Fiscal Year 2017 Research Program

(July 1, 2016 – June 30, 2017)

Ohio's Research Initiative for Locals
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In cooperation with the
Ohio Department of Transportation, Office of Statewide Planning and Research
Ohio Department of Transportation, Ohio Local Technical Assistance Program and the
U.S. Department of Transportation, Ohio Division of the Federal Highway Administration

Ohio's Research Initiative for Locals (ORIL) is a program designed to provide practice-ready solutions to real-world issues faced on Ohio's local transportation system through research. A collaborative effort between the Ohio Department of Transportation, the Ohio Township Association, the County Engineers Association of Ohio, the Ohio Municipal League, and Ohio's institutions of higher education, ORIL is overseen by a Board consisting of 15 voting members and 3 support members

ORIL Mission:

ORIL develops, funds, and oversees transportation research projects to meet the needs of local agencies for the safety and economic well-being of the traveling public.

ORIL Vision:

ORIL with self-sustaining funding, identifies, manages, and facilitates strategic research that solves local transportation challenges with implementable and cost-effective solutions.

ORIL Board:

Organization Represented	Members
Voting Board Members	
County Engineers Association of Ohio	Brett Boothe, Gallia County Bill Lozier, Licking County Steve Luebbe, Fayette County Warren Schlatter, Defiance County
Ohio Municipal League	Terry Lively, Belmont County Paul Schmelzer, City of Findlay Leo Shanayda, City of Springfield James Young, City of Columbus
Ohio Township Association	Greg Butcher, Violet Township
Ohio Department of Transportation	Jennifer Elston, District 8 Anna Kuzmich, District 11 Jack Noble, District 4 Brian Olson, District 4
Academia/Researchers	Rui Liu, Kent State University Eric Steinberg, Ohio University
Support Board Members	
FHWA Ohio Division Office Ohio LTAP Center ODOT Statewide Planning & Research	Frank Burkett Mike Fitch Vicky Fout

2017 Strategic Research Focus Areas:

Safety

Ensuring the safety of those utilizing and maintaining our transportation system is a priority for all transportation agencies. The traveling public expects the system to meet their individual needs in a manner that is safe, convenient, economic, and efficient with minimal disruption to their daily routines. In addition, protection for roadway crews working on-location is a prominent concern. Identifying, developing, and implementing corrective strategies before hazardous events occur is key to advancing a safe and reliable transportation system. For local agencies the identification of cost appropriate, yet effective, safety measures can often be a challenge.

Renewal/Infrastructure

Without meeting basic maintenance needs, pavements, bridges, signs, guardrail, pavement markings and other roadway features would degrade to the point of being hazardous. The major challenge is to sustain these conditions in a time of declining resources. As our infrastructure ages, it is important to find ways to preserve existing facilities, especially pavements and bridges, while improving design and construction methods which produce reliable, long-lasting facilities.

Operations & Business Practices

Local transportation agencies face a variety of challenges based on their geography, traffic, population density, funding, equipment, staffing, local expectations, governmental structure and history. The identification and evaluation of best practices can be difficult, given the uniqueness of individual organizations. The ability to be aware of existing research and its local applicability can be a challenge for local agencies.

Program Funding:

Funding for ORIL research projects is provided through the Ohio Department of Transportation's (ODOT's) State Planning and Research Part 2 (SP&R2) program. A total of $500,000 was initially budgeted in ODOT's SP&R2 program to support ORIL projects during fiscal year (FY) 2017. All FY2017 ORIL funding is at a ratio of 80% federal SP&R2 funds with the mandatory 20% matching funds provided by ODOT utilizing state funds. ODOT's Research Section provides oversight of all federal and state funds utilized by ORIL. In addition, ODOT's Research Section acts as the contracting agent for ORIL and provides administrative support.

In support of research projects that incorporate aspects of both the state and local transportation systems, ODOT's Research Section has collaborated with ORIL to initiate more comprehensive studies. In these instances, ODOT's Research Section has provided financial contributions to the projects through its traditional SP&R2 program at a funding ratio of 80% federal funds and 20% state funds. The program overview (page 3) denotes the difference between the ORIL (i.e.: local focused) and ODOT (i.e.: state focused) budgets/programs. A total budget is provided to highlight the overall value of ORIL, the local research program.

All projects listed in this program book are also included in ODOT's FY2017 Research, Development and Technology Transfer program book, which was approved by the Ohio Division of the Federal Highway Administration on June 30, 2016.

