

# I-95/I-395 Integrated Corridor Management Initiative Update

**Chris Francis**

Operations and Security Division, VDOT, Richmond, VA

**Commuter Connections Subcommittee Meeting**

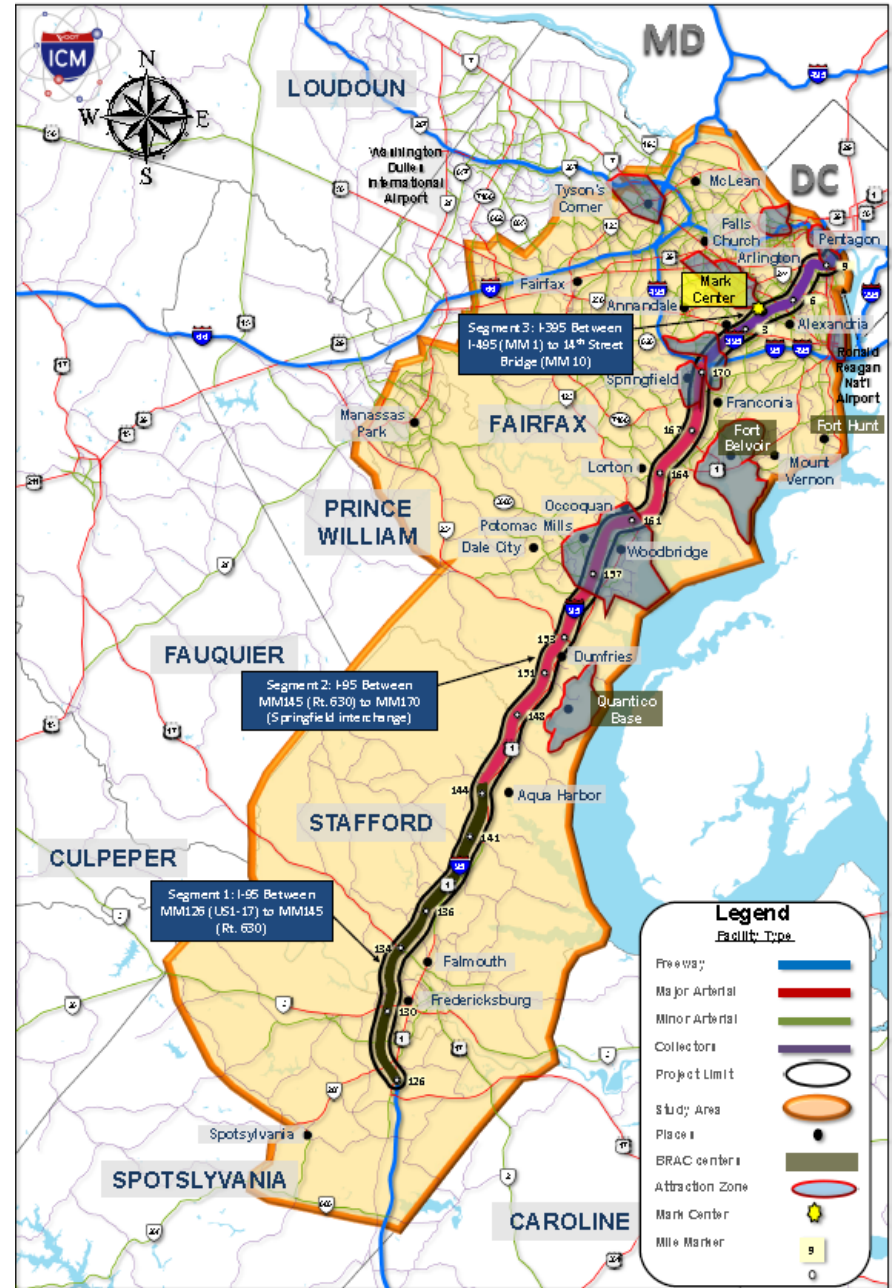
Metropolitan Washington Council of Governments

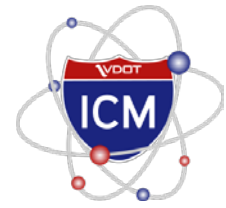
Washington, DC, September 18, 2012



# Status

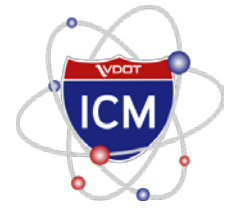
- I-95 / I-395 ICM ConOps & Project Development Task began **October, 2011**
- Extensive internal and external outreach resulted in definition of ICM strategies and **Concept of Operations**
- ICM Roll Out - Project **work packages** defined based on **corridor-wide** and **segment** needs, addressing “low hanging fruit” with an **ICM Partnership** to implement more complex multi-modal applications.





## Key ICM Deliverables

- Concept-of-Operations
- ICM Architecture and Systems Engineering Management Plan
- Deployment Plan **w/Multi-modal Work Packages** (Corridor-wide and Segment-based)
- **ICM Partnership** - Institutional Framework for ICM Implementation



***Significant  
Congestion***

***ICM Systems***

***Managing All  
Corridor Capacity***

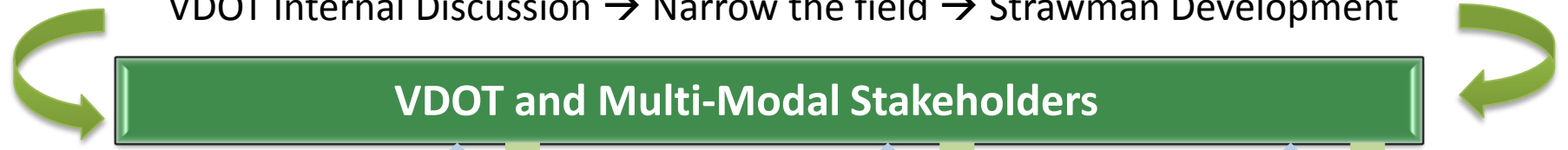


multi-agency collaboration and coordination



# Stakeholder Engagement & Project Development

VDOT Internal Discussion → Narrow the field → Strawman Development



*Project and Operational Knowledge*



- Operations, Traffic, and Travel Demand
- As-Built Infrastructure and ITS Assets
- Transit Projects and TDM Initiatives
- Roadway Projects and Transit/TDM Initiatives

Corridor Assessment (Baseline)

*Needs and Functional Input*



- Stakeholder Needs
- Technology Options
- Overall ICM Approach
- Coordination with Transit / Other

Project Needs and Strategy Formulation

*Coordination On System Elements*



- System Architecture
- Technology Definitions
- System Locations
- Technology Deployment Plan

Deployment Recommendations

*Operational Roles and MOU Needs*

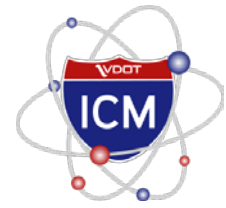


- Performance Measures
- Refined System Concept
- Roles and Responsibilities
- Multi-modal Operational Scenarios

Concept of Operations

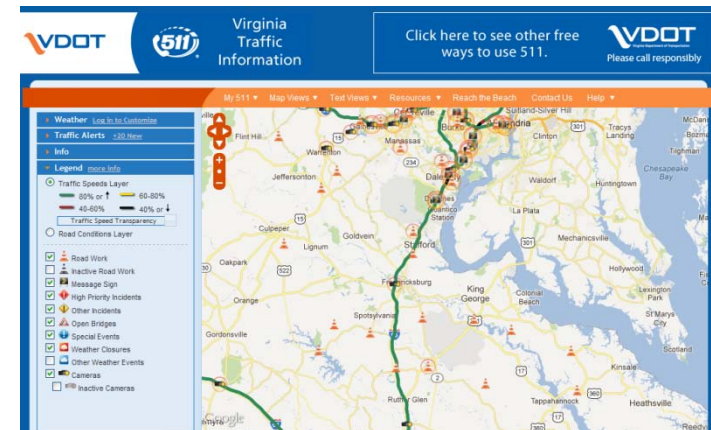
**ICM Project Development Activities**





# Needs Highlight

- Need real-time, multi-modal, end-to-end, traveler information data and services
- Need a single access point to an integrated multi-modal trip planning to include TDM options
- Need real-time parking availability
- Need enhanced incident management
  - Local incident info from local police CAD
  - Arterial incident coordination
- Need optimized signal operations
- Need to address Mark Center traffic impact



