



TSM&O CONSORTIUM MEETING SUMMARY

Meeting Date: May 31, 2018 (Thursday) **Time:** 10:00 AM – 12:00 PM

Subject: TSM&O Consortium Meeting

Meeting Location: Central Florida Expressway Authority
4974 Orl Tower Rd Orlando, FL 32807
Pelican Conference Room

I. OVERVIEW

The purpose of this recurring meeting is to provide an opportunity for District Five FDOT staff and regional agency partners to collaborate on the state of the TSM&O Program and ongoing efforts in District Five. David Williams gave a short introduction and explained the meeting agenda.

II. TSM&O STRATEGY GUIDE UPDATE

David Williams gave a brief update to Consortium members on the status of the District Five TSM&O Strategy Guide.

- Team met with FDOT District Five Leadership and will integrate into the planning process to support transportation practitioners in identifying potential TSM&O strategies for a given project; this will also improve coordination between planning projects and the TSM&O group
- The team recently put together a second draft, which is under final review and will be hosted online in the coming weeks

III. SIGNAL TECHNICIAN PROGRAM AT ORANGE TECHNICAL COLLEGE UPDATE

David Williams provided a brief explanation of progress on the District's progress on creating a signal technician program with Orange Technical College.

- Last August, began talking through this issue and how to address it
- Began working with Orange Technical College – Mid Florida Campus; met with faculty last week (week of May 21st)
 - Assistant Director Michael Martucci, Instructor Steve Bowman (Electronic Technology), and Instructor TJ Thoss (Cybersecurity)
- The program generally needs 14 students to pay for the instructor
- The school emphasizes practical, hands-on work experience
- Goal to combine three existing programs into a specialized Signal Technician Program:
 - Electronic Technology (1 & 2),
 - Enterprise Network and Server Support Technology, and
 - Basic electricity

- Assistant Director Michael Martucci indicated Orange Technical College – Mid Florida Campus needs three items of support from the local industry stakeholders to advance the signal technician program at the school
 - 1) A condensed, streamlined curriculum that meets minimum specifications of local industry
 - If there are any specific requests for the curriculum, please get in contact with Michael Martucci
 - Willing to work with the State to meet an industry standard
 - Please fill out electronically what is needed and share
 - David will send out list of skills taught for each of the three programs being combined into the signal technician program
 - Proposed IMSA certification, networking in CISCO/Juniper
 - 2) Letters of support from individual agencies
 - Indication of job placement opportunities
 - Indication of need for signal technicians
 - Indication of advisory support
 - 3) Commitment of resources
 - Equipment that could be provided to the technical college
 - Time on advisory committee
 - Time for site visits, tours, outreach
 - (This is to help build a pipeline; we need to make the program look attractive to potential students)
- These items are needed for Orange Technical College to get approval from the Education Board
- Short term goals of evening classes and standalone coursework for training existing staff
 - Tour of campus (abridged July 26 Consortium meeting, followed by tour?)
- Question: Will this program be eligible for dual enrollment?
 - A: Yes, students in the last 2 years of high school (16 and older) can attend
- Benton Bonney: We also need people in the private industry and letters of commitment from private companies because help is needed with I-4 Ultimate
 - Since FDOT is pushing us towards AV/CV we need people that can run these communications
 - City of Orlando has Project Blueprint so I think this is an important initiative that the City will get behind
- Michael Martucci: We are trying to provide skills as soon as possible but we are focused on getting practical skills and experience
- Question: Could we set up an internship program as well to get to know the students and for them to get familiar with their potential work?
 - A: Currently there is a program for a 12-week paid internship with *CareerSource Central Florida*
 - CareerSource picks up insurance and liability
 - There is also a 6-month on-the-job training (OJT) program
 - transfer employment of employee, but you only pay 50% of the cost
 - Are these internships only available to students in Orange Technical College?
 - Michael: Yes, they are written specifically for organizations
 - Comment: We would like interns to work during the day, but this is also when the program is happening, this is a conflict
 - This could be alleviated through evening classes

IV. FDOT D5 10-YEAR TSM&O REQUEST LIST (CFMPOA PRESENTATION – UPDATE)

David Williams provided a brief update on the District's 10-year TSM&O Request List.

- Identified ICMS Diversion routes, opportunity to coordinate traffic from mainline to arterials during significant non-recurring events (e.g., crashes block multiple lanes, hazardous material incidents)
- Presented slides that Jeremy is expected to show to the Central Florida MPO Alliance (See slides for more detail)
 - Introduction to Managing Transportation
 - Access to new data all the time is setting up a new transportation paradigm, with growing emphasis on performance measurement
 - Intro to TSM&O – continued need for O&M investment instead of large capital projects
 - Examples of TSM&O strategies deployed
 - Highlight current ICMS-system specific to Central Florida
 - ICMS Benefit Cost Ratio (from ICMS)
 - 10-Year ICMS Request List
 - Potential diversion routes
 - Cost estimates and FDOT contributions
 - Determined FDOT contributions for similar MPO operations projects
 - Google Earth view of proposed diversion routes
- Comment: Dr. Aty discussed being able to predict crashes - is FDOT working on this?
 - Tushar: We are having universities research this and once we have better tools to work with, we will work towards action
- Comment: Apart from predicting crashes, how can we best-monitor crashes? Are there improvements for TMCs?
 - We did identify operations costs, which is included in the 10-year request list – we will discuss this question with Jeremy
- Q: Can we get the Google Earth kmz Distributed?
 - A: Yes absolutely, this data should be used to build support and get everyone behind this effort
- Comment from Eric Hill: The purpose is to take this information back to our directors, so they are prepared, and to win the support of MPO directors for these action items

V. FTA's STRATEGIC TRANSIT AUTOMATION RESEARCH (STAR) PLAN¹

David Williams gave an overview of FTA's recently released Strategic Transit Automation Research (STAR) plan, which gives the first federal guidance on AV technology and transit.

- FTA recently released a five-year roadmap related to automation and transit. There was a demand for federal guidance from transportation/transit agencies across the country
- Wanted to enable local research by improving guidance
- Two primary components of the STAR Plan: Enabling research and integrated demonstration
- Research gaps identified
 - Safety & Security
 - Operations and Economics
 - Passenger Experience
 - Policy Research

¹ <https://www.transit.dot.gov/research-innovation/strategic-transit-automation-research-plan>

- Risks and barriers identified
- Preliminary Findings – Bus Operator Actions
 - Which tasks do bus drivers perform now, and how does current automated technology account for these actions? It was determined that certain actions can be performed by existing technology, while other actions will require advancements in technology
 - Basic cleanliness of the interior is an often overlooked, but common task performed by bus drivers that would be difficult for an automated bus to accomplish currently
 - [For a comprehensive list of actions performed, see the attached presentation slides]
- The FTA STAR Plan focuses on five main technology packages
 - Advanced Driver Assistance Systems (ADAS) (SAE L1-2)²
 - Automated Shuttles (slower speed, smaller vehicles) (SAE L4)
 - Maintenance, Yard, and Parking Operations (SAE L4)
 - Mobility-on-Demand Service (SAE L5)
 - First mile last mile
 - ADA Paratransit
 - On-Demand Shared Ride
 - Automated Bus Rapid Transit (SAE L4)
- Research efforts to bookend pilot projects
 - The purpose of the various research efforts is to improve the effectiveness of the integrated demonstrations and glean from them as much information as possible
- Federal Fiscal Year 2018
 - Enabling Research
 - Automation **Policy** Review
 - Transit Applications of **Light/Commercial Vehicle** Automation Technology
 - **Market Analysis** for Automated Transit Buses and Supporting Systems
 - Transit Automation **User Acceptance** Study and **Human Factors** Research
 - **Hazard & Safety Analysis** of AV Transit Bus Applications
 - Integrated Demonstration
 - **Test Facility Requirements** for Automated Transit Vehicles
 - **Evaluation Guidance** for Integrated Demonstrations
 - Transit Automation **Consortium Solicitation**
 - Integrated Demonstration 1: **Automated ADAS** for Transit Buses
- Federal Fiscal Year 2019
 - Enabling Research
 - *Transit Automation **User Acceptance** Study and **Human Factors** Research*
 - ***Hazard & Safety Analysis** of AV Transit Bus Applications*
 - Automated Transit **Labor Impacts** Assessment
 - **Automation Policy** Implementation
 - **Business Case** for Transit Automation
 - Integrated Demonstration
 - *Integrated Demonstration 1: **Automated ADAS** for Transit Buses*
 - Integrated Demonstration 2: **Automated Shuttles**
- Federal Fiscal Year 2020
 - Enabling Research

²Society of Automotive Engineers' Levels of Automation.

<https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety>

- **Automation Policy Implementation**
 - **Accessibility Analysis**
 - Integrated Demonstration
 - *Integrated Demonstration 1: **Automated ADAS** for Transit Buses*
 - *Integrated Demonstration 2: **Automated Shuttles***
 - **Integrated Demonstration 3: Automation for Maintenance and Yard Ops**
- Federal Fiscal Year 2021
 - Enabling Research
 - Automated Transit **Labor Impacts** Evaluation
 - **Finance Options** for Automated Transit Investments
 - Stakeholder Guidance Updates
 - Standards Assessment and Coordination
 - Integrated Demonstration
 - *Integrated Demonstration 3: **Automation for Maintenance and Yard Ops***
 - **Integrated Demonstration 4a: Automated ADA Paratransit**
 - **Integrated Demonstration 4b: Automated First-Mile / Last-Mile**
 - **Integrated Demonstration 4c: On-Demand Shared Ride**
- Federal Fiscal Year 2022
 - Enabling Research
 - *Automated Transit **Labor Impacts** Evaluation*
 - **Security & Customer Acceptance** Implications of Automated Buses
 - **Transition Costs & Planning** for Automated Transit Bus Deployment
 - Impact on **Service Patterns and Users**
 - Stakeholder Guidance Updates
 - Integrated Demonstration
 - *Integrated Demonstration 4a: **Automated ADA Paratransit***
 - *Integrated Demonstration 4b: **Automated First-Mile / Last-Mile***
 - *Integrated Demonstration 4c: **On-Demand Shared Ride***
 - **Integrated Demonstration 5: Automated Bus Rapid Transit**
- There are other tangential activities, including the Valley Metro Automation Pilot in Phoenix, AZ
- FTA Preliminary Findings when developing STAR Plan
 - Primary benefits identified include:
 - Mitigate crash risk for buses
 - Reduce first-/last-mile costs
 - Eliminate driver biases / discrimination
 - Expand reach of transit to underserved areas
 - Benefit-Cost Analysis conducted on implementations within the five main technology packages to determine theoretical viability of projects
 - Found that ADAS implementation had immediate cost savings given current costs
 - Determined fully-autonomous transit had the potential for substantial costs savings, **but only if there was no attendant on-board**
 - Automated BRT (without attendant) had the highest benefit-cost ratio (41:1)
- Comment: There is also concern over how automated transit can comply with ADA requirements
 - Also, shared-use vehicles will have cleanliness issues, how will we solve this problem? What are the subtleties of bus operator tasks that machines can't solve?