FY2017 Proposed Projects (Projects anticipated to being after July 1, 2016)

RFP #	Project Title	Project Duration (months)	ORIL Budget (estimated)	ODOT Budget (estimated)	Total Budget (estimated)
2017-ORIL1	Best Practices for Chip Sealing Low-Volume Roads in Ohio Agency: Michigan State University PI: Larry Galehouse	18	$106,193.00	$0.00	$106,193.00
2017-ORIL2	Optimizing the Effective Use of RAP in Local Roadways Agency: Ohio University PI: Munir Nazzal	24	$169,985.00	$0.00	$169,985.00
2017-ORIL3	Use of Crushed Recycled Glass in the Construction of Local Roadways Agency: University of Akron PI: Julian Tao	24	$144,161.00	$0.00	$144,161.00
2017-ORIL4	Storm Water BMP Tool Implementation Testing Agency: GS&P/OH Inc. PI: Mark McCabe	13	$27,945.00	$0.00	$27,945.00
	TOTAL ESTIMATED BUDGET FOR FY 2016:		**$448,284.00**	**$0.00**	**$448,284.00**

FY2017 Active Projects (Projects began prior to June 30, 2016. All funds encumbered during previous fiscal years.)

SJN	Project Title	FY2015 ORIL Funding	FY2015 ODOT Funding	Total Funding
134997	Evaluation and Design of a TL-3 Bridge Guardrail System Mounted to Steel Fascia Beams Agency: RoadSafe, LLC PI: Chuck Plaxico Start Date: January 5, 2015 End Date: May 5, 2017	$291,875.67	$0.00	$291,875.67
134847	Waterproofing Details of Connections for Adjacent Precast Concrete Box-Beam Bridges Agency: University of Akron PI: Anil Patnaik Start Date: January 6, 2014 End Date: March 31, 2017	$60,446.00	$210,000.00	$270,446.00
134989	Analysis of Ground Tire Rubber (GTR) in Mix Design on Local Roadways in Ohio Agency: Ohio University PI: Munir Nazzal Start Date: September 2, 2014 End Date: September 30, 2017	$200,733.06	$0.00	$200,733.06
TPF-5(318)	Practical Design Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossing in the Rural Mid-West Agency: Kansas DOT PI: Susan Barker Start Date: May 2015 End Date: August 2016	$0.00	$30,000.00	$30,000.00
135251	Best Practices of Road User Maintenance Agreements Amongst Local Government Agencies in Ohio Agency: Ohio University PI: Roger Green Start Date: September 21, 2015 End Date: January 21, 2017	$130,696.90	$0.00	$130,696.90
135245	Synthesis of Research on Load Capacity of Concrete Slabs Without Plans Agency: University of Cincinnati PI: Richard Miller Start Date: October 1, 2015 End Date: March 1, 2017	$59,530.20	$0.00	$59,530.20
135248	Structural Benefits of Concrete Paving of Steel Culvert Inverts Agency: Ohio University PI: Teruhisa Masada Start Date: November 1, 2015 End Date: March 1, 2017	$190,802.20	$0.00	$190,802.20
135261	Recommendations and Strategies for IRP Truck Licensing Impacts for Ohio Counties Agency: University of Kentucky PI: Andrew Martin Start Date: February 1, 2016 End Date: February 1, 2017	$40,059.17	$0.00	$40,059.17
	TOTAL BUDGET FOR FY 2016:	**$974,143.20**	**$240,000.00**	**$1,214,143.20**

Total Value of ORIL Program: $1,422,427.20 $1,662,427.20

Project Title:	Best Practices for Chip Sealing Low-Volume Roads in Ohio		
ORIL RFP#:	2017-ORIL1	**State Job #:**	135331
PID:	102220	**Agreement #:**	TBD
FY 2016 Funding:	$106,193.00	**Funding Source:**	ORIL - SP&R2
Start Date:	TBD	**End Date:**	TBD
Research Agency:	Michigan State University	**Researchers**	Larry Galehouse
ORIL TAC:	Greg Butcher, Violet Township Paul Schmelzer, City of Findlay James Young, City of Columbus Anna Kuzmich, ODOT District 11 Aric Morse, ODOT Office of Pavement Engineering Doug Davis, Muskingum County Stevan Hook, Morgan County Brett Boothe, Gallia County		

Project Summary:
Chip seal is widely used as an effective, low-cost preventative maintenance treatment for low-volume roads across Ohio and around the country. In some instances, states have used chip seal on select high-volume roads. In Ohio, local entities who do not utilize the ODOT specification for chip seal (Item 422), tend to rely on previous in-house experience or contractors to determine materials and construction processes for chip seal. As a result, a variety of different methods have been utilized throughout the state. While some of these have resulted in acceptable and even excellent results, others may have not been as successful. As constraints on local budgets continue to tighten, the need to identify the best chip seal techniques and methods increases.

