



RESEARCH PROGRAM

ACTIVITIES REPORT

F.Y. 2014-2015

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“The Research Program strives to support the strategic agenda of PennDOT by initiating and managing project activities that attempt to solve real-world transportation issues.”



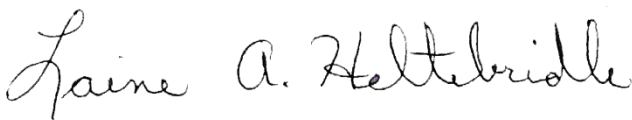
INTRODUCTION

Pennsylvania Department of Transportation (PennDOT) Bureau of Planning & Research | Research Program

This state fiscal year 2014-2015 PennDOT Research Program Activities Report showcases Pennsylvania's state-based research projects, participation in transportation pooled fund studies and efforts in technology transfer and program management.

This report will demonstrate how the Research Program strives to support the strategic agenda of PennDOT by initiating and managing project activities that attempt to solve real-world transportation issues. This is achieved through academic partnerships, cooperative arrangements and private sector contractors with emphasis on applied research, performance monitoring, implementation and technology transfer.

Through investments in research projects addressing construction, design, maintenance, operations and safety, planning and policy and technology transfer, PennDOT's Research Program serves internal and external customers and stakeholders. This includes PennDOT's 5 deputates, 24 bureaus and administrative offices, 11 districts and 67 county maintenance units, PA's citizens, municipalities, and other governmental agencies.



Mr. Laine Heltebride, Bureau Director
Bureau of Planning & Research

Research Division Vision

To build relationships throughout the Department so that the Research Division is the go-to unit for research studies and innovation implementation.

Research Division Mission

The Research Division manages and coordinates research, education and technology transfer programs and projects on behalf of PennDOT. The Research Division strives to support PennDOT's strategic agenda by addressing vital transportation needs of the Commonwealth.

