Central Florida TSM&O Consortium Meeting Summary

Meeting Date: October 7, 2021 (Thursday) **Time**: 10:00 AM – 12:00 PM

Subject: TSM&O Consortium Meeting

Meeting Location: Teleconference

I. OVERVIEW

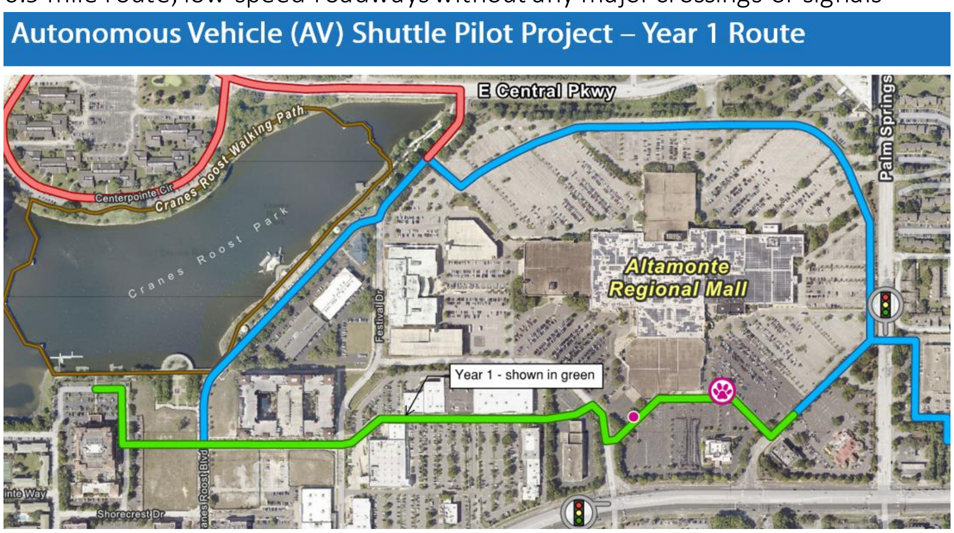
The purpose of this recurring meeting is to provide an opportunity for District Five FDOT staff and local/regional agency partners to collaborate on the state of the TSM&O Program and ongoing efforts in Central Florida. Jeremy Dilmore gave a short introduction and outlined the meeting agenda.

II. ALTAMONTE SPRINGS UPDATE – FLEXPATH AND AV SHUTTLE PILOT PROJECT

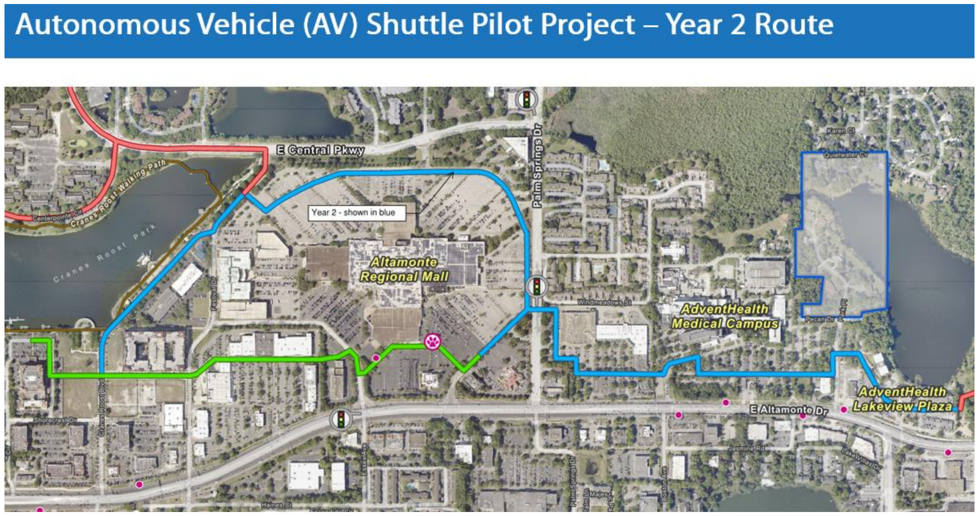
Brett Blackadar briefly discussed the Flexpath and AV Shuttle under development by the City of Altamonte Springs.

- Population of Altamonte Springs – ~50,000
- History of conducting pilot projects, including the 2-year pilot with Uber and other municipalities
- Flexpath & AV Shuttle Pilot
    - The Flexpath will accommodate walking, biking, and the AV shuttle

    - 1,200 apartments are being built along Flexpath
    - AV Shuttle features
        - relies on sensor suite of LiDAR, Radar, and GPS
            - LiDAR "sees"
            - Radar sensors are used for long and short range directional measurements

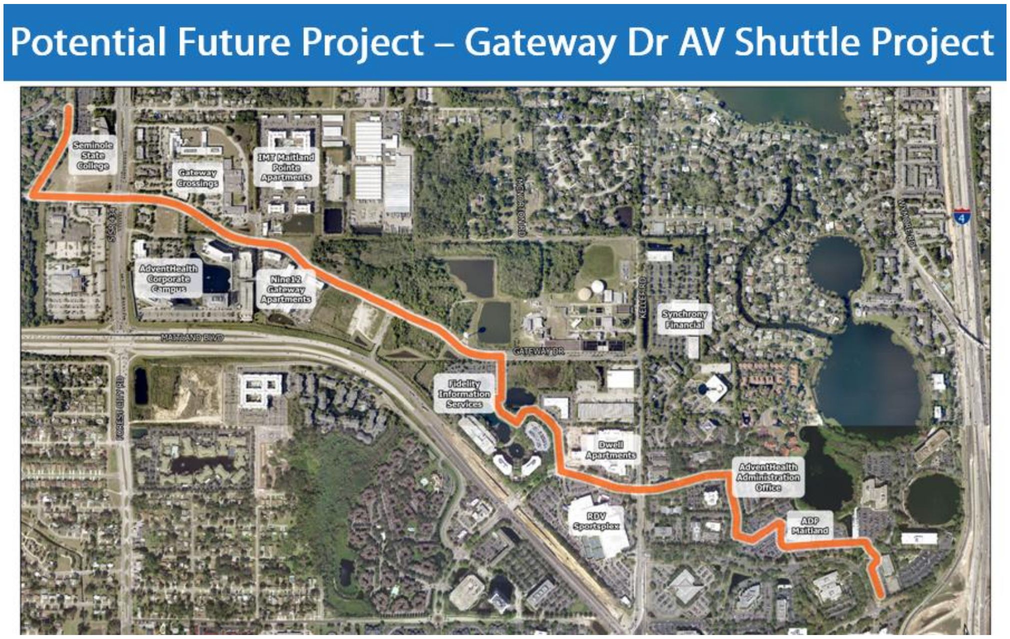
        - GPS is coupled with GNSS, GPRS, and Cellular communications to accurately determine the vehicle's location
    - AV Shuttle can be operated manually by the shuttle ambassador
    - AV Shuttle comes with a touch screen interface for users
        - Commands to proceed safely, stop, and basic door operation; also comfort controls
- AV Shuttle goals
    - improve safety (zero crashes during deployment)
    - develop mobile application for the local transit system with dynamic routing capabilities
    - produce mode shift away from the automobile
    - establish cooperative mobility at locations in the corridor to exchange data with high definition cameras and processors
    - use flexible lane on Central Pkwy to establish complete streets guidance for AV Shuttle incorporation
    - achieve Level 4 autonomy
    - develop replicable proof-of-concept for AV Shuttle operations for a local government dynamic transit system
- AV Shuttle – Year 1
    - 0.9 mile route; low-speed roadways without any major crossings or signals
    - 

- AV Shuttle – Year 2
    - Complete the loop around Altamonte Mall and Uptown Altamonte; extend route east to Palm Springs Center and AdventHealth Hospital Campus
    - Includes the crossing of Palm Springs Dr at a new signalized intersection adjacent to Palm Springs Center
    - Goals
        - connect traffic signal controllers to AV Shuttle OBUs
        - develop public application with dynamic routing capabilities
        - study interactions with high-volumes of pedestrians at the mall and hospital campus

- 

- AV Shuttle – Year 3
  - Route would be extended 1.0 miles to the west to connect to Centerpointe redevelopment project
  - Route would be extended 0.7 miles to the east to connect to Altamonte Springs SunRail station, the East Town Redevelopment Area and the City Hall complex
  - 

- Potential future project – Gateway Drive

  - 

- AV Shuttle
  - looking for turnkey vendor to come in to operate

Discussion:

- **Q:** Keith Deluca – are shuttles going to have cameras onboard for security?
  - **A:** Yes, that will be included in the RFP
- **Q:** Nabil Muhaisen – what type of trip is the shuttle being deployed for?
  - **A:** Don't think there's anything quite as aggressive; Year 3 is particularly advanced
- **Q:** Nabil Muhaisen – has it been modeled after another city?
  - **A:** Eric Hill – we have similar deployments at UCF (ATTAIN project) and Lake Nona project
- **Q**: Jeremy Dilmore – you went through a feasibility evaluation process that can be very useful and transferable to other agencies
- The interaction between modes will be interesting to see
  - collaborated with vendors currently operating AV shuttles in Europe

III. ATSPM DEPLOYMENTS ACROSS THE NATION

David Williams briefly discussed ATSPM benefits and deployment across the nation.

- ATSPMs help an agency to quickly identify and respond to issues, operate traffic signals via better timing parameters, and easily communicate outcomes to engineers, decisionmakers, and the public
- A 2020 FHWA report identified a 8.24 benefit-cost ratio for a hypothetical ATSPM deployment

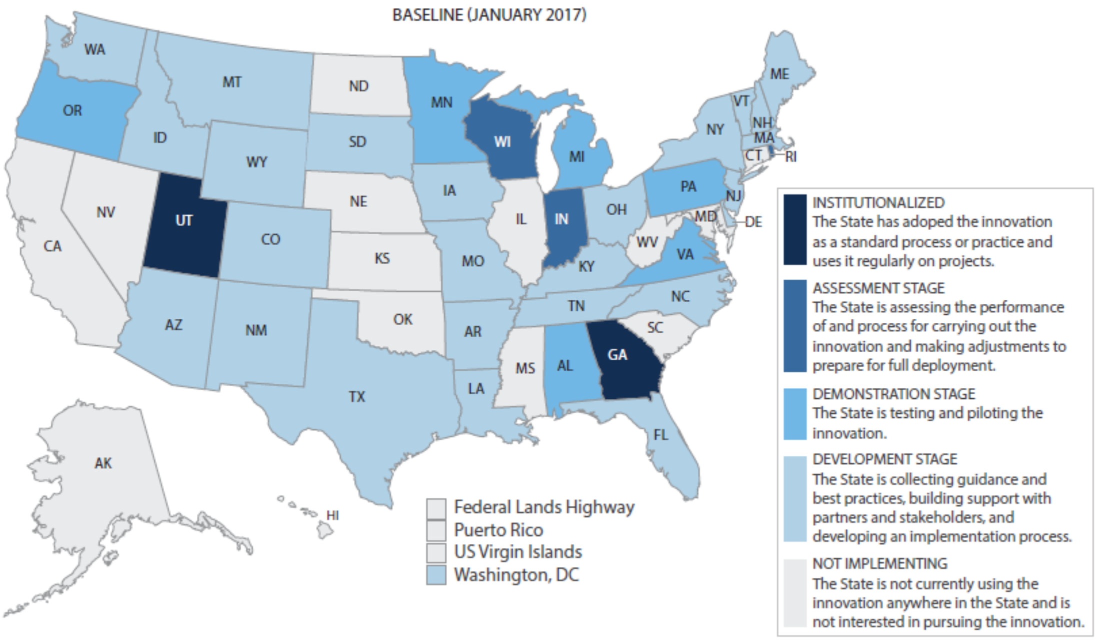
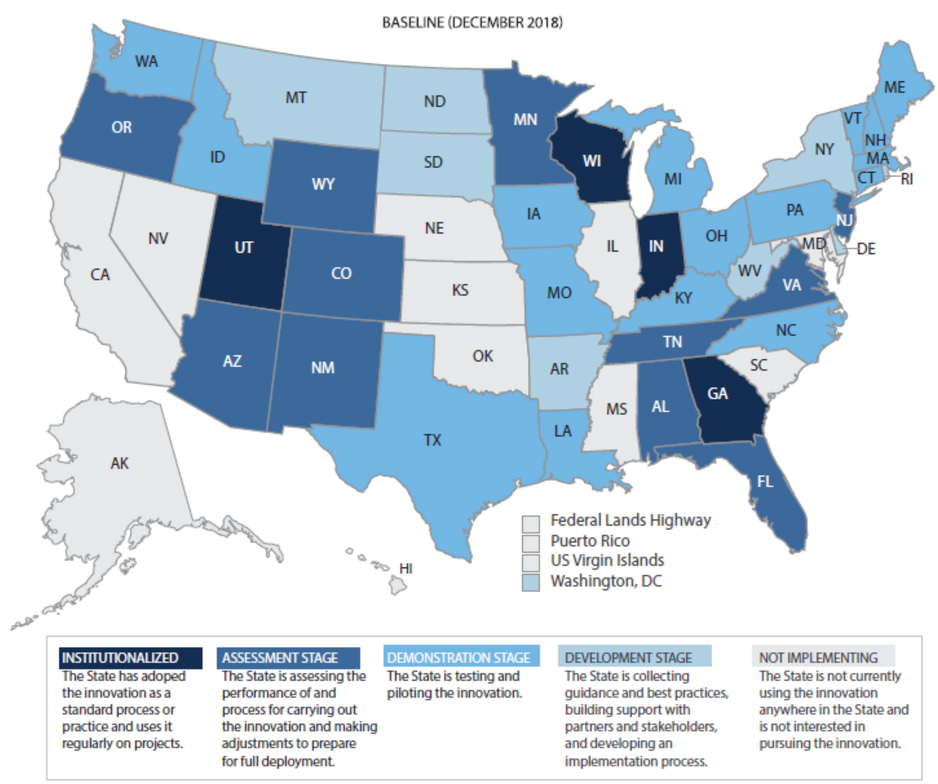
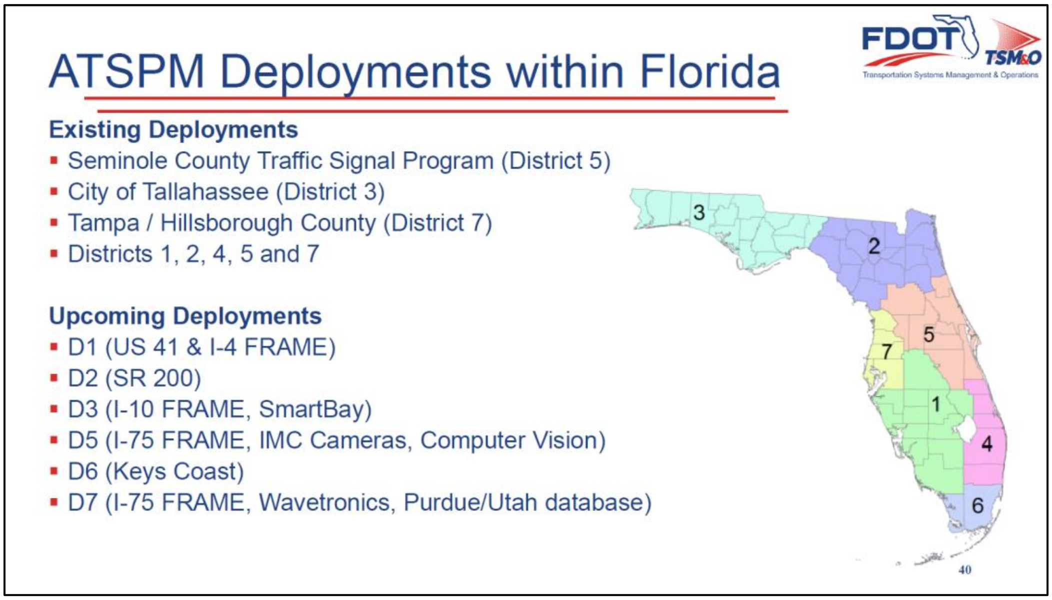
- 

Figure 8. Map. Status of automated traffic signal performance measures implementation in January 2017.
Source: FHWA
- 

Source: FHWA
Figure 9. Map. Status of automated traffic signal performance measures implementation adoption in December 2018.
- Utah was one of first agencies to use ATSPMs statewide (2011)

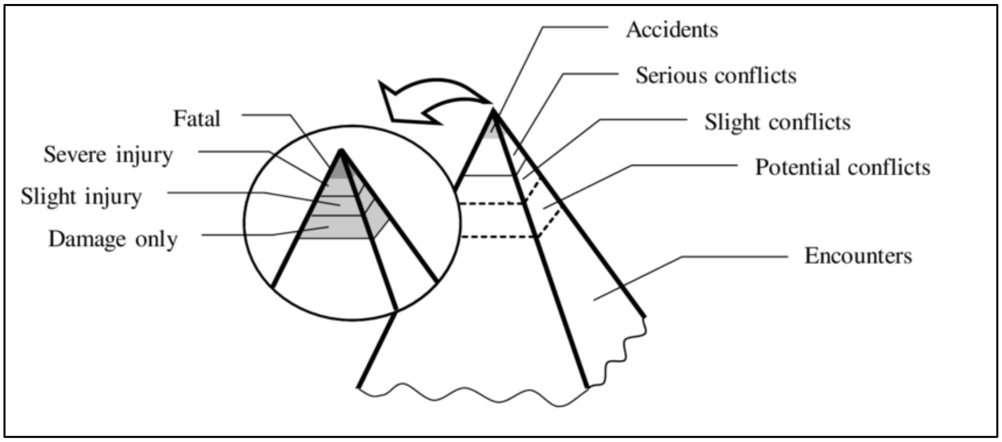
  - invested considerable resources to develop ATSPM software; made it open-source
- Georgia has the largest deployment of traffic signals equipped with high-resolution data-collection capabilities
  - 6,804 signals; 80% configured to create reports
  - prior to ATSPMs, Georgia relied on phone calls and complaints to trigger field staff
  - ATSPMs used to conduct Before/After evaluations
- ATSPMs within Florida
  - 

  - Channel Checker in development – a change in the channel will trigger an alert
  - biggest cost item is field data collection
  - District Five shared the Smart Signal package with Central Office, to potentially make it the state standard

IV. SURROGATE SAFETY MEASURES

David Williams presented on Surrogate Safety Measures (SSM) and their benefit in transportation planning and operations.

