University of Minnesota
Center for Transportation Studies

Minnesota LTAP
TECHNOLOGY EXCHANGE

mnltap.umn.edu | Minnesota Local Technical Assistance Program | March 2021 Vol. 29, No. 1

INSIDE:

Hot shots: treating the iciest spots with less salt

Striking a balance between keeping roads safe and protecting the environment from road salt is tricky. To find that balance, researchers are quantifying what makes for a bad patch—known as a "hot shot"—of snow or ice and raising awareness of issues such as level of service and public expectations.

Hot shots continued on page 6

Organizing maintenance crews during a pandemic

Keeping roads clear in winter storm conditions is a challenge even during a normal year, but the COVID-19 pandemic raises additional questions. What happens if an entire maintenance crew gets sick or needs to quarantine right before a storm?

Members of the NLTAPA community from the northeastern US convened for a "Virtual Supervisory Roundtable" session in November to discuss this eventuality and come up with options. The event was sponsored by Vermont Local Roads, in cooperation with Baystate Roads, the Delaware T2/LTAP Center, and the University of New Hampshire T2 Center.

"When I started circulating this line of questions, I was surprised to hear a variant of, 'Hmm, that's a good question,'" said Matheu Carter, municipal circuit

Pandemic continued on page 6

MS4 general permit changes: A how-to guide

The MS4 (municipal separate storm sewer system) permit from the Minnesota Pollution Control Agency (MPCA) recently got an update. There are new stormwater system requirements that cities, counties, highway departments, and other organizations need to meet, and this comes with paperwork.

The overall purpose of the MS4 general permit is to protect water systems from the various pollutants that might wash into them through municipal stormwater systems. The MPCA did a five-year update of the document in November 2020, and the due date for applying for this updated permit is April 15, 2021. It's a large document—28 pages with 174 questions—and can take a long time to fill out.

"A really important point: Whatever time you have planned for yourself and/or your staff to complete this form, plan on more time," says

Permit continued on page 7

READ THE
EXCHANGE
online for links to publications and other resources.

TECHNOLOGY EXCHANGE
Minnesota Local Technical Assistance Program
Center for Transportation Studies
University of Minnesota
University Office Plaza, Suite 440
2221 University Avenue SE
Minneapolis, MN 55414

NONPROFIT ORG.
U.S. POSTAGE
PAID
TWIN CITIES MN
PERMIT NO. 90155

ROADS SCHOLARS

Congratulations, Roads Scholar Class of 2020!

Fifteen standouts earned their Roads Scholar Maintenance Operations & Technical Certificates in 2020. Although we again are unable to formally honor our graduates in person, we still wish to recognize and thank you for your hard work!

Roads Scholar certificates reward commitment and dedication to continuing education. Graduates improve their skills and increase their knowledge and awareness of best practices and the latest innovations in roadway maintenance.

"This achievement benefits not only you and your employer, but all of us in Minnesota as you work to foster a safe, efficient, and environmentally sound transportation system," says Stephanie Malinoff, Minnesota LTAP's director. ■

2020 ROADS SCHOLAR MAINTENANCE OPERATIONS & TECHNICAL CERTIFICATE

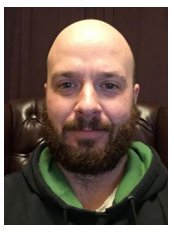
Brent Adams, City of Golden Valley
Marshall Beugen, City of Golden Valley
John Boland, City of Mendota Heights
Ben Brooks, City of Mankato
Alex Bruch, MnDOT
Michael Coleman, City of Lake Elmo
Joe Effinger, City of Lake Elmo
Zac Good, Baldwin Township
Jon Kirsch, City of Golden Valley
Jiri Klima, City of Golden Valley
Bill Neumann, City of Golden Valley
Travis Nevala, City of Robbinsdale
Jason Schaedler, City of Golden Valley
Jayd Terhell, City of Coon Rapids
Josh Yonak, City of Golden Valley

See what some of our grads say about the program (and thanks to those who sent their photos).

Marshall Beugen, Streets and Vehicle Maintenance Supervisor (15 years at the city, 3 years in current role), City of Golden Valley. "There was a lot of good information offered on pertinent subjects. It keeps our staff well informed of new technologies and maintenance strategies. The Roads Scholar Program offers good training at an affordable price and even allowed us to offer group training at the price of one class."

Alex Bruch, Road Weather Technology Coordinator (10 years), MnDOT. "I was able to learn new skills and able to implement them into my work practices. It keeps me up to date with current workplace maintenance trends."

Michael Coleman, Public Works Operator (3-1/2 years), City of Lake Elmo. Coleman likes best the variety of in-person and online courses and classes. "I'll take the expansion of knowledge of the latest innovations and best practices and apply them to my current and future work projects."



Jiri Klima, Street Maintenance (3 years), City of Golden Valley. "I like that the instructors were very easy to understand and were able to answer all questions. The classes gave me the knowledge I need to do my job more efficiently."

Travis Nevala, Public Works Maintenance, City of Robbinsdale. Nevala likes best the variety of classes offered in the program. He feels the LTAP Roads Scholar Program will help him in "being able to apply the best practices that are taught in class."

