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RESEARCH SERVICES & LIBRARY

ACCELERATOR

Putting your ideas in motion

Alternate Route Signage to Help Drivers Navigate Road Closures

Each year dozens of vehicle crashes, spilled loads and other incidents clog Minnesota freeways, causing major backups along key transportation corridors. Traffic detours choke off local roadways as drivers use intuition, maps or GPS to find alternate routes.

MnDOT research has enabled a new approach, with permanent signage to be placed on over 40 viable alternate routes that bypass sections of Interstate 94 through MnDOT District 3 and I-35 through District 6. The alternate route signs display Interstate shields to help keep drivers on track during major freeway incidents and field personnel out of temporary signing situations.

More importantly, the research project produced an easy-to-implement guide to help the Minnesota State Patrol and other authorities determine how and when to direct traffic onto these alternate routes and how to efficiently coordinate with local agencies such as 911 dispatch centers, state patrol, railroad offices and local public works offices.

To determine the alternate routes, researchers engaged local stakeholders to vet each potential route, looking at characteristics like speed limits, traffic control devices and capacity constraints to avoid school zones, traffic snarls and other problems. First responders will be free to respond to incidents more quickly, and secondary crashes on local roads will be reduced.

A permanent sign marks an I-94 alternate route on U.S. Highway 12 in Roberts, Wisconsin. Similar signs will soon be going up in Minnesota to mark alternate routes for portions of I-94 and I-35.

This approach can be applied to other Interstate corridors, and a similar plan is being developed for MnDOT District 4 on I-94 to the North Dakota border. **Technical Summary 2015-43**

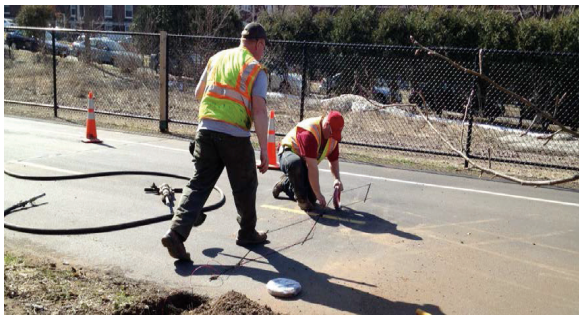
"Every time you come to an interchange, that alternate route will be in place."

—John Griffith, MnDOT Metro District West Area Manager

New Guidance for When to Use Flashing Yellow Arrows

Traffic & Safety — A flashing yellow arrow is an alternative to a simple green light. It signals that turning left is OK, as long as drivers yield to oncoming vehicles. Minnesota traffic engineers say these yellow arrows make intersections safer and more efficient, and MnDOT has instituted a policy to require their installation with any new signal heads. But it was unclear whether keeping these arrows active 24 hours a day would enhance safety. If traffic is too heavy, disallowing unprotected left turns like this altogether can be safer.

New MnDOT research has developed guidelines for determining what times of day, for a given intersection, permitted left turns should be allowed. This approach will be implemented by programming to use flashing yellow arrows during appropriate times. This signal plan is grounded on estimates of left-turn crash occurrence, intersection approach characteristics, speed limits, sight distances and other factors. **Technical Summary 2015-27**



Automating Bike and Pedestrian Traffic Monitoring

Multimodal — MnDOT and local agencies have made significant investments in bicycle and pedestrian facilities in recent years, but accurate data about this kind of traffic is needed to know if these investments are paying off. A new research implementation effort evaluated several commercially available technologies for automated counting of bikes and pedestrians. Sensors were permanently installed at five sites around the state and used for short-duration counts at 40 more sites. Researchers checked the accuracy of these counting methods by comparing their results to manual or video counts. Using these findings and synthesizing other research and guidance, they created a new manual with practical steps for collecting and interpreting nonmotorized traffic data. **Technical Summary 2015-33**

How Have Travel Patterns Changed Over Time?

Multimodal — The Metropolitan Council conducts periodic household surveys to gather information about how, when and why people travel. A recent Twin Cities Metro 2010-11 Travel Behavior Inventory added data to surveys from 2001, 1990, 1982 and 1970.

MnDOT sponsored a cluster of studies analyzing these data to inform transportation engineers, planners, economists, analysts and decision-makers about the effects of infrastructure and other changes on travel networks. The studies evaluated:

- **Accessibility and travel times:** How easy is it for people to get to their desired destinations?
- **Telecommuting:** How does telecommuting affect the demand for physical travel?
- **Transit service quality and transit use:** What factors increase or decrease people's use of transit?
- **Demographic change and travel behavior:** What long-term shifts result from the aging of particular generations?
- **Bicycling and walking:** How have biking and walking behavior patterns changed?

Technical Summary 2015-23

Designing biking and walking infrastructure has led to a heightening of these travel modes as a percentage of overall travel in the Twin Cities region.