The goal of this research is to assess the current state of practice for chip sealing on county, township, and municipal-maintained roads. The objective is to develop a matrix of best practices for chip sealing low-volume roads in Ohio and design a study to aid in the future assessment of long-term performance creating protocols for data collection.

The results of this research will provide local officials with enhanced knowledge and understanding of chip sealing practices on local roadways in Ohio. This will enable local transportation engineers to confidently apply chip seal in methods that strive to maximize longevity while being cost effective. Ultimately, this research will provide the foundation for the development of scientifically-based guidance on chip seal practices that will aid locals in managing budgets and ensuring the fiscal integrity of local pavement preservation programs.

Project Title:	Optimizing the Effective Use of RAP in Local Roadways		
ORIL RFP#:	2017-ORIL2	**State Job #:**	135330
PID:	102221	**Agreement #:**	TBD
FY 2016 Funding:	$169,985.00	**Funding Source:**	ORIL - SP&R2
Start Date:	TBD	**End Date:**	TBD
Research Agency:	Ohio University	**Researchers**	Munir Nazzal
ORIL TAC:	Rui Liu, Kent State University A. Abdulshafi, City of Columbus James Young, City of Columbus Michael (Mick) Green, ODOT District 6 Perry Ricciardi, ODOT District 3 Clifford Ursich, Flexible Pavements Dan Johnson, City of Columbus		

Project Summary:
The practice of utilizing reclaimed asphalt pavement (RAP) in new asphalt mixtures has increased in recent years due to their economic and environmental benefits. Although the potential benefits are high, the majority of local public agencies (LPAs) in Ohio allow using only small percentages of RAP (i.e.: less than 10%) in their roadways, if any. There has been numerous studies on the use of RAP in asphalt mixtures; however, these studies focus on interstates and highways systems only. Because local roads have different traffic types, volumes and patterns requiring the use of different types of mixtures than those typically utilized for interstates and highways, the RAP may influence the performance of local roadways in a different manner. Bus routes, tighter lane width, roadway diet, underground utilities, ADA curb ramps, are some factors that are generally not considered for interstate and highway systems, but contribute to local road design and mixture utilization.

The goal of this research is to assess the feasibility of RAP in the surface course of municipal and local roadways. The objective is to develop cost effective mix design and quality control recommendations for RAP use on local roadways in Ohio that does not adversely affect the performance or durability of the asphalt mixtures.

The results of this research will provide local officials with enhanced knowledge and a field validated assessment of RAP. The findings of this research will either validate or disprove the perception that utilizing RAP in the asphalt surface course can lead to cost savings while either improving or maintaining performance. It is anticipated that the results of this research may be beneficial in terms of sustainability of local roadways as it maximizes the use of recyclable materials. This information will be of assistance to local decision makers in managing budgets and the proper utilization of RAP on their respective projects.

Project Title:	Use of Crushed Recycled Glass in the Construction of Local Roadways		
ORIL RFP#:	2017-ORIL3	**State Job #:**	135329
PID:	102222	**Agreement #:**	TBD
FY 2016 Funding:	$144,161.00	**Funding Source:**	ORIL - SP&R2
Start Date:	TBD	**End Date:**	TBD
Research Agency:	The University of Akron	**Researchers**	Junliang Tao
ORIL TAC:	Rui Liu, Kent State University A. Abdulshafi, City of Columbus Stephen Henne, City of Columbus Paul Schmelzer, City of Findlay Perry Ricciardi, ODOT District 3 Greg Butcher, Violet Township Dan Johnson, City of Columbus Jennifer Elston, ODOT District 8		

Project Summary:
Glass cullet is produced from crushing waste glass collected in municipal and industrial waste streams to a uniform size. Currently, it is primarily used in Ohio in new glass container manufacturing; however, only clear glass cullet can be used. As a result, colored glass cullet has a relatively low market value as color sorting can be expensive. When market prices drop too low for long periods, some of the glass is sent to landfills instead of subsequent recycling because storage space can be limited or costly. One possible solution is using crushed glass in the construction of civil infrastructures. The Ohio DOT does not have a specification for using glass cullet as an aggregate. This is in part due to concerns with the propensity for glass to strip in the presence of moisture resulting in issues with asphalt binder sticking in the surface course and an overall lack of a consistent supply of product. Although ODOT has chosen not to pursue the incorporation of glass cullet in interstate and highway applications, some local public agencies (LPA) are of the opinion that there may be an appropriate application of this material in the local system.

