



Connected and Automated Vehicle (CAV) Integration for Local Governments

Maryland CAV Working Group

December 7, 2023

Eileen Singleton, P.E.



Presentation Overview

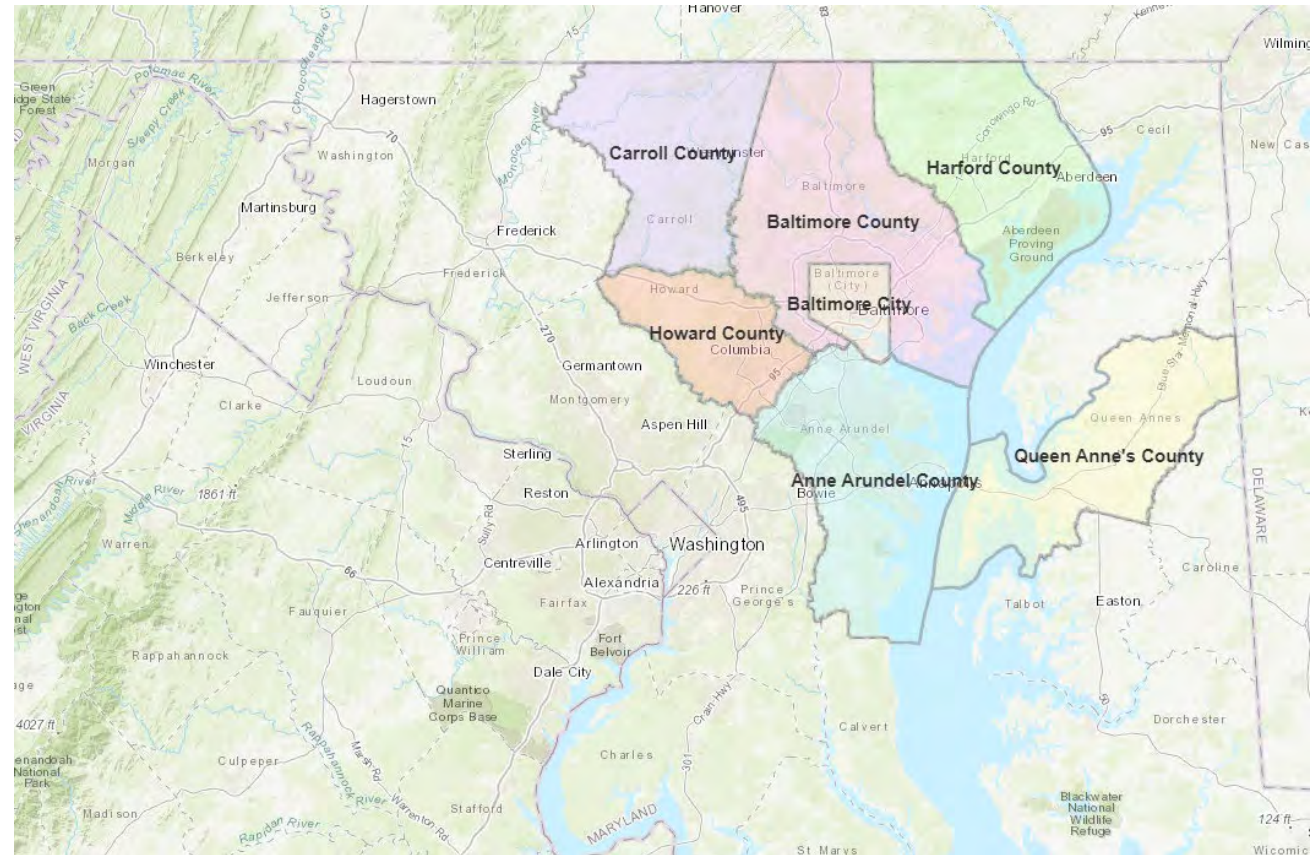
- Overview of the Baltimore Metropolitan Council and the Baltimore Regional Transportation Board
- Project Overview: CAV Integration for Local Governments

Overview of Baltimore Metropolitan Council

A Resource for the Region

BMC connects the Baltimore region – how we travel, work and live – by identifying mutual interests and developing collaborative strategies, plans and programs. BMC is a resource for the region.

- **Board of Directors:**
 - Mayor of Baltimore City
 - Executives of Anne Arundel, Baltimore, Harford and Howard counties, a Carroll County Commissioner, a Queen Anne's County Commissioner
 - Delegate and Senator from the State of Maryland, and a gubernatorial appointee



Overview of Baltimore Metropolitan Council

Work of BMC staff includes:

- Transportation Planning
- Economic and Demographic Research
- Computer Mapping and Geographic Analysis
- Air and Water Quality Programs
- Cooperative Purchasing
- Workforce Development
- Housing
- Rideshare Coordination
- Emergency Preparedness

www.baltometro.org



Overview of Baltimore Metropolitan Council

BMC staff provides technical support to the Baltimore Regional Transportation Board (BRTB).

