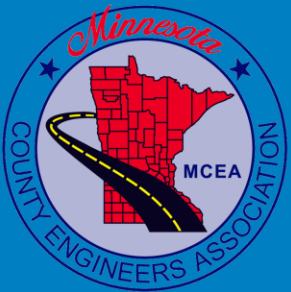


LRRB – DID YOU KNOW!

Minnesota County Engineers Conference 2023



Michael Marti
Sue Miller



Introductions



Sue Miller



Michael Marti





LRRRB
LOCAL
ROAD RESEARCH
BOARD

Agenda

- Overview of LRRRB
- Update on recently completed projects
- TAP members needed
- Status of new research ideas
(brainstorming during last fall pre-Screening Board)



Overview of LRRB

The Local Road Research Board



\$4M IN ANNUAL FUNDING



25+ NEW PROJECTS EACH YEAR



12 CITY/COUNTY BOARD MEMBERS

75+ ACTIVE PROJECTS

100+ TAP CITY/COUNTY MEMBERS

Who is the Local Road Research Board?



Jim Foldesi (Chair)
St. Louis County



Kristine Elwood
MnDOT State Aid



Brian Giese
Pope County



Duane Hill
MnDOT D1



Katie Walker
MnDOT Research



Matt Leonard
City of Monticello



Kyle Shelton
MnDOT R&I



Lon Aune
Marshall County



Paul Oehme
City of Lakeville



Wayne Sandberg
Washington County

Who is the Research Implementation Committee?



Will Manchester (Chair)
City of Minnetonka



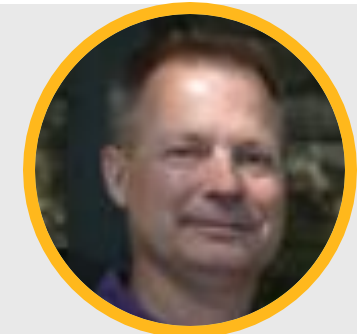
Kristine Elwood
MnDOT State Aid



Ben Worel
MnDOT Road Research



Fausto, Cabral
MnDOT D1



Guy Kohlnhofer
Dodge County



John Brunkhorst
McLeod County



TBD



Ryan Thilges
Blue Earth County



Stephanie Malinoff
U of M CTS



Steve Bot
City of St. Michael

An aerial photograph of a large, multi-level highway interchange with several overpasses and ramps, situated in a valley. In the background, a long dam spans across a wide river. The surrounding landscape is lush with green trees and vegetation. The entire image is overlaid with a semi-transparent blue filter.

Update on recently completed projects

Evaluation of SFDR Stabilizing Products

■ Purpose

- Conduct a side-by-side comparison of two stabilizers BASE ONE® and engineered emulsion used for SFDR

■ Process

- Leverage an existing rehabilitation project on the border of Beltrami and Hubbard counties.
- Gather data, conduct field testing and report on performance

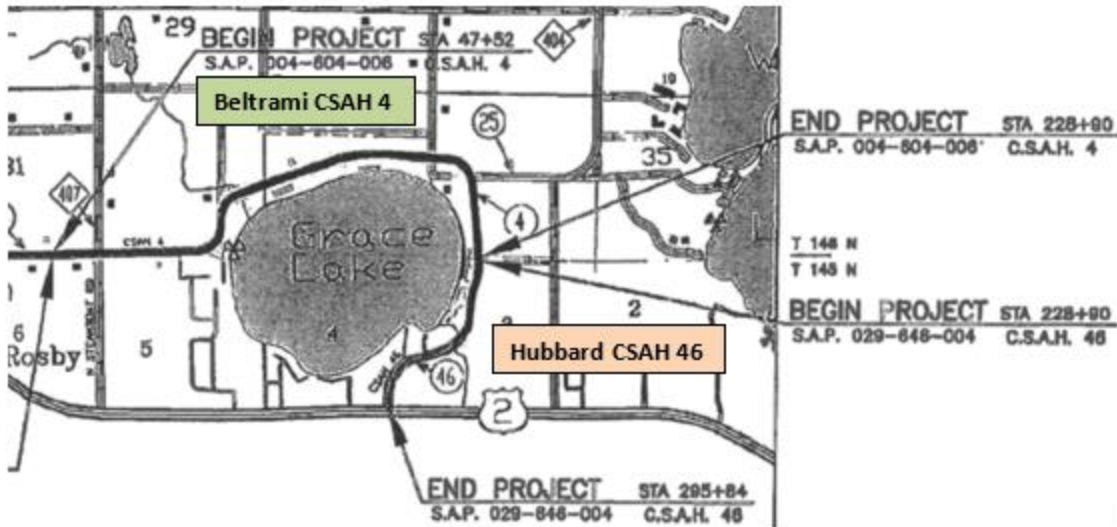


Technical Advisory Panel

- Bruce Hasbargen, Beltrami County and TAP Chair
- Jim Foldesi, St. Louis County and LRRB Chair
- Kaye Bieniek, Olmsted County
- Steve Bot, City of St. Michael
- John Brunkhorst, McLeod County
- Jed Nordin, Hubbard County
- Marcus Bekele, MnDOT
- Mike Marti, SRF Consulting Group, Braun Intertec as subcontractor

Evaluation of SFDR Stabilizing Products

- Final Deliverable
 - A report including a side-by-side comparison of two commonly used stabilizers, Base One and engineered emulsion in two neighboring counties (Beltrami and Hubbard).