- SSMs are various methods for identifying future traffic conflicts
  - "calculates collision risk of a certain traffic situation with microscopic traffic parameters such as vehicle speed, acceleration, time headway, and space headway"
- The most common SSMs are Post Encroachment Time, Time-to-Collision, and Time-to-Collision with Disturbance
- 1 month of SSM data is approximately equal to 5 years of crash data
- It was previously very hard to measure SSMs
-

- 

- Post Encroachment Time (PET)
    - time difference between a vehicle leaving the area of encroachment and a conflicting vehicle entering the same area; the higher the PET, the less likely an accident
- Time to Collision (TTC)
    - time required for two road users to collide if they continue at their present speeds and on the same trajectories
- Time to Collision with Disturbance (TTCD)
    - time it takes for collision to occur if the speed of the following vehicle remains unchanged after disturbance is imposed on lead vehicle
- Criticisms of Crash Data
    - long data collection period
    - potential for underreporting
    - altering infrastructure and/or operations may reduce relevance of the historical crash data
- Criticisms of SSMs
    - for typical SSMs, scenarios where the following vehicle's speed is lower than a leading vehicle's speed are regarded as safe, even when the spacing between them is very small
    - driver's reaction time not considered
    - arbitrary thresholds may lead to inaccurate outcomes
- The 2013 Safety Pilot Model Deployment (SPMD) study in Ann Arbor, Michigan identified a statistically significant relationship between typical SSMs and the relevant traffic data collected for the same time/roadways
- Collecting before/after data is much easier with SSMs (4-6week collection period before and after) compared to crash data (five years)
- trying to use existing camera infrastructure to limit capital costs to implement SSM use more broadly

V. GENERAL BIKESHARE FEED SPECIFICATION

Jeremy Dilmore briefly discussed the transition from General Bikeshare Feed Specification (GBFS) 1.0 to 2.0

- GBFS 1.0 – open data standard for shared mobility options; similar to GTFS standard

   - real-time, read-only data feeds in uniform format
   - originally developed for bikeshare; scootershare and other services adopted standard and improved data usage
   - 230+ shared bike/scooter operators adopted GBFS to share real-time data with mobile apps
- GBFS 2.0
   - deep lines added for seamless integration between provider app and third-party apps
      - improves convenience; no intermediary steps; no redirect to app stores
   - requires bike_id rotation after each rental to improve privacy by reducing ability reconstruct individual trips
   - adjusts file structure for cleaner feed communication
   - clarifies definitions; adjusts JSON values for clarity
- GBFS 2.x
   - 2.1 – support for geofenced areas and virtual stations (dockless operation)
      - vehicle type definitions
   - 2.2 (current version)
      - extend *system_pricing_plans* for dockless vehicles
   - 2.3 (release candidate)
      - add vehicle dropoff restrictions via geofencing
      - vehicle icons & brand info
      - reserve time
      - add pricing plans to vehicle types
      - add fields for terms/privacy policy
      - add field to designated vehicle charging stations
- GBFS 3.0 will require *license_url*
- Jeremy suggested that if an agency is looking at projects, highly recommend pointing people to GBFS 2.0 as a standard starting point

VI. CURRENT INITIATIVES

Jeremy Dilmore briefly provided updates on current initiatives in District Five and around the state.

- RSUs
   - Commsignia devices are working well
   - Kapsch is a new vendor in the space
      - rely on cloud-hosted system to update controller
- Bluetooth
   - rollout hopefully in November, likely later
- Smart Work Zone Trailer at RTMC
   - using camera to see when vehicle encroaches a WZ area
   - includes siren to alert workers of danger
   - will deploy WZ trailer on I4U
- Central Florida MPO Alliance (Eric Hill)
   - CFMPOA accepted definition that TSMO Consortium put together (led by Eric)

- drafting a method now to develop a TSMO list
- developing criteria to screen TSMO projects
- will evolve into a regional TSMO plan
- removed "separate MPO planning areas" given some projects are regional in nature though they may be deployed in a single county or area
- how can we leverage our combined clout to get more resources to the region?

VII. NEXT MEETING

- December 9, 2021

VIII. ATTACHMENTS

- A – Presentation Slides
- B – Meeting agenda

END OF SUMMARY

This summary was prepared by 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 the meeting summary can be finalized.*

Welcome to the TSM&O Consortium Meeting

October 7, 2021

FDOT TSM&O
Transportation Systems Management & Operations

Transportation Systems Management & Operations

CENTRAL FLORIDA TSM&O CONSORTIUM

Meeting Agenda

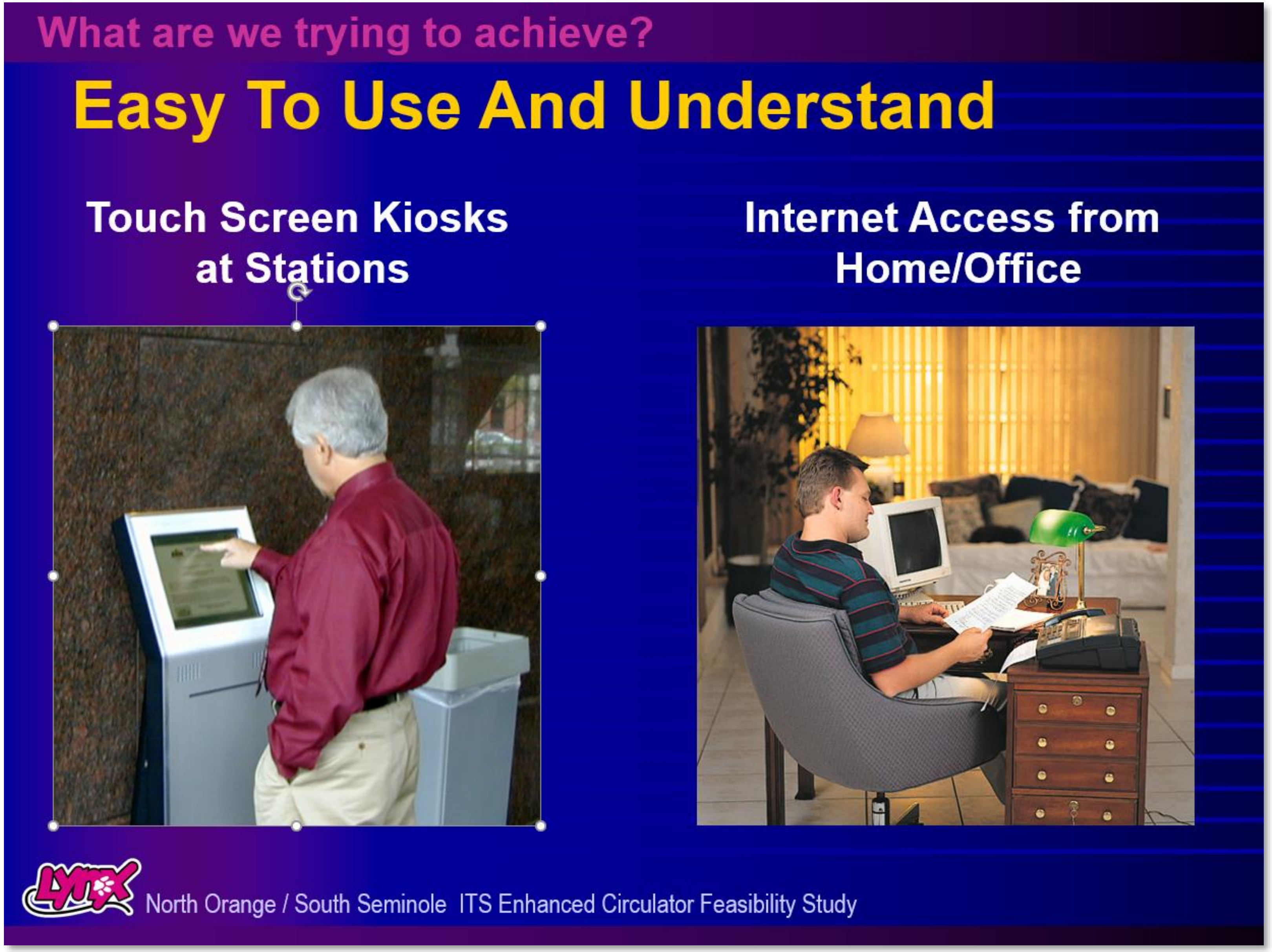
1. Welcome
2. Local Agency Update
    - City of Altamonte Springs
3. Safety Surrogate Measures
4. ATSPMs around the Country
5. MicroMobility – General Bikeshare Feed Specification (GBFS)
6. TSMCA Updates
7. Current Initiatives

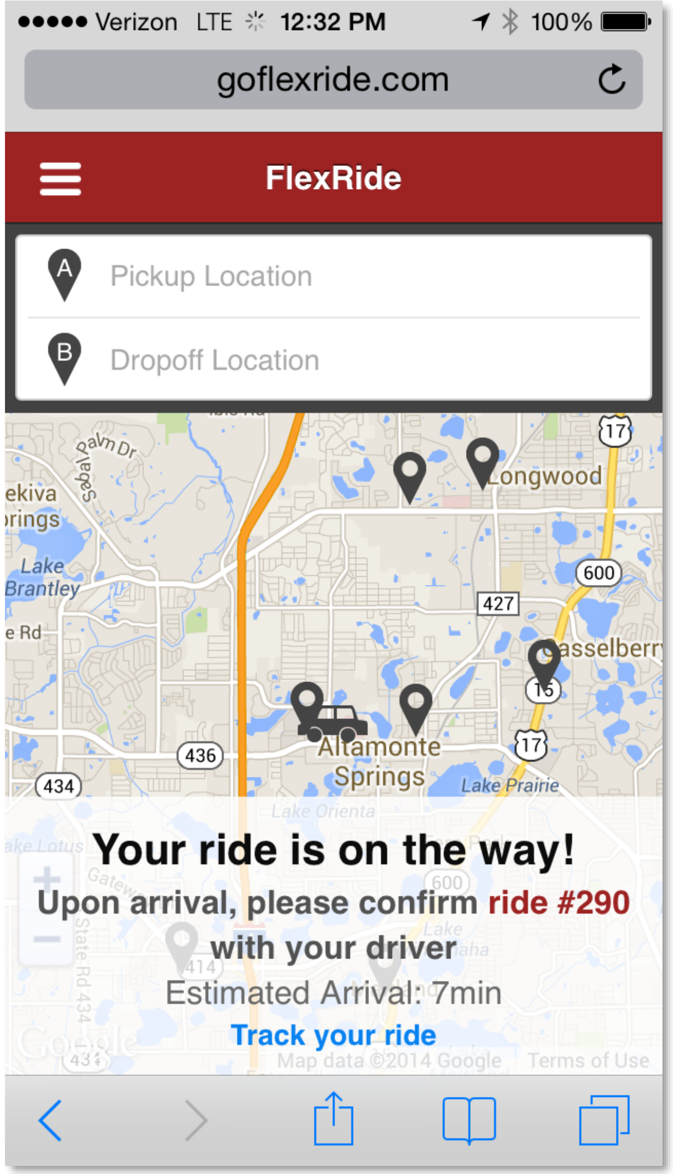
CITY OF ALTAMONTE Springs

Flexpath and AV Pilot Shuttle Project

Where
Inspiration
Sparks
Innovation

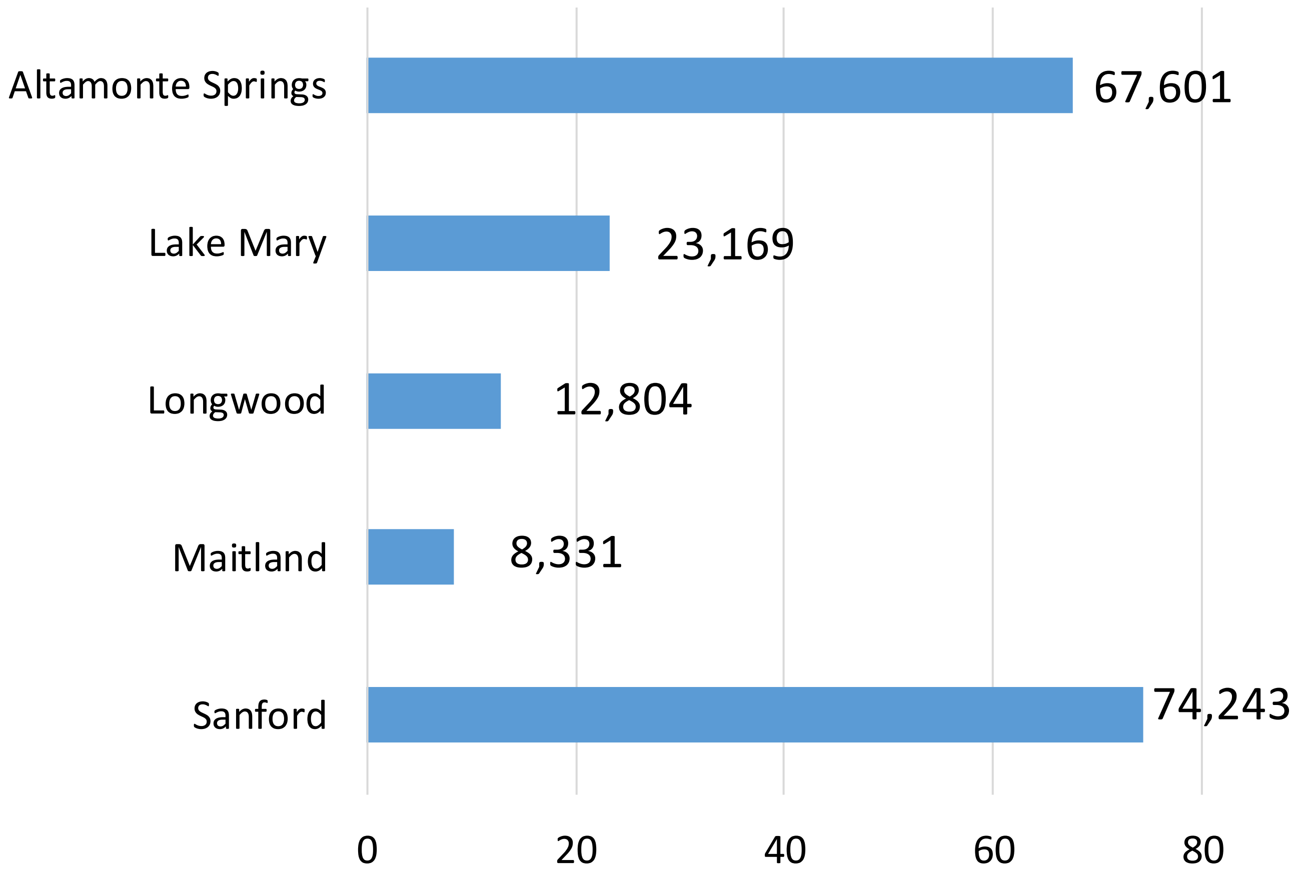
Early Transit in the City of Altamonte Springs

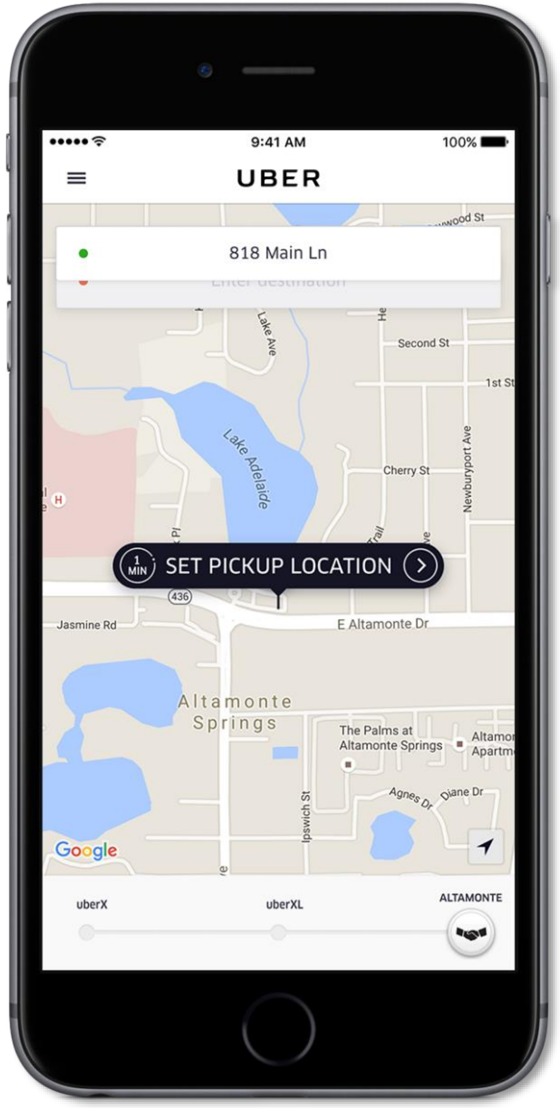




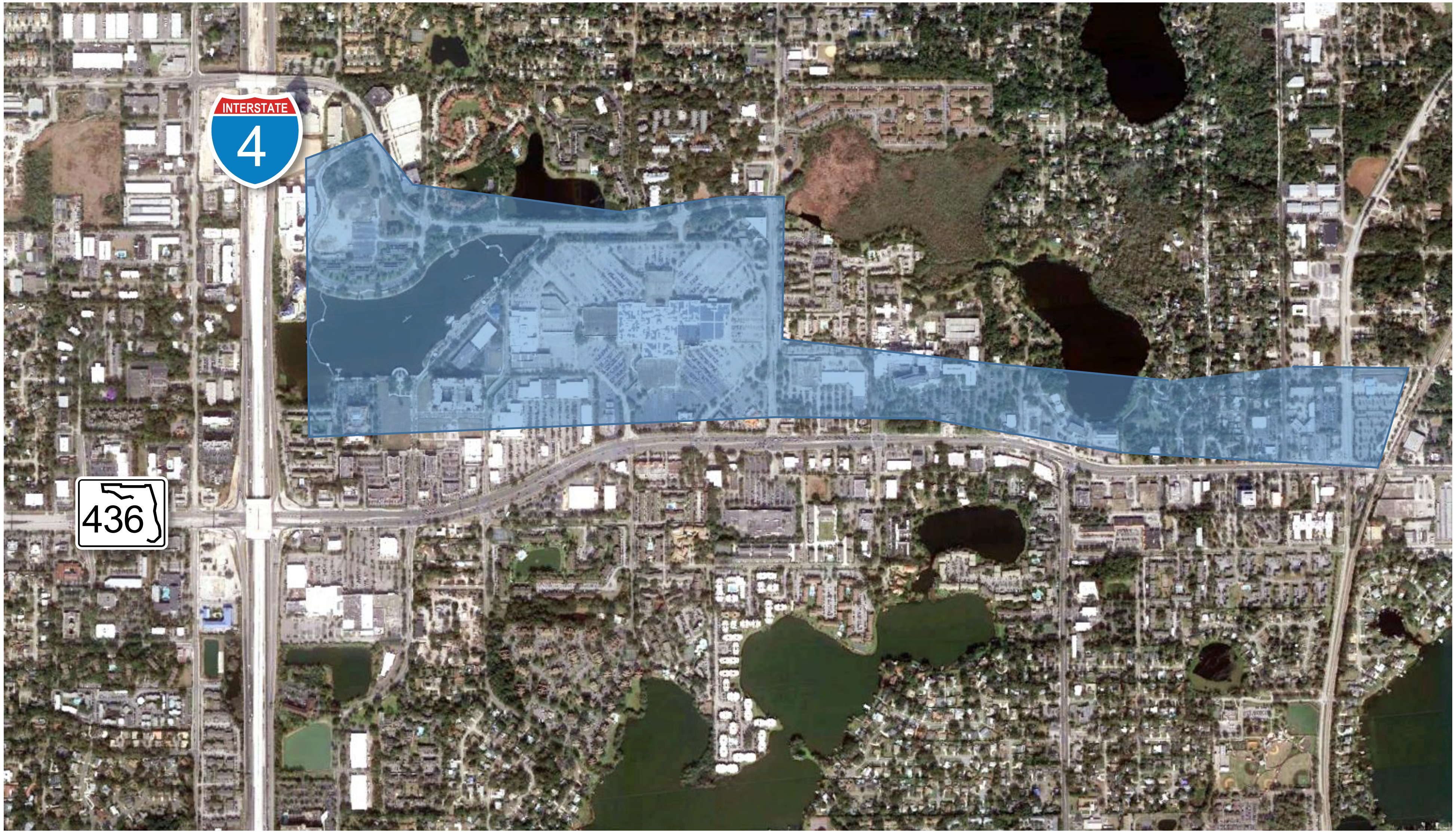
UBER Pilot Project

PHASE 2 TRIPS (In Thousands)