- BRTB is the designated Metropolitan Planning Organization (MPO) for the Baltimore region.

BRTB members:

– Voting:

- City of Annapolis
- Anne Arundel County
- Baltimore City
- Baltimore County
- Carroll County
- Harford County
- Howard County
- Queen Anne's County
- MD Department of Transportation
- Central Maryland RTA

– Non-Voting:

- MD Department of the Environment
- MD Department of Planning
- MD Transit Administration

Overview of Baltimore Metropolitan Council

- BRTB committees:
 - Baltimore Region GIS Committee
 - Baltimore Regional Safety Subcommittee
 - Baltimore Regional Transportation Board
 - Bicycle and Pedestrian Advisory Group
 - Congestion Management Process Committee
 - Cooperative Forecasting Group
 - Freight Movement Task Force
 - Interagency Consultation Group
 - Public Advisory Committee
 - Technical Committee
 - Traffic Incident Management Committee
 - Traffic Signal Subcommittee
 - Transportation & Public Works Committee
- Other BMC committees:
 - Baltimore Regional Cooperative Purchasing Committee
 - BMC Board of Directors
 - Energy Board
 - Executive Committee
 - Housing Affordability Preservation Task Force
 - Housing Committee
 - Regional Fair Housing Group
 - Reservoir Technical Group
 - Watershed Protection Committee
 - Food and Water Security

Project Overview: CAV Integration for Local Governments

CAVs are here now

Over 140 automated vehicle pilots have been completed or are planned across 29 states.¹

Existing Maryland CAV Plans include:

- [MDOT SHA CAV 2021-2025 Implementation Plan](#)
- [MDTA 2020 Planning for CAV Readiness](#)
- [Maryland CAV Strategic Framework 2020](#)
- [MDTA 2018 CAV Strategic Plan](#)
- [MDOT CAV Toolkit for Local Jurisdictions](#)

¹ [National Highway Traffic Safety Administration](#)



AV shuttle tested at National Harbor, MD (Source: Olli)



AVs tested in parking lots of Odenton and Dorsey MARC stations (Source: MDOT)



Westminster's Autonomous Corridor Project Planning (Source: Magic)



Personal Delivery Devices at Morgan State University (Source: WBAL-TV)

MDOT: Connected & Automated Vehicle Toolkit

Baseline Investment

- Get familiar with terms and resources
- Clearly establish agency roles and responsibilities
- Join the national dialogue

Medium Investment

- Understand community vision and needs
- Assess land use and zoning
- Review workforce readiness
- Attract CAV deployment

High Investment

- Assess physical or digital infrastructure needs

Project Need

Provide guidance specific to Baltimore region on planning for Connected and Automated Vehicles (CAVs)



Impacts of CAVs



Best practices in CAV
planning



Actionable
recommendations for local
agencies to prepare

Project Overview

Product 1: CAV Literature Review

Product 2: Customized, Actionable Recommendations

Product 3: User Guide

Product 4: Executive Summary for Leadership

Stakeholder Input

- Steering Committee meetings, reviews, and input
- Interviews with local, regional, state, and industry partners