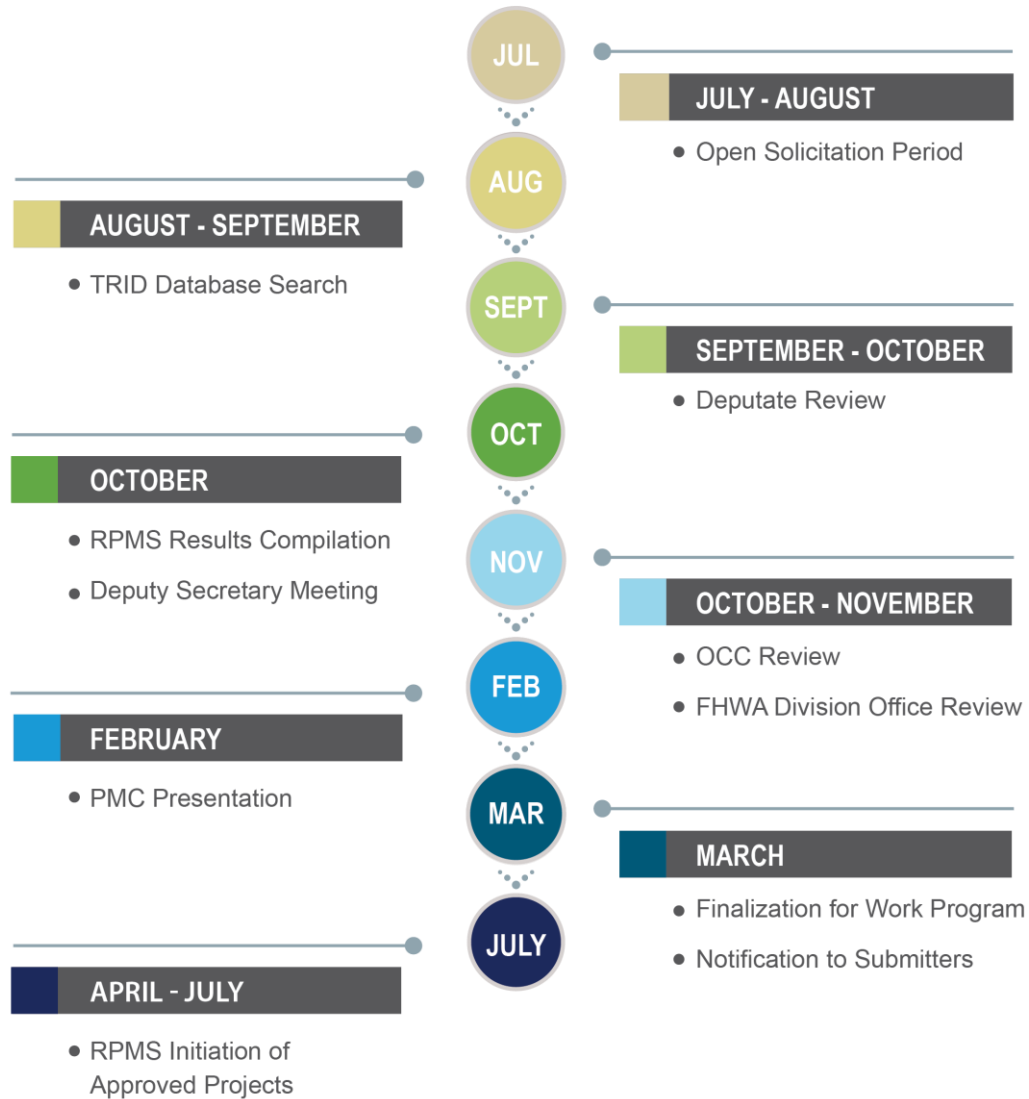
RESEARCH PROGRAM OVERVIEW

PennDOT's Research Program is developed, administered and managed by the Research Program Management Section (RPMS) of the Bureau of Planning and Research's Research Division. The RPMS has implemented an effective annual Research Program Solicitation Process, in accordance with the following steps:

1. Open Solicitation Period
2. Transport Research International Documentation (TRID) Search
3. Deputate Review of Topics Received During Solicitation Period
4. Results Compilation
5. Deputy Secretary for Planning Approval
6. Office of Chief Counsel (OCC) Review
7. FHWA Division Office Review
8. Program Management Committee (PMC) Presentation
9. Work Program Finalization
10. Notification to Submitters
11. Project Initiation

The RPMS staff works with the Bureau Directors, District Executives and Deputy Secretaries to prioritize all received Research Innovations Deserving Exploration and Analysis (IDEA) forms. From the amount of funding available to initiate new research projects, the staff ensures that the projects selected and initiated support PennDOT's key focus areas and that the Department obtains usable results from the projects as they are completed.

PennDOT Research Program Solicitation Process



Approximately \$5 million in funding was invested in research projects in F.Y. 2014-2015. These research projects addressed the vital transportation needs of Pennsylvania, which included the areas of construction, design, maintenance, operations, safety, planning and policy, and technology transfer.

These investments are detailed on the following pages.

RESEARCH PROJECTS F.Y. 2014-2015

Project Name	PennDOT Technical Advisor	Principal Investigator	F.Y. 2014-2015 Funds	Start Date	End Date
Research Invitation to Qualify (ITQ) Projects					
Approved Products for Low Volume Local Roads	Tom Welker	Pennsylvania State University (PSU) Mansour Solaimanian	\$91,576.98	6/20/2011	6/19/2016
Evaluation of Thin Hot Mix Asphalt Overlay	Neal Fannin	PSU Mansour Solaimanian	\$38,761.25	6/21/2012	6/20/2016
Cost Benefit Analysis of Anti-Strip Additives in Hot Mix Asphalt with Various Aggregates	Neal Fannin	Advanced Asphalt Technologies, LLC Donald Christiansen	\$154,436.00	8/15/2012	5/14/2015
Flexible Microsurfacing	Steve Koser	Applied Research Associates, Inc. Shreenath Rao	\$73,093.37	7/30/2012	12/8/2014
Optimizing the Life Cycle of PennDOT Equipment	Michael Connor	Vance & Renz, LLC Robert Vance	\$25,744.83	9/4/2012	10/3/2013
Methodology for Salt Brine Uses in a Winter Services Strategic Plan	William Davenport	Pennonni Associates, Inc. Cory Greene	\$121,285.46	12/3/2012	12/2/2014
Archaeological Predictive Model Set	Ira Beckerman	URS Corporation Matthew Harris	\$200,686.05	5/31/2013	3/31/2015
Bridge Deck Cracking: Effects on In-Service Performance, Prevention, and Remediation	Robert Watral	PSU Aleksandra Radlinska	\$254,498.00	8/6/2013	8/5/2015
Pennsylvania Statewide Transportation Operations Data Warehousing Business Plan	Doug Tomlinson	Michael Baker, Inc Todd Trautz	\$61,796.63	11/24/2014	5/24/2016
Request for Proposals (RFPs)					
Research Implementation Activities Renewal	Michael Bonini	Vance & Renz, LLC Robert Vance	\$258,436.92	10/1/2012	2/15/2015
LTAP Renewal	Lou Ferretti	Pennsylvania State Association of Township Supervisors (PSATS) Karen Atkinson	\$584,978.35	12/29/2013	12/28/2014