Project Location



FDOT Service Development Grant – FY 2022/2023 – FY 2024/2025

DocuSign Envelope ID: 2688824C-2CA8-4328-BF82-18ADE2C069B5

Florida Department of Transportation
420 W. Landstreet Road
Orlando, Florida 32824

RON DESANTIS
GOVERNOR

KEVIN J. THIBAULT, P.E.
SECRETARY

September 22, 2021

Franklin W. Martz, II
City Manager
City of Altamonte Springs
225 Newburyport Avenue
Altamonte Springs, Florida 32701

Re: State Fiscal Year 2022/2023 – Public Transit Service Development Program Intent to Award Letter

Dear Mr. Martz:

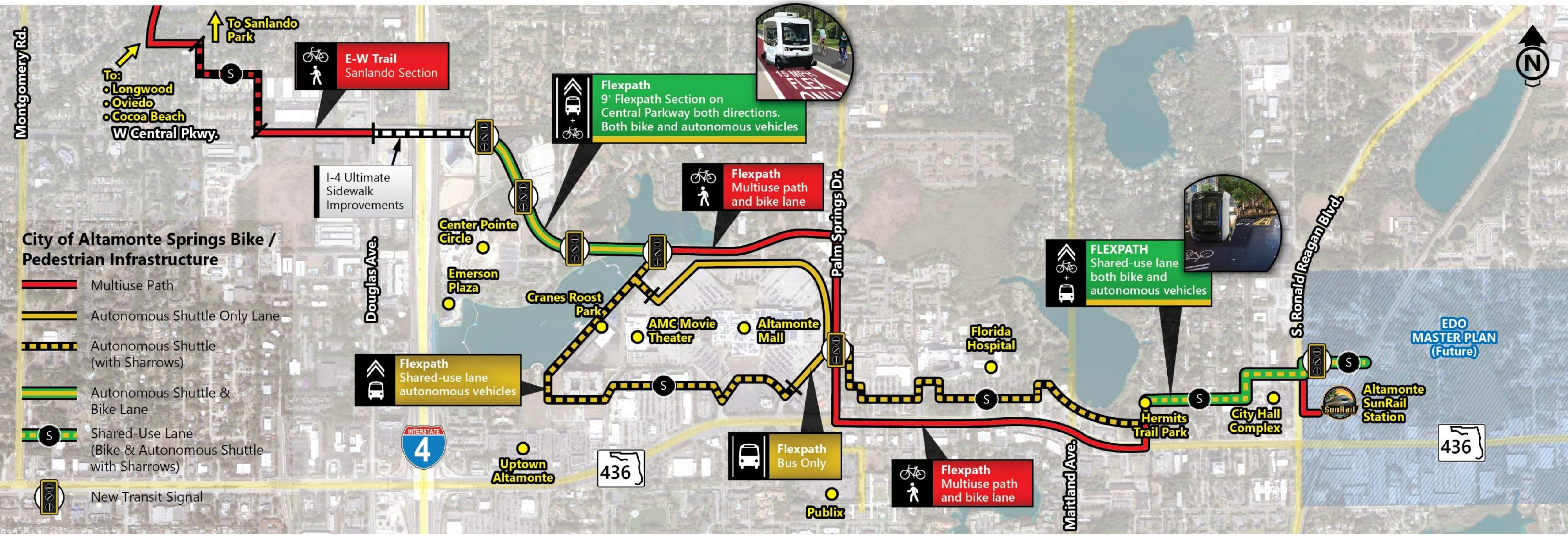
This notice is to advise the City of Altamonte Springs that the Florida Department of Transportation (FDOT) District Five Grant Review Team has completed the grant application review and ranking process for State Fiscal Year 2023/2024. Below is an overview of the City of Altamonte Springs' proposed Public Transit Service Development Program project and the anticipated amounts that will be awarded:

	Service Development Funding	Local Share
FY23 Capital	$156,250.00	$156,250.00
FY23 Operating	$159,539.00	$159,539.00
FY23 TOTAL	$315,789.00	$315,789.00
FY24 Capital	$187,500.00	$187,500.00
FY24 Operating	$191,448.00	$191,448.00
FY24 TOTAL	$378,948.00	$378,948.00
FY25 Capital	$250,000.00	$250,000.00
FY25 Operating	$255,263.00	$255,263.00
FY25 TOTAL	$505,263.00	$505,263.00
TOTAL PROJECT COST	$1,200,000.00	$1,200,000.00

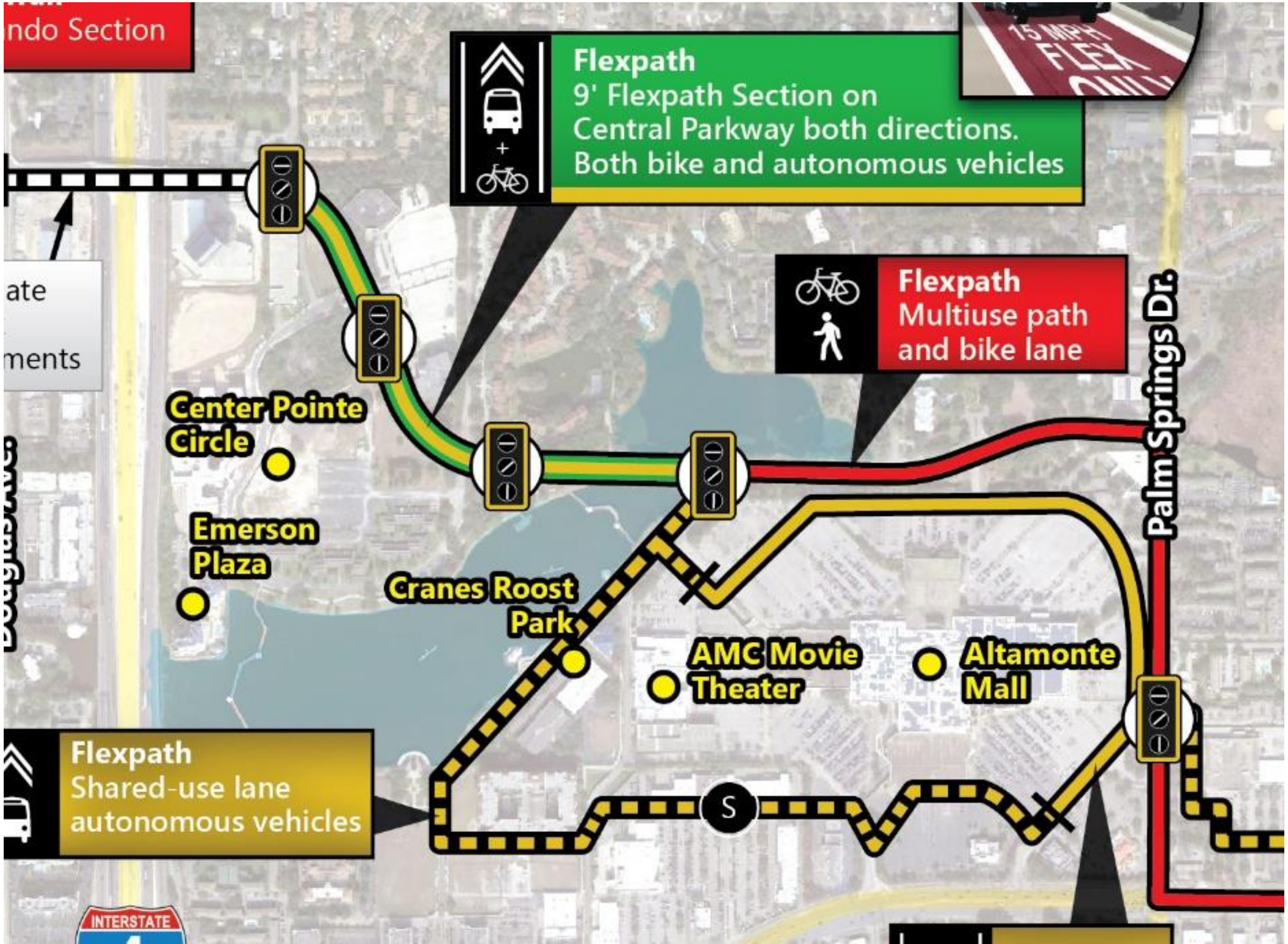
Please review the attached budget categories identified in Exhibit B (Attachment 1) and indicate how the tentative operating award will be distributed within each budget category for State Fiscal Year 2023. Thank you for participating in this competitive grant application process. If you have any questions, please contact me at (321) 319-8174 or email diane.poitras@dot.state.fl.us.

Improve Safety, Enhance Mobility, Inspire Innovation
www.fdot.gov

Project Overview



Project Overview

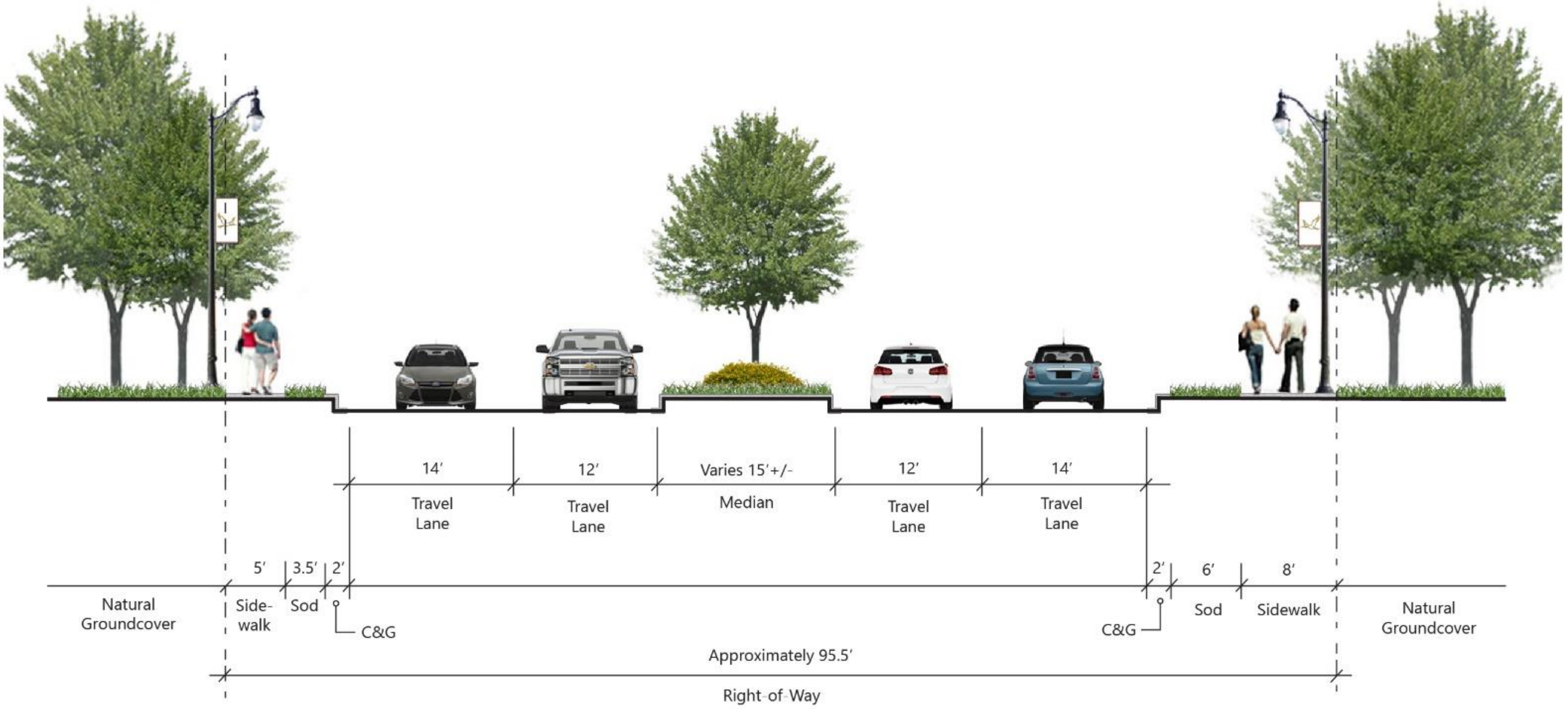


Flexpath Concept

Flexpath Concept

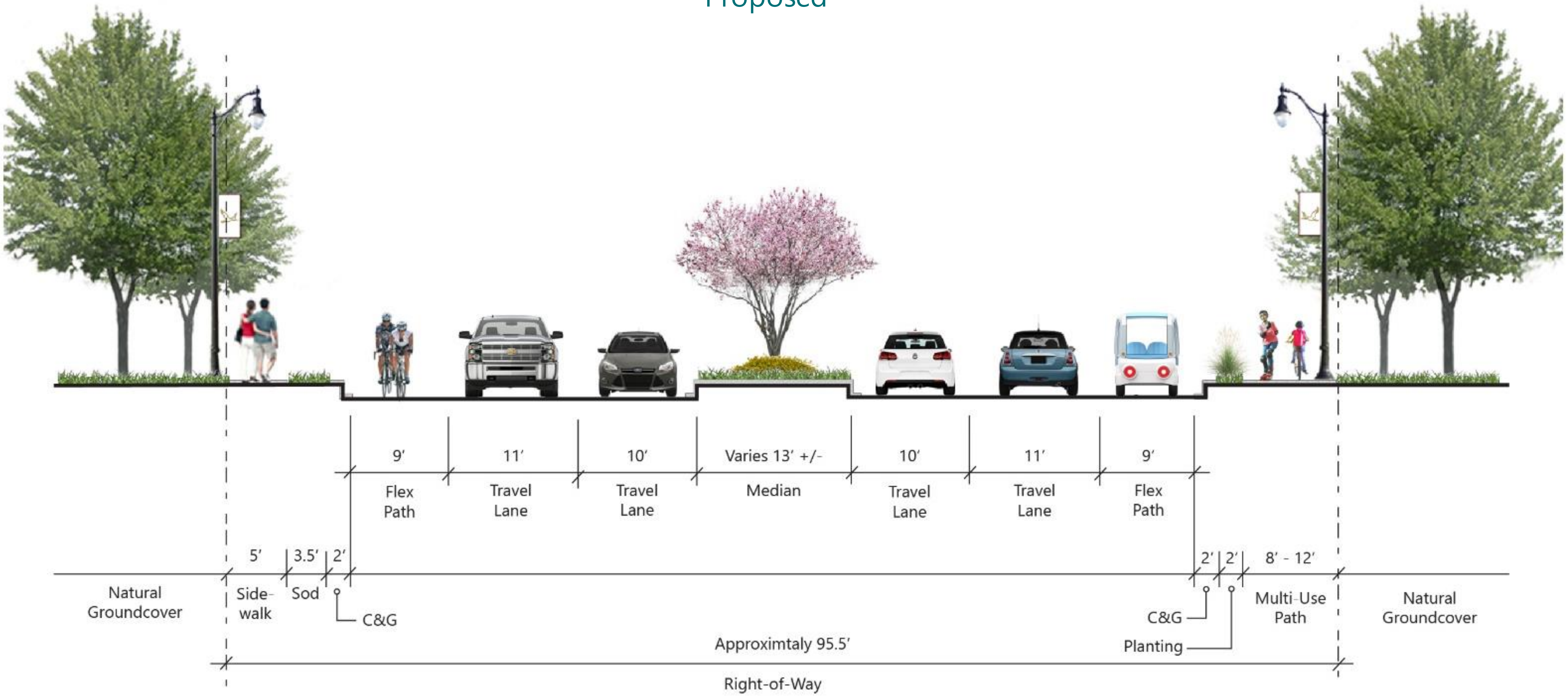
Central Pkwy Typical Sections with Flexpath

