



We developed a prototype smartphone application that alerts drivers to upcoming curves and suggests slowing at the optimal time. **Report 2018-12**



We combined weather, soil and topographical data with geotechnical theory to map highway slopes that are susceptible to storm damage. **Report 2018-05**



FY2018 Local Road Research Board

At-A-Glance

PREPARING TRANSPORTATION PRACTITIONERS
FOR TODAY'S AND TOMORROW'S DEMANDS

July 1, 2017, through June 30, 2018

LRRB.ORG



We created a new tool for road crew workers to use in reporting near misses in work zones. **Report 2018-09**



We demonstrated that even in areas with strong employment, spending on highway infrastructure improves employment rates. **Report 2018-04**

Welcome to the Local Road Research Board At-A-Glance for Fiscal Year 2018

Our Mission

The mission of the LRRB is to serve local road practitioners through the development of new initiatives, the acquisition and application of new knowledge, and the exploration and implementation of new technologies.

Preparing for Our Future

The LRRB is undergoing a strategic planning process to refine its vision, improve its processes and operations, and better meet the needs of Minnesota's local transportation practitioners. The planning process will be accompanied by an updated LRRB Strategic Plan (2019-2024). Through some of these governance changes, the board is also improving how it engages local stakeholders to ensure that its research is relevant, useful and easily available. The board will begin implementing the recommendations from the strategic plan in 2019.

The Local Road Research Board (LRRB) has been bringing innovations to local Minnesota engineers since 1959. The projects listed in this document continue to offer avenues for improving transportation-related processes ranging from high-level policy development to the design, construction and maintenance of pavements, bridges and culverts. To access new resources available to all LRRB members, see pages 4 and 5. For ongoing research updates and other news, visit our website: lrrb.org.



2018 Local Road Research Board: (first row, from left) Kent Exner, City of Hutchinson; Laurie McGinnis, University of Minnesota Center for Transportation Studies; Jim Foldesi, St. Louis County; Kaye Bieniek, Olmsted County; Mitch Bartelt, MnDOT Research Services & Library (staff); (second row) Kevin Western, MnDOT Office of Bridges and Structures; Linda Taylor, MnDOT Research Services & Library; Ben Worel, MnDOT Office of Materials and Road Research (staff); Mitch Rasmussen, State Aid Division; Lyndon Robjent (chair), Carver County; Paul Oehme, City of Chanhassen; Tim Stahl, Jackson County.



Laurie McGinnis, director of the University of Minnesota Center for Transportation Studies, participates in a strategic planning exercise at an LRRB summer board meeting.

To ensure that our research is responding to city and county needs, we have implemented the following process for selecting new projects:

1. **October prescreening meetings:** LRRB representatives will hold sessions at 16 State Aid prescreening meetings, where city and county engineers can discuss their research and technology transfer needs.
2. **December email survey:** In an email survey, we ask city and county engineers to prioritize the list of ideas generated from the prescreening meetings.
3. **January city/county association meetings:** Here we report on the ideas that were collected in step 1 and prioritized in step 2.
4. **February to December proposal development:** Throughout the year, we work with you to develop need statements for the top ideas. Then the LRRB issues requests for proposals and selects proposals to fund.



Shawn Wurst (right), City of St. Paul fleet manager, discusses results from a data collection protocol during a Technical Advisory Panel meeting for the research project, Techno-Economic Analysis of Implementing Hybrid Electric Utility Vehicles in Municipal Fleets. Also pictured is Paul Springston at left.

How the LRRB Works

LRRB research ideas come from local Minnesota transportation professionals like you. Come to the October prescreening meeting with your research ideas. You can also submit ideas anytime at lrrb.org (click the **Submit Ideas** button). We will help you identify existing solutions and formulate a need statement to elicit project proposals. In December, the LRRB evaluates all proposals and selects some for funding.

Your ideas make LRRB research happen. Please do not hesitate to reach out to us with any questions about LRRB's process and research and implementation efforts.

Lyndon Robjent

2018 LRRB Chair and Carver County Engineer
LRobjent@co.carver.mn.us

Mike Flaagan

2018 RIC Chair and Pennington County Engineer
MIFlaagan@co.pennington.mn.us

Mitch Rasmussen

Outreach Subcommittee Chair and MnDOT State Aid Division Director
Mitch.Rasmussen@state.mn.us

