HIGHWAY 52 CONNECTED AND AUTOMATED VEHICLE STUDY

2022 ITS Wisconsin Transportation Conference

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PROJECT CORRIDOR
HIGHWAY 52 – ST PAUL TO ROCHESTER

AGENDA

1. PROJECT OVERVIEW
2. CORRIDOR CHALLENGES
3. CAV APPLICATIONS
4. NEXT STEPS
5. LESSONS LEARNED

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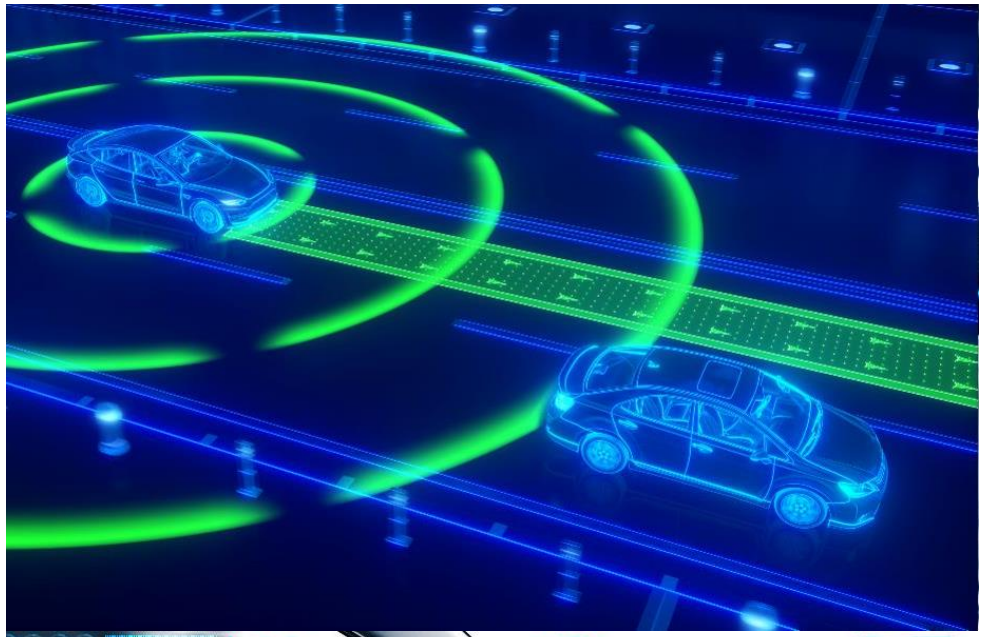
PROJECT OVERVIEW

PROGRAM APPROACH

INTRODUCTION

- **Prepare** for emerging technologies
- **Improve** lives of Minnesotans
- **Solve** the challenges we face in Minnesota



PROGRAM APPROACH

RELATED MNDOT CAV/ITS PROJECTS

- Connected Vehicle Traveler Alert
- Lafayette Bridge Queue Warning System
- Intelligent Work Zones
- CAV Standard Pavement Markings

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PROJECT PURPOSE

WHY THIS PROJECT?

- Advance safety, equity, accessibility, mobility, and sustainability on Highway 52
- Understand CAV technologies
- Select technology applications
- Partnership

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CORRIDOR AND PROJECT OVERVIEW

CORRIDOR OBJECTIVES

STAKEHOLDER & COMMUNITY ENGAGEMENT

TEST & DEPLOY SAFETY TECHNOLOGIES

PROMOTE WORK ZONE SAFETY

TRAVELER INFORMATION & TRAFFIC MANAGEMENT

CONDUCT APPLIED RESEARCH & TESTING

OPERATIONS & MAINTENANCE OF NEW TECHNOLOGIES

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CORRIDOR AND PROJECT OVERVIEW

WHY THIS CORRIDOR?

