The process and results developed through the research will be used in developing projects and programs that will have an impact in reducing fatalities and serious injuries on all public roads.

EXPECTED IMPLEMENTATION

The research results will be utilized in the SHSP implementation.

STATUS OF THE RESEARCH

The project is not yet under way.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Kohinoor Kar	ADOT Traffic Group (Champion)
Mark Poppe	ADOT Traffic Group (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Tomi St. Mars	Arizona Department of Health Services
Linda Gorman	AAA Arizona
TBD	Arizona Governor's Office of Highway Safety
Esther Corbett	InterTribal Council of Arizona
Kelly LaRosa	FHWA
Sue Olson	ADOT Safety and Health
Matt Burdick	ADOT Communications

Project Descriptions

SPR-672, Development of a Traffic Data Input System in Arizona for the Mechanistic Empirical Pavement Design Guide

ADVANTAGE No./Name	R0672 21P	Traffic Data Input System for MEPDG	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure Safety and Efficiency in Operations	
Investigator/Agency	Dr. Michael Darter	Applied Research Associates	
Program Budget	\$150,000	FY Authorization	2009
Contract Amount	\$150,000	Contract Date	4/16/2009
Expenditures to date	\$133,738	Est. Completion Date	6/30/2013
Available Amount	\$16,262	Project Manager	Christ Dimitroplos
Percent complete	95%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

In the next five years, the Arizona Department of Transportation (ADOT) will spend \$6.5 billion in highway construction. A significant portion of that money will be used for the highway pavement structures. Traffic data is one of the key data elements required for the design/analysis of all pavement structures. Currently, the only traffic data available to the Pavement Design Section for designing Arizona pavements are: (i) Annual Average Daily Traffic (AADT) obtained from the Multimodal Planning Division, and (ii) Equivalent Single Axle Load (ESAL) data predicted by the Pavement Management Section. Since current predictions are based on an old survey, it is important that new regular data collection and periodic traffic surveys be conducted. As ADOT is getting ready to adopt the new Mechanistic Empirical Pavement Design Guide (MEPDG), the old survey data will become incompatible with the new design protocols. The MEPDG requires a major change in the way ADOT has been acquiring and compiling traffic data. For example, the MEPDG uses traffic load spectra data instead of calculating ESALs. Therefore, it is imperative that ADOT has a comprehensive traffic data input system.

RESEARCH OBJECTIVES

1. Identify the needs of various sections within ADOT in terms of traffic data specifically related to the American Association of State, Highway and Transportation Officials (AASHTO) 1993 Pavement Design Guide and the new MEPDG.
2. Evaluate the current ADOT practice in terms of obtaining, compiling, and managing traffic data.
3. Investigate the existing traffic data collection infrastructures, such as weigh in motion (WIM) stations, and determine their validity and usefulness for use with the MEPDG.
4. Develop a detailed action plan for ADOT to continuously obtain all necessary traffic data and compile that information for effective use in the MEPDG. The action plan should also include a detailed cost estimate.

Project Descriptions

EXPECTED IMPLEMENTATION

Implementation will require changes in the work done by the Data Team in MPD and changes in the final product they provide to the Materials group. Implementation would be in stages as the MEPDG is incorporated into our Pavement Design and Management processes.

STATUS OF THE RESEARCH

The report is being edited for publication.

TECHNICAL ADVISORY COMMITTEE (TAC)

William Hurguy	ADOT Materials (Sponsor)
Paul Burch	ADOT Materials (Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Ron Fregin	ADOT Materials Group
Mark Hodges	ADOT Planning Division
Douglas Eberline	ADOT Planning Division
Mark Catchpole	ADOT Planning Division
Thomas Deitering	FHWA

Project Descriptions

SPR-673, Performing Lifecycle Cost Analysis of HPC and Developing HPC Specifications for ADOT Bridge Projects

ADVANTAGE No./Name	R0673 21P	HPC Specifications for Bridges	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Tarif Jaber	JEC Inc	
Program Budget	\$175,000	FY Authorization	2009
Contract Amount	\$175,000	Contract Date	4/28/2009
Expenditures to date	\$108,000	Est. Completion Date	10/30/2013
Available Amount	\$67,000	Project Manager	Christ Dimitroplos
Percent complete	65%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

Using High Performance Concrete (HPC) on bridge decks has been found to improve concrete quality, extend service life of the structure, and reduce maintenance. Many state agencies have used HPC on bridges and have developed special specifications for implementing HPC. While there might be an increase in construction cost for using HPC on bridge projects, a lifecycle cost analysis is needed to evaluate and confirm the cost benefits of using HPC local materials and technology on Arizona bridge projects.

Successful implementation of HPC on bridges requires proper specification of materials and technology. The Arizona Department of Transportation (ADOT) does not have a specification to facilitate the successful implementation of HPC on bridges. ADOT uses HPC materials on bridge deck repair projects, but the current specification lacks the technology and the provisions to make sure HPC implementation is carried out properly and HPC benefits are achieved.

RESEARCH OBJECTIVES

1. Provide ADOT with lifecycle cost analysis needed to evaluate the benefits of using HPC on bridge projects in Arizona in hot and arid climates and under various exposure conditions found in Arizona.
2. Develop a stand-alone special provision prescriptive specification for HPC bridge decks. ADOT will use this specification to implement HPC on bridge projects in Arizona.
3. Provide an interim performance specification for use on future ADOT bridge projects. Data collected and experience gained from implementing HPC on upcoming bridge projects using prescriptive specifications will help ADOT update and finalize this interim performance specification.

Project Descriptions

EXPECTED IMPLEMENTATION

Project results shall include:

1. A prescriptive specification for implementing HPC using ADOT specification formats.
2. HPC guidelines, proposed test methods, and acceptance limits for bridges in Arizona.

STATUS OF THE RESEARCH

The project is in active status.

TECHNICAL ADVISORY COMMITTEE (TAC)

William Hurguy	ADOT Materials Group (Sponsor)
Paul Sullivan	ADOT Materials
Gregg Inman	ADOT Materials (Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Shawn Farahzadi	ADOT Construction Group
Pe-Shen Yang	ADOT Bridge Group
Aryan Lirange	FHWA

Project Descriptions

SPR-675, Effectiveness of Young Driver Training and Graduated Licensing Laws

ADVANTAGE No./Name	R0675 22P	Young Driver Training	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Rong Pan, Jing Li	Arizona State University	
Program Budget	\$200,000	FY Authorization	2009
Contract Amount	\$200,000	Contract Date	10/31/2008
Expenditures to date	\$176,469	Est. Completion Date	5/31/2013
Available Amount	\$23,531	Project Manager	Javier Gurrola
Percent complete	95%	Project Sponsor	Cydney Demodica

PROBLEM STATEMENT

Licensed drivers in Arizona ages 16 to 19 account for only 4.22% of the total drivers in 2006; yet drivers under the age of 20 account for approximately 11% of all motor vehicle crashes. According to the Arizona Department of Transportation (ADOT) Motor Vehicle Crash Facts Report for 2006, the number of drivers, under age 20, killed due to car crashes is 57 and injured 4,858, which are 10% and 11.6% of the total fatalities and injuries, respectively. These statistics indicate there is a significantly higher collision rate of young drivers compared to other age groups. Speeding and loss of control are the two major causes of vehicle crashes for this age group. Furthermore, an Allstate Foundation survey shows that among 16-year-old drivers, the leading cause of fatal crashes is driver error (77%). Arizona law does not require young drivers to take any formal training before the first driver license exam. Many high schools are eliminating driver education from their curriculum due to budget constraints and other priorities.

RESEARCH OBJECTIVES

To evaluate the current practice of young driver training programs, including available public service announcements, and to develop effective training curriculum and safe driving campaigns to improve young driver skills and attitude towards driving.

EXPECTED IMPLEMENTATION

The research results will be provided to ADOT's Motor Vehicle Division and the state legislature for their consideration of adopting new young driver training methods and potentially enhanced GDL laws.

STATUS OF THE RESEARCH

The contract expired June 30, 2012, and will not be renewed. The remaining tasks include editing and publishing a final report.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Sue Olson	ADOT Safety and Health (Champion)
Cydney Demodica	ADOT Motor Vehicle Division (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Joyce Cota	ADOT Motor Vehicle Division
Karen Harmon	ADOT Motor Vehicle Division
Larry Talley	ADOT Traffic Group
Rick Turner	ADOT Traffic Records
Mark Gotsch	AAA Arizona
Maria Wojtczak	Driving MBA
Charles Sobczak	Driving MBA
Alan Hansen	FHWA
Kelly LaRosa	FHWA
John Quartuccio	Federal Motor Carrier Safety Association
Liz Pence	Arizona Department of Administration

Project Descriptions

SPR-677, Evaluation of Measures to Promote Desert Bighorn Sheep Highway Permeability: U.S.Route 93

ADVANTAGE No./Name	R0677 21P	US 93 Bighorn Sheep Study	
Topic/Focus	Environment	Planning and Environment	
Investigator/Agency	Ray Schweinsburg	Arizona Game and Fish Department	
Program Budget	\$185,000	FY Authorization	2009
Contract Amount	\$185,000	Contract Date	02/13/2009
Expenditures to date	\$172,636	Est. Completion Date	06/30/2013
Available Amount	\$12,363	Project Manager	Tom Kombe
Percent complete	95%	Project Sponsor	Michael Kondelis

PROBLEM STATEMENT

One of the most pervasive impacts of highways on wildlife is the barrier effect that results in diminished habitat connectivity and permeability. Highways block animal movements between seasonal ranges or other vital habitats, fragment habitats and populations, reduce genetic interchange, and disrupt viable population processes. Recent research on desert bighorn sheep movements and crossing patterns adjacent to U.S.Route 93 point to the barrier created by this highway through the largest bighorn sheep populations in Arizona, as well as the impact of bighorn-vehicle collisions. U.S.93 (MP 2-17) is planned for reconstruction from a two-lane to a four-lane divided highway beginning in either late 2008 or early 2009 (actually completed in late 2010). Concerns exist that this reconstruction could further fragment bighorn habitat and contribute to increased bighorn-vehicle collisions. Wildlife passage structures have shown benefit in promoting passage for a variety of wildlife species, have reduced the incidence of wildlife-vehicle collisions, and yielded substantial economic benefit.

As such, the Arizona Department of Transportation (ADOT) plans to construct three wildlife overpasses with fencing linking the structures to promote bighorn permeability across the U.S.93 corridor. This represents a commitment on the part of ADOT and warrants thorough evaluation to assess the efficacy of overpasses in promoting permeability, particularly since few overpasses exist in North America. To assess the efficacy of the planned U.S.93 wildlife overpasses in promoting permeability, it is necessary to compute bighorn passage rates as an objective metric, comparing passage rates before (phase I; two years, before and during construction) and after construction of the planned passage structures is completed (phase II; two years, future funding). This funding request covers phase I. It is anticipated that once completed, wildlife use of the overpasses will be monitored by video surveillance.

RESEARCH OBJECTIVES

This proposed research project will add greatly to our understanding of desert bighorn sheep-highway relationships and the effectiveness of planned overpasses to promote permeability.

