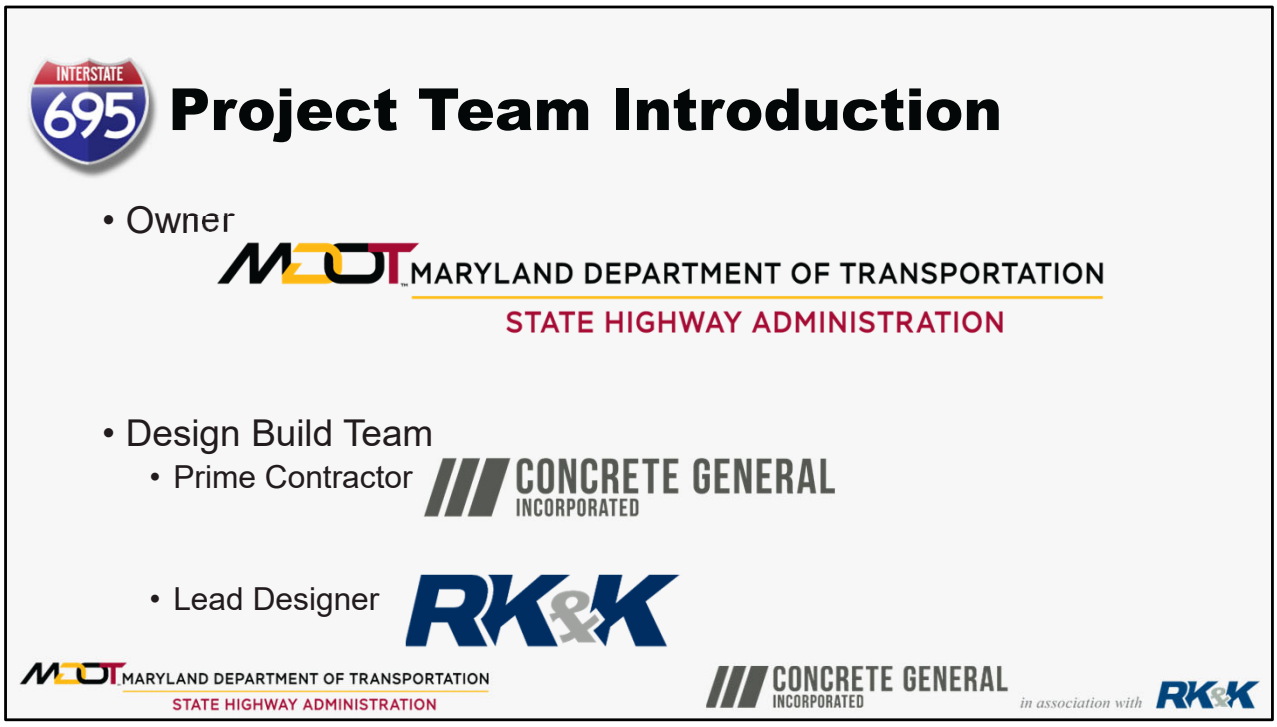
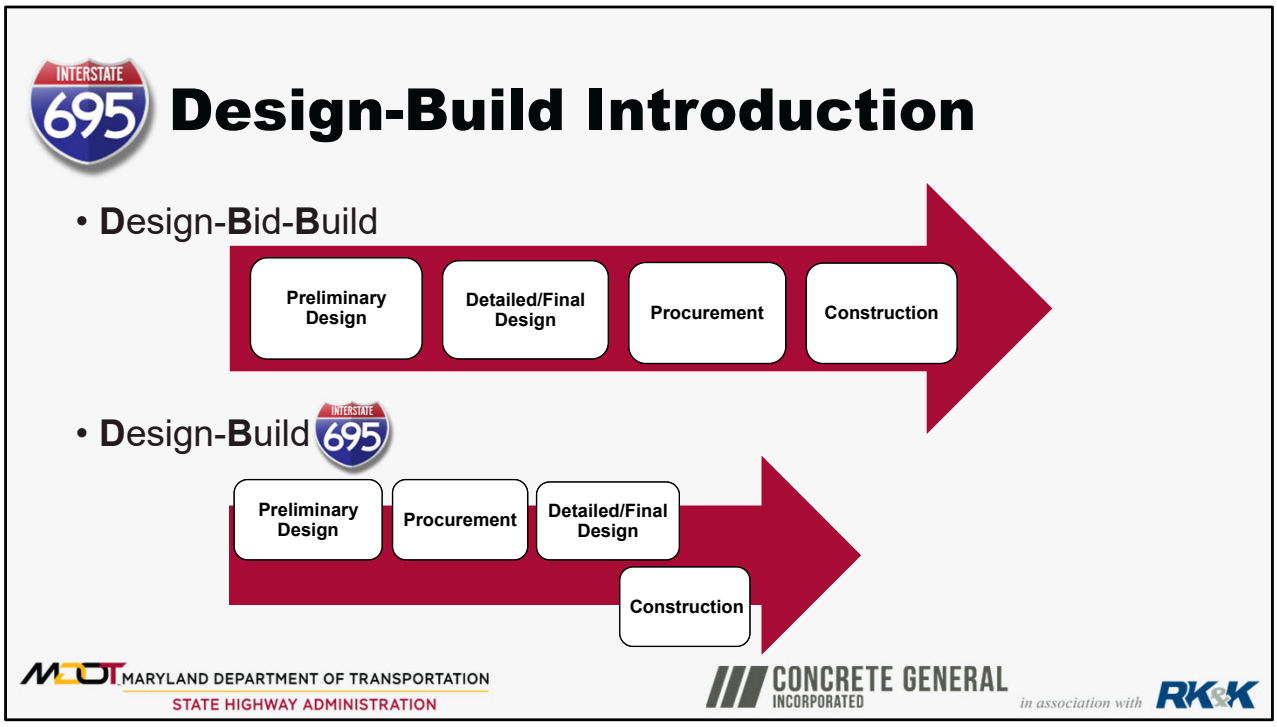