- Safety and mobility projects over the last 20 years – focus corridor for MnDOT
- Travel increase due to rapid regional growth
- Recently completed Traffic Management System (TMS) upgrades
- Corridor varies from very rural to very urban
- 75-mile corridor

CORRIDOR CHALLENGES

CORRIDOR CHALLENGES

STAKEHOLDERS

- Project Management Team (MnDOT CAV-X and SRF)
- Project Team (other MnDOT staff)
- Advisory Committee (other public agency staff)
- Other Stakeholders (industry representatives)

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CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 1

- Breakout discussions to dig into the issues:

Safety

Mobility & Access

Transit/ Multimodal

Equity

CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

Safety

1. Snowplow rear-end crashes
2. Mix of slow-moving and high-speed traffic
3. Mix of freight and passenger vehicles
4. Challenges in work zones – lots of upcoming construction
5. Safety concerns when first responders or maintenance staff are on shoulders
6. Farm equipment on shoulders or crossing the highway
7. School buses stopping to pick up students
8. Weather events – snow, ice, blow ice, flooding, etc.
9. Transitions between expressway and freeway segments – changes in access control
10. Reduced conflict intersections do not feel safe to all motorists
11. Wrong-way entry

CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

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CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

Mobility & Access

1. Significant congestion where 52 enters St. Paul / Lafayette Bridge
2. Need wider shoulder for farm equipment crossings
3. Truck lanes underutilized
4. Lack of alternative routes
5. Need more traveler information (511, message signs, etc.)
6. Improve travel time reliability
7. Connection between MSP and Rochester is important
8. Non grade-separated intersections pose mobility challenges

CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

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CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

Transit/Multimodal

1. Need more multi-modal options – corridor mainly promotes passenger vehicle transportation
2. Find ways to replace cars with buses
3. Need more bike lanes/infrastructure
4. Support micro-mobility (scooters)
5. Need more bus service, BRT, park and rides, etc.
6. Need more reliable travel times for all modes
7. Use technology to increase interest in transit
8. Consider dedicated lanes for direct/express service

CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

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CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