Jason Schaedler, formerly with the City of Golden Valley (6 years). "I enjoyed the depth of content provided in the program."

John Boland, Public Works Superintendent (2 years), City of Mendota Heights. "I've been with the city since 1991 and worked [in] street and park maintenance and as a parks lead worker prior to superintendent. (I also served as a captain on the Mendota Heights Volunteer Fire Department—retired after 21 years.) The knowledge of the instructors was excellent, and their message to network with others in the field couldn't be more spot on. We have many and new challenges (pandemic, pollinator friendly, deicing chemicals, etc.) all the time that need to be addressed, and solutions need to be found that satisfy our need to do a job that satisfies neighbors on either end of a problem. These types of issues can best be addressed through training with professionals and working with others in the same field to finalize a best practice. I will continue to participate in continuing education through the LTAP program and encourage staff to do the same, so we can all complete tasks as efficiently as possible."

Technology Exchange

The Minnesota Local Technical Assistance Program is part of the Federal Highway Administration's Local Technical Assistance Program (LTAP). LTAP is a nationwide effort designed to foster and improve information exchange among local practitioners and state and national transportation agencies. Minnesota LTAP is administered by the Center for Transportation Studies at the University of Minnesota, and cosponsored by the Minnesota Local Road Research Board and the Minnesota Department of Transportation.

Contact us
Technology Exchange is published quarterly. For free subscriptions, mailing list changes, or extra copies, contact us at the address or phone number below.

Technology Exchange welcomes contributions and suggestions from its readers. Submit ideas and other comments to Pamela Snopl, managing editor.

Minnesota LTAP
Center for Transportation Studies
University of Minnesota
University Office Plaza, Suite 440
2221 University Avenue SE
Minneapolis, MN 55414
Phone: 612-626-1077
Email: mnltap@umn.edu
Web: mnltap.umn.edu

Minnesota LTAP Staff
LTAP Director: Stephanie Malinoff
LTAP Program Director: Mindy Carlson
LTAP Program Coordinator: Katherine Stanley
CTAP Instructor: Kathy Schaefer
Managing Editor: Pamela Snopl
Editors: Christine Anderson, Michael McCarthy
Designer: Angela Kronebusch

Photo Credits
Stephen Druschel, Shutterstock, MnDOT, LRRB, CEAM, MCEA, Sandbagstore.com

Printed on 50% recycled fibers, including minimum 30% postconsumer waste.

HONORS

Associations honor 2020's top projects

Please see the association websites for a full list of award recipients. Congratulations to all!

Hanson Boulevard railway grade separation

City Engineers Association of Minnesota
Project of the Year: Hanson Boulevard (CSAH 78) Railway Grade Separation

Hanson Boulevard (CSAH 78) provides mobility and access through Anoka County and the City of Coon Rapids. In the project area, Hanson Boulevard crosses the BNSF Railway. With traffic projected to increase on both the roadway and railway, there were concerns that crashes would rise.

Since BNSF planned to add a third track along this line, Anoka County and the City of Coon Rapids began planning upgrades to better serve the traveling public, local land owners, and pedestrians in the area. The county and city completed a feasibility study that identified a grade separation of Hanson Boulevard over the railroad tracks as the preferred alternative. Project components included:

- Three bridges to provide safe access to Hanson Boulevard
- Concrete curb and gutter, a storm sewer system, and drainage and ponding improvements
- A shared-use path and sidewalk on either side of the roadway for safer passage for pedestrians and bicyclists in all seasons.

Minnesota County Engineers Association
Project of the Year: Ramsey County I-694/Rice Street Interchange Project

For years, Ramsey County had identified this interchange as a top priority for reconstruction. This project addressed existing safety and operational issues along Rice Street and at the interchange ramp intersections. Detailed traffic studies concluded that, by 2040, traffic operations at the interchange intersections would consistently fail. The Rice Street Corridor was also identified as a notable barrier and safety concern for people walking, biking, and using transit.

I-694/Rice Street interchange

The project replaced the four existing signal systems with three roundabouts—one at the single point ramp connection and two others at adjacent city streets—dramatically improving efficiency and safety. The project also included construction of three new bridges and realignment of connecting roadways.

The design also provides multimodal transportation connections and safety for users of all abilities.

American Public Works Association – Minnesota Chapter
2020 Project of the Year, Honorable Mention—CSAH 21 Downtown Prior Lake Improvements

The intersection of Trunk Highway 13 and CSAH 21 in Prior Lake and the adjacent corridor lacked the capacity to move traffic safely and efficiently. While the project started with a divided populace, the project team was able to harness strategic and flexible engagement strategies to bridge the gap and address issues that dated from 15+ years of uncertainty. In the end, the improvement project, which includes roundabouts and planted medians, has had broad public support and was well-received by the community after construction. A YouTube video is available about the project ("CSAH 21 Downtown Prior Lake Reconstruction," Nov. 5, 2020, 3:27). ■

Laurie McGinnis

CTS director retires after distinguished career

Laurie McGinnis stepped down as director of the Center for Transportation Studies on January 15 after a distinguished career of leadership and innovation. She led CTS for 10 years and also served on the Minnesota LTAP Steering Committee and the Minnesota Local Road Research Board. Below, she looks ahead to new opportunities for transportation.

