



# Minnesota's Experience with Hard Shoulder Running

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Minnesota Department of Transportation





# Regional Transportation Management Center

- Shared Operations Center
  - MnDOT Traffic Operations
  - MnDOT Maintenance Dispatch
  - State Patrol Dispatch
- 400 miles of freeway management system
  - Cameras
  - Changeable Message Signs
  - Freeway Service Patrol





# MnPASS Express Lanes

- Give commuters a reliable travel choice that saves them time
- Increase a highway's capacity to carry more people during peak-drive times
- Enable faster, more reliable bus service

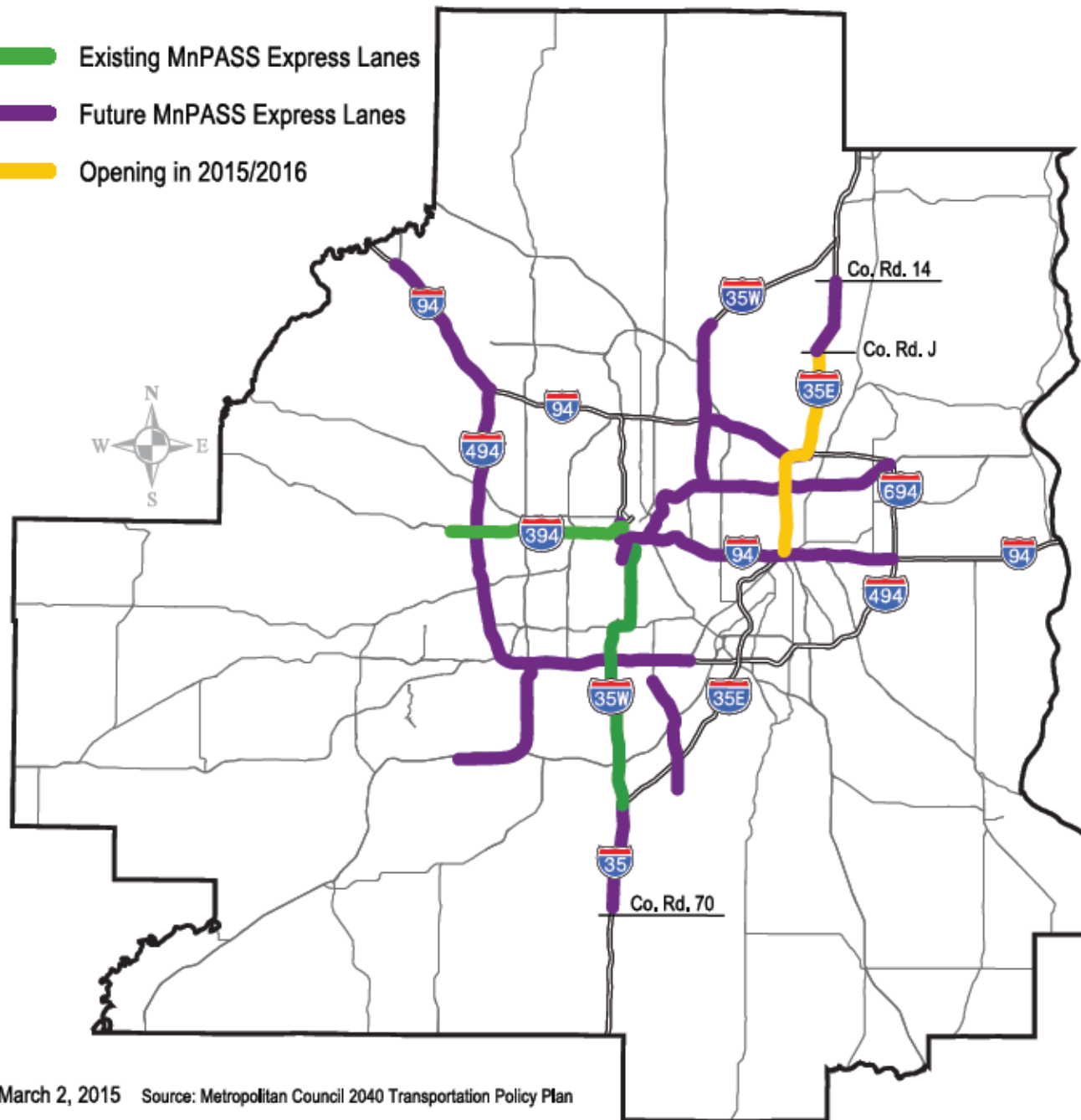


**MnPASS**



# MnPASS Express Lane System

- Existing MnPASS Express Lanes
- Future MnPASS Express Lanes
- Opening in 2015/2016





# I-35W: The 21<sup>ST</sup> Century Highway

- Expanded MnPASS System
- Smart Lanes
- Priced Dynamic Shoulder Lane
- Bus Rapid Transit and Stations
- Integrated Park and Rides
- Low cost/high benefit capacity





# Smart Lanes





# I-35W and I-94 Smart Lanes

- Intelligent Lane Control Signals (ILCS) located every  $\frac{1}{2}$  mile over every lane.
- A total of 297 ILCS.
  - 187 ILCS on I-35W
  - 110 ILCS on I-94
- ILCS are a 4ft x 5ft full color matrix signs.
- Use of the ILCS is for incident management, variable speeds and priced dynamic shoulder lane.