VI. BUILDING MOMENTUM FOR AV

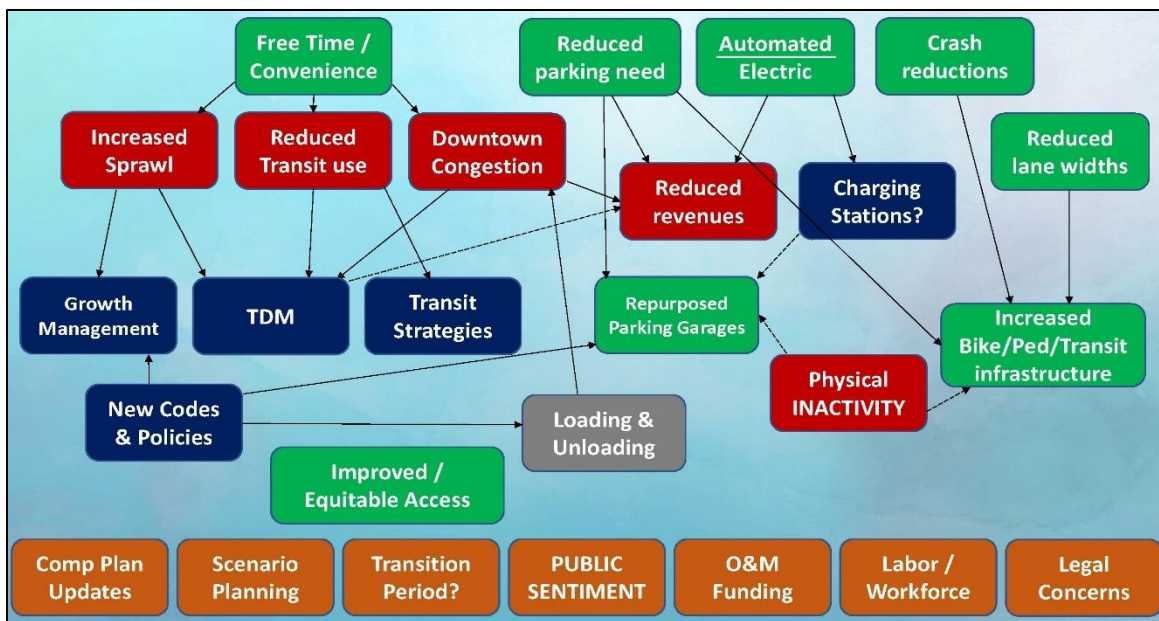
David Williams provided an overview of how local agencies can begin to prepare for Connected and Autonomous Vehicles (CAV) technology by investing in transit.

- Investing in AV seems like a daunting task, but investments in transit and transit-oriented policies can be an intermediary step. Through research, we identified certain types of investments and policies that could benefit cities today, but also prepare them for the new kinds of demands CAV will put on roadways.
- Land Use Related Investments
 - Passenger loading and unloading zones – curb demand
 - Freight loading and unloading zones
 - Transit-Oriented Development
 - Electric Charging Stations
 - Multimodal Superstops
 - Emphasis on public lands and parks
- Infrastructure
 - Transit signal priority (TSP) and similar CV applications
 - Investments in bike and pedestrian infrastructure
 - Shelters and amenities
 - Investments in communications infrastructure
 - Mid-block crossing and refuge islands
 - Investments in Bike/Ped safety systems
- Data Management
 - Collecting, storing, managing, and securing data
 - Investments in transit traveler information
 - Framework for on-demand transit and route optimization
- Roadway Design
 - BRT and other strategies may operate on separate ROW – this can eventually be shared with AV
 - Curb Design
 - Lane Width
 - Complete Streets near heavy bike/pedestrian movements
- Policy
 - Public Private Partnerships (P3)
 - Incentivizing electric vehicles
 - *Curb priority*, pricing, and timing
 - Public outreach campaigns
 - Revisiting developer obligations
 - Travel Demand Management strategies
 - Congestion pricing, encouraging alternative modes of transportation, etc.
 - Reinforce and invest in heavy ridership routes
 - Regional Payment system
 - Time of Day management
- Comment: Even with exclusive bus routes there are still crossings and right now bikes are demanding to use bike lanes
- Steven Bostel: What are the proposed timelines for the progression of technology, because Space Coast TPO is about to work on their 2045 long range plan and we are curious about what should be included policy-wise

- Tushar: We should be looking at existing land use requirements in different agencies and which are restrictive once AV exists – what intermediate needs can apply to more long-term needs for AV
- Question: As we are trying to implement this technology, is the legislation keeping up?
 - Answer: Florida is one of the more progressive states; federally, there is a lot of current research so guidance will be getting better all the time
 - Current legislation in Florida (HB 7027, 2016, altered several Florida Statutes) allows for the testing of fully autonomous vehicles, given the owner has a valid driver’s license and the required level of insurance and liability
- Eric Hill: We are looking at VMT tax revenue source, but there has been pushback from the public. We think it will be the best way to tax eventually.
 - The I-95 corridor is currently doing research on this – what would be a good equivalent VMT model? Oregon and Washington are using this model already.
 - On-board unit (OBU) or app is best for measuring, paired with self-reporting
 - Overall, we need to take advantage of emerging issues in transportation
- Alyssa Torres: Regarding repurposing parking spaces into public use or public parks, from a local government standpoint, I think there are real operational and funding challenges for dispersed sites; may want to look at public private partnerships for these spaces.
 - Also, it is more likely that governments will not want to add a curb control responsibility for drop-offs, how can we best address this need, and should it be controlled?
 - We also should remember that suburban context is different from urban contexts

VII. PREPARING FOR AN AV FUTURE

David Williams discussed opportunities, challenges, and solutions when considering the autonomous vehicle. In the figure shown below, those items in **green** represent positive impacts, while those in **red** represent negative impacts. Items in **gray** represent those concepts that have both positive and negative impacts associated with them. Items in **blue** are potential solutions and support, while items in **orange** are additional considerations. After discussing a variety of things to be considered by practitioners, David opened the discussion for a potential autonomous vehicle workshop.



- The map (shown above) was presented to give stakeholders a better understanding of all the different considerations, relationships, and cause & effect spurred on by Autonomous Vehicles
 - AV will turn drivers into passengers, giving them more “free time.” If they don’t need to be engaged during their drive, they will be more accepting of longer commutes, with increased potential for sprawl
 - Growth management strategies will need to address the potential issue of sprawl
 - More vehicle miles traveled (VMT) and loading/unloading may cause more congestion in (sub)urban areas
 - Travel Demand Management strategies, such as congestion pricing and alternative transportation incentivization, will be needed to counteract this
 - Loading and unloading locations for freight and for passengers will require additional land use planning and zoning to protect mainline traffic from stop-and-go activities like dropping off passengers
 - Increased rideshare and AV usage may result in reduced parking needs, which could lead to repurposing parking garages, possibly into electric charging stations
 - Comment: this is assumed to be the responsibility of the local agency, but this will require significant investments and funding; potential P3 opportunity?
 - AV will reduce crashes, but may cause more inactivity, leading to public health problems
 - Without the need for street parking, we could add bike/ped infrastructure which could address these public health concerns
 - Again, issue of funding
 - Comprehensive plans will need to stay up to date with technologies, and may need to be updated more frequently
 - Scenario planning for different levels of AV market penetration may be useful for keeping agencies and communities flexible as AV comes online
 - Focus on O&M Funding will be important to keep traffic operations flowing smoothly
 - Legal/liability issues will need to be considered moving forward
- David shared some recent quotes from transportation practitioners that suggested AV technology will change many aspects of modern life
- If we hold a Central Florida AV Workshop/Summit, who else would need to be involved?
 - Answers included:
 - City Managers
 - Legal
 - Data managers
 - Land use planners
 - Transportation planners
 - Should also include students, professors and policymakers?

VIII. CURRENT INITIATIVES

Representatives from different agencies provided updates on their agency’s efforts and projects.

- Eric Hill, MetroPlan Orlando
 - Working on traffic signal retiming- this has been going well
 - Before & After study each year; MetroPlan Orlando is retiming for local municipalities
 - use separate consultant for Before & After assessment and the vendors for retiming

- After 1st year, sat down with local municipalities and there were no huge issues – so into 2nd year
 - FHWA – integrating reliability and transportation system management and organizing an expert panel. Eric is one of 2 MPO staff; mostly state DOT staff represented
 - Mainstreaming TSMO panel with FHWA – completed Capability Maturity Model.
 - Overall, FHWA has found that there has not been a lot of movement nationwide. They are thinking about how MPOs can be pushed to move forward.
 - AV/CV
 - Last month, Eric started briefing MetroPlan Orlando Board
 - The goal of MPO is to keep stakeholders informed and educated – improved safety on our roadways;
 - AV will be integral in working towards Vision Zero (i.e., zero roadway fatalities). Discussion of prepared presentation:
 - Presentation focuses on subtleties of AV/CV and how we are slowly transitioning
 - Discussion of state legislation and what is happening at the federal level
 - House has passed legislation
 - Senate is working on it but has not moved forward, most likely because freight is left out of bill as it is written
 - US DOT policy guidance- USDOT's *Automated Driving Systems 3.0* to be released in 2018
 - Due diligence on how to integrate AV/CV
 - Developing framework for MPOs to integrate into L RTPs
 - Presentation ends with spaghetti graph that shows how quickly this technology will have an impact
 - MetroPlan Orlando TSM&O Committee recently held a discussion on Connected Vehicle-readiness in the region during the committee meeting
 - Focused on cybersecurity
- Hazem El-Assar, Orange County
 - Currently working on replacing controllers – approved recently and will allow us to access ATSPM data – procurement has been harder
 - ATMS phase 4 will be awarded in next month or so
 - School zone time clock replacement
 - 320 replaced throughout Orange County by Temple AI which will allow for 2-way communication
- Stephen Bostel, Space Coast TPO
 - Working on updating existing system
 - City of Palm Bay applying for fiber and other technologies; SCTPO supporting application development
 - Local working group to be established and get together to talk about local issues
 - Working closely with Jeremy to take advantage of any excess TPO funding that becomes available – looking to make a list of priority projects that are ready for this funding
 - New TMC in design phase, advertising in September
 - May move SCTPO staff into this office to be more integrated with data collection
 - Working on LRTP update and researching how to incorporate TSM&O
 - As early as PD&E phase possibly

