

# ATI/ALDOT Collaborative Transportation Operation Project Updates

Alabama Transportation Planners Association  
2023 Annual Conference

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*July 19 - 21, 2023 - Tuscaloosa, AL*

# ATI/ALDOT projects

- *ATCMTD (ACTION) - WCR*
- *ATCMTD 2.0 (PROACT) - North Alabama/Cullman*
- *ATSPM - WCR & Statewide*
- *ALDOT HPMS - statewide*

# What is ATCMTD?

Fixing America's Surface Transportation Act or "FAST Act"

## ADVANCED TRANSPORTATION AND CONGESTION MANAGEMENT TECHNOLOGIES DEPLOYMENT

Fiscal year	2016	2017	2018	2019	2020
Authorization	\$60 M	\$60 M	\$60 M	\$60 M	\$60 M

### Program purpose

The FAST Act established the Advanced Transportation and Congestion Management Technologies Deployment Program to make competitive grants for the development of model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment.

# ATCMTD in WCR (2018 - present)

Initiative to deploy an **A**dvanced **C**onected **T**ransportation **I**nfrastructure & **O**perations **N**etwork on freeway and arterials in and around Tuscaloosa

**ACTION**

\$16.8 million (USDOT \$8m, ALDOT \$4m, TCRC \$4.3m and UA \$0.5m)



## West Central Alabama ACTION

Advanced Connected Transportation Infrastructure and Operations Network

*Improving Efficiency, Capacity, and Safety through Technology Deployment*

# **ACTION - technology deployment**

- *Network Pan-Tilt-Zoom Cameras*
- *Deep-Learning Algorithms for Camera Crash Detection*
- *Fiber optic communication*
- *Dynamic digital message signs (DMSs)*
- *Communication - Radios and Cellular*
- *Vehicle monitoring and counting system*
- *Advanced Traffic Signal Controllers*
- *Mobile Application Platform (Travel Safely)*
- *CV Traffic Communications*

# ACTION - Objectives

- **Deploy** sensors, communications, analytical tools, and technologies to monitor and proactively manage the freeway and arterial network for safer and more efficient operations.
- **Improve** system reliability and performance using data integration, analytics, and applications.
- **Enhance** mobility within the region to improve access to economic activities, education, employment, and healthcare, especially for underserved communities.
- **Increase** system level fuel economy and mitigate adverse environmental effects.
- **Provide** economic benefits to the region by improving system throughput and reducing delays.

# ACTION - Performance Goals

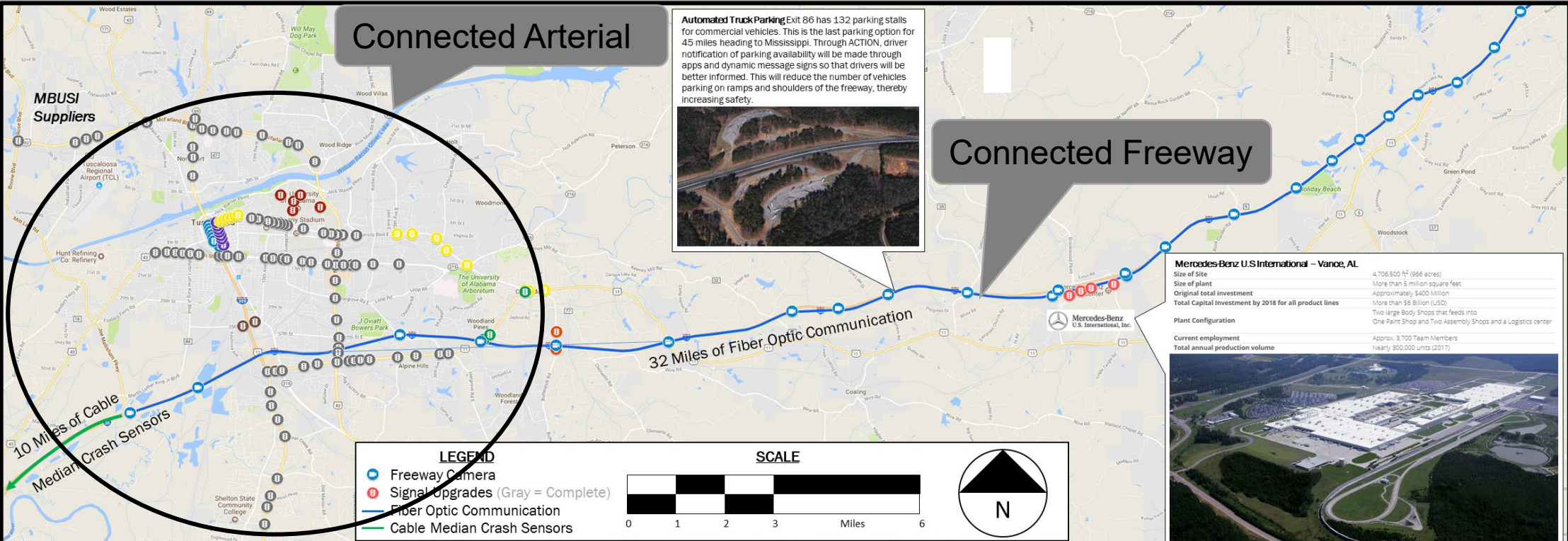
- **Improve** safety by reducing the number of secondary crashes by 20% in this area.
- **Increase** travel time reliability and system resilience by 25%, and increase transit accessibility and mobility.
- **Reach** at least 50% of the motorists in the region with apps and other information systems.
- **Achieve** systems-level fuel economy benefits by up to 5% and thereby reduce emissions.
- **Reduce** industry downtime for JIT and JIS manufacturing by 5%.
- **Integrate** at least 75% of intersections and 70% of the freeway network in the ACTION region.

# Connected Arterial

**Automated Truck Parking** Exit 86 has 132 parking stalls for commercial vehicles. This is the last parking option for 45 miles heading to Mississippi. Through ACTION, driver notification of parking availability will be made through apps and dynamic message signs so that drivers will be better informed. This will reduce the number of vehicles parking on ramps and shoulders of the freeway, thereby increasing safety.



# Connected Freeway



**Mercedes-Benz U.S. International – Vance, AL**

Size of Site	4,706,500 ft <sup>2</sup> (866 acres)
Size of plant	More than 5 million square feet
Original total investment	Approximately \$400 Million
Total Capital Investment by 2018 for all product lines	More than \$5 Billion (USD)
Plant Configuration	Two large Body Shops that feeds into One Paint Shop and Two Assembly Shops and a Logistics center
Current employment	Approx. 3,700 Team Members
Total annual production volume	Nearly 300,000 units (2017)



**LEGEND**

- Freeway Camera
- Signal Upgrades (Gray = Complete)
- Fiber Optic Communication
- Cable Median Crash Sensors

**SCALE**

- Lurleen B Wallace Blvd (DSRC + Cameras)**
- University Blvd
  - 6th St
  - 7th St
  - 8th St
  - Stillman Blvd
  - Paul W Bryant Dr
  - 11th St
  - 12th St

- Greensboro Ave**
- 12th St
  - Paul W Bryant Dr
  - Stillman Blvd
  - 8th St
  - Stillman Blvd
  - Paul W Bryant Dr
  - 11th St
  - 12th St

- University Blvd**
- 23rd Ave
  - 22nd Ave
  - 21st Ave
  - 20th Ave
  - 19th Ave
  - Queen City Ave

- UA Campus**
- Hackberry@Campus
  - Campus@Bryce
  - Hackberry@Bryce
  - Bryce@NorthCampus
  - Hackberry@McCorvey

- University Blvd East**
- 25th Ave
  - 26th Ave
  - 30th Ave
  - Crescent Ridge Rd E
  - Brookhill Rd
  - Veterans Memorial Pkwy
  - Buttermilk Rd
  - Skyland Blvd E
  - Prude Mill Rd

- US-11 Exit 89 MBUSI**
- Daimler Benz Blvd
  - West Plant Entrance
  - East Plant Entrance

- I-359 Exit 2 - 35<sup>th</sup> St**
- 11th Ave
  - Trevor S Phillips Ave

- US-11 Skyland Blvd**
- I-20/59 WB Ramp
  - Jvc Rd

- Buttermilk Rd Exit 77**
- I-20/59 EB Ramp
  - Jvc Rd

- I-20/59 Camera + Volume/Count + DSRC Locations**
- CCTV Exit 68
  - CCTV MP 70.0
  - CCTV MP 74.3
  - CCTV Exit 76
  - CCTV Exit 77
  - CCTV Exit 79
  - CCTV MP 82.5
  - CCTV MP 83.6
  - CCTV MP 84.6
  - CCTV Exit 86
  - CCTV Exit 89 EB Off-Ramp
  - CCTV Exit 89 WB On-Ramp
  - CCTV Exit 89 EB On-Ramp
  - CCTV Exit 89 WB Off-Ramp
  - CCTV MP 90.6
  - CCTV MP 92.2
  - CCTV MP 93.5
  - CCTV MP 94.5
  - CCTV MP 95.5
  - CCTV MP 96.0
  - CCTV MP 96.7
  - CCTV MP 97.6
  - CCTV MP 98.6
  - CCTV MP 99.6
  - CCTV Exit 100



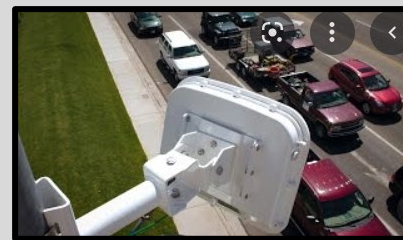
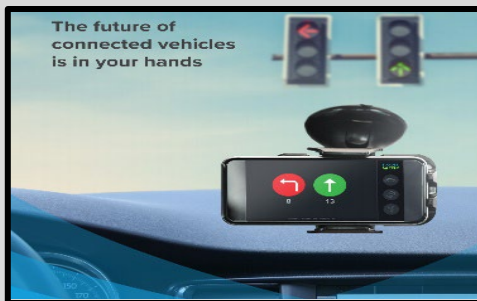
# ACTION - Deployment Plan

## Deploy Connected Freeway Components:

- 22 locations - interchanges 1-2 miles apart
  - camera pole, power, CV2X, volume/speed detection, and etc.
- Fiber over 20+ miles to link each camera location to the RTMC
- 3 Dynamic digital message signs (DMS)
- ASAP truck