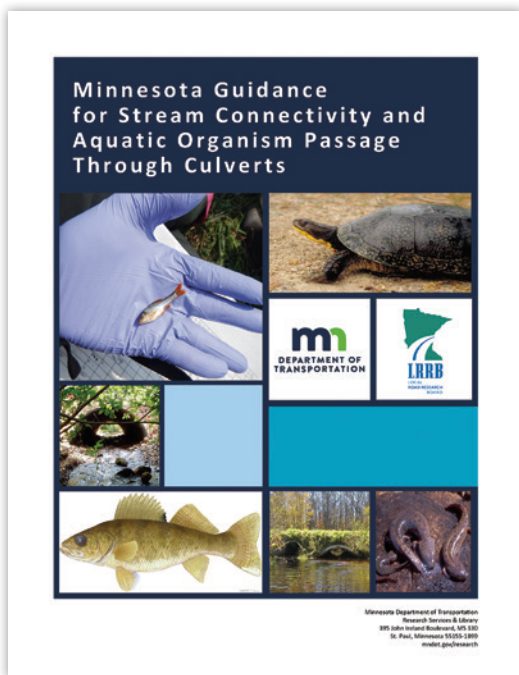


2018 LRRB Research Implementation Committee (RIC): (first row, from left) Mike Flaagan (chair), Pennington County; Guy Kohnhofer, Dodge County; Hafiz Munir, MnDOT Research Services & Library; Kaye Bieniek, Olmsted County; Stephanie Malinoff, University of Minnesota Center for Transportation Studies; Joel Urling, MnDOT State Aid Division (staff); (second row) Ben Worel, MnDOT Office of Materials and Road Research (staff); Bruce Holdhusen, MnDOT Research Services & Library (staff); Steve Bot, City of St. Michael; John Brunkhorst, McLeod County; Kelvin Howieson, MnDOT District 3; Klayton Eckles, City of Woodbury. Not pictured: Kristine Elwood, MnDOT State Aid Division.

Join a Technical Advisory Panel

If your idea is selected or you have expertise or interest in a research area, you may be asked to serve on a Technical Advisory Panel (TAP). Participation involves helping guide researchers, attending a limited number of meetings (in person or via video conferencing) and reviewing research results. This puts you in a good position to ensure the research results fit your needs and is applied in the most productive way in the field. To participate on a TAP, contact any board member.

New Tools for Local Agencies



◀ Minnesota Culvert Manual to Accommodate Aquatic Species Passage

A new manual addresses culverts to use in Minnesota waters to accommodate aquatic species. The guidance is based on five years of research about aquatic species and their migration processes. [Report 2019-02](#)

Gravel Road Management Tool—AVAILABLE SOON

A new spreadsheet-based management tool for gravel roads, available in early 2019, will help county engineers track gravel road conditions, document construction and maintenance history, schedule and prioritize maintenance, and optimize material and maintenance costs. [Project page](#)



▲ Fleet Management Tools for Local Agencies

This new guide describes software that Minnesota local agencies use for managing roadwork fleets and offers best approaches for managing, purchasing and maintaining an equipment fleet. [Report 2017RIC01](#)

Tool for Prioritizing Pavement Markings on Low-Volume Roads ▶

A new spreadsheet-based tool helps agencies prioritize and budget restriping needs based on road condition, size, safety rating and traffic volume. This tool will help local agencies meet public safety needs strategically. [Report 2018-21](#)

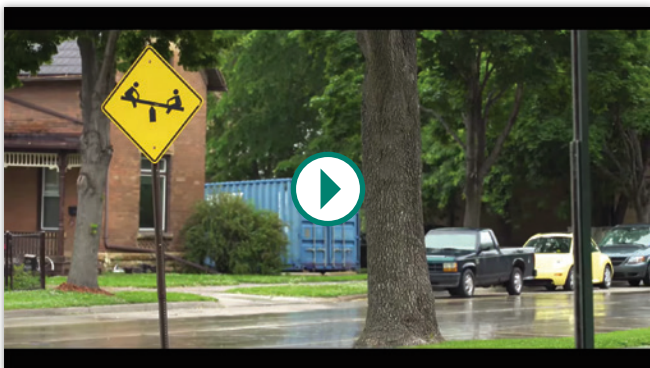
Pavement Marking Prioritization Tool											
Enter data into highlighted boxes and under the highlighted sections.											
1.1 Enter total marking budget:											
2.2 Enter total marking cost estimates (per foot):											
(i.e. cost for two edge-lines on a roadway, not individual.)											
3.1 Enter project data in table below:											
Project/Location	Length (feet)	Road Type	Roads Prioritization				Marking Type Prioritization				
			PA/CTSP Item (Based on Project)	Priority (Based on Project)	Current Condition	Traffic Volume	Current marking age	Total pavement markings per foot	Marking Cost	Marking Priority	Crash Reduction Potential
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
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20											



Request a Transportation Research Synthesis

A Transportation Research Synthesis (TRS) is a short-turnaround research report that you can request to answer your research question. TRSs can summarize completed and in-progress research, or report about the state of practice among your peers in Minnesota and other states. For more information or to request a TRS, visit mndot.gov/research/TRS.html.

[TRS 1802](#), High Friction Surface Treatments, surveyed state transportation agencies and reviewed recent literature on the use of this safety-enhancing approach. The report describes how and in what situations state transportation departments use the treatments, in which epoxies and polish-resistant aggregates are favored, and the safety benefits that are realized.