Project Descriptions

Specific objectives include assessing:

1. Desert bighorn sheep movement and highway crossing patterns, and calculate permeability across the highway corridor before and after overpasses are constructed.
2. Spatial and temporal relationships of bighorn highway crossing patterns to vehicular traffic volume.
3. Wildlife-vehicle collision patterns.
4. Impact of highway construction activities on bighorn sheep.
5. Wildlife use of wildlife overpasses and jump-outs.

EXPECTED IMPLEMENTATION

The results of this project will validate the benefit of overpasses in promoting bighorn permeability, and will be used by highway and wildlife departments across North America to address wildlife permeability. The results and insights will also be integrated into design concept planning for future highway reconstruction as well as new construction.

STATUS OF THE RESEARCH

The report is currently awaiting final editing and publication.

TECHNICAL ADVISORY COMMITTEE (TAC)

Michael Kondelis	ADOT Kingman District (Sponsor)
Julie Alpert	ADOT Kingman District (Champion)
Tom Kombe	ADOT Research Center (Project Manager)
Meesa Otani	FHWA
Trevor Buhr	Arizona Game and Fish Department
John Reid	U.S. Bureau of Land Management
Jim Holland	U.S. National Park Service
Ross Haley	U.S. National Park Service
Marc Maynard	U.S. Bureau of Reclamation

Project Descriptions

SPR-679, Platform for Evaluating Emergency Evacuation Strategies – Phase II

ADVANTAGE No./Name	R0679 19P	Emergency Evac Strategies – Phase 2	
Topic/Focus	Intelligent Transportation Systems (ITS)	Safety and Efficiency in Operations	
Investigator/Agency	Dr. Mark Hickman (UA), Dr. Pitu Mirchandani (ASU), Dr. Yi-Chang Chiu (UA)	University of Arizona w/ Arizona State University	
Program Budget	\$200,000	FY Authorization	2009
Contract Amount	\$200,000	Contract Date	10/26/2010
Expenditures to date	\$84,373	Est. Completion Date	12/31/2013
Available Amount	\$115,627	Project Manager	Frank Di Bugnara
Percent complete	60%	Project Sponsor	Scott Nodes

PROBLEM STATEMENT

All emergency operational planning suffers from the inability to analyze, rehearse, and exercise responses to large scale incidents. The ideal operation plan must perform from the global scale, down to the entity/individual level; however, there is no current simulation capability to reliably test those plans. Realistic field exercises are impossible due to the cost and complexity of closing roads, civilian involvement, and area safety control, among other issues. Exercises attempted in the past employed unrealistic assumptions and were confined to artificial exercise areas, resulting in limited benefits to participants and flawed “lessons learned” that may increase the risk to public safety. It is imperative that the planning process for complex operations identify command and control options, intervention techniques, and responder actions to be inserted in real time into the simulation, and enable success or failure to be analyzed accurately and in depth. Working at this level of fidelity requires real-time inputs and outputs and geo-specific inter-visibility of movements. All of this must be effective down to the entity level - a capability that does not yet exist.

RESEARCH OBJECTIVES

This project, in the absence of suitable existing tools, will build on the Arizona Transportation Research Center’s current project SPR-634, which has created a Phoenix-area database to fully employ the functionality of the new Multi-resolution Assignment and Loading of Transportation Activities (MALTA) modeling platform.

The objective is to develop a real-time, geo-specific, threat-specific simulation tool capable of replicating individual vehicle and person actions, responder actions, and unscripted operations initiatives.

Project Descriptions

EXPECTED IMPLEMENTATION

As ADOT's ability improves to examine plans that deal with large, complex operations, it will increase its capacity to better control high traffic flow durations, test and rehearse complex emergency response plans, and increase public safety. In addition to testing plans/strategies, the project will provide a tool for alleviating traffic congestion whether in new construction planning or planning for a large event.

If the developed platform works as well as anticipated, state emergency and traffic planners will make use of the models immediately as they are constructed.

STATUS OF THE RESEARCH

The PIs have not submitted a deliverable, have apparently ceased work, and have declined to request no-cost extensions. The last NCE expired December 31, 2012, and no further NCE will be approved. Project is dormant and may be cancelled. Prior to cessation, the UA and ASU teams had devised new modules for the Multi-resolution Assignment and Loading of Transportation Activities (MALTA) evacuation modeling platform. These modules simulate pedestrians, route-choice assignment (software (DynusT)). They also enhanced a Phoenix-specific Cardinals-game evacuation model and worked on incorporating a Tucson evacuation into an existing DynusT model.

TECHNICAL ADVISORY COMMITTEE (TAC)

Scott E. Nodes	ADOT Traffic Group (Sponsor)
Frank Di Bugnara	ADOT Research Center (Project Manager)
Reza Karimvand	ADOT Transportation Technology Group – TOC
Courtney Perrier-Bear	ADOT Emergency Response
Timothy Tait	ADOT Communication and Community Partnerships
Lydia D. Warnick	ADOT Transportation Technology Group – TOC
Marisa Walker	ADOT Multimodal Planning Division – CANAMEX
Debbie Albert	City of Glendale
Jeff Guthrie	Pima County Office of Emergency Management
Bill Hahn	Maricopa County DOT
Faisal Saleem	Maricopa County DOT
John Rose	Maricopa County DOT
Leo Luo	Maricopa Association of Governments (MAG)
Sarath Joshua	Maricopa Association of Governments (MAG)
Gabe Thum	Pima Association of Governments (PAG)
Paul Casertano	Pima Association of Governments (PAG)
Aichong Sun	Pima Association of Governments (PAG)
Romare Truely	FHWA

Project Descriptions

SPR-680, Development of Intersection Performance Measures for Timing Plan Maintenance Using an Actuated Controller — Phase II: Data Collection

ADVANTAGE No./Name	R0680 21P	Actuated Controller — Phase 2	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Ed Smaglik	Northern Arizona University	
Program Budget	\$75,000	FY Authorization	2009
Contract Amount	\$75,000	Contract Date	8/7/2009
Expenditures to date	\$65,448	Est. Completion Date	6/30/2013
Available Amount	\$9,552	Project Manager	Frank Di Bugnara
Percent complete	96%	Project Sponsor	Kent Link

PROBLEM STATEMENT

Limited resources are available for maintenance of traffic signal timing plans. Because of this, it is important to ensure that resources are allocated to signals and corridors in need of retiming. The Highway Capacity Manual (1) (HCM) provides methodologies for development of quantitative measures (Arrival Type, V/C ratio, delay) to aid in analysis, however preparation of these measures through traditional methods is labor intensive (turning movement counts, travel time studies), and not often feasible, especially for hours that fall outside of the typical work day (special events, Saturday at the mall, etc). Because of this, it is desirable to have an automated method to tabulate data at signalized intersections.

RESEARCH OBJECTIVES

Phase II of this research focuses on Data Collection. The Phase II objective is to develop a data collection module to interface with existing Arizona Department of Transportation (ADOT) intersections, as well as create updated standards for new and rehabilitated intersections that would enable data collection at these locations.

EXPECTED IMPLEMENTATION

As part of this project, the module will be deployed at up to three (3) representative locations. Assuming the results of Phase II are deemed practical by the TAC, Phase III would develop a desktop computer data storage and management system for collected data, and more importantly, a user-friendly interface to mine data for input into desired software analysis tools (such as Synchro, HCS+, etc.).

STATUS OF THE RESEARCH

The draft report will be in final editing by the on-call editing consultant upon the Research Center's approval of a task assignment to the selected firm.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Walter Kent Link	ADOT Flagstaff District (Sponsor)
Frank Di Bugnara	ADOT Research Center (Project Manager)
Reza Karimvand	ADOT Transportation Technology Group
Raul Amavisca	ADOT Traffic Group
Scott E. Nodes	ADOT Traffic Group
Mohamed Youssef	ADOT Traffic Group
Robert LaJeunesse	ADOT Prescott District
Ed Pressley	ADOT Prescott District
Jay L. Werne	ADOT Traffic Group
Romare Truely	FHWA

Project Descriptions

SPR-681, Work Zone Instant Driver Warnings: Speed or Penalty Messages

ADVANTAGE No./Name	R0681 19P	Speed or Penalty Messages	
Topic/Focus	Intelligent Transportation Systems (ITS)	Safety and Efficiency in Operations	
Investigator/Agency	Dr. Craig Roberts	Northern Arizona University	
Program Budget	\$62,500	FY Authorization	2009
Contract Amount	\$62,500	Contract Date	8/14/2009
Expenditures to date	\$50,000	Est. Completion Date	6/30/2013
Available Amount	\$12,500	Project Manager	Frank Di Bugnara
Percent complete	99%	Project Sponsor	Scott Nodes

PROBLEM STATEMENT

Excess speeds in construction work zones (as well as other zones, e.g., school, maintenance, etc.) cause safety problems to workers, pedestrians and vehicle drivers. Deployment of portable photo radar equipment is one current method of providing feedback to drivers as to their actual speed, but is a limited resource. Dynamic Message Signs (DMS) are often used but have no feedback capability.

RESEARCH OBJECTIVES

This research proposes to explore providing the driver with different feedback information--namely the amount of the dollar fine that would be imposed if the driver were cited for a speeding violation at the speed and location that the radar sensor measures. Comparisons would be made among (a) using speed feedback only, (b) using dollar traffic fine only, and (c) using both speed and traffic fine feedback.

EXPECTED IMPLEMENTATION

This project is expected to benefit both the public and ADOT regarding safety in zones for both workers and drivers; it is expected to provide ADOT with a potential method to improve speed reduction compliance in maintenance and construction zones. Benefits will potentially be realized with reduced speeds in work zones, which could reduce collisions. If the research is successful, then speed reduction in work (school) zones could save injury, property damage, and lives of workers and drivers. After proof of concept, a prototype(s) could be installed for more extensive field-testing, prior to statewide implementation.

STATUS OF THE RESEARCH

The draft report will be published as soon as the Research Center, acting for the PI, obtains rights and permissions for the PI's attributed use of previously published figures and tables.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

Scott E. Nodes	ADOT Traffic Group (Sponsor)
Frank Di Bugnara	ADOT Research Center (Project Manager)
Kohinoor Kar	ADOT Traffic Engineering
Madhu Reddy	ADOT Phoenix District Construction
Chuck Gillick	ADOT Flagstaff District
Dallas Hammitt	ADOT ITD Administration
Walter Kent Link	ADOT Flagstaff District
Pradeep Tiwari	ADOT MPD Roadway Inventory Management
Adam C. Umholtz	ADOT Flagstaff District
Mohamed Youssef	ADOT Traffic Group
Astrid Potter	ADOT Flagstaff District
Jeff Bauman	City of Flagstaff
Romare Truely	FHWA

Project Descriptions

SPR-687, Analysis of the State of the Art of Precast Concrete Bridge Substructure Systems

ADVANTAGE No./Name	R0687 21P	Precast Concrete Substructures	
Topic/Focus	Structures	Preservation and Renewal of Infrastructure	
Investigator/Agency	Dr. Joshua Hewes	Northern Arizona University	
Program Budget	\$25,000	FY Authorization	2010
Contract Amount	\$25,000	Contract Date	10/13/2009
Expenditures to date	\$20,000	Est. Completion Date	6/28/2014
Available Amount	\$5,000	Project Manager	Christ Dimitroplos
Percent complete	90%	Project Sponsor	Jean Nehme

PROBLEM STATEMENT

Interest in accelerated bridge construction in the United States has increased markedly in the last decade because of a desire to reduce the on-site construction time and minimize traffic impacts in the vicinity of the construction zone. One means of speeding up bridge construction is prefabrication of bridge elements including both substructure and superstructure, and in 2001 the Federal Highways Administration's (FHWA) Technology Implementation Group selected prefabrication as a technology that should be developed and implemented for bridge construction in the U.S. Precasting bridge components has the advantage of removing the forming, pouring and curing of concrete from the construction site. This in turn reduces potential impacts to the environment and total time for construction, which has the added benefit of reduced disruption of traffic surrounding the construction site. This is important because costs associated with user delays can be significant. Also improved is safety since reductions in construction schedule alleviate the potential for traffic accidents within the construction area. Precasting bridge components can also improve the quality of construction and consequently lower life-cycle costs.