Existing

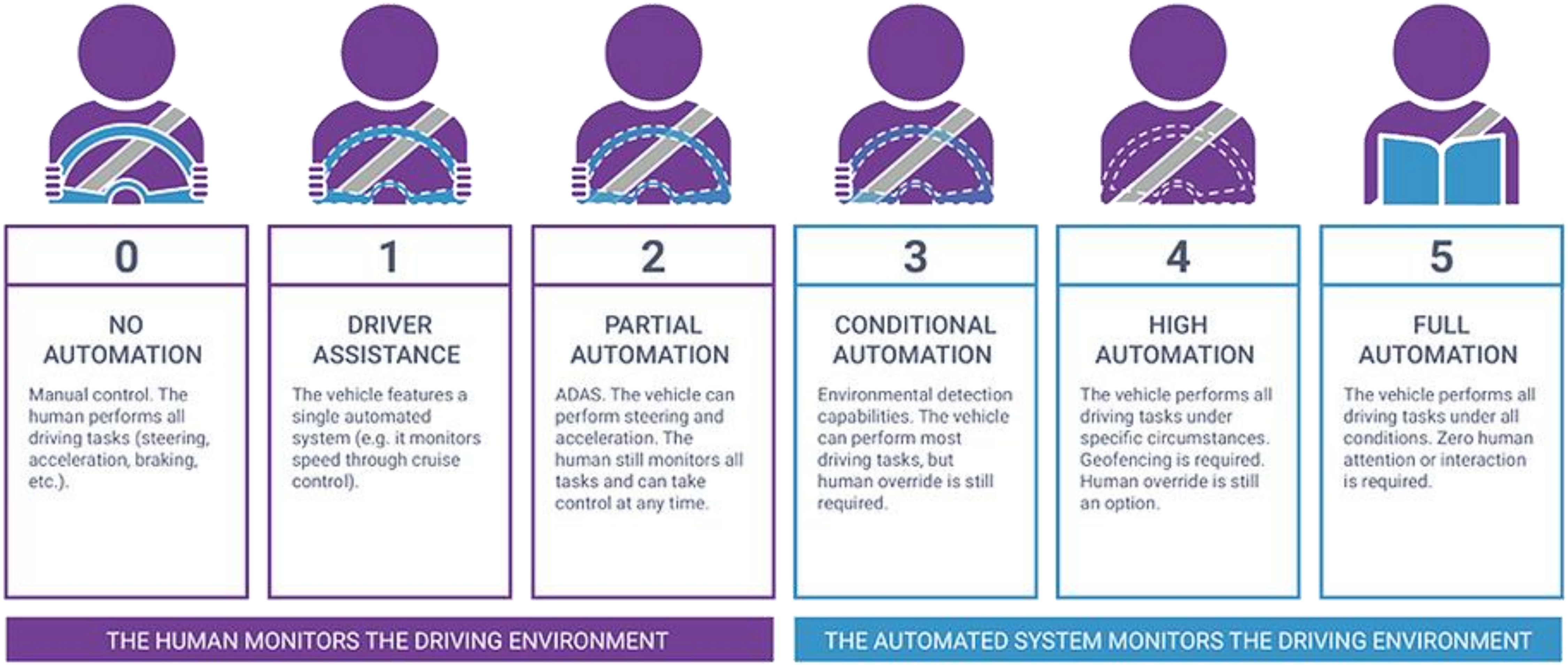


Central Pkwy Typical Sections with Flexpath

Proposed

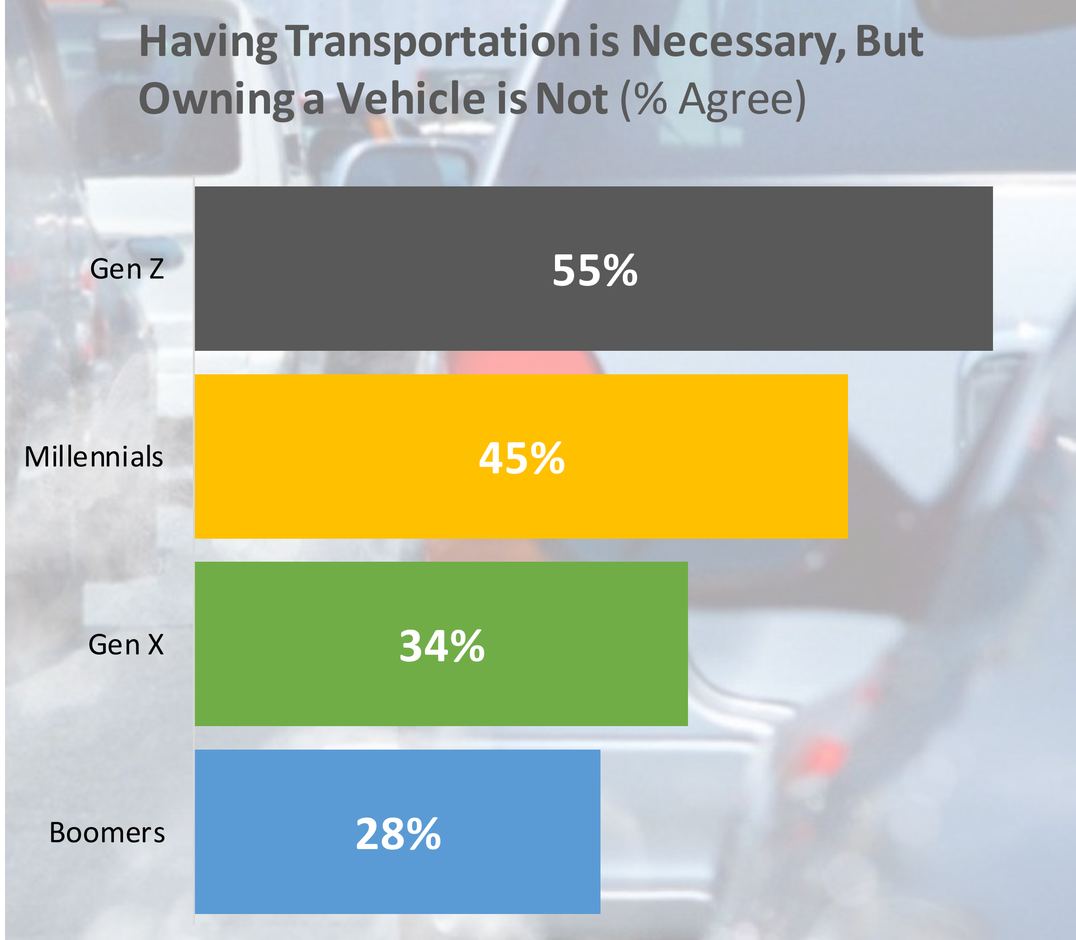


Levels of Autonomy



Why is AV Technology Worth Studying?

- The younger generations are less car dependents and are more open to alternative means of transportation.
- Human error causes 90% of all accidents, and distractions are increasing. AV shuttles are much faster to reacting to obstacles than humans are.
- Smaller AV shuttles can access areas that larger transit vehicles cannot.
- This pilot will strive to reach Level 4 Autonomy, which will not require a safety driver. This could produce a long-term cost effective transit solution.
- They could provide a reliable alternative to auto trips, resulting in less overall auto congestion.



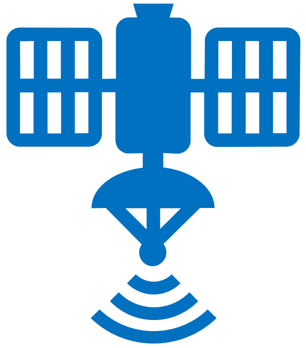
Source: https://www.coxautoinc.com/learning-center/2018-mobility-study/

AV Shuttle Physical Characteristics

- Passenger Capacities
  - Most shuttles will advertise a capacity of 10 to 12 passengers
  - Only have seating for 6-8
  - Capacity counts do not include shuttle ambassador
- Speeds
  - Speeds are dependent on geometric and environmental factors
  - Most shuttles will have a maximum speed of 25 MPH
  - Most operational speeds will be <20 MPH
  - Current AV shuttle routes use roads with speed limits 25 MPH or lower

How do AV Shuttles Operate?

- Sensor Suite with a **LiDAR, Radar, and GPS base**
  - LiDAR systems are used to "See" the world around the shuttle and track objects
  - Radar sensors are used for long and short range directional measurements
  - GPS is coupled with GNSS, GPRS and Cellular communications to accurately determine the vehicles location
- **Ambassador in the shuttle can take control** of the vehicle using a device similar to a Microsoft XBOX controller
- **Interface in shuttle provides touch screen** commands to proceed safely, stop, and basic door operation and comfort controls



AV Shuttle Pilot Project – Overall Goals

- Improve Safety – zero crashes during the pilot project
- Develop a mobile application for the local transit system with dynamic routing capabilities.
- Produce mode shift away from the automobile.
- Establish Cooperative mobility at locations in the corridor to exchange data with high definition cameras and processors.

AV Shuttle Pilot Project – Overall Goals

- Use the flexible lane on Central Pkwy to establish Complete Streets guidance for AV shuttle incorporation and the interaction with bicyclists and micromobility.
- Achieve level 4 autonomy without the need for a safety driver.
- Develop a replicable proof of concept for AV shuttle operations for a local government dynamic transit system.

Autonomous Vehicle (AV) Shuttle Pilot Project – Year 1 Route

Autonomous Vehicle (AV) Shuttle Pilot Project – Year 1

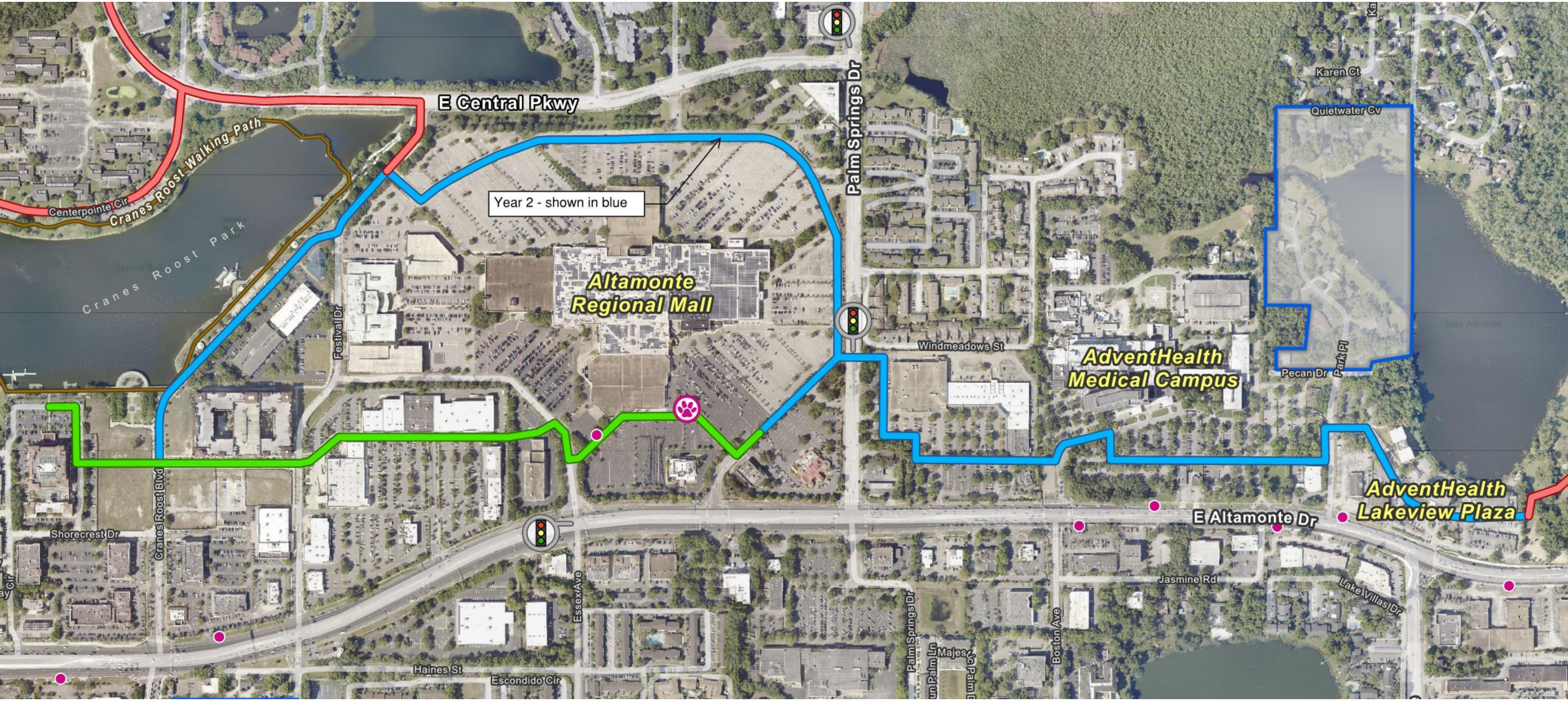
Year 1 Description

- This initial 0.9 mile route would travel from Embassy Suites to the Altamonte Mall and would access to Cranes Roost Park and Whole Foods in the Renaissance Centre.
- The route is all on low speed roadways without any major crossings or signalized intersections.

Year 1 Goals

- Initiate the pilot and setup all operation protocols with the vendor, including charging areas, drop off/pick up locations, etc.
- Implement the public awareness and marketing campaign for the project.

Autonomous Vehicle (AV) Shuttle Pilot Project – Year 2 Route



Autonomous Vehicle (AV) Shuttle Pilot Project – Year 2

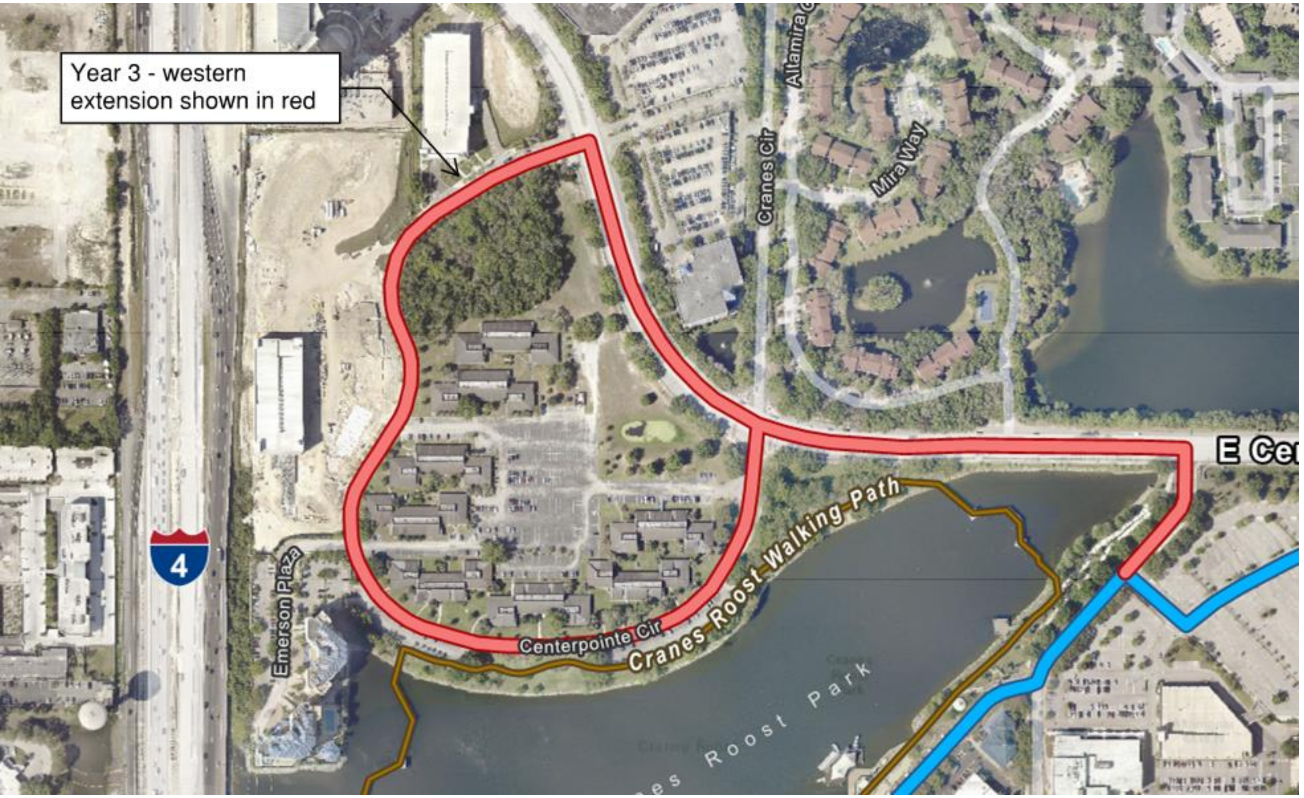
<u>Year 2 Description</u>

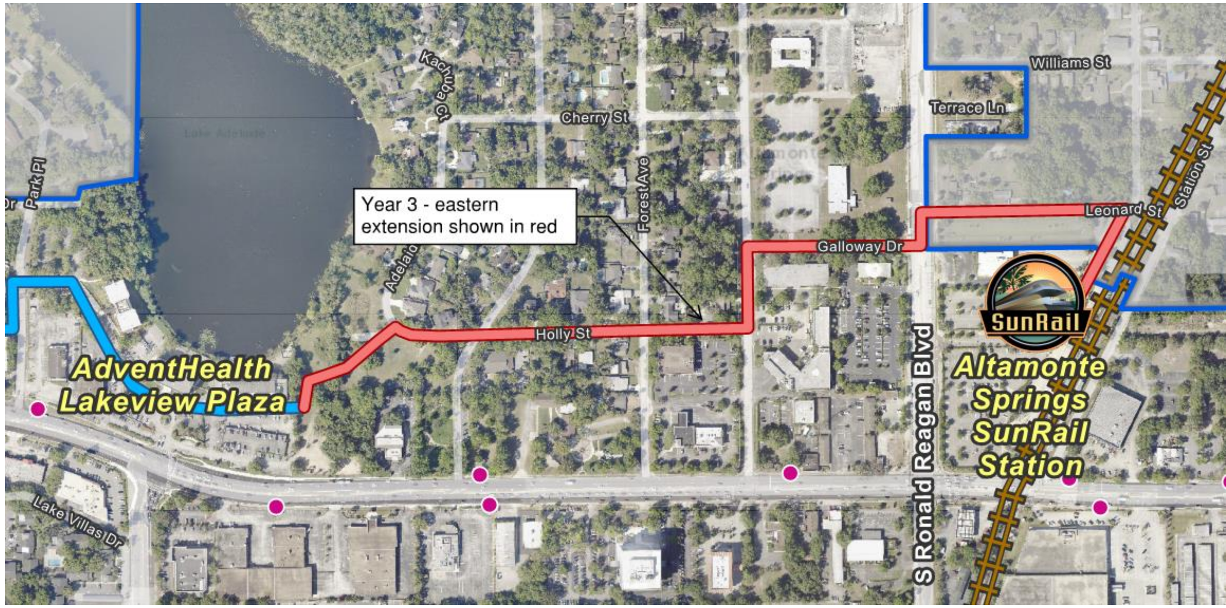
- Complete the loop around the Altamonte Mall and Uptown Altamonte and extend the route east to Palm Springs Center (Publix location) and the AdventHealth Hospital campus.
- This route includes the crossing of Palm Springs Dr at a new signalized intersection adjacent to Palm Springs Center.

<u>Year 2 Goals</u>

- Connect the traffic signal controllers to the AV shuttle on-board units and analyze the best technology for this interaction.
- Develop a public application with dynamic routing capabilities.
- Study the interactions with high volumes of pedestrians at the mall and hospital campus.
- Establish cooperative mobility at locations in the corridor to exchange data with high definition cameras and processors.

Autonomous Vehicle (AV) Shuttle Pilot Project – Year 3 Goals





Autonomous Vehicle (AV) Shuttle Pilot Project – Year 3

<u>Year 3 Description</u>

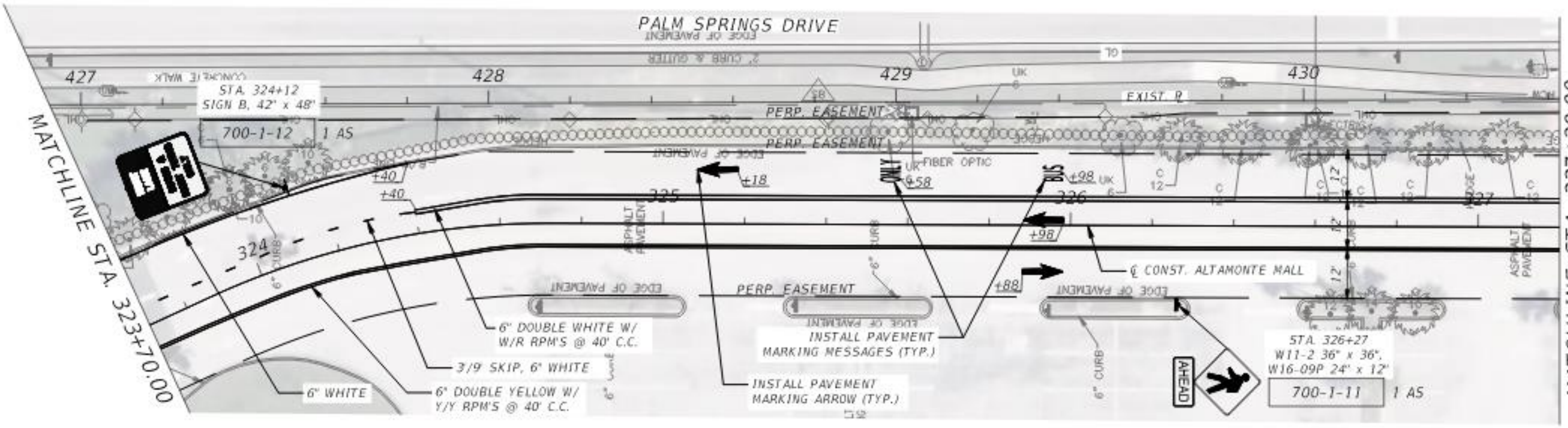
- The route would be extended 1.0 mile to the west to connect to Centerpointe Circle and the Lakeshore at Centerpointe redevelopment project.
- The route would be extended 0.7 miles to the east to connect to the Altamonte Springs SunRail station, the East Town Redevelopment Area and the City Hall complex.