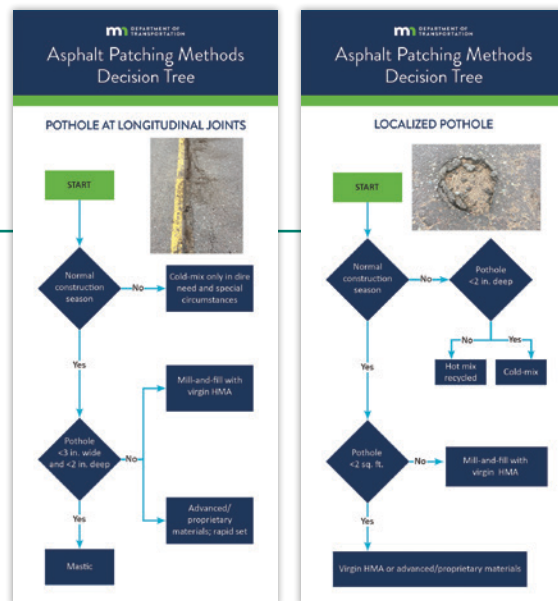
◀ “Ineffective Specialty Warning Signs” Video

A great companion to last year’s [Addressing Citizen Requests guidebook](#), this new [video](#) helps local agencies explain to the public why some popular warning signs are actually counterproductive.

Pothole Prevention and Innovative Repair Guidance ▶

Building on previous research from [Report 2017-25](#) about innovative pothole repair methods (which developed the how-to cards pictured at right), this study established that circular patches last longest, and new materials like graphite nanoplatelets can improve compaction and fracture resistance in warm weather repairs.

[Report 2018-14](#)



◀ Nontraditional Fog Seal Performance Analysis

This research shows that newer, clear fog seals created from agricultural byproducts protect low-speed, local street pavements from water damage.

[Report 2018-18](#)

Other resources at Irrb.org:

[Addressing Citizen Requests for Traffic Safety Concerns](#)

[Alternate Design Methods to Renew Lightly Traveled Paved Roads](#)

[Base Stabilization Additives for Pavement Design](#)

[Enhanced Culvert Inspections—Best Practices Guidebook](#)

[Modernizing Road Construction Plans and Documentation](#)

[Nontraditional Fog Seal Performance Analysis](#)

[Slope Stabilization Guide for Minnesota Local Engineers](#)

[Synopsis of Recycled Asphalt Pavement Material](#)

[Strategies for Effective Roundabout Approach Speed Reduction](#)

[Traffic Generating Development and Roadway Life Consumption Tool](#)

[Using Waste Shingles for Stabilization or Dust Control for Gravel Roads and Shoulders](#)



LRRB Research

Active Projects in FY2018

Projects highlighted on the front cover and pages 4 and 5 are indicated below by **bold text**.
For more information about these projects, including a short Technical Summary for completed reports, search at lrrb.org.

COMMON FUNDING SOURCES

LRRB	Local Road Research Board
SP&R	State Planning & Research (FHWA)
SRP	MnDOT State Research Program

Bridges & Structures

LRRB Identifier	Title	Report #/Status	Investigator	Technical Liason	End Date	Funding Source	Project Cost
INV 976	Development and Integration of Advanced Timber Bridge Inspection Techniques for NBIS—Purchase Equipment and Train Users	In Progress	Victor Krause, University of Minnesota Duluth	David Conkel, Peter Wilson	1/20/20	LRRB	\$42,794
INV 983	Cost-Competitive Timber Bridge Designs for Long-Term Performance	In Progress	Don Fosnacht, University of Minnesota Duluth	David Conkel	8/31/20	LRRB	\$212,883
INV 1009	Field Investigation of Bridge Deck Reinforced With GFRP Rebar	In Progress	Behrouz Shafei, Iowa State University	Paul Rowekamp	8/31/19	LRRB, State Research Program	\$88,000
INV 1035	Anchorage of Epoxy-Coated Rebar Using Chemical Adhesives	In Progress	Ben Dymond, University of Minnesota Duluth	Joseph Black	4/30/19	LRRB	\$42,210
INV 1035	Bridge Deck Performance	In Progress	Ben Dymond, University of Minnesota Duluth	Nickolas Haltvick	4/30/19	LRRB	\$34,400
INV 1035	Debonded Prestressed Strand in Prestressed Beams	In Progress	Cathy French, University of Minnesota	Brian Homan	7/31/19	LRRB	\$35,000