Arizona is experiencing rapid growth and recently has been the fastest growing state in the United States in terms of population growth (U.S. Census Bureau 2006). This has resulted in significant increases in traffic volumes in urban areas and in the need for improved infrastructure to support the needs of the public and industry. Although development of new highway transportation links will ultimately alleviate traffic congestion, the actual construction will exacerbate the problem because of the required detours and lane and speed restrictions near the construction zone. Utilization of precast construction for bridge piers and columns in Arizona offers the many benefits described above and should be considered for implementation by ADOT. Work is needed to synthesize the available research and practice information to create practical and safe design specifications and procedures.

Project Descriptions

RESEARCH OBJECTIVES:

1. Synthesize existing information on the behavior, analysis, and design of precast substructure systems. Literature including journal publications, federal and state reports and design standards, and conference proceedings will be surveyed. A compilation of constructed bridge projects utilizing precast substructures will also be made. Experiences of other State DOTs that have pursued or implemented precast substructure systems will be collected.
2. This task will be an analysis of the existing research and technologies, and will identify concepts, standards, etc. that may be readily exportable to ADOT practice.
3. Based on Tasks 1 and 2, the steps required to implement precast substructure technology for Arizona bridges will be identified.
4. A final project report documenting Tasks 1 – 3 will be produced.

EXPECTED IMPLEMENTATION:

The information will support the development of an ADOT plan for future implementation of precast bridge substructure technology. Such a plan may include simply a modification and incorporation of existing design standards into ADOT practice.

STATUS OF THE RESEARCH

A draft report has been approved by the FHWA. The report is being edited prior to publication.

TECHNICAL ADVISORY COMMITTEE (TAC)

Jean Nehme	ADOT Bridge Group (Sponsor)
Pe-shen Yang	ADOT Bridge Group (Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Aryan Lirange	FHWA

Project Descriptions

***SPR-689, Performance Evaluation of a Highway Fencing Retrofit for Wildlife:
Interstate 17 Munds Park to Woods Canyon***

ADVANTAGE No./Name	R0689 22P	I-17 Fencing for Wildlife: Munds Park	
Topic/Focus	Environment	Planning and Environment	
Investigator/Agency	Ray Schweinsburg	Arizona Game and Fish Department	
Program Budget	\$170,000	FY Authorization	2010
Contract Amount	\$170,000	Contract Date	5/27/2011
Expenditures to date	\$41,587	Est. Completion Date	6/31/2015
Available Amount	\$128,412	Project Manager	Tom Kombe
Percent complete	30%	Project Sponsor	Justin White

PROBLEM STATEMENT

Interstate 17 is the primary route connecting Phoenix to Flagstaff and is the main artery serving northern Arizona and supporting the transport of goods along Interstate 40 to the east and west. Interstate 17 is traveled by millions of tourists each year visiting area national parks (NP) and recreation areas, including the Grand Canyon NP, Petrified Forest NP, Sunset Crater Volcano National Monument, Glen Canyon Recreation Area, etc. As Arizona continues to grow, traffic on I-17 will also increase. This stretch of highway is considered one of the highest elk-vehicle collision areas in Arizona; the majority of these collisions (97 %) occur between Stoneman Lake Road and Flagstaff. Further, I-17 is considered a very high-volume highway, and as such, is predicted to pose a significant barrier to wildlife (Mueller and Berthoud 1997). Wildlife passage structures have shown benefit in promoting passage for a variety of wildlife species, have reduced the incidence of wildlife-vehicle collisions, and yielded substantial economic benefit (Dodd et al. 2007). As such, ADOT has committed funds to support a SAFETEA-LU project that will link existing bridges and transportation interchanges to reduce elk-vehicle collisions and promote permeability across the I-17 corridor. This represents a tremendous commitment on the part of ADOT and warrants thorough evaluation to assess the efficacy of this fencing in promoting permeability, particularly since few retrofit opportunities have been attempted and can lead to future cost-savings and accident reductions for many highways throughout Arizona and the rest of the nation. Research here will also complement that ongoing on State Route 260, I-17, U.S. Route 89, State Route 64, and I-40 and will provide valuable insights into wildlife-highway interactions for a range of wildlife and approaches to mitigate highway and traffic impacts.

RESEARCH OBJECTIVES

Specific objectives include assessing:

1. Elk movement and highway crossing patterns, including calculating permeability across the highway after fencing is constructed to compare to movement patterns and permeability evaluated during pre fencing research.
2. Movements of wildlife through the bridges and transportation interchanges.
3. Wildlife-vehicle collision patterns following implementation of fencing.

Project Descriptions

EXPECTED IMPLEMENTATION

The results of this project will validate the benefit of a “retrofit” of existing structures in reducing elk-vehicle collisions while promoting elk permeability, and will be used by highway and wildlife departments across North America to address wildlife permeability. The results and insights will also be integrated into design concept planning for future highway reconstruction, as well as similar potential opportunities throughout Arizona. This project will begin immediately following the installation of SAFETEA-LU/ Flagstaff District funded elk fencing and escape mechanisms.

STATUS OF THE RESEARCH

Research continues on schedule with good progress made regarding data-collection efforts.

TECHNICAL ADVISORY COMMITTEE (TAC)

John Harper	ADOT Flagstaff District (Sponsor)
Justin White	ADOT Flagstaff District (Champion)
Tom Kombe	ADOT Research Center (Project Manager)
Chuck Howe	ADOT Environmental Services
Ray Schweinsburg	Arizona Game and Fish Department
Rebecca Swiecki/David Cremer	FHWA
Chris Fetzer	Northern Arizona Council of Governments

Project Descriptions

***SPR-691, Development of Application Rate Guidelines for Winter Storm Management
Chemical Additives in Use by ADOT through an Ambient Monitoring System***

ADVANTAGE No./Name	R0691 23P	Application Rate Guidelines	
Topic/Focus	Maintenance	Safety and Efficiency in Operations	
Investigator/Agency	Ed Latimer	AMEC Environment and Infrastructure, Inc.	
Program Budget	\$400,000	FY Authorization	2010
Contract Amount	\$398,000	Contract Date	10/18/2011
Expenditures to date	\$151,237	Est. Completion Date	12/31/2014
Available Amount	\$248,762	Project Manager	Tom Kombe
Percent complete	50%	Project Sponsor	Lonnie Hendrix

PROBLEM STATEMENT

The application of anti-icing and de-icing chemicals by ADOT has become one of their most effective winter storm management measures. It is widely known that chemical additives related to winter storm management activities can impact water quality and soil salinity. The primary factors in determining environmental impacts resulting from the use of chemical additives are the type and amount of chemicals used. An increase in the amount of chemical additive applied to a transportation corridor equates to an increased potential for additives in pavement runoff and snowmelt. Yet, the total amount of chemicals used will depend largely on the number and severity of winter storms being managed. Unfortunately, the over-application of the chemical additives can often result in environmental impacts.

RESEARCH OBJECTIVES

The desired outcome of this research is to recommend initial application rate guidelines, implement a winter storm management recordkeeping system of chemical usage and storm events along transportation corridors, and define how best to evaluate that information to minimize potential environmental impacts. The focus of the research will be to identify trends indicating the accumulation of chemicals along transportation corridors and observed or potential impacts to natural resources associated with these accumulations.

EXPECTED IMPLEMENTATION

Districts would be issued application rate guidelines for winter storm management chemical additives specific to their critical roadway segments, in both the form of a memorandum and a users' chart that specifies the application rate of the target chemical as a function of roadway and weather conditions.

Project Descriptions

STATUS OF THE RESEARCH

Three of four seasonal sampling and laboratory analysis efforts are complete. The final effort is scheduled for April/May 2013. The data analysis and report writing will follow.

TECHNICAL ADVISORY COMMITTEE (TAC)

Todd Williams	ADOT Office of Environmental Services (Champion)
Lonnie Hendrix	ADOT Maintenance (Sponsor)
Tom Kombe	ADOT Research Center (Project Manager)
Emily Christ	ADOT Office of Environmental Services
Justin White	ADOT Office of Environmental Services
Stan Tierney	ADOT Maintenance Management Services
Sandra Henson	ADOT Globe District
Rebecca Swiecki/David Cremer	FHWA

Project Descriptions

SPR-692, Development of a Comprehensive Plan to Enhance ADOT's Pavement Management Forecasting and Decision-Making Capability

ADVANTAGE No./Name	R0692 21P	Pavement Management Forecasting	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$400,000	FY Authorization	2010
Contract Amount		Contract Date	(est. 30 months)
Expenditures to date	\$0	Est. Completion Date	12/30/2016
Available Amount	\$400,000	Project Manager	Christ Dimitroplos
Percent complete	0%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

As the Arizona Department of Transportation (ADOT) approaches the second decade of this century, it is clear that the implementation of significant improvements in project development and system preservation are necessary. Historically, improvements to transportation infrastructure have directly correlated with improvements to the local, state, and national economy. To maximize asset management; to facilitate pavement design and pavement preservation; and to precisely target highway infrastructure improvements, it is critical that ADOT enhances its pavement management cross-functional interconnectivity.

The Pavement Management Section lacks the ability to support the Materials Group's new Mechanistic-Empirical Pavement Design Guide. Designers are unable to access critical information concerning pavement condition, including the extent of traffic exposure, and the type and extent of cracking. In addition, there is no existing provision that facilitates updating and distribution of critical data to the Engineering Districts. This research is expected to recommend and provide some type of software that will provide real time access to pavement condition and design data on a statewide basis, in a manner that can be readily used by Highway Development and Engineering District personnel. Implementation will result in lower costs to develop highway design strategies. Even more importantly, it will result in lower costs for the construction and maintenance of the state's highways throughout their lifecycle.

RESEARCH OBJECTIVES:

1. Review the Department's current Pavement Management System interdisciplinary data sharing functionality.
2. Identify the critical connectivity nodes and determine the relative strength or weakness of their ability to transfer the appropriate data.

Project Descriptions

3. Evaluate the performance of extant alternative systems to determine their potential to enhance the Pavement Management Section's link to ADOT's maintenance systems, the bridge systems, and the *AASHTO Mechanistic-Empirical Pavement Design Guide* requirements.
4. Implement a functional web based database that is compatible with these research objectives, and will monitor the Pavement Management organization's network optimization and interdisciplinary connectivity.