# ICM Vision for I-95 / I-395 Corridor



**MAIN NEED (GOAL) TO BE ADDRESSED**

**IMPROVE MOBILITY FOR TRAVELERS IN CORRIDOR**

**KEY OBJECTIVES/ PERFORMANCE MEASURES**

REDUCE DELAY

REDUCE PRIMARY/  
SECONDARY CRASHES

REDUCE TRAVEL TIME  
VARIABILITY

REDUCE SOV VOLUME  
TO MARK CENTER

REDUCE TRAVEL COSTS

**ICM TECHNOLOGY/ INFRASTRUCTURE**

**DEPLOYMENT COMPLEXITY**

**LOW**

**MODERATE**

**HIGH**

MULTI-MODAL  
TRAVEL TIME  
DMS

ATM/HSR  
(P1)

WEB/APP  
TRAVEL TOOL  
(P3)\*

PARKING LOT  
MGMT DMS

ARTERIAL  
SIGNAL  
SYSTEMS

ADVANCED  
DECISION  
SUPPORT

WEB/ MOBILE  
APP TRAVEL  
TOOLS (P1)\*

ADAPTIVE  
RAMP  
METERING

TRANSIT SIGNAL  
PRIORITY

WEB/APP  
TRAVEL  
TOOL(P2)\*

FULL ICM  
MODULE  
AT TOC

**ICM STRATEGY AREAS**

INFORMATION SHARING  
&  
DISTRIBUTION

IMPROVE OPERATIONAL  
EFFICIENCY OF  
NETWORK JUNCTIONS &  
INTERFACES

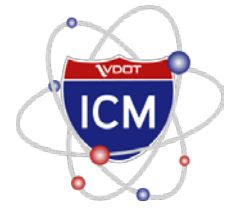
MANAGE CAPACITY-  
DEMAND: REAL -TIME/  
SHORT TERM

MANAGE CAPACITY-  
DEMAND:  
LONG TERM

PROMOTE CROSS  
NETWORK ROUTE/  
MODAL SHIFTS

**STRATEGY FOCUS**

**REDUCE CONGESTION &  
IMPROVE QUALITY OF  
SERVICE**

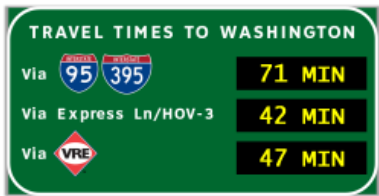


# Emphasis Areas

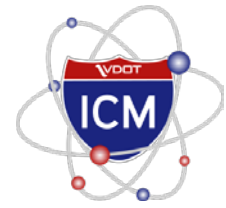
- **Operations-Related Work Packages**
  - Segment-based (but includes central hardware/software)
  - Infrastructure-oriented
  - En-route orientation
  - Benefits to various modes
  - TMP-related offsets could be at least \$3.96M of above
- **Traveler Information-Related Work Packages**
  - Corridor-wide
  - Build on 511 / current rideshare initiatives
  - Pre-trip orientation
  - Encourage mode shift, moves from SOV to HOV and transit
  - Entire investment could qualify as a TMP-related offset
- **Decision Support and Performance Management Systems are future elements**



# ICM Concept Applications



- **Travel Time Information for All Travel Modes**
  - Pre-trip and en-route travel time information for multiple travel modes along the corridor (95/395. HOT, US1, bus, train)
  - Delays, congestion, restrictions at bases / work locations
  - Personal trip planning tool (end-to-end, compare/mix travel modes)
  - Address road and transit options and available parking should transit, carpool or slugging option be considered by the traveler
- **Real-time Parking Management and Guidance**
  - Park-and-ride space and guidance information (VDOT, VRE, WMATA parking facilities near I-95) for travelers entering the corridor via arterials, where they may have two or more options relative to parking and either carpooling, slugging or using transit.
  - Comparative travel time information for transit options (including next bus / train departure) would be presented along with parking space availability.

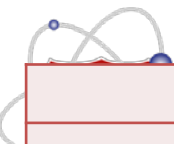


## TDM is a key focus of ICM Applications

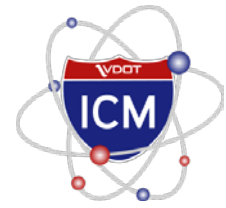
- Achieving the goals to increase dynamic rideshare, change of mode and time of travel will be facilitated through improved transparency of information provided:
  - Travel times for all modes
  - Real-time availability of parking spaces at existing parking areas
- Better informed travelers will make better decisions on mode, time and route of travel

## Traveler Information-Related Packages

TDM GOALS	Integrated Single Info Gateway	Kiosks	Expanded Multi-Modal and Parking Info	Personalized Multi-Modal Real-Time Trip Planning
Increase Carpooling	Provide links to carpool providers, improve awareness of corridor operational status	Improve awareness of corridor operational status	Real-time parking info promotes use of carpool / rideshare staging areas at new/different facilities	Provide trip planning capability with modal option for rideshare requests and responses (integrate with Commuter Connections, dynamic ridesharing systems). Providing parking status info between ICM and rideshare providers permits ability to arrange trips from specific park-and-ride locations, assuring availability of parking for rideshare users.
Increase Dynamic Rideshare	Provide links to carpool providers, improve awareness of corridor operational status	Improve awareness of corridor operational status	Real-time parking info promotes use of carpool/rideshare staging areas at new/different facilities	SEE ABOVE
Increase Transit Use	Increase awareness of transit options in the event that an incident on I-95 or 395 results in transit being more convenient.		Increase awareness of transit options in the event that an incident on I-95 or 395 results in transit being more convenient. Parking info can assist in facilitating mode shift where needed.	Provides flexible options for trip planning, including transit for part, most or all of a corridor trip, using real-time information for all modes.
Change Time of Travel	Better awareness of travel conditions prior to all times of travel	Potential encouragement to wait till later to travel home	Provide predictive information on when parking or transit is full on daily basis, encourage travel before heart of peak period.	Provide flexible options for travel based on time and mode, including ability to arrange rides, carpools or vanpools at whatever time the person is traveling

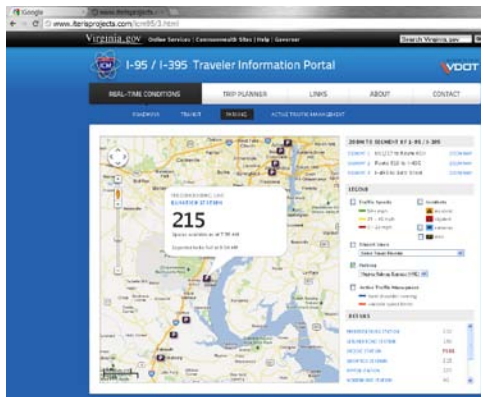


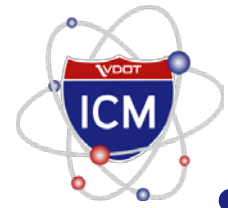
	Operations-Related Packages			
<b>TDM GOALS</b>	Multi-Modal and Parking Information Systems	Arterial Enhanced Signal Operations	Freeway Active Traffic Management	ICM Central Systems
Increase Carpooling	Real-time parking info promotes use of carpool/slugline staging areas at new/different facilities	Enhancing signal operations between park-and-ride and I-95 can reduce delays	Use of HOV restrictions for hard-shoulder running and HOV bypass lanes at new ramp meters may encourage carpool use as best means of reducing delay	Systems required for multi-modal/parking information systems deployment
Increase Dynamic Rideshare	Real-time parking info promotes use of carpool/slugline staging areas at new/different facilities		Use of HOV restrictions for hard-shoulder running and HOV bypass lanes at new ramp meters may encourage carpool use as best means of reducing delay	
Increase Transit Use	Increase awareness of transit options in the event that an incident on I-95 or 395 results in transit being more convenient. Parking info can assist in facilitating mode shift where needed.	Providing traffic signal priority may reduce travel time and enhance schedule adherence.	Use of HOV restrictions for hard-shoulder running and HOV bypass lanes at new ramp meters favors transit by allowing it to bypass meter queues while at the same time benefitting from the demand control strategies on the mainline that are provided through metering.	
Change Time of Travel		Reinforce better periods to travel through improved operating parameters / performance	Provide more favorable restrictions for earlier periods (e.g., no HOV restriction for hard-shoulder running lane in Stafford during first hour of peak, HOV-3 after)	



# Information-Related Packages

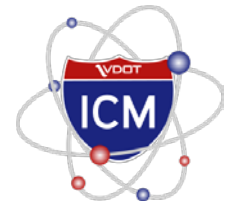
- Integrated Single Information Gateway
- Expanded Multi-Modal and Parking Information for 511
- Personalized Multi-Modal Real-Time Trip Planning
- Kiosk Installations