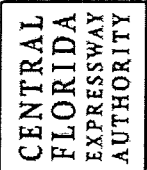
- ITS Master Plan Update – update to ITS Master Plan will start in 2019 and will not be called an ITS Master Plan, but a *TSM&O Master Plan*
- Participated in a conference call with Blynscy, an alternative to Blue Toad
 - Higher match rate on the corridors and is all open source.
 - If we purchase some units, others could as well to have access to the data and be interoperable with our system
- Bryan Homayouni: Good match rate and in the process of a rough draft comparison analysis
 - This will be sent to David to be sent to everyone
- Benton Bonney, City of Orlando
 - After building out fiber plan, we realized we don't have a clear understanding of fiber locations;
 - Updating GIS with fiber locations
 - Focused on just location now, but will identify fiber county later so we can communicate permitting issues better
 - Added maintenance responsibilities from PedSafe installations are a concern for us
- **NEXT MEETING – July 26, 2018 at Orange Technical College – Mid Florida Campus (details to follow)**

IX. ATTACHMENTS

- A – Sign in sheets
- B – Presentation Slides
- C – Meeting agenda

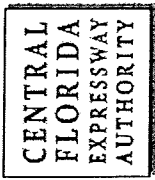
END OF SUMMARY

This summary was prepared by Jordan Crandall and David Williams, and is provided as a summary (not verbatim) for use by the Consortium Members. The comments do not reflect FDOT's concurrence. Please review and send comments via e-mail to dwilliams@vhb.com so they can be finalized for the files.



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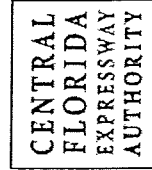
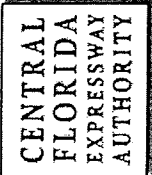
MAY 2018



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5.31.2018	Brian Stanger	FDOT	E. Potter	9:50	11:53	2
5.31.2018	hoxi Sellers	FDOT / HANSON	E. Potter	9:55		15
5.31.2018	Heather Grubert	FDOT	E. Potter	9:55	11:53	1
5.31.2018	Mary McGehee	FDOT	E. Potter	9:55		22
5.31.2018	Christy Lofe	Orange Co.	E. Potter	9:56	11:07	11
5.31.2018	Doug Jamison	LYNX	E. Potter	9:56	11:39	30
5.31.2018	MIKE MARTEL	OCS	E. Potter	9:56	10:29	3
5.31.2018	H. Walker	FTE	E. Potter	10:03		10
5.31.2018	C. Gumm	BCTO	E. Potter	10:05	11:22	46
5.31.2018	R. ATAMAN	BCTO	E. Potter	10:05	11:39	24

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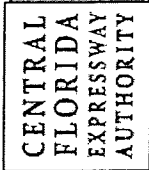
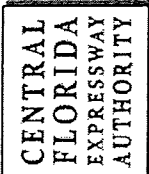
MAY 2018



5.31.2018	Visitor Name	Company Name	Person Authorizing Access	ARRIVAL TIME	DEPARTURE TIME	Visitor Badge Number
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5.31.2018	JOE DAVIS	VHB	E. Potter	9:00	11:53	7
5.31.2018	Jordan Grandall	VHB	E. Potter	9:00	11:47	21
5.31.2018	TUSHAR PATIL	FDOT	E. Potter	9:21		8
5.31.2018	Melissa Gross	InNovo	E. Potter	9:25	10:48	29
5.31.2018	Scott Arnold	City of Melbourne	E. Potter	9:35	11:23	12
5.31.2018	James Globby	State LA	E. Potter	9:37	11:47	30
5.31.2018	Noel O'Hara	Seminole County	E. Potter	9:45	11:56	25
5.31.2018	BRIAN AULT	LSMPO	E. Potter	9:44	11:53	17
5.31.2018	Jay Williams	FOOT	E. Potter	9:57		28

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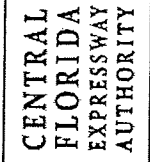
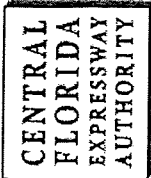
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5.31.2018	Alison Steth	FDOT	E. Potter	9:54	12:00	8
5.31.2018	Artem Et-Aszar	Orapco	E. Potter	9:55	11:50	16
5.31.2018	Francis Franco	CSMPO	E. Potter	9:58	12:00	6
5.31.2018	Amy Dunham	WSP	E. Potter	10:02		14
5.31.2018	Conroy Jacobs	City of Palm Bay	E. Potter	10:15	12:00 pm	26
5.31.2018	Sean Castle/b	Volusia County FL	E. Potter	10:20	12:00	19
5.31.2018	Bobby Madhox	Volusia County FL	E. Potter	10:20	12:00	11
5.31.2018			E. Potter			
5.31.2018			E. Potter			

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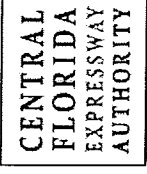
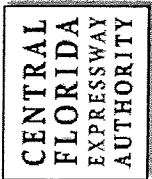
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5.31.2018	CLAUDIA PASIAUSKAS	INNOVIO PARTNERS	E. Potter	9:07	10:48	136
5.31.2018	Lindsey Giovinazzo	Osceola County	E. Potter	9:30		25
5.31.2018	Kerry Sobel	Lake County	E. Potter	9:37	11:51	17
5.31.2018	Humberto Cashiers	Orange County	E. Potter	9:43		26
5.31.2018	Jeremy Upchurch	FAOT - D5	E. Potter	9:46	11:53	49
5.31.2018	Sheryl Paradley	FAOT / HNRB	E. Potter	9:49		18
5.31.2018	Steven Bostel	SCFPO	E. Potter	9:50	11:47	22
5.31.2018	AUSA TORRES	ORANGE COUNTY	E. Potter	9:51	11:39	5
5.31.2018	John Zielinski	FAOT	E. Potter	9:51	11:53	27
5.31.2018	Benton Bonney	Orlando	E. Potter	09:56		14

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Welcome to the TSM&O Consortium Meeting May 31, 2018



Meeting Agenda

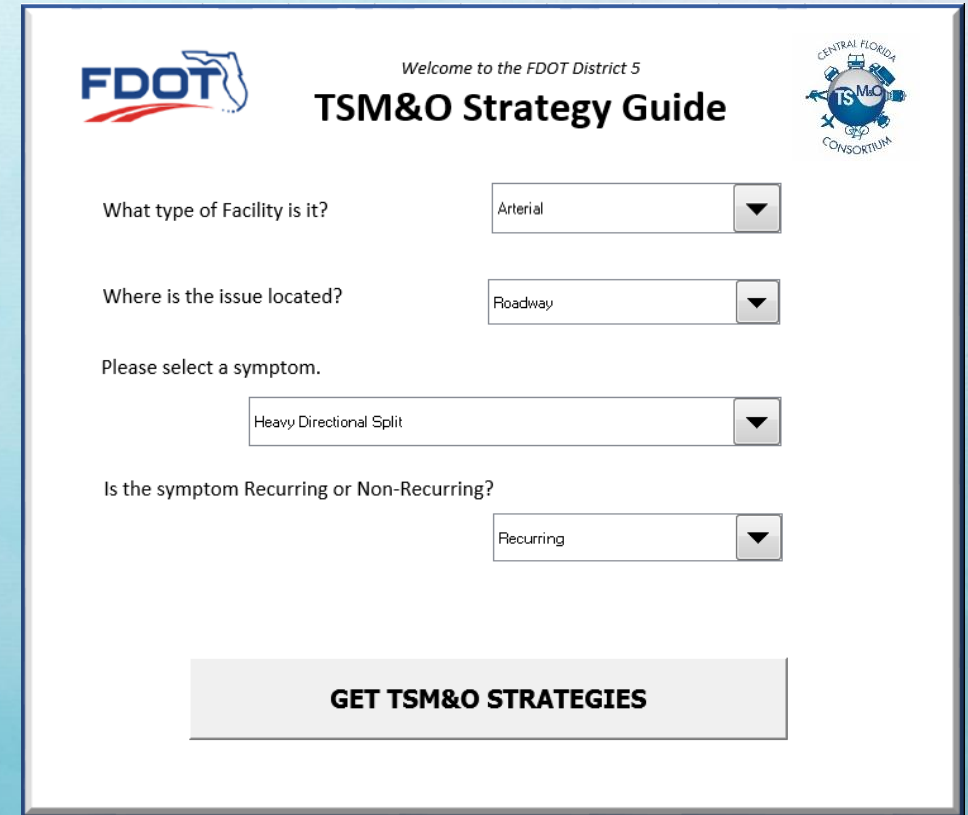
1. Introduction
2. TSM&O Strategy Guide – Update
3. Signal Technician Program – Update
4. FDOT D5 TSM&O Request List 2019-2028 (CFMPOA) – Update
5. FTA Strategic Transit Automation Research Plan
6. Building Momentum for Autonomous Vehicles
7. Preparing for the Automated Future
8. Current Initiatives

TSM&O Strategy Guide

David Williams, VHB

TSM&O Strategy Guide

- Met with FDOT District Five leadership
- Integrating into planning process
- Final review



The screenshot shows a web application interface for the TSM&O Strategy Guide. At the top left is the FDOT logo. To its right, it says "Welcome to the FDOT District 5" and "TSM&O Strategy Guide". On the top right is the Central Florida TSM&O Consortium logo. The main content area contains four dropdown menus:

- "What type of Facility is it?" with "Arterial" selected.
- "Where is the issue located?" with "Roadway" selected.
- "Please select a symptom." with "Heavy Directional Split" selected.
- "Is the symptom Recurring or Non-Recurring?" with "Recurring" selected.

At the bottom of the form is a large button labeled "GET TSM&O STRATEGIES".

Questions?