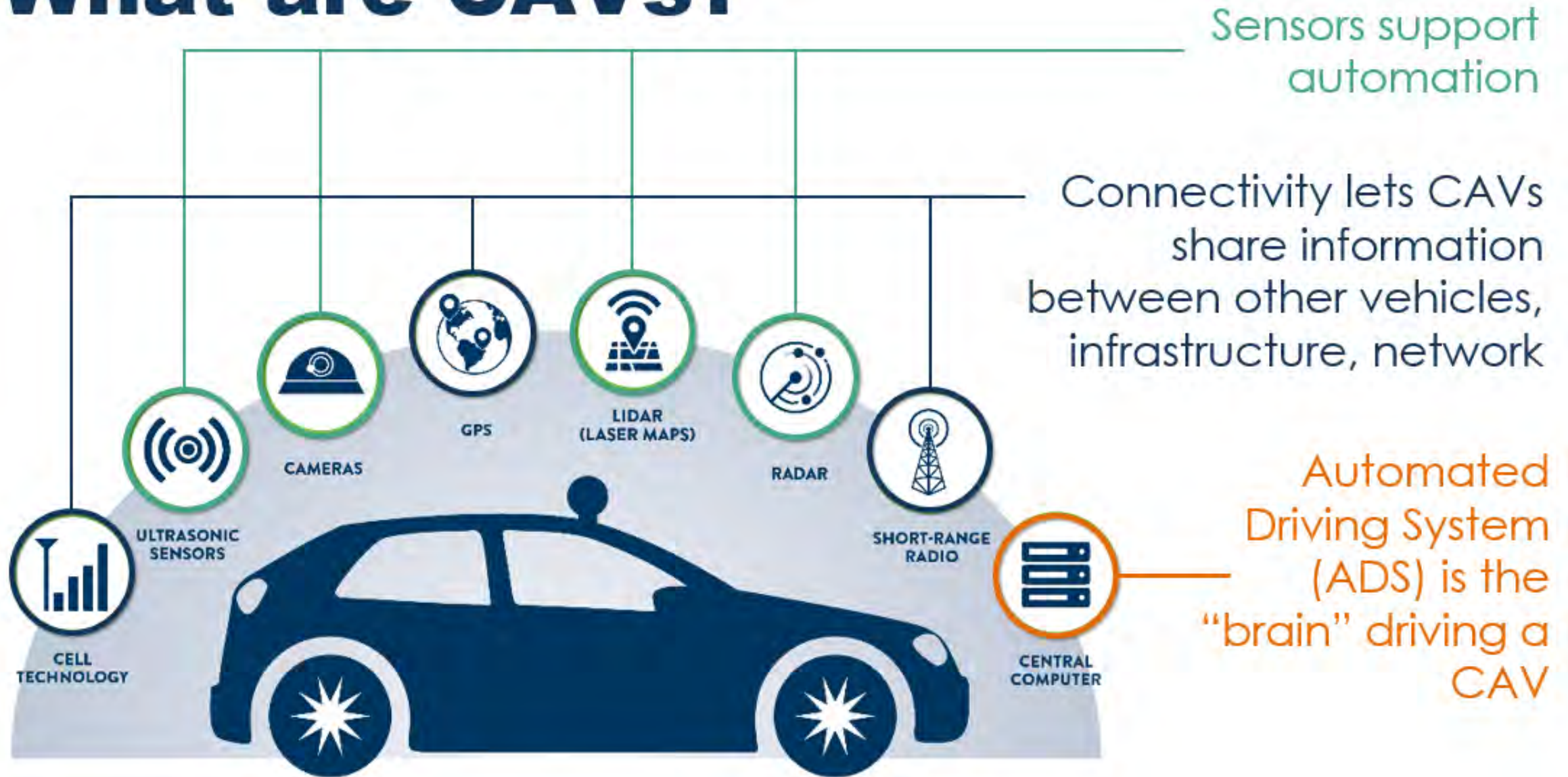


Product 1: CAV Literature Review

- Introduction
- What are Automated Driving Systems?
- How are Automated Driving Systems being used?
- Why do we need to plan for CAVs?
- Best Practices for Planning CAV Impacts
- Top Take-Aways from Literature Review

<https://baltometro.org/transportation/planning-areas/multi-modal-planning/emerging-technologies>

What are CAVs?



Connected Infrastructure

Transit Signal Priority (TSP)



Connected Vehicle Pilot



**US 1 Innovative
Technology Deployment
Corridor**

Passenger Shuttles



National Harbor

Automated Ridehail & Trucking



Small Package Delivery



Stevenson
University

Morgan State
University

Why do we need to plan for CAVs?

Local policies and investments can incentivize impacts and guide development to meet local goals.

Safety

Land-Use

Mobility

Equity

Accessibility

Labor and Workforce

Congestion

Data and Privacy

Environmental

Considerations for Equitable & Accessible Deployment

Local agencies could consider:



Vehicle & Ride Affordability

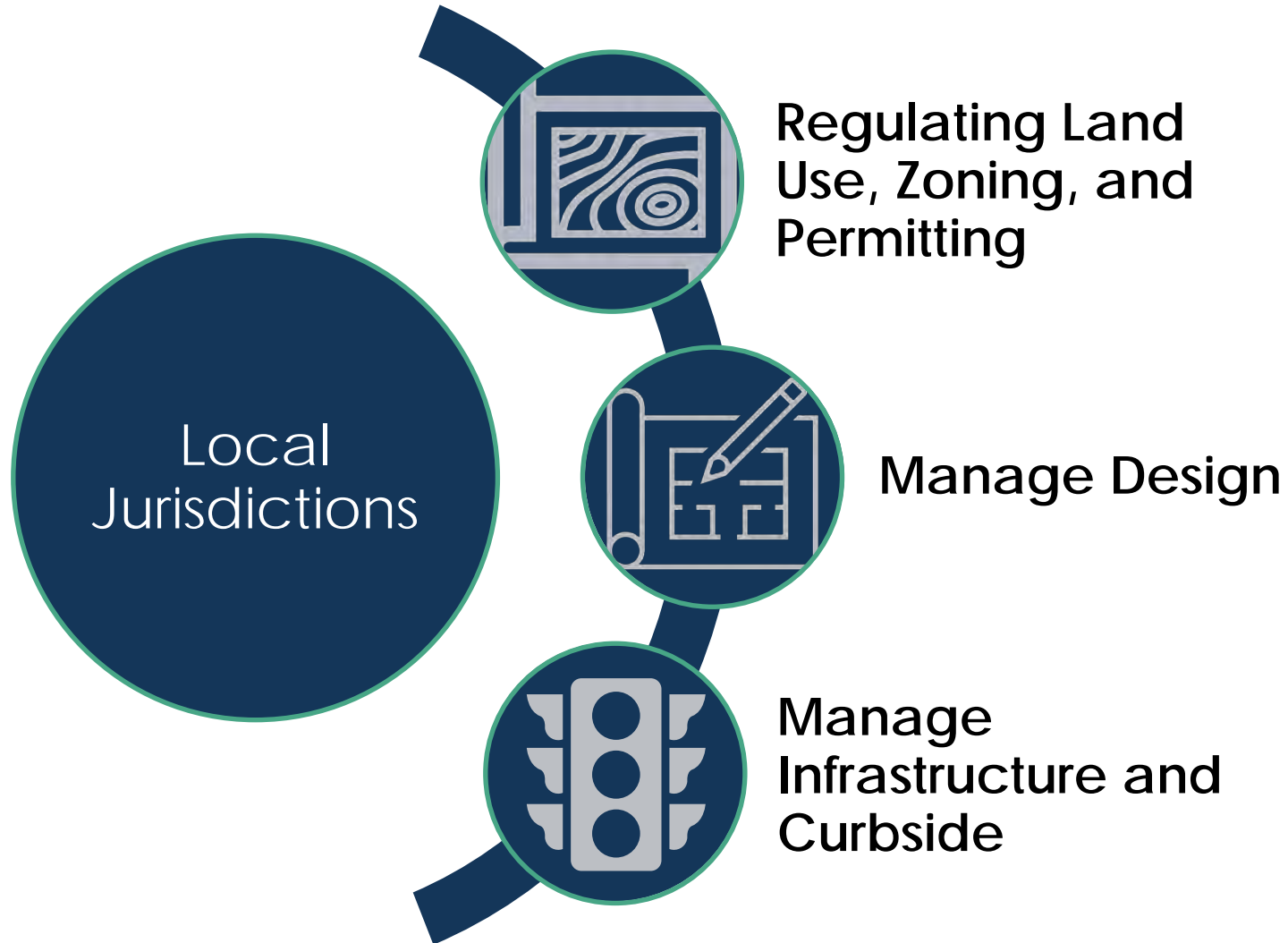


Accessibility



Deployment Location

What role do local jurisdictions play?



How are agencies planning for CAVs?