Environmental

LRRB Identifier	Title	Report #/Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 965	Study of Deicing Salt Accumulation and Transport Through a Watershed	2017-50	William Herb, University of Minnesota	Wayne Sandberg	12/31/17	LRRB	\$164,043
INV 979	Slope Stabilization Guide for Minnesota Local Government Engineers	2017-17, 2017-17G	David Saftner, University of Minnesota Duluth	Blake Nelson	8/31/17	LRRB	\$78,124
INV 984	Expanding the Success of Salt-Tolerant Roadside Turfgrasses Through Innovation and Education	In Progress	Eric Watkins, University of Minnesota	Dwayne Stenlund	6/30/19	LRRB	\$168,974
INV 1003	NPDES Stormwater Post-Construction Design Guidebook	Completed	Randy Neprash, Stantec Consulting, Inc.	Michael Flaagan	1/31/18	LRRB	\$89,745
INV 1006	Regional Optimization of Roadside Turfgrass Seed Mixtures	In Progress	Eric Watkins, University of Minnesota	Dwayne Stenlund	1/31/19	LRRB, SRP	\$142,346
INV 1007	Minnesota Culvert Manual to Accommodate Aquatic Species Passage	2019-02	Matt Hernick, University of Minnesota	Petronella DeWall	2/28/19	LRRB, SRP, SP&R	\$164,353
INV 1016	Pavement for Road Salt Reduction	In Progress	John Gulliver, University of Minnesota	Richard McCoy	8/31/19	LRRB	\$197,835
INV 1017	Iron-Enhanced Swale Ditch Checks for Phosphorus Removal	In Progress	John Gulliver, University of Minnesota	Barbara Loida	8/31/19	LRRB, SRP	\$200,036
INV 1027	Characterization of Runoff Quality from Paved Low-Volume Roads and Optimization of Treatment Methods	In Progress	John Gulliver, University of Minnesota	John Welle	11/30/20	LRRB	\$192,527
INV 1038	Regional Optimization of Roadside Turfgrass Seed Mixtures—Phase II: Regional Field Trials and Economic Analysis	In Progress	Eric Watkins, University of Minnesota	Dwayne Stenlund	8/31/22	LRRB	\$467,139

Environmental [cont.]

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 1039	Design and Construction of Infiltration Facilities	In Progress	John Gulliver, University of Minnesota	Dwayne Stenlund	8/31/21	LRRB	\$238,572

TENTATIVELY FUNDED FOR FY2020: Evaluation of Environmental Impacts of Potassium Acetate Used as a Road Salt Alternative; Reuse of Regional Waste in Sustainably Designed Soils; Wet Pond Maintenance for Phosphorus Retention

Maintenance Operations

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	Fleet Management Tools for Local Agencies	2017RIC01	Michael Marti, SRF Consulting Group, Inc.	Guy Kohnhofer	7/31/19	LRRB	\$26,437
INV 645	Personal Protection Equipment Poster and Website	Completed	Mindy Carlson, University of Minnesota Center for Transportation Studies	John Brunkhorst	12/31/18	LRRB	\$69,285
INV 952	Best Management Practices for Establishment of Salt-Tolerant Grasses on Roadsides	2017-31	Eric Watkins, University of Minnesota	Dwayne Stenlund	9/30/17	LRRB	\$193,677
INV 974	Nontraditional Fog Seals for Asphalt Pavement: Performance on Shoulder Sections in Minnesota	2018-18	Eddie Johnson, MnDOT Office of Materials and Road Research	Bruce Hasbargen	6/30/18	LRRB, SRP	\$20,000
INV 980	Pothole Prevention and Innovative Repair	2018-14	Mihai Marasteanu, University of Minnesota	Todd Howard	5/31/18	LRRB, SRP	\$129,914
INV 1015	Optimized Taconite-Based Pavement Repair Compound and Deployment System	In Progress	Lawrence Zanko, University of Minnesota Duluth	Perry Collins	2/28/19	LRRB	\$69,285
INV 1018	Field Usage of Alternative Deicers for Snow and Ice Control	TRS 1706	Laura Fay, Montana State University, Western Transportation Institute	Ryan Peterson	11/30/17	LRRB	\$69,285
INV 1029	Cost-Benefit Analysis of the Effectiveness of Crack Sealing Techniques	In Progress	Manik Barman, University of Minnesota Duluth	Daniel Knapek	7/31/19	LRRB	\$69,285
INV 1034	Adaptive Management to Improve Deicing Operations	In Progress	Larry Baker, University of Minnesota	Ross Bintner	7/31/20	LRRB	\$69,285
INV 1047	Techno-Economic Analysis of Implementing Hybrid Electric Utility Vehicles in Municipal Fleets	In Progress	Will Northrop, University of Minnesota	Kevin Schlangen	2/29/20	LRRB	\$69,285

TENTATIVELY FUNDED FOR FY2020: Implementation of Lane Boundary Guidance System for Snowplow Operations