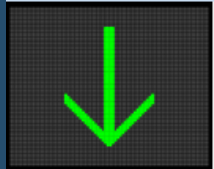




# ILCS Sign Options



Blank – default



Green – Lane Open



Flashing Yellow – Caution



Red X – Closed



Lane Closed Ahead



Merge Left



Merge Right



Merge Both



Speed Limit



White Diamond





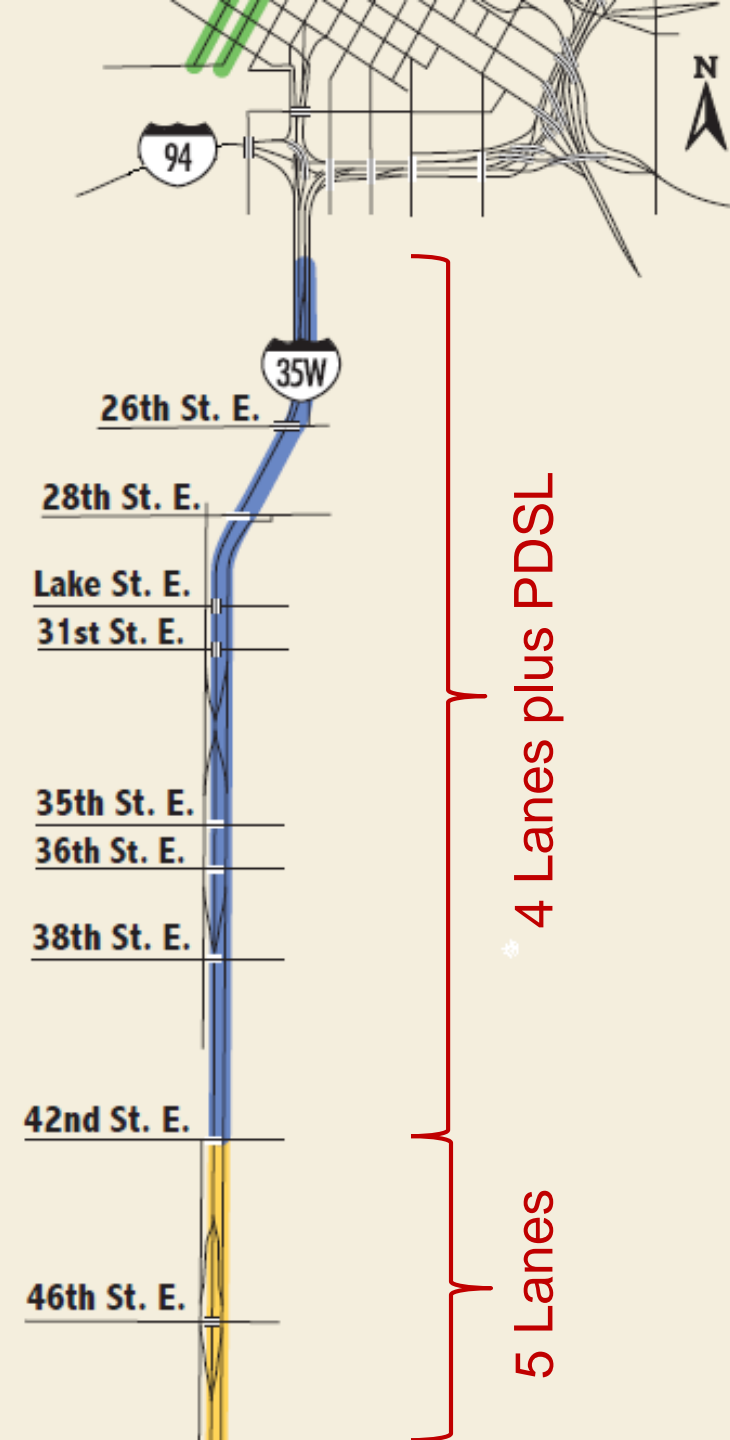
# Variable Speed Limits



- Advisory Only
- Detection measures traffic speeds downstream
- Speeds are posted up to 1 ½ miles upstream

# Priced Dynamic Shoulder Lane (PDSL)

- 3 Mile Segment on NB 35W
- Maintains existing 4 lanes with an added PDSL Lane
- Effectively extends the MnPASS lane to downtown Minneapolis using existing road space
- Total Cost = \$17 M