# Information-Related Packages

- **Integrated Single Information Gateway**
  - Create corridor-focused web and mobile access point within 511
  - Add transit data access to 511 interface
  - Corridor-based traffic, travel time, and transit status information
  - Basis for additional Transit / TDM activities
- **Expanded Multi-Modal and Parking Information for 511**
  - Create distinct tabs and interfaces for traffic, ATM-related info (speeds, shoulder status), each transit carrier, parking facilities)
  - Requires data from park-and-ride information projects (operations related)
  - Would greatly benefit and support dynamic ridesharing activities through sharing of parking information with rideshare systems / services



# Information-Related Packages

- **Personalized Multi-Modal Real-Time Trip Planning**
  - Add access and interface to commuter connections and dynamic ridesharing services including sharing of parking and system status info with those services
  - Develop personal multi-modal trip planner interface allowing incorporation of road, transit, rideshare options and reservations
  - Would integrate transit and rideshare options and arrangements into trip planning mechanism
- **Kiosk Installations**
  - Corridor-based traffic, travel time, and transit status information
  - Locate at:
    - Pentagon, Mark Center, Ft Belvoir, MC Quantico, Pentagon City Mall, Landmark Mall, Franconia-Springfield Metro Station, Potomac Mills



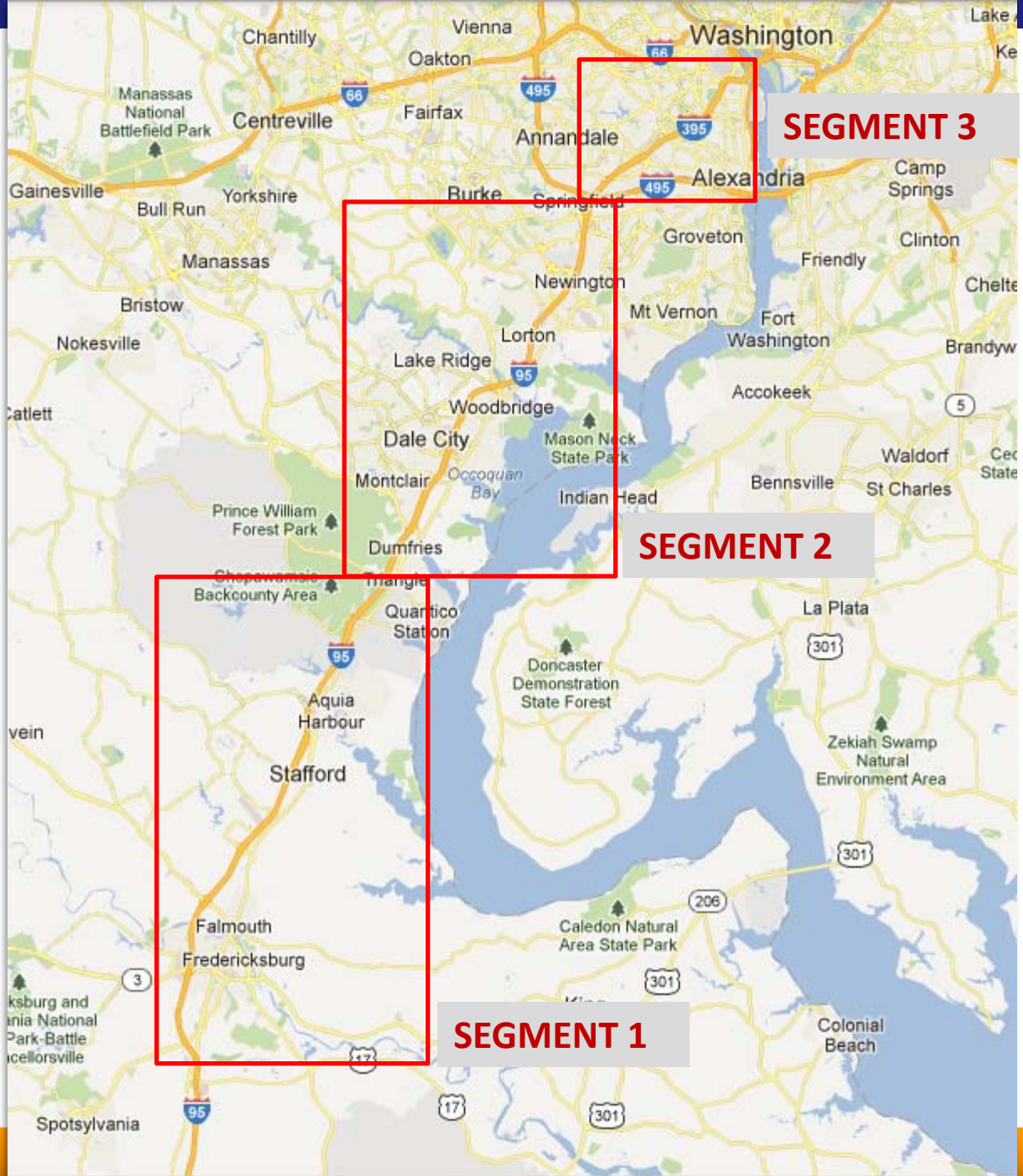
# Operations-Related Packages

## 3 SEGMENTS

MM 126-145

MM 145 – 170 (Springfield)

I-395 (MM 0 – 10)

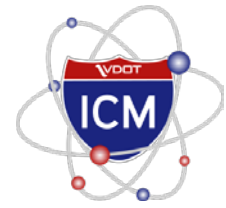




Project ID #	Project Element (Segment 1)	Location	TDM / Transit Support	Potential Trips Influenced (est.)
1a1	Active Traffic Management / Hard Shoulder Running	MM 138 - 145	HOV-2, transit only for peak period use	14,000
1b1	Enhanced Arterial Signals	US 1 MM 126 to US 17	Signal priority for express buses.	4400
1b2	Enhanced Arterial Signals	Route 3 I-95/ US1	Enhance access from park-and-ride, signal priority for express buses.	2200
1c1*	P&R Management and Guidance	MM 139-145	Encourage shifting of demand, increase dynamic rideshare options**.	3500
1c2	P&R Management and Guidance	MM 126-139	See #1c1 above	2200
1c3*	Comparative Travel Time System	MM 126-145	Compare mode and lane options	14,000

\* Elements of these projects support TMP Mitigation of Express Lanes Project

\*\* Required for providing parking information as part of Traveler Information enhancement activities

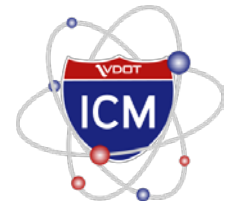


# Fulfillment of TDM Goals

## Segment 1

Project ID #	Project Element (Segment 1)	Increase Carpooling	Increase Dynamic Rideshare	Increase Transit Use	Change Time of Travel
1a1	Active Traffic Management / Hard Shoulder Running (MM138-145)	Indirect		Indirect	
1b1	Enhanced Arterial Signals (US 1)			Direct (if TSP used)	
1b2	Enhanced Arterial Signals (Route 3)			Direct (if TSP used)	
1c1*	P&R Management and Guidance (Stafford)	Direct	Direct	Direct	Indirect
1c2	P&R Management and Guidance (Frederickburg)	Direct	Direct	Direct	Indirect
1c3*	Comparative Travel Time System				

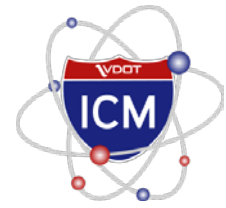
Project ID #	Project Element (Segment 2)	Location	TDM / Transit Elements	Potential Trips Influenced (est.)
2a1*	P&R Management and Guidance	Dale City/ Woodbridge	Encourage shifting of demand, increase dynamic rideshare options**	15,400
2a2*	P&R Management and Guidance	Lorton/ S. FFX County	See #2a1 above**	5,900
2a3*	Comparative Travel Time System	Dale City/ Woodbridge	Compare mode and lane options	15,400
2b1	Ramp Queue Warning - Quantico	Exit Ramps to Quantico	Improve safety, reduce access delay	8,400
2c1	Ramp Metering – PW & FFX Counties	PW/ Fairfax Counties	Include HOV meter bypass lane to favor HOV and transit at entrance ramps	21,300
2d1*	Enhanced Arterial Signals US1 in PW Co.	US 1 (PW County)	Express bus signal priority and overall flow enhancement	2,000
2e1*	Enhanced Arterial Signals US1 to I-495	Woodbridge to I-95/I-495	Express bus signal priority	3,000
2e2*	Enhanced Arterial Signals – Dale City	Dale City Area	Emphasis on express bus signal priority as well as overall accessibility from P+R	4,000
* Elements of these projects support TMP Mitigation of Express Lanes Project				
** Required for providing parking information as part of Traveler Information enhancement activities				