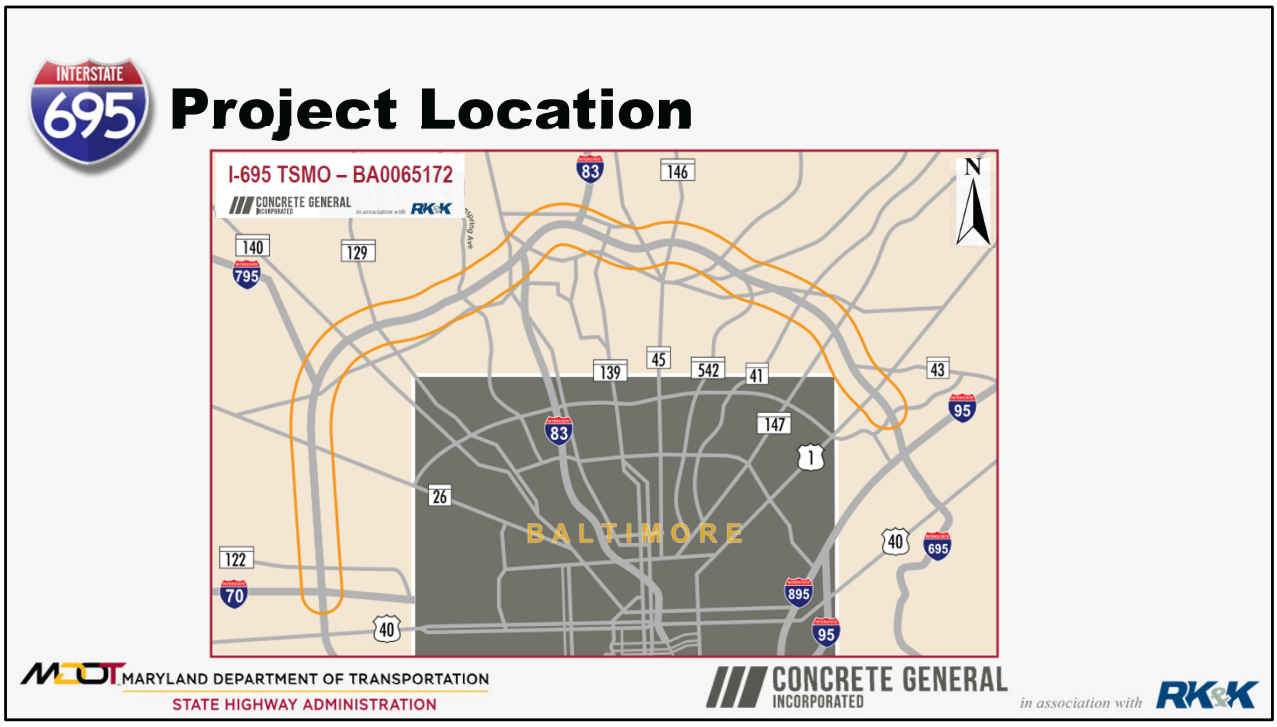