Stabilized Full Depth Reclamation (SFDR)

Evaluation of Two Products:
Base One®
Engineered Emulsion



March, 2022

2022-06

<https://www.dot.state.mn.us/research/reports/2022/2022-06.pdf>

Mohammadreza Sabouri, PhD, PE

Daniel E. Wegman, PE

Michael Marti, PE

Braun Intertec Corporation

Braun Intertec Corporation

SRF Consulting Group, Inc.

Evaluation of SFDR Stabilizing Products

	Beltrami County engineered emulsion	Hubbard County Base One®
Original Structure (reported)	2.75" Bituminous 10.00" Class 3	2.75" Bituminous 4.25" Class 5 12.00" Select Granular
Initial PQI (prior to rehabilitation)	2.4	2.7
ADT (reported)	770	370

Evaluation of SFDR Stabilizing Products

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ADT (reported)	770	370
SFDR Stabilizer	engineered emulsion	BASE ONE®
SFDR Pavement Design (10-ton)	3.5" HMA 5.0" SFDR w/EE 7.8" Class 3	3.5" HMA 6.0" SFDR w/BASE ONE® 1.0" Class 5 12.0" Select Granular
Stabilizer Application Rate	2.9 gallons/sq yd (approximately 30% water)	0.03 gallons/sq yd (Concentrate)
Cost – Construction, per mile	\$360,000	\$259,000
Cost – Stabilizer, per mile	\$ 88,391	\$ 10,625

Evaluation of SFDR Stabilizing Products

Conclusions

- Both products yielded pavements that exceed their 10-ton design. The engineered emulsion, using a GE factor of 1.5 produced a higher capacity pavement; BASE ONE® GE factor was 1.25.
- Engineered emulsion requires a mix design; has a higher application rate and cost more per mile.
- The engineered emulsion sections were able to be cored and tested (tensile strength); the BASE ONE® sections did not yield a bound layer that could be tested in the laboratory.
- After one-year low severity transverse cracking occurred within both sections; the engineered emulsion section had fewer cracks per mile.

	Beltrami County engineered emulsion	Hubbard County Base One®		
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Cost – Construction, per mile	\$360,000	\$259,000		
Cost – Stabilizer, per mile	\$ 88,391	\$ 10,625		
Tests Results				
CBR, average (calculated from DCP testing)	Before 29-31 After 33-34	Before 28-31 After 17-25		
Core Results (Tensile Strength)	2020	2021	2020	2021
Dry Indirect	38	39	unbound, no test	
Conditioned Indirect	20	25	unbound, no test	
FWD Results (capacity, tons/axle)	2020	2021	2020	2021
Effective Capacity (15th percentile)	14.2	15.1	12.1	11.9
FWD Results (R-value)	25.8		24.2	
Pavement Condition	8.3		45	
L-severity transverse cracks per mile				

Pavement Marking Decision Tree – Project Level

For a new surface or replacing existing markings with a different material



START →

Technical Advisory Panel

- Jon Pratt (Technical Liaison/Chair), City of Detroit Lakes
- Marcus Bekele, MnDOT (Project Coordinator)
- David Glycer, MnDOT
- Eddie Johnson, MnDOT
- Ethan Peterson, MnDOT
- HunWen Westman, City of St. Paul
- Matt Zinniel, Stearns County
- Mitch Bartelt, Washington County
- Vic Lund, St. Louis County

Pavement Marking Guide

■ Purpose

- To assist agencies in understanding their options and determining which pavement marking materials may be considered for a new surface or when replacing existing markings with a different material

■ Process

- Surveyed cities/counties to understand existing practices
- Drafted and reviewed with decision tree and content with technical experts and TAP. The materials included:
 - Standard Latex/High Build Latex
 - Multi Component Liquid Markings (Epoxy)
 - Preformed Tape
 - Preformed Thermoplastic
 - Late Season Pavement Markings
 - Recessing Markings to Enhance Performance

Pavement Marking Decision Guide

Deliverables

- A clickable decision tree to guide agencies through the decision-making process.
- Summary one-pagers on each pavement marking material for an in-depth dive
- General “Did You Know” Q&A one-pager, and additional resources for more information.