Equity

- Address everything through an Equity lens

CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

- **Prioritizing Issues/Challenges**
  1. Snowplow rear-end crashes
  2. Mix of freight and passenger vehicles
  3. Challenges in work zones – lots of upcoming construction
  4. Safety concerns when law enforcement, maintenance staff are on shoulders
  5. Weather events – snow, ice, blow ice, flooding, etc.
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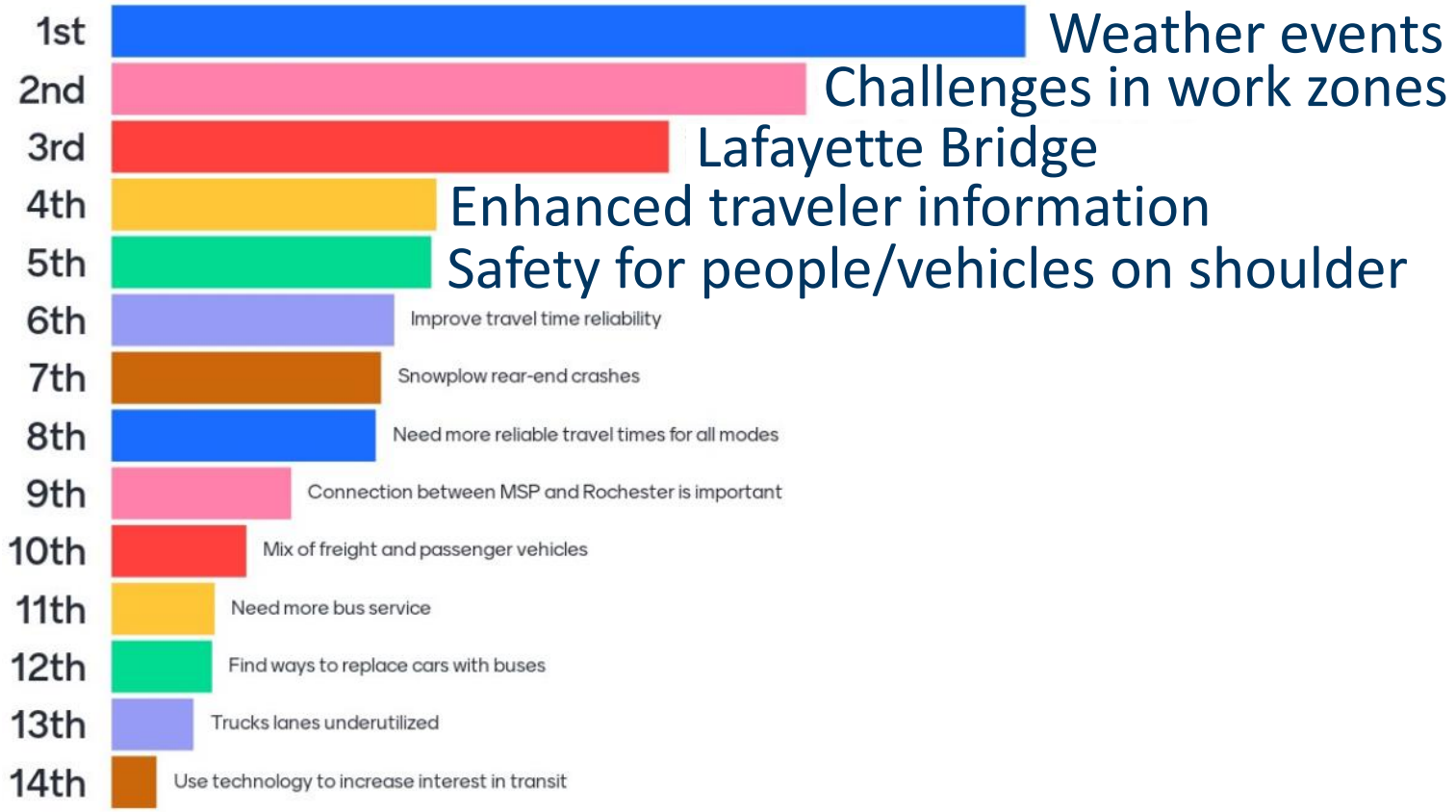
CORRIDOR CHALLENGES

STAKEHOLDER WORKSHOP 2

- What are your **top three** priority Highway 52 challenges for this project to address?



CAV APPLICATIONS

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ISSUE TO APPLICATION MAPPING

ISSUES

1. Snowplow rear-end crashes
2. Mix of freight and passenger vehicles
3. **Challenges in work zones – lots of upcoming construction**
4. Safety concerns when law enforcement, maintenance staff are on shoulders
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APPLICATIONS

Category #1: Traveler Information
- **Intelligent work zones**
- **Hazard warnings**
- **Weather warnings and alerts**

Category #2: Traffic Management/Control
- **Signal phasing and timing**
- Snowplow and signal priority
- Eco-driving

Category #3: Autonomous Shuttles, Transit, and Freight
- Automated transit and shuttles
- Bike/Pedestrian Detection and Warning
- Automated freight and platooning
- Multi-modal trip planning

Category #4: Outreach and Engagement
- Workshops and public events
- Technology demonstrations
- Surveys