RESEARCH DIVISION ACTIVITIES REPORT

Project Name	PennDOT Technical Advisor	Principal Investigator	F.Y. 2014-2015 Funds	Start Date	End Date
RFPs continued					
LTAP Renewal	Lou Ferretti	PSATS Karen Atkinson	\$289,546.94	12/29/2014	12/28/2015
Memorandum of Understanding (MOU) Projects Letter of Understanding (LOU)					
LOU 1-11 F.Y. 2014-2015 – Training	Lou Ferretti	PSATS Karen Atkinson	\$23,641.43	7/17/2013	6/30/2014
LOU 1-12 F.Y. 2013-2014 - STIC Outreach Plan	Andrea Bahoric	PSATS Karen Atkinson	\$37,335.60	8/28/2013	6/30/2015
LOU 1-14 F.Y. 2013-2014	Lou Ferretti	PSATS Karen Atkinson	\$100,507.07	9/30/2014	6/30/2015
LOU 1-15 F.Y. 2014-2015 - Stormwater Training	Daryl St. Clair	PSATS Karen Atkinson	\$51,492.62	10/3/2014	6/30/2015
Pennsylvania State University (PSU) Projects					
Potential Use and Applications for Reclaimed Millings	Doug Schofield	Shelley Stoffels	\$19,114.00	5/1/2013	1/15/2015
Polymer Modified Cold Recycled Asphalt Evaluation and Methodology	Doug Schofield	Mansour Solaimanian	\$114,222.00	6/10/2013	7/27/2015
Safety Performance Functions (SPFs)	Gavin Gray	Paul Jovanis	\$339,987.00	8/9/2013	10/8/2014
Establishing Crash Modification Factors and Their Use	Gavin Gray	Vikash Gayah	\$17,182.00	3/3/2014	9/3/2014
Rumble Strip Installation on Thin Pavement Overlays	Gavin Gray	Eric Donnell	\$26,672.00	3/3/2014	9/3/2014
Best Practices for the Design, Evaluation and Quality Control of High Percentage RAP Mixes	Tim Ramirez	Mansour Solaimanian	\$30,910.00	7/1/2014	12/1/2015
Evaluation of High Friction Surface Treatment (HFST) Binders	Alberto Medina	Eric Donnell	\$31,792.03	7/1/2014	6/15/2016