BA0065172 I-695 from I-70 to MD 43
Transportation Systems Management & Operations
INTERSTATE
695
INTERSTATE
70
MARYLAND
43
EXIT 29B
EXIT 29A
Cromwell Bridge Road
Transportation Engineering & Safety Conference
December 8, 2023
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
CONCRETE GENERAL INCORPORATED
in association with
RK&K



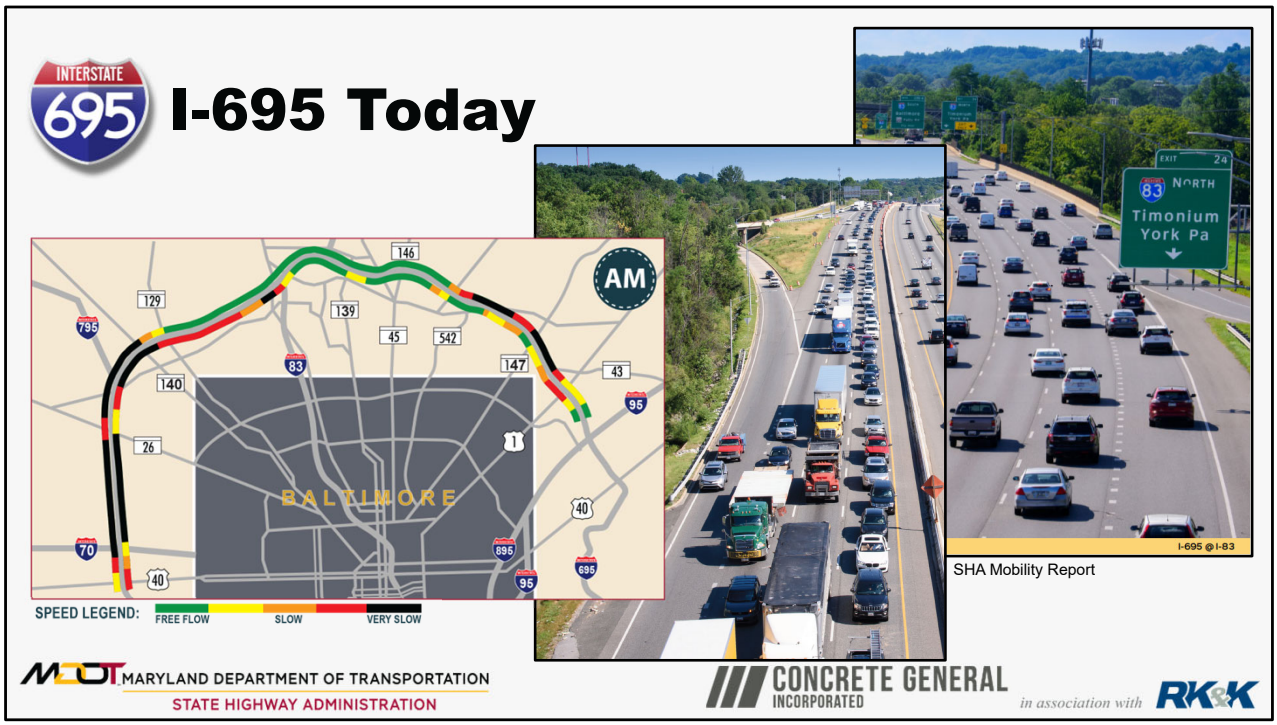
The I-695 TSMO project team consists of SHA, Concrete General and RK&K.



The I-695 TSMO project utilizes the Design-Build delivery which allows elements of design and construction to overlap. It also allowed a lot of close collaboration between the design team and the construction team to discuss ideas and resolve issues quickly.



The I-695 TSMO project is located in Baltimore County along approximately 40 miles of I-695 inner and outer loop from south of I-70 to east of US 1 (almost to I-95).



I-695 has 4 of the states most congested freeway segments and carries over 200,000 vehicles per day in some segments. Bottlenecks and high volumes cause recurring congestion during weekday peak periods throughout the peak periods from 6A to 10A and 2P to 7P. The graphic on the left is what your Google Maps probably looks like if you travel I-695 in the morning rush hour.

I-695 Today

SHA Mobility Report

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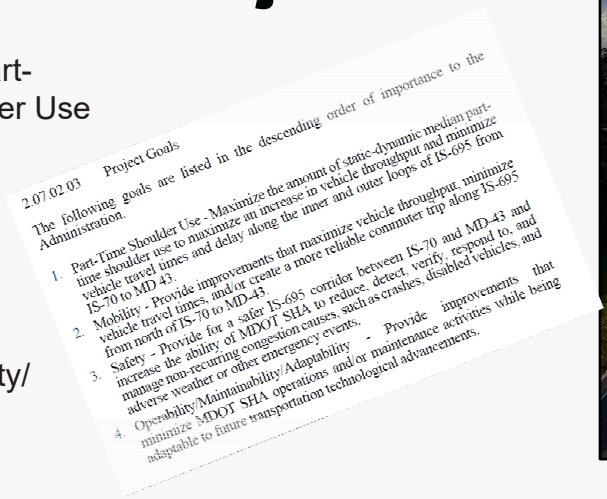
I-695 averages 1,100 crashes per year (3 per day) with 60% being rear-end crashes with many of the crashes attributed to congestion and bottleneck locations.

TSMO Project Goals

- Maximize Part-Time Shoulder Use
- Mobility
- Safety
- Operability/ Maintainability/ Adaptability



2.07.02.03 Project Goals

The following goals are listed in the descending order of importance to the Administration.