Self-Assess



Understand
Regulatory Roles



Rethink Your
Workforce



Build Partnerships &
Champions



Plan for Multiple
Future Scenarios



Prepare
Infrastructure



Develop
Policies



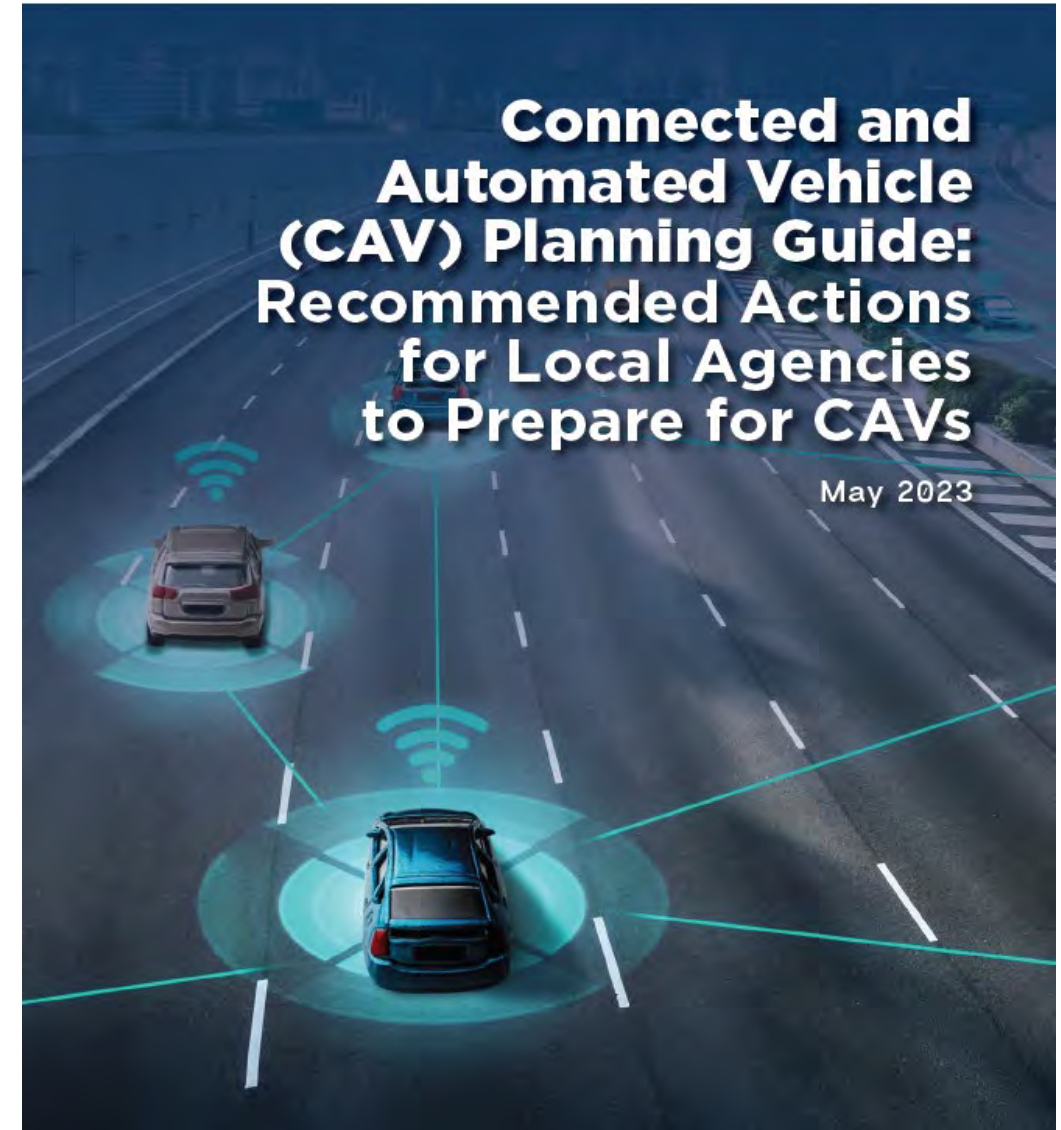
Collect and
Share Data



Monitor State of the
Practice

Product 2: CAV Planning Guide

Available for download on the BMC website:
<https://baltometro.org/transportation/planning-areas/multi-modal-planning/emerging-technologies>



CAV Planning Guide Contents

Introduction

CAVs in Maryland

State and Local Partner Engagement

CAV Impacts




Functional Roles in CAV Planning

Recommended Actions for Local Jurisdictions

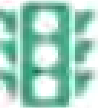

Key Near-Term Actions for Local Agencies to Prepare for Connected and Automated Vehicles (CAVs)

Key Near-Term Local Agency Actions

Cross-Cutting

-  Coordinate with State and BMC
-  Identify safety partners and define safety goals
-  Plan for the different needs of automated freight or goods delivery.

Infrastructure


-  Maintain infrastructure in State of Good Repair
-  Follow industry guidance on data collection, storage, and security



Planning

-  Define your agency's vision and nominate a champion
-  Include equity and accessibility partners in all projects and require service to underserved communities
-  Integrate CAVs and other emerging technologies into land use and transportation plans, travel demand models, codes, and design manuals
-  Plan for impacts on local fiscal health
-  Prioritize multimodal mobility and Complete/Slow Streets

Workforce Development

-  Invest in people and the future of the workforce

Key Opportunities and Challenges for CAVs Identified by Project Participants



- **Equity. Access for underserved communities**
 - including people with disabilities, older adults, and people living in food deserts.



- **Safety. Impacts on overall system safety**
 - including speeds, crashes, congestion, enforcing rules of the road, and data privacy.



- **Emergency Response. Updating first responder training, enforcement procedures, and response plans, and improving vehicle predictability**
 - (e.g., moving over for emergency vehicles or responding to human traffic control).



- **Built Environment & Infrastructure. Land use and potential infrastructure needs**
 - such as communication networks, dedicated lanes, parking, roads, electric vehicle charging stations, and sidewalks.



- **Collaboration. Partnering with new companies, service providers, and other agencies.**



- **Community Education. Identifying key champions and local partners to be involved in planning, education, outreach, and support.**

Examples of Impacts

Impact Area	Opportunities	Challenges
Safety	<ul style="list-style-type: none"> • Faster reaction times than humans • Not distracted, impaired, or drowsy • Additional safety features with low-level automation features like Advanced Driver Assistance Systems 	<ul style="list-style-type: none"> • Crash exposure risks might increase if Vehicles Miles Traveled (VMT) and travel distances increase due to reduced driver stress and value of time • Drivers and other travelers might not understand capabilities and limitations of technology • CAVs might not detect vulnerable road users

Proactive planning will help agencies maximize the potential benefits of CAV technology and minimize the potential negative impacts.