What challenges and opportunities do you see for transportation?

Transportation equity is becoming a critically important issue for CTS and our stakeholders. We've convened several meetings around this topic over the past six months, and significant work has begun toward defining roles for CTS and University of Minnesota researchers in addressing this challenge. Sustainability and technological innovation, including shared/automated/electric vehicles, are other areas of ongoing importance. I expect, too, that traditional issues such as safety, asset management, infrastructure design, and transportation finance, to name a few, will be with us for a long time.

The challenge, and the fun, is that transportation issues are complex and cross-cutting. The field keeps getting broader and drawing in more disciplines. That's a key reason why the University of Minnesota is so well-positioned to address today's complex transportation needs. The breadth and depth of research talent here means there are few limits to how the U can help address these challenges.

What will you miss the most?

I will dearly miss the professional and personal relationships I have built over the years. I needed a "relationship job" to truly thrive and I landed in an amazing one. I'll miss drawing on those relationships to be the broker—connecting researchers with funders, practitioners, and policymakers to ensure effective, impactful research solutions. And I'll miss being part of strategic discussions about the new opportunities that continuously present themselves in this dynamic field. The variety of opportunities that crossed my desk made this feel like a new job week after week. ■

MCEA honors Laurie McGinnis

The Minnesota County Engineers Association presented the "Outstanding Contribution to Better Minnesota Transportation Award" to Laurie McGinnis as part of its 2021 annual meeting, held virtually.

Rick West, a member of the MCEA awards committee, presented the award. "You have been a cheerleader and a champion for research," he said. "Through your leadership and contributions, Minnesota at all transportation jurisdictional levels, and I believe the nation, enjoys the positive outcomes of your outstanding work in [creating] better transportation systems. We have enjoyed and appreciated our relationship with you."

"It is truly a great honor for me to receive this award," McGinnis said. "Working with the LRRB throughout my entire career at CTS has been both rewarding and fun. I am very appreciative that the city and county engineers value research and training and have been so supportive of sustaining a partnership with CTS and the University. LRRB is a model organization that is the envy of others around the country. It provides great leadership in advancing transportation research that will solve today's and tomorrow's challenges to save money and lives in Minnesota." ■

In memoriam: Steve Klein

Steve Klein, an engineer and vice president with Barr Engineering for 45 years, died December 1. Klein's contributions advanced water resources management to solve today's complex water management problems. He provided extensive service to municipalities and counties, and his leadership and innovation led to several award-winning projects. He served on the APWA–Minnesota Education Subcommittee, and he and his team helped develop the Minnesota LTAP Culvert Installation and Maintenance for Local Agencies online course. He will be missed. ■

INNOVATIONS

OPERA project: Cement-stabilized gravel road

Upgrading a gravel road to a bituminous surface road can cost hundreds of thousands of dollars per mile. Some gravel roads have increasing traffic but lack the truck volumes needed to warrant a full reconstruction project with a bituminous surfacing. With ever-tightening budgets, it is important to find an alternate low-cost construction method.

McLeod County undertook a rehabilitation project of County Road 54 in 2018 using cement-stabilized full-depth reclamation to increase the road strength, along with the application of a double chip-seal surface. Unfortunately, the road has not performed as desired. The chip-seal surface has debonded in many areas, exposing the stabilized surface.

Project Leader
John Brunkhorst

Agency
McLeod County Public Works

Phone
320-484-4321

Testing for condition, strength, and structural stability

McLeod County received a $20,000 grant through the Minnesota Local Road Research Board Local Operational Research Assistance (OPERA) Program to evaluate the road for potential causes of its poor performance and to determine potential repair and rehabilitation options. The goal is to improve the condition of the road so it performs as intended.

The county worked with American Engineering Testing Inc. to review the construction records and perform several structural tests on the road to determine the thickness of the stabilized layer and evaluate the condition and strength of the cement stabilization.

Finding construction process shortcomings

The evaluation showed that the stabilization wasn't fully effective. It found issues related to the construction process, including working larger areas than were possible to obtain final compaction within the timeframe required. In addition, the micro-milling might have resulted in fines being left on the road surface that were not fully removed by sweeping prior to the application of the chip seal. The application of a scrub seal prior to placing the chip seal might have improved the bonding of the chip seal.

Next steps for McLeod County focus on working with the contractor for resolution and identifying appropriate fixes for current conditions. Those fixes may include adding gravel to the current surface or paving the entire road. McLeod County also shared its findings with the McLeod County Board and county residents as well as other county engineers in Minnesota. It is hoped other agencies may benefit from the lessons learned from this case study in their road projects.