RESEARCH DIVISION ACTIVITIES REPORT

Project Name	PennDOT Technical Advisor	Principal Investigator	F.Y. 2014-2015 Funds	Start Date	End Date
PSU Projects continued					
Evaluation of Hydraulic Plate Compactor	Joe Cribben	Tong Qiu	\$111,930.00	8/26/2014	12/26/2014
Evaluation of Geotextile Separation to Prevent Migration of Subgrade Fines into Subbase	Kerry Petrasic	Ming Xiao	\$21,629.00	11/24/2014	9/15/2016
70 MPH Study	Bob Pento	Eric Donnell	\$36,305.00	12/4/2014	6/30/2016
University of Pittsburgh (PITT) Projects					
50 KSI Steel H-Pile Capacity	Charlie Carey	Kent Harries	\$78,281.48	5/1/2014	6/30/2015
Noninvasive Assessment of Existing Concrete	Ron Schreckengost	Piervincenzo Rizzo	\$7,594.00	2/3/2015	2/2/2016
Temple University (TEM) Projects					
TDM (Travel Demand Management) Best Practices for Southeast Pennsylvania's US 422 Corridor	Michael Baker	Brad Flamm	\$200,000.00	5/1/2014	12/31/2014
Environmental and Cost Effectiveness of Partially Grouted Riprap for Scour Countermeasures	Peter Berg	Bechara Abboud	\$159,628.00	5/5/2014	3/4/2018
Effective Use and Application of Winter Roadway Maintenance Material Enhancers	William Davenport	Erica McKenzie	\$10,000.00	4/17/2015	10/16/2015
University of Maryland (UMD) Projects					
I-95 Corridor Coalition Research & Technology Transfer Initiative	Lisa Tarson	Kathy Frankle	\$20,387.00	5/2/2014	5/2/2017

RESEARCH DIVISION ACTIVITIES REPORT

Project Name	PennDOT Technical Advisor	Principal Investigator	F.Y. 2014-2015 Funds	Start Date	End Date
Carnegie Mellon University (CMU) Projects					
Connected and Autonomous Vehicles 2040 Vision	Brian Hare	Chris Hendrickson	\$25,606.80	7/11/2013	7/10/2014
Road Condition Reporting	Doug Tomlinson	Christoph Mertz	\$94,744.00	1/16/2014	1/15/2015
Real-Time Incident Detection Using Social Media Data (Twitter)	Mark Kopko	Sean Qian	\$24,248.07	5/11/2015	5/10/2016
Department Wide Research Initiatives (DWRI) Projects					
Winter Severity Index Development	Daryl St. Clair	GHD, Inc. – Shiv Iyer	\$36,642.46	11/26/2013	6/30/2014
STIC Outreach Support Activities	Lisa Tarson	McCormick Taylor, Inc. Leanne Doran	\$226,771.34	3/20/2014	10/29/2015
STIC Outreach 2015	Lisa Tarson	McCormick Taylor, Inc. Leanne Doran	\$179,778.18	2/19/2015	10/12/2017

RESEARCH PROJECTS SPOTLIGHT

Evaluation of Thin Hot Mix Asphalt (HMA) Overlay

Nationwide there has been a move toward the development of asphalt mixtures that can be placed in thinner layers in order to facilitate the preservation of roadways for longer periods of time at reasonable costs. The Thin HMA Overlay research project evaluated the performance of 6.3mm Superpave mixtures that can be placed from $\frac{5}{8}$ inches to $\frac{3}{4}$ inches thick instead of the normal 1½ inches thick HMA layer.

Project Purposes:

- Evaluate the 6.3mm Thin HMA Overlay asphalt to see if it will perform in high traffic areas
- Evaluate the constructability of the 6.3mm Thin HMA Overlay asphalt
- Develop draft guidelines and specifications for the implementation of 6.3mm Thin HMA Overlay asphalt

Anticipated Outcomes:

- The development of a specification that will allow the routine use of 6.3mm Thin HMA Overlays
- More long lasting and cost-effective pavement preservation through the use of 6.3mm Thin HMA Overlays



Source: PennDOT 2013

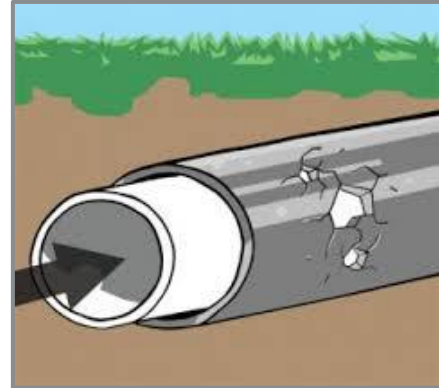
Approved Products for Low Volume Local Roads

This project is very important to PennDOT since its purpose is to have a contractor help evaluate products to be designed as “eligible products” for use on Pennsylvania’s low volume local roads and to evaluate products already listed as eligible products/processes in the Approved Products for Lower Volume Local Roads (Pub. 447).