		<ul style="list-style-type: none"> • Increased competition for limited curb space
Equity & Accessibility	<ul style="list-style-type: none"> • Opportunities to meet transportation needs of people who do not drive, people with disabilities and older adults • Increase transit connections by reducing first/last mile costs or increasing accessibility in areas with gaps in the transit network 	<ul style="list-style-type: none"> • Availability and costs of CAVs sufficiently equipped to aid older adults and people with disabilities • Competitions with high-occupancy transit • Service areas may not include underserved communities or have lengthy wait times

Roles and Responsibilities

Table 2. Key Roles and Responsibilities in CAV Planning

Private Industry	Federal Government	State Government	Local Government	MPO / Other Organizations
<ul style="list-style-type: none"> • Manufactures vehicles and equipment and develops CAV technology. • Self-certifies regulatory compliance (such as with Federal motor vehicle safety standards and Federal communications standards). • Manages operations of the vehicle and fleet. 	<ul style="list-style-type: none"> • Sets minimum performance safety standards for new motor vehicles and motor vehicle equipment. • Enforces compliance with safety standards. • Investigates safety-related defects and non-compliances and manages recalls or remedies. • Issues guidance, 	<ul style="list-style-type: none"> • Registers motor vehicles. • Licenses human drivers. • Issues permits for automated vehicle operations. • Educates and trains human drivers. • Develops training for older adults and people with disabilities on 	<ul style="list-style-type: none"> • Sets and enforces traffic laws and regulations as permitted by the state, such as speed limits. • Updates land use plans, codes, and land development regulations. • Updates building codes. • Updates local street design standards and complies with 	<ul style="list-style-type: none"> • Communicates specialized community needs for safe, acceptable customer services. • Participates in educational outreach. • Advocates for policies that further goals. • Participates in workforce training. • Coordinates planning

Local Role in CAV Planning



Set and enforce traffic laws as permitted by state



Update local street design standards



Update land use plans, codes, and land development regulations



Operate and maintain infrastructure



Update building codes



Proactively prepare for CAV impacts and use public policy to steer adoption to support local goals

Policy Approach

Reactive

No agency intervention

What does a reactive scenario look like?

Policy

State or municipal policy to incentivize CAVs to meet agency goals

What are reasonable policy levers? (CAV use, land use, etc.)

High-Investment

Public infrastructure investment to support CAVs

What are reasonable investment levers? (CV communications, striping, etc.)

Recommended Near-Term Local Agency Actions

Cross-Cutting



Coordinate with State and BMC

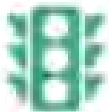


Identify safety partners and define safety goals



Plan for the different needs of automated freight or goods delivery.

Infrastructure



Maintain infrastructure in State of Good Repair



Follow industry guidance on data collection, storage, and security



Planning



Define your agency's vision and nominate a champion



Include equity and accessibility partners in all projects and require service to underserved communities



Integrate CAVs and other emerging technologies into land use and transportation plans, travel demand models, codes, and design manuals



Plan for impacts on local fiscal health



Prioritize multimodal mobility and Complete/Slow Streets

Workforce Development



Invest in people and the future of the workforce

CAV Planning Guide

Preparing for CAV Safety

Local governments want CAVs to operate safely. CAV performance could be different if they don't work closely with the State on specific safety issues. Local agencies might also need to do more to ensure safety.

How can local agencies ensure safety?

Recommended Actions for Local Agencies

Coordinate with MDT to develop **operational performance** measures for CAVs to meet the needs from testing to deployment to ensure safety.

Monitor and advocate for safety performance of CAV deployments (crash and personal safety). Performance measures may include:

- Number of reported crimes, crashes, or incidents.
- Number of hard braking events (location, time, date).
- Number of false-positive hard braking events (location, time, date).
- Number of crashes involving a CAV (including new reporting procedures and training).

Include **emergency responders on advisory committees** and **inter-agency working groups**.

Participate and **engage the Emergency Responders** in the MD CAV Working Group to learn best practices and provide feedback on needed research or next steps.

Require Emergency Response Plans from vendors operating in your jurisdiction. Collaborate with mobility providers and

Where can I learn more?

The [Automated Vehicle Safety Consortium \(AVSC\)](#) provides best practice documents, including:

- First Responder Interactions.
- Interactions with Vulnerable Road Users.
- Safe testing and Evaluation.

Safety Case Studies

Updated Emergency Response Plan: The Maryland CAV Emergency Responder Subgroup updated the state's Emergency Response Plan to include recommendations for appropriate procedures for testing and deployment for truck platooning and personal delivery devices. BMC staff maintains a site of [CAV Resources for Emergency Responders](#) for the Subgroup.

National Highway Traffic Safety Administration (NHTSA) Reporting: In June 2022, NHTSA published the [initial round of crash data](#) for Advanced Driver Assistance Systems (ADAS) and Automated Driving Systems (ADS). In 2021, NHTSA began to evaluate whether the manufacturers of ADS and ADAS systems and the vehicles equipped with them, including manufacturers of prototype vehicles and equipment, are meeting their statutory obligations to ensure that their vehicles and equipment are free of defects that pose unreasonable risks to motor vehicle safety.