EXPECTED IMPLEMENTATION:

The project will significantly improve ADOT's pavement condition forecasting and decision making capability. It will facilitate database maintenance and data validation thereby maximizing both development and operations efficiency. Enhanced pavement preservation strategies and resource allocation will reduce transportation life cycle costs.

STATUS OF THE RESEARCH:

The project is pending advertisement.

TECHNICAL ADVISORY COMMITTEE

William Hurguy	ADOT Materials Group (Sponsor)
Yongqi Li	ADOT Materials Group(Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Mafiz Mian	ADOT Materials Group
Ron Fregin	ADOT Materials Group
Lonnie Hendrix	ADOT Maintenance
Joel Miller	ADOT Globe District
TAC Member	FHWA

Project Descriptions

SPR-693, A Feasibility Study for Arizona’s Roadway Safety Management Process Using the Highway Safety Manual and SafetyAnalyst

ADVANTAGE No./Name	R0693 23P	HSM and SafetyAnalyst	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$200,000	FY Authorization	2010
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	0	Est. Completion Date	12/31/2014
Available Amount	\$200,000	Project Manager	Javier Gurrola
Percent complete	1%	Project Sponsor	Mark Poppe

PROBLEM STATEMENT

The Arizona Department of Transportation (ADOT) needs a research study conducted on data assessment and integration requirements for implementation of the Highway Safety Manual (HSM) using SafetyAnalyst software. The study will develop the requirements for ADOT’s roadway safety management process, to include network screening, diagnosis, countermeasures selection, economic appraisal, project prioritization, and safety effectiveness evaluation.

AASHTO has identified 13 lead states and ADOT has been selected as one of eight support states for initial implementation of the HSM. Tools and methods recommended in the HSM are heavily data driven. SafetyAnalyst software can handle most of HSM Part B tools. However, enormous amounts of crash, roadway, and traffic data are required for successful applications of HSM and SafetyAnalyst. Much of the data currently exists in various databases within ADOT and some of the data required is available outside of ADOT. From the preliminary in-house research on the data needs, gaps in the data have been identified and will be provided to the selected-Consultant for further evaluation. It also appears that significant data manipulation and integration will be required to successfully import the data into SafetyAnalyst.

Two lead states, Washington and Ohio, have successfully deployed SafetyAnalyst. These states have indicated that GIS tools were an important component in the manipulation and integration of the various data sets as well as the presentation and interpretation of the SafetyAnalyst output. ADOT does not currently have the required GIS applications to support SafetyAnalyst.

RESEARCH OBJECTIVES

The research’s desired outcome will identify the data needs for SafetyAnalyst software, assess the quality of data available, address all data gaps, and prepare the requirement for data input and post-processing SafetyAnalyst’s output for presentation and interpretation. The project’s intent is to provide ADOT management with a feasibility report on the labor, materials, and other resources necessary to implement SafetyAnalyst in Arizona.

Project Descriptions

EXPECTED IMPLEMENTATION

The research results will be utilized in the identification of safety programs and cost-effective allocation of safety dollars.

STATUS OF THE RESEARCH

The project is under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Kohinoor Kar	ADOT Traffic Group (Champion)
Mark Poppe	ADOT Traffic Group (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Shan Chen	ADOT Traffic Group
Nancy Ann Crandall	ADOT Traffic Group
Larry Talley	ADOT Traffic Group
Pradeep Tiwari	ADOT Traffic Group
James Meyer	ADOT GIS
Haleh Farhadi	Information Delivery Solutions
Kelly LaRosa	FHWA

Project Descriptions

SPR-699, Materials Properties and Optimum Geometries for the Design of Noise Walls

ADVANTAGE No./Name	R0699 23P	Design of Noise Walls	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure Planning and Environment	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$300,000	FY Authorization	2011
Contract Amount		Contract Date	(est. 48 months)
Expenditures to date	\$0	Est. Completion Date	6/30/2016
Available Amount	\$300,000	Project Manager	Christ Dimitroplos
Percent complete	0%	Project Sponsor	William Hurguy

PROBLEM STATEMENT

Highways built by the Arizona Department of Transportation (ADOT) that include Federal Highway Administration (FHWA) funding must comply with FHWA noise abatement standards. One of the traditional strategies used to reduce roadside noise is the use of noise walls parallel to a roadway. Most noise walls are currently designed to reflect sound. However, new materials and designs are emerging that may provide more effective control of roadway noise. There is no quantitative, objective information available that can be used to evaluate the suitability and effectiveness of these new technologies and designs.

RESEARCH OBJECTIVES:

1. Identify materials and designs that may have advantages over traditional, reflective noise walls.
2. Summarize available information regarding the effectiveness of these materials and designs in reducing roadway noise.
3. Recommend a field test to evaluate the most promising materials and designs in improving roadway noise reduction. Materials would be evaluated based upon constructability and life cycle costs/maintenance.

EXPECTED IMPLEMENTATION:

This research would lead to a field test to evaluate the most promising materials and designs. Identifying potential improved noise wall materials and designs has the potential to reduce construction costs, reduce roadway noise, and enhance the quality of life in the community.

STATUS OF THE RESEARCH:

The project has not yet begun.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE

William Hurguy ADOT Materials Group (Sponsor)
Christ Dimitroplos ADOT Research Center (Project Manager)
The remainder of the TAC is to be determined.

Project Descriptions

SPR-704, State-Specific Crash Prediction Models: An Arizona Needs Study

ADVANTAGE No./Name	R0704 24P	AZ HSM Calibration	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$125,000	FY Authorization	2012
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	0	Est. Completion Date	12/31/2014
Available Amount	\$125,000	Project Manager	Javier Gurrola
Percent complete	0%	Project Sponsor	Mark Poppe

PROBLEM STATEMENT

The first edition of the AASHTO Highway Safety Manual (HSM) was released in June 2010. Part C of the HSM contains the Predictive Method, which provides a procedure to estimate the “expected average crash frequency” of a roadway network, facility, or site. Specifically, the HSM includes predictive methods for Rural Two-Lane Roads, Rural Multilane Highways, and Urban and Suburban Arterials. The Safety Performance Functions (SPFs) provided in the HSM are the basis of the predictive models and were developed from the most complete and consistent available data sets. The general level of crash frequencies may vary substantially from one jurisdiction to another for a variety of reasons, including climate, driver populations, animal populations, crash reporting thresholds, and crash reporting system procedures. Comparison of default SPF values with base condition sites in Arizona may yield the need to develop local SPFs to account for the observed variation. As a result of this variation, research identifying the magnitude and distribution of these variations is needed in order to determine if Arizona will utilize a statewide local calibration factor for each SPF or if multiple SPFs are needed to account for varying local conditions.

RESEARCH OBJECTIVES

Research of statewide calibration factors will assess and determine the possible jurisdictional distribution of calibration factors for SPFs to be implemented for use of the Part C, Predictive Method, of the HSM.

A comparison of the default SPFs to the SPFs observed in Arizona will determine the need for development of state-specific SPFs. An evaluation will be performed on SPFs for segments and intersections of Rural Two-Lane Roads, Rural Multilane Highways, and Urban and Suburban Arterials.

Project Descriptions

EXPECTED IMPLEMENTATION

ADOT Traffic Group will be responsible for the implementation of the research results pertaining to the use of HSM in Arizona. Follow-up research may be needed at an interval to be defined during the research in order to ensure the calibration values remain current and to improve reliability of the Part C tools of the HSM using state-specific SPFs.

STATUS OF THE RESEARCH

The project is not yet under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Kohinoor Kar	ADOT Traffic Group (Champion)
Mark Poppe	ADOT Traffic Group (Sponsor)
Javier Gurrola	ADOT Research Center (Project Manager)
Kelly LaRosa	FHWA

Project Descriptions

SPR-705, *Specifications and Design Guide for Structural Applications of Fiber Reinforced Concrete*

ADVANTAGE No./Name	R0705 24P	Fiber Reinforced Concrete	
Topic/Focus	Structures	Preservation and Renewal of Infrastructure	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$170,000	FY Authorization	2012
Contract Amount		Contract Date	(est. 18 months)
Expenditures to date	\$0	Est. Completion Date	3/20/2014
Available Amount	\$170,000	Project Manager	Christ Dimitroplos
Percent complete	0%	Project Sponsor	Jean Nehme

PROBLEM STATEMENT

A large majority of structures such as canal lining, bridge deck resurfacing, and water retaining structures use a reinforced concrete design approach based on welded wire mesh or continuous reinforcement. These structures are designed using traditional methods that are based on linear elastic analysis/ultimate strength approach, or empirical methods which avoid structural analysis. Normally a prescribed design steel ratio applicable for majority of the practical cases is used. Significant cost could be saved if construction of slabs on grade, canal linings, and deck resurfacing could be done using an alternative reinforcing method such as fiber reinforced concrete. Recent studies show that fiber reinforced concrete can be effectively used as a reinforcing component for a majority of applications with significant cost savings. Simplified design equations developed recently however need to be calibrated using testing, field work, and various fiber types. Theoretical justification for significant cost savings can be established and correlated with field studies.

RESEARCH OBJECTIVES:

Opportunities for proper design with fiber reinforced concrete in areas such as bridge decks, slabs, and slabs on ground will be investigated. The project involves experimental evaluation, as well as theoretical analysis of the capacity of various structural applications using an equivalent reinforcing system. A new design approach will be developed and compared with available LRFD based deck, retaining wall, and slab design methods.

EXPECTED IMPLEMENTATION:

Results of this study will allow cost savings in terms of developing materials for innovative applications in all reinforced concrete applications. Results will be used to improve the quality and durability of concrete construction in the State of Arizona. Special provisions and guidelines will be developed and presented to the ADOT/ARPA committee.

Project Descriptions

STATUS OF THE RESEARCH

The study is not yet under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Jean Nehme	ADOT Bridge Group (Sponsor)
Pe-shen Yang	ADOT Bridge Group (Champion)
Christ Dimitroplos	ADOT Research Center (Project Manager)
Aryan Lirange	FHWA

Project Descriptions

SPR-706, Wildlife Vehicle Collision Mitigation Study: State Route 260 – Rim to Show Low

ADVANTAGE No./Name	R0706 23P	SR260 Wildlife Collision Mitigation	
Topic/Focus	Environment	Planning and Environment	
Investigator/Agency	Ray Schweinsburg	Arizona Game and Fish Department	
Program Budget	\$275,000	FY Authorization	2012
Contract Amount	\$275,000	Contract Date	(est. 48 months)
Expenditures to date	\$0	Est. Completion Date	9/30/2016
Available Amount	\$275,000	Project Manager	Tom Kombe
Percent complete	10%	Project Sponsor	Matt Moul

PROBLEM STATEMENT

ADOT wildlife-vehicle collisions data indicates that collisions with elk and deer make up a large proportion of all accidents along SR 260 from the Mogollon Rim to Show Low. Insights gained from this study will help determine the best strategies of mitigating elk-vehicle collisions while maintaining connectivity and permeability for elk and other wildlife species. This study will encompass the area from the Rim (MP 280) to Show Low (MP 340.1) and include all areas of high wildlife vehicle collisions east of the ongoing SR 260 Payson-Rim Project. ADOT has begun the development of a Design Concept Report (DCR) for the stretch of SR 260 from MP 309.4 – MP 340.1, Overgaard to Show Low. Information from this proposed study will be used in the DCR process to provide a more integrated and comprehensive analysis that will address highway safety as well as promoting wildlife permeability. This information will also be valuable for the reassessment of wildlife-vehicle collision mitigation efforts for MP 280 – 309 prior to reconstruction where an Environmental Assessment (EA) was completed in the early 1990’s, however no mitigation for elk-vehicle collisions was included.