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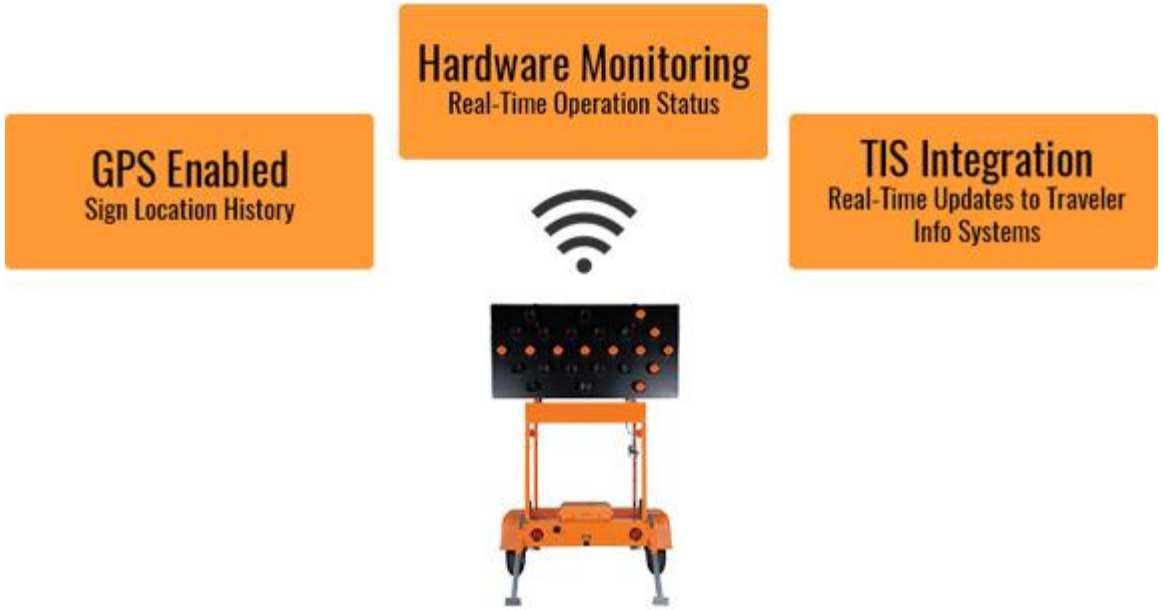
RECOMMENDED CAV APPLICATIONS

- Intelligent Work Zones
  1. Real-time Information Sharing
  2. Queue Warning System Enhancements
- Hazard Warning Systems
  3. Law Enforcement
  4. Weather
  5. Vehicle on Shoulder
- Traveler Information
  6. Alternate Route Advisories
  7. Data Fusion and Integration
  8. Special Purpose Data Portals

1. REAL-TIME INFORMATION SHARING

- Work zone data is typically static and requires manual entry into 511
- Deploy IWZ devices to provide real-time traveler info
- Share data via Work Zone Data Exchange (WZDx) for easier integration into other tools such as Google Maps, Waze, etc.



2. QUEUE WARNING SYSTEM ENHANCEMENTS

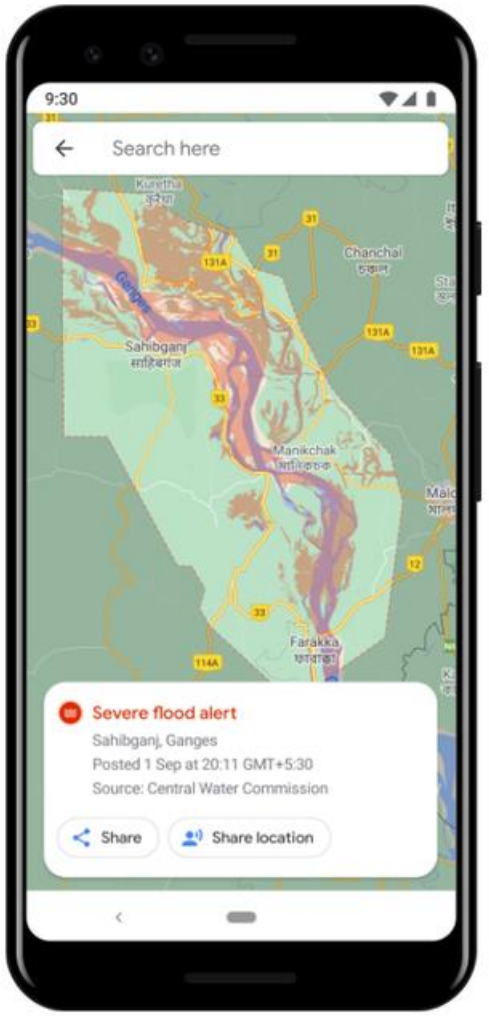
- Queue warning systems typically consist of a series of roadside detectors
- Supplement roadside detection with large traffic data sets from third party data providers (Inrix, Wejo, Mobileye, etc.)
- Potentially reduce costs and increase coverage area