The potential to mix crushed glass cullet into aggregates exists for many applications including roadway and parking lot base or leveling courses, glasphalt, pipe bedding and backfill, drainage material, fill and concrete. Using a recycled product, like crushed glass, can have environmental benefits to projects seeking Leadership in Energy and Environmental Design (LEED) or National Green Building Standard (NGBS) certification. Because local roads have different traffic types, volumes, and patterns requiring the use of different types of mixtures and aggregates than those typically utilized for interstates and highways, research is needed to analyze the application of recycled crushed glass on local transportation projects.

The goal of this research is to assess the feasibility of using crushed recycled glass as an aggregate in local roadway construction. The objective is to develop recommendations for implementing the use of crushed recycled glass in local roadway applications in Ohio that do not adversely affect the performance or durability of the pavement or structure.

The results of this research will provide local officials with enhanced knowledge of recycled glass cullet and its potential for use in local transportation projects. The findings of this research will either validate or disprove the perception that utilizing glass cullet as part of an aggregate mix is feasible in local roadway construction and can lead to cost savings while maintaining performance. The results of this research may also produce environmental benefits as it could maximize the use of a recyclable material and lead to a reduction in landfills and waste

Project Title:	Storm Water BMP Tool Implementation Testing		
ORIL RFP#:	2017-ORIL4	**State Job #:**	135400
PID:	103394	**Agreement #:**	TBD
FY 2016 Funding:	$27,945.00	**Funding Source:**	ORIL - SP&R2
Start Date:	TBD	**End Date:**	TBD
Research Agency:	GS&P/OH Inc.	**Researchers**	Mark McCabe
ORIL TAC:	Becky Humphreys, ODOT – Hydraulic Engineering Jon Prier, ODOT – Hydraulic Engineering James Ramsey, Franklin County Engineer's Office		

Project Summary:

Gresham, Smith, and Partners (GS&P) completed the ORIL 2015-7 research project for the ORIL Research Initiative for Locals (ORIL) in September 2015. One of the primary deliverables from the research was a storm water best management practice (BMP) selection tool (Tool) targeted for use by Locals. The Tool's performance was tested by the Technical Advisory Committee and GS&P for quality conformance. This new project will conduct a "pilot test" with up to three Local entities to confirm the ease of use of the tool and usefulness of the outputs as applied to actual projects over several months.

The goals of this project include providing training on use of the tool to individuals at each of the selected pilot groups, providing feedback to ORIL and providing information to guide potential future users and promotion of the BMP Selection Tool. The objective of this project will be to gather data on the tool to gain an understanding of the use of the tool and to determine the next steps for possible statewide implementation of the tool.

Project Title:	Best Practices of Road User Maintenance Agreements Amongst Local Government Agencies in Ohio		
ORIL RFP#:	2016-ORIL1	**State Job #:**	135251
PID:	100819	**Agreement #:**	27234
FY 2016 Funding:	$130,696.90	**Funding Source:**	ORIL - SP&R2
Start Date:	September 21, 2015	**End Date:**	January 21, 2017
Research Agency:	Ohio University	**Researchers**	Roger Green
ORIL TAC:	Joe Bachman, Tuscarawas County Terry Bell, Jefferson County Township Association Greg Butcher, Violet Township Matt DeTemple, Ohio Township Association Anna Kuzmich, ODOT District 11 Terry Lively, Belmont County Roger Wright, Washington County Stephen McCall, Champaign County Travis McGarvey, Paulding County		