RESEARCH OBJECTIVES

1. Assess elk (and potentially deer) movement patterns and distribution relative to SR 260 in order to determine the location of high-frequency crossing zones and assess pre-reconstruction elk permeability across the highway corridor using GPS technology.
2. Investigate the spatial and temporal relationships of elk highway crossing and distribution patterns to vehicular traffic volume.
3. Evaluate elk movements associated with water sources located in close proximity to SR 260
4. Investigate wildlife-vehicle collision patterns along SR 260.
5. Develop recommendations both for the retrofitting of existing structures and reconstruction of new wildlife passage structures and other mitigations to reduce elk-vehicle collisions while maintaining or promoting highway permeability along SR 260.

Project Descriptions

EXPECTED IMPLEMENTATION

The results of this study can be incorporated into the Final Design of the SR 260 Overgaard-Show Low upgrade as stated in the EA. They will also cover the stretch of SR 260 from the Mogollon Rim to Overgaard where the EA was completed but did not include elk-vehicle collision mitigation strategies. Results from this study combined with ongoing wildlife-vehicle collision data collection will provide the best possible information to reduce this liability.

STATUS OF THE RESEARCH

The project is under way. Monitoring equipment is partially in place and key elements of the effort are in progress.

TECHNICAL ADVISORY COMMITTEE (TAC)

Matt Moul	ADOT Globe District
Justin White	ADOT Environmental Services (Champion)
Tom Kombe	ADOT Research Center (Project Manager)
Ray Schweinsburg	Arizona Game and Fish Department
Dannettee Weiss	Arizona Game and Fish Department
David Cremer	FHWA
David Seery	US Forest Service
James Lemmon	ADOT Environmental Planning Group
Laura Nordan	ADOT Globe District

Project Descriptions

SPR-707, Driver Attitudes on Managed Lanes/Toll Roads

ADVANTAGE No./Name	R0707 24P	Managed Lanes/Toll Roads	
Topic/Focus	Planning and Administration	Service and Mobility Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$120,000	FY Authorization	2012
Contract Amount	170,000	Contract Date	(est. 30 months)
Expenditures to date	0	Est. Completion Date	7/31/2015
Available Amount	\$120,000	Project Manager	Dianne Kresich
Percent complete	2%	Project Sponsor	Gail Lewis

PROBLEM STATEMENT

The gap between transportation needs and anticipated revenue continues grow to an unprecedented level. Existing sources and levels of funding are expected to remain static, at best. New sources and/or higher levels of funding may be seen as necessary to fill even a portion of the revenue gap. Approaching the public regarding the extent to which they are willing to pay requires sensitivity and good timing. Historically, attempts to raise existing taxes, establish new taxes, or institute novel means of financing transportation improvements have achieved only moderate success in Arizona. Decision-makers currently lack an understanding of how the public perceives it own role in the funding of the transportation system. With new legislation allowing Arizona to more fully explore public-private partnerships, including toll road concepts, the conceptual framework for transportation system funding may be on the verge of a transformation. Essentially, what will it take to influence users of the system to decide to opt for alternatives that come at a more personal, rather than distributive, cost?

RESEARCH OBJECTIVES

The suggested research would probe personal decision-making on transportation investments to identify which funding scenarios have the greatest effects. ADOT, like most other transportation agencies, has almost exclusively used interviews and polling to acquire data on public opinion regarding financing. In contrast, the suggested research would use a quantitative and qualitative methodology to manipulate variables, test against controls, and identify the funding scenarios that most positively influence public opinion. In other words, it would identify the points at which public opinion/decisions veers toward acceptance or rejection of a particular funding mechanism on micro (individual decisions to use a toll facility or lane) and macro levels (factors leading to societal action to raise revenue levels). However, the primary focus will remain on personal decisions and macro-level choice determinations.

An example of a scenario that might be tested is the following:

When confronted with a request to consider funding increases or approve of new mechanisms for funding, such as tolling, what does the public need in order to be comfortable with supporting such requests – specific projects guaranteed to be implemented? Performance measurement that

Project Descriptions

instills confidence that the most efficient and/or effective projects are funded? Maximum application of user fees? On specific types facilities? At a more personal level, what commuting or lifestyle factors contribute to a driver's decision to use a managed/toll lane over a non-tolled lane? Upon the introduction of what factors do drivers accept tolling, and under what conditions?

EXPECTED IMPLEMENTATION

Aligned with ongoing and current analysis into managed lanes/toll roads in the state and, in particular, the Maricopa County region, this study would provide greater insights into not just public opinion on toll roads but the individualized factors and considerations that would inform any decision-making process for policy makers and establish a data-rich foundation for further study and discussion. This research is designed to uncover, in a new and innovative way, what we do not know as a state. While other jurisdictions and communities have toll roads, the values and interests of Arizona drivers are different. As reflected in the literature review, data of this nature can support implementation of public private programs that are tiered over several years, or result in varied implementation strategies to address consistent themes.

STATUS OF THE RESEARCH

The study is in its initial stage.

TECHNICAL ADVISORY COMMITTEE (TAC)

Gail Lewis	ADOT Director's Office (Sponsor)
Stephanie Brown	ADOT P3 (Champion)
Dianne Kresich	ADOT Research Center (Project Manager)
Tim Tait	ADOT Communication and Community Partnerships
Tracy Clark	ADOT MPD
Eric Anderson	Maricopa Association of Governments (Co-champion)
Bob Hazlett	Maricopa Association of Governments
Rob Samour	ADOT ITD

Project Descriptions

SPR-709, Field Evaluation of Pilot Programs for Bridge Scour

ADVANTAGE No./Name	R0709 24P	Pilot Programs for Bridge Scour	
Topic/Focus	Structures	Preservation and Renewal of Infrastructure	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$175,000	FY Authorization	2012
Contract Amount		Contract Date	(est. 18 months)
Expenditures to date	\$0	Est. Completion Date	12/30/2014
Available Amount	\$175,000	Project Manager	Christ Dimitroplos
Percent complete	0%	Project Sponsor	Jean Nehme

PROBLEM STATEMENT

The purpose of this project is to develop pilot programs to evaluate bridge scour for selected bridges in Arizona. Current methodologies for predicting bridge scour are largely based on a combination of theory, controlled laboratory experiments, and observed field measurements of bridge scour; however, the vast majority of these field measurements have been taken outside of the arid Southwest, let alone Arizona. Because of the unique hydrologic and geologic conditions of watercourses in Arizona, particularly those of ephemeral streams, a field evaluation of bridge scour for structures throughout the state is necessary to help evaluate the suitability of current bridge scour methodologies.

The ADOT Bridge Group conducts an inspection program to evaluate bridges throughout the state. An inspection team visits each bridge on an annual or semi-annual basis and collects data, including cross section and profile information of the watercourse at the bridge. These pilot projects are meant to integrate with the existing bridge inspection program, review previously collected data, and obtain additional information to relate scour measurements with flow data.

For this project, meetings will be conducted with ADOT district engineers to select up to two recently constructed bridges for each district. Selection of bridge locations for the pilot program will be based on meeting some or all of the following criteria:

1. Watercourse is located in a watershed with stream gages, preferably operated by the United States Geological Survey (USGS) or the local county.
2. Bridge site is accessible, particularly during flood events.
3. A flood warning system is located nearby.
4. ADOT structures are preferred; however, non-ADOT bridges meeting the other criteria may be considered with approval from the corresponding municipality or County.
5. Ideally, the selection of sites covers a variety of characteristics such as
 - a. Type of river bed material
 - b. Ephemeral or perennial flows
 - c. Geographic area
 - d. Presence or absence of dams upstream
 - e. Burned or unburned watershed

Project Descriptions

The Post-Flood Reconstitution pilot program will entail the deployment of field teams to measure scour depths by observation, excavation or probing after a flood has occurred. These field teams should be coordinated closely with the current bridge inspection program in order to leverage existing efforts and procedures. While the drawback of this program is the limited accuracy in measuring the maximum scour depth of a given flood, the benefits are that it can be easily implemented over a large geographic area and does not necessarily require sophisticated equipment.

The Mobile Team pilot program will consist of deploying teams to measure scour depths during a flood. The benefit of this program is the ability to more accurately measure the maximum scour depth; however, this program requires longer duration storms, more easily accessible sites, and specialized equipment to take measurements from the bridge deck. As mentioned in SOA 14, it may be advisable to include participation from the USGS in collecting data for the Mobile Team program due to the wide coverage of USGS offices (Phoenix, Tucson, Yuma and Flagstaff). Close coordination with existing bridge inspection teams is also important for this program. In addition to collecting field measurements of bridge scour, the pilot program teams will also make field observations on the effectiveness of existing scour countermeasures around each of the bridges such as grade control structures, spur dikes and bank protection. Such observations will be useful in making recommendations for the design of future scour countermeasures.

RESEARCH OBJECTIVES:

1. Assist ADOT in developing standard procedures for evaluating bridge scour using both post-flood reconstitution and mobile teams;
2. Help ADOT evaluate the applicability of current methodologies for evaluating scour using field-based measurements of bridges throughout the state; and
3. Serve as a stepping stone toward developing bridge scour methodologies that are more suited to the unique characteristics of streams in the arid Southwest.

EXPECTED IMPLEMENTATION:

The results of this project will be used by the Materials Group and Bridge Group to better evaluate scour at existing bridges and to consider updating bridge scour analytical methods.

STATUS OF THE RESEARCH

The project is being advertised.

TECHNICAL ADVISORY COMMITTEE (TAC)

Jean Nehme	ADOT Bridge Group (Sponsor)
Pe-shen Yang	ADOT Bridge Group (Champion)
Itty P. Itty	ADOT Bridge Group
Christ Dimitroplos	ADOT Research Center (Project Manager)
Aryan Lirange	FHWA

Project Descriptions

SPR-710, Evaluation of Bighorn Sheep Overpass Effectiveness: U.S. Route 93 Long Term Monitoring

ADVANTAGE No./Name	R0710 23P	US 93 Bighorn Sheep Long Term Monitoring	
Topic/Focus	Environment	Planning and Environment	
Investigator/Agency	Ray Schweinsburg	Arizona Game and Fish Department	
Program Budget	\$245,000	FY Authorization	2012
Contract Amount	\$245,000	Contract Date	(est. 60 months)
Expenditures to date	\$0	Est. Completion Date	6/30/2017
Available Amount	\$245,000	Project Manager	Tom Kombe
Percent complete	10%	Project Sponsor	Mike Kondelis

PROBLEM STATEMENT

Bighorn-vehicle collisions are a safety concern to motorists. Furthermore, highways block animal movements between seasonal ranges or other vital habitats, fragment habitats and populations, reduce genetic interchange, and disrupt viable population processes. Recent research on desert bighorn sheep movements and crossing patterns associated with US 93 point to the barrier created by this highway through the largest bighorn sheep population in Arizona, as well as the impact of bighorn-vehicle collisions (McKinney and Smith 2007). U.S.93 (MP 2-17) was reconstructed from a two-lane to a four-lane divided highway beginning in early 2009 and was completed in late 2010. Concerns exist that this reconstruction could further fragment bighorn habitat and contribute to increased bighorn-vehicle collisions. ADOT constructed three wildlife overpasses (the first in Arizona) and two bridges, with fencing linking the structures to promote bighorn permeability across the U.S.93 corridor while reducing motorist collisions with sheep. This represents a commitment on the part of ADOT and warrants thorough evaluation to assess the efficacy of overpasses in promoting permeability, particularly since few overpasses exist in North America. To assess the efficacy of the planned U.S.93 wildlife overpasses in promoting permeability, it is necessary to compute bighorn passage rates as an objective metric, comparing passage rates before and after the passage structures are completed using GPS telemetry (Dodd et al. 2007). Wildlife use of the overpasses will be monitored by video surveillance. Research here will complement ongoing studies along SR 260, I-17, I-40, U.S.89, and SR 64 and together they provide valuable insights into the impact of traffic volume on a range of wildlife species and approaches to mitigate highway and traffic impact.