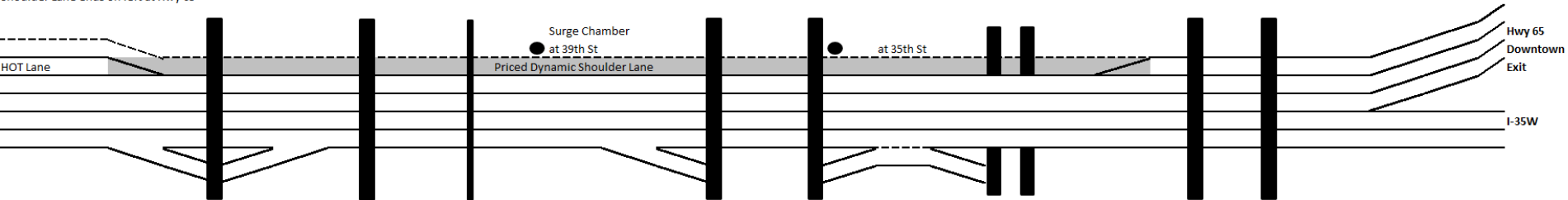




# I-35W PDSL Full View

## Left Side Priced Dynamic Shoulder Lane

5 Lanes from Crosstown - Lane drop on Left  
Shoulder Lane picks up at lane drop  
Shoulder Lane ends on left at Hwy 65







# I-35W PDSL Cross Section

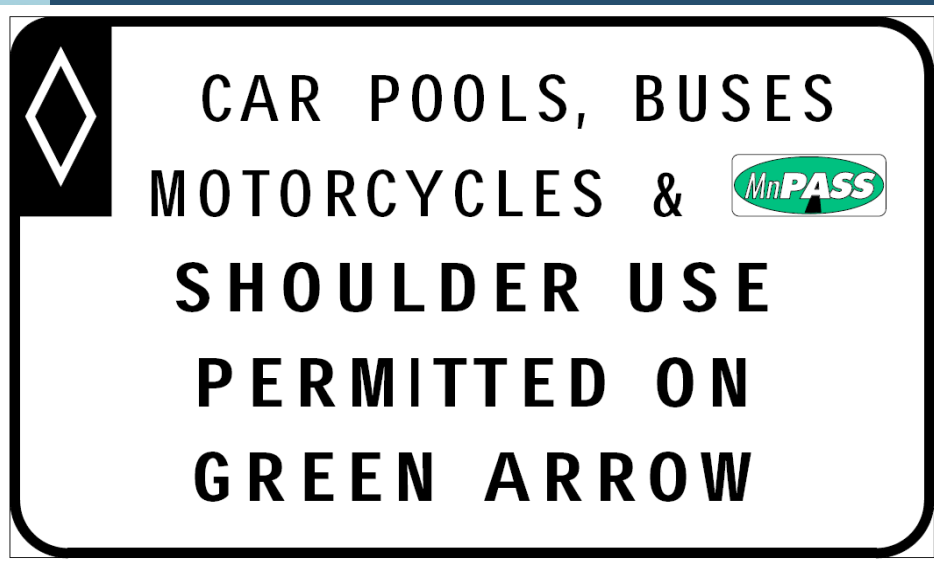


# I-35W PDSL Operations

- Monday – Friday
  - 6:00 AM to 7:00 PM
  - Expanded Mid-day hours due to high violation rates
- Can be open on weekends or evenings for special events, weather or incidents.
  - Regular Saturday hours from 11:00 AM to 7:00 PM



# I-35W MnPASS: Regulatory Signing







# I-35W MnPASS: PDSL Closed





# I-35W MnPASS: In Pavement Lighting PDSL Closed





# I-35W MnPASS: In Pavement Lighting PDSL Open







# I-35W MnPASS: In Pavement Lighting Corrosion and Failure



**No distinguishable difference in violation rates of the PDSL with or without the in pavement lighting.**

# Structure Protection and Pull-Offs



- Projection for sign structure also protects ITS cabinets