Project Summary:
Road User Maintenance Agreements (RUMAs) are legal agreements between local governments and for-profit organizations outlining the responsibility for road construction and repairs resulting from excessive damage to local infrastructure caused by those organizations activities. These RUMAs can also stipulate travel routes for heavy equipment haulers in order to ensure safety and help minimize damage to roadways as well as specify testing methods and rating criteria organizations are required to follow. The recent boom in the oil and gas industry in eastern Ohio has brought the use of RUMAs to the forefront. In 2012, Ohio passed Senate Bill 315 which requires well operators to enter into RUMAs or demonstrate a good-faith effort to do so. ODOT in collaboration with the Ohio Department of Natural Resources, the County Engineer's Association of Ohio, and various local transportation officials created a RUMA template to assist local governments in developing RUMAs, but is not a mandated/standard document. Many counties and townships have taken this template and modified it to meet their specific purposes. As a result, a plethora of RUMA versions are in existence within Ohio. As industries such as oil and gas, wind power, coal, and timber expand or relocate production in Ohio, the utilization of RUMAs varies. The variations in requirements, language, and execution of Ohio RUMAs can lead to confusion not only among local governments, but also with the organizations/industries attempting to enter into these agreements. The issue is further complicated as some local governments may be using RUMAs in situations where they are not necessarily app2015-ropriate. A fair amount of research has been conducted nationally on the subject of RUMAs; however, it is not necessarily easily manageable or accessible to local transportation officials. A focused synthesis study to identify the current best practices for RUMAs is needed.

The goal of this research is to conduct a synthesis of current practices related to the development and execution of RUMAs. The objective of this research is to identify current best practices and provide recommendations for RUMA development to assist Ohio's local transportation officials. The results of this research will highlight the practices that have produced the best return on investment in a clear and concise manner. This will provide inexperienced agencies with a better understanding on how to approach these agreements while more experienced agencies will have exposure to different philosophies and applications. Not only will local governments benefit from this research, but the industries/organizations that typically enter into these agreements may also benefit. This research can provide them with a better understanding of what local governments are trying to accomplish with RUMAs. A thorough review of the findings may also help industries to anticipate what may be required by the RUMAs used in specific counties, thereby helping them to estimate potential costs and efforts for the their expanded development into a particular region.

Project Title:	Synthesis of Research on Load Capacity of Concrete Slabs Without Plans		
ORIL RFP#:	2016-ORIL2	**State Job #:**	135245
PID:	100776	**Agreement #:**	27226
FY 2016 Funding:	$59,530.20	**Funding Source:**	ORIL - SP&R2
Start Date:	October 1, 2015	**End Date:**	March 1, 2017
Research Agency:	University of Cincinnati	**Researchers**	Richard Miller Bahram Shahrooz
ORIL TAC:	Jim Branagan, Jefferson County Rui Liu, Kent State University Steve Luebbe, Fayette County Frederick Pausch, County Engineers Association of Ohio Eric Steinberg, Ohio University Amjad Waheed, ODOT Office of Structural Engineering		

Project Summary:
Approximately 6,550 small span concrete slab brides exist in Ohio. Of these bridges, approximately 1,234 (19%) do not have any plans. Many of these structures, still in-service today, were built decades ago; some dating as far back as the 1930s. The vast majority of these bridges are on the local system as less than 20 can be found on state routes. Some counties have as many as 30 of these slab bridges with no plans while other counties find a significant portion of their inventory (approximately 31% or 133 bridges) comprised of these structures all without plans. While these structures are routinely inspected and given a general appraisal rating, a mechanism for load rating these structures is either unavailable or unknown by county engineers. As a result, county engineers rely on past performance and engineering judgment to determine the approximate load capacity of the structure. This likely leads to an overly conservative evaluation. Exacerbating this issue, recent developments in industries, such as oil and gas, have some counties experiencing sudden and significant increases in heavy truck traffic on these structures. These bridges were not built with the expectation of the size and quantity of this traffic. In order to optimize the usefulness of these bridges and ensure the safety of the traveling public, a simple, low-cost scientifically-based method for determining the load capacity of these structures is needed.

The goal of this research is to identify a simple, low-cost, reliable method for county and city engineers to use to evaluate the load capacity of concrete slab bridges without plans. The objective of this research is to perform an in-depth synthesis study to identify the current state of practice and, if an established method is not identified, indicate the future steps necessary in order to achieve the stated goal. The results of this research will aid in optimizing the usefulness of these structure, provide increased confidence in the structure's performance and anticipated lifespan, and enhance the overall safety of the traveling public. As larger and heavier vehicles continue to expand their use of the local system, having greater confidence in the load capacity of these structures becomes a more pressing concern. This research will not only improve the understanding of the current condition of these structures, but assist local transportation officials in understanding their true capacity and limitations.