PennDOT’s Pub. 447 allows local governments to use liquid fuels funding for procurement of such eligible products. Additionally, the project will enable the successful contractor to conduct periodic reviews of eligible products/processes already included in Pub. 447 to ensure that the specifications remain consistent with any changes or revisions to existing specification of eligible products. Updated information on each eligible product will be submitted to PennDOT in a format ready for inclusion in Pub. 447, for which PennDOT already has a New Products Selection Committee in place that acts in an advisory capacity that selects the products for evaluation.

During 2015 the following evaluations were conducted:

- Anti-skid Materials
- Small Diameter Pipes
- Timber Slab Bridges
- Trenchless Pipe Rehabilitation



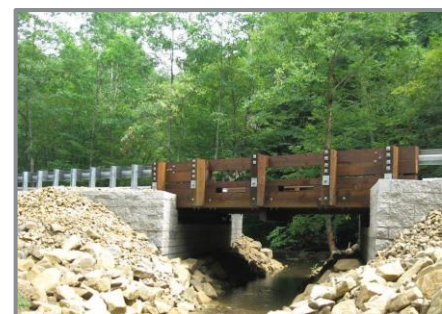
Trenchless Pipe Rehabilitation
Source: Google Images



Small Diameter Pipes
Source: Google Images



Anti-skid Materials
Source: Google Images



Timber Slab Bridges
Source: PennDOT

TRANSPORTATION POOLED FUND PROJECTS: F.Y. 2014-2015

Project Name	PennDOT Technical Advisor	Lead Agency	F.Y. 2014-2015 Funding
Development of Maintenance Decision Support System (MDSS)	Jason Norville	FHWA	\$25,000.00
Traffic Control Device (TCD) Consortium	Justin Smith	FHWA	\$25,000.00
Evaluation of Low Cost Safety Improvements	Jason Herschok	FHWA	\$30,000.00
Pavement Surface Properties Consortium: A Research Program	Rodney Irving	Virginia	\$20,000.00
Research Program to Support the Research, Development and Deployment of System Operations Applications of Vehicle Infrastructure Integration (VII)	Mark Kopko	Virginia	\$40,000.00
Clear Roads Winter Highway Operations Pooled Fund	Jonathan Fleming	Minnesota	\$25,000.00
ITS Pooled Fund Program (ENTERPRISE)	Douglas Tomlinson	Michigan	\$30,000.00
Technology Transfer Intelligent Compaction Consortium (TTICC)	Daniel Clark	Iowa	\$7,000.00
Library Connectivity	Brian Wall	Missouri	\$5,000.00
National Sustainable Pavement Consortium	Steve Koser	Virginia	\$25,000.00
Real-Time Quality Control Monitoring and Characterizations of Aggregate Materials in Highway Construction Using Laser Induced Breakdown Spectroscopy	Patricia Miller	Kansas	\$50,000.00
The Influence of Vehicular Live Loads on Bridge Performance	Charles Carey	FHWA	\$20,000.00
Next Generation Concrete Pavement Road Map	Neal Fannin	Iowa	\$15,000.00

Project Name	PennDOT Technical Advisor	Lead Agency	F.Y. 2014-2015 Funding
Aurora Program	Jason Norville	Iowa	\$25,000.00
Assessing Roadway Traffic Count Duration and Frequency Impacts AADT Estimations	Jeremy Freeland	FHWA	\$6,000.00
Improving Specifications to Resist Frost Damage in Modern Concrete Mixtures	Steve Koser	Oklahoma	\$17,500.00
Improving the Quality of Pavement Surface Distress and Transverse Profile Data Collection and Analysis	John Van Sickle	FHWA	\$15,000.00
2015 Performance Measures Technical Transfer Conference and Asset Management Peer Exchange	Doug Zimmerman	Iowa	\$12,000.00
Regional and National Implementation and Coordination of ME Design	Lydia Peddicord	FHWA	\$10,000.00
The Use of Bridge Management Software in Network Analysis of Big Bridges	Justin Bruner	Michigan	\$20,000.00
11 th International Conference on Low Volume Roads and Peer Exchange	Brian Wall	Iowa	\$8,000.00
Technology Transfer Concrete Consortium (TTCC)	Steve Koser	Iowa	\$8,000.00
Statewide Geospatial Transportation Development of the All Road Network of Linear Referenced Data (ARNOLD)	Frank DeSendi	FHWA	\$50,000.00
Transportation Management Center (TMC)	Eric Sponsler	FHWA	\$25,000.00
Develop and Support Transportation Performance Management Capacity Development Needs for State DOTs	Doug Zimmerman	Rhode Island	\$10,000.00