Signal Technicians Program at Orange Technical College – Update

David Williams, VHB

Orange Technical College – Mid Florida Campus

- It takes 14 students to pay for an instructor
- 500 dual-enrolled H.S. students at Mid Florida Campus
- Mid Florida Campus facilities will be updated/replaced in 2020
- 106 Full-time faculty; 35 Part-time faculty
- Diverse student pop. (2017/18): **41%** - Hispanic; **34%** - Black; **17%** - White
- Students get practical experience with real-world equipment



Signal Technician Program

- Meeting held at Mid Florida Campus
 - Assistant Director Michael Martucci
 - Instructor Steve Bowman (Electronic Technology)
 - Instructor TJ Thoss (Cybersecurity)
- Goal: Combine 3 programs to create a **signal technician program**
 - Electronic Technology
 - Enterprise Network / Server Support
 - Basic Electricity



Signal Technician Program

- Orange Technical College needs support from the region:
 - 1) Condense current curricula between three programs into a single program that meets the minimum specifications of the local industry
 - 2) Letters of support from individual agencies
 - 3) Commitment of resources

Signal Technician Program

- 1) Condense current curricula between three programs into a single program that meets the minimum specifications of the local industry
 - Certifications for electronic equipment and electricity?
 - Certifications for networking/server support?
 - Baseline skillsets needed?

Signal Technician Program

2) Letters of support from individual agencies in the region

- Indication of job placement opportunities / interviews
- Indication of need for signal technician program (labor shortfall)
- Advisory support

Signal Technician Program

3) Commitment of Resources

- Equipment
- Time on advisory committee
- Time for site visits, tours, outreach, etc.

Signal Technician Program

- Long-term goals
 - Develop and streamline a traffic signal technician program for the Central Florida region
 - Conduct outreach with local high schools
- Short-term goals
 - Evening classes
 - Standalone coursework / training for existing staff
 - **Tour of the campus (July 26 Consortium?)**

Questions?

FDOT D5 TSM&O Request List 2019-2028 (CFMPOA Presentation Update)

David Williams, VHB

Transportation Systems Management & Operations (TSM&O)

Integrated Corridor Management Systems (ICMS)

Jeremy Dilmore, FDOT District Five TSM&O Engineer
July 13, 2018

Photo: © Shutterstock.com/iofoto (6234271)

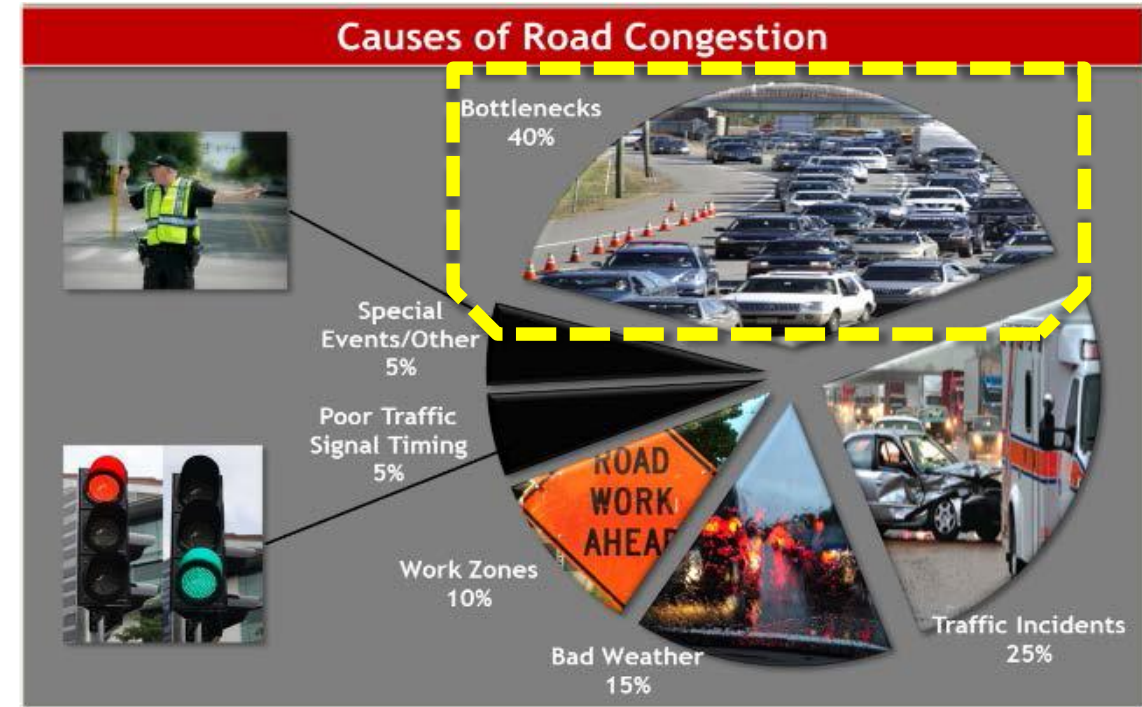


Traditional Approach to Managing Transportation

1. Predict future **traffic volumes**
2. Then **fund expensive major capital projects** to provide additional capacity

But this....

- Only addresses **40%** of the congestion problem
- Can be difficult to implement due to **physical/financial constraints**



(Source: FHWA)

The Transportation Environment is Changing – **A New Paradigm**

- Increased opportunities with **information** and **technology**
- Emergence of **Connected / Automated Vehicles**
- Emergence of **Rideshare / Ride-hailing**
- Growing emphasis on **performance measurement**
- Increasing **financial / physical constraints**



The Opportunity

Transportation Systems Management and Operations (TSM&O) strategies keep traffic moving by:

- **Maximizing** existing roadway capacity
- **Minimizing** impact of unexpected events
- **Improving** safety for all users
- **Improving** reliability

Different Cost Model:

Continued O&M investment instead of large capital improvements



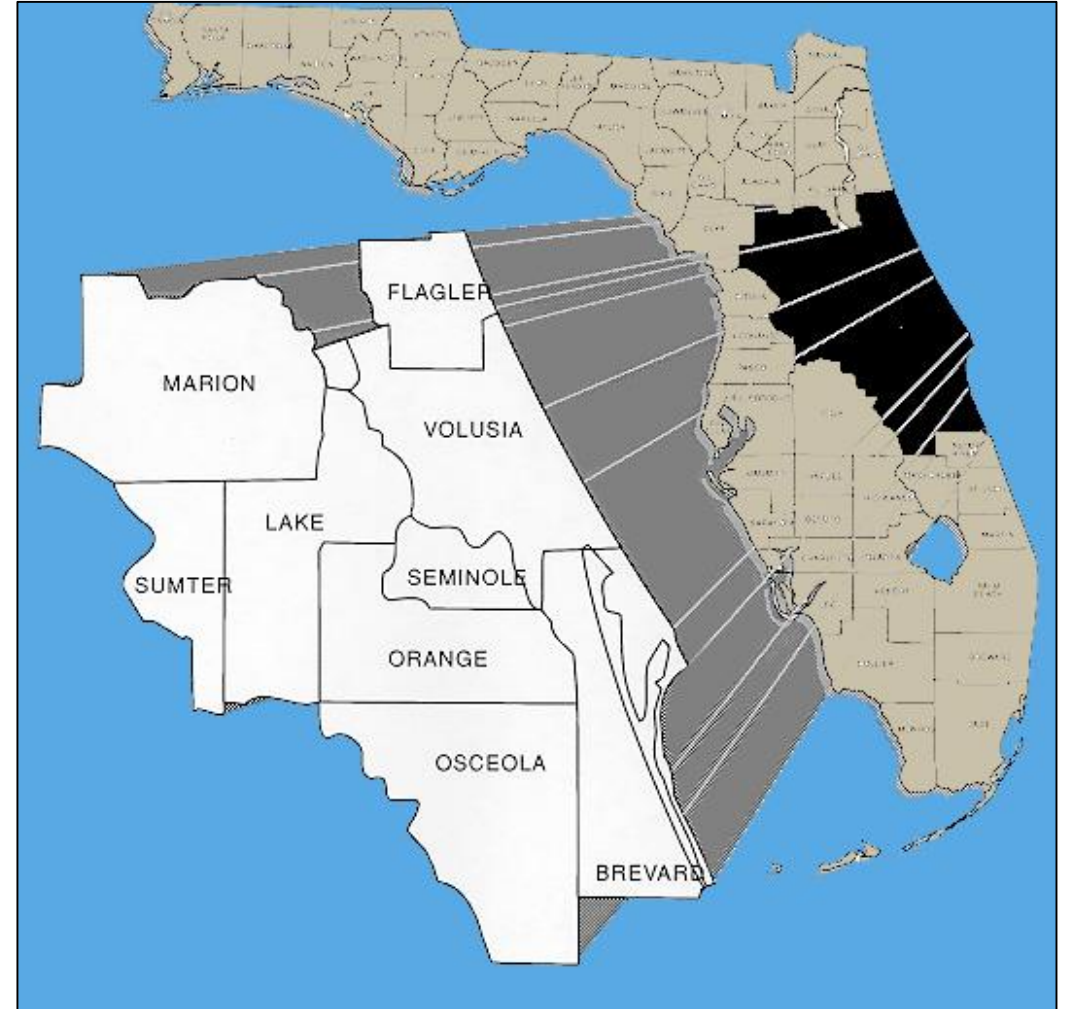
Photo: © Kevin Lee, Kittelson & Associates, Baltimore, MD

What is TSM&O?