Project Title:	Structural Benefits of Concrete Paving of Steel Culvert Inverts		
ORIL RFP#:	2016-ORIL3	**State Job #:**	135248
PID:	100810	**Agreement #:**	27231
FY 2016 Funding:	$190,802.20	**Funding Source:**	ORIL - SP&R2
Start Date:	November 1, 2015	**End Date:**	March 1, 2017
Research Agency:	Ohio University	**Researchers**	Teruhisa Masada

ORIL TAC:
Doug Gruver, ODOT District 8
Ed Herrick, Franklin County
Frederick Pausch, County Engineer's Association of Ohio
Mike McColeman, ODOT Office of Hydraulic Engineering
Warren Schlatter, Defiance County

Project Summary:

Over time, a steel culvert invert will experience invert material loss due to corrosion and abrasive flow. The material loss progresses from minor perforations to ultimate invert loss if corrective action to protect the culvert invert is not taken. Invert material loss can lead to erosion of the supporting backfill which is an integral component for the structural integrity of a steel culvert. A common corrective maintenance action is to place 4-6 inches of concrete onto the invert of the steel culvert for the bottom 1/3 of the rise of the culvert. Light reinforcing mesh is attached to the culvert and concrete is poured and shaped to the bottom of the barrel in most applications. If total invert loss or significant backfill erosion has occurred and the exiting shape is unaffected, additional measures may be required such as: additional reinforcing steel and replacement of the backfill with cementitious materials.

This corrective maintenance action is cost effective and widely used because it seals the culvert invert, prevents backfill loss, and provides a protective layer between the abrasive flow and the steel material. However, the impact of this corrective maintenance action on the structural integrity of the culvert is unknown. Additionally, it is unknown if additional reinforcement is required when there is total invert loss and the existing shape is unaffected. While it is clear that the pipe has been weakened by the loss of the steel section, it is unclear if the stiffness of the added concrete compensates and restores the culvert to its original strength. Furthermore, once the floor is sealed with concrete, inspectors are unable to visually confirm additional damage to the remaining steel. This could adversely impact load capacity ratings causing some culverts to receive a higher load rating than is actually warranted. Research is needed to verify the viability of this practice and provide engineers with scientifically-based guidance on its proper application.

The goal of this research is to enhance the understanding of the mechanics of steel culverts and the impact that this common corrective maintenance action has on the structural integrity of the steel culvert. The objectives of this research are to: (1) determine and quantify the influence the repair has on the structural integrity of the culvert system, (2) determine if additional reinforcing steel is required when there is total invert loss, and (3) develop a scientifically-based, cost effective, repeatable methodology engineers can use to evaluate repairs to steel culvert inverts with deteriorated inverts. The results of this research may influence ODOT's current standard specifications for metal culverts (item 611.11). The findings will enable engineers to make more informed decisions on which culverts are ripe for the invert rehabilitation and the most appropriate application of this practice.

Project Title:	Recommendations and Strategies IRP Truck Licensing Impacts for Ohio Counties		
ORIL RFP#:	2016-ORIL4	**State Job #:**	135261
PID:	101068	**Agreement #:**	27260
FY 2016 Funding:	$40,059.17	**Funding Source:**	ORIL - SP&R2
Start Date:	February 1, 2016	**End Date:**	February 1, 2017
Research Agency:	University of Kentucky	**Researchers**	Andrew Martin Jennifer Walton

ORIL TAC:

Quan Boyd, Ohio Department of Public Safety – Bureau of Motor Vehicles
Stephanie Cook, Ohio Department of Public Safety – Tax Distribution Section
Paula Gilleland, Xerox – Ohio's IRP Consultant
Kathy Corrigan, Ohio Department of Public Safety – Bureau of Motor Vehicles
Jeff Honefanger, ODOT's Office of Permits
Leora Knight, Ohio Department of Public Safety – Tax Distribution Section
Anna Kuzmich, ODOT District 11
Jeff Linkous, Clinton County
Terry Lively, City of Marion
Sarah Lown, Western Reserve Port Authority
Randy Partika, Mahoning County
Tom Stiver, Xerox – Ohio's IRP Consultant

Project Summary:
The goal of this research is to expanded upon a previously conducted study (SJN: 134988) aimed at assessing the economic impact of non-Ohio registered commercial vehicle fleets based within Ohio jurisdictions. The objective of this project is to provide recommendations for short- and long-term solutions to address the registering and/or fee allocation process for IRP registration within Ohio. As a result, this will enhance the state's ability to ensure the appropriate retrieval and allocation of IRP registration revenue for maintaining Ohio's roadways. It will also equip local officials with the tools needed to conduct their own investigations as the economic and business situation of their locality changes over time.