"The public and policymakers have been asking for evidence about how investments impact usage."

— Jonathan Ehrlich, Metropolitan Council Planning Analyst

Cyclopath Goes Statewide

Multimodal — **Cyclopath** is an online bike route-finding tool equipped with a geowiki, an editable map that users can update as roads and conditions change. This tool has already proved to be valuable in promoting biking in the Twin Cities, and a MnDOT project has now incorporated data for the rest of the state, allowing users to generate routes involving bicycle trails, the most bikeable roads and other connections that a GPS alone couldn't locate. Users can adjust route preferences to prioritize speed, routes with bike lanes or trails, or roads highest rated by users. After the expansion, use of Cyclopath jumped quickly from 100 users creating routes daily to about 250.
Technical Summary 2015-29

Video: Car-Mounted LiDAR Opens Up Data Collection Possibilities

A Local Road Research Board project has enabled the creation of a test car with light detection and ranging (LiDAR) technology, which is similar to radar but uses laser beams, GPS and other equipment to capture real-time, 360-degree 3-D views of activity around the vehicle. These images can be used for **asset management**, traffic counts, emergency management and many other applications.

Watch a demonstration at **mntransportationresearch.org**.

Other Research

Stronger, Longer Lasting Asphalt Roads

Materials & Construction — Layers of asphalt pavement are held together by a tack coat—an emulsion sprayed between layers during construction. The tack coat makes the pavement as a whole much stronger than the individual layers. But if the strength of the bond is poor and the layers come apart, the service life of the road can decrease by up to 25 percent.

Minnesota transportation agencies are looking to add bond strength testing to their construction processes, and new research funded by the LRRB into the connection between bond strength and failure rates produced a target range for bond strength. The study also developed testing procedures that will be used in a pilot program to test tack bond strength. **Technical Summary 2015-25**

Larger Limestone Aggregate in Base Layer Improves Pavement Performance, Saves Money

Materials & Construction — The base of a road is constructed with rocks of a specified size. Too many small particles can lead to excess water absorption and freeze-thaw damage. Current MnDOT specifications dictate that rocks be about 0.75 inch in diameter, but in southern Minnesota this requires crushing available limestone, which is expensive and also produces small particles.

As an alternative, pavement test sections were constructed with larger particle sizes and various compositions in the base layer on two Olmsted County roads. Continued monitoring of these roads revealed that some of the sections are performing very well, and MnDOT's specification has now been altered to include a new Class 5 modified aggregate that allows for 2-inch rocks (shown above). Olmsted and two other southern Minnesota counties are now using the new specification for base layers on all new asphalt pavements. **Technical Summary 2015-28**

Traffic Simulations Will Help Optimize MnPASS Pricing

Traffic & Safety — MnPASS lanes are high-occupancy toll lanes installed on I-394 and I-35W, where a single-occupant vehicle is automatically charged a variable fee for using the lane (currently ranging from 25 cents to $8, depending on congestion levels). However, if the cost of using the lanes becomes too expensive, drivers won't use them; if the cost is too low, the lanes will soon become overcrowded.

To optimize the pricing algorithm, researchers conducted field tests and computer simulations using various pricing schemes. The results provided insight into when higher prices discourage usage (above $5), how to avoid the rapid price spikes associated with the current algorithm and what traffic conditions cause changes in pricing. While a vendor currently operates the MnPASS pricing algorithm, MnDOT is looking to take over this responsibility and incorporate the study findings into new practices that will maximize MnPASS benefits. **Technical Summary 2015-22**

Saving Money on Long-Lasting Steel Culverts

Bridges & Structures — The steel pipes that commonly allow water to flow beneath Minnesota roads and bridges corrode over time. How fast they corrode depends on properties of the surrounding soil, so engineers use different wall thicknesses and either an aluminum or zinc coating to make sure the pipe will not corrode too quickly. MnDOT research created a map of soil properties and consequent expected service lives of the different kinds of steel pipes throughout the state. This resource makes it easier to choose the right pipe for each environment so that a culvert will last without wasting materials. **Technical Summary 2015-31**

Correction: In the May/June edition of Accelerator, the article "Newly Funded Projects Will Implement Key Innovations" included some projects that were under consideration, but which were not ultimately funded. The **current online version** of the newsletter contains the correct projects.

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Calendar

10/7-8	Minnesota Fall Maintenance Expo, St. Cloud
10/15	US Domestic Scan Program proposals due
10/26	LRRB meeting, St. Cloud
10/29-30	Minnesota Toward Zero Deaths Annual Conference, St. Cloud
11/2	TRB's Transit IDEA proposals due
11/3	TRIG Fall Meeting
11/19-20	American Public Works Association – Minnesota Chapter Fall Conference, Brooklyn Center
11/23	Research Implementation Committee Meeting, Woodbury

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