<u>Year 3 Goals</u>

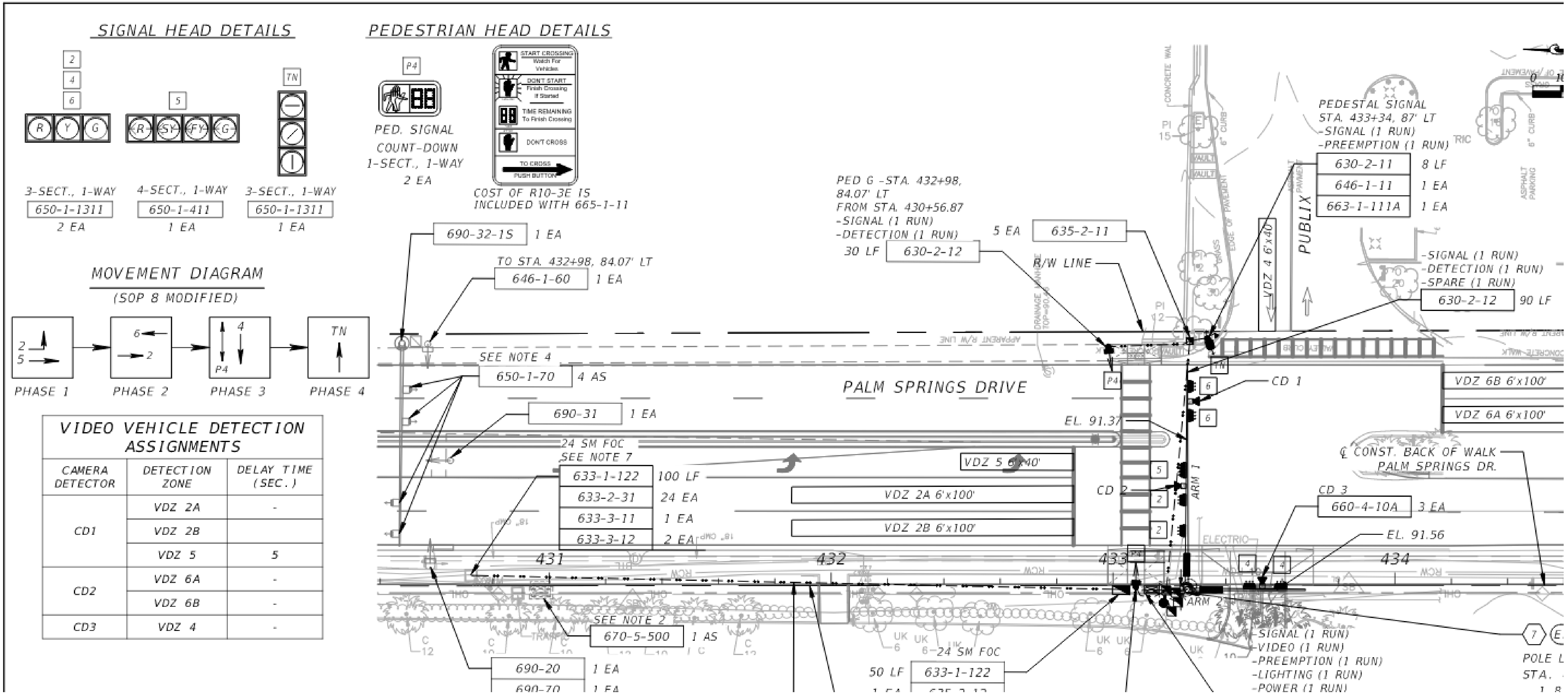
- Study the flexible lane on Central Pkwy to establish Complete Streets guidance for AV shuttle incorporation and the interaction with bicyclists and micromobility.
- Achieve Level 4 Autonomy without the need for a safety driver.
- Mature to a fully operating local transit system.

Altamonte Mall Exclusive AV Lane

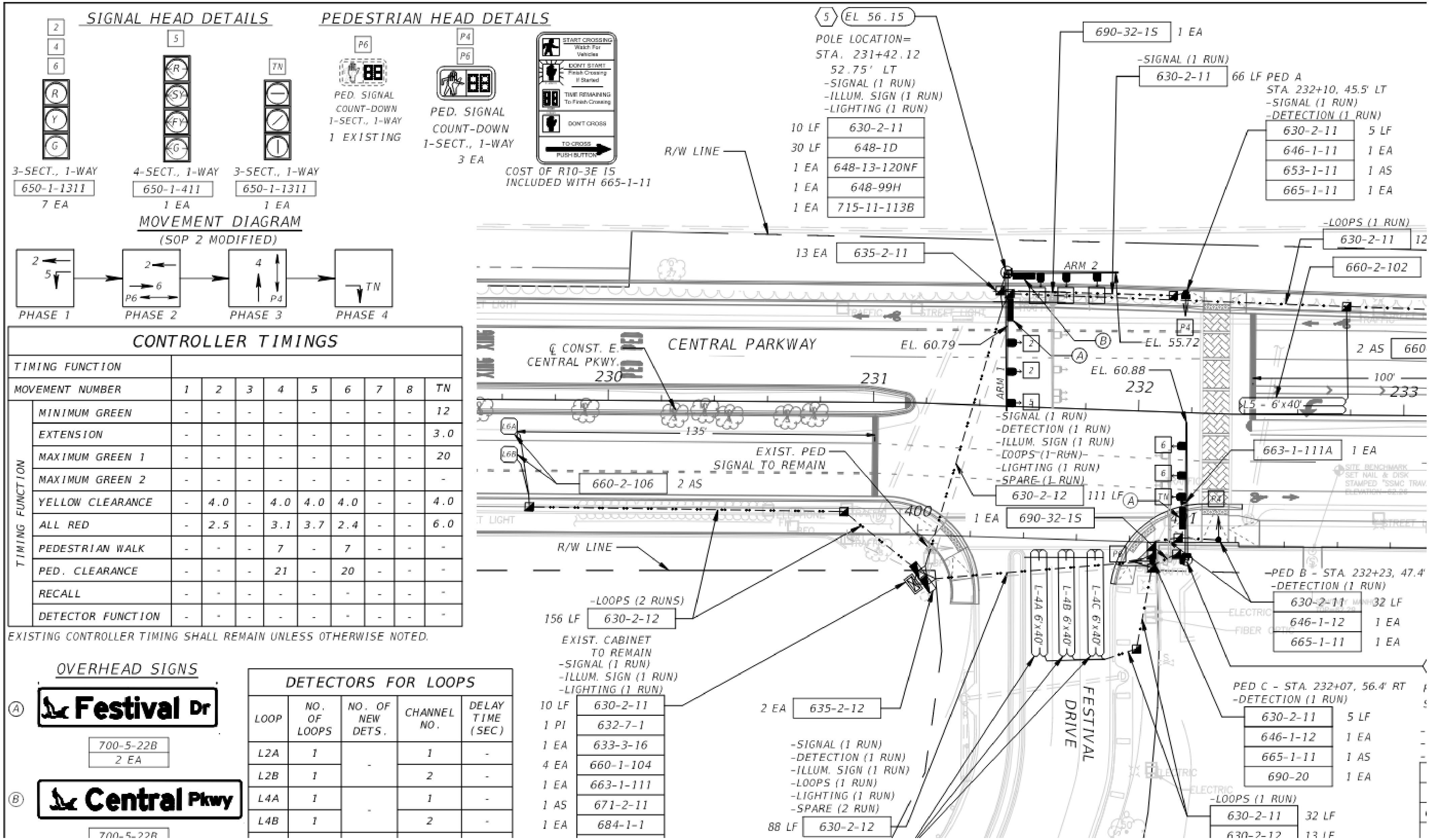
Altamonte Mall Exclusive AV Lane



Intersection AV Movements



Intersection AV Movements



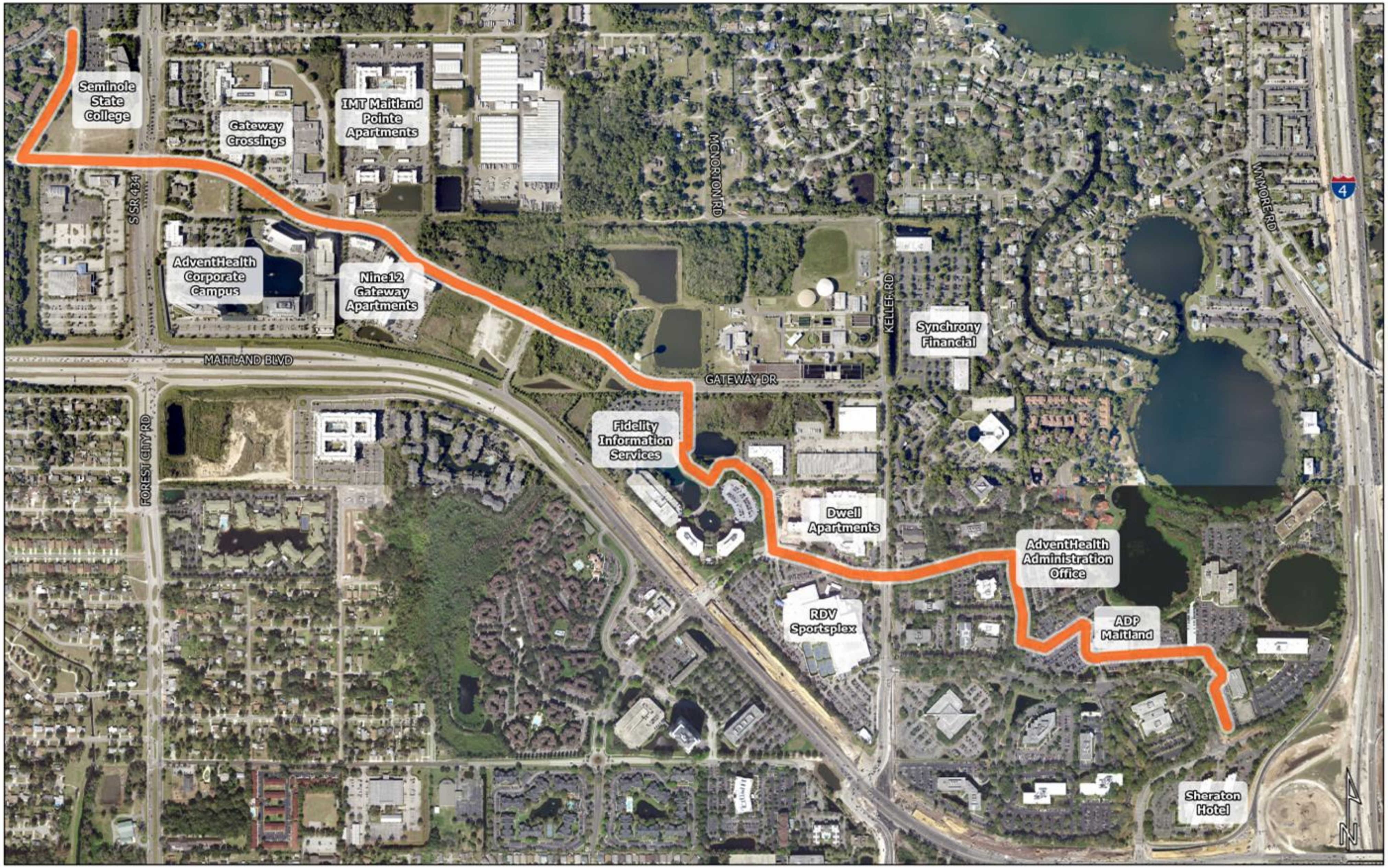
CONTROLLER TIMINGS

TIMING FUNCTION	1	2	3	4	5	6	7	8	TN
MINIMUM GREEN	-	-	-	-	-	-	-	-	12
EXTENSION	-	-	-	-	-	-	-	-	3.0
MAXIMUM GREEN 1	-	-	-	-	-	-	-	-	20
MAXIMUM GREEN 2	-	-	-	-	-	-	-	-	-
YELLOW CLEARANCE	-	4.0	-	4.0	4.0	4.0	-	-	4.0
ALL RED	-	2.5	-	3.1	3.7	2.4	-	-	6.0
PEDESTRIAN WALK	-	-	-	7	-	7	-	-	-
PED. CLEARANCE	-	-	-	21	-	20	-	-	-
RECALL	-	-	-	-	-	-	-	-	-
DETECTOR FUNCTION	-	-	-	-	-	-	-	-	-

DETECTORS FOR LOOPS

LOOP	NO. OF LOOPS	NO. OF NEW DETS.	CHANNEL NO.	DELAY TIME (SEC)
L2A	1	-	1	-
L2B	1		2	-
L4A	1	-	1	-
L4B	1		2	-

Potential Future Project – Gateway Dr AV Shuttle Project



Potential Future Project – Gateway Dr AV Shuttle Project

QUESTIONS?

BRETT BLACKADAR, PE, PMP, PTOE
Director of Mobility and Innovation/City Engineer
BBlackadar@altamonte.org
(407) 571-8338

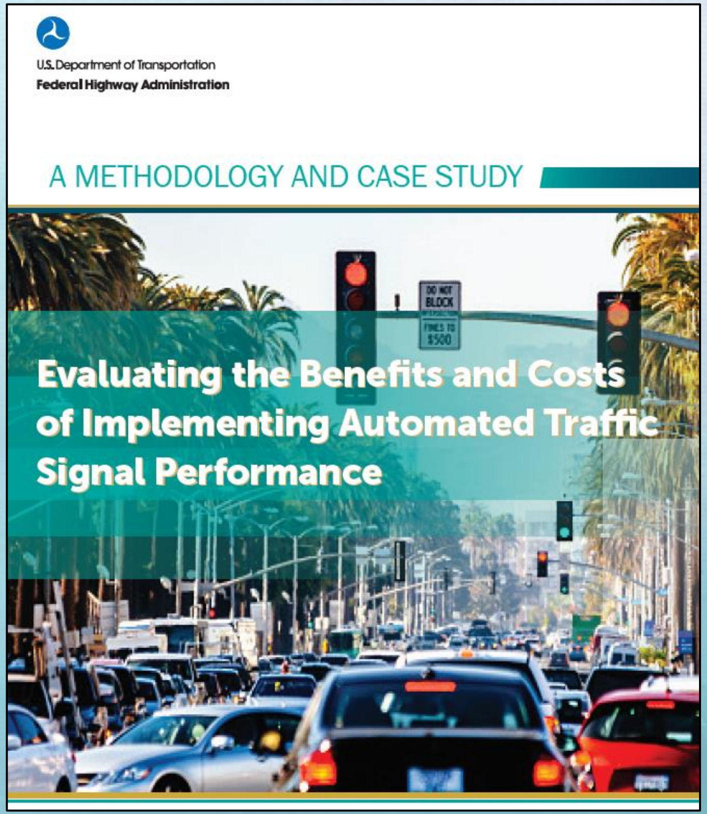
CITY OF ALTAMONTE Springs

ATSPM
Deployments across the Nation

David Williams, VHB

Automated Traffic Signal Performance Measures

- ATSPMs help an agency to:
  - Quickly identify issues
  - Proactively respond to issues
  - Efficiently operate the traffic signals via better timing parameters
  - Easily communicate outcomes to engineers, decision-makers, and the public
- A 2020 FHWA report examined benefits and costs of implementing ATSPMs, looking at six case studies



Automated Traffic Signal Performance Measures

- BCR of implementing ATSPMs in hypothetical scenario = **~8.24**
  - Costs

Table 5. List of cost items.

Line	Scope	Category	Item	Cost Type
1	S	Data logger	Procuring new controllers or controller add-on equipment/firmware.	Labor, infrastructure
2	S	Data logger	Updating existing controller firmware.	Labor
3	S	Data logger	Procuring external data collection devices.	Labor, infrastructure
4	S	Communication	New communication system added.	Infrastructure
5	L	Communication	Communication system maintenance.	Infrastructure
6	S	Detection	New detection systems added.	Infrastructure
7	L	Detection	Detection system maintenance.	Infrastructure
8	S	Detection	Reconfiguration of existing detection systems.	Labor, equipment
9	S	Detection	Documentation of detector assignments.	Labor
10	S	Server	New server procurement.	Equipment, labor
11	L	Server	Server maintenance and database management.	Labor
12	S	Software	Software license cost.	Equipment
13	S	Software	Installation cost.	Labor
14	L	Software	Maintenance and troubleshooting.	Labor
15	S	Integration	Business process integration.	Labor
16	L	Integration	Active ATSPM management/operations cost.	Labor

ATSPM = automated traffic signal performance measures. S = short term. L = long term.

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Automated Traffic Signal Performance Measures

- BCR of implementing ATSPMs in hypothetical scenario = **~8.24**
  - Benefits

Table 6. List of benefit items.

Line	Scope	Category	Item	Benefit Type
1	L	Organizational	Avoidance of manual data collection.	Agency
2	L	Organizational	Avoidance of unneeded retiming/maintenance activities.	Agency
3	L	Organizational	Reduced public complaint response time.	Agency
4	L	Organizational	Value of performance documentation.	Agency
5	Both	Maintenance	Discovery and repair of failed detectors.	Public (TT)
6	Both	Maintenance	Discovery and repair of broken communication.	Public (TT)
7	Both	Maintenance	Discovery and repair of other equipment failures.	Public (TT)
8	Both	Operations	Discovery and resolution of inefficient green distribution.	Public (TT)
9	Both	Operations	Discovery and improvement of poor coordination.	Public (TT)
10	Both	Operations	Discovery and mitigation of pedestrian operational issues.	Public (TT)
11	Both	Operations	Discovery and resolution of preemption-related issues.	Public (TT)
12	Both	Operations	Identification of locations with potential safety issues.	Public (CR)

CR = crash reduction. L = long term. TT = travel time or delay.