Project Name	PennDOT Technical Advisor	Lead Agency	F.Y. 2014-2015 Funding
Strain-Based Fatigue Crack Monitoring of Steel Bridges Using Wireless Elastomeric Skin Sensors	Guozhou Li	Kansas	\$10,000.00
No Boundaries Roadway Maintenance Practices	Jonathan Fleming	Ohio	\$10,000.00
Enhancements to the Intelligent Construction Data Management System (VEDA) and Implementation	Dan Clark	Minnesota	\$10,000.00

TRANSPORTATION POOLED FUND PROJECTS SPOTLIGHT

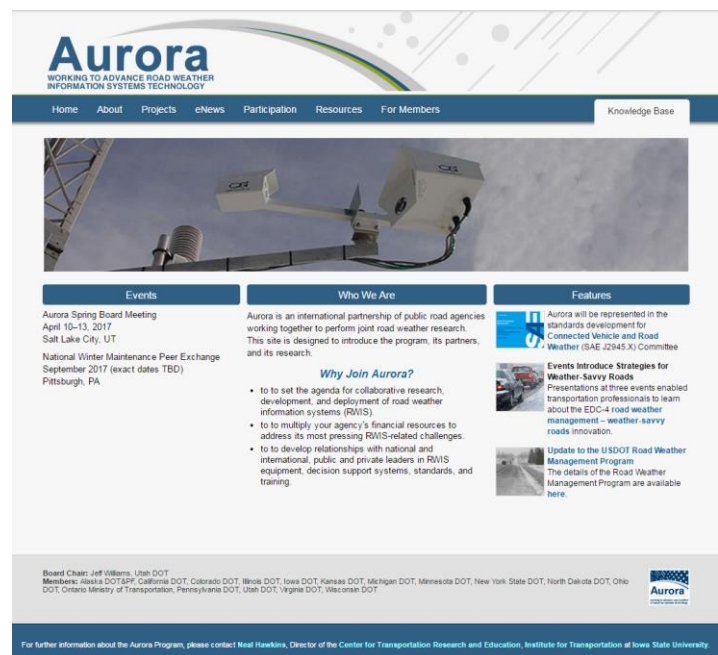
Aurora Program

Aurora is an international program of collaborative research, development, and deployment in the field of Road Weather Information Systems (RWIS). The program, launched in 1996, serves the interests and needs of public agencies by bringing together several U.S., Canadian, and European agencies.

The Aurora vision is to deploy RWIS to integrate state-of-the-art road and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures. It is hoped this will facilitate advanced road condition and weather monitoring and forecasting capabilities for efficient highway maintenance and real-time information to travelers.

As technology use has expanded throughout the surface transportation world in general, RWIS use has expanded as well. The weather and road condition information is now being disseminated to a wide range of transportation users and operators to aid in their decision making. The largest constituency within this expanded market is the traveling public, though many others benefit for this expansion, such as traffic managers and transit operators.

Aurora's initiatives are conducted and funded by member agencies, for member agencies. Several times a year, Aurora members meet to set the agenda for RWIS research. Selected initiatives are led by "champion" member agencies, managed by committees of Aurora members, and funded out of the Aurora pooled fund. Through these meetings, members stay informed about progress on program initiatives and other RWIS-related activities around the world, share their agencies' accomplishments, and learn solutions for common in-the-field problems.