3. LAW ENFORCEMENT WARNING

- Location of law enforcement vehicles is already known using existing on-board equipment (CAD/AVL)
- Law enforcement could "activate" the sharing of their location when desired
- Notify upstream motorists via dynamic message signs, 511, etc. of an upcoming vehicle on the shoulder to encourage them to move over

4. WEATHER WARNINGS

- Road conditions are typically gathered from road weather information systems (RWIS)
- Augment with data from on-board vehicle sensors
- Use this data to provide road condition / weather warnings to motorists
- Leverage data to guide maintenance response for icy bridges, blow ice, etc.

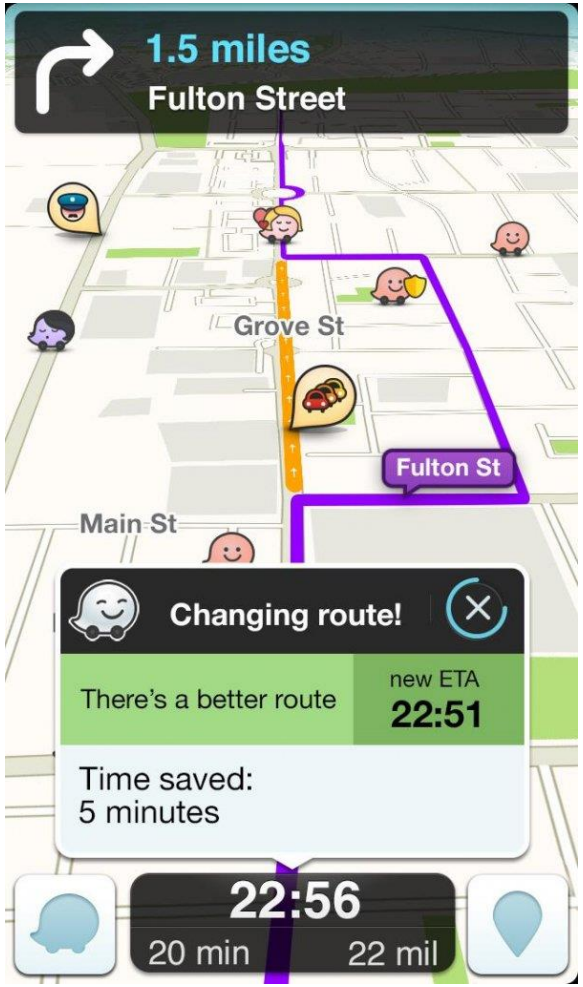


5. VEHICLE ON SHOULDER WARNING

- Third party data vendors can provide information about the presence of vehicles on the shoulder based on:
  - Location/speed info
  - Analysis of images from on-board cameras
- Provide notification to upstream motorists via 511, in-vehicle display, etc.
- Use as a form of automated incident detection to improve response time to incidents

6. ALTERNATE ROUTE ADVISORIES

- Expand traveler information to include alternate routes
- Completion of Highway 14 construction will enable a more viable alternate route for Highway 52
- Obtain traffic data for alternate routes using third party data providers to supplement existing roadway detection



