



# ACCELERATOR

*Putting your ideas in motion*

## Pooled Fund Research Helps Improve Winter Maintenance Operations

**E**nhancing financial effectiveness is currently MnDOT's top priority, and Research Services & Library supports this goal by providing tools to facilitate operational transparency.

A new tool developed by Clear Roads research will help winter maintenance personnel collect the necessary data and make calculations to thoroughly assess and communicate winter maintenance labor and material costs.

Minnesota is the lead state for this Clear Roads pooled fund study, which conducts a variety of research into winter maintenance materials, equipment and methods. Clear Roads research in progress includes developing a **totally automated deicer spreading system** and identifying **environmental factors causing fatigue in snowplow operators**. Recently completed research investigated **deicer toxicity** and developed a **draft standard protocol** for connectivity of snowplow communi-

cations devices from different vendors. More information about these projects is available at [www.clearroads.org/research-projects.html](http://www.clearroads.org/research-projects.html). For an overview of Clear Roads, see **Technical Summary 2012-TPF-5(218)**.

Multi-state pooled fund studies like Clear Roads enable Minnesota to multiply the value of our research investments by cooperating with other states to fund and oversee research into areas of mutual interest. MnDOT is also a member of **Aurora**, which conducts research, development and deployment activities related to road and weather information systems, and the **Maintenance Decision Support System pooled fund study**, which develops and implements automated software that



*"MnDOT continues to find great value in Clear Roads. We reaffirmed our commitment to Clear Roads by taking over as the lead state, which we continue today while remaining active in its many research initiatives."*

**—Tom Peters, Research and Training Engineer, MnDOT Maintenance Operations**

proposes real-time winter maintenance treatment options.

The money that supports these studies does not come from state taxes, but from a federal allotment (part of the Federal Highway Administration's State Planning and Research Program) that must be used for transportation research. Pooled fund projects help MnDOT enrich our infrastructure and operations, improve traveler safety and save money. Beyond the research benefits, these studies provide a very useful line of communication between MnDOT and other state transportation agencies, keeping us aware of emerging technologies and best practices.

For more information about pooled fund studies, visit [www.pooledfund.org](http://www.pooledfund.org).

### To Patch a Pothole

As winter begins to wind down, Minnesota transportation agencies will be stepping up their attacks on the potholes that formed in this year's freeze-thaw cycle. The Local Road Research Board-funded video "Minnesota Pothole Professionals: Smoothing the Way to Safer Travel" shows how potholes form, the different ways they get patched and how to report potholes in your area.



You can find all of Research Services & Library's videos at [mndot.gov/research/videos.html](http://mndot.gov/research/videos.html).

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## Research Implementation

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### Spreading Best Practices in Culvert Repair

**Bridges & Structures** — Erosion, corrosion, freeze-thaw cycles and many other factors can lead to culvert deterioration, which can seriously damage the roadway above. There are more than a dozen methods of repairing and rehabilitating culverts, each appropriate to address specific issues and with its own advantages and limitations. To help practitioners easily find information related to the culvert repair they need, researchers assembled a best practices guide for the most commonly used techniques: paved inverts, cured-in-place pipe liners, sliplining, centrifugally cast concrete mortar liners, spall repair, joint repair and filling voids outside the culvert. This guide synthesizes current research from the Federal Highway Administration, the National Cooperative Highway Research Program, the American Association of State Highway and Transportation Officials, and several state transportation agencies. Researchers also prepared special provisions and standard details for each of the featured techniques that engineers can adapt to the needs of a specific project.

[Technical Summary 2014-01](#)



*“There has been a lot of evolution in culvert repair practices, and it has been hard to keep up with what’s going on. We wanted to develop a state of the practice and put it into one place so people could easily find the information they need.”*

—Lisa Saylor,  
MnDOT Assistant State  
Hydraulic Engineer

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## Supporting All Modes of Transportation

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### Guidance for Local Complete Streets Implementation

**Multimodal** — Complete Streets, an approach to transportation infrastructure design and maintenance that serves all users regardless of ability or mode of transport, represents a significant shift from the policy of designing transportation networks simply to maximize vehicle capacity. Like any major shift, implementation is not always simple. “Complete Streets offers quality of life improvements and better options for people to choose how they would like to travel,” observed Richfield City Engineer Kristin Asher. “But some areas can be tricky due to limited space in the right of way and the conflicting demand for that limited space from different segments of the community.”

Three MnDOT research projects from the past year offer valuable insights for engineers working to implement Complete Streets in their communities:

- **Complete Streets from Policy to Project** used 11 diverse Complete Streets case studies in Minnesota and nationwide to develop best practices for implementation. The resulting guidebook also offers insights that communities can use to address their unique challenges and opportunities. [Technical Summary 2013-30](#)
- **Implications of Modifying State Aid Standards** found no negative safety impacts from implementing nonstandard Complete Streets features such as road diets or narrowing lanes to reduce vehicle speeds. [Technical Summary 2013-31](#)
- **Complete Streets Implementation Resource Guide for Minnesota Local Agencies** developed a Complete Streets worksheet that helps local agencies assess a planned roadway construction project for its ability to safely and cost-effectively accommodate multiple modes of transport and users of all abilities. [Technical Summary 2013RIC02](#)



### Accurately Measuring Bike and Pedestrian Traffic

**Multimodal** — It’s difficult to optimally design facilities for nonmotorized traffic without accurate data about bicycle and pedestrian traffic. MnDOT helped launch the Minnesota Bicycle and Pedestrian Counting Initiative by developing protocols and other guidance and performing pilot field counts. The study also sought to assess automated counting technologies. While automated systems are useful for some purposes, they can’t accurately gather information about demographics or how many bicyclists wear helmets, so manual counts are still necessary. The analysis shows that the techniques currently used to extrapolate motorized traffic data from short-term manual counts should be adaptable to bicycle and pedestrian traffic data.