Aurora Program Homepage
<http://www.aurora-program.org/>

LOCAL TECHNICAL ASSISTANCE PROGRAM (LTAP)

PennDOT's Local Technical Assistance Program (LTAP) is one of 58 LTAP centers across the nation (one in each state, Puerto Rico and regional centers serving American Indian tribal governments.) These centers are dedicated to transferring transportation technology through training, technical assistance, and other customer services to municipal elected officials and their staff. PennDOT LTAP provides technical information and proven technologies dealing with roadway maintenance and safety methods to meet the growing demands on municipal governments, which in total, maintain over 77,000 miles of Pennsylvania roads. PennDOT LTAP has provided technology transfer services to Pennsylvania's more than 2,500 municipal governments since 1983.

LTAP by the numbers for 2015:

- In all, **3549** individuals representing **601** municipalities attended LTAP classes.
- **231** classes for **32** course titles were held throughout the Commonwealth.
- Of all classes held, **112** addressed maintenance topics and **119** addressed safety topics.
- **393** one-on-one technical assistance sessions were provided.



Source: PennDOT

In addition to providing training and technical assistance sessions to municipal governments, for the past six (6) years PennDOT's LTAP has been involved in the Build a Better Mousetrap National Competition. The Build a Better Mousetrap National Competition highlights innovative solutions to everyday problems and issues that local and tribal transportation workers and other LTAP and Tribal Technical Assistance Program (TTAP) clients encounter. They can range from the development of tools, equipment modifications, and/or processes that increase safety, reduce cost, improve efficiency and the quality of transportation.

PennDOT LTAP holds their own yearly statewide Build a Better Mousetrap Competition. The competition is opened to all Commonwealth municipalities' employees or crew who have designed and built an innovative gadget or developed an improved way to do a job.

The deadline for entry is March of the following year and all entries are judged on the following criteria, by a committee of municipal road employees:

- Cost savings/benefits to the community
- Ingenuity
- Transferability to others
- Effectiveness

The winners of the statewide competition are then submitted as nominees to a regional and national competition. Winners of the Better Mousetrap National Competition are announced at the LTAP/TTAP National Conference in the summer.

All entries at the national level are posted on the LTAP/TTAP program website and compiled into an electronic booklet. The 2014 winner details are listed on the following page.



Pennsylvania Build a Better Mousetrap 2014 Winner

Problem Statement:

When a job required the use of the road saw, the saw needed to be loaded on a trailer, transported, and delivered to the job site. This task took time and it was not always easy to maneuver the trailer in a work zone, causing a disruption in the flow of traffic. When the job was completed, the trailer would again need to disrupt traffic in the work zone to pick up the saw. How do you make the process of loading, transporting, and delivering a road saw more efficient?

Solution:

The solution was to build a lightweight carrier that hooks to a truck and carries the road saw. The invention, called the “Road Saw Hitch Receiver/Carrier” can efficiently transport the road saw where needed.

Labor/Materials/Cost:

\$40 in labor

Savings/Benefits to the Community:

The receiver/carrier allows for a faster and easier transport to a work site. At the site, the truck can quickly maneuver in a work zone reducing the disruption in the flow of traffic. Also, it eliminates the need to store and maintain another trailer. Buying another trailer to do the same operations, along with maintenance would run the municipality \$500 to \$3,000.



Source: Upper Nazareth Township

PENNDOT RESEARCH DIVISION, F.Y. 2014-2015



Contact Information

Research Division	PennDOT Library
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Acronyms

DWRI: Department Wide Research Initiatives
FHWA: Federal Highway Administration
F.Y.: Fiscal Year
F.F.Y.: Federal Fiscal Year
HMA: Hot Mix Asphalt
IDEA: Innovations Deserving Exploration and Analysis
ITQ: Invitation to Quality
LOU: Letter of Understanding
LTAP: Local Technical Assistance Program
MOU: Memorandum of Understanding
MRO: Municipal Research and Outreach
NCHRP: National Cooperative Highway Research Program
OCC: Office of Chief Counsel
PA: Pennsylvania
PennDOT: Pennsylvania Department of Transportation
PMC: Program Management Committee
RFP: Request for Proposals
RWIS: Road Weather Information Systems
RPMS: Research Program Management Section
STIC: State Transportation Innovation Council
TA: Technical Advisor
TRID: Transport Research International Documentation
TTAP: Tribal Technical Assistance Program
TPF: Transportation Pooled Fund
TRB: Transportation Research Board
US DOT: United States Department of Transportation