Project Title:	Evaluation and Design of a TL-3 Bridge Guardrail System Mounted to Steel Fascia Beams		
ORIL RFP#:	2015-ORIL1	**State Job #:**	134997
PID:	98644	**Agreement #:**	26602
FY 2015 Funding:	$291,875.67	**Funding Source:**	ORIL - SP&R2
Start Date:	January 5, 2015	**End Date:**	May 5, 2017
Research Agency:	RoadSafe, LLC	**Researchers**	Chuck Plaxico Malcolm Ray
ORIL TAC:	Brett Boothe, Gallia County Scott Coleman, Logan County Dennis Gonano, Stahl Sheaffer Engineering Sean Meddles, ODOT Structural Engineering Eric Steinberg, Ohio University Dave Morgan, US Bridge Mike Bline, Licking County Engineer's Office		

Project Summary:
For structures with concrete bridge decks, the railing system is typically connected to the deck. However, for bridges on Ohio's local road system, non-concrete bridge decks (e.g. timber, asphalt filled steel stay-in-place forms, fiber reinforced composite, etc.) are very common and require the railing connection to be located on the fascia beam. Although this fascia mounted system is performing well on the local system, a crash tested version is not available and it is ineligible for use on federal aid projects. Research is needed to evaluate and, if necessary, improve the design of a bridge guardrailing system with steel bridge posts mounted to steel fascia beams.

The goal of this two-phased research project is to analyze and design a steel fascia beam mounted railing system for use on Ohio's local transportation system. The objective is to obtain MASH TL-3 approval of the designed system to allow for its use on federal aid and credit bridge projects. Since the connection would occur at the beam as opposed to the deck, the application of the system would be suitable with a myriad of bridge deck types. The ability to utilize materials other than concrete for bridge decks results in substantial cost savings for locals. Furthermore, the use of an approved railing system will enhance the overall safety of the traveling public and confidence in Ohio's local transportation system.

Project Title:	Waterproofing Details of Connections for Adjacent Precast Concrete Box-Beam Bridges		
ORIL RFP#:	2015-ORIL2	**State Job #:**	134847
PID:	97083	**Agreement #:**	26163 A
FY 2015 Funding:	$270,446.00	**Funding Source:**	ORIL – SPR2 $60,446.00 ODOT – SPR2 $210,000.00
Start Date:	January 6, 2014	**End Date:**	March 31, 2017
Research Agency:	University of Akron	**Researchers**	Anil Patnaik
ORIL TAC:	Waseem Khalifa, ODOT District 11 Steve Luebbe, Fayette County Warren Schlatter, Defiance County Eric Steinberg, Ohio University Jim Welter, ODOT Construction Administration James Wiechart, Mercer County Perry Ricciardi, ODOT District 3		

Project Summary:

Adjacent box-beams need to work together for a bridge to function effectively as a single unit. Structural performance of non-composite box-beam bridges is greatly dependent on the shear key, the connection details including the grout, waterproofing, and the tie rods. Severe leakage is commonly documented. Water leakage leads to premature aging and is the primary cause for corrosion of the prestressing strands and non-prestressed steel, which causes spalling and snapping of strands.

Prevention of water leakage is critical to minimize corrosion related deterioration at the longitudinal joints of adjacent box-beams. Any cracking along the joints and differential deflection of adjacent beams causes water proofing membrane to get damaged making water leakage inevitable. Most times the seeping water is contaminated with chloride from deicing materials which makes the concrete susceptible to corrosion related damage such as cracking and spalling.

This research was initiated by ODOT to establish the sources, causes and effects of inadequate waterproofing at joints and develop preventive measures through careful evaluation of alternatives on the state system. The scope of work was expanded to incorporate aspects specific to the local system such as: (1) analysis of adjacent precast reinforced concrete box-beams to establish the sources, causes and effects of inadequate waterproofing at the joints; (2) an evaluation of peel-and-stick waterproofing as a membrane alternative, (3) an analysis of grouting options/alternatives for keyway joints; and (4) develop preventive measures for existing and new box-beam bridges. The results of this research will provide a basis for better preparation of local officials to deal with system degradation of these structure types and maintenance of existing structures in addition to providing an opportunity for improvements in planning and design of new structures.