Tool Demo



Implementing a Pavement Marking Best Practice
Types of Pavement Marking Materials

Latex Paint - Standard
A pavement marking that is water-based. It is typically considered a conventional material. Latex is a quick dry material. It is also referred to as waterborne paint.

High Build Latex Paint
High Build Latex Paint can be used either dry reflective glass beads or wet reflective elements. When using wet reflective elements, the marking must be recessed or ground in to protect the reflective elements.

Specifications
2582 Pavement Markings (2020 edition)
B.2 Concrete Surface Preparation
Before applying Multi Comp or Paint markings on new Portland cement concrete surfaces, remove surface treatments and cement concrete surface treatments for at least 30 days (or follow manufacturer's specifications for Calendar Days (or follow manufacturer's specifications for pavement cure time, whichever is greater), unless otherwise directed by the Engineer.
B.3 Bituminous Surface Cure
Before applying non-recessed permanent pavement markings, allow bituminous pavement to cure a minimum of 10 Calendar Days (or follow manufacturer's specifications for pavement cure time, whichever is greater), unless otherwise directed by the Engineer.
B.7 Recessing - See Grooving to Recess Pavement Markings one pager
B.8 Retroreflective Media
For Paint linear markings that are not WR, apply glass beads specified in 3592 "Drop-On Glass Beads" immediately after applying a Paint line at a rate of at least 8 pounds per gallon. Apply beads at a greater rate if recommended by the manufacturer to achieve the minimum levels of retroreflectivity in accordance with Table 2582.3-2.
For WR markings, apply wet reflective media per manufacturer's specifications.
Evenly distribute retroreflective media on pavement markings.

Local Road Research Board

Pavement Marking Decision Tree - Project Level

Resources

Start the Decision Tree

MnDOT Pavement Marking Field Guide

MnDOT Provisions for Pavement Marking Operations Technical Memorandum

Prioritizing Pavement Markings on Low-Volume Roads

Pavement Markings: Epoxy Paints and Thick Coats Perform Best on Challenging Asphalt Surfaces

Using a National Database to Develop Performance Metrics for Local Pavement Markings

Optimization of Pavement Marking Performance

Pavement Marking Selection, Installation and Inspection Manual

MnDOT Rumble Strips and Stripes

Pavement Markings - Wet Retroreflectivity Standards Final Report

Resources

DID YOU KNOW?

Product Summaries

Pavement Markings: Epoxy Paints and Thick Coats Perform Best on Challenging Asphalt Surfaces
The Local Road Research Board, June 2016

The report provides a detailed account on which pavement markings approaches perform best on chip seals and/or microsurfacing practices. Agencies who practice these techniques and want to learn more and understand how to overcome challenges they face may want to review the report further. The report goes in-depth on the best practices for application and what to keep in mind when considering chip seal or microsurfacing. The report reviews existing practices and compares them to the performance of various pavement marking test sections to identify which held up the best. The report includes many images and graphs of the product results for easy digestion.

For those interested in a higher-level summary, review the key findings at the end of the report.

Section 2
25 mil
High Build



Before 2 winters (2013) After 2 winters (2015)

Section 3
95 mil



Section 4
12 mil



Report: <https://www.dot.state.mn.us/research/TS/2016/201608.pdf>
Technical Summary: <https://www.dot.state.mn.us/research/TS/2016/201608TS.pdf>

Pavement Marking Decision Tree - Project Level

Longitudinal Pavement Marking on Concrete/Asphalt

Start the Decision Tree

Is the air and pavement temperature >40 degrees F?

Yes

Are you installing longitudinal lines or transverse messages?

Longitudinal Lines

What is your surface type?

Concrete/Asphalt

Do you want wet recoverable or wet reflective markings?

No

Do you want enhanced service life by recessing?

No

What is your expected performance life: (recessed application)

1 - 2 years

Resources

Print Your Decision

DID YOU KNOW?

Product Summaries

What is your expected performance life? (surface applied)

1 - 2 years

Standard Latex

High Build Latex

3 - 5 years

Multi Component Epoxy - ultra fast dry

Multi Component Epoxy - fast dry

Multi Component Epoxy - slow dry

5+ Years

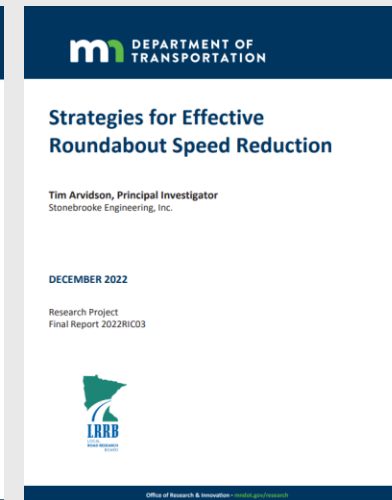
Preformed Tape

Preformed Thermoplastic³

³ Preformed Thermoplastic has reflective elements in material. Thermoplastics are not considered to be wet reflective or wet recoverable markings.