Regional integration is a central component

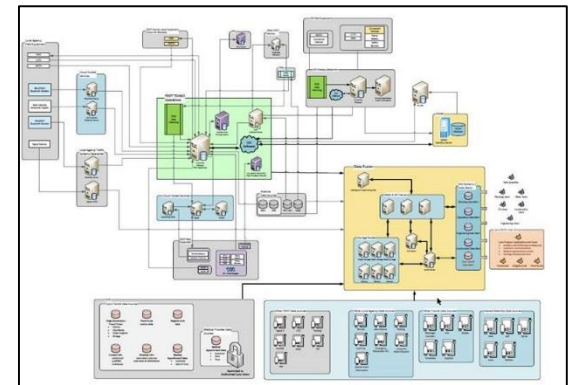
All strategies require **inter-agency collaboration**, including:

- Signal Timing
- Incident Response
- Security



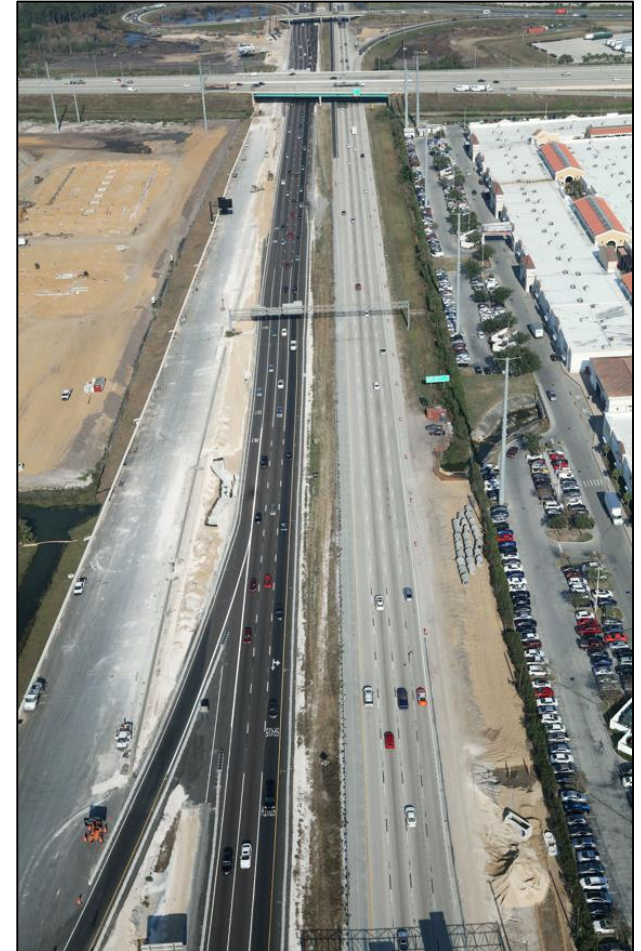
TSM&O Examples in Central Florida

- Automated Traffic Signal Performance Measures (ATSPM)
- **Integrated Corridor Management System (ICMS)**
- Software platforms, Big Data, and Data Management
- Coordination with UCF
- Signal Technician Training with Orange Technical College
- Standardizing practices
- Working with LYNX to develop a Technology Master Plan



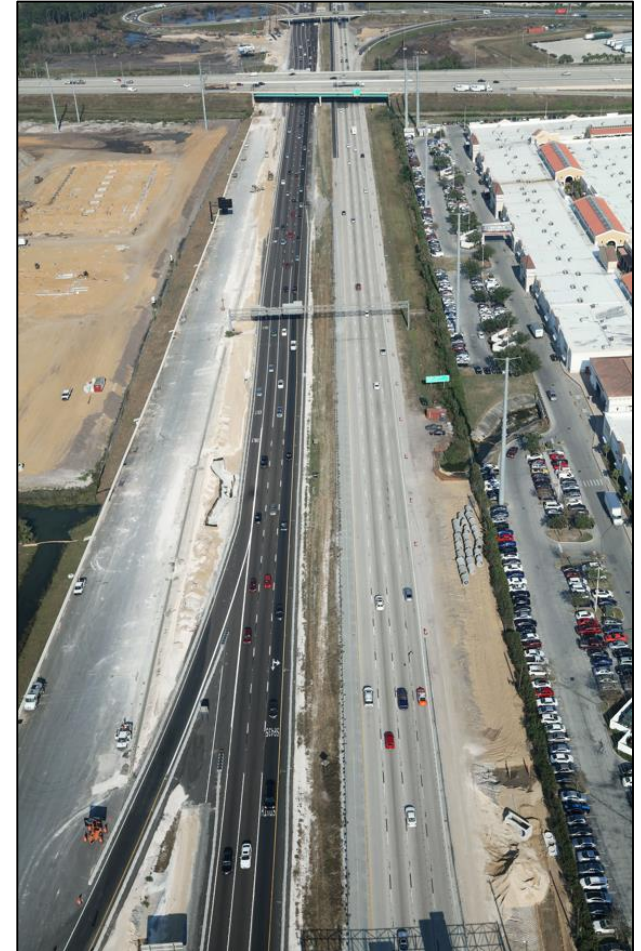
Integrated Corridor Management System in Central Florida

- Freeway and Arterial personnel **in close coordination**
- Freeway and Arterial data used to make operational decisions for the benefit of system mobility **as a whole**
- ICMS includes a **variety of strategies**
 - Active Traffic Management (ATM)
 - Traveler Information
 - Incident Management
 - Emergency Management
 - Information/Data Management



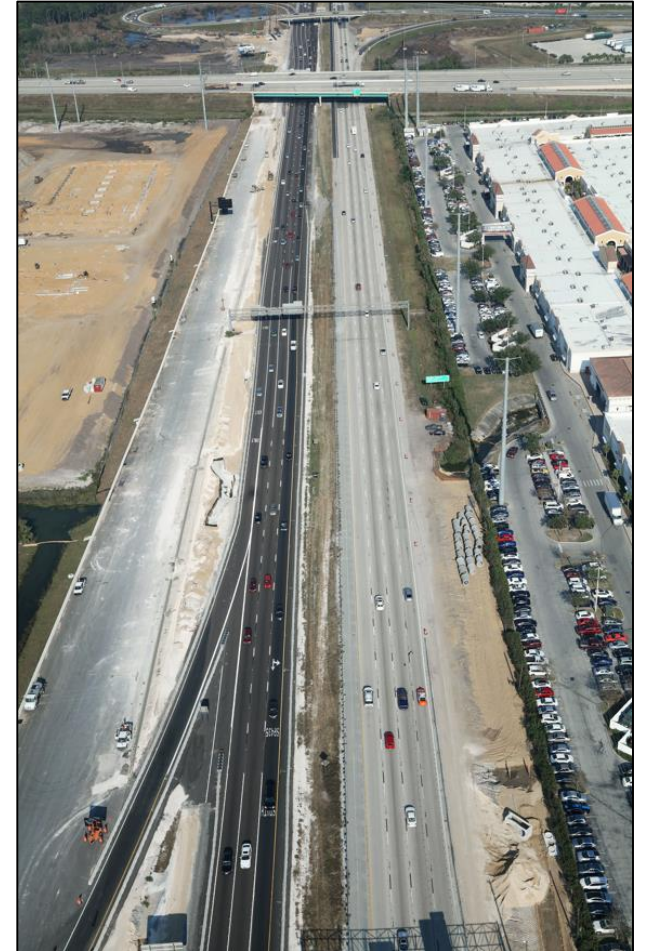
Integrated Corridor Management System Benefits

- Focus on the **whole** transportation network
- Additional operational data and control
- Allows transportation practitioners to get the most out of each corridor's available capacity through
 - Alternate arterial routes,
 - Alternate modes of transportation,
 - Data Management,
 - Traveler Information, and
 - Intelligent infrastructure.



Integrated Corridor Management System Benefit-Cost Analysis

**Update with BCR for ICMS
(from TOPS-BC if available)**



ICMS Diversion Routes Ten-Year Request List

District Five:

- Identified **potential diversion routes** that could provide support to Interstates/Expressways (e.g., I-4, I-75, I-95, SR 408, SR 417, SR 429, SR 528)
- Determined **cost estimates and FDOT contributions** for upgrading proposed diversion routes to **ICMS-ready corridors**
- Determined FDOT contributions for **similar M/TPO operations projects** (e.g., ATMS, Adaptive Signal)

Breakdown of cost estimates, by facility, can be found in meeting packet

Integrated Corridor Management System Benefit-Cost Analysis

**Jump to Google Earth view of
proposed diversion routes**

ICMS Diversion Routes Ten-Year Request List

Proposed ICMS Diversion Routes

Fiscal Year-by-Year Planning Breakdown					
FY	Implementation		Operation		
	No. of Projects	FY Total Cost	No. of Corridors Added	Total No. of Corridors	FY Total Added Cost
2018	0	\$ -	0	0	\$ -
2019	1	\$ 625,169.41	0	0	\$ -
2020	3	\$ 5,149,472.91	0	0	\$ -
2021	2	\$ 4,491,677.02	1	1	\$ 300,000.00
2022	2	\$ 1,226,733.30	1	2	\$ 600,000.00
2023	6	\$ 10,158,815.30	0	2	\$ 600,000.00
2024	7	\$ 10,372,819.86	2	4	\$ 1,200,000.00
2025	8	\$ 12,840,062.04	2	6	\$ 1,800,000.00
2026	6	\$ 10,616,970.81	3	9	\$ 2,700,000.00
2027	5	\$ 8,328,000.58	2	11	\$ 3,300,000.00
2028	2	\$ 3,738,359.63	2	13	\$ 3,900,000.00
Total Program Cost		\$ 67,548,080.86		Total Operation Cost	\$ 14,400,000.00

ICMS Diversion Routes Ten-Year Request List

TPO Program Cost

Fiscal Year-by-Year Planning Breakdown				
FY	Implementation		Operation	
	No. of Projects	FY Total Cost	Projects in Operation	Total Operation Cost
2018	2	\$ 46,337.50	0	\$ -
2019	4	\$ 958,975.00	0	\$ -
2020	5	\$ 4,958,876.25	0	\$ -
2021	9	\$ 1,381,502.50	2	\$ 600,000.00
2022	8	\$ 2,821,080.00	3	\$ 900,000.00
2023	3	\$ 1,198,760.00	6	\$ 1,800,000.00
2024	3	\$ 5,185,589.33	8	\$ 2,400,000.00
2025	4	\$ 3,722,655.05	9	\$ 2,700,000.00
2026	3	\$ 4,125,000.00	11	\$ 3,300,000.00
2027	2	\$ 1,930,000.00	13	\$ 3,900,000.00
2028	1	\$ 1,115,000.00	14	\$ 4,200,000.00
Total Program Cost		\$ 27,443,775.63	Total Operation Cost	\$ 19,800,000.00

ICMS Diversion Routes Ten-Year Request List

- Seeking approval of the ICMS Diversion Routes Ten-Year Request List into the Strategic Regional Plan

Summary

For additional information, please contact:

Jeremy Dilmore, P.E.