# Fulfillment of TDM Goals

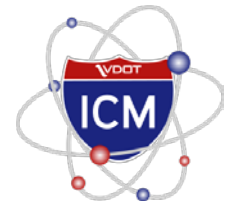
## Segment 2

Project ID #	Project Element (Segment 2)	Increase Carpooling	Increase Dynamic Rideshare	Increase Transit Use	Change Time of Travel
2a1*	P&R Management and Guidance	Direct	Direct	Direct	Indirect
2a2*	P&R Management and Guidance	Direct	Direct	Direct	Indirect
2a3*	Comparative Travel Time System			Indirect	Indirect
2b1	Ramp Queue Warning - Quantico				Indirect
2c1	Ramp Metering – PW & FFX Counties	Indirect	Indirect	Indirect	Indirect
2d1*	Enhanced Arterial Signals US1 in PW Co.			Direct (if TSP used)	
2e1*	Enhanced Arterial Signals US1 to I-495			Direct (if TSP used)	
2e2*	Enhanced Arterial Signals – Dale City			Direct (if TSP used)	



## Segment 3 Overview

Project ID #	Project Element (Segment 3)	Location	TDM / Transit Elements	Potential Trips Influenced (est.)
3a1	Enhanced Arterial Signals – Transit Signal Priority	Seminary Rd Mark Center to I-395	Express bus signal priority	2000 (assuming 30% transit use to Mark Center)
3b1	Hard Shoulder Running	I-395 at Edsall Rd	Reduce traffic bottlenecks	35,000



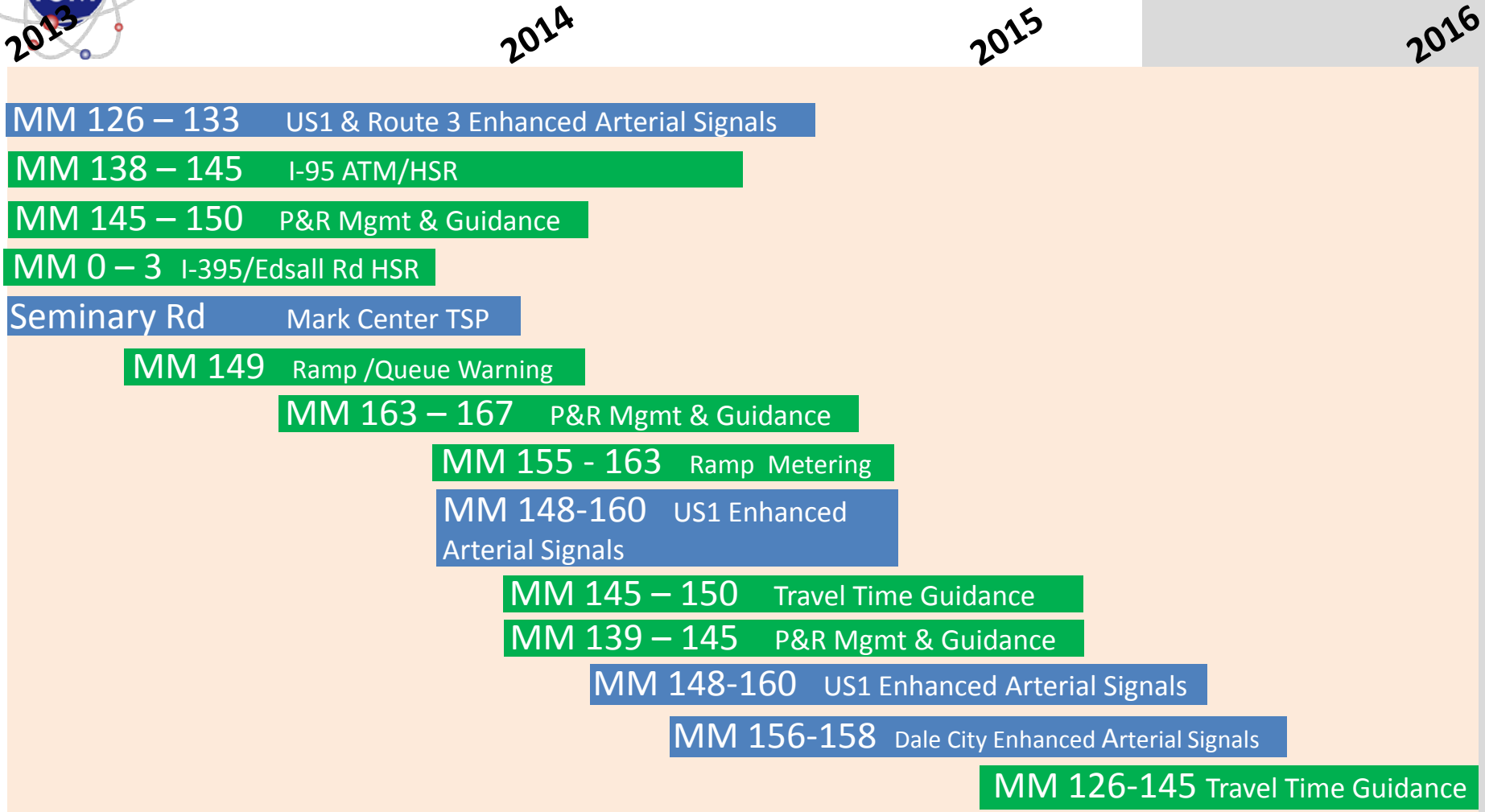
# Fulfillment of TDM Goals

## Segment 3

Project ID #	Project Element (Segment 3)	Increase Carpooling	Increase Dynamic Rideshare	Increase Transit Use	Change Time of Travel
3a1	Enhanced Arterial Signals – Transit Signal Priority (Mark Ctr / Seminary)			Direct	
3b1	Hard Shoulder Running (395/Edsall)				