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Deployments across the Country – January 2017

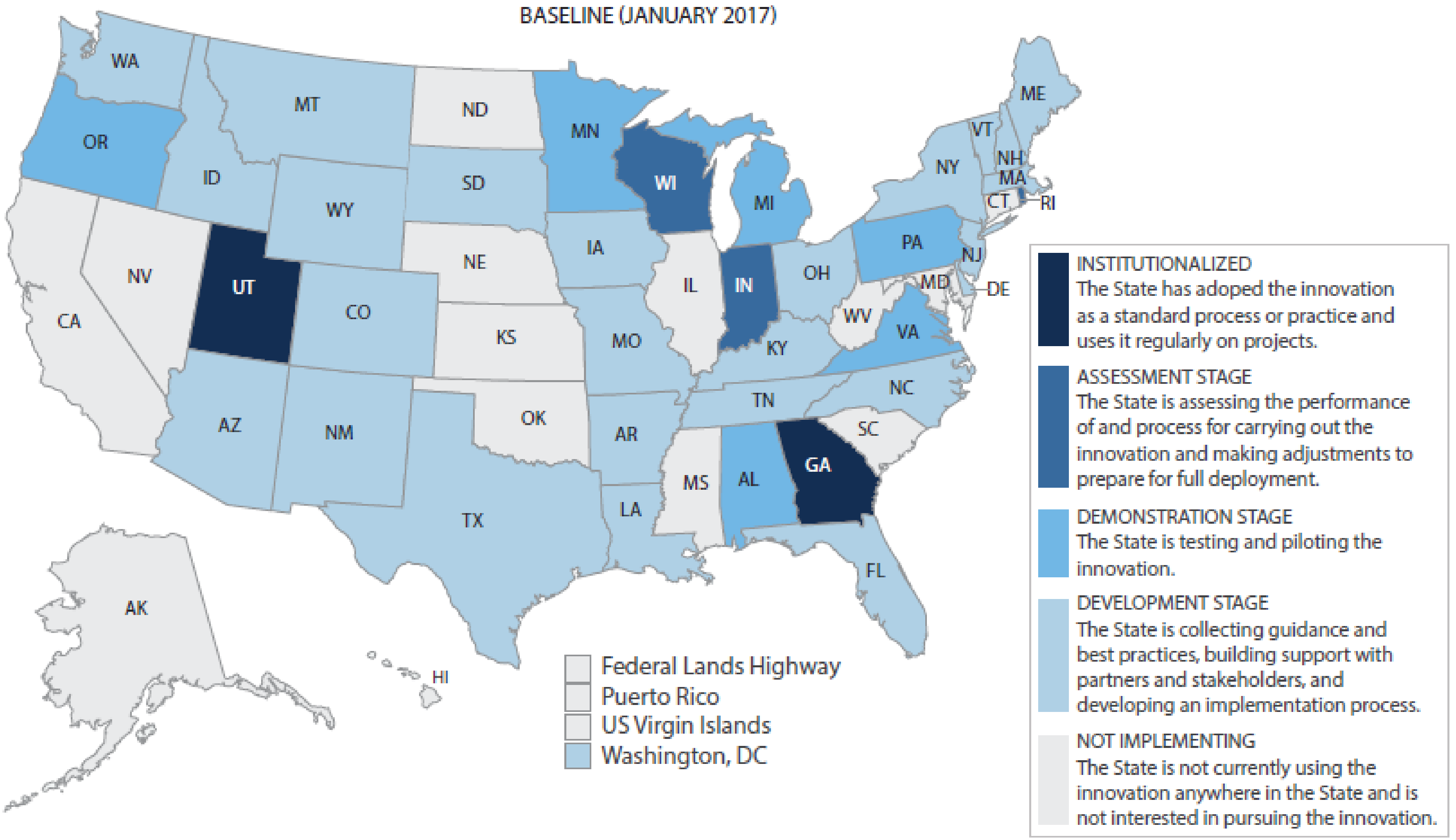
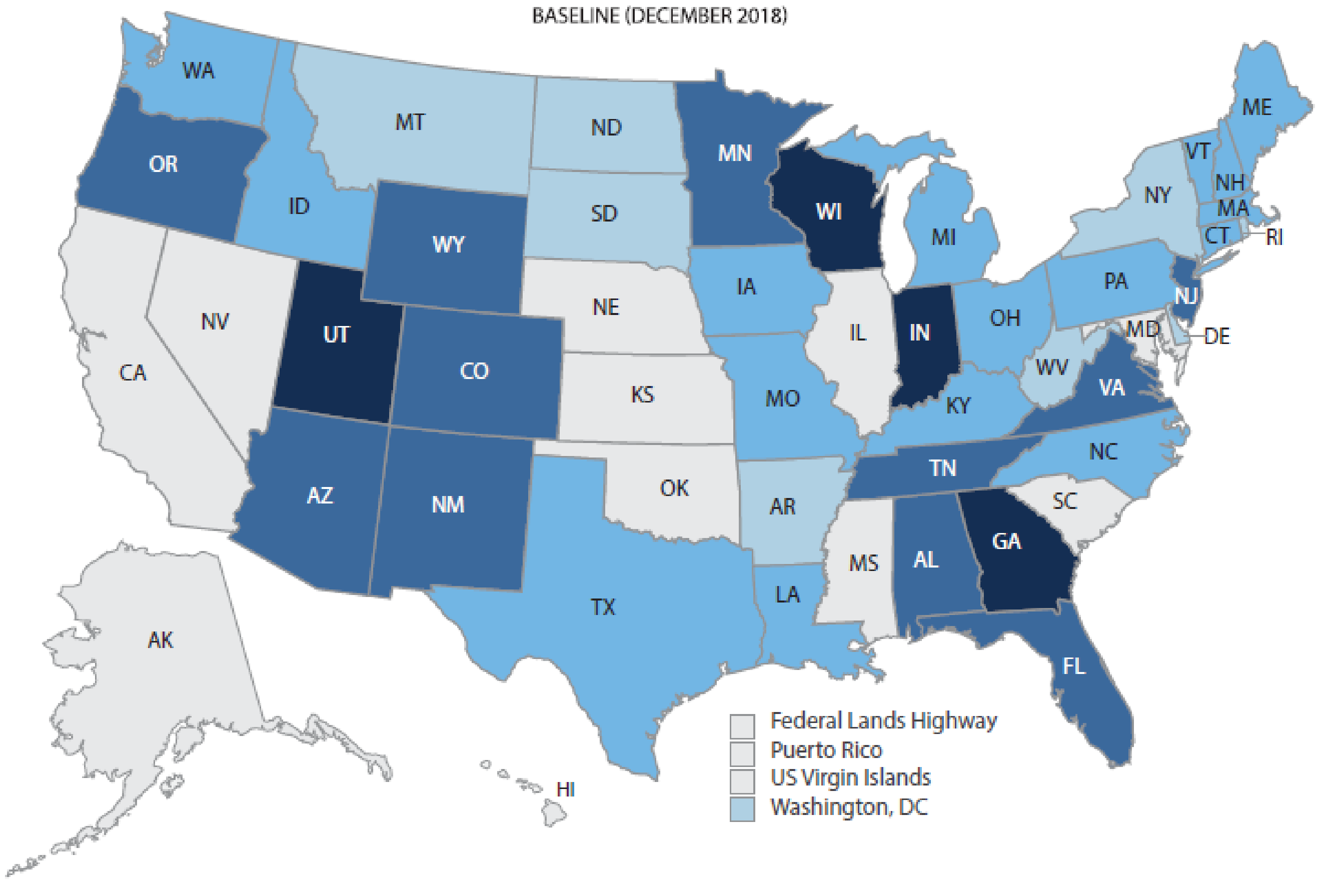


Figure 8. Map. Status of automated traffic signal performance measures implementation in January 2017.

Source: FHWA

Deployments across the Country – December 2018



INSTITUTIONALIZED	ASSESSMENT STAGE	DEMONSTRATION STAGE	DEVELOPMENT STAGE	NOT IMPLEMENTING
The State has adopted the innovation as a standard process or practice and uses it regularly on projects.	The State is assessing the performance of and process for carrying out the innovation and making adjustments to prepare for full deployment.	The State is testing and piloting the innovation.	The State is collecting guidance and best practices, building support with partners and stakeholders, and developing an implementation process.	The State is not currently using the innovation anywhere in the State and is not interested in pursuing the innovation.

Source: FHWA

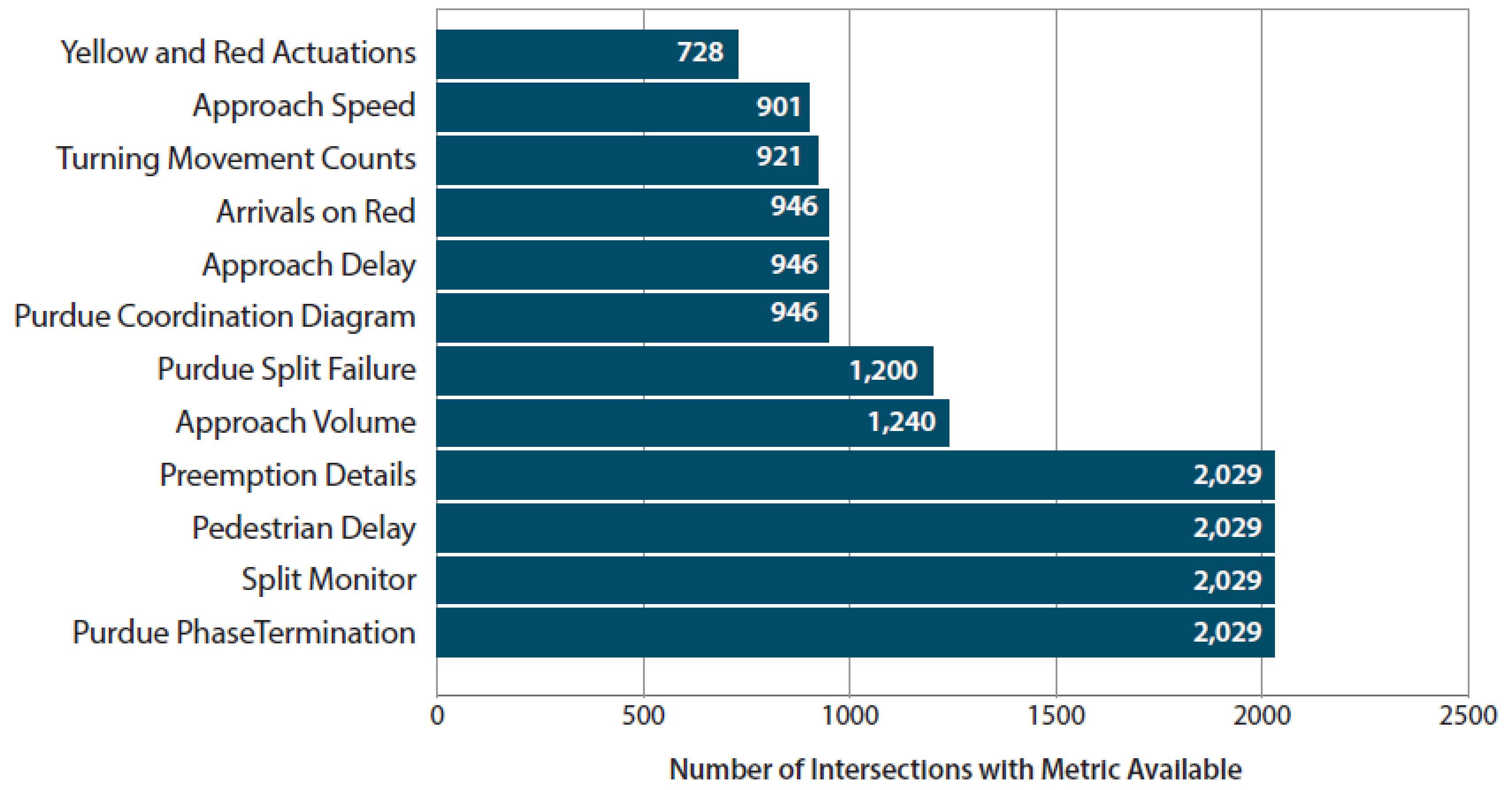
Figure 9. Map. Status of automated traffic signal performance measures implementation adoption in December 2018.

Case Study – Utah DOT

- Utah was one of the first agencies to use ATSPMs statewide (2011)
- Invested considerable resources to develop ATSPM software, now open-source
- Three questions led to Utah working with ATSPMs
  - How effective is traffic signal timing in Utah?
  - What is the trend in signal operations? Improving, staying the same, or getting worse?
  - What are the areas with the greatest need?

Case Study – Utah DOT

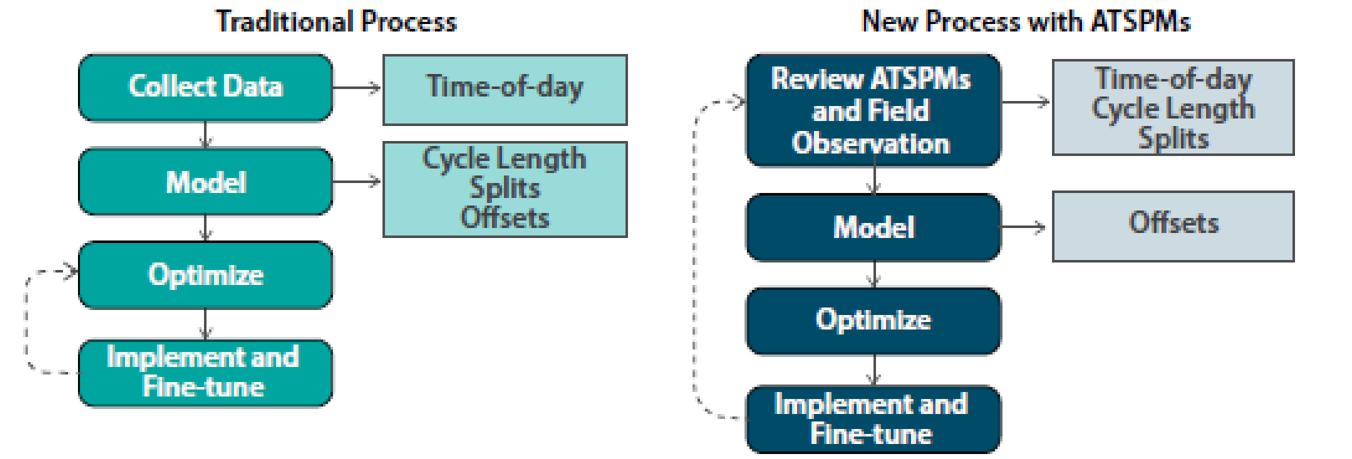
- Availability of PMs at # of traffic signal (as of May 2019)



Source: FHWA

Case Study – Utah DOT

- Most-used metrics (on web front-end; maintenance alert emails not included)
  - Purdue Phase Termination diagram
  - Turning Movement Counts
  - Approach Volumes
- ATSPMs have revolutionized UDOT's approach to O&M and signal timing



Source: Jamie Mackey (Utah Department of Transportation)

Figure 13. Flowchart. Transformation from traditional signal timing to a new process enabled by automated traffic signal performance measures.

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Case Study – Utah DOT

- Receiving complaints
  - When fielding complaints, staff member can now actively review the problem signal with the customer on the phone
    - In many cases, working with the customer like this can avoid a site visit
- Automated Detector Anomaly Detection

Utah DOT – ATSPM use cases over 10-month period

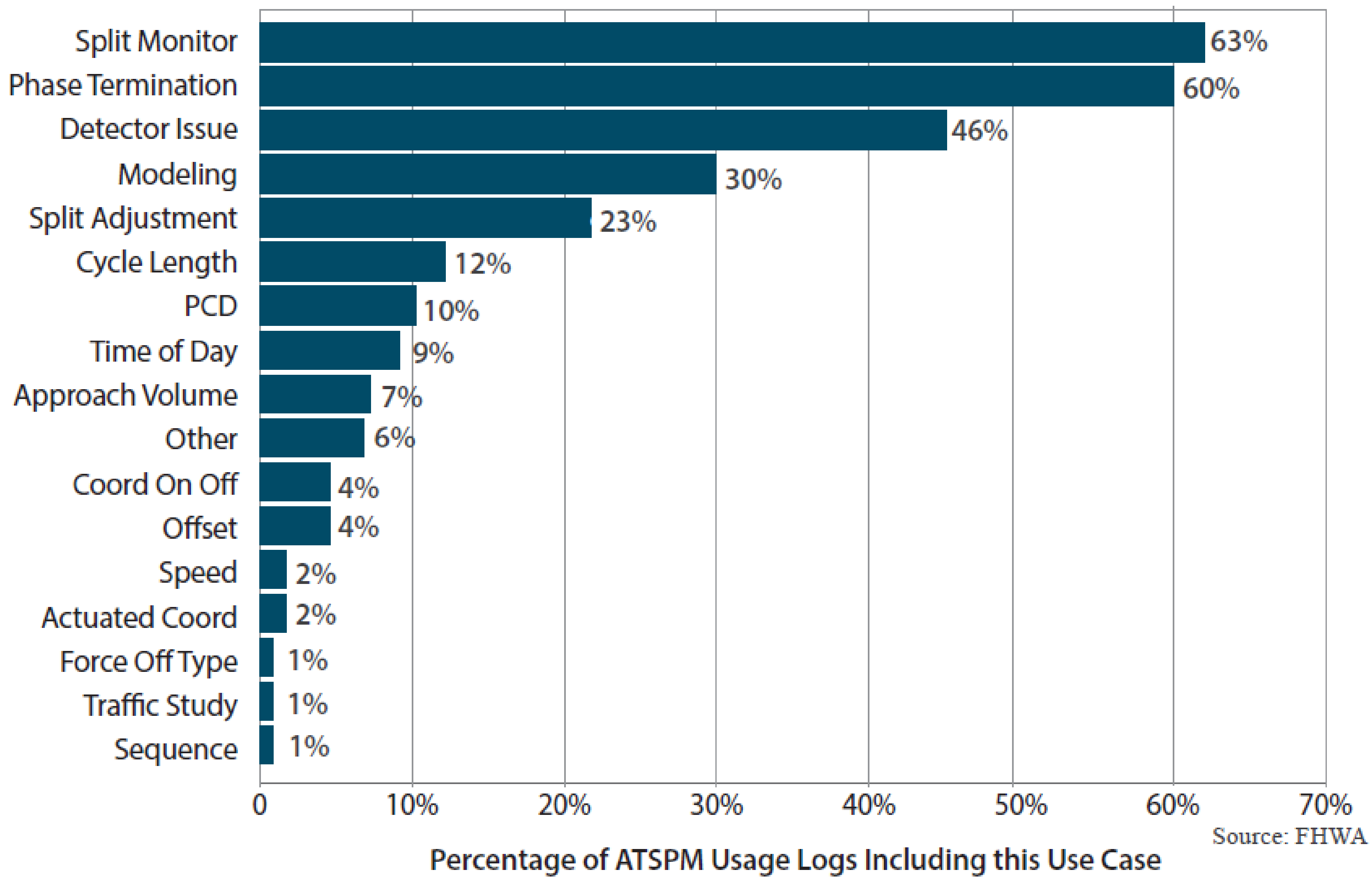


Figure 14. Bar Chart. Automated traffic signal performance measures use cases in Utah over a 10-month period from August, 2013, to May, 2014.

Case Study – Georgia DOT

- Largest deployment of traffic signals equipped with high-resolution data-collection capabilities
- 6,804 signals; 80% configured to create reports
- 70-80 full-time operations employees
- UDOT open-source ATSPMs used to:
    - Review data at a finite level (phase termination, coordination diagram, split monitor) and optimize operation
    - Track trends at the aggregated level

Case Study – Georgia DOT

- Prior to ATSPMs, GDOT relied on phone calls and complaints as the trigger to dispatch field staff
- Traffic signal infrastructure is now connected to management system that alerts operators to equipment malfunctions and assists in managing timing plans
- ATSPM results used for Before/After evaluations of implementations
- Configure detection for each intersection to align with ATSPM requirements
- GDOT created ATSPM documentation for other agencies to utilize in standing up their own ATSPM program

Case Study – Georgia DOT

- Most-used metrics
  - Phase Termination Diagram
  - Purdue Coordination Diagram
  - Split Monitor
  - Approach Volumes
  - Split Failures
- Mostly use ATSPMs for O&M
  - Have not yet used ATSPMs significantly for communication to decision-makers

Other Case Studies in FHWA Report

- Pennsylvania DOT
- Maricopa County DOT
- Lake County DOT
  - Purdue Coord. Diagram
  - Phase Termination
  - Ped Actuation to service time
  - Preemption event diagram
- Clark County, Washington

Table 20. Advantages of automated traffic signal performance measures, as stated by Maricopa County Department of Transportation.

Tasks	Conventional Operations	Operations with Automated Traffic Signal Performance Measures
Signal Retiming	· 3-day tube counts. · Develop plans in Synchro. · Tweak plans based on field observation. · Retime every 3–5 years.	· Continuous adjustment based on 24–7/365 performance measures.
Responding to Public Complaint Calls	· Investigate using central system software. · Observe on CCTV. · Send someone to field to observe.	· Show the performance of a particular phase at the exact time of day.
Performance Monitoring	· Assumed to be acceptable, unless there is a complaint. · Performance only based on yearly travel time assessment—only shows performance of progression and not side-street or left-turn impacts.	· Daily notification whether performance is below or above a threshold.

ATSPM = automated traffic signal performance measures. CCTV = closed-circuit television. MCDOT = Maricopa County Department of Transportation.