The Local OPERA Program encourages maintenance employees from all cities and counties to get involved in operational, "hands-on" research. OPERA helps to develop innovations in the construction and maintenance operations of local government transportation organizations and share those ideas statewide. ■

Send us your OPERA ideas: Tools, processes, or tips for COVID-19

Do you have ideas for improving tools or processes? Or maybe you've been finding solutions for COVID-related impacts to your job that could benefit other agencies? If so, please send your ideas to the LRRB's Local Operational Research Assistance (OPERA) Program. There is no deadline to submit your proposal, but funding is limited. Please see the OPERA web page for details: **mnltap.umn.edu/opera**. ■

Burcham sandbagger improves efficiency, safety

Below is an innovation from MnDOT's Maintenance Operations Research (MOR) program. For more from MOR, see dot.state.mn.us/maintenance/research.html.

Project description

District 2 has some of the worst flooding in the state due to its flat landscape, insufficient infrastructure, and soil type. In the past, MnDOT has not been able to make sandbags with any type of efficiency. The Burcham Sandbagger Pro is the only sandbag-filling machine that fills the sandbag and sews it shut.

Contact
Danny Hoeper

Agency
MnDOT D2/Warren

Phone
218-745-4881

Project cost
MOR – $14,077
District – $2,320

Vendor
sandbagstore.com

Purpose

The purpose of the Burcham sandbagging machine is to replace the making of sandbags by hand, which causes injuries and overexertion. The Burcham Sandbagger Pro will eliminate virtually all of the risk related to making sandbags.

Test procedure

The Burcham Sandbagger Pro was evaluated for 12 months for labor-related cost savings and improved quality. The district also evaluated the machine for safety improvements by eliminating overexertion.

Conclusions

The district compared filling sandbags by hand to using the Burcham Sandbagger Pro. It found that the Burcham sandbagging machine saved on labor—the time to fill bags fell by 75 percent. Quality improved because the sewn-shut bags kept the sand where it was needed. Safety also improved because the sandbagging machine was set so that bags were lifted from waist height, which resulted in less bending.

Recommendation

The district recommends both statewide and districtwide implementation for any areas that use sandbags to assist with keeping signs up or to protect property from flood waters. ■

Submit your ideas for the 2021 Mousetrap recognition!

As you work on projects throughout the year, please keep Minnesota's 2021 contest in mind. We want to hear about your agency's creative solutions, and submissions are welcome at any time. To enter, just submit an entry form by May 15, 2021. You're also encouraged (but not required) to submit photos and short video clips showcasing your project along with your entry form. For more information, please contact Katherine Stanley at **sell0146@umn.edu** or 612-626-1023, or visit **mnltap.umn.edu/mousetrap**. ■

Fixing problems before they happen: proactive maintenance

Proactive safety planning can change the landscape of road design and maintenance. Reactively adding safety countermeasures to crash sites is a viable strategy—but requires crashes happening in the first place.

As part of the virtual 2020 National Summit on Rural Road Safety, presenters from the Federal Highway Administration and National Center for Rural Road Safety (NCRRS) hosted a series of breakout sessions on "Strategies for Applying Rural Safety Countermeasures in a Proactive (Not Reactive) Way."

FoRRRwD

Dick Albin, safety engineer with the FHWA, gave a talk about the Focus on Reducing Rural Roadway Departures program (FoRRRwD), an initiative designed to provide transportation professionals with resources for reducing lane-departure crashes on rural roads.

"When we look at fatalities on the nation's roads, over 35,000 people get killed in an average year," Albin said. "About half of those happen on a rural road. The majority of those are roadway departures."

The objectives of FoRRRwD are, in order:

- To keep vehicles in their lane.
- To reduce the potential for crashes when drivers leave the roadway.
- To minimize the severity of crashes that do occur.

To achieve this, the program has four pillars that form the basis of its response strategy:

- Addressing all public roads, since almost half of rural roadway departures occur on roads not maintained by a state agency.
- Using a systemic approach to identify risk factors, since roadway departures are widespread and difficult to stay ahead of using only crash data.
- Creating safety action plans at all levels of government—federal, tribal, state, region, and local—to ensure the problem is uniformly addressed.
- Applying redundant safety countermeasures so that if one fails, another might take over.

"Really, what we're trying to do is get there before the crash happens," said Albin, "rather than waiting for the crash to happen."

More information on the program can be found at the FoRRRwD website: **safety.fhwa.dot.gov/FoRRRwD**.

Low-cost countermeasures

To implement road safety countermeasures in a widespread and proactive manner, keeping costs down is an important factor. Nicole Oneyear, research engineer at the Iowa State University Institute for Transportation and representative for the NCRRS, focused her presentation on specific, relatively inexpensive improvements that traffic professionals can apply to their own local roads.

The presentation detailed low-cost safety strategies for dealing with unsignalized intersections, signalized intersections, pedestrians/bicyclists, and overall maintenance. Some notable countermeasures include:

- Placing an extra stop sign at an intersection—usually to the left of the road or on an island—so there's an increased chance of being spotted.
- Advanced intersection warning—signs that give drivers a heads-up before they come to the actual intersection.
- Dilemma zone protection—stop lights that don't change to yellow when they sense an oncoming car is too close to comfortably stop.
- Leading pedestrian intervals —walk signals at intersections that give pedestrians the chance to start crossing 3 to 7 seconds before vehicles get a green light.
- Bike boxes—painted, designated areas at the head of a traffic lane where cyclists can safely wait for intersection lights to change.