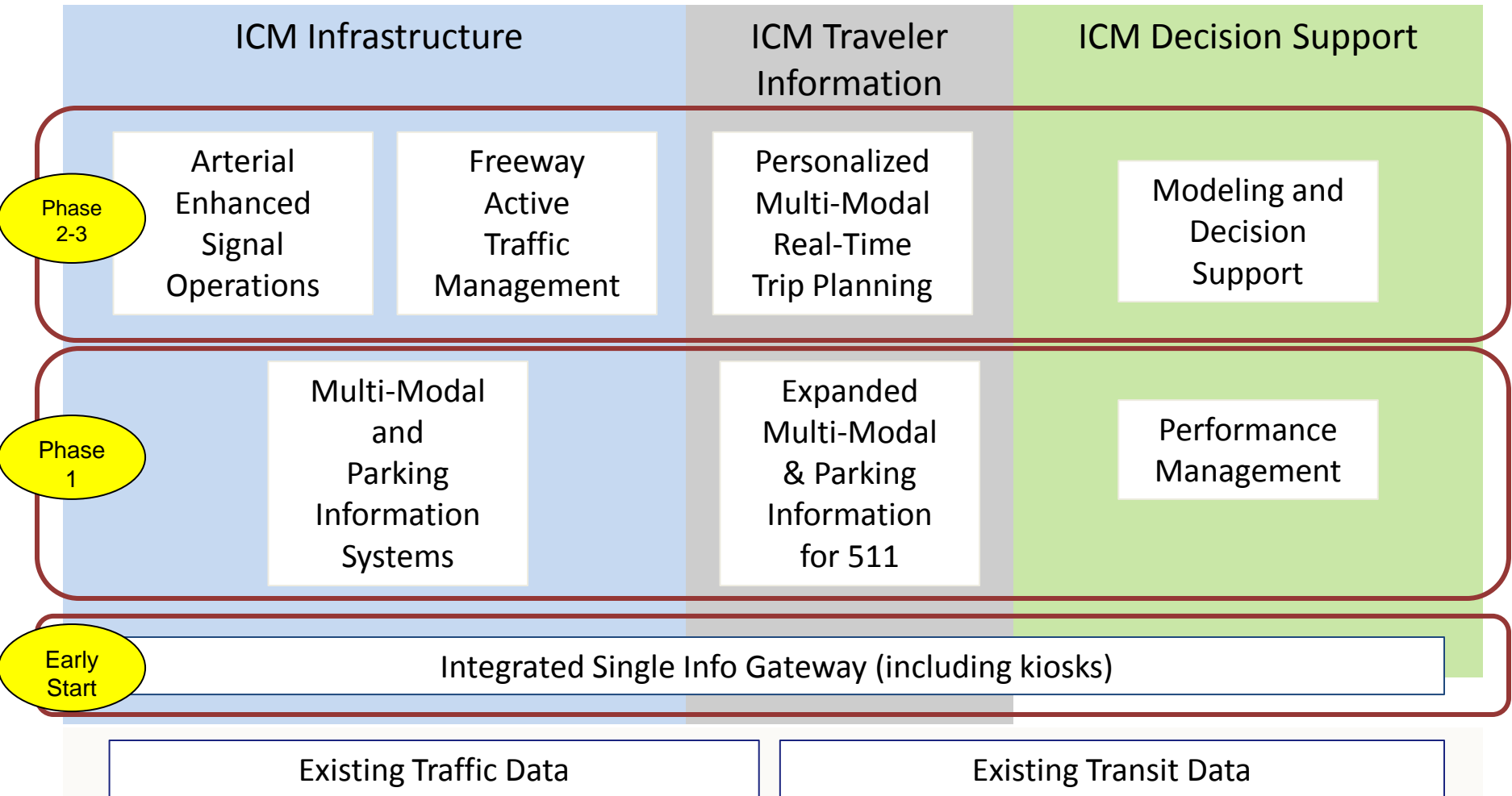


# Preliminary Project Schedule and Sequencing Summary



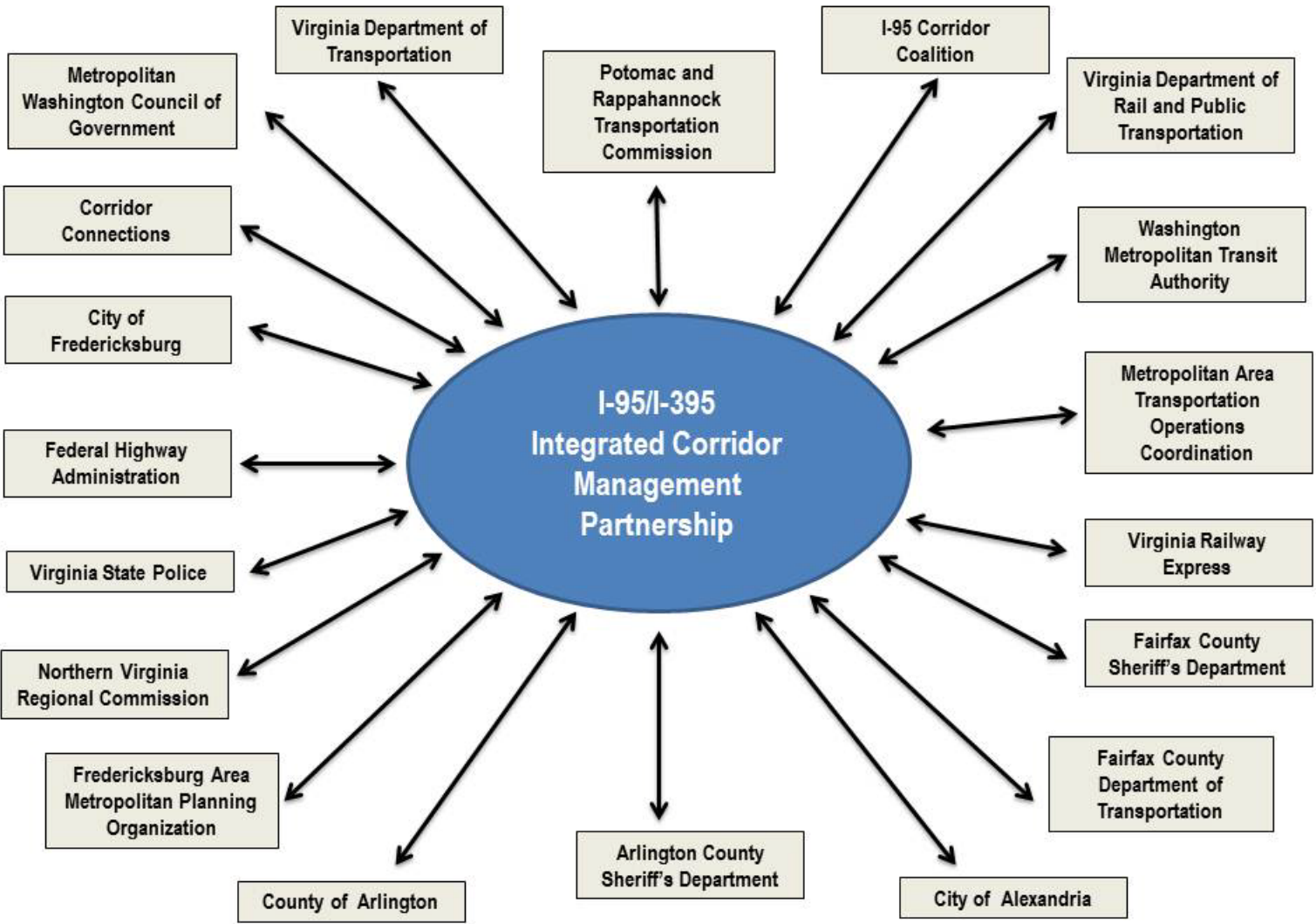


# Deployment View: Project Packages Derived from “Building Blocks”



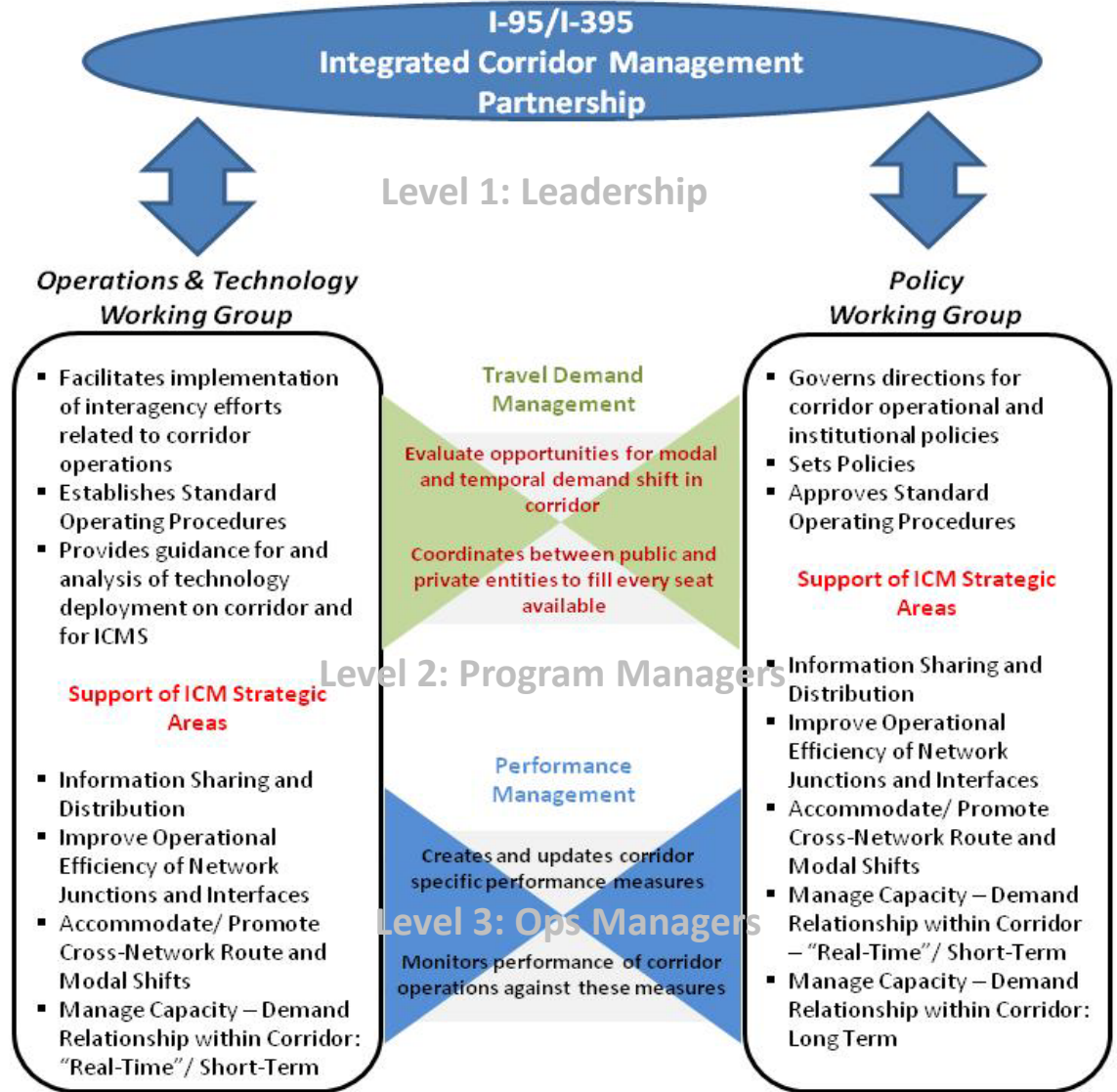


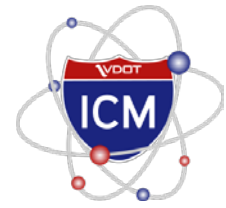
# Institutional View: The ICM Partnership





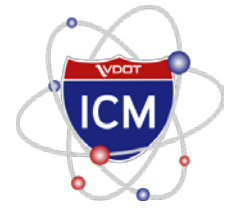