Additional Recently Completed Projects

- [20 Tips to Up Your Social Media Game \(202215\)](#)
- [Impacts of Deferred Maintenance in Minnesota \(202208\)](#)
- [Reuse of Regional Waste in Sustainably Designed Soils \(202210\)](#)
- [Minnesota Snow and Ice Field Handbook for Snowplow Operators Update \(2022RIC01\)](#)
- [Strategies for Effective Roundabout Speed Reduction \(2022RIC03\)](#)





TAP Members Needed

The LRRB Needs YOU!

- Your participation would entail:
 - Directing the research
 - Attending 4-5 meetings (approximately 2 hours each virtual/in-person).
 - Reviewing and approving task products
- If you are interested, sign up by scanning the QR code or visiting www.surveymonkey.com/r/7cvl8ln

Any questions, contact Sue or Mike



The Local Road Research Board Needs You! 2023 TAP Sign-Up



www.surveymonkey.com/r/7CVL8LN

If you would like to serve on a technical advisory panel (TAP) for any of the following projects, please scan the QR code or visit the website to submit your selection.

Questions? Sue Miller sgmiller@srfconsulting.com and Mike Marti mmarti@srfconsulting.com

Bridge and Structures

- Understanding Driving Causes of Bridge Replacement
- Deck Reinforcement Detailing and Concrete Mix Additives to Reduce Bridge Deck Cracking

Environmental

- Development of Biochar Specification Criteria as Soil Amendment for Slopes, Conveyances and Stormwater Treatment Systems
- Assessment of Efficacy and Environmental Effects of Sodium Chloride Alternatives
- Wet Pond Modeling for Contaminant Retention and Maintenance

Equity

- Advancing Equity in Capital Investment Decision-Making

Implementation

- Impacts on Design Standards Related to Speed
- Safety: Developing Tools to Address Behavioral Factors
- Promoting a Career as a County/City Engineer
- Sealcoats: Synthesis of Minnesota Research
- Asphalt Rejuvenators
- CIP Tool
- Public Works 101 for Elected Officials & the Public
- Rural Guidelines on Prescriptive ROW
- Impacts on Design Standards Related to Speed
- Expanding the Transportation Workforce: Roadway Maintenance Workers
- Gravel Shoulder Maintenance

Maintenance Operations

- Human-Centered Testing of Rear-Facing Display to Reduce Vehicle Collisions with Snowplows
- Fleet – Life Cycle

Materials and Construction

- Pavement Design: Performance of Base versus Subbase
- Use of Plastics in Road Materials (Paving)
- Sawing and Sealing Joints in Bituminous Pavements to Control Cracking
- Investigation on Mix Design of Recycled Asphalt Pavement (RAP) Materials

Policy and Planning

- Impacts of Shared Mobility on Infrastructure Usage, Greenhouse Gas Emissions, and Accessibility

Traffic and Safety

- Improving Safety for People Walking and Biking at Roundabouts
- Behavioral Investigation of Temporary and Permanent Pedestrian Infrastructure
- Right-Turn Lane Safety Improvements for Pedestrians

2023 Research Projects

Bridge and Structures

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- Deck Reinforcement Detailing and Concrete Mix Additives to Reduce Bridge Deck Cracking

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- Safety: Developing tools for engineers to address behavioral factors improving local road safety
- CIP Tool
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- Rural Guidelines on Prescriptive ROW
- Impacts on Design Standards Related to Speed
- Expanding the Transportation Workforce: Roadway Maintenance Workers
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2023 Research Projects

Maintenance and Operations

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Join our LinkedIn Community



VISIT: [Linkedin.com/company/lrrb](https://www.linkedin.com/company/lrrb)

 **Minnesota Local Road Research Board**
66 followers
3mo • 


Left-turn flashing yellow arrows have been used to improve traffic flow at signalized intersections throughout the state; however, some drivers still struggle to understand them. [...see more](#)





New Project: Driver Comprehension of Flashing Yellow Arrows
mntransportationresearch.org • 2 min read

 **Minnesota Local Road Research Board** ...
66 followers
2mo • 


The **City of Richfield** began a [#completestreets](#) redesign in 2013, dubbed Sweet Streets, to [...see more](#)



Richfield "Sweet Streets" Improve Quality of Life, Traffic Times Citywide
mntransportationresearch.org • 6 min read

 **Minnesota Local Road Research Board** ...
66 followers
3mo • 

Hey local [#fleet](#) managers! [...see more](#)