FDOT District Five TSM&O Engineer

Jeremy.Dilmore@dot.state.fl.us

or visit

www.CFLSmartRoads.com

FTA's Strategic Transit Automation Research (STAR) Plan

David Williams, VHB

FTA's STAR Program

- Five-year program of research and *integrated demonstrations* (pilot projects)
- Two primary components:
 - Enabling Research
 - Integrated Demonstration



FTA's STAR Program – Research Gaps Identified

- Safety & Security
- Operations & Economics
- Passenger Experience
- Policy Research



FTA Preliminary Research - Findings

- Four categories of risk identified:

- Safety & Security
- Operations, Maintenance, and Cost-Effectiveness
- Passenger Experience
- Equity

Table B-1 Overview of Risks and Mitigations

Risks and Outcomes			Mitigation Strategies							
Category	Risk	Outcomes	Technology R&D	Safety Research	Workforce Research	Accessibility Research and Policy	Technology Policy Research	Infrastructure Research	Technical Assistance	Federal Guidance
Safety and Security	Software and hardware failures or limitations	<ul style="list-style-type: none"> • Diminishment of potential safety benefits • "False positives" create operational challenges 	X	X					X	X
	Human factors	<ul style="list-style-type: none"> • Overreliance and overestimation of capabilities • Operator skills atrophy • Other road users misjudge or overestimate capabilities and take greater risks 	X	X	X	X	X			X
	Security and cybersecurity considerations	<ul style="list-style-type: none"> • Potential increase in assaults and criminal activity • Transit vehicles "hacked" 	X	X			X		X	X
	Emergency response	<ul style="list-style-type: none"> • Emergency response and communications with responders impeded 	X	X		X			X	
	Quiet operations	<ul style="list-style-type: none"> • Reducing vehicle conspicuity for vulnerable road users 	X	X		X				

FTA Preliminary Research - Findings

- Barriers identified:
 - Product availability
 - Labor Relations & Human Resources
 - Financial Constraints
 - Risk-Aversion
 - Accessibility
 - Law, Regulation, Liability/Insurance
 - Institutional Capacity & Planning
 - Interagency Cooperation
 - Public Opposition

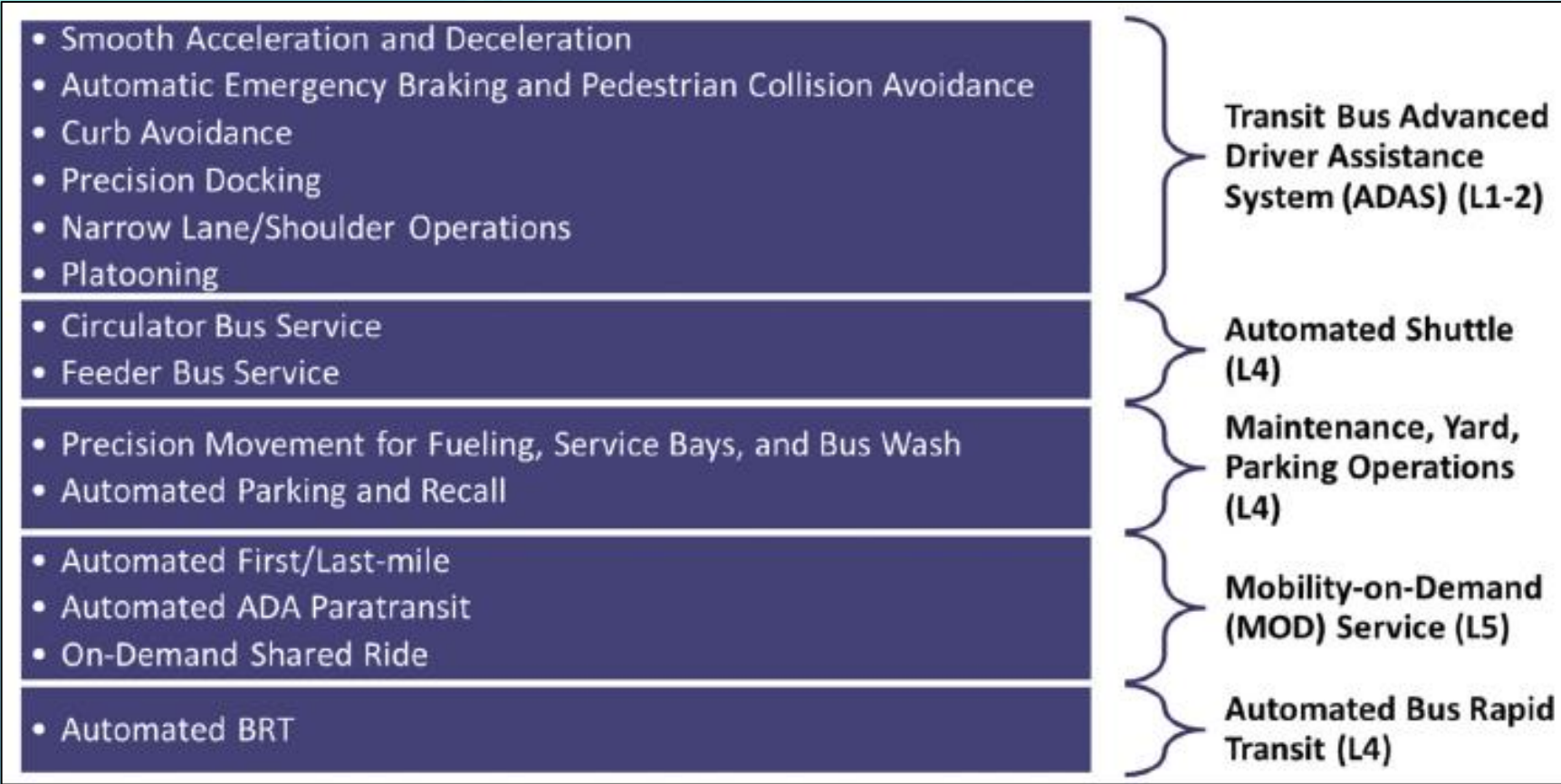
Table B-2 Overview of Barriers and Mitigations

Category	Barrier	Outcomes	Mitigation Strategies							
			Technology R&D	Safety Research	Workforce Research	Accessibility Research and Policy	Technology Policy Research	Infrastructure Research	Technical Assistance	Federal Guidance
Product Availability	Limited market size	<ul style="list-style-type: none"> • Limited potential for economies of scale • Fixed R&D costs spread across few units 	X							
	Complex operational requirements	<ul style="list-style-type: none"> • Frequent service stops in congested areas challenge sensing systems and control algorithms • Potential limitations in rain, in snow, or at night 	X	X						
	Certification	<ul style="list-style-type: none"> • Safety standards and testing protocols for automation have not yet been developed 	X	X			X			X
Labor Relations and Human Resources	Opposition from labor	<ul style="list-style-type: none"> • Automation may be viewed as reducing jobs or "de-skilling" vehicle operators 			X					
	Training and workforce needs	<ul style="list-style-type: none"> • Transit agencies may not be able to recruit and retain the necessary highly-skilled workers 			X					
Financial Constraints	Procurement	<ul style="list-style-type: none"> • Procurement processes to favor tried-and-true vehicle designs and industrywide standards • Lag between availability of technology and incorporation into RFP specifications 							X	X
	Buy America	<ul style="list-style-type: none"> • Automated transit vehicles may not meet content requirements 								X
Risk Aversion		<ul style="list-style-type: none"> • Transit agencies are generally conservative in adopting new technologies, services, and business models 	X	X					X	X

FTA Preliminary Research – Bus Operator Actions

- Pre-trip inspection
- Vehicle movement
- Communication w/users and potential users
- Fare payment & revenue collection
- Interacting with passengers
- Flagged Service or Deviated Route
- Support for mobility devices
- External roadway information
- Fueling, Servicing, Cleaning
- Agency/Passenger assistance during collision
- Mechanical failure detection while in service
- Blocked roadways, traffic light outages, construction, and other roadway issues
- Emergencies and events

FTA's STAR Plan



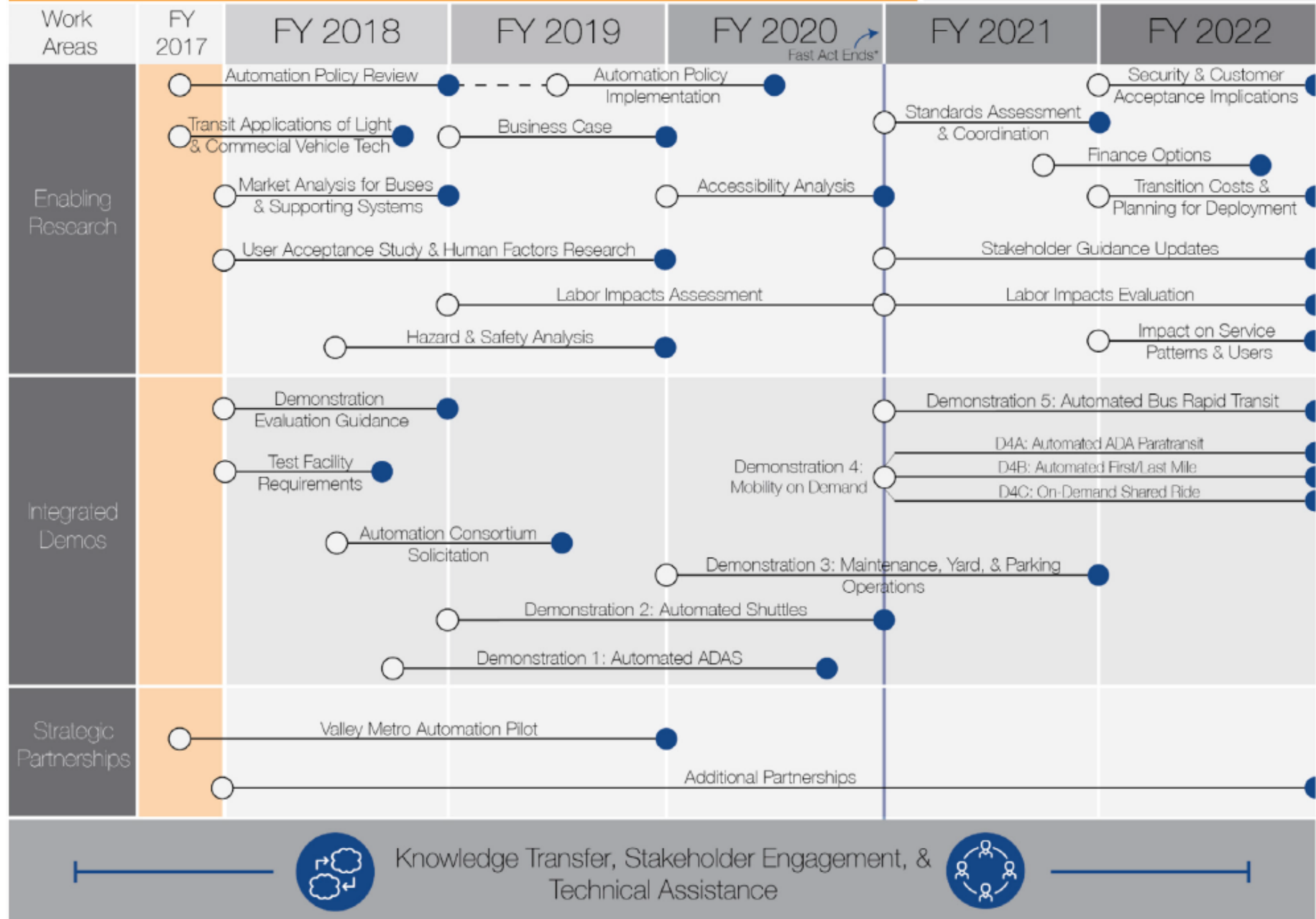
Summary of Technology Packages and Use Cases