RESEARCH OBJECTIVES

This proposed research project will add greatly to our understanding of desert bighorn sheep-highway relationships and the effectiveness of overpasses in promoting permeability and reducing bighorn sheep-vehicle collisions. Specific objectives include assessing: 1) desert bighorn sheep movement, highway crossing patterns, and permeability across the highway corridor (using GPS technology); 2) spatial and temporal relationships of bighorn highway crossing patterns to vehicular traffic volume; 3) wildlife-vehicle collision patterns; 4) wildlife

Project Descriptions

use of overpasses (using video and still camera surveillance); and 5) provide recommendations for future projects regarding crossing design and placement.

EXPECTED IMPLEMENTATION

If the results of this project validate the benefit of overpasses in promoting bighorn permeability, it can be an example for highway and wildlife departments across North America. Given the time period required for wildlife to adapt to new crossing structures, a long-term monitoring project is essential. The results and insights can be integrated into design concept planning for future highway reconstruction.

STATUS OF THE RESEARCH

The project is under way. Most of the monitoring equipment is now in place, and key elements of the effort are in progress.

TECHNICAL ADVISORY COMMITTEE (TAC)

Mike Kondelis	ADOT Kingman District (Sponsor)
Julile Alpert	ADOT Kingman District (Champion)
Tom Kombe	ADOT Research Center (Project Manager)
Justin White	ADOT Environmental Services
David Cremer	FHWA
Trevor Buhr	Arizona Game and Fish Department
Ray Schweinsburg	Arizona Game and Fish Department
John Reid	U.S. Bureau of Land Management
Jim Holland	U.S. National Park Service
Ross Haley	U.S. National Park Service
Marc Maynard	U.S. Bureau of Reclamation

Project Descriptions

SPR-716, Evaluation of the Planning Assistance for Rural Areas (PARA) and Small Area Transportation Study (SATS) Programs

ADVANTAGE No./Name	R0716 23P	PARA Evaluation	
Topic/Focus	Planning and Administration	Planning and Environment	
Investigator/Agency	Beth Wemple	Cambridge Systematics	
Program Budget	\$80,000*	FY Authorization	2012**
Contract Amount	\$80,000	Contract Date	1/17/2012
Expenditures to date	\$9,746	Est. Completion Date	12/31/2014
Available Amount	\$70,254	Project Manager	Dianne Kresich
Percent complete	40%	Project Sponsor	Mike Kies

* Includes \$40,000 SPR Part 1 funding.

** Study is funded with FY 2011 dollars.

PROBLEM STATEMENT

The Planning Assistance for Rural Areas (PARA) program, which is administered by ADOT MPD, allocates federal funds for the development of long-range transportation planning studies in nonmetropolitan communities. PARA studies are managed by ADOT MPD planning staff in close partnership with the local communities. The PARA program was reorganized in 2008 (formerly the Small Area Transportation Study Program). Since the program reorganization, ADOT has completed two rounds of PARAs and is currently in Round 3. Research on how the program (PARA and former SATS program) is meeting the needs and objectives of ADOT and the local jurisdictions (cities, counties, and tribal communities) has not been completed. A review of the program (and outcome of recommendations of SATS program) will identify enhancements or modifications to improve program effectiveness.

There has been no formalized outreach to PARA recipients and ADOT MPD project managers regarding the effectiveness of the program, and this research is addressing this concern.

RESEARCH OBJECTIVES

This research is evaluating the effectiveness of the PARA program, evaluating user satisfaction with the program, and suggesting enhancements to the program. Project objectives include:

- Prepare an inventory of information associated all SATS and PARA studies completed over the past 10 years, and develop a database to document the information. The database will be maintained into the future with information on future studies.
- Identify best practices from other states.
- Identify the program's successes and opportunities for enhancement through stakeholder interviews and a survey

Project Descriptions

- Recommend program enhancements to better accomplish ADOT and local agency objectives. This may include recommendations to assist local agencies to implement project recommendations.

EXPECTED IMPLEMENTATION

The research results will guide the future direction of the PARA program. The results of the research could potentially result in changes to the application process, PARA manual, scope of work template, and other aspects of the program.

STATUS OF THE RESEARCH

The inventory of past studies is complete. Surveys and interviews with key stakeholders are under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Mike Kies	ADOT MPD (Sponsor)
Justin Feek	ADOT MPD (Champion)
Dianne Kresich	ADOT Research Center (Project Manager)
Shilpa Panicker	ADOT MPD Transit
Lars Jacoby	ADOT Communications
Thor Anderson	ADOT MPD
Charla Glendening	ADOT MPD
Giao Pham	City of Apache Junction City Engineer
Chris Fetzer	Northern Arizona Council of Governments
Romare Truely	FHWA

Project Descriptions

SPR-717, *Impact of Arizona Highways Magazine's Facebook Page on Tourism*

ADVANTAGE No./Name	R0717 23P	Arizona Highways Facebook Page	
Topic/Focus	Planning and Administration	Service and Mobility	
Investigator/Agency	Debra Pryor	Partners in Brainstorms	
Program Budget	\$31,000	FY Authorization	2012*
Contract Amount	\$30,989	Contract Date	3/28/2012
Expenditures to date	\$0	Est. Completion Date	12/31/2014
Available Amount	\$31,000	Project Manager	Dianne Kresich
Percent complete	30%	Project Sponsor	Win Holden

*Study is funded with FY 2011 dollars.

PROBLEM STATEMENT

The study is examining the relationship between the use of *Arizona Highways Magazine's* Facebook pages and the decisions of potential visitors to travel in Arizona.

RESEARCH OBJECTIVES

The study is addressing: what motivates the use of the Facebook page of *Arizona Highways Magazine* (AHM); how personality characteristics influence the use of Facebook (e.g., which type of users post); the likelihood of Facebook users to place trust in the AHM site and each other, and how that likelihood affects willingness to share information and develop new relationships; and how the social interaction through Facebook has influenced tourism in Arizona.

This project involves an online survey that will be administered to a sample of the 16,000 users of *AHM* Facebook. The online questionnaire and an online survey link will be posted as a link on the *AHM* Facebook page.

EXPECTED IMPLEMENTATION

ADOT, *Arizona Highways Magazine*, and professionals in the tourism industry will gain information about the effectiveness of Facebook in influencing decisions regarding travel in Arizona. The project can also serve as a model study for others who have interest in the use of social media.

Project Descriptions

STATUS OF THE RESEARCH

The review of peer publications is complete. Surveys and focus groups with key stakeholders are under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Win Holden	Arizona Highways Magazine (Sponsor and Champion)
Dianne Kresich	ADOT Research Center (Project Manager)
Romare Truely	FHWA
Robert Stieve	Arizona Highways Magazine
Kelly Kramer	Arizona Highways Magazine
Kelly Mero	Arizona Highways Magazine

Project Descriptions

SPR-718, The Role of Arizona Tribes in Transportation Decision Making

ADVANTAGE No./Name	R0701 21P	Tribes in Transportation Decision Making	
Topic/Focus	Planning and Administration	Service and Mobility	
Investigator/Agency	Peggy Fiandaca	Partners for Strategic Action	
Program Budget	94,800*	FY Authorization	2012**
Contract Amount	\$200,167	Contract Date	9/7/2011
Expenditures to date	\$44,907	Est. Completion Date	12/31/2014
Available Amount	\$155,260	Project Manager	Dianne Kresich
Percent complete	30%	Project Sponsor	Scott Omer

* Includes 54,800 SPR Part 1 funding.

**Study is funded with FY 2009 dollars.

PROBLEM STATEMENT

The Indian Reservations Roads (IRR) Program is presently the single major source of funding for transportation projects available to Arizona's 22 tribes. Unfortunately, this funding source is unable to meet all tribal transportation needs and objectives. To help mitigate this situation, the tribes have expressed a desire to positively influence the quality of life in their communities by having the authority to make decisions regarding funds from multiple sources in addition to the IRR Program used for transportation improvements.

Public Law 93-638, the Indian Self-Determination and Education Assistance Act (ISDEA), gave tribes the right to self-government and opened the doors to government-to-government relationships. Tribal governments envision obtaining funding through this type of relationship with entities such as the federal government and the state, with the authority to commit the funds to projects determined to be of greatest need by the tribes.

This study is investigating the current and potential role of Arizona tribes in transportation decision making.

RESEARCH OBJECTIVES

This study is identifying current practices regarding the funding of transportation projects on tribal lands, define existing problems, investigate barriers and opportunities to obtaining funding and the authority to make decisions on funding, identify successful practices and coordination activities between the tribes and other governmental agencies from other states, and recommend next steps. The study is addressing all modes and the entire transportation infrastructure on tribal lands, with an emphasis on facilities owned by tribes.

Project Descriptions

EXPECTED IMPLEMENTATION

Research results will include recommendations for ADOT, metropolitan planning organizations, councils of government, and tribes regarding the role of tribes in transportation decision-making. The study will offer suggested steps to achieve implementation of the recommendations, which may include further study.

STATUS OF THE RESEARCH

Surveys and interviews with key stakeholders are under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Scott Omer	ADOT MPD (Sponsor)
Misty Dayzie Klann	ADOT MPD (Champion)
Don Sneed	ADOT MPD
Dianne Kresich	ADOT Research Center (Project Manager)
Grant Buma	Colorado River Indian Tribes
Esther Corbett	Inter Tribal Council of Arizona
Margie Begay	Navajo DOT
Ronald C. Hall	Tribal Technical Assistance, Colorado State University
Danny Honanie	Hopi Transportation Task Team
Romare Truely	FHWA
Phillip Matthews	Salt River Pima-Maricopa Indian Community
Robert Maxwell	BIA Western Regional Office Division of Transportation
Erika McCalvin	Ft. McDowell Yavapai Nation
Nathan B. Pryor	Maricopa Association of Governments
Royce Gchachu	Pueblo of Zuni
Sasha Saliego	Gila River Indian Community DOT
David Silversmith	Navajo DOT
Bart Smith	Ak-Chin Indian Community
Fred Stevens	Tohono O'odham Nation
Steve Tipton	Tohono O'odham Nation
Ruth Greenspan	ADOT

Project Descriptions

SPR-720, Addressing Work Zone Traffic Safety Issues in Arizona

ADVANTAGE No./Name	R0720 25P	Work Zone Traffic Safety Issues	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$148,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$148,000	Project Manager	Javier Gurrola
Percent complete	0%	Project Sponsor	Julie Kliewer

PROBLEM STATEMENT

The statewide crash database maintained by Arizona Department of Transportation (ADOT) Traffic Records Section contains information provided as a result of a police investigation and physical evidence collected at the scene and witness statements. During the police investigation the crash contributing factors are identified and later are used by transportation professionals to provide and propose adequate safety countermeasures to minimize the number of crashes.