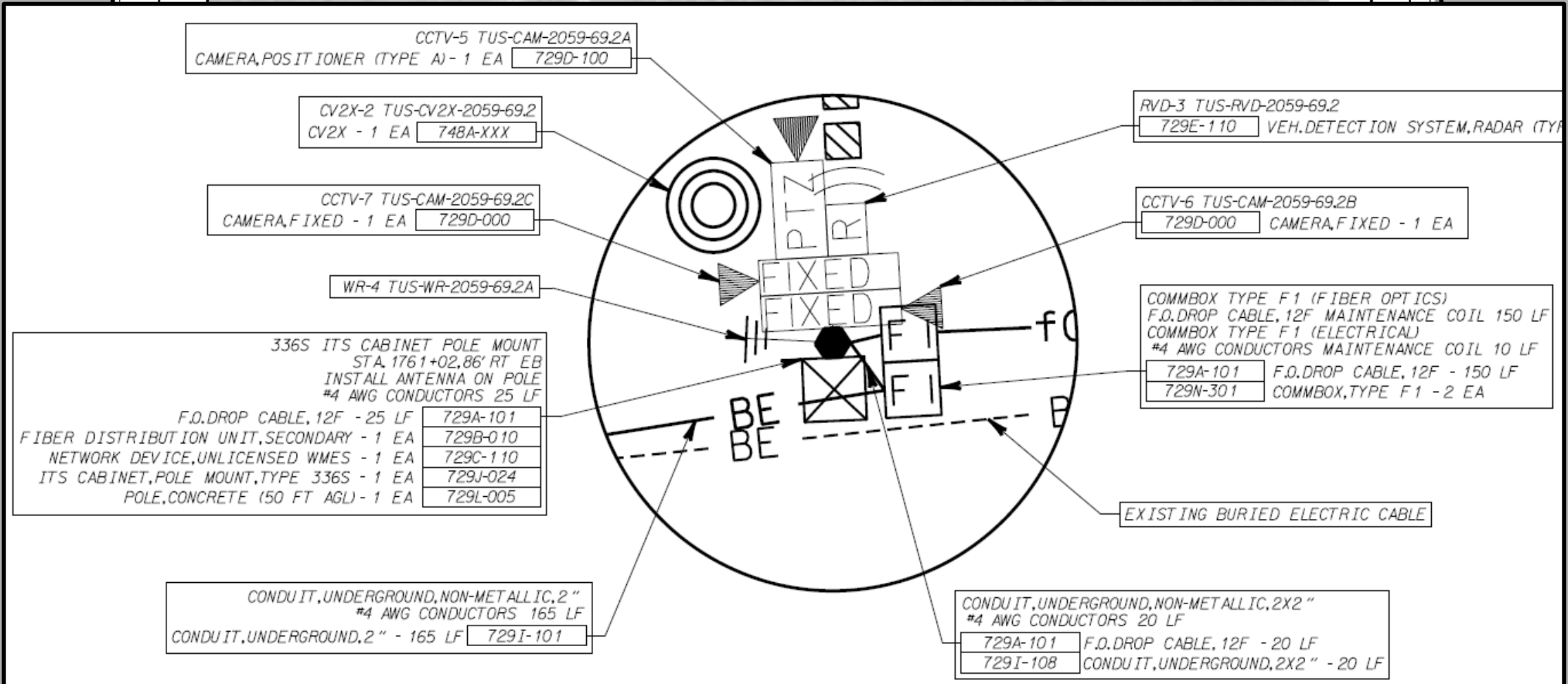
## Deploy Connected Arterial Components:

- Advanced detection
- Connected vehicle platform - *TravelSafely™*
- Hi-res controllers
- PTZ camera
- INRIX data



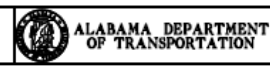
# ITS PLAN LAYOUT

REFERENCE PROJECT NO.	FISCAL YEAR	SHEET NO.
ACT 10N-6319; 250	2020	15



6/29/2020 3:38:44

RESPONSIBLE PE: THOMAS MONTZ, PE	DESIGNER: CORY EVANS, EIT	PLAN SUBMITTAL
DATE: 06/26/2020	DATE: 06/26/2020	100X



SHEET TITLE	ROUTE
ITS PLAN LAYOUT	I-20/59

The screenshot displays a Zoom meeting interface. At the top, a video gallery shows participants: Alex Hainen, Jonathan Mills, CREvans, Chris Sewell, Robert Maxwell, and Jason Taylor. The main window shows a technical drawing titled "ITS PROJECT LAYOUT LEGEND" with two sheets. The drawing includes various road names and technical specifications. A red box highlights a note: "Begin Work / Begin Project. Need to show limits with Cable Median Barrier. Show Cable median Barrier items." The participant list on the right shows 15 participants, including Alex Hainen (Host, me), CREvans (Guest), Chris Sewell (Guest), Jason Taylor (Guest), Jonathan Mills (Guest), Robert Maxwell (Guest), and others. The Zoom Group Chat is visible at the bottom right.

*30 - 60% Internal Plan Review - 4+ hrs*

The screenshot displays a Zoom meeting interface. At the top, a toolbar includes controls for Unmute, Stop Video, Security, Participants (30), Polls, New Share (01:05:33), Pause Share, Annotate, Remote Control, and More. A green notification bar indicates "You are screen sharing" with a "Stop Share" button. Below the toolbar is a secondary toolbar with icons for Mouse, Select, Text, Draw, Stamp, Spotlight, Eraser, Format, Undo, Redo, Clear, and Save.

The main area shows a grid of participants. The first row includes video thumbnails for "audrey" and "Alex Hainen", followed by name tiles for "Chris Hilyer", "Robert Maxwell", and "cory Evans". The second row features "Brett", "Laura Myers", "Patrick", a red tile with a white "J" (Jonathan Mills), and a photo of "Kristina Franklin". The third row shows "Blake Newman", "Tommy Alfano", a photo of "Elsa Tedla", "Ashley", and a photo of "Jeff Little". The fourth row contains "Menasse", "Thomas Woodh...", "Travis Atkison", a purple tile with a white "J" (Jason Taylor), and "Wallace McAdory". The fifth row lists "iPad", "Wesley Hallman", "Clayton Dodd", "David Jordan", and "Chris Sewell". The bottom row consists of five circular icons with white telephone handset symbols, each with a phone number below it: 12052426301, 12055537030, 14046420157, 12053938993, and 12059327560. The first icon is highlighted with a yellow border.

At the bottom left, the time and date are displayed as "10:30:53" and "6/11/2020".

*90% Plan Review with ALDOT - 10-12 hrs*

# ACTION - Challenges

## COVID19

- Remote work, supply chain issue => delayed project, increased \$\$

Technology becomes obsolete before deployment

- DSRC

Proposed technology underperforms => alternative – but might not exist

- Vehicle detection, e.g. Pucks, Radar, ...

Vendor proposed/promised product  $\neq$  actual product performance

- Cable median sensor, Radar

Prices have gone up – some doubled

- Fiber from \$70k to \$140k+

Bid doubled the budget \$9 - \$11+ million

- Forced re-bid => delayed project 9 - 12 month

# Exploring Detection Alternatives ( 2019-2022)

**\$1 million detection for 35+ Signals**

**Iteris Radar (UA)**



**GridSmart (ALDOT)**



**MioVision (UA)**



# Process/timeline in a nutshell

- Proposal 2017
- Award 2018
- Consultant selection and design 2019-2020
- Bid and letting 2021
  - Bid 1
  - Bid 2
- Construction started March 2022 (**5 years after proposal!**)
  - Team met every two weeks – zoom
  - Quarterly and annual reports shipped to FHWA
- And we are in 2023 and it is still on-going!