1. Part-Time Shoulder Use - Maximize the amount of static-dynamic median part-time shoulder use to maximize an increase in vehicle throughput and minimize vehicle travel times and delay along the inner and outer loops of IS-695 from IS-70 to MD 43.
2. Mobility - Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and/or create a more reliable commuter trip along IS-695 from north of IS-70 to MD-43
3. Safety - Provide for a safer IS-695 corridor between IS-70 and MD-43 and increase the ability of MDOT SHA to reduce, detect, verify, respond to, and manage non-recurring congestion causes, such as crashes, disabled vehicles, and adverse weather or other emergency events.
4. Operability/Maintainability/Adaptability - Provide improvements that minimize MDOT SHA operations and/or maintenance activities while being adaptable to future transportation technological advancements.

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This was a best value design-build project: So, what are we doing to help improve safety and reduce congestion? The goals that SHA established for the project were Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more reliable trip on I-695. Provide a safer I-695 and increase the ability of SHA to reduce, detect, verify, respond to and management non-recurring congestion causes such as crashes, disabled vehicles and poor weather. Provide improvements that minimize operations and maintenance. And maximize Part-Time Shoulder Use. That is really the core of the proposed solution to meet the goals for the project.

PTSU Limits

- Inner Loop:
  - I-70 to Lillian Holt Drive
  - 20.5 miles
- Outer Loop:
  - MD 43 to South of I-70 Triple Bridges
  - 19.1 miles
- Typical Hours of Operation

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The limits of PTSU are proposed from south of I-70 to east of US 1 on the inner loop and from MD 43 to south of I-70 on the outer loop

Part-Time Shoulder Use (PTSU)

What is PTSU?

- Shoulder is used as a travel lane during peak travel hours or as needed during incidents to provide congestion relief
- Also known as Hard Shoulder Running
- Limit right-of-way and environmental impacts

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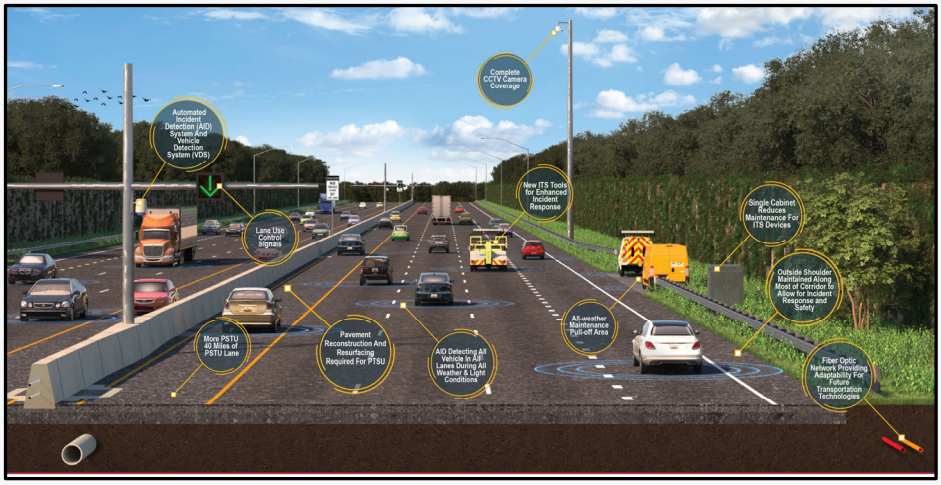
So what is PTSU. Part-time shoulder use is using the shoulder as a travel lane during peak travel hours or during incidents. The figures on the right show how the shoulder would be opened or closed as a travel lane. In the case of I-695, we are using the median shoulder as the PTSU lane.

Civil/Roadway to Support PTSU

- PTSU lane is shoulder when not in operation



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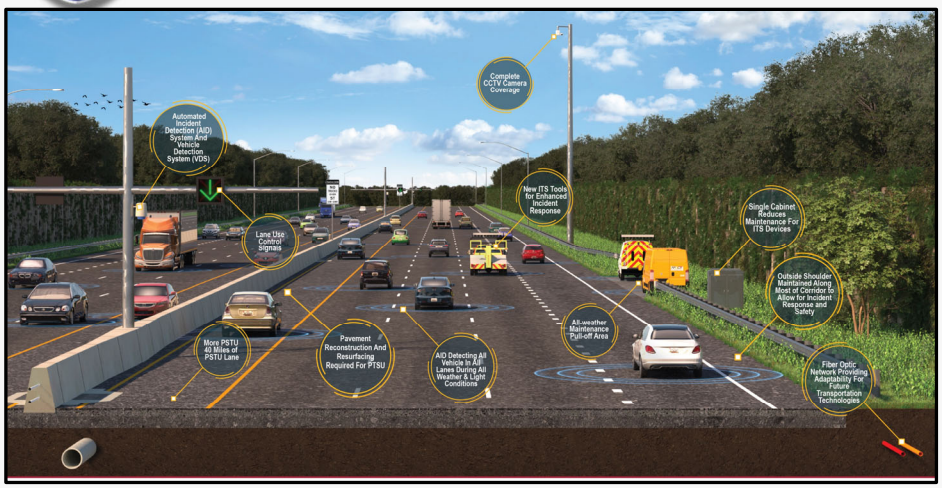
Let's go through a few of the civil and roadway details to support PTSU while looking a typical section of I-695. We have the PTSU lane in the median where it will be operated as a travel lane during peak hours or for incidents and will be a shoulder when not in operation.