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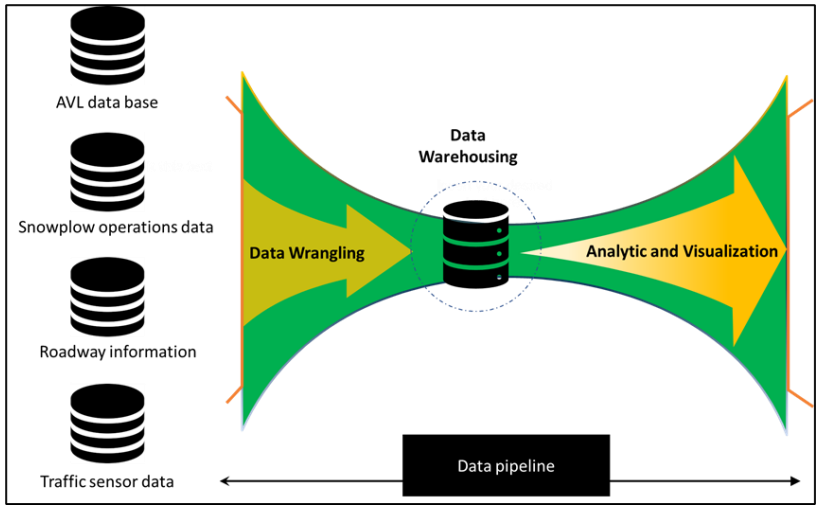
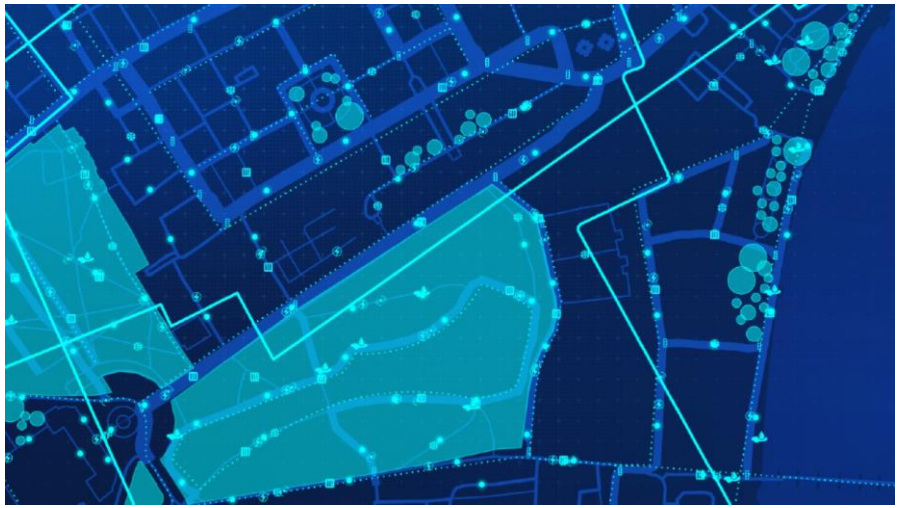
7. DATA FUSION AND INTEGRATION

- The ability to process and visualize large amounts of data has become more feasible
- Analyze traffic data for anomalies to identify potential locations of concern
  - Abrupt braking
  - Near misses
  - Pedestrian crossing a high-speed roadway
- Provide real-time notifications or use to identify spot improvements