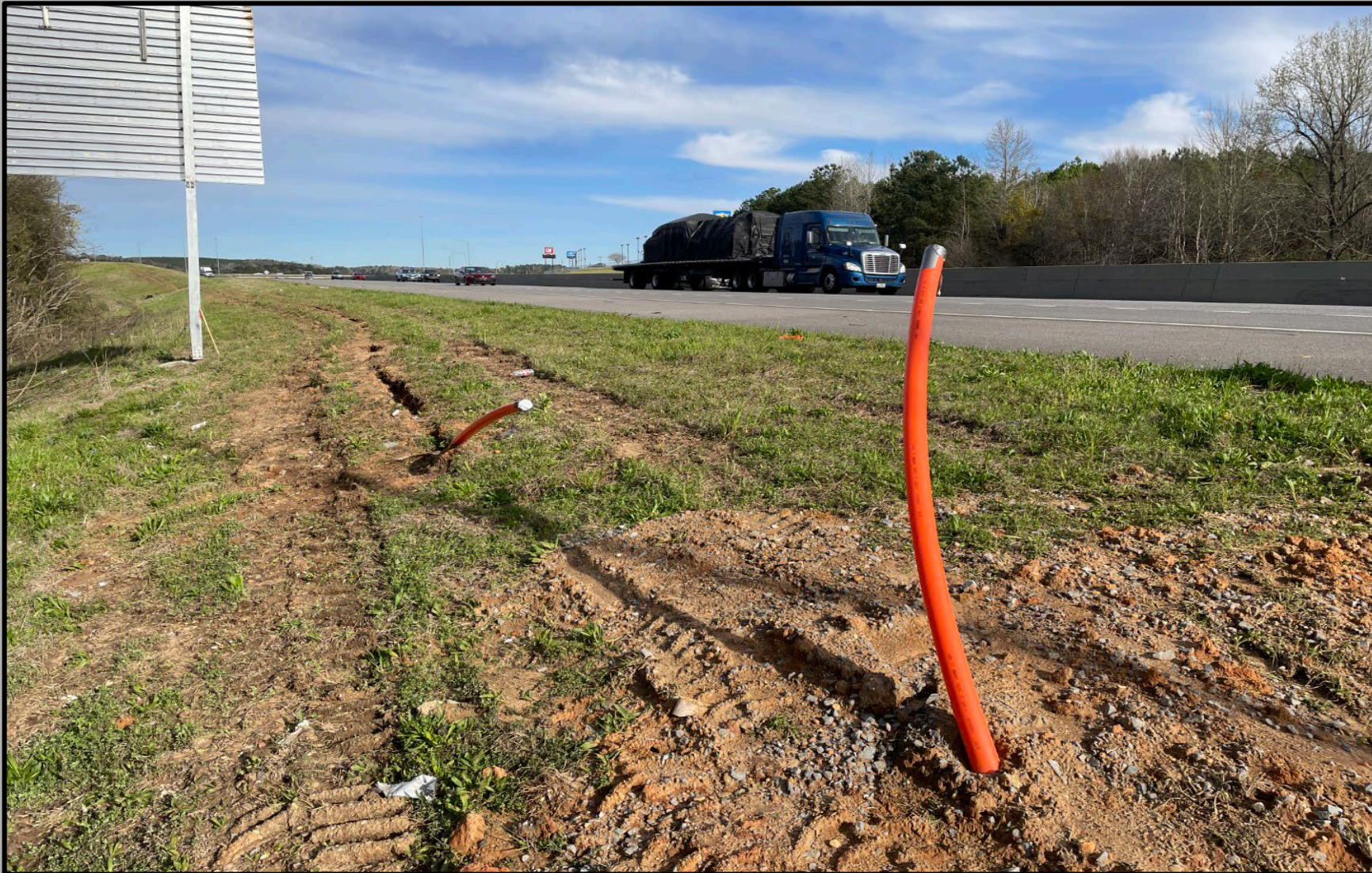
# ACTION - Current Status

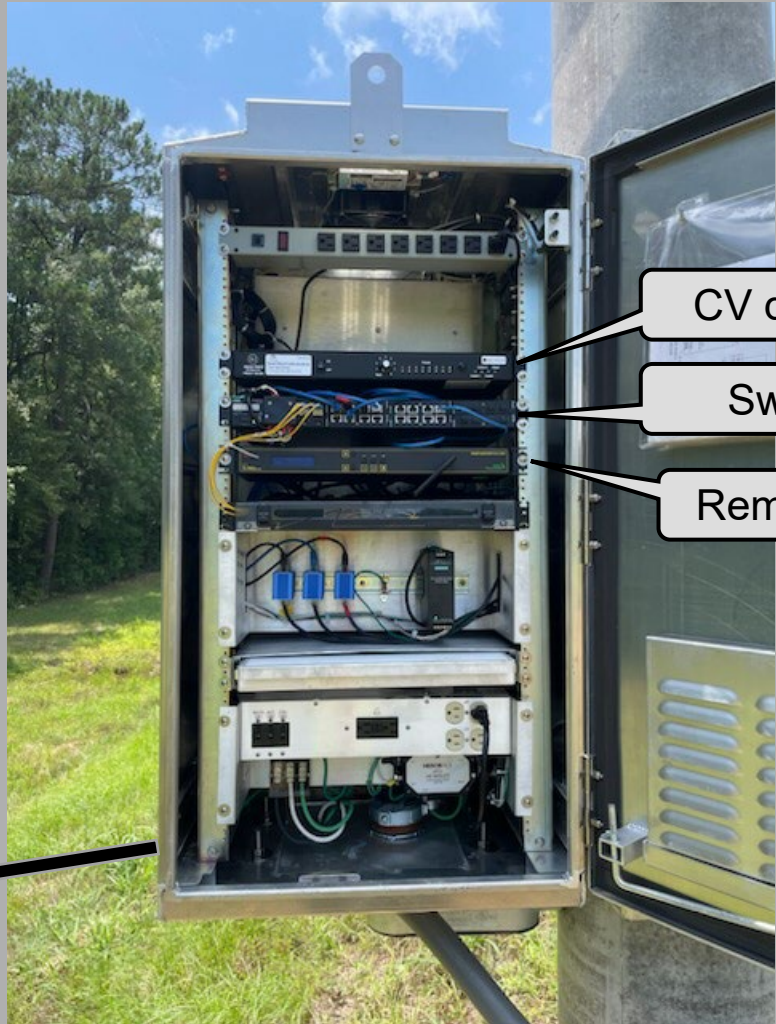
- Freeway Construction nearly complete
  - few weeks
- Fiber communication from Freeway to UA (Cyber Hall)
  - Being established
- Nearly \$1 million worth of signal detection & equipment on it way
  - Installation expected 6-9 months

## Going forward, hopefully:

- Data to RTMC/Cyber Hall
- Software and platform integration
- RTMC will monitor Freeway before end of summer 2023
- 100% of project (Freeway + Arterial) before summer 2024
- Project evaluation, BCA, final report to FHWA by end of 2024







CV device

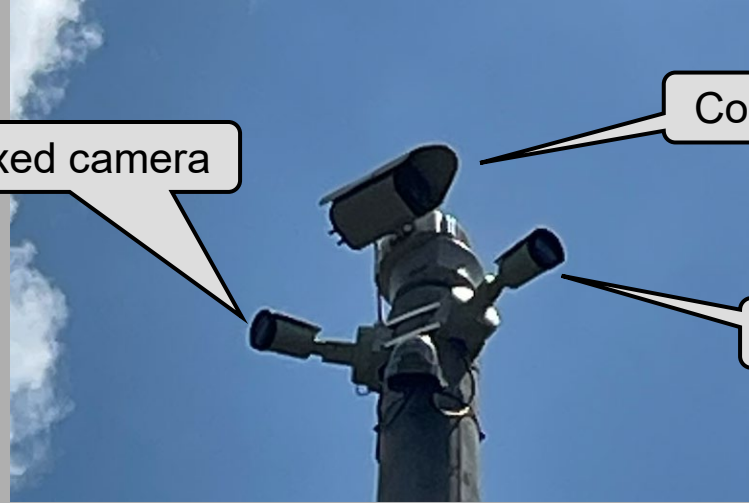
Switch

Remote power control

Pole mounted ITS cabinet – 20+



Axis Fixed camera



Cohu PTZ camera

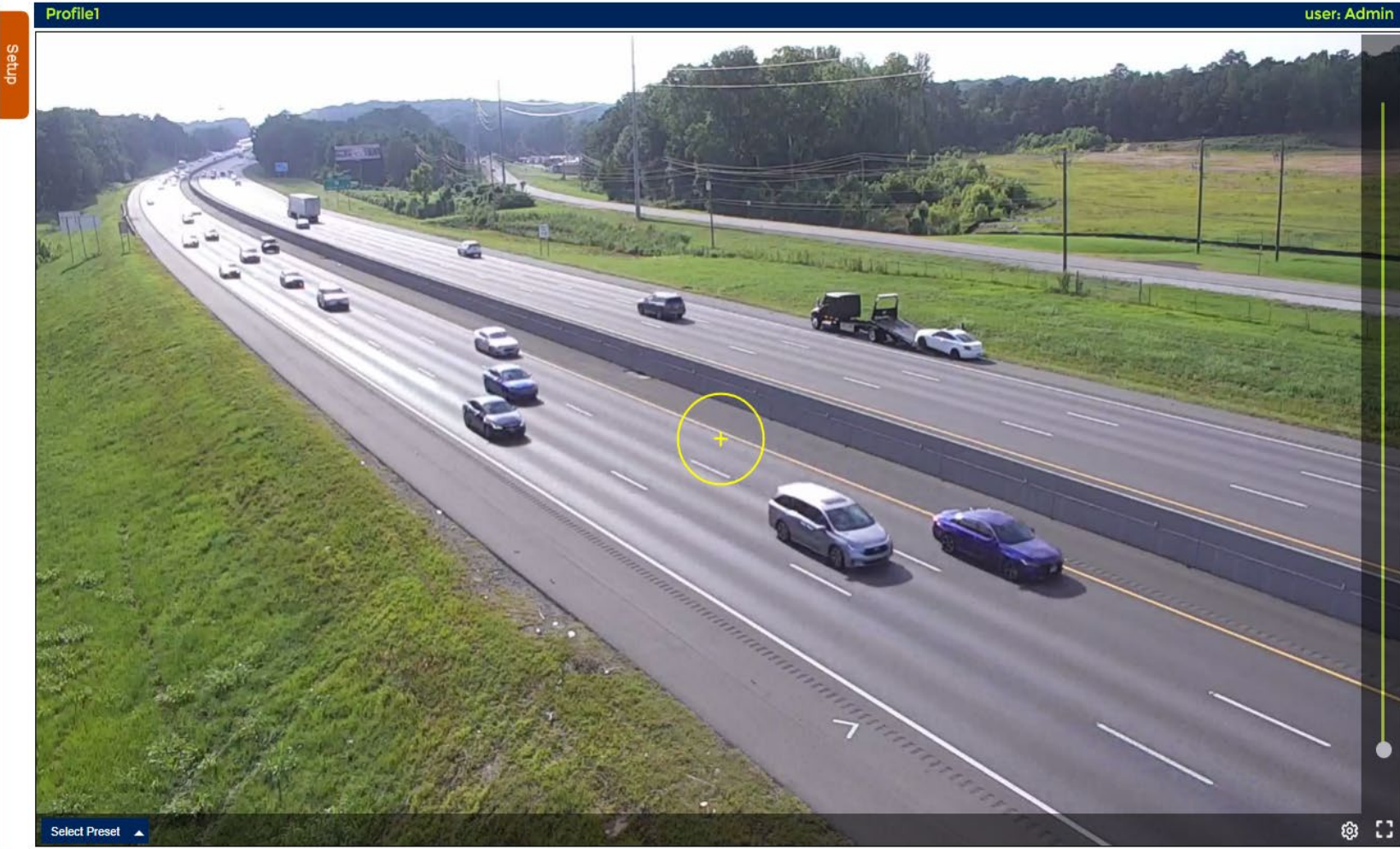
Axis Fixed camera



Wavetronix  
Permanent counter

Roadside Unit (RSU)

- Image
- Positioner
- Media
- Action Engine
- Video Analytics
- Users
- IP Protocol
- Date and Time
- On-Screen Display
- Privacy Mask
- Accessories
- System