Civil/Roadway to Support PTSU



- AASHTO compliant outside shoulder maintained for 99% of corridor in final condition

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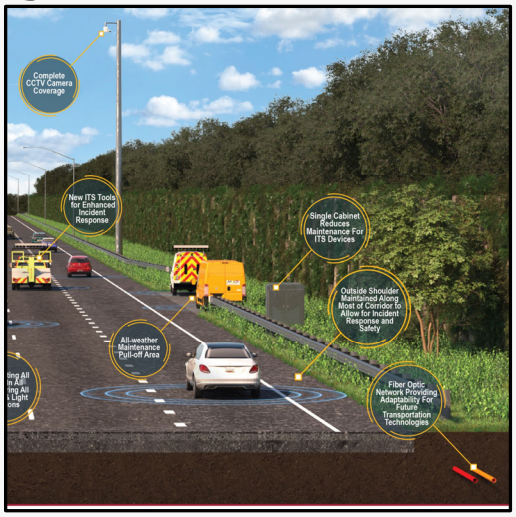
We are maintaining AASHTO compliant wide shoulders on the outside of the roadway for most of the corridor, even while the PTSU lane is open to facilitate emergency response and provide space for emergency breakdowns.

Civil/Roadway to Support PTSU

- Pull-Off Areas for Maintenance



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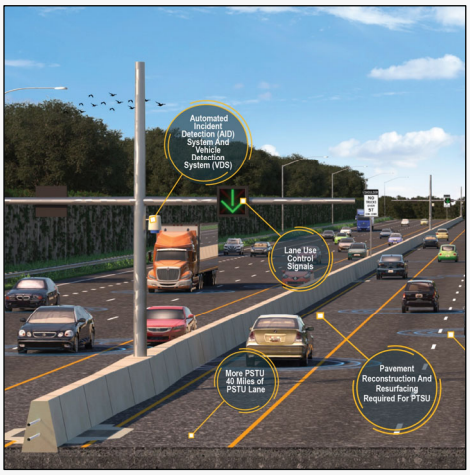
We are installing substantial ITS as part of this project, to support maintenance of those devices we are installing maintenance pull-off areas.

Operations to Support PTSU

- Open for Static Operating Hours
  - Recurring congestion relief
- Ability to Open for Incidents
  - Non-recurring congestion relief
- Decision Support System



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The Operations to support the PTSU lane include opening the PTSU lane during scheduled peak hours. Generally 6-10 and 2-7 on weekdays. The system will also have the ability to open for non-recurring congestion such as crashes, events or other congestion causes. The project is deploying a decision support system to aid with operating the system.

Operations to Support PTSU

- Automated Sweep of PTSU Lane Prior to Opening
- Closure of PTSU Lane
  - Blockage
  - End of Static Operating Period

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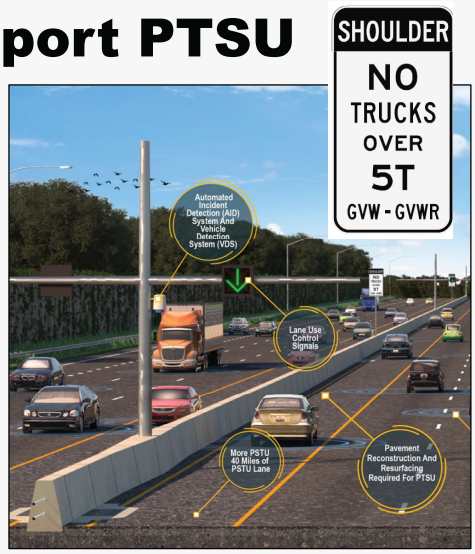
The system will perform continuous automated sweeps of the PTSU lane before opening and while it is open to ensure the lane is not blocked. We will discuss the technology used to perform that automated incident detection later in this presentation. The system has the ability to close the PTSU lane in real time in response to a blockage or the end of the static operating period (after traffic volumes have reduced). The goal is to support safe operations of the PTSU lane.