Figure 1-1

Strategic Transit Automation Research Roadmap

Strategic Transit Automation Research Roadmap

Federal Transit Administration
U.S. Department of Transportation



FTA's STAR Plan – FFY 2018

Oct 1, 2017 – Sept 30, 2018

- Enabling Research
 - Automation **Policy** Review
 - Transit Applications of **Light/Commercial Vehicle** Automation Technology
 - **Market Analysis** for Automated Transit Buses and Supporting Systems
 - Transit Automation **User Acceptance** Study and **Human Factors** Research
 - **Hazard & Safety Analysis** of AV Transit Bus Applications
- Integrated Demonstration
 - **Test Facility Requirements** for Automated Transit Vehicles
 - **Evaluation Guidance** for Integrated Demonstrations
 - Transit Automation **Consortium Solicitation**
 - Integrated Demonstration 1: **Automated ADAS** for Transit Buses

FTA's STAR Plan – FFY 2019

Oct 1, 2018 – Sept 30, 2019

- Enabling Research
 - *Transit Automation **User Acceptance Study** and **Human Factors Research***
 - ***Hazard & Safety Analysis** of AV Transit Bus Applications*
 - Automated Transit **Labor Impacts** Assessment
 - **Automation Policy** Implementation
 - **Business Case** for Transit Automation
- Integrated Demonstration
 - *Integrated Demonstration 1: **Automated ADAS** for Transit Buses*
 - Integrated Demonstration 2: **Automated Shuttles**

FTA's STAR Plan – FFY 2020

Oct 1, 2019 – Sept 30, 2020

- Enabling Research
 - ***Automation Policy Implementation***
 - **Accessibility Analysis**
- Integrated Demonstration
 - ***Integrated Demonstration 1: Automated ADAS for Transit Buses***
 - ***Integrated Demonstration 2: Automated Shuttles***
 - **Integrated Demonstration 3: Automation for Maintenance and Yard Ops**

FTA's STAR Plan – FFY 2021

Oct 1, 2020 – Sept 30, 2021

- Enabling Research
 - Automated Transit **Labor Impacts** Evaluation
 - **Finance Options** for Automated Transit Investments
 - Stakeholder Guidance Updates
 - Standards Assessment and Coordination
- Integrated Demonstration
 - *Integrated Demonstration 3: **Automation for Maintenance and Yard Ops***
 - Integrated Demonstration 4a: **Automated ADA Paratransit**
 - Integrated Demonstration 4b: **Automated First-Mile / Last-Mile**
 - Integrated Demonstration 4c: **On-Demand Shared Ride**

FTA's STAR Plan – FFY 2022

Oct 1, 2021 – Sept 30, 2022

- Enabling Research

- *Automated Transit Labor Impacts Evaluation*
- **Security & Customer Acceptance** Implications of Automated Buses
- **Transition Costs & Planning** for Automated Transit Bus Deployment
- Impact on **Service Patterns and Users**
- Stakeholder Guidance Updates

- Integrated Demonstration

- *Integrated Demonstration 4a: Automated ADA Paratransit*
- *Integrated Demonstration 4b: Automated First-Mile / Last-Mile*
- *Integrated Demonstration 4c: On-Demand Shared Ride*
- Integrated Demonstration 5: **Automated Bus Rapid Transit**

FTA's STAR Plan – Other Activities

- Valley Metro Automation Pilot
 - Shared AV pilot in Phoenix, AZ
- Additional Partnerships as identified
 - Strategic Partnerships to supplement work
- Stakeholder Engagement
- Conferences
- Outreach Materials
- Technical Assistance



FTA Preliminary Research – Benefit-Cost Analysis

- Primary Benefits of Automation identified
 - Mitigate crash risk for buses
 - Reduce first- / last-mile costs
 - Eliminate driver bias / discrimination
 - Expand reach of transit to underserved areas

FTA Preliminary Research – Benefit-Cost Analysis

- ADAS capabilities showed favorable investment profiles at current cost levels
- Fully-driverless automated vehicles revealed potential for large cost savings, but only in scenarios without an on-board attendant
- Information on Automated Mobility-on-Demand services relating to cost, availability, and business model is still too speculative to produce a BCA

FTA Preliminary Research – Benefit-Cost

Technology Package	Implementation	Example Benefit-Cost Ratio
ADAS	Smooth Acceleration / Braking for Diesel Bus	6.1
ADAS	Automatic Emergency Braking and Pedestrian Collision Avoidance	3.1
ADAS	Narrow Lane / Shoulder Operation	17.2
Automated Shuttle	Unstaffed Automated Shuttle	4.9
Automated Maint. Yard	Precision Movement (scenario simplified due to lack of data)*	0.8
Automated Maint. Yard	Automated Parking & Recall*	1.9
Mobility-on-Demand	Automated Paratransit (5-year lifecycle)	1.7
Automated BRT	Automated BRT	40.8

*largely uses the same technology, so combining these implementations would add to the benefit

Questions?

<https://www.transit.dot.gov/automation-research>



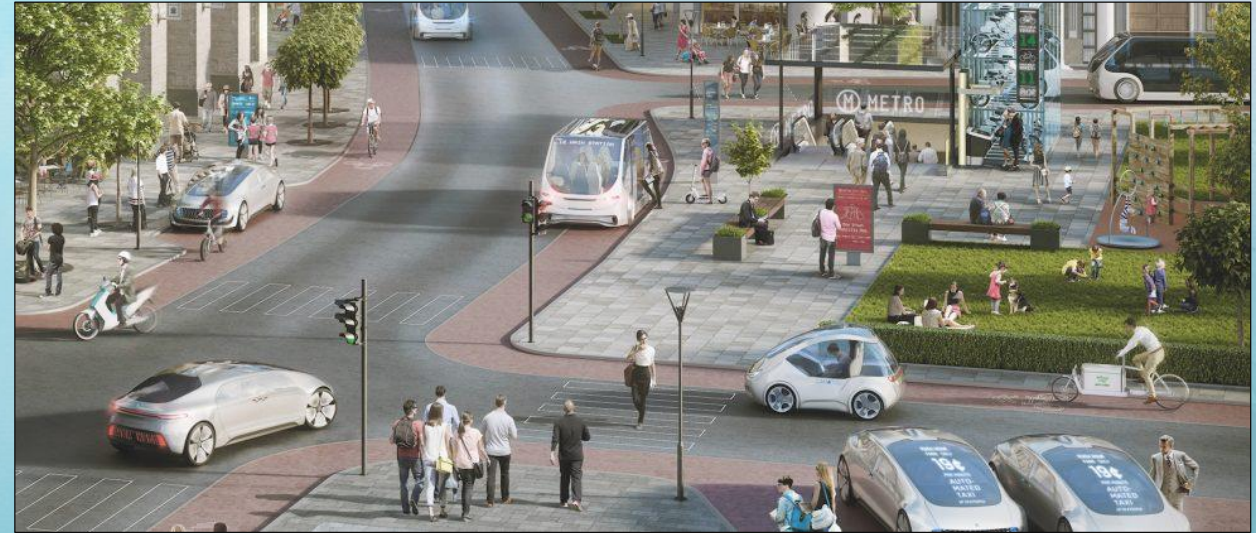
Building Momentum for Autonomous Vehicles

David Williams, VHB

Building Momentum for Autonomous Vehicles

- Preparing for Connected & Autonomous Vehicles can seem daunting to **local agencies with limited budgets**

- **Intermediate steps and improvement** toward CAV infrastructure / applications can ease the financial burden



SlashGear (April 4, 2017). Bosch and Daimler team to make fully autonomous vehicles for city driving.

- **Planning for Transit** and **Planning for CAV** require similar considerations, infrastructure, roadway design, and skillsets

Intersection of Transit and AV – Land Use

- Passenger loading / un-loading zones
- Freight loading / un-loading zones
- Transit-Oriented Developments



- Electric charging stations
- Multimodal Superstops
- Emphasis on public lands / parks

Intersection of Transit and AV – Infrastructure

- Transit Signal Priority (TSP) and similar CV applications
- Investments in **bike/ped infrastructure**
- Shelters and Amenities



- Investments in **communications infrastructure**
- Mid-block crossings / refuge islands
- Investments in **Bike/Ped safety systems**

Intersection of Transit and AV – Data Management

- Collecting, storing, and managing data
- Investments in **transit traveler information**



- Investments in **data storage, security, and management**
- Framework for **on-demand transit and route optimization**

Intersection of Transit and AV – Roadway Design

- Bus Rapid Transit and other transit strategies may operate on **separate rights-of-way**
- Curb design



- Lane width reductions
- Complete Streets near heavy bike/ped movements

Intersection of Transit and AV – Policy

- Public-Private Partnerships (P3)
- Incentivize electric vehicles
- Curb priority / pricing / timing
- Public outreach campaigns
- Revisit developer obligations