Control Panel

PTZ Presets & Tours Advanced

Play Stop Profile1

Pan/Tilt Speed

Magnification 1x

Zoom Speed

Focus Auto Focus On

Iris Auto Iris On



1:1



# Lesson learned from the 1<sup>st</sup> ATCMTD

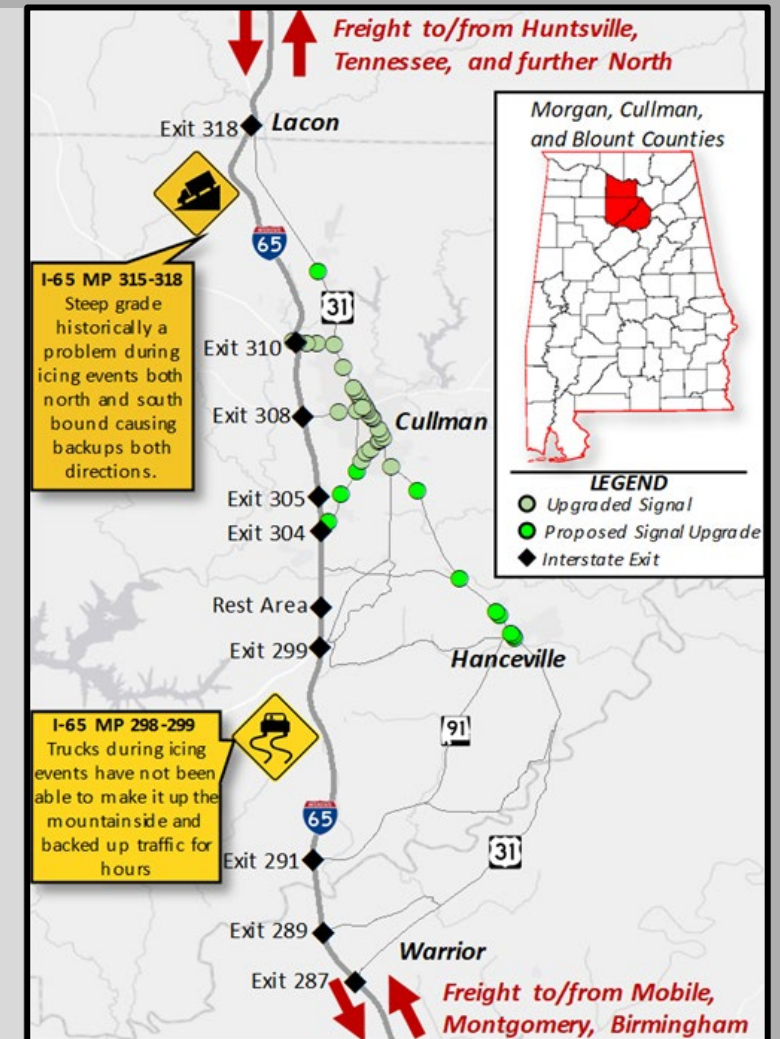
- Over-budget \$\$ estimates as much as possible
  - > 50%
- Propose longer project duration... to the extent possible
- Technology will become obsolete... prepare for back-up plan

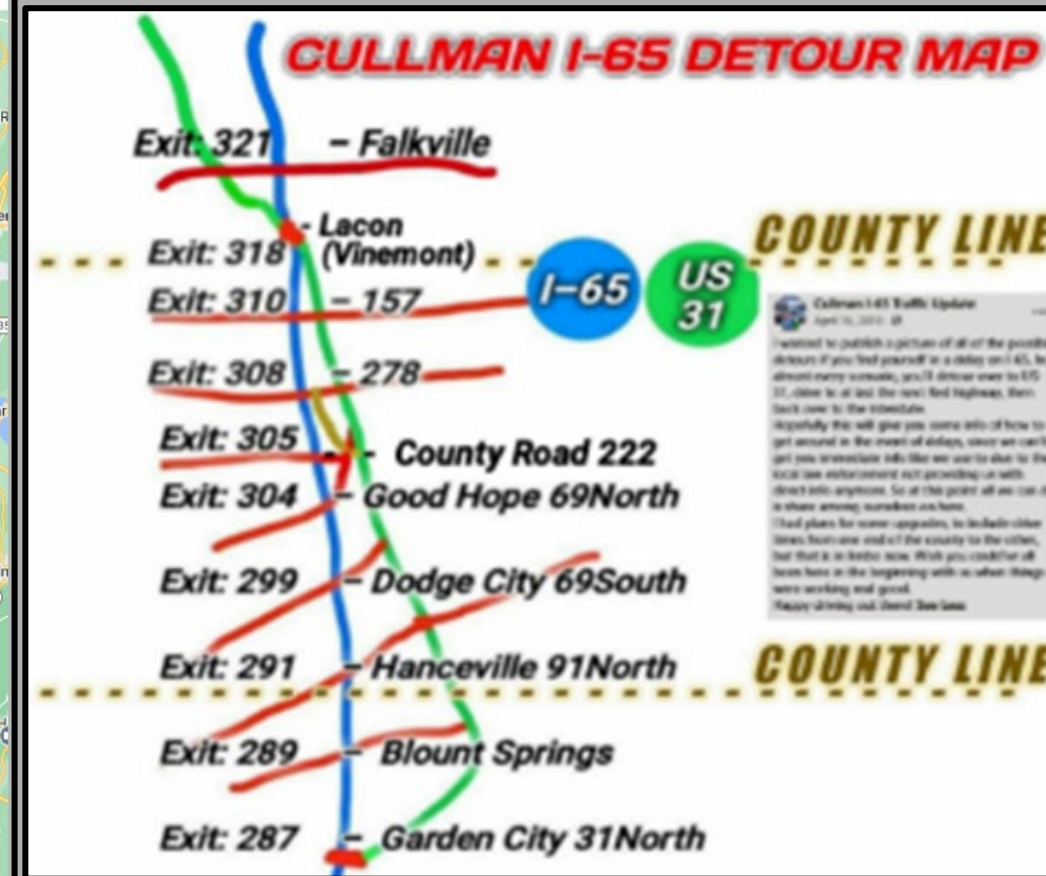
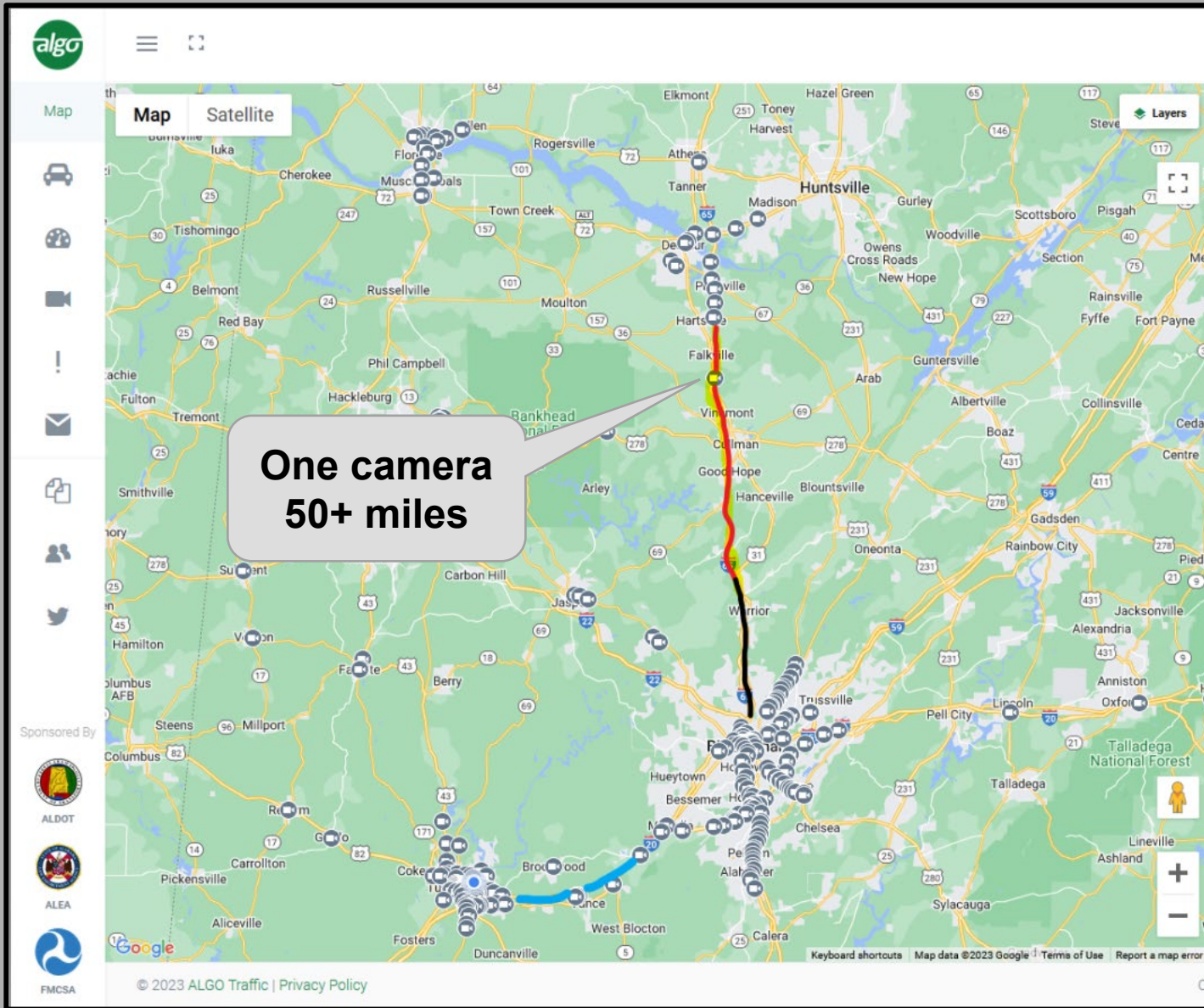
# ATCMTD 2.0 in North Alabama (2022 - present)

## Proactive Route Operations to Avert Congestion in Traffic

**PROACT** - \$10.5 million (USDOT \$5m, ALDOT \$5m, UA \$0.5m)

- Freeway - I65 in Cullman Area (Warrior to Lacon)
- Arterials - Detour routes
- Oct 2022 – Sep 2026





# Unofficial Facebook Detour for I-65



# PROACT - Objectives and Goals

***Alleviate*** non-recurring congestion through the use of technology and data analytics.

***Measure and improve*** the operational performance to enhance machine learning tools.

***Reduce*** the number and severity of crashes within the project area.

***Collect and disseminate*** real time transportation related information to improve mobility.

# PROACT - technology deployment

- **Advanced Road Weather Monitoring** and Forecasting Tools and Technologies
- **Advanced Transportation Management System** & Connected Vehicle Probe Data
- **Central Traffic Management System** and Machine Vision for Signalized Intersection Operations and Safety
- **Connected Vehicle Hardware** and Freight Priority Application
- Communications and **Traveler Information System** Applications

# PROACT - Current Status

- At the initial stages of PS&E (Plan, Specification and Estimate)
- Consultant selected few months back
- Initial survey using Drone in June
- Possibly letting in 6-9 months?