[Technical Summary 2013-24](#)

## Other Research

### Reducing Collision Rates in Multi-Lane Roundabouts

**Traffic & Safety** — Transportation engineers recognize roundabouts as useful tools that reduce congestion and improve safety in many circumstances. [NCHRP Report 572](#) reported that roundabouts reduced intersection collisions by 35 percent. But the public is often confused by traffic rules in roundabouts, particularly those with two lanes. To help pedestrians understand how to navigate a multi-lane roundabout, the Local Road Research Board produced a [video](#) showing drivers the rules for yielding to vehicles and pedestrians, and for choosing the appropriate lane to navigate the roundabout.

Also, the City of Richfield recently experimented with several changes to signage and striping at a roundabout at East 66th Street and Portland Avenue South to reduce driver confusion. The changes included replacing curved “fish-hook”-style turn arrows with standard turn arrows, lengthening the solid lane line that extends from the yield line, and lowering and enlarging signs to improve visibility. Immediately after the changes, turning violations, which are responsible for nearly half of roundabout collisions, decreased by 48 percent. Occurrences stayed near that level when the intersection was monitored again one year later. [Technical Summary 2014-04](#)

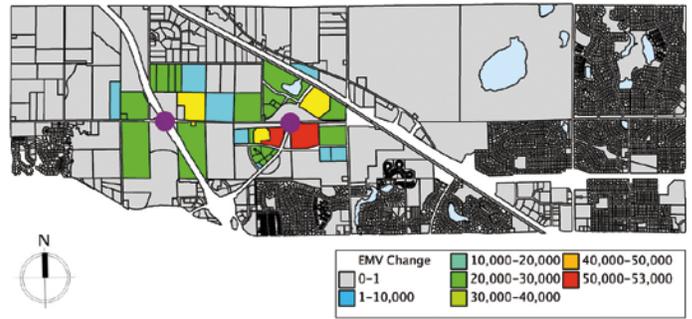


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### Do Flashing LEDs at Stop Signs Reduce Crashes?

**Traffic & Safety** — Several Minnesota communities have installed stop signs with flashing light-emitting diodes at selected intersection in hopes that they would be more visible to drivers and reduce the frequency of right-angle crashes. Based on study results, investigators projected potential decreases of up to 42 percent at 15 intersections in Minnesota where flashing LED stop signs had been installed for at least three years, compared to 240 intersections without LED signs. Further monitoring will be needed to confirm these projections. Video-based observations of driver behavior at an intersection where a flashing LED sign was installed found that drivers were much more likely to stop after installation if opposing traffic was present. Researchers also developed a spreadsheet-based decision support tool that helps engineers identify intersections where right-angle crashes are more frequent than expected based on characteristics like traffic volume and speed limits. The tool estimates the number of crashes a flashing LED sign is likely to prevent, and the results are then used in cost-benefit analyses. [Technical Summary 2014-02](#)

### Value Capture: A New Way to Finance Transportation Investments



**Policy & Planning** — The fuel taxes that fund most transportation infrastructure in the United States are inadequate for current and future needs, but raising them is politically difficult. Value capture is an emerging financing technique that attempts to recover fees to fund infrastructure improvements from the property owners or developers who will benefit from the improvements. Using a long-delayed section of Trunk Highway 610 in Maple Grove as a case study, researchers modeled the impact of the completed highway on nearby property values (EMV Change in the map above) and, for the first time, quantified the potential revenues from several value capture strategies. With a highway premium impact on property value of \$65,450 per acre, researchers calculated that a strategy of special assessments for developed or tax-exempt parcels in the area plus development impact fees for undeveloped parcels could raise \$37.1 million. [Technical Summary 2014-03](#)

## Transportation Research Syntheses

*Transportation Research Syntheses are short-turnaround research projects that summarize research activity and practices among state departments of transportation. Learn more at [mndot.gov/research/transportation-research-syntheses.html](http://mndot.gov/research/transportation-research-syntheses.html).*

### How Do Our Airport Safety Zoning Rules Compare?

**Multimodal** — Airport owners are responsible for protecting airports from hazards that could interfere with the safe operation and navigation of the aircraft they serve. To prevent obstructions to airspace and to ensure compatible land uses around airports, many states' statutes authorize local governments to establish airport zoning ordinances. MnDOT is analyzing Minnesota's existing statutes and rules regarding airport safety zoning to determine whether updates are needed, and requested this TRS to review state statutes nationwide. It answers the question: “How do other states approach the issue of requiring local governments to enact land use zoning?” The TRS identified the applicable statutes in each state and included a survey of other states that identified related guidance documents, planning tools and draft legislation. [Transportation Research Synthesis 1401](#)



RESEARCH SERVICES & LIBRARY

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## Calendar

- 3/16–19 Asphalt Pavement Technologies Conference
- 3/18, 4/15, American Public Works Association Underground  
5/20 Utilities Inspector School
- 3/19, 3/26 Seal-Coating Operations Workshop for Practitioners
- 4/9–11 International Transportation Economic  
Development Conference
- 4/14–17 Transport Research Arena
- 4/22–25 Third International Conference on Transportation  
Infrastructures
- 4/23 CTS Annual Awards Meeting and Luncheon
- 5/6–8 80th Annual Minnesota Safety & Health Conference
- 5/15 Minnesota Roadway Maintenance Training & Demo Day
- 5/21–22 CTS Transportation Research Conference

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