Materials & Construction

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	Base Stabilization Guidance and Additive Selection for Pavement Design and Rehabilitation	2017RIC02	Michael Marti, SRF Consulting Group, Inc.	Benjamin Worel	7/31/19	LRRB	\$29,476
INV 645	Gravel Road Management Tools	In Progress	Michael Marti, SRF Consulting Group, Inc.	Michael Flaagan	7/31/19	LRRB	\$18,021
INV 645	Workshop and Materials: Current Practices for Lightly Surfaced Roadway	In Progress	Michael Marti, SRF Consulting Group, Inc.	Michael Flaagan	7/31/19	LRRB	\$25,029
INV 885	Research Test Section Tracking—Phase II	Completed	Jeffrey Brunner, MnDOT Office of Materials and Road Research	Luane Tasa	6/30/18	LRRB	\$55,000
INV 935	Design Considerations for Embankment Protection During Road Overtopping Events	2017-21	Jeff Marr, University of Minnesota	John Anderson	8/31/17	LRRB, SRP	\$194,787
INV 935	Design Considerations for Embankment Protection During Road Overtopping Events	2017-21	Jeff Marr, University of Minnesota	John Anderson	8/31/17	LRRB, SRP	\$194,787

Materials & Construction [cont.]

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 971	Optimal RAP Content for Minnesota Gravel Roads	In Progress	Charles Jahren, Iowa State University	Joel Ulring	2/28/19	LRRB	\$92,538
INV 975	Prevention of Stripping Under Chip Seals	2017-35	Dave Rettner, American Engineering Testing, Inc.	Klayton Eckles, Tony Kutzke	10/31/17	LRRB	\$18,942
INV 981	Evaluation of Stabilized Full Depth Reclamation (SFDR)	2018-33	Charles Jahren, Iowa State University	Guy KohlInhofer	1/31/19	LRRB, SRP	\$126,991
INV 985	Life-Cycle Cost Analysis Tool for Minnesota Pavements	Completed	Derek Tompkins, University of Minnesota	John Brunkhorst	2/28/18	LRRB	\$54,682
INV 986	Performance Monitoring of Olmsted CR 117/104 and Aggregate Base Material Update.	In Progress	Kyle Hoegh, MnDOT Office of Materials and Road Research	Kaye Bieniek	6/30/20	LRRB	\$44,000
INV 989	Storm-Induced Slope Failure Susceptibility Mapping	2018-05	Omid Mohseni, Barr Engineering Company	Blake Nelson	1/31/18	LRRB	\$85,000
INV 1013	Comparison of Performances of Structural Fibers and Development of a Specification for Using Them in Thin Concrete Overlays	2018-29	Manik Barman, University of Minnesota Duluth	Maria Masten	8/31/18	LRRB, SRP, SP&R	\$153,792
INV 1023	Experimental and Computational Investigations of High-Density Asphalt Mixtures	In Progress	Mihai Marasteanu, University of Minnesota	Eddie Johnson	8/31/19	LRRB, SRP	\$150,935
INV 1028	Is Seal Coating Counterproductive or Not?	Completed	Brian Arman, American Engineering Testing, Inc.	Steven Bot	8/31/18	LRRB	\$14,923
INV 1028	Is Seal Coating Counterproductive or Not? (Evaluation of Stripping Under Chip Seals—Phase II)	In Progress	Zhanping You, Michigan Technological University	Steven Bot	12/31/19	LRRB	\$140,508
INV 1040	Development of Pavement Condition Forecasting for Web-Based Asset Management for County Governments	In Progress	Bradley Wentz, North Dakota State University	Bruce Hasbargen	4/30/20	LRRB	\$92,831
INV 1045	Life-Cycle Civil Integrated Management (CIM)	In Progress	Chris Trboyevich, SRF Consulting Group, Inc.	Lyndon Robjont	10/31/19	LRRB	\$98,901
INV 1046	Innovative Materials and Advanced Technologies for a Sustainable Pavement Infrastructure	In Progress	Jia-Liang Le, University of Minnesota	Juan Pinero	8/31/20	LRRB	\$151,514

TENTATIVELY FUNDED FOR FY2020: Best Practices for Preventing Settling/Heaving at Catch Basins/Manholes; Construction Inspection Training/Documentation; Base Stabilization Additives: Effect on GE; Determine a Granular Equivalent (GE) Factor; Effectiveness of Geotextiles/Geogrids in Roadway Construction; Evaluation of Curing Effects on Cold In-Place Recycling (CIR); Optimizing Asphalt Mixture Designs for Low-Volume Roads of Minnesota

Multimodal

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	FY2018 ADA Workshops for Local Agencies	In Progress	Stephanie Malinoff, University of Minnesota Center for Transportation Studies	Kristine Elwood	2/28/19	LRRB	\$125,000
INV 645	HCV Unified Permitting Process—Phase II	Completed	Annette Theroux, Pro-West & Associates, Inc.	Rich Sanders	8/31/17	LRRB	\$17,548
INV 645	Oversize/Overweight Vehicle Unified Permitting Process—Phase I	2017-26	Michael Marti, SRF Consulting Group, Inc.	Rich Sanders	8/31/17	LRRB	\$50,176
INV 964	Traffic Impacts of Bicycle Facilities	2017-23	Greg Lindsey, University of Minnesota Humphrey School of Public Affairs	James Rosenow	7/31/17	LRRB	\$138,914