# Working Group Structure



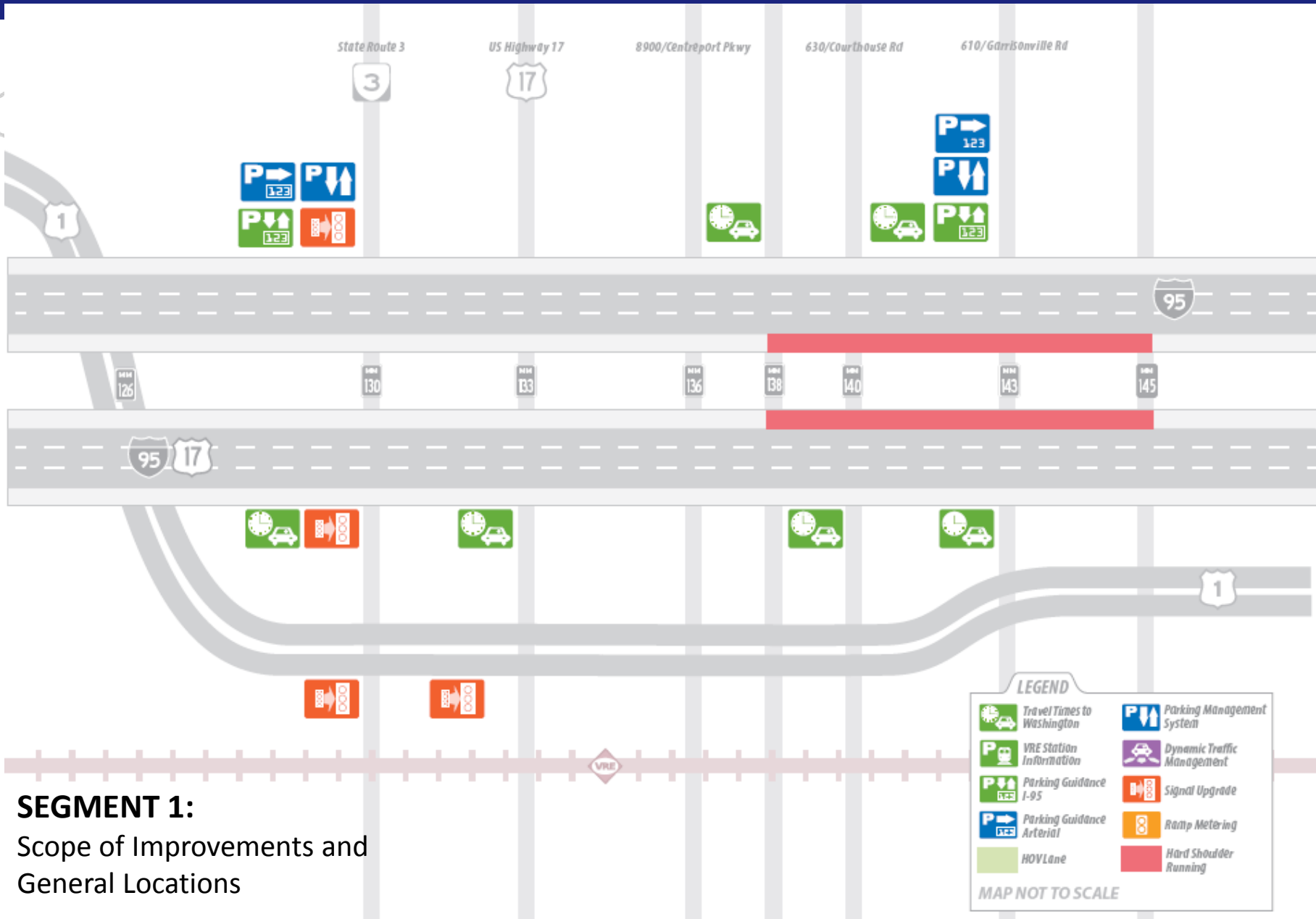


# Feedback

- Any further transit and TDM activities in corridor related to ICM activities we should address or know about?
- Coordination needs
- Other



# TYPICAL ICM CONCEPT EXAMPLES



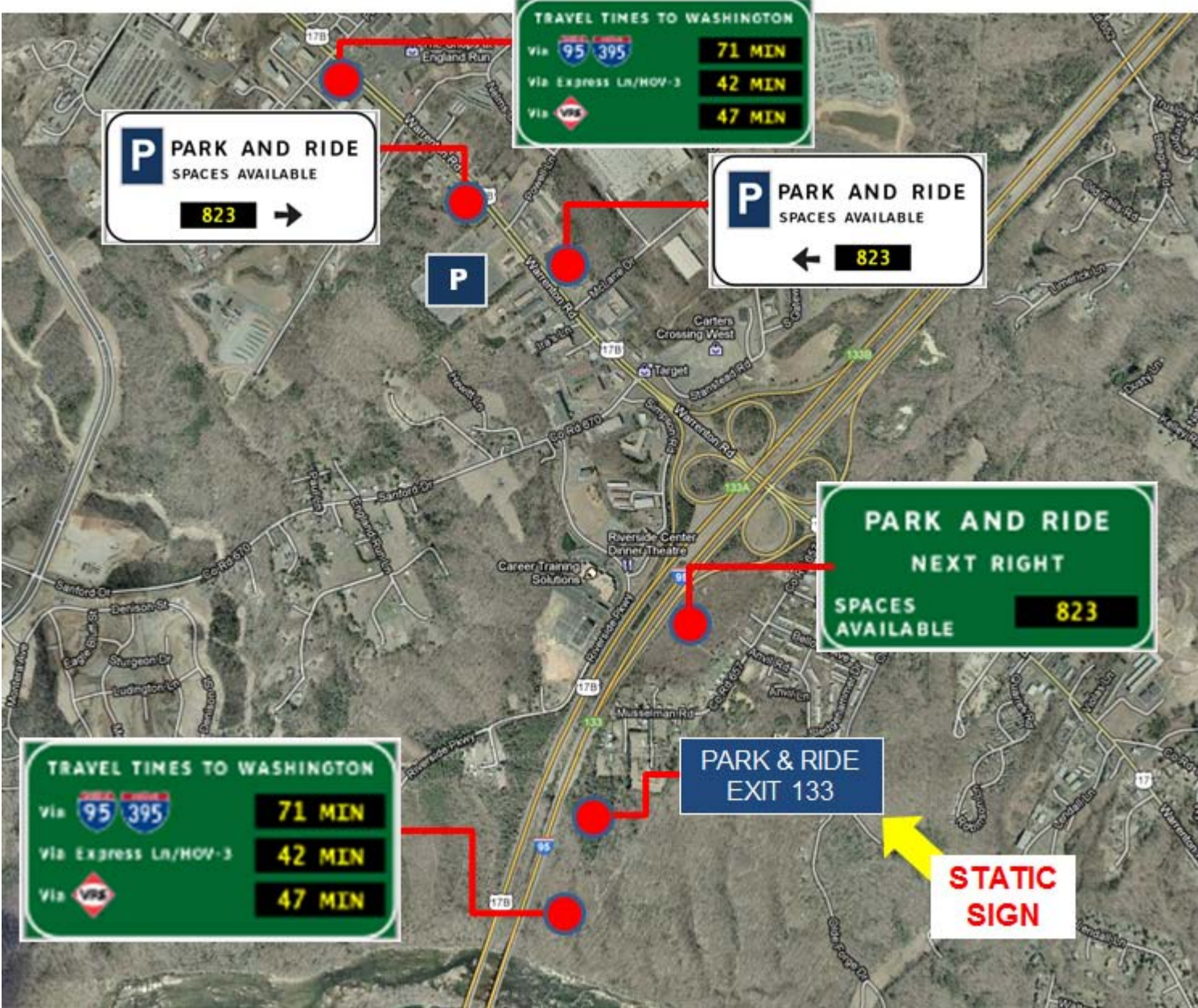
## SEGMENT 1: Scope of Improvements and General Locations