Operations to Support PTSU

- Vehicle (Truck) Restriction in PTSU Lane
  - 5 Tons Gross Vehicle Weight – Gross Vehicle Weight Rated



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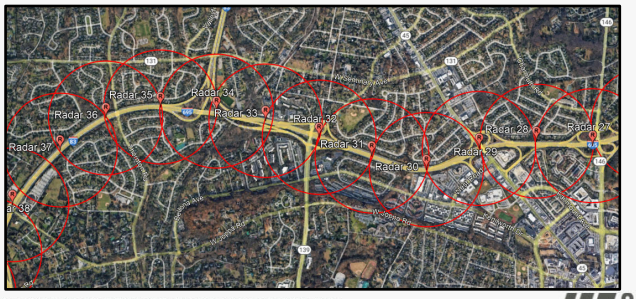
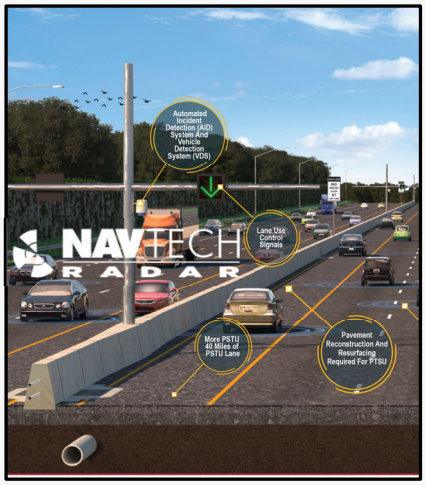
The PTSU lane will include vehicle restrictions. No trucks will be permitted to travel in the PTSU lane. Signing will be deployed with a truck restriction for the shoulder lane.

Technology to Support PTSU

- Radar Automated Incident Detection (AID)
  - Navtech Radar Clearway
    - Approximately 80 sensors
    - Covers all Lanes





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Now we are going to discuss the technology to support the PTSU lane. This is where we get into some very cool devices and ITS devices. The first is the Automated Incident Detection system which will continuously monitor the PTSU lane for obstruction. For the project we evaluated a variety of AID solutions and selected a global leader with over 5,000 sensors deployed throughout the world: Navtech Radar Clearway system. Their Clearway system deploys 360 degree radar sensors to monitor the roadway. A bonus of the Clearway system is that we can provide AID in all lanes, not just the PTSU lane. This is an added benefit which will decrease verification, validation and response times for incidents on I-695. This is the first major product using this technology in the United States.

To cover the 40 miles of PTSU lane deployed for the project, we are using 80 radar sensors. A camera based system covering the same function would have required over 300 cameras.

Technology to Support PTSU

- Radar Automated Incident Detection (AID)
  - AID Types

AID Type
Stopped Vehicle Detection
Slow Vehicle Detection
Wrong Way Driver Detection
Queue Detection
Pedestrian Detection
Debris (2'x2'x'2 Min) Detection

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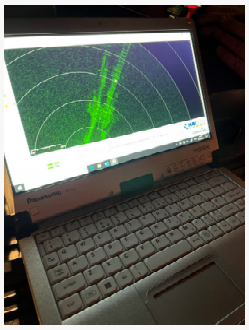
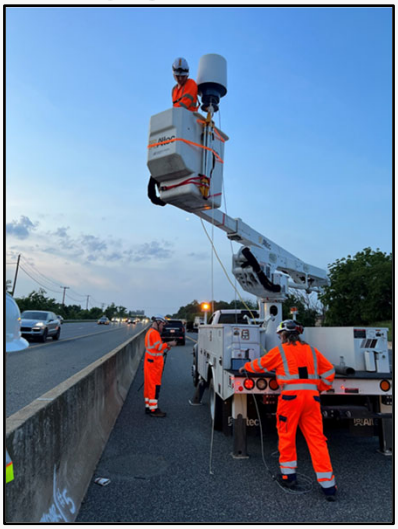
The AID system can detect stopped vehicles, slow vehicles/queues, wrong way drivers, pedestrians in the roadway and debris as small as 2'x2'x2'. We have designed the system to provide complete coverage of the PTSU lane and coverage of over 90% of the general purpose lanes. This provides unmatched situational awareness of operations on I-695 by SHA. The photo on the right is what the radar sensor looks like, this is from a pilot installation completed by TSNT on I-495 in Virginia.

Technology to Support PTSU

- Radar Automated Incident Detection (AID)
  - Site Survey





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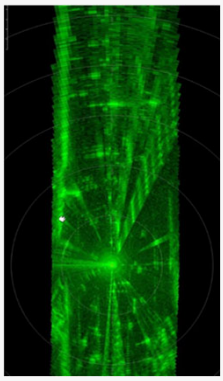
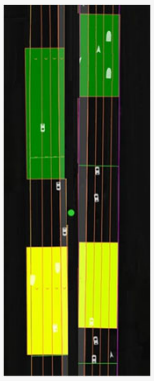
As part of the design and construction process for the Navtech Radar system we complete a site survey using the actual radar to confirm the placement of the system and also to allow Navtech to start configuration of the system before the detectors are installed. We visited all 80 sites and took radar readings.