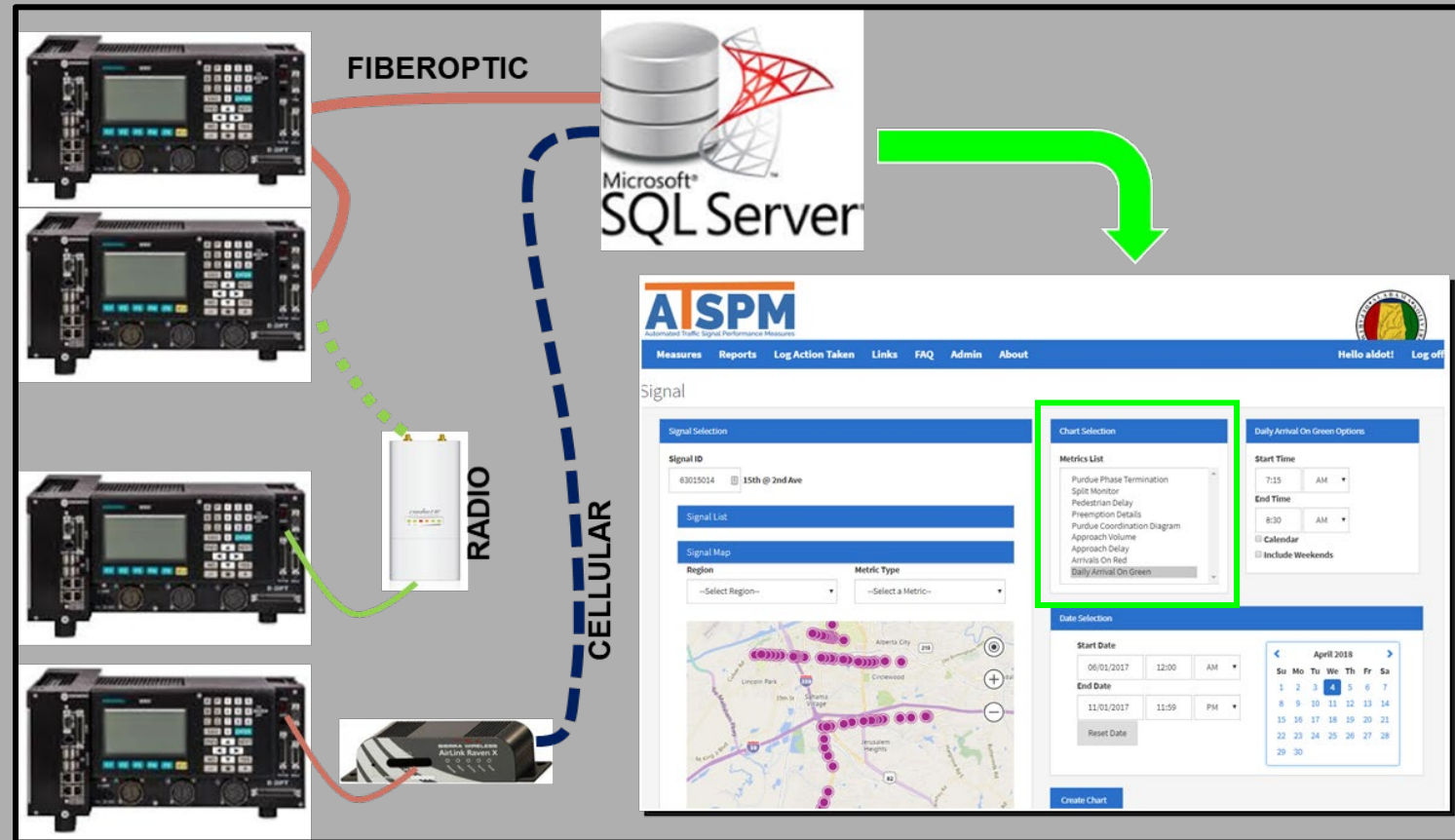
# Automated Traffic Signal Performance Measures (2016 – present)

## ATSPM

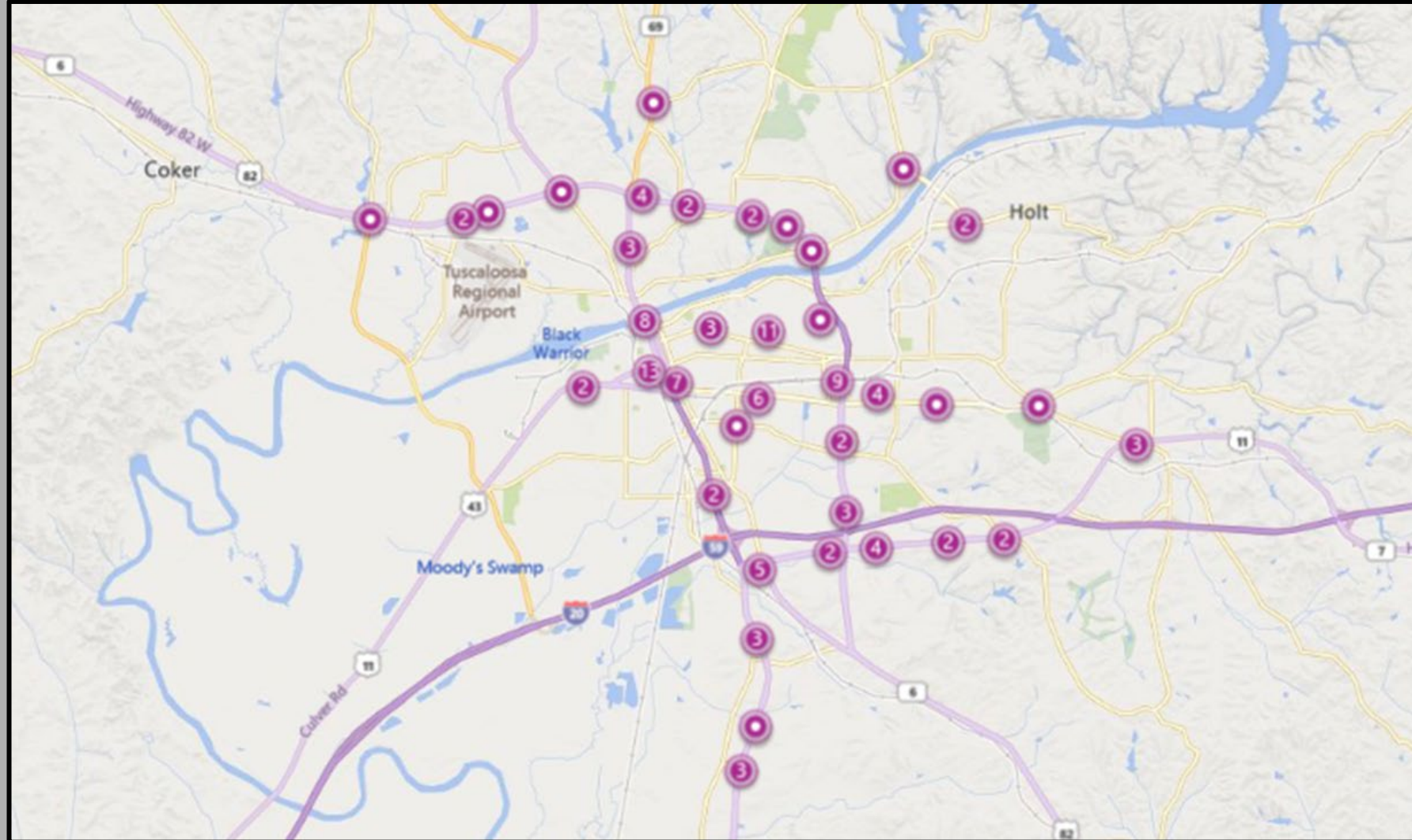
## \$3.2 million

### Initial Goals and Objectives:

- Upgrade 85 signals controllers in WCR
- Upgrade detection
- Establish communication to Central server
- Optimize signals on major corridors