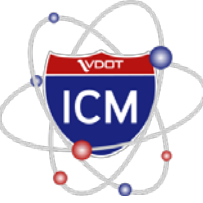
### PROJECT PACKAGE 1

- 1A1 - ATM/Hard Shoulder Running I-95 (MM 138-145)
- 1B1 - Arterial Enhanced Signal Operations (US 1)
- 1B2 - Arterial Enhanced Signal Operations (Route 3)

- 1C1 - Park and Ride Management and Guidance System (MM 139-145)
- 1C2 - Park and Ride Management and Guidance System (MM 126-139)
- 1C3 - Comparative Multi-Modal Travel Time Signage (MM 126-145)



Example  
@  
US 17/  
Warrenton  
Rd



# Proposed Hard Shoulder Running (MM 139 to MM 145)

**Major Gantry (1/2 mile Spacing)  
HSR (left shoulder),  
Speed Restriction)**



**Major Gantry (1/2 mile Spacing)  
Normal Operation,  
No HSR**

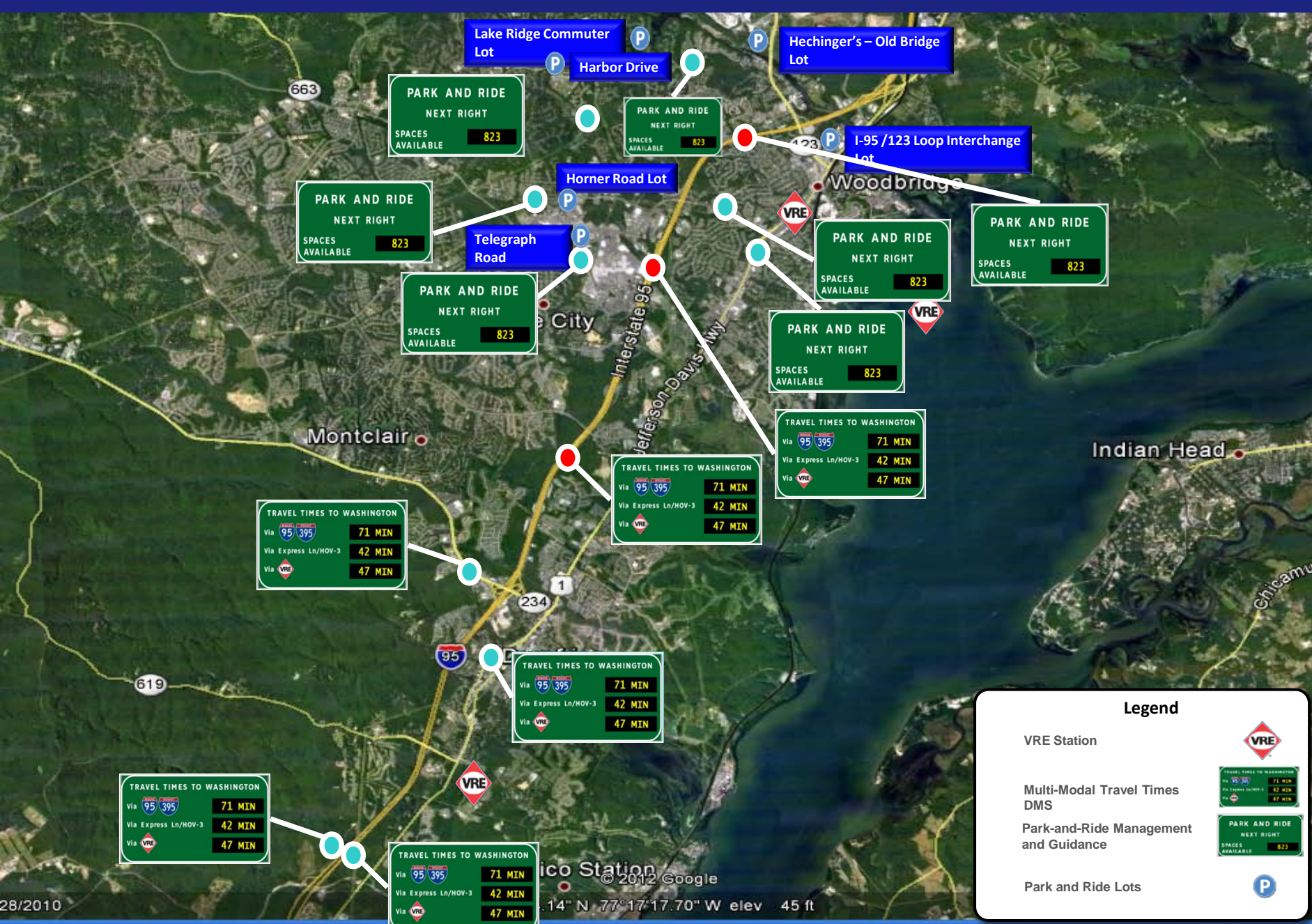


**Mini-Gantry (between Major Gantries HSR)**







**Mini-Gantry (between Major Gantries No HSR)**



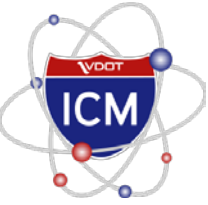


### Legend

- VRE Station 
- Multi-Modal Travel Times DMS 
- Park-and-Ride Management and Guidance 
- Park and Ride Lots 

**Park & Ride Management & Guidance Systems/ Comparative Travel Time signage (Dale City to Woodbridge)**

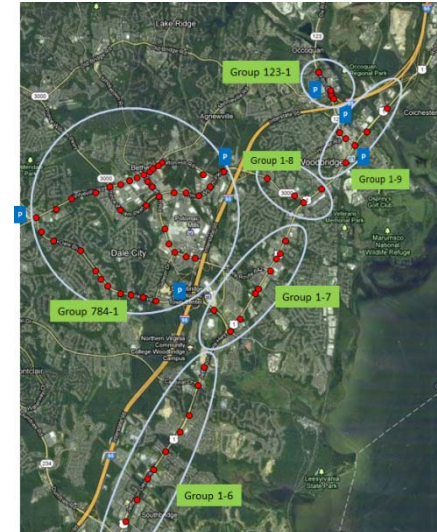
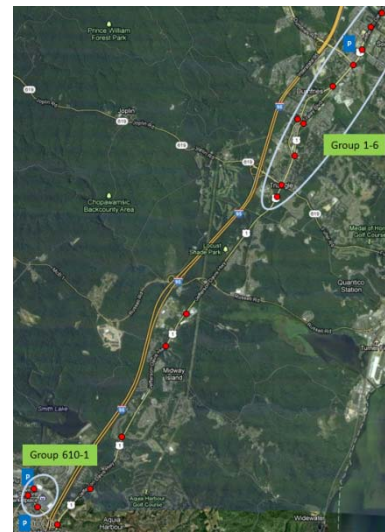