Project Title:	Analysis of Ground Tire Rubber (GTR) in Mix Design on Local Roadways in Ohio		
ORIL RFP#:	2015-ORIL4	**State Job #:**	134989
PID:	98609	**Agreement #:**	26595
FY2015 Funding:	$200,733.06	**Funding Source:**	ORIL - SP&R2
Start Date:	September 2, 2014	**End Date:**	September 30, 2017
Research Agency:	Ohio University	**Researchers**	Munir Nazzal Sang-Soo Kim
ORIL TAC:	JuanPablo Ascarrunz, City of Akron Mitch Blackford, ODOT District 6 Michael Huber, City of Akron Robert Liang, University of Akron Rui Liu, Kent State University Perry Ricciardi, ODOT District 3 Michael Teodecki, City of Akron James Young, City of Columbus		

Project Summary:
For decades, transportation agencies have considered the incorporation of crumb rubber, now referred to as ground tire rubber (GTR), in asphalt mixtures to enhance the durability and longevity of pavements. In addition to the improvements in pavements, GTR has demonstrated the potential for positive environmental impacts through its reuse of recycled tires. While the benefits of using GTR appear to be great, the initial cost to implement GTR can often render the material as being cost-prohibited. ODOT has various specifications concerning asphalt mix designs (e.g.: Nos. 446 and 448) including GTR (e.g.: No. 887). While these specifications address the utilization of materials on interstates and highways, their direct application to local roadways may not be appropriate. Factors such as variations in traffic volume and traffic patterns (e.g.: intersections) may influence the performance of GTR resulting in the ODOT specifications being either over or under designed for local roads. Furthermore, advances in technology over the years have increased the options available to transportation agencies in regards to both application methods and products. Since 2005, GTR has been used on approximately 33 local roads and 3 state highways. This presents Ohio with the opportunity to analyze the actual in-field performance of GTR, assess the pros and cons of using the material, and determine if the life-cycle cost of the materials offsets the installation costs.

The goal of this two-phased research project is to assess the true life-cycle cost of GTR mixes on local roads within Ohio and identify opportunities for GTR to be more affordable. The objective is to develop specifications and supplemental QC/QA testing and acceptance criteria for GTR additive/mixture use on municipal and local roads. The results of this research will provide local officials with enhanced knowledge and a field validated assessment of the life-cycle cost of GTR enhanced mixes on its use and performance. The development of a specification for GTR use on local roads will encourage uniformity and provide clear guidance. This information will be of assistance to local decision makers in managing budgets and the proper utilization of GTR on their respective projects.

Project Title:	Practical Design Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossing in the Rural Mid-West		
ORIL RFP#:	Pooled Fund SOL:1373	**State Job #:**	TPF-5(318)
PID:	101663	**Agreement #:**	N/A
FY 2015 Funding:	$30,000.00	**Funding Source:**	ODOT - SP&R2
Start Date:	May 2015	**End Date:**	August 2016
Research Agency:	Kansas DOT	**Researchers**	Susan Barker
ORIL TAC:	Terry Lively, Belmont County Bill Lozier, Licking County		

Project Summary:
This is a pooled fund study being led by the Kansas Department of Transportation. The research is expected to be conducted by Dr. Bruce McEnroe of the University of Kansas and will last a total of 18 months. This research is contingent upon meeting the funding commitment level established by the Kansas DOT.

Many county-owned rural areas bridges are deficient and in need of replacement. Counties cannot afford to replace all deficient bridges and must prioritize their expenditures. In many locations the type and volume of traffic is too low to justify the expense of bridge replacement. This situation is worsening as the rural population declines. Some counties are closing low-volume roads rather than replacing deficient bridges. In some locations a low-water stream crossing might be a practical low-cost alternative to road closure.

County engineers and engineering consultants need guidelines to assess the practicality of replacing a deficient bridge with a low-water crossing and to select the best type of crossing. They also need straightforward design procedures and general design details for common types of crossings. Some general guidance on low-water crossings can be found in reports by the U.S. Forest Service (2006) and Iowa State University (2003). However, these reports do not provide some of the specific information needed for site assessment and crossing design.

This pooled fund study will produce a report that provides practical engineering guidance for the replacement of deficient bridges with low-water stream crossings in the rural Midwest. The report will address the following issues:

1) Site assessment and economics.
2) Selection of crossing type. The two basic types of low-cost low-water crossings are the unvented ford and the vented ford.
3) Design of roadway profile and culvert pipes.
4) Selection of crossing materials. Low-water crossings can be built of concrete, crushed stone, natural stone, stone reinforced with geogrid or geotextile, stone-filled gabions and other materials. We will provide guidelines for materials selection.
5) General design details. We will provide general design details for unvented fords and vented fords constructed of different materials. We will also provide guidance on signage of low-water crossings.