- 60 ft maintenance pull-off located downstream
- Some sites have 200 ft pull-off for emergency refuge area.



# Operations Software

- IRIS Software Developed In-house controls all FMS equipment including the ATM equipment
- Developed recommended deployment plans for ILCS
  - Operator enters in incident location and what lanes are blocked
  - IRIS auto-deploys signs based on these inputs
- Streamlined other operations software to ease workload for operators
  - Example – State Patrol CAD data automatically deployed to 511 system





# Designed for Maintenance





# I-494 Lane Add Project

## Dynamic Shoulder Lane Considered

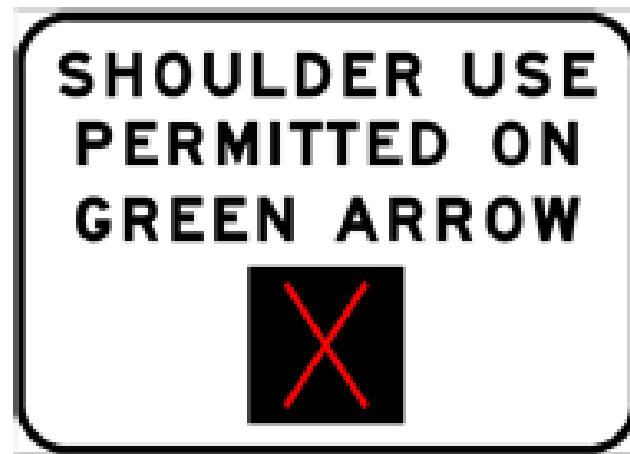
- Developed concept for right hand dynamic shoulder
- Open during peak hours to general purpose traffic
- About 5-miles in length

## New Lane Added

- Full construction of a 3<sup>rd</sup> lane in each direction
- 2015-2016 construction season