# ATSPM – around Tuscaloosa (2016-2020)



# ATSPM (updated Algo Suite) – 500 signals (2021)

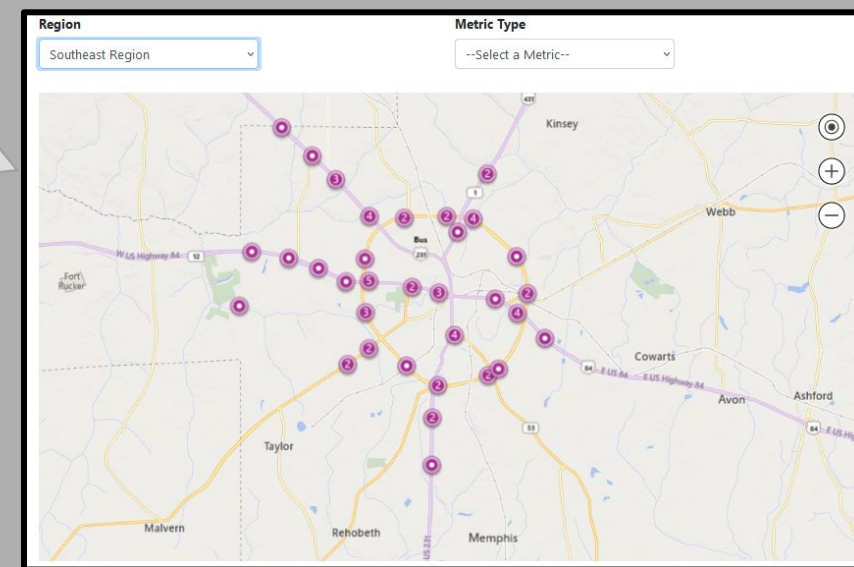
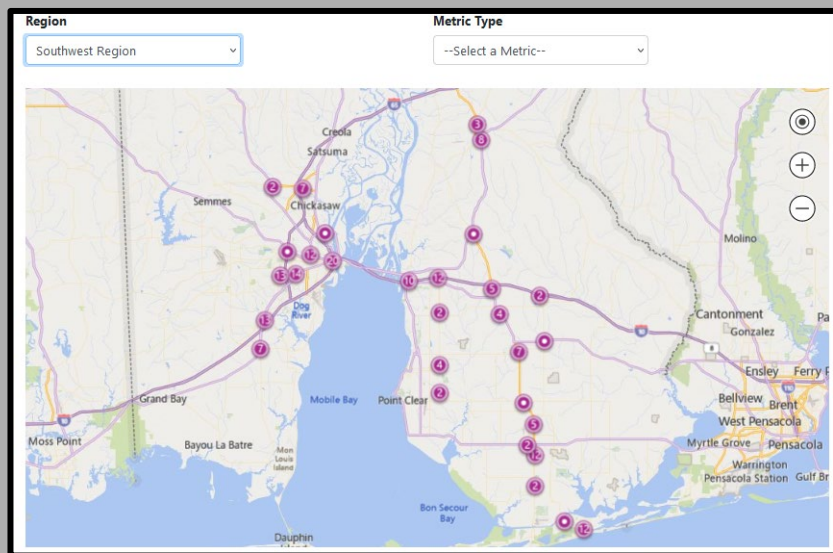
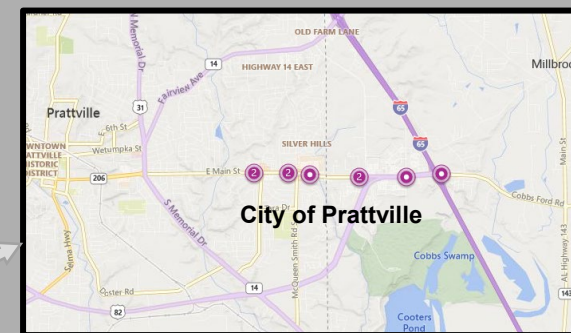
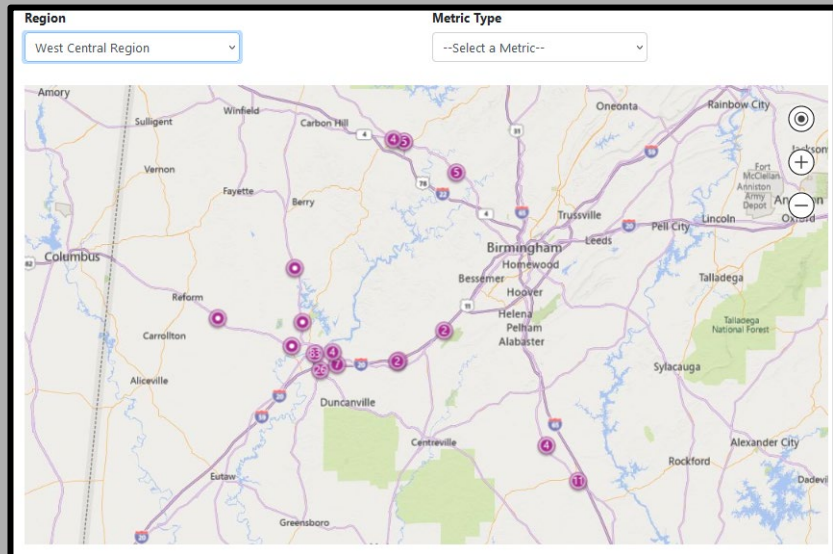
*Expanding Statewide! Working with RTOP and ALDOT*

The screenshot displays the ATSPM web application interface. At the top left is the ATSPM logo (Automated Traffic Signal Performance Measures) and at the top right is the ALDOT logo (Alabama Department of Transportation) with the 'algo' sub-brand. A green navigation bar contains menu items: Measures, Reports, Log Action Taken, Links, FAQ, UDOT Traffic Signal Documents, ATSPM Manuals, ATSPM Presentations, and About. On the right side of the navigation bar are 'Register' and 'Log in' links.

The main content area is titled 'Signal' and is divided into several sections:

- Signal Selection:** Includes a 'Signal ID' field with the value '63069002' and a 'Select' button. Below it, the address '69 S @ Kauloosa Ave' is displayed.
- Signal List:** A section for listing signals.
- Signal Map:** A map of Alabama with a callout for 'Signal #63069002' at '69 S Kauloosa Ave'. The map shows major cities like Birmingham, Atlanta, and Macon, and highways like I-65 and I-75.
- Chart Selection:** A 'Metrics List' dropdown menu with options: Purdue Phase Termination, Split Monitor, Pedestrian Delay, Preemption Details, Timing And Actuation, Approach Volume, Approach Delay, Arrivals On Red, **Purdue Coordination Diagram** (highlighted), Daily Arrivals On Green, and Left Turn Gap Analysis.
- Purdue Coordination Diagram Options:** Includes input fields for 'Y-axis Max' (200) and 'Secondary Y-axis Max' (3000). It also has dropdowns for 'Volume Bin Size' (15), 'Line Size' (Small), and 'Dot Size' (Small). There are checkboxes for 'Show Plans' and 'Show Volumes', both of which are checked.
- Date Selection:** Includes 'Start Date' (02/21/2023, 12:00, AM) and 'End Date' fields. A calendar widget shows 'February 2023' with days of the week (Su, Mo, Tu, We, Th, Fr, Sa) and dates (1, 2, 3, 4).

# ATSPM - statewide



# ATSPM - Performance Metrics

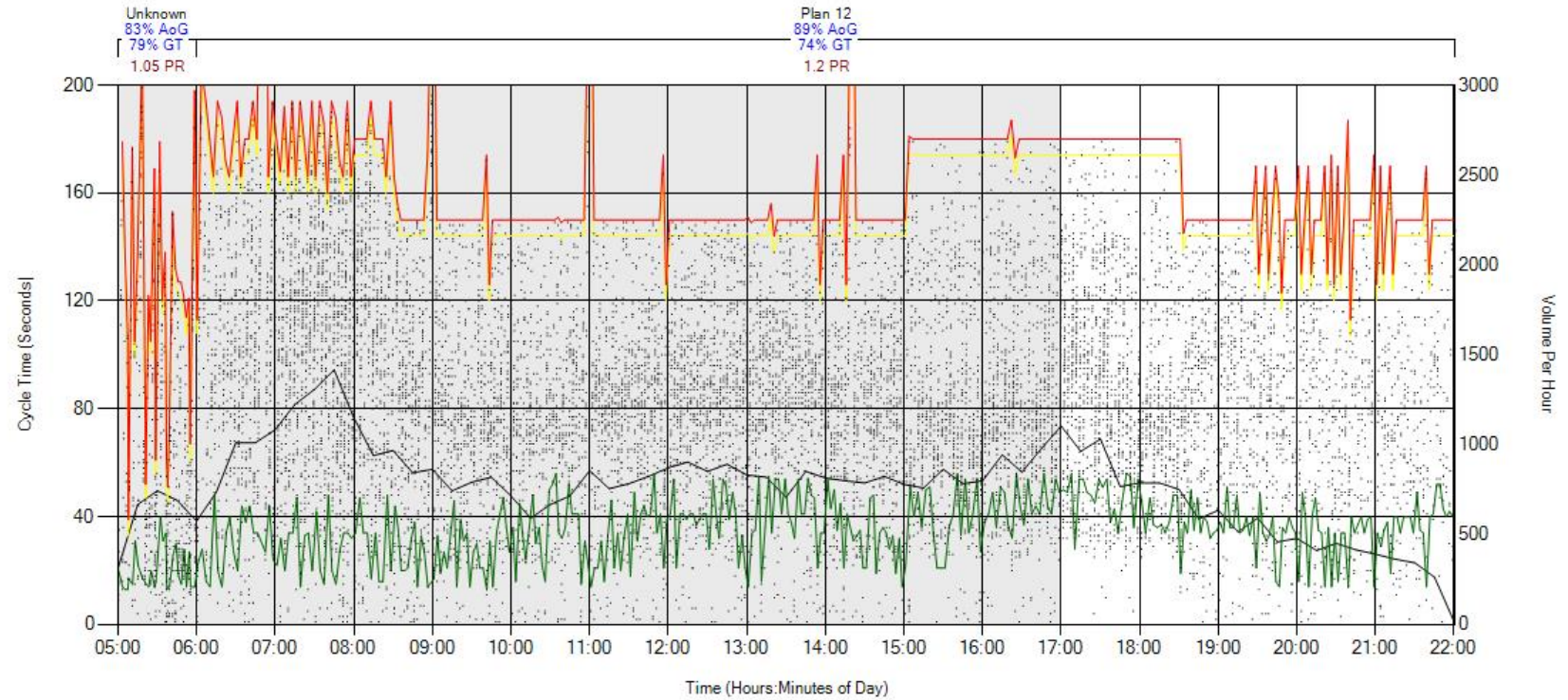
## Purdue Coordination Diagram

69 S @ Kauloosa Ave - SIG#63069002  
Wednesday, June 21, 2023 5:00 AM - Wednesday, June 21, 2023 10:01 PM  
Advanced detector located 405 ft. upstream of stop bar

### Phase 2: Northbound

AoG = 88%

- Volume Per Hour
- Detector Activation
- Change to Green
- Change to Yellow
- Change to Red
- AoG - Arrival On Green
- GT - Green Time
- PR - Platoon Ratio