TENTATIVELY FUNDED FOR FY2020: Best Management Practices of Bicycle Pedestrian Facilities; Pedestrian Crosswalk Policy

Policy & Planning

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	Consolidated Asset Management Guide for Local Agencies	In Progress	Michael Marti, SRF Consulting Group, Inc.	Lyndon Robjent	7/31/19	LRRB	\$18,188
INV 645	Training Workshop: Americans With Disabilities Act (ADA) for Local Agencies	In Progress	Michael Marti, SRF Consulting Group, Inc.	Ted Schoenecker	7/31/19	LRRB	\$36,289
INV 963	Stakeholder Attitudes, Knowledge and Engagement in Local Road Systems Planning and Decision-Making	2017-39	Guillermo Narvaez, University of Minnesota	Bruce Hasbargen	9/30/17	LRRB	\$139,793
INV 1008	Effective Social Media Engagement Options for Minnesota's Diversifying Population	2018-08	Ingrid Schneider, University of Minnesota	Renee Raduenz	4/30/18	LRRB, SRP	\$163,783
INV 1014	Transportation Investment and Job Creation in Minnesota Counties	2018-04	Zhirong Jerry Zhao, University of Minnesota	Bruce Hasbargen	3/31/18	LRRB	\$110,350
INV 1020	LRRB Strategic Plan Update	In Progress	Donald Ludlow, CPCS Transcom, Inc.	Lyndon Robjent	7/31/19	LRRB	\$88,821
INV 1031	Investigating Inductive Loop Signature Technology for Statewide Vehicle Classification Counts	2018-31	Chen-Fu Liao, University of Minnesota	Gene Hicks	2/28/19	LRRB, SRP	\$92,820
INV 1043	Evaluating the Impact of Local Expenditures on State and Regional Transportation Facilities	In Progress	Zhirong Jerry Zhao, University of Minnesota	Russ Matthys	8/31/20	LRRB	\$121,668
INV 1058	Local Agency Permit Fee Policies for Oversize/Overweight Vehicles	TRS 1806	Patrick Casey, CTC & Associates LLC	Rich Sanders	1/31/19	LRRB	\$9,896

TENTATIVELY FUNDED FOR FY2020: Construction Incentives—Are They Working?; GIS Tools and Apps—Integration with Asset Management; Managing Utility Congestion Within the Right of Way

Traffic & Safety

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	Addressing Citizen Requests for Traffic Safety Concerns	2017RIC05	Michael Marti, SRF Consulting Group, Inc.	Steven Bot	7/31/19	LRRB	\$25,157
INV 924	Ineffective Specialty Signs Video for Local Agencies	Completed	Bryan Nemeth, Bolton & Menk, Inc., Consulting Engineers & Surveyors	Gary Reihl	8/31/18	LRRB, Other State Funds	\$28,569
INV 962	Evaluation of Safety and Mobility of Two-Lane Roundabouts	2017-30	John Hourdos, University of Minnesota	Joe Gustafson	8/31/17	LRRB	\$124,920
INV 972	Minnesota Local Agency Pavement Marking: Mining Existing Data	2017-43	Omar Smadi, Iowa State University	Kate Miner	10/31/17	LRRB	\$65,000
INV 978	In-Vehicle Work Zone Messages	2017-19	Nichole Morris, University of Minnesota	Kenneth Johnson	8/31/17	LRRB, SRP	\$105,167
INV 1004	Development and Demonstration of a Cost-Effective In-Vehicle Lane Departure and Advanced Curve Speed Warning System	2018-34	Imran Hayee, University of Minnesota Duluth	Victor Lund	2/28/19	LRRB	\$124,704
INV 1005	In-Vehicle Dynamic Curve-Speed Warnings at High-Risk Rural Curves	2018-12	Brian Davis, University of Minnesota	Bradley Estochen	4/30/18	LRRB, SRP, SP&R	\$161,803
INV 1010	Strategies for Effective Roundabout Approach Speed Reduction	2017-14	Susan Chrysler, Texas A&M Transportation Institute	Joe Gustafson	7/31/17	LRRB, SRP	\$74,989
INV 1011	Work Zone Intrusion Report Interface Design	2018-09	Nichole Morris, University of Minnesota	Todd Haglin	4/30/18	LRRB, SRP, SP&R	\$200,638
INV 1012	Investigating the Necessity and Prioritizing Pavement Markings on Low-Volume Roads	2018-21	David Veneziano, Iowa State University	Bruce Hasbargen	6/30/18	LRRB	\$71,475
INV 1022	Pavement Markings—Wet Retroreflectivity Standards	In Progress	Adam Pike, Texas A&M Transportation Institute	Kenneth Johnson	4/30/19	LRRB, SRP, SP&R	\$175,062
INV 1024	Evaluation of the Effectiveness of Stop Lines in Increasing the Safety of Stop-Controlled Intersections	In Progress	John Hourdos, University of Minnesota	Nick Bauler	9/30/19	LRRB	\$150,330
INV 1025	How Locals Need to Prepare for the Future of V2V/V2I Connected Vehicles	In Progress	John Hourdos, University of Minnesota	Deb Heiser	11/30/19	LRRB	\$79,260
INV 1026	Prepare Local Agencies for Future of V2V/V2I and Connected Vehicle Technologies	In Progress	Shauna Hallmark, Iowa State University	Douglas Fischer	5/31/19	LRRB	\$51,503