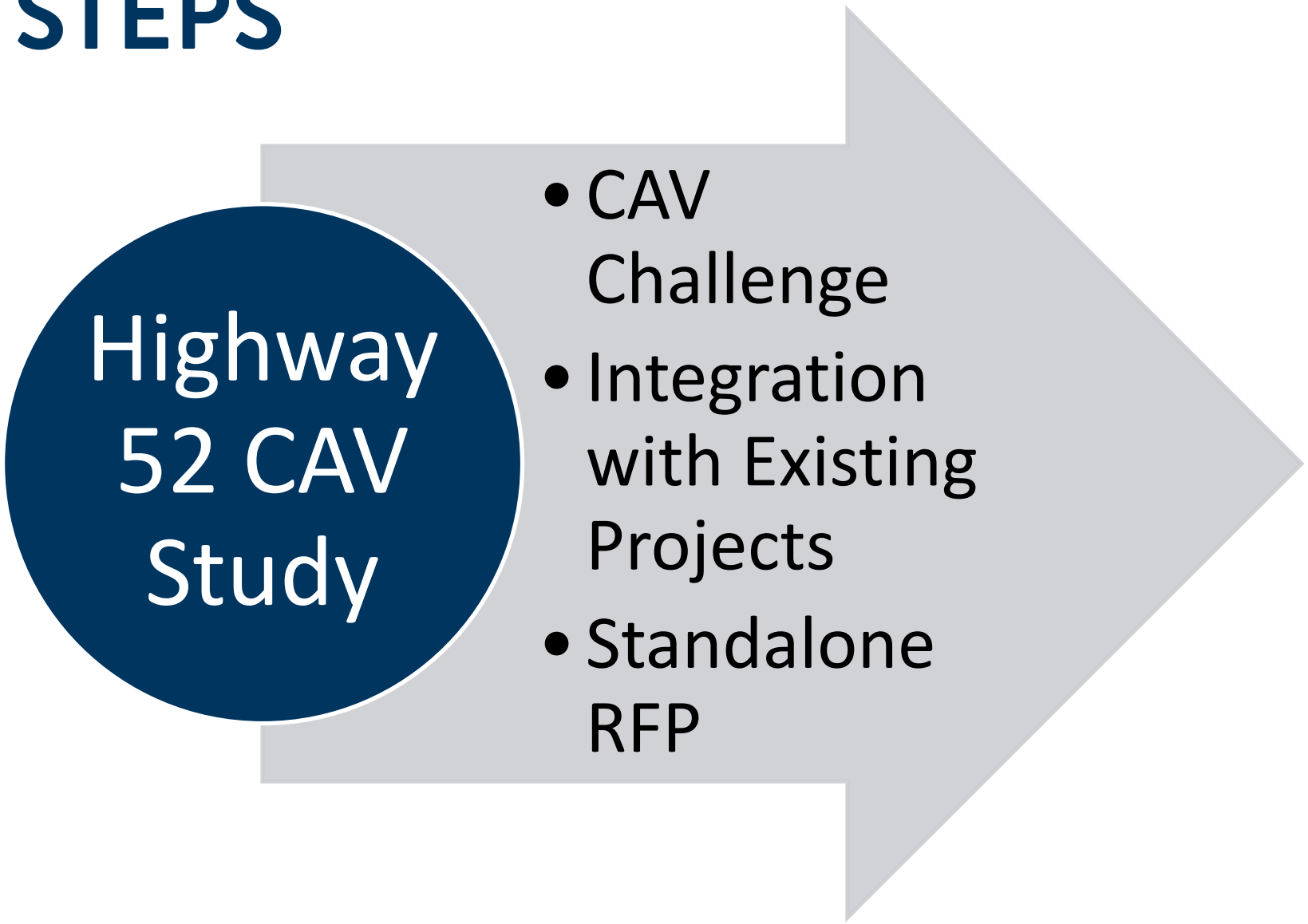


8. SPECIAL PURPOSE DATA PORTALS

- Develop custom websites for specific transportation uses (freight, transit, etc.)
- Users can leverage this as a trip planning tool (depart early, postpone trip, cancel trip)
- Aggregate historic and real-time data sources (AVL, roadway sensors, third party data, weather forecasts, etc.), to provide more detailed traveler information

NEXT STEPS

NEXT STEPS


Highway 52 CAV Study
• CAV Challenge
• Integration with Existing Projects
• Standalone RFP

LESSONS LEARNED

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CAV PLANNING

- Everyone has unique perspective
  (DOT, local agencies, law enforcement, etc.)
- Stakeholders are great at conveying corridor issues
- Stakeholders have a challenge making connections between transportation challenges and CAV/technology solutions – educate and inform!
- Tie CAV applications back to larger MnDOT strategic plan goals/objectives
- Apply this to other corridors statewide

QUESTIONS?

HIGHWAY 52 CONNECTED AND AUTOMATED VEHICLE STUDY

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