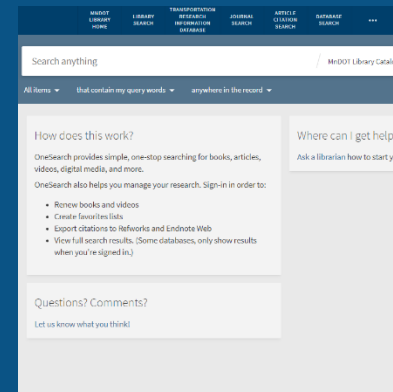
Evaluating the Use of Hybrid Vehicles in Municipal Fleets
mntransportationresearch.org • 4 min read

MnDOT Library

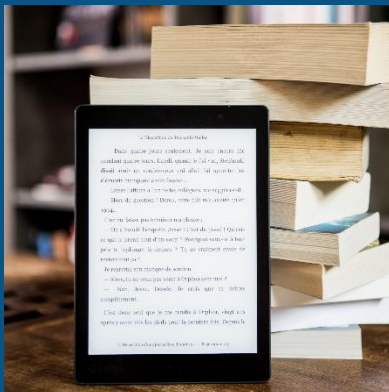
QUESTIONS? JUST ASK A LIBRARIAN AT dot.state.mn.us/library



MnDOT Library professionals can provide in-depth research assistance, saving you time, effort and money



Use the “Search the Library” feature at dot.state.mn.us/library/ to research materials on a vast array of topics.



The library provides free access to eBooks

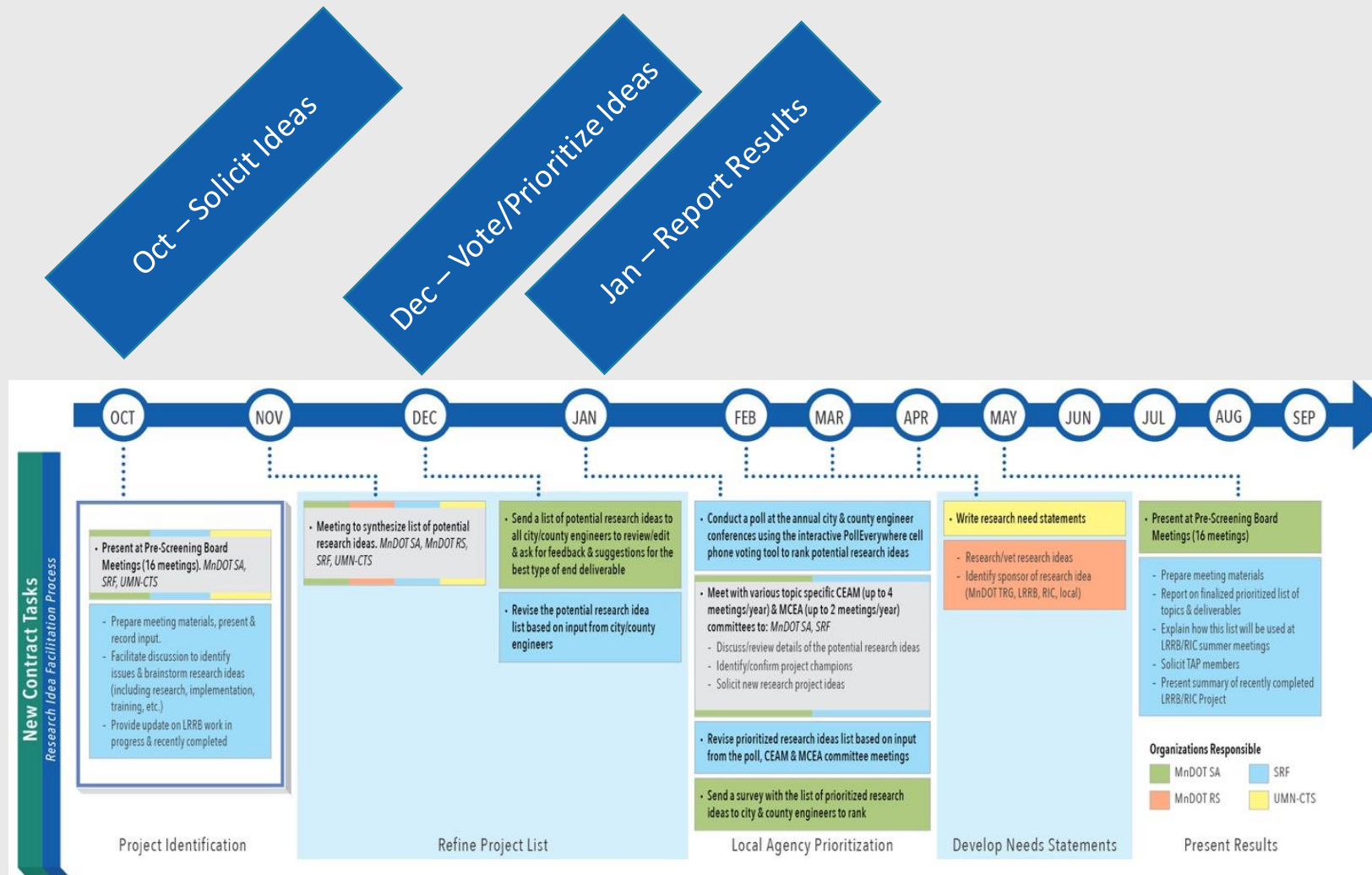


Sign up for email alerts to receive a curated list of news headlines on the transportation topics you care about