Traffic & Safety [cont.]

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 1030	Examining Optimal Sight Distances at Rural Intersections	In Progress	Nichole Morris, University of Minnesota	Tracey Von Bargaen	3/31/19	LRRB	\$170,549
INV 1032	Personal Warning Sensor for Road Construction Workers	In Progress	Gerald Ullman, Texas A&M Transportation Institute	Milford Ulven	8/31/19	LRRB, SRP	\$113,693
INV 1033	Cloud-Based Dynamic Warning System	In Progress	Bradley Wentz, North Dakota State University	Richard West	2/28/19	LRRB	\$79,629
INV 1036	High Friction Surface Treatments Supplement	TRS 1802, TRS 1802S	Patrick Casey, CTC & Associates, LLC	Tracey Von Bargaen	8/31/18	LRRB	\$9,988
INV 1051	Development and Demonstration of an In-Vehicle Lane Departure Warning System Using DSRC-Based V2V Communication	In Progress	Imran Hayee, University of Minnesota Duluth	Victor Lund	2/28/21	LRRB	\$133,656

TENTATIVELY FUNDED FOR FY2020: Establishing a Repeatable Method for Presenting Nontraditional Traffic Treatments to Maximize Stakeholder Support; Toward Implementation of Max-Pressure Signal Timing on Minnesota Roads

Administrative

LRRB Identifier	Title	Report #/ Status	Investigator	Technical Liaison	End Date	Funding Source	Project Cost
INV 645	Implementation Planning by Evaluating or Updating Completed Local, State or FHWA Projects/Products	In Progress	Michael Marti, SRF Consulting Group, Inc.	Michael Flaagan	7/31/19	LRRB	\$13,217
INV 645	Research Implementation Committee—RIC Implementation of Research Findings (FY2017-2019)	In Progress	Michael Marti, SRF Consulting Group, Inc.	Michael Flaagan	7/31/19	LRRB	\$544,925
INV645B	LRRB Outreach and Marketing Support	Completed	Renae Kuehl, SRF Consulting Group, Inc.	Shannon Fiecke	7/31/17	LRRB	\$20,000
INV 645B	LRRB Outreach and Marketing Support	In Progress	Renae Kuehl, SRF Consulting Group, Inc.	Shannon Fiecke	8/31/19	LRRB	\$99,886
INV 645B	LRRB Outreach and Marketing Support (2017-2018)	Completed	Renae Kuehl, SRF Consulting Group, Inc.	Shannon Fiecke	8/31/18	LRRB	\$83,812
INV 668	FY2018 Local Technical Assistance Program (LTAP)	Completed	Stephanie Malinoff, University of Minnesota Center for Transportation Studies	Mitchell Rasmussen	6/30/18	LRRB, Other Federal Funds	\$450,000
INV 916	LRRB 2017 Technology Transfer Material Development	Completed	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	7/31/18	LRRB	\$98,942
INV 916	LRRB Technology Transfer Materials Development (FY2018)	In Progress	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	2/29/20	LRRB	\$99,824
INV 924	State Aid: Professional Services for Careers in Civil Engineering Video	Completed	Renae Kuehl, SRF Consulting Group, Inc.	Mitchell Rasmussen	2/28/18	LRRB, Other State Funds	\$82,912
INV 927	LRRB Website Development and Hosting	In Progress	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	7/31/21	LRRB	\$39,462
INV 936	FY2016 and FY2017 LRRB Focus Groups	Completed	Jim Grothaus, University of Minnesota Center for Transportation Studies	Paul Oehme	7/31/17	LRRB	\$29,382
INV 936	Research Need Statement Development for Minnesota Local Road Research Board	In Progress	Renae Kuehl, SRF Consulting Group, Inc.	Mitchell Rasmussen	7/31/18	LRRB	\$51,459
INV 998	Operational Research Program for Local Transportation Groups (OPERA) (FY2017-2018)	In Progress	Mindy Carlson, University of Minnesota Center for Transportation Studies	Mitchell Rasmussen	9/30/18	LRRB	\$160,000
INV 999	FY2016 RSS Report Publication Services	Completed	Arlene Mathison, University of Minnesota Center for Transportation Studies	Shannon Fiecke	8/31/17	SRP, LRRB	\$73,035
INV 999	Research Services & Library Report Publication Services (FY2018-2019)	In Progress	Arlene Mathison, University of Minnesota Center for Transportation Studies	Shannon Fiecke	6/30/19	SRP, LRRB	\$86,329

2019 LRRB and RIC Meetings

Get up-to-date information on these meetings at lrrb.org.