Require Emergency Response Plans from vendors operating in your jurisdiction. Collaborate with mobility providers and	Low	Short	State or Local Transportation Department
--	-----	-------	--

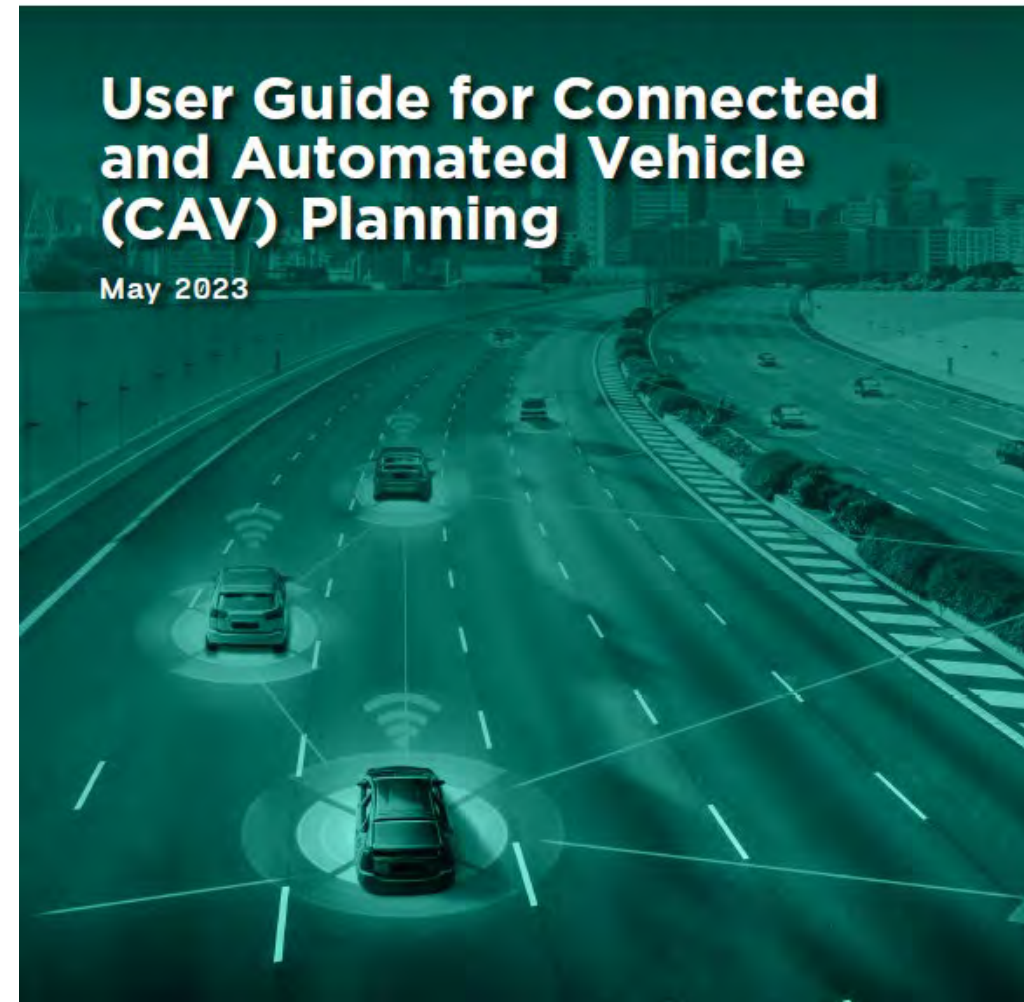
Product 3: User Guide for CAV Planning



How to Use this User Guide

Where should you begin?

- Read the CAV Planning Guide.
- Collaborate within your applicable local agency(s), Baltimore Metropolitan Council (BMC), and the State to complete this User Guide for CAV Planning.
- Refer to the *CAV Planning Guide* for the full recommendations and additional details.
- Refer regularly to this User Guide for CAV Planning to track progress and to identify next steps. Come back to this guide to periodically update your progress as you implement the actions and update other plans and policies.



Getting started: User Guide for CAV Planning

For each topic area, the *User Guide for CAV Planning* includes:



The near-term recommendation



Why is the action needed?



Who is the lead agency or department?