Technology to Support PTSU

- Radar Automated Incident Detection (AID)
  - Provides Vehicle Detection System

Traffic Data Type
Volume (Count)
Speed
Classification (Length Based)
Occupancy





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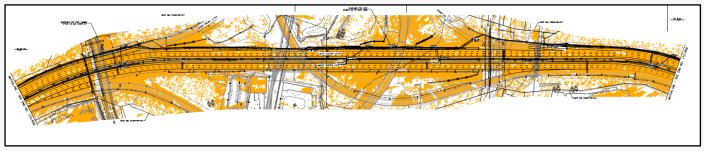
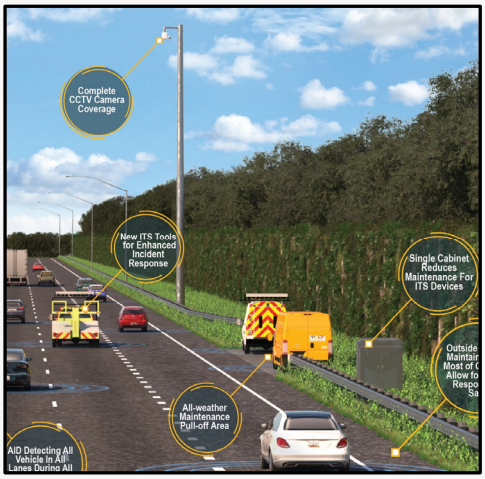
Another benefit of the Navtech Clearway system is that the same 80 detectors used for AID will fulfill the requirements for the vehicle detection system required per the RFP. SHA requested volume/occupancy/speed detectors be installed every 3rd of a mile along the project. The Navtech radar can be configured to collect that data using the same sensor that is used for AID. This slide shows an example of the detection areas and the raw radar returns.

Technology to Support PTSU

- CCTV Coverage
  - Approximately 50 new cameras
  - Sight-line Analysis





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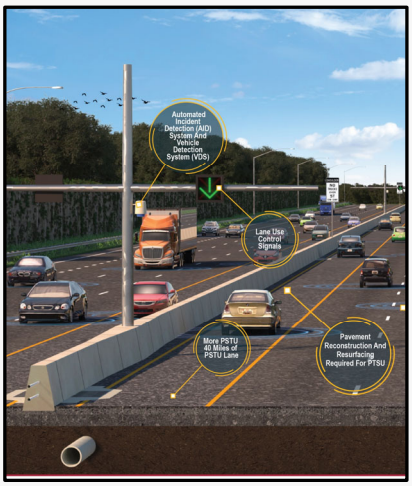
To support operations, we are deploying Complete CCTV Camera Coverage. We completed sightline analysis using Lidar and ArcGIS to confirm the view from each CCTV camera. This was also validated using existing cameras. The project will deploy approximately 50 new cameras

Technology to Support PTSU

- Lane Use Control Signal
  - Approximately 189 LUCS



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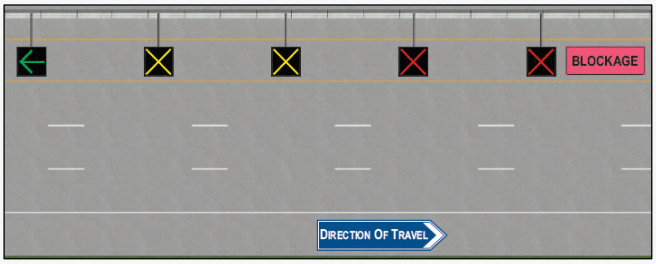
To open and close the PTSU lane, our project proposed lane use control signals using red x, yellow x and green arrow symbols.
We will deploy approximately 189 LUCS for the project mounted on mast arm poles and overhead sign structures.
We are using PLC's to control the LUCS and tie into the central software.

Technology to Support PTSU

- Emergency Response
  - Approximately 18 Segments
  - Collaboration with MSP, CHART, etc.



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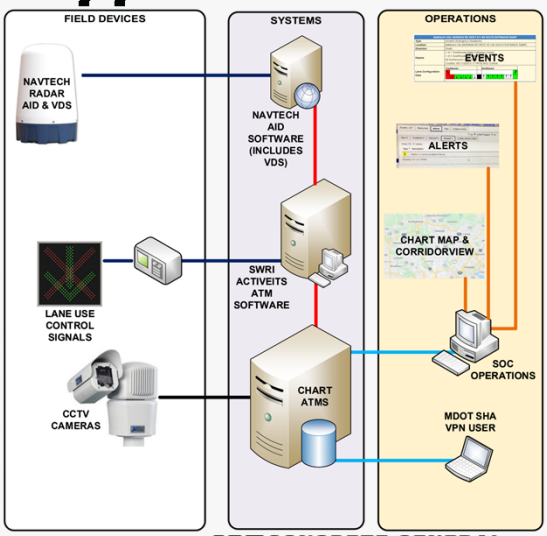
To support operations we have broken the project into 18 operating PTSU segments (9 per direction). We are able to open or close them independently based on detector data, AID alarms, schedule or other event needs. As deployment gets closer coordination will continue with emergency responders, police and highway maintenance.