Many police investigators are trained and certified to evaluate collision causation (e.g. Accreditation Commission for Traffic Accident Reconstruction or ACTAR certification). However, “accident reconstruction” is not a straightforward task, and frequently requires knowledge from other areas such as human factors and traffic engineering. Some of the methods applied during the police investigation may be incorrect and consequently may provide misleading opinions and misleading crash contributing factors. Additionally, a lack of knowledge in the area of human factors and traffic engineering make it more difficult for police investigators to truly identify crash causation, in particular, work zone-related crashes.

RESEARCH OBJECTIVES

The objective of this research study is to analyze the causation of work zone related crashes. An analysis of work zone crashes should be performed by an expert in the area of traffic and transportation engineering with an understanding of human factors and “accident reconstruction” principles.

First, a review of provided police reports related to work zone crashes (Arizona work zone related crashes between 2006 and 2010) will be performed. The crash contributing factors as documented during the police investigation will be identified.

Second, selected work zone crashes will be examined by experts in the area of human factors, accident reconstruction, and transportation engineering and the primary contributing factors will be evaluated.

Project Descriptions

Third, the comparison and evaluation between the contributing factors identified by police and those discovered during expert analysis will be performed.

Finally, recommendations and countermeasures for improving work zone traffic control plans, strategies, and construction management will be developed.

EXPECTED IMPLEMENTATION

Anticipated research results will contain set of factors which were found to be inaccurately identified during police crash investigations. These factors should be taken into account during future work zone crash related investigations. Additionally, true identification of accident contributing factors as expected by the subject research study, should provide good information for future work zone traffic control strategies and prevent from implementing not appropriate safety countermeasures. Additionally, if any work zone safety deficiencies will be found during the study, they can be proactively implemented and prevent future work zone related crashes. Support for improved policies regarding management and documentation of work zone traffic control in situ.

STATUS OF THE RESEARCH

The project manager has been assigned.

TECHNICAL ADVISORY COMMITTEE (TAC)

The TAC has not yet been formed.

Project Descriptions

SPR-721, Data Needs for Tree Removal Crash Modification Factor on Arizona State Highways

ADVANTAGE No./Name	R0721 25P	CMF for Trees – 2-Lane Rural Roads	
Topic/Focus	Traffic and Safety	Safety and Efficiency in Operations Planning and Environment	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$90,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$90,000	Project Manager	Javier Gurrola
Percent complete	0%	Project Sponsor	Mark Poppe

PROBLEM STATEMENT

Rural roads account for about one-third of the vehicle-miles traveled in Arizona but see more than half of the state's traffic fatalities. Five-year statistics show that a vehicle occupant hurt while colliding with a fixed object is twice as likely to die if the collision is on a rural road rather than an urban road. Among such fixed objects are trees beside two-lane rural highways. A systematic assessment of countermeasures for vehicle-tree collisions on such highways is needed. The crash modification factor (CMF), a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site and maintained at the Crash Modification Factors Clearinghouse, though tabulated in the Highway Safety Manual (HSM) for roadside fixed objects along urban and suburban arterials, does not presently extend to roadside fixed objects, including trees, on two-lane rural highways.

RESEARCH OBJECTIVES

This study aims to determine the needed CMSs by finding any existing, pertinent CMFs in the literature even beyond the HSM and Clearinghouse; determining the data and analysis needed to develop CMFs for countermeasures along two-lane rural highways; recommending a data collection plan; and performing a statistically sound pilot before-and-after evaluation of countermeasures.

EXPECTED IMPLEMENTATION

This research will produce enhanced knowledge of vehicle-tree collisions, state-of-practice guidelines for implementing countermeasures, a learned evaluation of countermeasures, a detailed CMF data collection plan, and more comprehensive CMFs in the future.

STATUS OF THE RESEARCH

The project was advertised on March 19, 2013.

Project Descriptions

TECHNICAL ADVISORY COMMITTEE (TAC)

The TAC has not yet been formed.

Project Descriptions

SPR-722, Geosynthetics: Specifications and Applications

ADVANTAGE No./Name	R0722 25P	Geosynthetics: Specs and Applications	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$150,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 24 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$150,000	Project Manager	Stephanie Huang
Percent complete	0%	Project Sponsor	J.J. Liu

PROBLEM STATEMENT

The geosynthetic guidelines outlined in the current 2008 ADOT Specifications for Road and Bridge Construction were formulated in the late 1980s, presumably based on research data available at that time along with the available manufactured products and data. These method specifications, i.e. based solely on material properties, were developed at a time when geosynthetic use was in its infancy and there was a limited variety of products available for transportation infrastructure applications. Combined with the limited quantity of research data available at the time, this resulted in empirically derived design procedures.

From the time of their development, these original specifications have since remained virtually unchanged.

Over the last 20-plus years, the geosynthetic industry has made significant developments. New technologies have emerged. Now a wide range of material types, manufactured products, and composite systems are available for a variety of applications in civil engineering practice, including drainage and filtration, separation, soil reinforcement (roadway embankments, steep slopes, and walls), moisture barriers, and waste containment.

Completed and continuously ongoing research projects now focus not only on material properties, but also on overall product/system characteristics and performance evaluation through lab testing, test sections, and accelerated testing, to quantify the benefits of using geosynthetics as a design/construction alternative.

Based on the advances that have been made in the geosynthetic industry, and documented through research, there is a requirement to review and comprehensively update the ADOT geosynthetic specifications (geogrids, geotextiles, geomembranes, composites), to utilize and maximize the benefits of the variety of existing products available as well as newer and more innovative products being produced by the industry.

Project Descriptions

RESEARCH OBJECTIVES

This research effort will seek to accomplish the following:

1. A comprehensive review of the ADOT geosynthetic specifications (actual section on geosynthetics and associated sub-sections.)
2. Update and expand the ADOT geosynthetic specifications to revise outdated test standards, and accommodate multiple products per required application, such as, soil reinforcement, separation and drainage, and, moisture barriers. This would require a comprehensive literature review of available research, and independent lab testing to evaluate the effectiveness of a product for a given application.
3. Update the current method specifications to not only address material properties, but take into consideration performance of the system for acceptance. Newer and more innovative products often may not meet the current individual index property requirements as outlined in the current specifications. There are, however, claims that these new products are better performing as a system relative to the performance of older products. This should be evaluated, again through a combination of a review of existing and ongoing research materials, and independent lab and field testing.

EXPECTED IMPLEMENTATION

The ultimate goal of this research effort will be a complete revision of the ADOT specifications addressing geosynthetics and their applications.

STATUS OF THE RESEARCH

The project manager has been assigned.

TECHNICAL ADVISORY COMMITTEE (TAC)

Stephanie Huang	ADOT Research Center (Project Manager)
Dhaneshwar Harnanan	ADOT Materials Group (Champion)
J.J. Liu	ADOT ITD (Sponsor)
	The remainder of the TAC is to be determined

Project Descriptions

SPR-723, Communication Plan for Windblown Dust

ADVANTAGE No./Name	R0723 25P	Blowing Dust Advisory Program	
Topic/Focus	Planning and Administration	Planning and Environment Safety and Efficiency in Operations	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$125,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 30 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$125,000	Project Manager	Dianne Kresich
Percent complete	0%	Project Sponsor	Matt Burdick

PROBLEM STATEMENT

Windblown dust events occur along Interstate 10 from mileposts 160 to 250 (metropolitan Phoenix to metropolitan Tucson) and can negatively affect driving conditions. Blowing dust has been considered a contributing factor in serious crashes in that region. ADOT is interested in learning the most effective means to acquire data about approaching or in-progress dust events, and methods of communicating information about approaching and in-progress dust storms to the public using a variety of means, to include but not limited to social media, traditional media, Intelligent Transportation System assets, and other options that may be available.

RESEARCH OBJECTIVES

The study process begins with the identification of practices to communicate information about windblown dust. This includes practices used by ADOT over approximately the past 40 years, and those used elsewhere within the transportation industry to forecast, detect, and communicate information on approaching dust and other weather events, such as fog and snowstorms. Following the identification of ADOT and industry practices, the study will assess the extent to which current ADOT practices meet department needs. Based on these findings, the study will conclude with recommendations that ADOT can implement to effectively acquire and communicate information about approaching windblown dust in the vicinity of Interstate 10 between Phoenix and Tucson.

EXPECTED IMPLEMENTATION

The recommendations are expected to help ADOT Communications convey this information to the public, including the media and commercial and noncommercial drivers. Recommendations will include a communication implementation plan, which will detail tools, process steps, and the desired outcomes of the communication outreach.

Project Descriptions

STATUS OF THE RESEARCH

This project is in the consultant selection stage.

TECHNICAL ADVISORY COMMITTEE (TAC)

Dianne Kresich	ADOT Research Center (Project Manager)
Tim Tait	ADOT Communications (Champion)
Matt Burdick	ADOT Communications (Sponsor)
Garin Groff	ADOT Communications
Beverly Chenausky	ADOT MPD

Project Descriptions

SPR-724, Arizona-specific Data for EPA’s “MOVES” Model

ADVANTAGE No./Name	R0724 25P	Data for MOVES Model	
Topic/Focus	Environment	Planning and Environment	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$100,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 30 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$100,000	Project Manager	Tom Kombe
Percent complete	0%	Project Sponsor	Beverly Chenausky

PROBLEM STATEMENT

The U.S. Environmental Protection Agency (EPA) released a new model for mobile source emissions called Motor Vehicle Emission Simulator, MOVES2010. This model replaces the previous EPA emission model, MOBILE6.2. MOVES2010 is used to estimate exhaust and evaporative emissions as well as brake and tire wear emissions from all types of on-road vehicles. After a three-year grace period, which ended March 3, 2013, MOVES2010 is required for all new regional emissions analyses for transportation conformity. The new model presents both an opportunity and a challenge for ADOT. The opportunity is that the sophistication of the model allows for a much more robust assessment of on-road vehicle emissions, provided that states have the local data and information needed to replace model default values. The challenge is that ADOT does not have the local information needed to optimally use the model. Running MOVES is a multi-step, data-intensive process requiring specific datasets, including those with vehicle registration information and travel activity data, such as that from HPMS and/or relevant travel demand model output. Since current ADOT mobile source data are generated mostly for the previous EPA model, MOBILE6.2, it is necessary to determine what processes are needed to modify current input data and develop the corresponding specifications to optimally run MOVES for Arizona transportation conformity cases.

RESEARCH OBJECTIVES

This research will result in a guideline document that will give ADOT an implementation plan to make optimal use of the new MOVES model. The research will evaluate the essential local data needed to use MOVES, evaluate the degree to which ADOT has already collected such local data to run the prior model (MOBILE6.2), and evaluate gaps in available data and data processing needs related to using MOVES. In addition, this work will assess steps being taken by other states for developing their MOVES models, to identify whether there are opportunities to build on other state efforts to design MOVES-related data collection and processing techniques. Specifically, research objectives focus on assessing:

- General requirements needed to run MOVES, and how those differ from MOBILE6.2.