LRRB Presentations at State Aid Prescreening Meetings: May

LRRB representatives attend all 16 State Aid prescreening meetings across the state to present the results of completed research and share project updates. Research topics include design, environmental compatibility, maintenance, materials and construction, policy and planning, and traffic and operations.

RIC: March 11—MnDOT Training Center, St. Cloud LRRB: March 20—Carver County Public Works

The spring meeting is devoted to programming and strategy identification, with emphasis on identifying research topics for the following year. The LRRB determines ongoing funding commitments, deciding on RIC funding every other year, and approves the next year's travel budget. Information is also provided about projects completed during the past year.

LRRB and RIC: June 19-10—Cragun's Resort, Brainerd

Each summer, LRRB and RIC members meet in a joint session to formally adopt the upcoming year's strategic plan. The meeting always takes place outside of the metro area, and when possible, LRRB staff arranges a field tour of a nearby research installation or project site. During the meeting, members use prescreening meeting feedback, themes and gaps identified in Research Road Map efforts and completed research reports to determine research needs for the upcoming RFP and implementation strategies for the RIC. Information is also provided about projects completed during the past year.

RIC: September 5—MnDOT Fort Snelling Office, St. Paul

LRRB: October 16—Stearns County Public Works, Waite Park

The fall meeting focuses on prioritizing university research proposals to be presented at the LRRB project selection winter meeting. Our fall prescreening meetings held throughout the state provide you with an opportunity to discuss your needs for research and technology transfer.

LRRB Focus Group at State Aid Prescreening Meetings: October

LRRB representatives will again hold sessions at all 16 State Aid prescreening meetings. City and county engineers are encouraged to bring research ideas to discuss with the group. These will be collected for consideration for funding as a research or technology transfer project.

RIC: November 13—MnDOT Fort Snelling Office, St. Paul

LRRB: December 11-12—University of Minnesota Coffman Memorial Union, Minneapolis

At the winter meeting, the LRRB prioritizes research needs identified throughout the previous year and decides what projects will be funded in the upcoming fiscal year. Research investigators give brief presentations to LRRB members, who can then ask questions about the proposed projects.



LRRB member Paul Oehme, Chanhassen city engineer, reviews budget details during the summer board meeting.

Our research ideas come from local Minnesota transportation practitioners like you. In addition to attending a fall State Aid prescreening meeting, you can submit ideas any time: Visit lrrb.org and click the **Submit Ideas** button. We'll let you know whether current solutions to your problem already exist and help you take your idea to the next stage of consideration for funding.

MnDOT's expert librarians are here to serve not just MnDOT employees but also Minnesota city and county engineers. Request a literature search, interlibrary loan or special publication at 651-366-3791, library.dot@state.mn.us or mndot.gov/library.

Illustration of a worker wearing various PPE:

- Hard hat: Protects against falling objects.
- Safety glasses: Protects eyes from blowing dust or particles, acids or caustics.
- Earmuffs: Protects hearing from machinery equipment.
- High-visibility vest: Ensures the worker is an errant vehicle.
- Gloves: Protects hands from sharp objects.

Help your roadway maintenance workers choose the right protection for the job with these new shop posters, a PPE decision matrix, fact sheets and technical resources available at mnltap.umn.edu/PPE.



The LRRB partners with the National Road Research Alliance, a multi-state pooled fund focused on solving widespread problems impacting road owners and users.

Members help direct the research program at the MnROAD pavement testing facility. For more information, see mndot.gov/mnroad/nrra.

CIVIL ENGINEERING

The LRRB funds videos that communicate research results to transportation practitioners

as well as the public. Check out the [LRRB YouTube channel](#) or lrrb.org/resources/videos.

Administered by the Minnesota Local Technical Assistance Program, the Operational Research Assistance (OPERA) Program funds innovative maintenance and construction methods developed and demonstrated by local agencies. Read more at mnltap.umn.edu/opera/.

- Otter Plow Cushion—Otter Tail County
- Evaluating Pickle Brine for Ice Control—Carver County
- Pollinator Habitat Along Roadsides—Washington County
- Retrofitting Bridge Approach Transition Curbs—Jackson County
- Biobased Sealant for Bridge Decks—City of Hutchinson
- Project Management With BrightWork—Carver County
- Pavement Management Software Evaluation—St. Louis County



Produced by CTC & Associates for **Minnesota Department of Transportation, Office of Transportation System Management, Research Services & Library, Local Road Research Board**

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