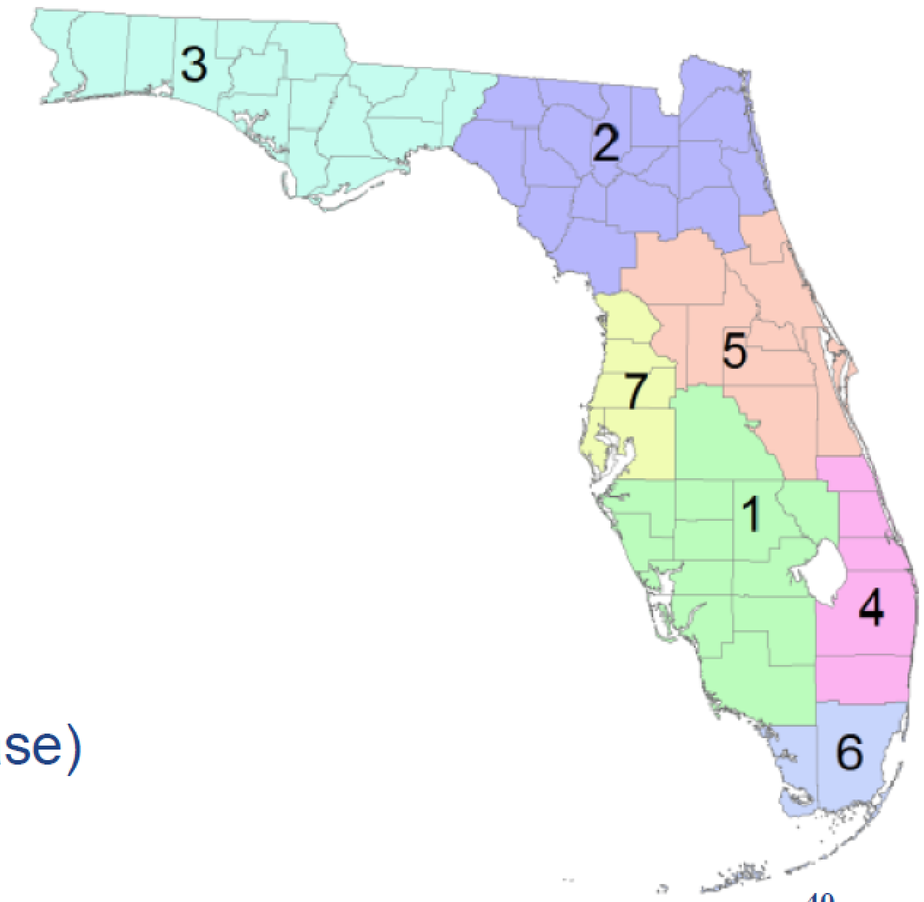
ATSPM Deployments within Florida

Existing Deployments

- Seminole County Traffic Signal Program (District 5)
- City of Tallahassee (District 3)
- Tampa / Hillsborough County (District 7)
- Districts 1, 2, 4, 5 and 7

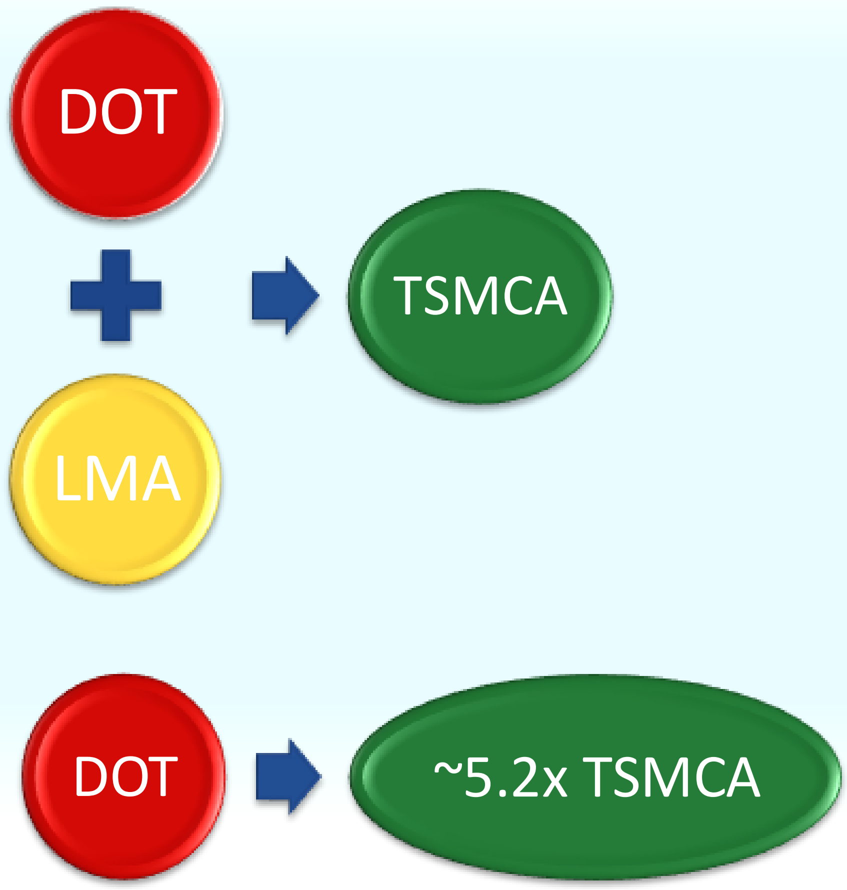
Upcoming Deployments

- D1 (US 41 & I-4 FRAME)
- D2 (SR 200)
- D3 (I-10 FRAME, SmartBay)
- D5 (I-75 FRAME, IMC Cameras, Computer Vision)
- D6 (Keys Coast)
- D7 (I-75 FRAME, Wavetronics, Purdue/Utah database)



Assume Full Traffic Signal Operations & Maintenance

99% of current conditions



D6 Florida Keys Example Raising standard of care

*2021 AASHTO CTE Survey

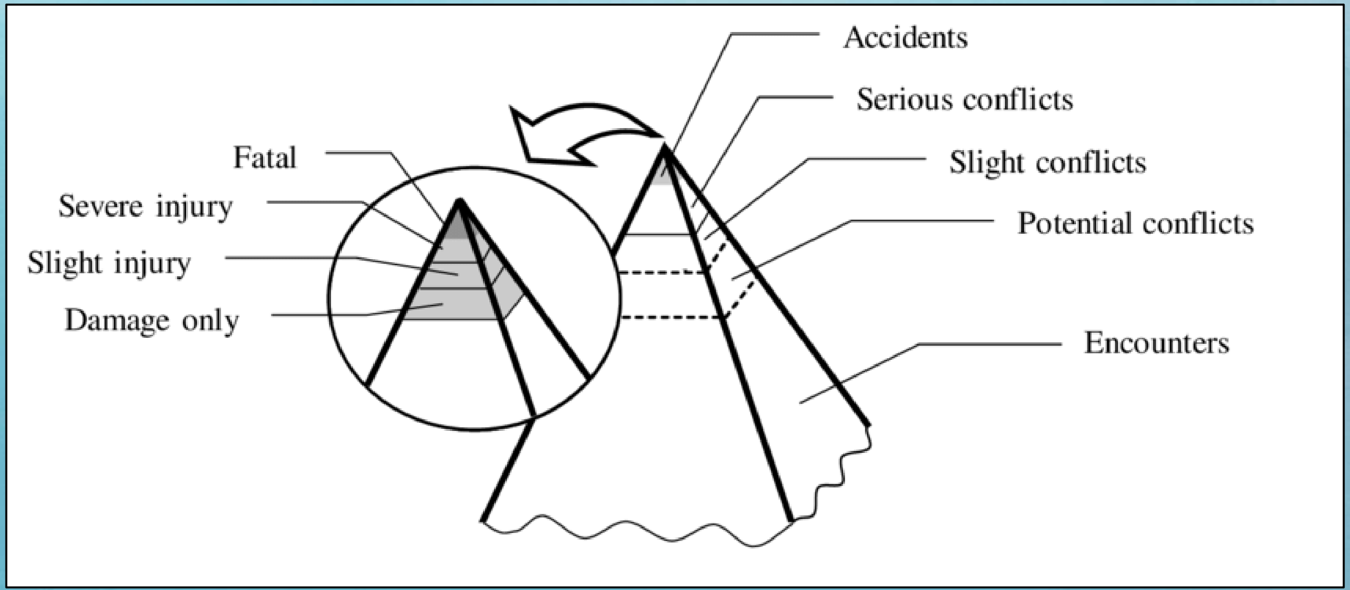
Estimate of Maintenance Cost per DOT Maintained Signal	
Georgia*	$10,200
Texas*	$7,039
Utah*	$6,000
Florida (IMTS FY 22)	$5,134
Nebraska*	$5,000
Oregon*	$5,000
Average	**$4,047**
Florida (TS FY 22)	$3,573
Ohio*	$3,000
Maine*	$2,500
Indiana*	$2,280
Wyoming*	$2,234
North Carolina*	$2,200
South Dakota*	$2,000
Rhode Island*	$500

Surrogate Safety Measures

David Williams, VHB

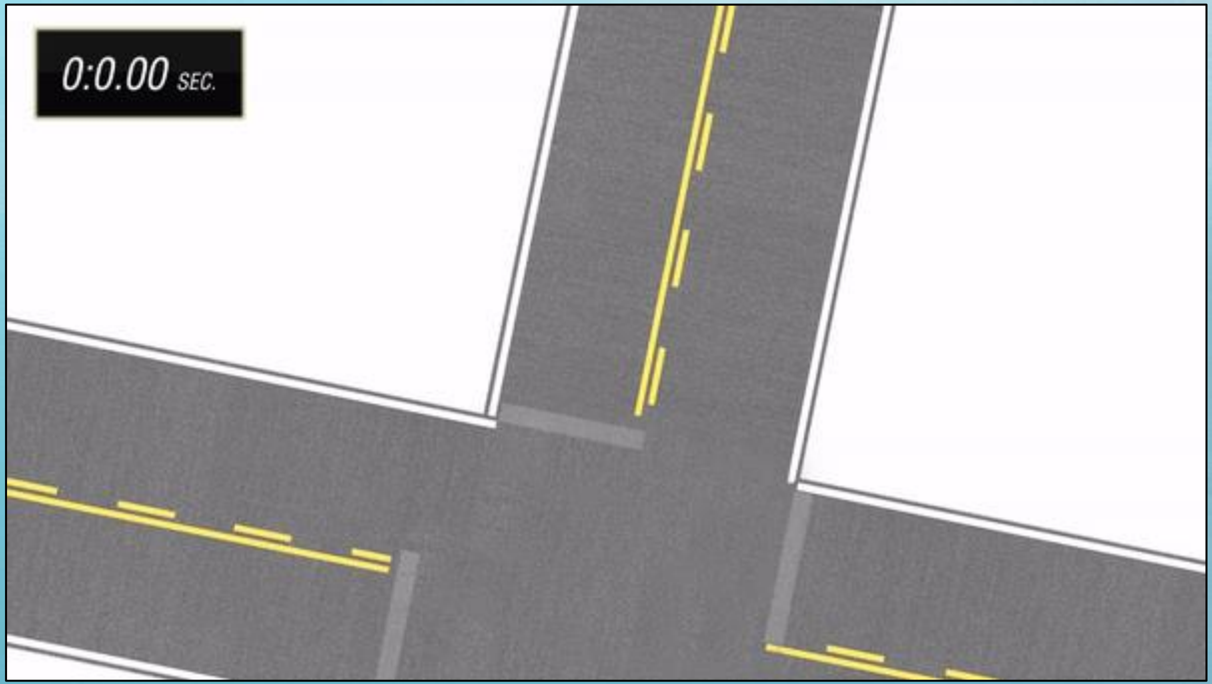
Surrogate Safety Measures

- Various methods for identifying future traffic conflicts
- “Calculates collision risk of a certain traffic situation with microscopic traffic parameters such as vehicle speed, acceleration, time headway, and space headway”
- Typically account for either crash probability or crash severity



Surrogate Safety Measures

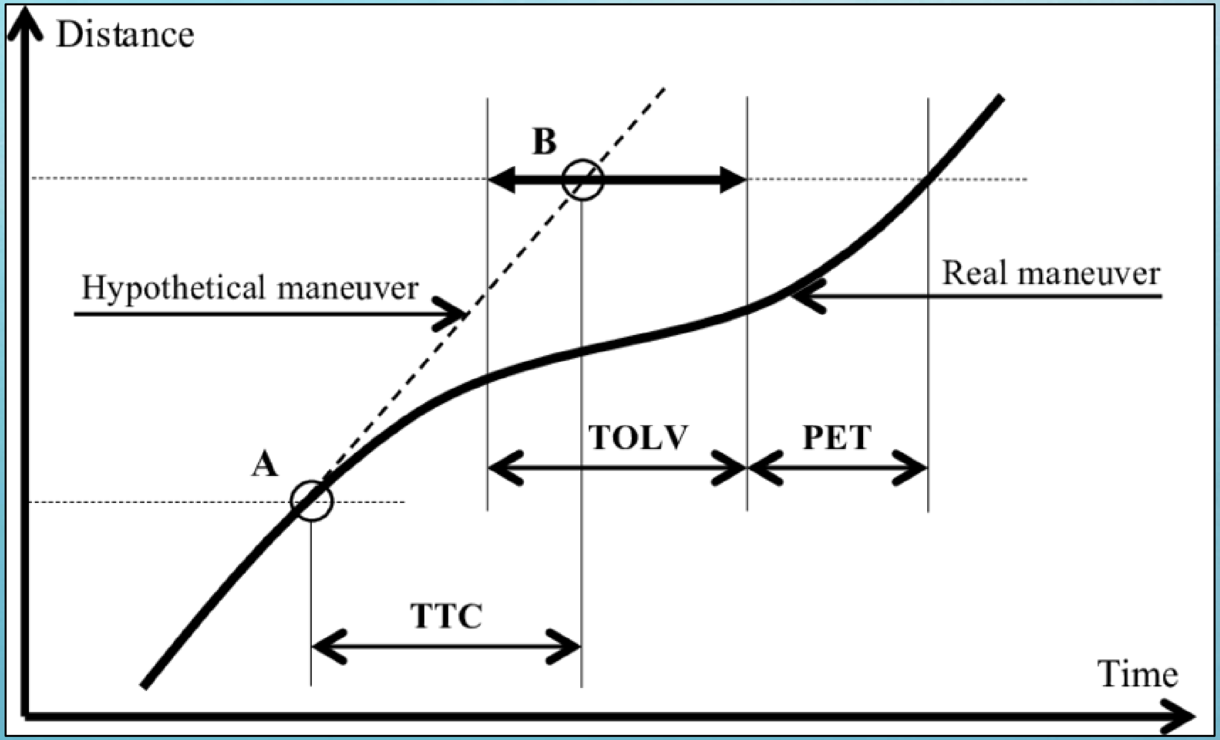
- **Post Encroachment Time (PET)**
  - Time difference between a vehicle leaving the area of encroachment and a conflicting vehicle entering the same area
  - The higher the PET, the less likely the collision



Transoft Solutions (2021). https://safety.transoftsolutions.com/blog/collision-probability-vs-collision-severity/

Surrogate Safety Measures

- **Time-to-Collision (TTC)**
  - Time required for two road users to collide if they continue at their present speeds and on the same trajectories
    - Continually calculated over time as the vehicles change trajectory/speed



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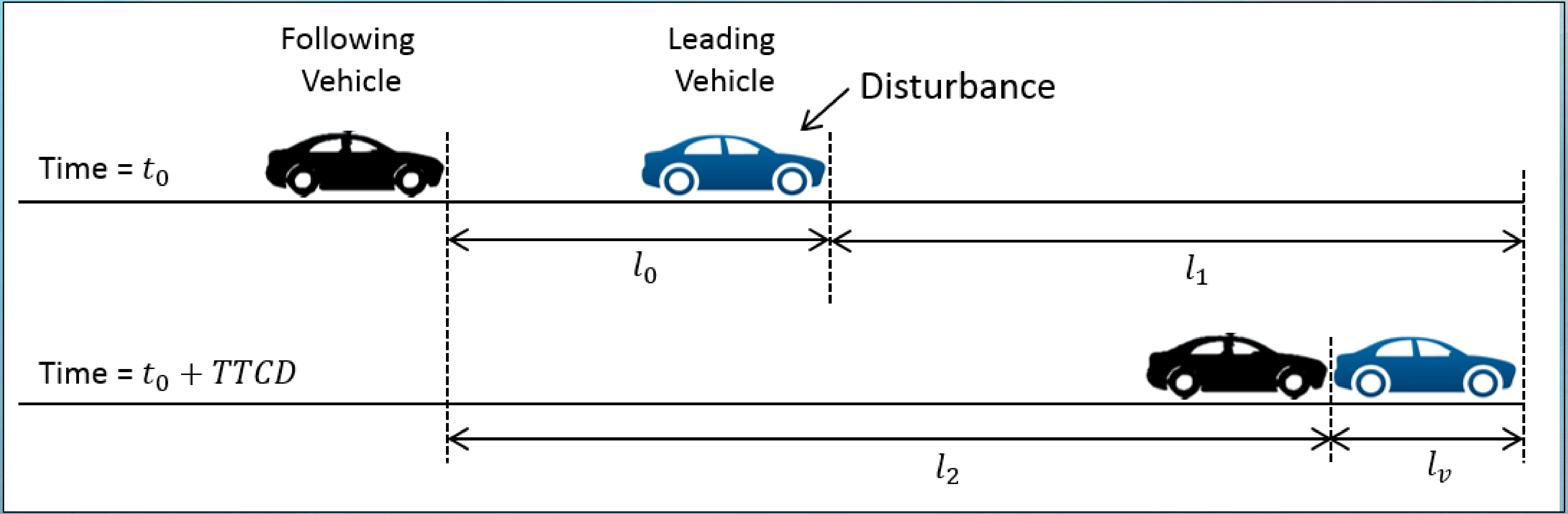
Surrogate Safety Measures

- **Time-to-Collision with Disturbance (TTCD)**
  - Time it takes for collision to occur if the speed of the following vehicle remains unchanged after disturbance is imposed on lead vehicle
    - Recent SSM introduced in 2018 study



Surrogate Safety Measures

- **Deceleration Rate to Avoid Crash (DRAC)**
  - Minimum deceleration rate required for following vehicle to avoid a collision with lead vehicle
  - AASHTO quantifies a vehicle as in conflict if it exceeds DRAC ratio of $3.4 m/s^2$
  - Higher DRAC value indicates a more dangerous car-following scenario
- **Crash Potential Index (CPI)**
  - Probability that a given vehicle's DRAC exceeds its maximum available deceleration rate (MADR)
- **Encroachment Time (ET)**
  - Time during which the turning vehicle infringes upon the thru vehicle's right-of-way
- **Proportion of Stopping Distance (PSD)**
  - Ratio between the remaining distance to the potential point of collision and the minimum acceptable stopping distance.