Safety action plans are a map to safer roadways.

More information about countermeasures: **safety.fhwa.dot.gov/provencountermeasures**. ■

—Sophie Koch, LTAP freelancer

Is seal coating counterproductive?

While seal coating has been widely used as a cost-effective strategy in asphalt pavement preservation, some cities and counties have reported concerns about premature stripping.

A study sponsored by the Minnesota Local Road Research Board (LRRB) investigated the mechanisms that cause asphalt pavement stripping under seal coats and provided recommendations to improve seal-coat implementation.

For the study, a Michigan Tech research team did a comprehensive field data collection to diagnose premature stripping. Some possible causes of stripping were proposed after preliminary diagnoses, and corresponding laboratory testing was then conducted.

Based on the laboratory testing results, the research team arrived at these general conclusions:

- The interface and shear bond strength between the laboratory seal-coat layer and the asphalt pavement layer decreased with the increase of freeze-thaw cycles.
- Weak asphalt-aggregate combination in seal-coat application and increased freeze-thaw cycles are the main factors for premature stripping of many seal-coat asphalt pavements. Due to multiple freeze-thaws and other factors, asphalt may be stripped from the aggregates of the asphalt mixture layers and the seal-coat layer.
- Further deterioration accelerates in the pavement system when partial damage occurs in the seal coats.

The study did not address what happens when there is no seal-coat failure—whether the seal coat protects the asphalt pavement or extend sits service life. Based on the research that was conducted, the team could not conclude that seal coating is counterproductive.

The researchers were able make recommendations for implementing seal coating on street asphalt pavements. The freeze-thaw resistance in the seal coat depends on moisture infiltration, temperature, mechanical properties of the seal coat, and the interface between asphalt and aggregates of the seal coat. According to their final report, there are at least two methods to improve freeze-thaw resistance:

- The pre-coated aggregate method. To better control the pre-coating quality and promote full bonding of aggregate and asphalt prior to use, the plant pre-coated aggregate method is recommended rather than field pre-coating.
- Improved seal-coating design. One design could be to control technical parameters according to the combination of aggregate and asphalt (such as aggregate size and shape, functional groups, and pH of both the asphalt and aggregate). A suitable material combination is critical. ■

Learn more:

- *Is Seal Coating Counterproductive or Not?* (MnDOT/LRRB 2020)

Timber-based bridges offer a cost-effective, durable alternative

As Minnesota's local road agencies grapple with the challenges of renewing an aging bridge infrastructure with limited resources, alternatives to bridges made with concrete and steel are needed.

In a recent project, researchers found that timber-based bridges can be built more quickly than steel or concrete bridges for similar costs, perform well for 70 years or more, and help meet green construction standards. They can also be built in winter conditions. The project was sponsored by MnDOT and the LRRB.

From 2000 through 2019, Minnesota local agencies built more than 4,000 bridges, yet only 26 were timber-based.

The report includes design aids and case studies. ■

Learn more:

- *Development of Cost-Competitive Timber Bridge Designs for Long-Term Performance* (MnDOT/LRRB 2020)

MAINTENANCE

Pandemic from page 1

rider engineer for the Delaware T2/LTAP Center and one of the main speakers. "It is unreasonable for the public to expect we have a perfect plan, but it is reasonable for them to expect us to have thought about the issue."

The first line of defense is COVID prevention, said Mike Smith, another speaker and a technical training specialist with Baystate Roads. Municipalities, he said, need to start making changes to ensure the virus can't spread freely throughout an entire crew—changes such as ventilating common areas, designating drivers to specific vehicles, establishing quick testing protocols, and encouraging basic practices such as six-foot distancing and masks.

"Anything you do is better than nothing," Smith said.

However, COVID prevention might still fail, and the next step is to set up a backup system in case a significant portion of the maintenance crew or their supervisors falls ill.

Jan Sotirakis, emergency management director for the town of Chittenden, Vermont, and a guest at the roundtable, suggested that municipalities should formally create "continuity of operations plans" to ensure that there are established protocols for filling in vacancies and prioritizing jobs in the case of an emergency. The roundtable also discussed establishing mutual aid partnerships with neighboring municipalities and training more town employees with commercial driver's licenses to help out with winter snow and ice maintenance.

"The outside-the-box thinking…" Smith said, "if ever there was a time for it, it is now."

Transparency and communication were also recurring themes throughout the webinar. Carter brought up the need to keep communication open among crews; maintenance crews need to be well-informed about what is going on and why, and they should feel comfortable telling supervisors if they feel ill or suspect they've been exposed.

Marilee LaFond, manager for the University of New Hampshire T2 Center, also emphasized that networking with the community is important as a way of keeping people informed when a situation arises and of managing expectations. She suggested that municipalities utilize a wide array of outlets—Facebook communities, email alerts, press releases, or even state alert systems such as Vermont Alert (**vem.vermont.gov/vtalert**).