Status of LRRB New Ideas

The Research Process

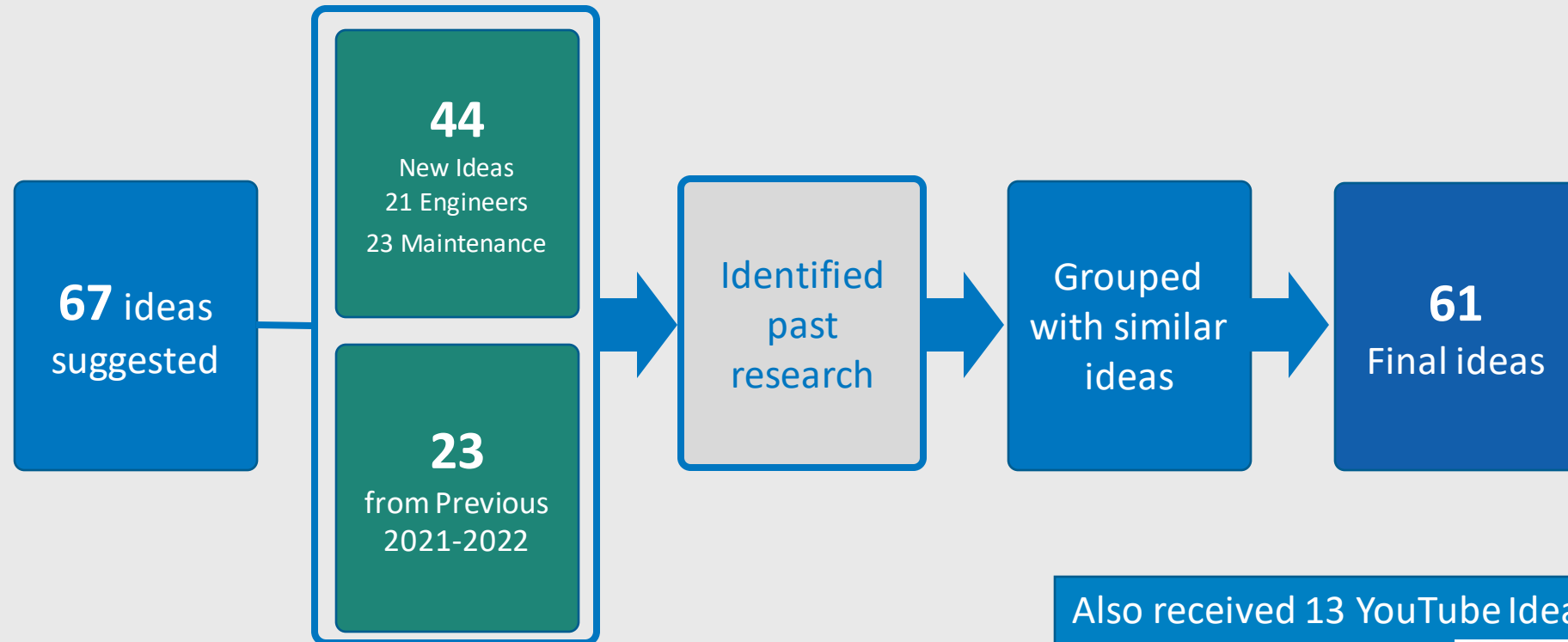


Brainstorming at Prescreening Board Meetings

Mtg	Date	Dist	County/Muni	Location
1	6-Oct	8	County	Granite Falls
2	11-Oct	7/8	City	Redwood Falls
3	11-Oct	SW	Maintenance	Redwood Falls
4	12-Oct	6	City	Rochester (virtual)
5	12-Oct	NW	Maintenance	Detroit Lakes
6	12-Oct	2/4	County	Detroit Lakes
7	13-Oct	6	County	Owatonna (virtual)
8	13-Oct	2/4	City	Detroit Lakes
9	17-Oct	M	City	Shoreview
10	17-Oct	Metro	Maintenance	Shoreview
11	18-Oct	NE	Maintenance	Virginia
12	19-Oct	7	County	Kasota
13	1-Nov	SE	Maintenance	Rochester

- 13 Meetings
- 11 Locations
- 150+ Participants

Process to Reduce the Number of Ideas



Also received 13 YouTube Ideas





Category

Click any research idea to see full details

Use the arrows to adjust vote count

Submit »

Remaining Votes 18

If you submit now, you can return later.