# I-494 Dynamic Shoulder Signing Over Shoulder Lane Only

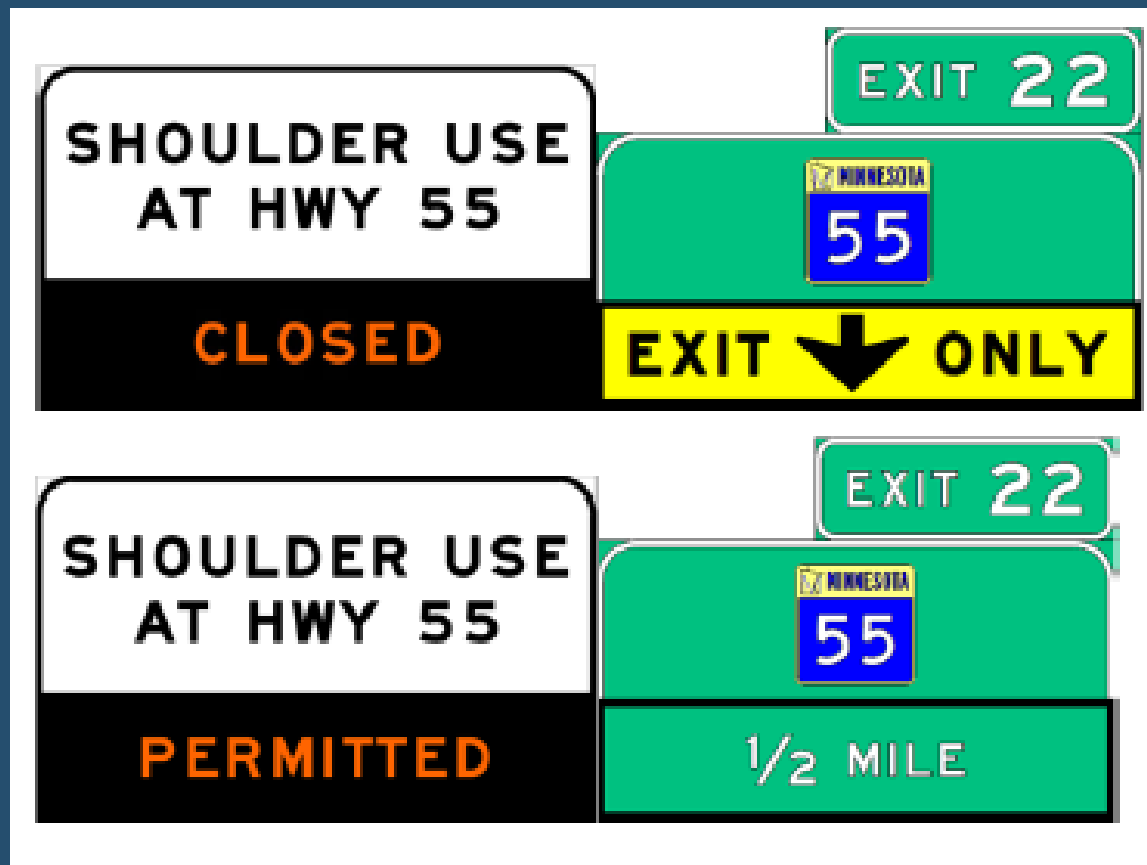


# I-494 Dynamic Shoulder Advanced Signing - 1 Mile





# I-494 Dynamic Shoulder Advanced Signing – 1/2 Mile

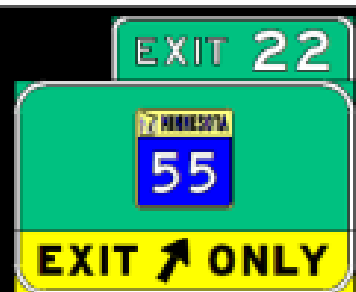






# I-494 Dynamic Shoulder Advanced Signing – 0.2 Mile

SHOULDER USE  
PERMITTED  
AHEAD



Flip Down  
Sign

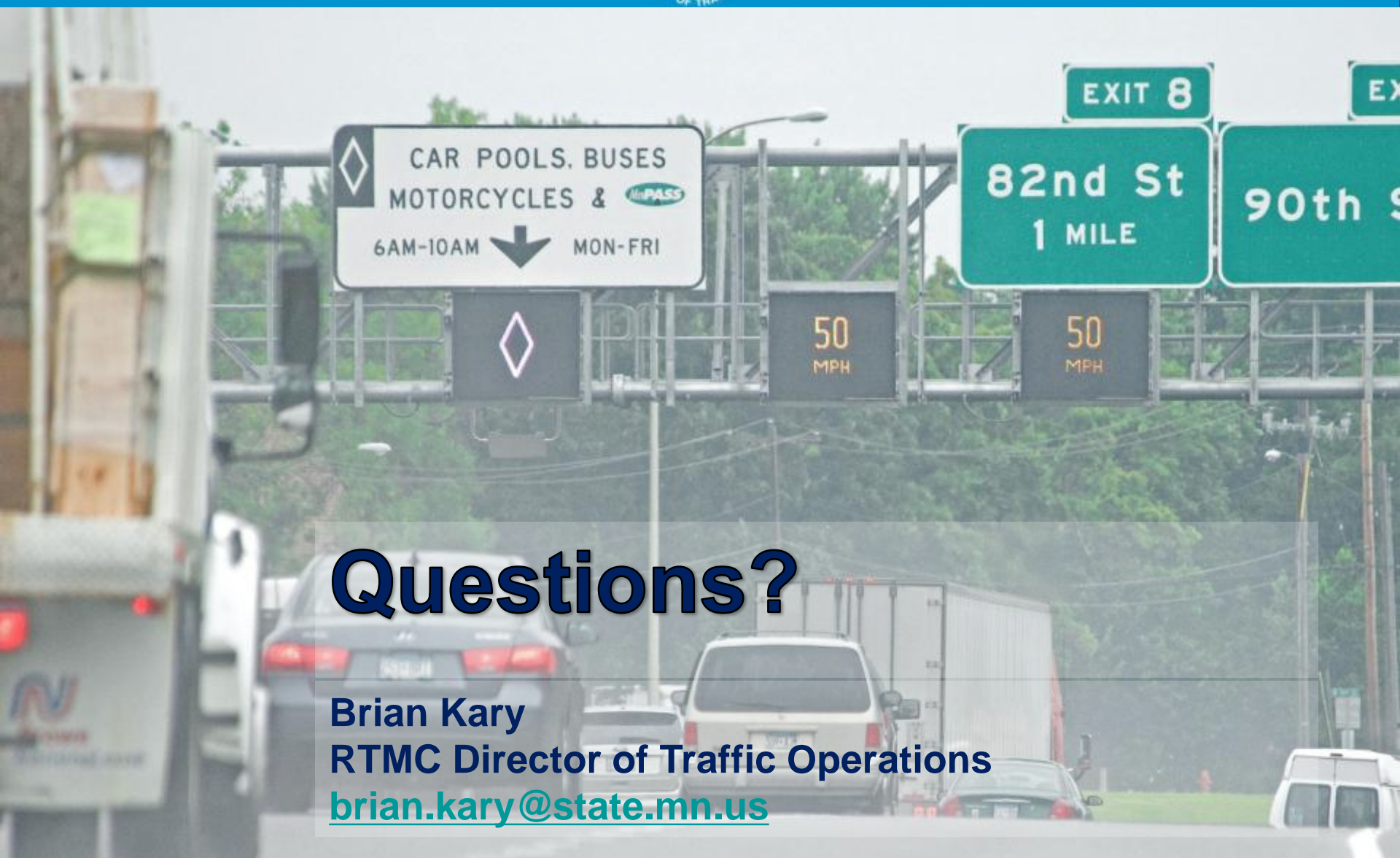
# I-494 Dynamic Shoulder Ramp Signing





# Future of ATDM in MnDOT

- Dynamic Shoulders
  - Nothing planned, but still in the toolbox
  - I-35W PDSL being rebuilt as a permanent lane starting 2018.
- Smart Lanes
  - Some removal as part of future construction projects
  - No plans to expand existing system
  - Signs failing at a high rate. Manufacturer went out of business. No warranty. Limited spare parts.
  - Looking to replace system with more frequent DMS rather than ILCS



# Questions?

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