Many of these strategies have broad application, even beyond winter and into the warmer months of road maintenance. Overall, Carter said, the goal of the roundtable was to get people thinking about these issues and to start thinking outside the box.

"It's a tough topic and we surely didn't come up with all the right answers," Carter said, "but hopefully we both elevated and advanced the discussion for local agencies across the country." ■

—Sophie Koch, LTAP freelancer

Organizations respond to the pandemic

In the summer of 2020, the City Engineers Association of Minnesota issued a survey to see how organizations handled COVID-19. Some highlights:

- 92 percent of respondents made changes that will be retained—chiefly, that remote working will be allowed more widely. Other examples include a switchover to laptops and greater use of virtual meetings.
- People adapted to new work styles and technology. One comment: "The way things were done in the past has changed. Those organizations that adapt, shift, and let go of past ways of doing business will be successful." ■

Hot shots from page 1

Hot shots, Stephen Druschel says, are the patches of snow or ice that are so bad that they prompt snowplow drivers to drop an increased load of road salt in response. Often the reaction is warranted—icy roads can permanently change a person's life. However, treating hot shots regularly this way can leave the roads crusted with excess salt that then washes into nearby water systems. Since road salt can burst the cells of juvenile aquatic organisms and create deoxygenated brine layers in water bodies, this is something to mitigate as well.

Druschel, a professor of civil engineering with Minnesota State University, Mankato, was the principal investigator for a recent MnDOT-funded study titled "Hot Shots for Cold Climes: Evaluating Treatment of the Hardest Icy Spots." He presented findings at the CTS Transportation Research Conference in November, and the final report and six videos about the study are now online.

"Safety takes precedence when accidents are happening and the Highway Patrol is shouting for more salt, meaning the environment will likely lose," Druschel says.

As part of a consultation with MnDOT, Druschel and a team of student research assistants set out to quantify the exact nature of a hot shot. Their definition largely went by a basis of contrast: "a spot treatment with adjacent areas being treated with zero deicer."

They then laid out a list of worst icing zones that MnDOT has been keeping GIS records of for the past 15 years. These zones include:

- Drifting
- Blow ice
- Cold air capture (ice fog)
- Shading
- Bridge decks

Druschel and the students then picked out 20 sites that were known to develop one of these conditions (plus control sites). Each site was equipped with time-lapse cameras, light meters, humidity meters, and thermometers to monitor conditions. Advanced vehicle location (AVL) data was captured from the trucks that visited each site to determine how much salt they used.

By comparing salting at each site to the total average salt usage from the entire season, the team was able to detect patterns in hot-shot application. Overall, the researchers found that traffic levels (which can wear away ice without salt use), seasonal differences, and the individual judgments of drivers were some of the most influential factors in salt application.

With this in mind, Druschel says, the best way to balance hot-shot salt usage and environmental risks might be public and driver education. If public

expectations about roads can be changed—for example, encouraging people to drive slower in the winter and to get winter tires—then plow drivers may feel less pressure to oversalt in an effort to get to bare pavement. Similarly, if plow drivers are encouraged to share their experience and are trained in the environmental risks of salt, their applications may become more uniform.

"We're walking that middle zone here," Druschel says, "and trying to build a discussion." ■

—Sophie Koch, LTAP freelancer

Learn more:

- Project page, with final report and links to a video playlist: Go to **researchprojects.dot.state.mn.us** and search on "hot shots"

Hot shots video series

Six educational videos are available about the Hot Shots for Cold Climes study. Topics of the short videos include drifting, blow ice, fog, bridges, and shading. The playlist is available on YouTube. ■

INFORMATION SERVICES

THE SHELF

Minnesota LTAP partners with the MnDOT Library to operate a state-of-the-art service that can help you track down almost any resource from Minnesota or beyond. Questions? Contact Marilee Tuite, Minnesota LTAP librarian, 612-626-8753, **ctslib@umn.edu.**

Characterization of Runoff Quality from Paved Low-Volume Roads and Optimization of Treatment Methods *(MnDOT, September 2020)*

Recommends roadside drainage ditches/swales for cost-effective treatment of runoff from low-volume roads over ponds, sand filters, and infiltration basins.

Bicycle Facility Implementation: Quick Reference Guide *(LRRB, October 2020)*

Offers local agencies a quick reference to key resources, frequently asked questions, a bike selection and policy flowchart, and more.

NCHRP Synthesis 558: Availability and Use of Pedestrian Infrastructure Data to Support Active Transportation Planning *(Transportation Research Board, November 2020)*

Summarizes current DOT practices for defining, storing, collecting, and sharing pedestrian infrastructure data to help agencies with more consistent and efficient planning and management of pedestrian infrastructure.

Using Municipal Vehicles as Sensor Platforms to Monitor the Health and Performance of the Traffic Control System *(Mobility21 UTC, November 2020)*

Shows the promise of using already available video imagery obtained at low cost from transit buses in regular service.

Evaluation of StreetLight Data's Traffic Count Estimates from Mobile Device Data *(MnDOT, November 2020)*

Recommends that MnDOT consider a phased approach to using probe-based traffic count estimates.