Bridge and Structures (5)		-
0	↕	Load Posting Implements of Husbandry and Emergency Vehicles for Minnesota's Local Bridge Inventory
0	↕	High Performance Concrete: Why do Cylinders Continue to Break?
0	↕	Cost of Precast Concrete Structures Escalating and Delayed Supply
0	↕	Precast vs. Cast in Place culverts
0	↕	Bridge Maintenance - partnership with MnDOT
Construction/Materials (1)		+
Maintenance Operations (24)		+
Materials and Construction (6)		+
Pavement (1)		+
Policy and Planning (15)		+
Traffic and Safety (9)		+

Full Details

Load Posting Implements of Husbandry and Emergency Vehicles for Minnesota's Local Bridge Inventory

AMC hosted a working group on IOH and there was a recent conference (Alexandria) on IOH. With approximately 15,000 local bridges, developing a representative screening approach for Minnesota's local bridge owners is needed to assure IOH vehicles are properly and consistently evaluated and load posted. Additionally, educational outreach materials are needed for farmers and bridge owners.

Survey Sent to Cities and Counties



Survey Sent to Cities and Counties...results

District	City	County	Total
1	3	5	8
2	0	5	5
3	7	9	16
4	3	7	10
M	38	5	43
6	7	8	15
7	3	12	15
8	0	11	11
Total	61	62	123

And the winners are....

1st Sara Buermann, Wright County

20th Lyndon Robjent, Carver County

23rd Anthony Sellner, Redwood County



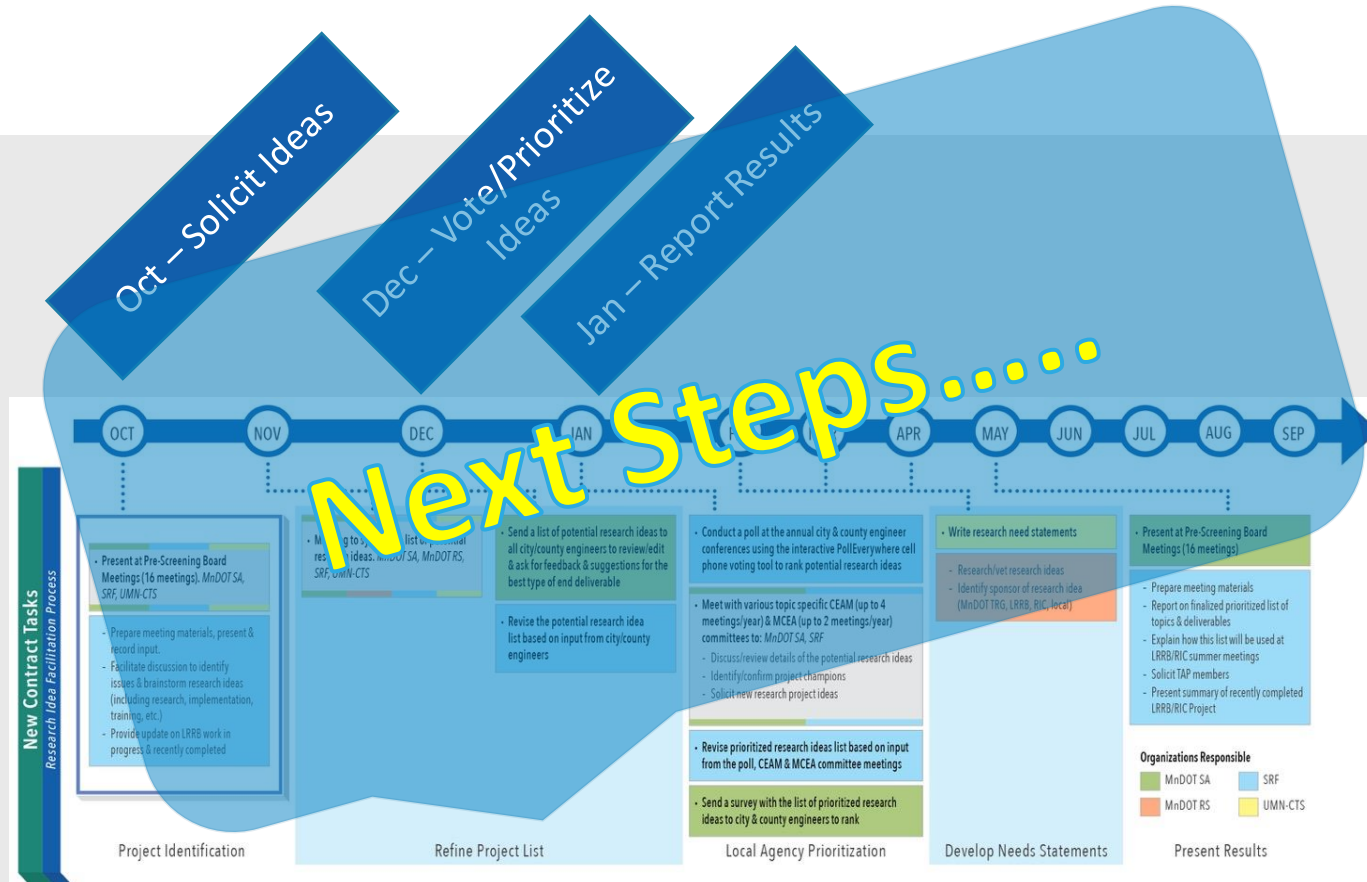
Voting Results (page 1 of 2)