Systems to Support PTSU

- SouthWest Research Institute ActiveITS ATM Software Deployed to Control PTSU Lane
  - Integration with CHART ATMS



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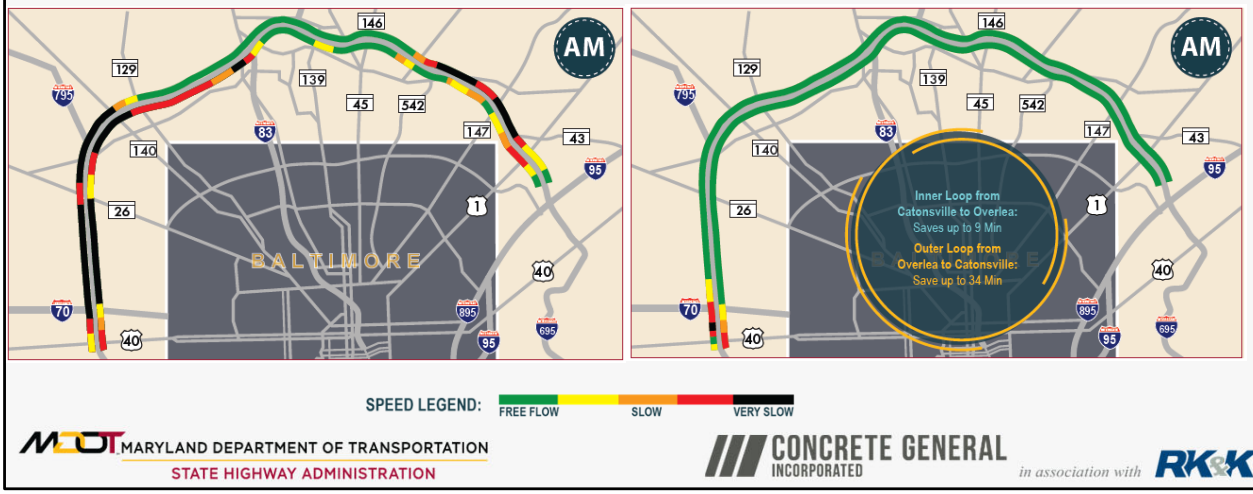
To support the technology and operations, we are deploying the Southwest Research Active ITS software which will be directly integrated into the CHART ATMS to provide a seamless operations experience for SOC Operators.

PTSU Mobility & Safety Improvements



SPEED LEGEND: FREE FLOW SLOW VERY SLOW

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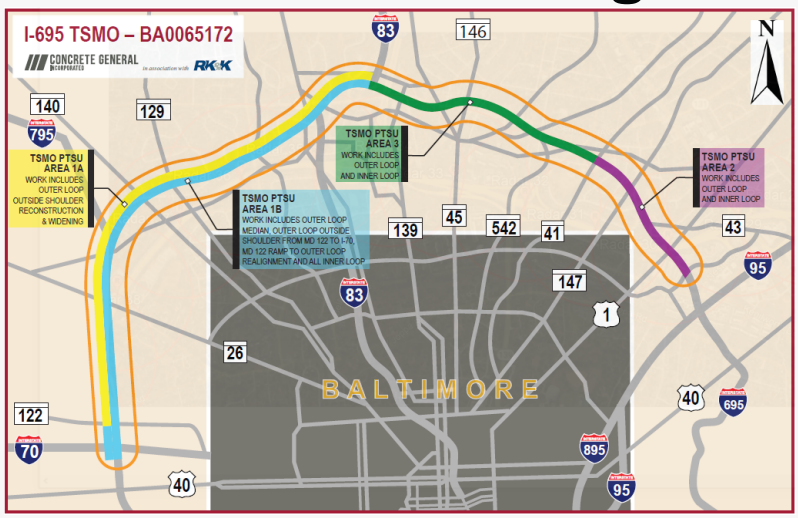
This graphic shows the projected changes in travel speed and travel time. We expect upon opening, the commute from Overlead to Catonsville will be reduced by up to 34 minutes!!!

Construction Phasing



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For the purposes of permitting, design and construction we split the project into 4 areas. Area 1A included the outside work along I-695 outer loop between I-83 and MD 122 Security Blvd. Area 1A was the early work package along I-695 outer loop from I-83 HBX to MD 122 because there were no impacts to natural resources, which allowed construction to start before the final wetlands/waterways permits were in-hand. Area 1B was the remaining work between I-70 and I-83. Area 2 was the eastern limit of the project and Area 3 was between I-83 and MD 41 Perring Parkway. Area 3 was the most complex from a permitting and design perspective, so it was the last area to begin work. We also had an early work ITS package and a corridorwide ITS package.

Questions?

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