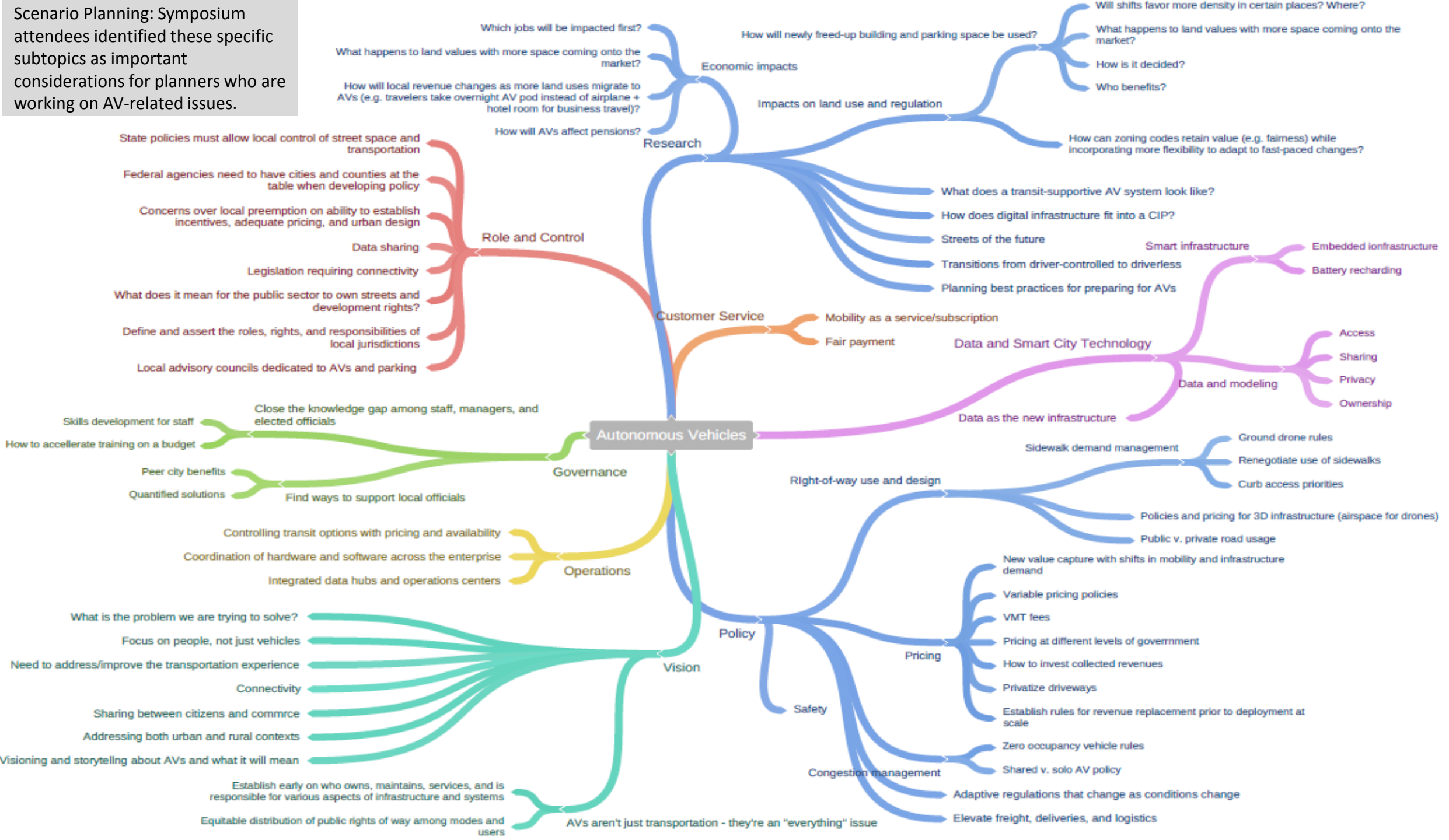
- ★ • Travel Demand Management ★
- Reinforce heavy-ridership routes
- Regional Payment System
- Time of Day Management

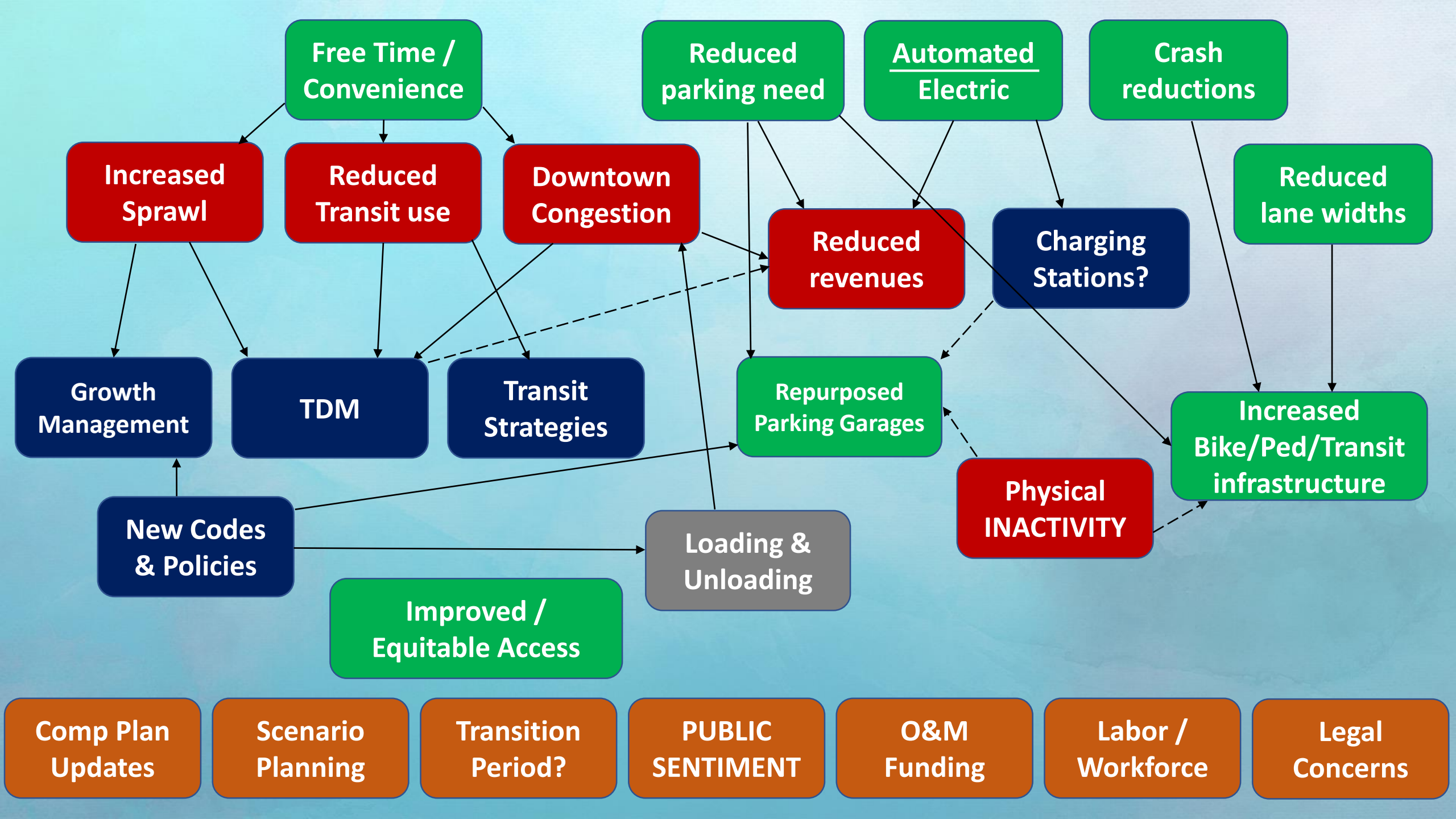
Questions?

Preparing for the Automated Future

David Williams, VHB

Scenario Planning: Symposium attendees identified these specific subtopics as important considerations for planners who are working on AV-related issues.





Free Time /
Convenience

Reduced
parking need

Automated
Electric

Crash
reductions

Increased
Sprawl

Reduced
Transit use

Downtown
Congestion

Reduced
revenues

Charging
Stations?

Reduced
lane widths

Growth
Management

TDM

Transit
Strategies

Repurposed
Parking Garages

Physical
INACTIVITY

Increased
Bike/Ped/Transit
infrastructure

New Codes
& Policies

Loading &
Unloading

Improved /
Equitable Access

Comp Plan
Updates

Scenario
Planning

Transition
Period?

PUBLIC
SENTIMENT

O&M
Funding

Labor /
Workforce

Legal
Concerns

Preparing for the Automated Future

- Autonomous Vehicles will impact more than just transportation:

- Land use
- Site design
- Environmental
- Recreational
- Health
- Right-of-way
- Housing
- Tourism
- Transit
- Public Sentiment
- Public Revenues
- Comprehensive Planning
- Parking
- Retail
- Warehousing / E-Commerce
- Local Economies
- Growth Management (sprawl)
- Data infrastructure
- Governmental Coordination
- Freight
- Hospitals
- Transition Period
- Stormwater
- Utilities
- Legal
- Labor/Workforce
- Special Events
- Major Developments

Preparing for the Automated Future

- Autonomous cars are “not about technology, this is about public policy.” – *Seleta Reynolds, General Manager LADOT*
- “Autonomous cars are one of those points where urban planning and transportation can’t be divorced from each other anymore.” – *Sarah Potts Ashton, Southern California Public Affairs Representative for UBER*
- “What we do know is that AVs will transform everything they touch.” – *Stephen Buckley, P.E., General Manager of Transportation, City of Toronto*
- “...self-driving will encompass all modes of driving by the end of the next year [2019].” – *Elon Musk, CEO Tesla*

Autonomous Vehicle Workshop

- Autonomous vehicles are coming
- They will affect more than just our industry
- We do not have all the expertise necessary to prepare the Central Florida region
- **If we were to hold a Central Florida AV Workshop/Summit, who else should be involved?**

Current Initiatives

THANK YOU!

Next Consortium – July 26, 2018



TSM&O Consortium Meeting

MEETING AGENDA

Central Florida Expressway Authority
4974 Orl Tower Rd
Orlando, FL 32807
Pelican Conference Room

May 31, 2018; 10:00 AM-12:00 PM

- 1) WELCOME
- 2) TSM&O STRATEGY GUIDE – UPDATE
 - David Williams, VHB
- 3) SIGNAL TECHNICIAN PROGRAM AT ORANGE TECHNICAL COLLEGE – UPDATE
 - David Williams, VHB
- 4) FDOT D5 10-YEAR TSM&O REQUEST LIST (CFMPOA PRESENTATION – UPDATE)
 - David Williams, VHB
- 5) FTA's STRATEGIC TRANSIT AUTOMATION RESEARCH (STAR) PLAN
 - David Williams, VHB
- 6) LAND USE PLANNING AND AUTONOMOUS VEHICLES
 - David Williams, VHB
- 7) PREPARING FOR THE AUTOMATED FUTURE
 - David Williams, VHB
- 8) CURRENT INITIATIVES