Project Descriptions

- Available information from ADOT for running the models, including traffic data and fleet mix information.
- Gaps between currently available data and EPA recommended data for running MOVES.
- Applicability of EPA data conversion tools to ADOT.
- Applicability of other states' data preparation tools to ADOT (e.g., Michigan DOT MOVES interface, New Jersey and Pennsylvania use of "ppsuite," availability of other state resources).
- Options to fill current data gaps.
- The prioritization of steps necessary to complete a valid MOVES model that EPA would approve.

EXPECTED IMPLEMENTATION

By providing guidance on the steps needed to be taken to optimally use MOVES, the research will improve ADOT's development of operational models, which can be implemented in regional and project-level air quality analyses in Arizona. A second work phase, if funded, will develop a case study of guideline implementation using Pinal County.

STATUS OF THE RESEARCH

This project is not yet under way.

TECHNICAL ADVISORY COMMITTEE (TAC)

Beverly Chenausky	ADOT MPD Air Quality (Sponsor)
Joonwon Joo	ADOT MPD Air Quality (Champion)
Tom Kombe	ADOT Research Center (Project Manager)
Darcy Anderson	ADOT Environmental Planning Group
Tracy Clark	ADOT MPD Transportation Analysis
Phillip DeNee	Arizona Department of Environmental Quality
Ashim Garg	ADOT MPD Transportation Analysis
Ed Stillings	FHWA
Rebecca Swiecki	FHWA

Project Descriptions

SPR-725, Recycled Construction Waste for Mutual Beneficial Use

ADVANTAGE No./Name	R0725 25P	Recycled Construction Waste	
Topic/Focus	Materials and Construction	Preservation and Renewal of Infrastructure Planning and Environment	
Investigator/Agency	Unassigned	Unassigned	
Program Budget	\$40,000	FY Authorization	2013
Contract Amount		Contract Date	(est. 18 months)
Expenditures to date	\$0	Est. Completion Date	
Available Amount	\$40,000	Project Manager	Stephanie Huang
Percent complete	0%	Project Sponsor	Janet Doerstling

PROBLEM STATEMENT

One construction project's waste is another project's material source. Every day, a large amount of potentially recyclable construction waste is dumped in our landfills. Materials such as refuse concrete, asphalt roof shingles, asphalt millings, tar paper, rubber tires, brick, and other valuable materials can be reused within the transportation industry; this in turn can reduce the amount of mined materials or virgin materials used, and increase landfill capacity and lifetime. The unit price of mining/extracting raw materials (asphalt, ABC, aggregate, sub-grade), including their transportation, will continue to increase as fossil fuel prices rise, land value goes up, and virgin materials are consumed. This project will determine the feasibility of using recycled materials within the transportation industry.

RESEARCH OBJECTIVES

- Compile literature review of economic aspects, using transportation research databases and best practices of other transportation departments.
- Survey and interact with solid waste/landfill officials and roofing contractors in Arizona.
- Survey recycling facilities and material sources throughout Arizona.
- Conduct cost/benefit analysis and feasibility study for the following:
 - The usability of refuse concrete, asphalt millings, or bricks to be crushed and used aggregate in asphalt or concrete, roadway subgrade, or non-structural fill.
 - The usability of asphalt from refuse roof shingles and tar paper as a binder in hot or warm mix asphalt.
 - The usability of aggregate and asphalt from asphalt millings in hot or warm mix asphalt.
 - The usability of rubber from tires as a binder for hot or warm mix asphalt.
 - The usability of mining waste for transportation purposes.

Project Descriptions

EXPECTED IMPLEMENTATION

This research has the potential to develop cost-saving and more-sustainable practices for use in ADOT construction projects statewide.

STATUS OF THE RESEARCH

The project manager has been assigned.

TECHNICAL ADVISORY COMMITTEE (TAC)

Stephanie Huang	ADOT Research Center (Project Manager)
Ashek Rana	ADOT Materials Group (Champion)
Janet Doerstling	ADOT Materials Group (Sponsor)
	The remainder of the TAC is to be determined

Project Descriptions

SPR-727, The Impact of Research: Implementation at the Arizona Department of Transportation

ADVANTAGE No./Name	R0727 23P	Research Implementation Study	
Topic/Focus	Planning and Administration	Service and Mobility	
Investigator/Agency	Diane Ginn	Partners in Brainstorms	
Program Budget	\$185,000	FY Authorization	2013*
Contract Amount	\$185,000	Contract Date	4/8/2013
Expenditures to date	\$0	Est. Completion Date	12/31/2015
Available Amount	\$185,000	Project Manager	Dianne Kresich
Percent complete	\$0	Project Sponsor	Anne Ellis

*Study is funded with FY 2011 dollars.

PROBLEM STATEMENT

The Research Center annually produces and submits to FHWA the *Research Implementation Report* that highlights several completed studies for which implementation of research recommendations occurred at ADOT during the previous year. Taken cumulatively, these reports do not provide the Research Center with a complete understanding of which recommendations, among the hundreds of studies that have been completed, have been implemented in the past or are actively being implemented. They also do not provide a thorough description of the nature of the implementation, such as cost savings, process improvement, better-informed decision making, or product development.

Consistent monitoring and documentation of the implementation of research recommendations are needed to clearly communicate ADOT's use of federal funds to FHWA and other stakeholders, to assess and promote the value of research to ADOT, and to develop a research agenda that meets the needs of the department.

RESEARCH OBJECTIVES

The project will document the implementation of recommendations from research studies completed by the ADOT Research Center. This information will enhance understanding of the value of research to ADOT, and would assist the Research Center in crafting research that meets department's strategic objectives.

The study will focus on all completed research studies included in Project Track, an Access database that was launched by the Research Center in approximately 2002 as a means of collecting and monitoring the most pertinent information on each study.

Project Descriptions

EXPECTED IMPLEMENTATION

The Research Center is responsible for implementation of the recommendations of this research. Staff will update the database on a continual basis. Using the database, staff will produce an annual *Implementation Report* that will be distributed to ADOT management and FHWA, and will be posted on the ADOT website.

The Research Center is also responsible for using the information obtained from the database to develop and maintain a research agenda that will guide the identification and funding of research topics that will best meet ADOT's strategic objectives.

STATUS OF THE RESEARCH

The study is in its earliest stage.

TECHNICAL ADVISORY COMMITTEE

Anne Ellis	ADOT Research Center (Sponsor)
Dianne Kresich	ADOT Research Center (Project Manager/Champion)
Jennifer Catapano	ADOT Research Center
Todd Williams	ADOT OES
Mark Poppe	ADOT Traffic
Marwan Aouad	ADOT Maintenance
Reza Karimwand	ADOT TOC
Paul Burch	ADOT Materials

Research Support Programs

Research Support Programs

SPR-110, *Library Resources*

This budget item provides for the following services on an ongoing basis:

Technical—Requests and receives new publications from federal, state, and private sources, classifies and catalogs new materials, maintains the library computer databases, maintains circulation records.

Service—Provides complete research assistance, including customized bibliographies from computer databases for Arizona Department of Transportation (ADOT) staff upon request, distributes library materials to ADOT staff, provides photocopies of articles upon request, provides interlibrary loans of books.

Public Awareness—Monitors the printing and distribution of all Research Center publications, coordinates the efforts taken to increase public awareness, provides brief library presentations to ADOT staff upon request, maintains both Internet and Intranet sites.

SPR-111, *AASHTO and Transportation Research Board Correlation Service*

This budget item is established to enable ADOT to participate in research studies initiated by the American Association of State Highway and Transportation Officials (AASHTO), implement the results of AASHTO work, and to support the annual subscription to the Transportation Research Board (TRB) Correlation Service. Dues for participation in AASHTO's National Transportation Product Evaluation Program (NTPEP) are provided by this item.

SPR-112, *Administration of Research*

The ADOT Research Center is responsible for initiation, technical review, coordination, and implementation of the research activities of ADOT. The budget for Administration of Research covers expenses for these activities. Other participating charges made to Administration are out-of-state travel expenses to national/regional conferences, short courses or seminars.

Other administrative costs are computer use, in-state travel, and office supplies. Research personnel are responsible for the publication of many reports derived from these activities. Payroll expenditures for secretarial service and typing are charged as overhead costs, as well as graphic artwork and printing.

Research Support Programs

SPR-112, Administration of Research (continued)

This budget item also provides for state services rendered in support of the SPR program. Examples include, but are not limited to, engineering consultant services and external/internal audits. Other costs include miscellaneous services and employee-related expenses.

SPR-113, Support Staff Salaries

SPR-114, Research Reports – Technical Editing and Printing

This budget item provides support for research report editing and publishing, as well as draft reports sent to on-call technical editors for final preparation.

SPR-115, Roadway Changes (Roadway Group Changes)

This budget item provides funding for ADOT personnel in support of research projects requiring work in the field.

SPR-116, Product Evaluation Program

The Product Evaluation Program coordinates the review and acceptance of new products for possible use by ADOT and maintains the Approved Products List (APL). The program administrator coordinates the program with two Product Evaluation Committees: Materials Product Evaluation Committee (MatPEC), and Traffic Control Product Evaluation Committee (TCPEC).

SPR-117, Local Technical Assistance Program (LTAP)

This budget item is to identify the State's portion of the LTAP undertaking for this fiscal year. Annual renewal is subject to co-sponsorship by the Federal Highway Administration (FHWA).

SPR-118, Transportation Research Quick Study (TRQS) Program

This budget item provides funds for specific research topic support. TRQS studies are limited to budgets of \$25,000 or less.

SPR-994, MPD Portfolio Adjustment Projects

Research Support Programs

These funds will enable the MPD Director, working with the research director and staff, to commission studies that will help to balance the research portfolio in accordance with FHWA Performance Measures.

SPR-996, *Project Additions*

These funds are available to fund expansions or additions to existing research projects.

SPR-998, *Budget Closeout Funds*

Carry over funds from budget years that are closed out do not become available for 6-12 months after the budget year is closed. These funds are used to finance active projects from the closed year until the rollover funds become available.

SPR-999, *Special Projects/Contingency*

This is a placeholder for unused funds from completed projects and a reserve for project additions and executive management projects above the planned amounts. They can also be used to fund additional projects supported by the Research Council.

Research Support Programs

Current Pooled Fund Projects

Project No.	National Studies	Obligated Amount	Project Manager
TPF-5(105)	Transportation Library Connectivity and Development	\$10,000	Dale Steele
TPF-5(166)	Application of Three-Dimensional Laser Scanning for the Identification, Evaluation, and Management of Unstable Highway Slopes	No funding in FY 2012	Christ Dimitroplos
TPF-5(250)	Executive Workshops on Strategies and Best Practices for State Departments of Transportation to Support Commercialization of Electric Vehicles (EV) and Infrastructure	\$10,000	John Nichols
TPF-5(275)	Asset Management Conference and Training on Implementation Strategies	\$10,000	Jean Nehme

For additional information on pooled fund projects see the Internet at: www.pooledfund.org