Rank	Total	City	County	SA	CategoryName	Item Name
1	144	69	70	5	Materials and Construction	Chip Sealing Bituminous Pavements - Optimal Timing and Benefits
2	140	43	97	0	Policy and Planning	Wage Comparison: Pubic vs Private Sector
3	95	54	41	0	Maintenance Operations	Current Sealcoating Practices
4	93	36	57	0	Policy and Planning	Promote Career as County or City Engineer
5	78	57	21	0	Maintenance Operations	Best Practices: Texas Underseal (Seal Coat Underneath an Overlay)
6	77	55	22	0	Traffic and Safety	Pedestrian Crossings
7	75	23	52	0	Maintenance Operations	CDL License Guide for Maintenance Workers
8	73	55	18	0	Policy and Planning	Right-Of-Way Management (Utilities): Impacts of Abandoned Utilities within the ROW
9	71	8	63	0	Bridge and Structures	Precast vs. Cast in Place culverts
10	67	47	20	0	Materials and Construction	Best Practices for Cost-Effective Material Options for Temporary Patches
11	65	48	17	0	Maintenance Operations	Notifying the Public of Neighborhood Roadway Projects
12	64	34	30	0	Traffic and Safety	Understanding Economic Impacts of Alternative Intersections such as RCIs and Roundabouts.
13	60	33	27	0	Maintenance Operations	Deicing Products User Guide
14	56	35	21	0	Traffic and Safety	RAB Design changes
15	55	8	47	0	Bridge and Structures	Cost of Precast Concrete Structures Escalating and Delayed Supply

Voting Results (page 1 of 2)

Rank	Total	City	County	SA	CategoryName	Item Name
16	55	14	41	0	Maintenance Operations	Best Practices on Roadside Vegetation Management
17	54	20	34	0	Bridge and Structures	Bridge Maintenance - partnership with MnDOT
18	54	43	11	0	Policy and Planning	Managing Private Assets within ROW
19	47	36	11	0	Policy and Planning	Best Practices for Electric Vehicles
20	43	8	35	0	Maintenance Operations	Snowplowing Guidance for Non-Metro Agencies
21	40	8	32	0	Maintenance Operations	Best Practices for Shoulder Maintenance Without a Curb
22	40	17	23	0	Policy and Planning	Best Practice for Oversized/Overweight Vehicles
23	39	29	10	0	Maintenance Operations	Career/Expo Day for Recruiting Maintenance Workers
24	39	12	27	0	Policy and Planning	The Future of Weigh Tickets
25	37	10	27	0	Policy and Planning	FHWA Pavement Marking Retroreflectivity Mandate
26	36	22	14	0	Traffic and Safety	User Understanding of Pedestrian Hybrid Beacon Operation
27	34	12	22	0	Maintenance Operations	Best Practices for Mowing in the Right-of-Way
28	34	12	22	0	Maintenance Operations	Develop App for using iPad /Tablet to Measure Stockpiles
29	33	19	14	0	Maintenance Operations	Quick Reference on OSHA Procedures
30	32	25	7	0	Maintenance Operations	Best Practices for Snowplowing in Mini-Roundabouts

Idea Solicitation Schedule:





Research Need Statement

Date: 4/1/19

Need Statement Champion: _____

Agency: _____

Email: _____

Phone: _____

Idea Submitted by: LRRB via Priority Process (3/19/19 Mtg)

Idea Originated from: 2019 LRRB Idea Solicitation Process (Pre-Screen Board mtgs)

Select Program:

MnDOT OR Local Road Research Board (LRRB)

Research OR Implementation

Need Statement Title: _____

Need Statement: Describe the problem or the opportunity. Include background and objective.

Provide a summary of the potential benefits:

How does this project build upon previous research (include title or reference to a completed research effort)?

Provide names to consider for a technical advisory panel:

Please submit completed form to
 or
 395 John Ireland Blvd., MS 330, St. Paul, MN 55155

Thank You!



Sue Miller

Director

sgmiller@srfconsulting.com

Michael Marti

Director

mmarti@srfconsulting.com