# ATSPM - Performance Metrics

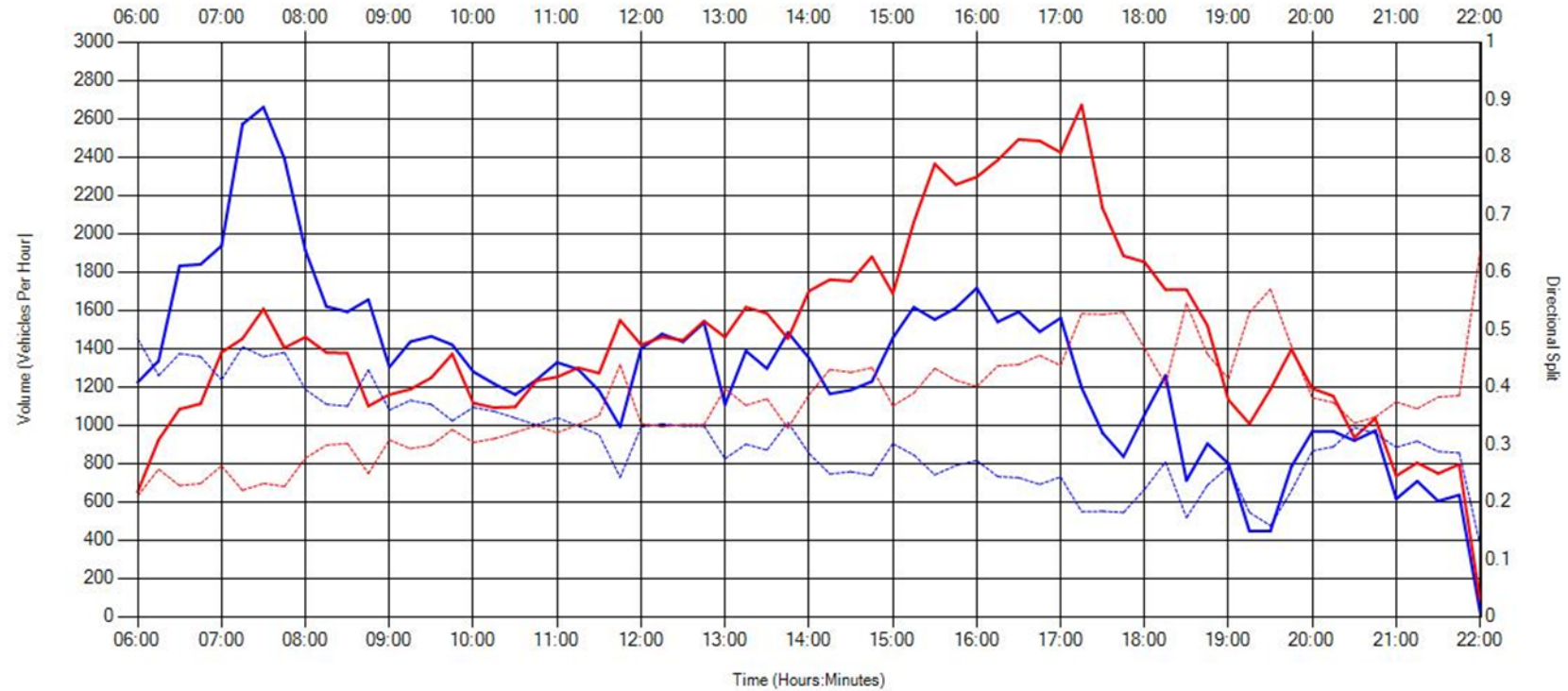
## Approach Volume

69 S @ Kauloosa Ave - SIG#63069002  
Thursday, April 20, 2023 6:00 AM - Thursday, April 20, 2023 10:01 PM

Northbound and Southbound Approaches

Unknown located 405ft. upstream of the stop bar

- Northbound
- Southbound
- Northbound D-Factor
- Southbound D-Factor



# ATSPM - Performance Metrics

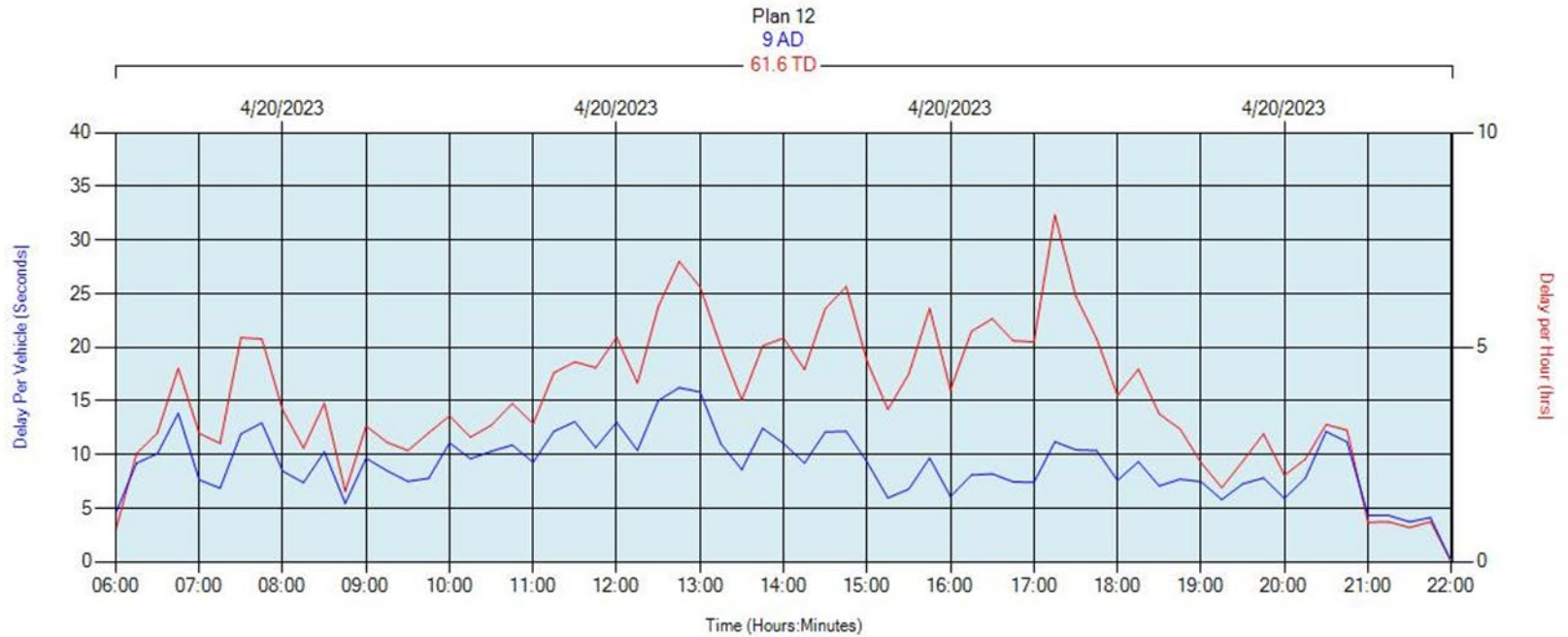
## Approach Delay

69 S @ Kauloosa Ave - SIG#63069002  
Thursday, April 20, 2023 6:00 AM - Thursday, April 20, 2023 10:01 PM

Phase 6: Southbound

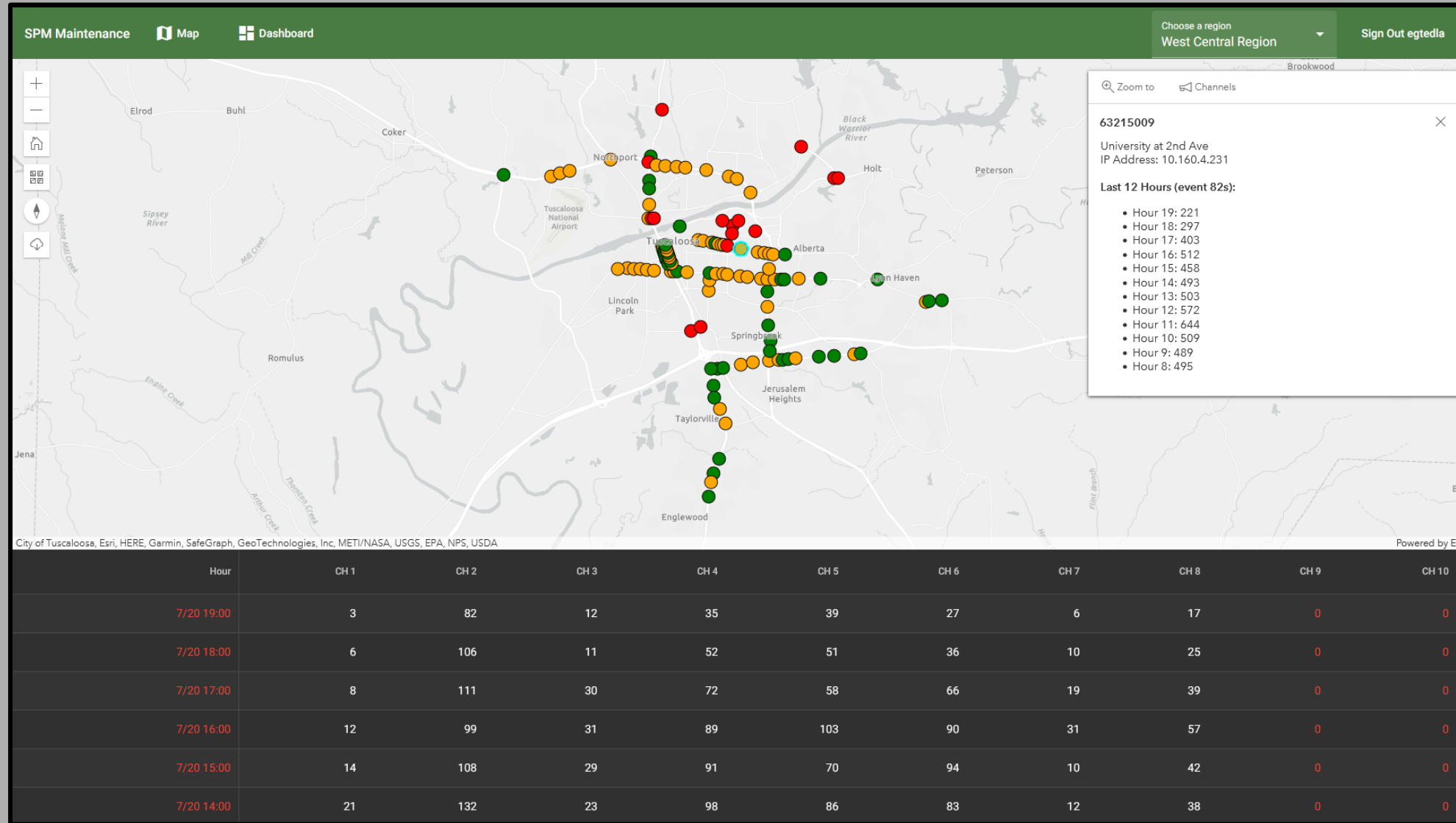
Average Delay Per Vehicle (AD) = 9 seconds; Total Delay For Selected Period (TD) = 61.6 hours