Criticisms of Crash Data and SSM

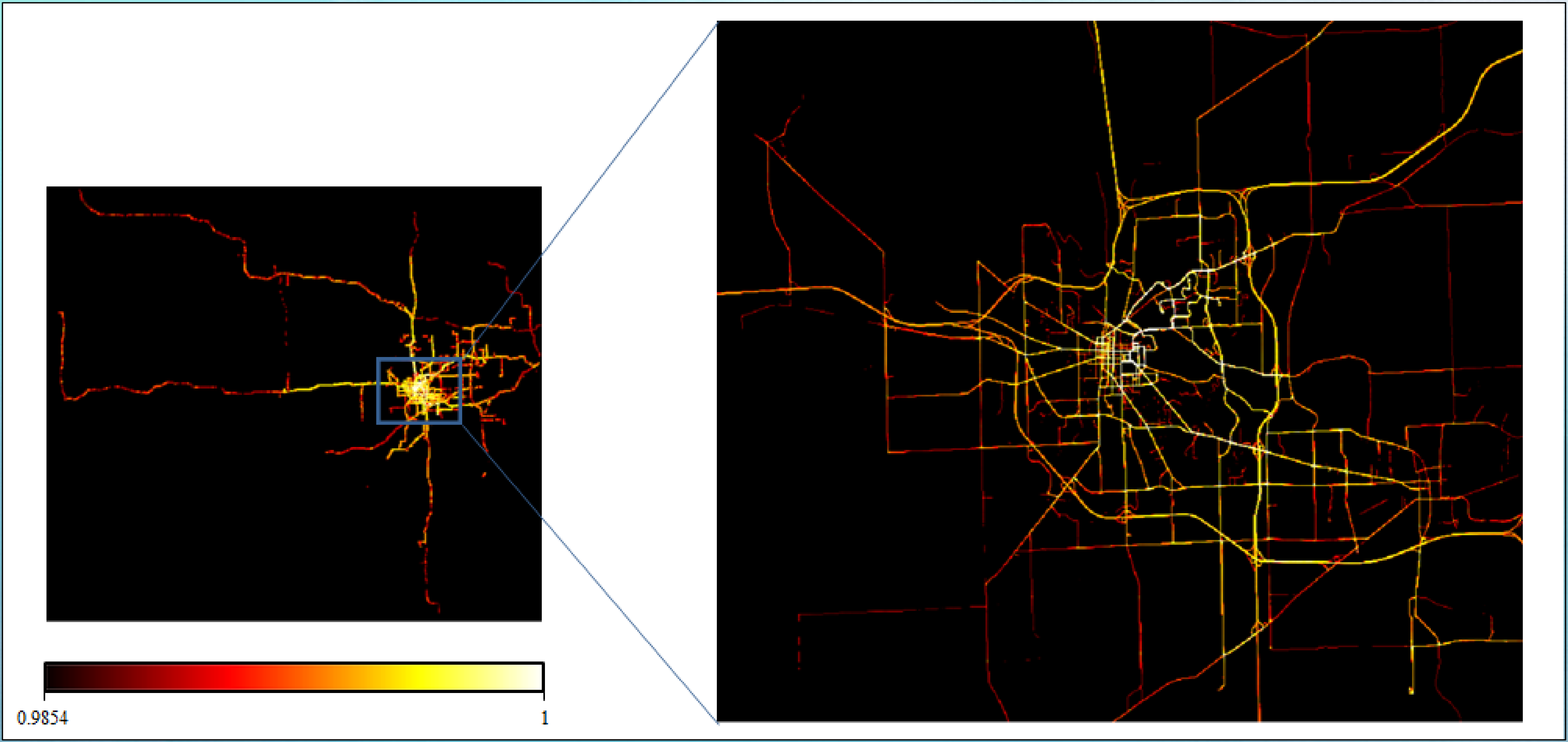
- Crash data
  - Long data collection period
  - Potential for underreporting
  - Altering infrastructure and/or operations may reduce relevance of the historical crash data
- Surrogate Safety Measures
  - For typical SSMs like TTC, scenarios where the following vehicle's speed is lower than a leading vehicle's speed are regarded as safe, even when the spacing between them is very small
  - Driver's reaction time not considered
  - Arbitrary thresholds (DRAC > $3.4 m/s^2$) may lead to inaccurate outcomes

Safety Pilot Model Deployment (SPMD)

- In 2013, the SPMD was conducted in Ann Arbor, Michigan
  - ~3,000 vehicles equipped with V2V communications operating under real-world conditions, collecting and transmitting high-quality CV data
- A 2018 study* used the SPMD data from April 2013 to compare SSMs with available crash data
  - 62,589,725 messages were collected by 90 vehicles equipped with Data Acquisition System (DAS) in the study during that month
    - 15,721,962 GPS points collected (see heatmap)
  - Crash data and traffic volumes were obtained for 75 highway segments
    - 2,323 crashes occurred on selected highways in 2013; 1,027 (44%) were rear-end

Xie et al (2018). *Use of Real-world Connected Vehicle data in identifying high-risk locations based on a new surrogate safety measure.* https://www.researchgate.net/publication/326234849_Use_of_Real-world_Connected_Vehicle_data_in_Identifying_High-risk_Locations_based_on_a_New_Surrogate_Safety_Measure

Heatmap of SPMD CV data



Safety Pilot Model Deployment (SPMD)

- Using the optimal threshold values, the 2018 study compared the CV data against the crash data
  - Identified ***statistically significant relationships*** between each SSM and the crash data

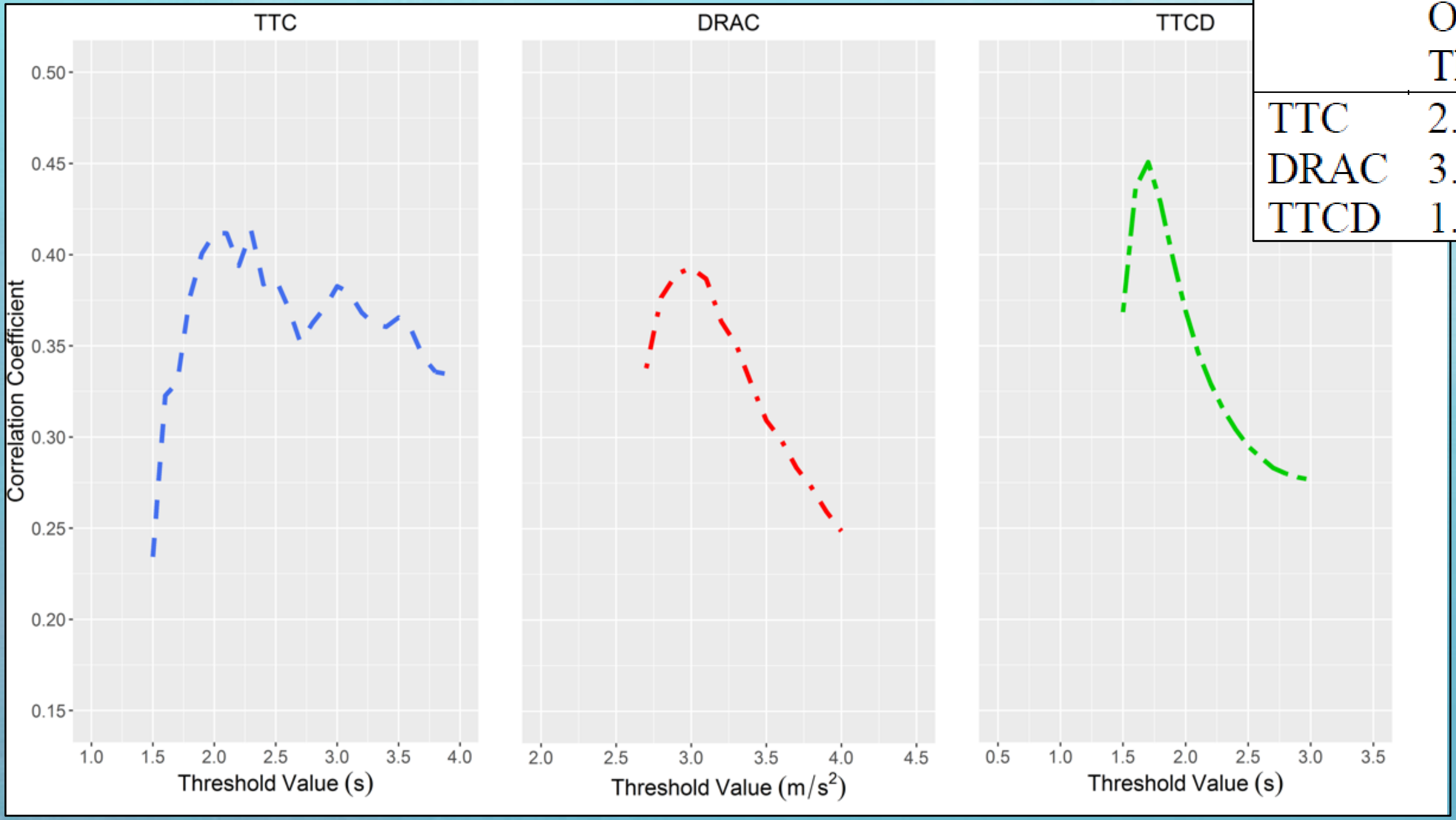


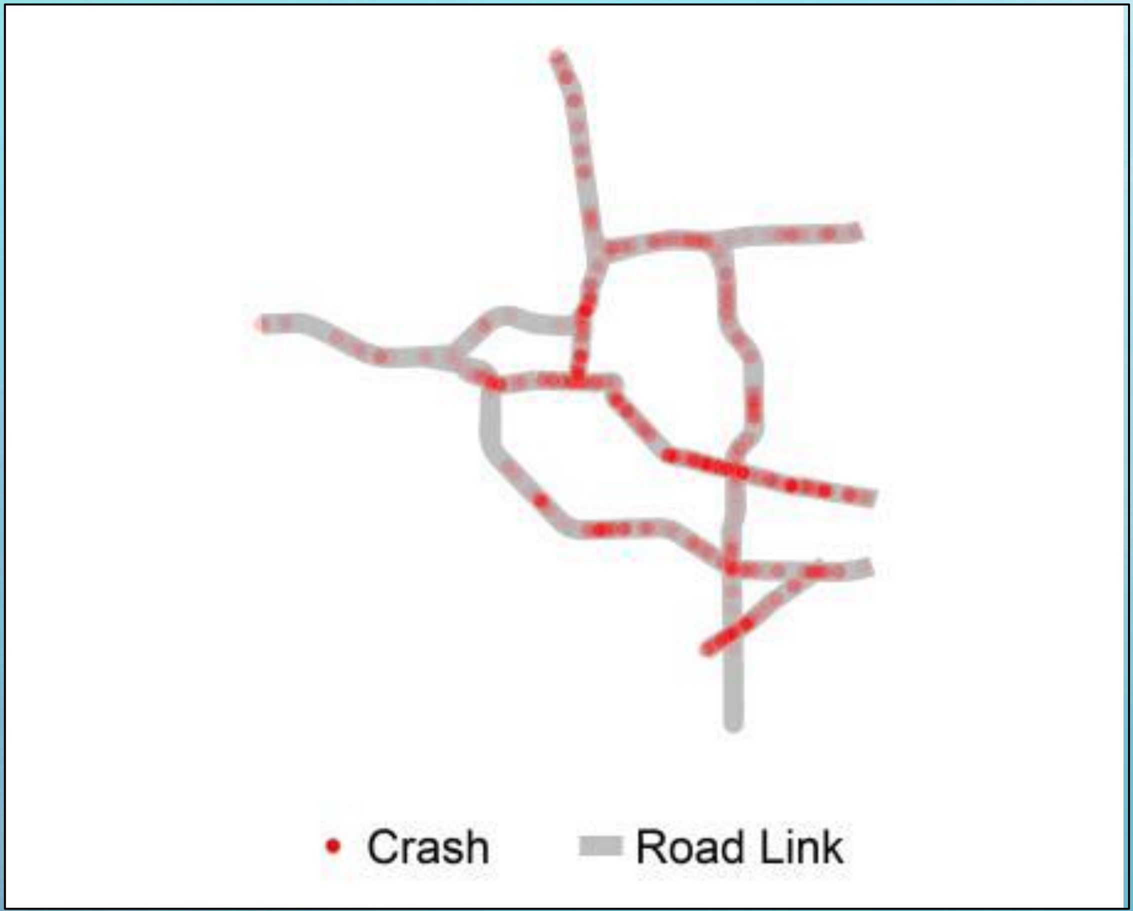
Table 2 Correlation Significance Test Summary

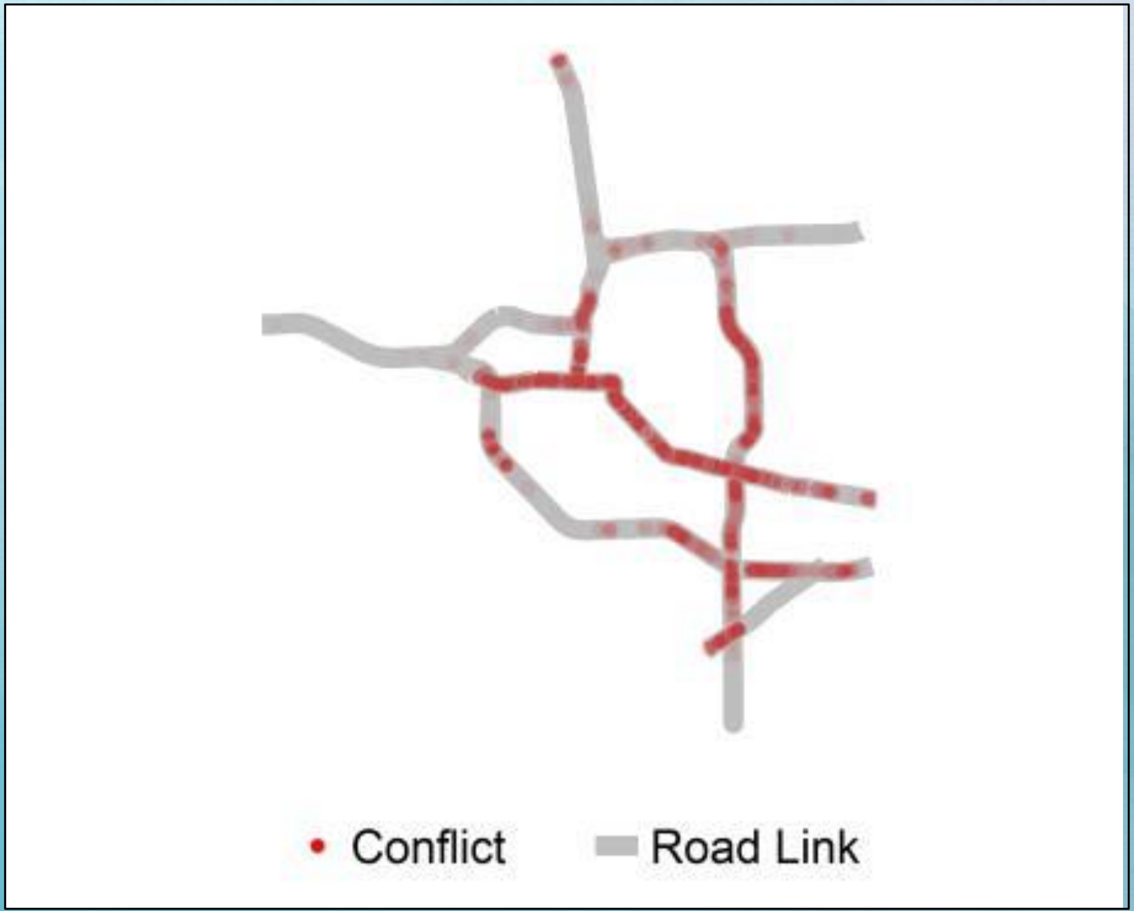
	Optimal Threshold	Pearson's correlation coefficient	P-value
TTC	2.3 s	0.41	0.0002
DRAC	3.0 m/s^2	0.39	0.0005
TTCD	1.7 s	0.45	0.0000

Optimal thresholds for each SSM determined by maximizing correlation coefficients between risk and rear-end crash data

Safety Pilot Model Deployment (SPMD)

- The TTCD metric was also able to identify high-risk locations that were comparable to the historical rear-end crash data





Questions

General Bikeshare Feed Specification

1.0 → 2.0

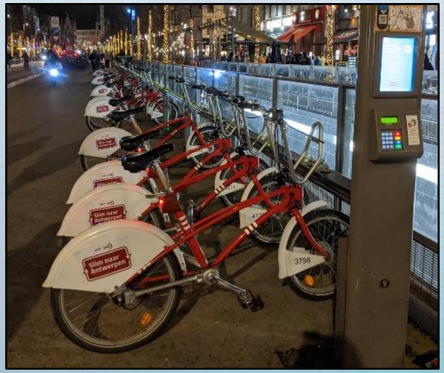
Jeremy Dilmore, District Five TSM&O

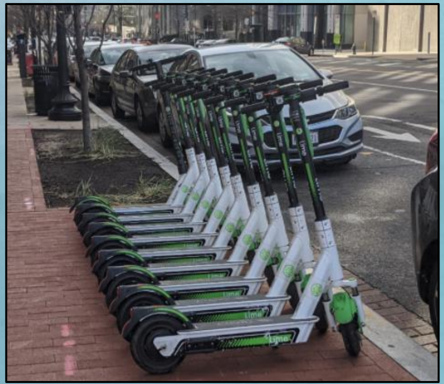
General Bikeshare Feed Specification

- GBFS 1.0 – open data standard for shared mobility options, similar to the GTFS standard
  - Provides publicly available **real-time, read-only data** feeds in uniform format
  - Originally developed for bikeshare; scootershare and other services adopted standard and improvised data usage
  - 230+ shared bike/scooter operators adopted GBFS to share real-time data with mobile apps

GBFS 1.0 → 2.0

- **Deep links** added for seamless integration between provider app and third-party apps
  - Improves convenience
  - No intermediary steps; no redirect to app store
- Requires *bike_id* rotation after each rental
  - Improves privacy by increasing difficulty to reconstruct individual trips
- Adjusts file structure for cleaner feed communication
- Clarifies definitions; adjusts JSON values for clarity





*Summary provided by MobilityData. https://mobilitydata.medium.com/whats-new-in-gbfs-v2-0-63eb46e6bdc4

GBFS 2.x

- v2.1
  - Support for geofenced areas and virtual stations (dockless operation)
  - Vehicle Type definitions
- **v2.2 (current version)**
  - Extend *system_pricing_plans* for dockless vehicles
- v2.3 Release Candidate (proposed)
  - Add vehicle drop-off restrictions via geofencing
  - Vehicle icons & brand info
  - Reserve time for vehicle type
  - Add pricing plans to vehicle types
  - Add fields for terms/privacy policy
  - Add field to designated vehicle charging stations

Additional Information

- Google: “GBFS” or “Bikeshare Feed”
- Direct Link to **current GBFS**
  - https://github.com/NABSA/gbfs/blob/master/gbfs.md
- GBFS Version History
  - https://github.com/NABSA/gbfs/blob/master/README.md#read-the-spec--version-history
- North America Bikeshare & Scootershare Association
  - https://nabsa.net/

Current Initiatives

Jeremy Dilmore, District Five TSM&O

THANK YOU!

Next Consortium – December 2, 2021

TSM&O Consortium Meeting

MEETING AGENDA
Teleconference | FDOT D5 RTMC 4975 Wilson Rd. Sanford, FL 32771

October 7, 2021
10:00 AM-12:00 PM

1) WELCOME
2) LOCAL AGENCY UPDATES
   - City of Altamonte Springs – Brett Blackadar
3) AUTOMATED TRAFFIC SIGNAL PERFORMANCE MEASURES
   - David Williams, VHB
4) SAFETY SURROGATE MEASURES
   - David Williams, VHB
5) MICROMOBILITY – GENERAL BIKESHARE FEED SPECIFICATION (GBFS)
   - Jeremy Dilmore, District Five TSM&O
   - https://github.com/NABSA/gbfs/blob/master/gbfs.md
6) TSMCA UPDATES
   - Jeremy Dilmore, District Five TSM&O
7) CURRENT INITIATIVES
   - Jeremy Dilmore, District Five TSM&O