Assessment of Immediate Small and Rural Transit Training Needs *(Upper Great Plains Transportation Institute, December 2020)*

Reports the results of a survey to FTA Section 5311 recipients in rural areas with populations of less than 50,000 and to FTA Section 5307 recipients in small urban areas with populations under 200,000.

TCRP Report 223: Guidebook and Research Plan to Help Communities Improve Transportation to Health Care Services *(Transportation Research Board, December 2020)*

Details how to start a dialogue between transportation and health care providers and includes strategies for pursuing solutions appropriate for patients.

Steep Climb Ahead: How Fleet Managers Can Prepare for the Coming Wave of Electrified Vehicles *(Rocky Mountain Institute, January 2021)*

Offers the first comprehensive assessment of how major US fleet managers are approaching the electrification of their fleets.

Predictive Deep Learning for Flash Flood Management *(Missouri DOT, January 2021)*

Offers results to produce planning documents based on geospatial data and information to develop region-specific tools and response methods to potential flash flood events.

Nonmotorized Traffic Monitoring and Crash Analysis *(Oregon DOT, January 2021)*

Documents the collaboration between Oregon DOT and Bend MPO to develop and execute a nonmotorized traffic data collection program.

Local Climate Action Planning as a Tool to Harness the Greenhouse Gas Emissions Mitigation and Equity Potential of Autonomous Vehicles and On-Demand Mobility *(Mineta Transportation Institute, January 2021)*

Focuses on how cities can use climate action plans to ensure that on-demand mobility and autonomous vehicles help reduce, rather than increase, greenhouse gas emissions and inequitable impacts from the transportation system. ■

Search me

The Minnesota LTAP website features custom search engines to help you find information. You can search:

- LTAP & TTAP Centers
- State DOTs
- Transit agencies
- University transportation centers

Bookmark **mnltap.umn.edu/publications/library**.

Other great resources are:

- LRRB's site: **lrrb.org**
- MnDOT Library's catalog: **dot.state.mn.us/library** ■

NRRA workshops on YouTube

The first phase of the National Road Research Alliance (NRRA) has concluded and the second phase began in February. Many meetings and webinars from 2020 were recorded and are available on the NRRA YouTube channel. Information about 2021 NRRA workshops will be available on the alliance website: **dot.state.mn.us/mnroad/nrra**. ■

Permit from page 1

Randy Neprash, a stormwater regulatory specialist with Stantec and the Minnesota Cities Stormwater Coalition (MCSC).

To help streamline the application process, Neprash hosted a how-to-apply webinar during the City Engineers Association of Minnesota annual meeting on January 29.

The permit, Neprash says, applies to stormwater systems owned by public entities that meet certain requirements in terms of population, urban classification, and proximity to impaired waters.

Some of these new items aim to more closely regulate pollutants such as chloride and bacteria. Others require municipalities to provide better documentation. For example, if a municipality claims to be meeting total maximum daily load regulations, it must now document its load reduction strategies and prove that they are MPCA-approved methods.

These new requirements, Neprash says, do not need to be met immediately. Once the MS4 general permit is approved by the MPCA, municipalities have 12 months to update their stormwater pollution prevention plans, revise or add to city ordinances, and update best management practices.

Overall, Neprash says, municipalities with well-documented stormwater programs will have a quicker time with the application process. It helps to already meet the requirements of the 2013 MS4 permit and to have storm sewer system maps.

The MPCA website offers a variety of resources for permittees to use when applying for the permit. This includes an MS4 toolkit and an MS4 digital document library.

The MCSC also offers resources, meetings, and advice to its members. Neprash recommends contacting him with questions at **randy.neprash@stantec.com** for more information. ■

—Sophie Koch, LTAP freelancer

Learn more:

- MPCA permit website: **pca.state.mn.us/water/2020-ms4-general-permit**
- MS4 updated permit: **pca.state.mn.us/sites/default/files/wq-strm4-94a.pdf**

Questions about spring load restrictions?

Find answers and much more on the Minnesota Truck-Weight Education Program web page. It includes a clickable, county-level Minnesota state map for finding basic truck-weight information, including restrictions for bridges and seasonal loads. It also has links to training videos and other resources. See **mnltap.umn.edu/training/truckweight**. ■

Unmanned aerial systems aid in flood response

An eight-page technical brief from the Federal Highway Administration highlights how unmanned aerial systems (UAS) are being used to respond to flooding events. The devices serve seven mission categories during flood events:

- Strategic situational awareness, survey, and reconnaissance
- Detailed or structural inspection
- Ground search and rescue
- Water search and rescue
- Debris, flood estimation, and damage assessment
- Tactical situational awareness
- Material delivery

The brief describes these categories and primary use cases for UAS during flooding events. ■

Learn more:

- *Use of Small Unmanned Aerial System for Emergency Management of Flooding* (FHWA, 2019): **fhwa.dot.gov/uas/resources/hif19019.pdf**
- Every Day Counts UAS web page: **fhwa.dot.gov/innovation/everydaycounts/edc_5/uas.cfm**

EDC

Every Day Counts is the FHWA's initiative to advance a culture of innovation in the transportation community in partnership with public and private stakeholders.