A checklist of steps to take action



An editable worksheet to document and track progress

User Guide for CAV Planning

Safety <i>See: Safety (Page 14)</i>		
NEAR-TERM RECOMMENDATION	STEPS TO TAKE ACTION	IMPLEMENTATION
<p>Develop goals and performance measures for CAV deployment safety. Collaborate with industry to monitor safety performance of local CAV deployments.</p> <p>Why? CAVs should meet or exceed the core driving competencies of a human driver and follow all rules of the road.</p> <p>Who? Transportation and Planning Departments, Local CAV Champions</p>	<p>Identify a champion (s) who is:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Develop safety goals and performance metrics for local CAV deployments (see Vision and Goals step above). <input type="checkbox"/> Review existing state or local Emergency Response Plans from local CAV deployers. <input type="checkbox"/> Monitor safety performance of local CAV deployments (if applicable). <input type="checkbox"/> Schedule weekly meetings with local CAV deployers to discuss safety and operational performance (if applicable). <input type="checkbox"/> Assign staff to join the Emergency Responder Subgroup of Maryland's CAV Working Group 	<p>Define local CAV deployment safety goals:</p> <p>List CAV deployment safety performance measures and potential data sources:</p>

Next Steps Recommended in the User Guide

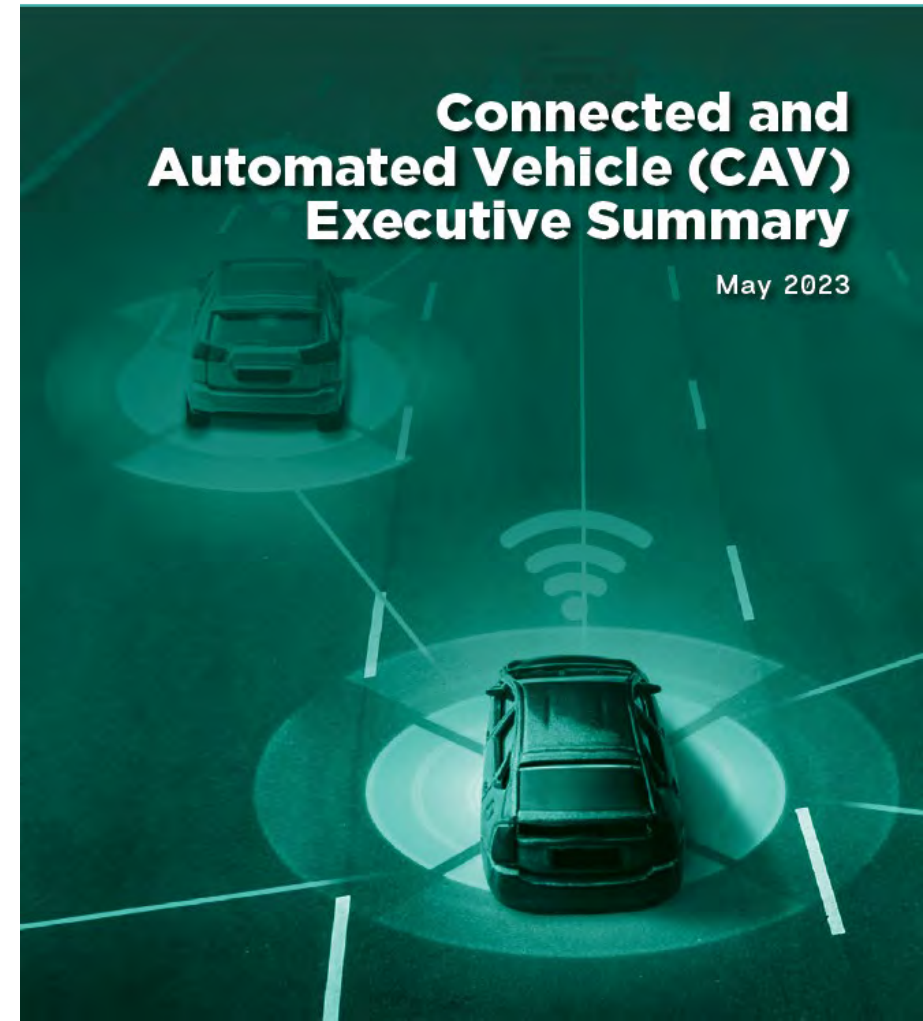
Next Steps

Your jurisdiction has worked through the User Guide for CAV Planning. Now what? Put these actions into practice!

- Coordinate your actions with peer jurisdictions, BMC, and the State.
- Establish timely recurring touchpoints with your agency's staff to check-in on the status of each recommended action.
- Include CAV-supporting projects in Capital Investment Program (CIP), Transportation Improvement Program (TIP), and other plans.
- Implement necessary policy changes and internal agency practices, procedures, and actions.
- Consider sponsoring a pilot demonstration program.

Product 4: Executive Summary

- High-level talking points for agency staff and decision makers on the region's CAV planning efforts and needs
- Recommendations to proactively prepare for the impacts of CAVs



For More Information

Eileen Singleton, P.E. | Principal Transportation Engineer

410-732-0500 x 1033 | esingleton@baltometro.org | www.baltometro.org

 @BALTOMETROCOUNCIL

 @BALTIMORE METROPOLITAN COUNCIL

 @BALTIMORE METROPOLITAN COUNCIL