— Approach Delay  
— Approach Delay Per Vehicle

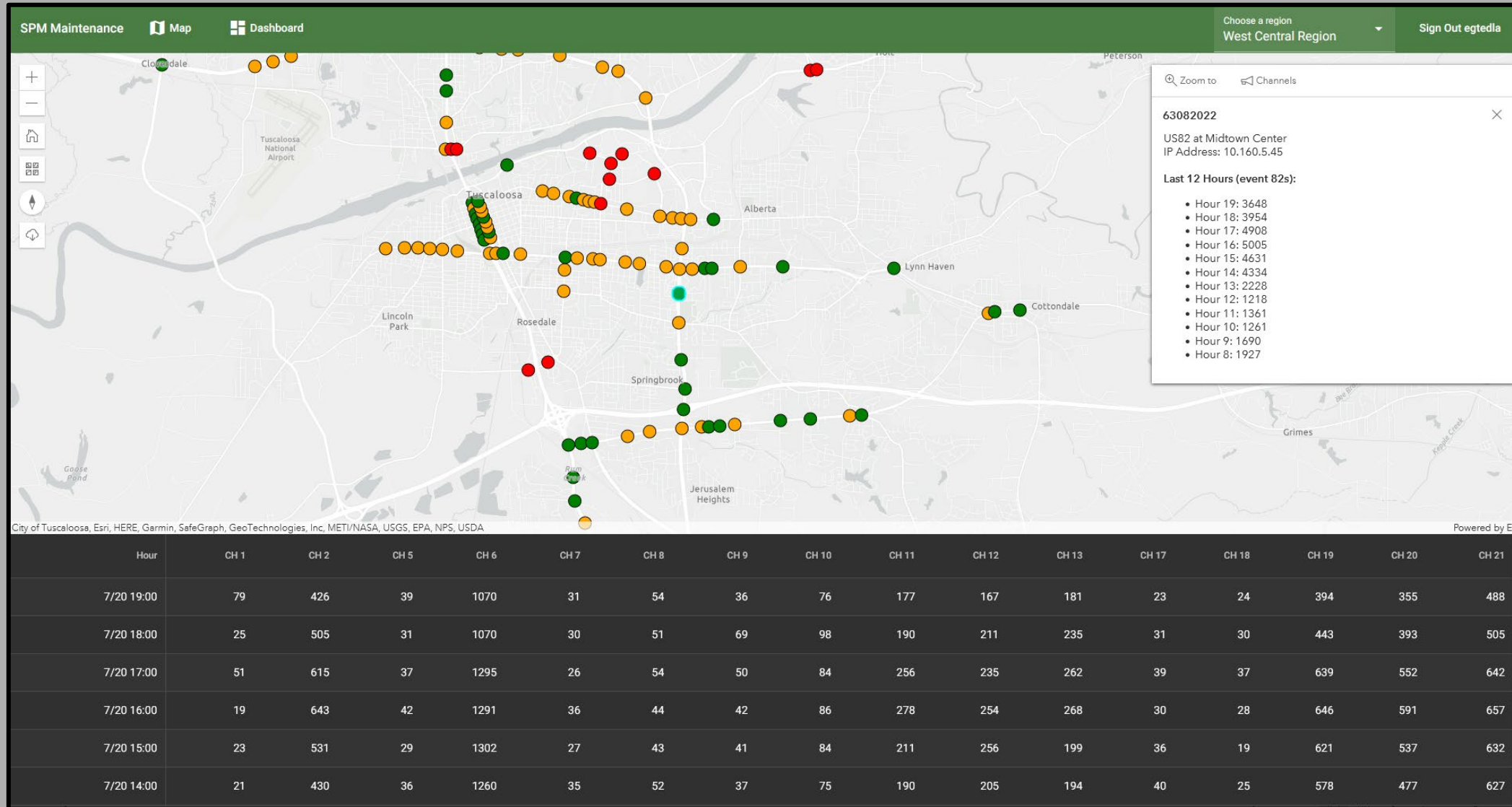


Simplified Approach Delay. Displays time between approach activation during the red phase and when the phase turns green.  
Does NOT account for start up delay, deceleration, or queue length that exceeds the detection zone.

# ATSPM – Detection Maintenance dashboard (2022)



# ATSPM – Detection Maintenance dashboard (2022)



# NextGen Alabama Traffic Monitoring Program (aka. HPMS)

2012 – present , ~\$1 Million annually


## Policy and Governmental Affairs Office of Highway Policy Information

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### Highway Performance Monitoring System (HPMS)

The HPMS is a national level highway information system that includes data on the extent, condition, performance, use and operating characteristics of the nation's highways. The HPMS contains administrative and extent of system information on all public roads, while information on other characteristics is represented in HPMS as a mix of universe and sample data for arterial and collector functional systems. Limited information on travel and paved miles is included in summary form for the lowest functional systems.



HPMS was developed in 1978 as a continuing database, replacing the special biennial condition studies that had been conducted since 1965. The HPMS has been modified several times since its inception. Changes have been made to reflect changes in the highway systems, legislation, and national priorities, to reflect new technology, and to consolidate or streamline reporting requirements.

#### HPMS and R

- [Quick Find Mileage Data](#) (table)
- [HPMS Field Manual](#)
- [HPMS Software Guide](#)
- [HPMS Primer](#) (Overview of the HPMS)
- [ARNOLD Guidance](#)
- [State HPMS Program Guidance](#)

#### HPMS Archive Item Descriptions

- [1982-1987 Archive](#)
- [1988-1992 Archive](#)
- [1993-1998 Archive](#)
- [Urbanized Area Codes 19](#)

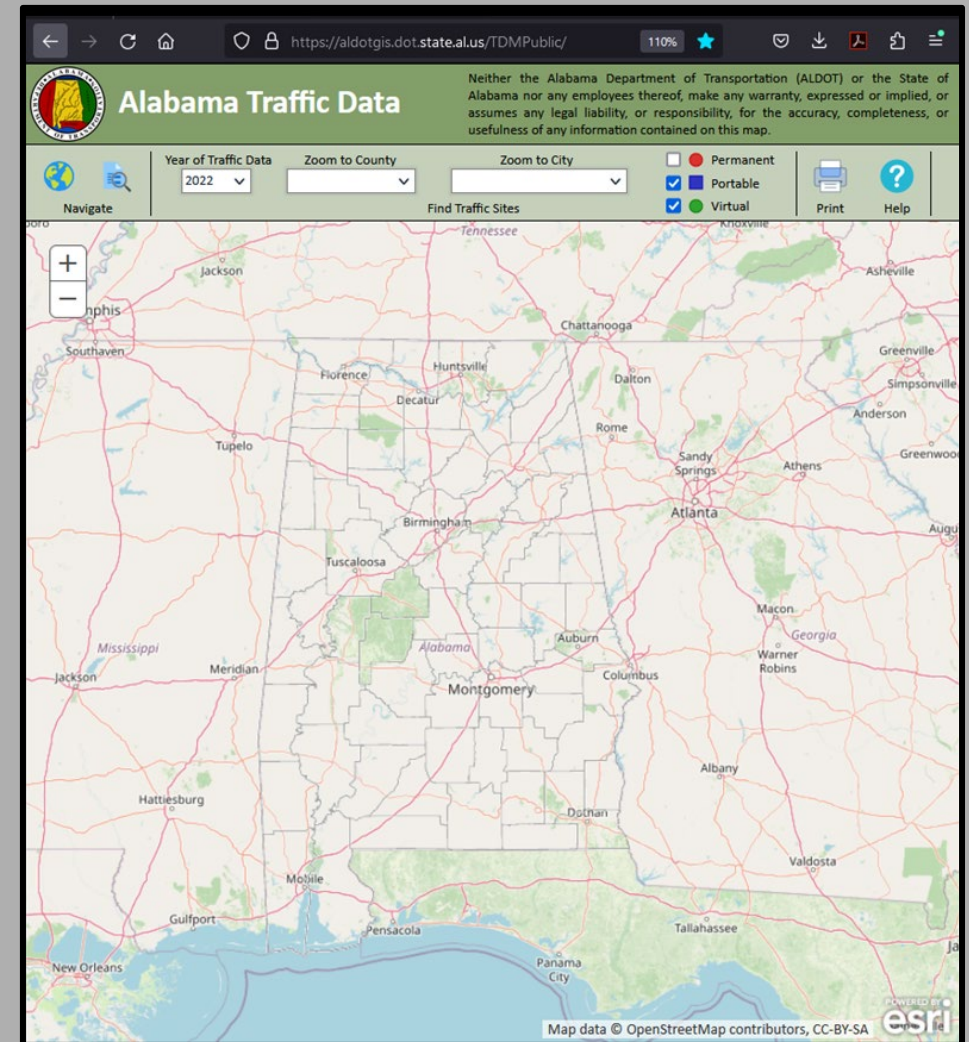
#### Use of Census Boundaries for HPMS

[FAQs: Applying 2000 Census Data to Urban Area Boundaries](#)

#### Highway Functional Classification

[Highway Functional Classification](#)

#### HPMS Travel Data Reporting



# Tuscaloosa 956

**Alabama Traffic Data**

Year of Traffic Data: 2022

Zoom to County: [Dropdown]

Zoom to City: [Dropdown]

Permanent  Portable  Virtual

Print Help

Counter Location

Counter ID: **Tuscaloosa 956**

AADT Year: 2022 AADT: 4,489

K Factor: 11 TADT %: 7.703000068664551

D Factor: 53

Portable Direction Reports

Volume 03/22/2021

Class [Dropdown]

Open as PDF

[Request Information](#)

# Station 956

2023\_Shapefile - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

Scale: 1:14,250

Table Of Contents

Layers

- dbo.DEFAULT (coe-tra)
  - HPMS\_ET.DBO.Aut
  - HPMS\_ET.DBO.East
  - HPMS\_ET.DBO.Mo
  - HPMS\_ET.DBO.Sho
  - HPMS\_ET.DBO.Phe
  - HPMS\_ET.DBO.Tus
  - HPMS\_ET.DBO.Dec
- C:\Users\egtedla\Desktop
  - Auburn\_Traffic
  - EasternShores\_Traffic
  - Mobile\_Traffic
  - Shoals\_Traffic
  - Phenixcity\_Traffic
  - Tuscaloosa\_Traffic
  - Decatur\_Traffic
  - From\_Brette\_2023
- World Boundaries and Imagery
- World Street Map

Identify

Identify from: Top-most layer

Location: 472,188.520 3,672,621.5

Field	Value
LUCountyID	Tuscaloosa
Station	956
RouteID	IV0000930125
FromMeasur	1.0296
ToMeasure	1.90636
YearAADT	2022
F21AADT	4473
POINT_X	472192.099
POINT_Y	3672623.569
County_ID	63
Station_4	0956
STATION_NU	630956

Identified 1 feature

HPMS_ET.DBO.Tuscaloosa_Traffic											
LUCountyID	Station	RouteID	FromMeasur	ToMeasure	YearAADT	F21AADT	POINT_X	POINT_Y	County_ID	Station_4	STAT
Tuscaloosa	956	IV0000930125	1.0296	1.90636	2022	4473	472192.099	3672623.569	63	0956	630956

(1 out of 877 Selected)

HPMS\_ET.DBO.Tuscaloosa\_Traffic

473971.881 3672146.867 Meters

## Conclusion:

ATI co-located with TMC has been a backbone of several research collaborations and partnerships,  
**Outstanding transportation projects!**