Answer to test on page 8: 2—expected time range

TRAINING

Online training

To help slow the spread of COVID-19, Minnesota LTAP has suspended all in-person activities until further notice. In the meantime, we invite you to participate in online training, webinars, and virtual events. Please see our calendar for a variety of options from MnLTAP and other agencies to meet your training needs during this time.

MnLTAP online courses

Culvert Design and Maintenance – $45
(1 RS Maintenance credit) ***LTAP***

Sign Maintenance and Management for Local Agencies – $45
(1 RS Maintenance credit) ***LTAP***

Gravel Road Maintenance and Design – $45
(1 RS Maintenance credit) ***LTAP***

Work-Zone Safety Tutorial – Free
(0.5 RS Maintenance credit) ***LTAP***

Fundamentals of Construction Inspection – Free
(1 RS Maintenance credit) ***LTAP***

Other online courses eligible for RS credit

Maintenance Stormwater – Free
(0.5 RS Maintenance credit)

Math Basics for Maintenance Technicians
(1 RS Maintenance credit) – Free

Administration and Management Basics
(1 RS Leadership credit) – Free

Installation and Management of Roadside Turfgrasses – $175
(1 RS Maintenance credit)

MnLTAP webinars

Periodically, Minnesota LTAP offers live webinars on maintenance topics. Recordings are archived for later viewing.

Snow and Ice Control Material Application (CTAP) – Free
(0.5 RS Maintenance credit) ***LTAP***

Tips to Improve Your Public Speaking – Free ***LTAP***

Gravel Roads Webinar Series (4-part series) – Free
(0.25 RS Maintenance credit per webinar) ***LTAP***

MnLTAP training videos

These include recordings from some of our in-person and virtual workshops as well as special presentations recorded by our instructors.

Current Practices for Lightly Surfaced Roads – Free ***LTAP***

Minnesota Truck-Weight Education Program: Special Products Presentation – Free

ADA Training (3-part series) – Free

LTAP training

LTAP training is marked above with an ***LTAP***. Check the web for details and to register: mnltap.umn.edu. To be added to our mailing list, email mnltap@umn.edu or call 612-625-1813.

Roads Scholar Program

You can earn credits in Minnesota LTAP's two Roads Scholar (RS) certificate programs by completing LTAP and other cosponsored training. One certificate is focused on maintenance operations and the other on leadership and supervision. To learn more or enroll in the program, visit mnltap.umn.edu/roadsscholar. ■

Other online training resources:

- National LTAP Tailgate Talks
- AASHTO's TC3 Library
- APWA eLearning webinars and courses
- and much more!

Going virtual: Minnesota Roadway and Maintenance Demo Day

The pandemic means we're again unable to bring you our in-person Demo Day, so instead, Minnesota LTAP will host virtual trainings and demonstrations in April and May. There is no cost to participate, but registration is required. Roads Scholar credit will be awarded.

For more information and to register, please visit our website or contact Katherine Stanley, 612-626-1023, **sell0146@umn.edu**.

Excavation and Trenching Safety—April 13 and May 18
This comprehensive training program educates workers on the hazards found in trench and excavation work in the transportation construction industry. It explains protective systems and describes inspection requirements and other considerations.

The program will be offered twice: on April 13 and May 18, from 7:30 a.m. to 12:00 p.m.

Chainsaw Safety and Maintenance—May 12
Carr's Tree Service will do a shortened demo highlighting the importance of chainsaw safety. For some, this may be a refresher course. Personal protective equipment, proper positioning, and how to make running a chainsaw safer and easier will be at the forefront of the discussion.

The workshop will be held May 12 from 7:30 to 8:30 a.m.

Drones: Another Tool for Maintenance and Operations—May 13
This presentation will cover how Fridley is using a drone in public works and the obstacles and unforeseen complications. It will also share how the expansion of drone flights helps staff see things differently and increase efficiency.

It will be held May 13 from 7:30 to 8:30 a.m.

Cargo Securement Requirements and Updates on Recent Changes in CDL Driving Rules—May 20
One part of this training will let participants refresh and learn new ways to properly inspect securement devices and secure cargo according to regulation requirements. The other part will cover new requirements for Class A or B commercial driver's license (CDL) holders.

This workshop will be held May 20 from 7:30 to 9:30 a.m. ■

Level of service: Test your knowledge

It's never too late to brush up on your winter skills. One training option is the Clear Roads snowplow operator and supervisor training program, meant for both entry-level and experienced snowplow operators and supervisors. The training materials are available free of charge to any agency, including local and county highway departments.

The 22-module program covers equipment, materials, techniques, and procedures. A test question from the 11th module—Level of Service (LOS)—is shown at right (answer on page 7).

Revisiting LOS and public education is a suggestion in the Hot Shots for Cold Climes study (see page 1) to reduce pressure on plow drivers to oversalt.

For access to the training materials, email Clear Roads administrator Greg Waidley at **greg.waidley@ctcandassociates.com** or call 608-490-0552. ■