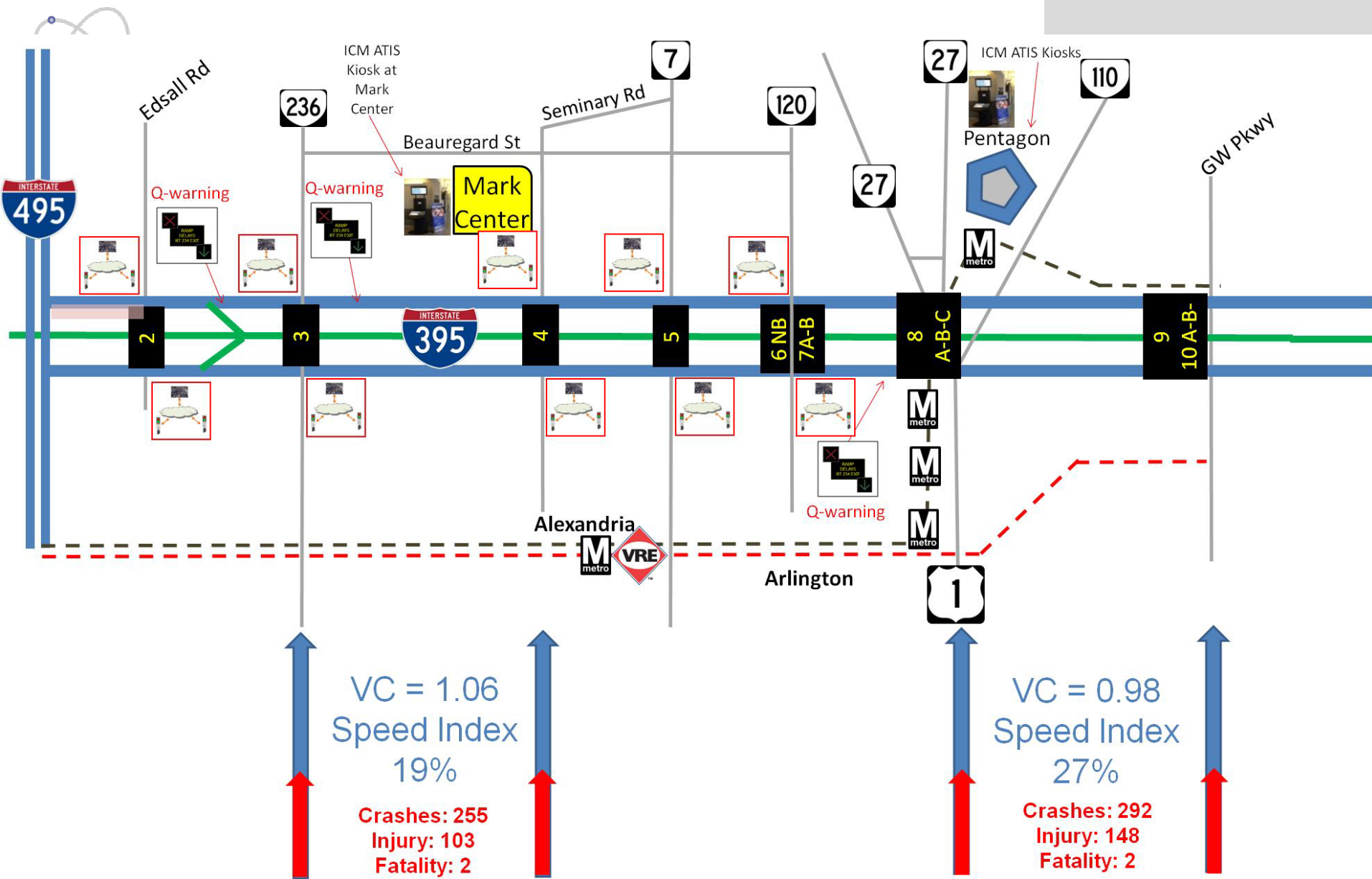
# Future Activities: Arterials



## CANDIDATE SIGNAL GROUPS



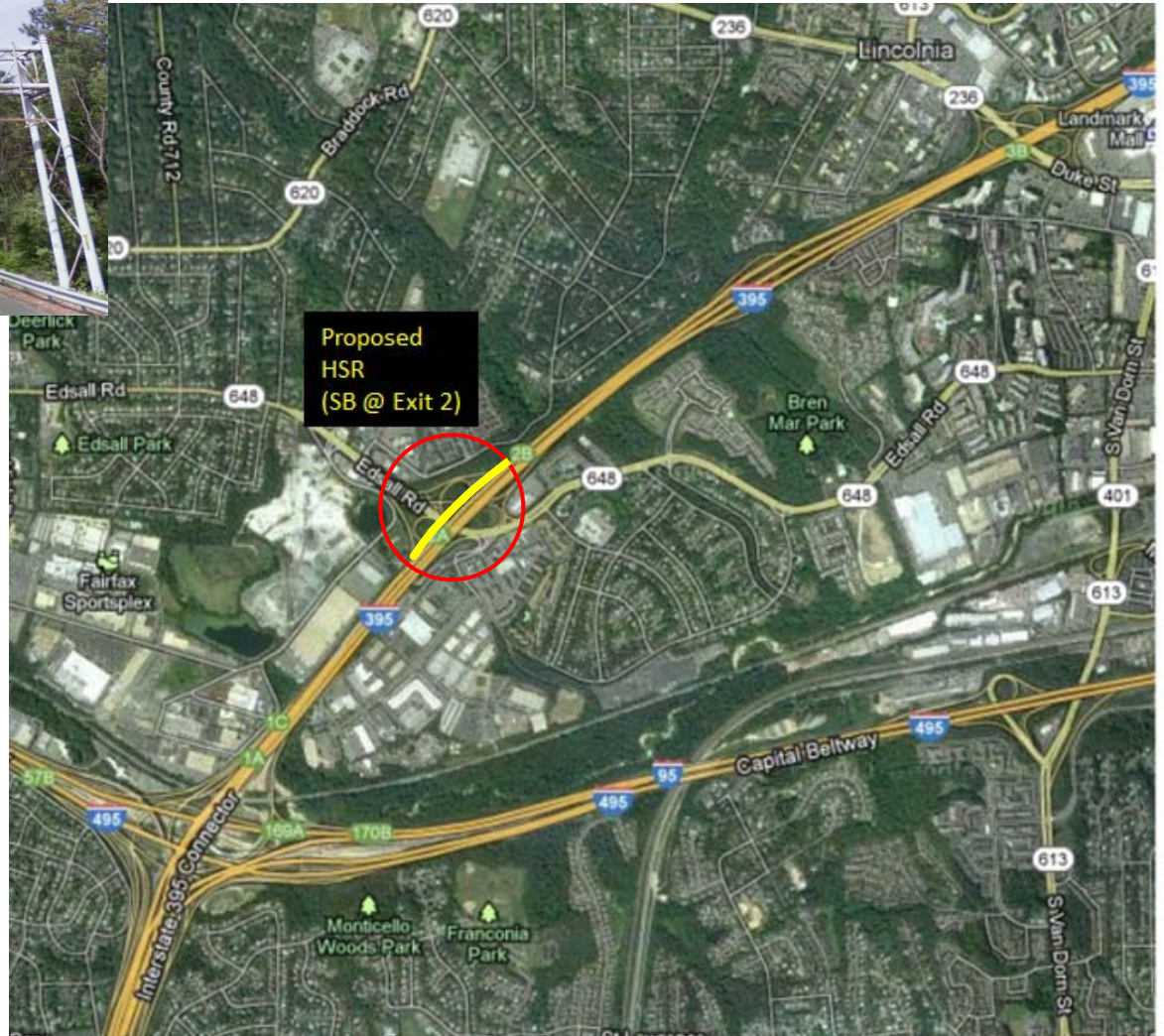
- Transit signal priority along express bus routes
- Adaptive control along:
  - Arterial alternate routes (incidents, congestion)
  - Key routes between park-and-ride and I-95



**ICM Deployment Concept – Segment 3 (MM 170-14<sup>th</sup> St Bridge)**



# I-395 south / Edsall Rd proposed HSR



DMS on three Edsall Rd exit direction signs. Propose 2 mini-gantries thru interchange to permit additional peak capacity on shoulder

# Multi-Modal Travel Times on DMS / Park-and-Ride Management and Guidance



**TRAVEL TIMES TO WASHINGTON**

Via  95 395	<b>71 MIN</b>
Via Express Ln/HOV-3	<b>42 MIN</b>
Via	<b>47 MIN</b>

**Comparative Travel Times**

**LORTON STATION**

NEXT TRAIN to Washington	<b>7:41 AM</b>
PARKING SPACES AVAILABLE	<b>317</b>

**Rail Station Info**

**PARK AND RIDE**

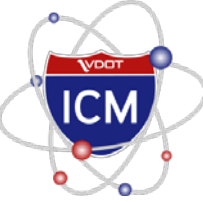
NEXT RIGHT

SPACES AVAILABLE	<b>823</b>
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**Parking Info**

“Reach the Beach” Example (recently commissioned)





# Visualization – “Landing Page”

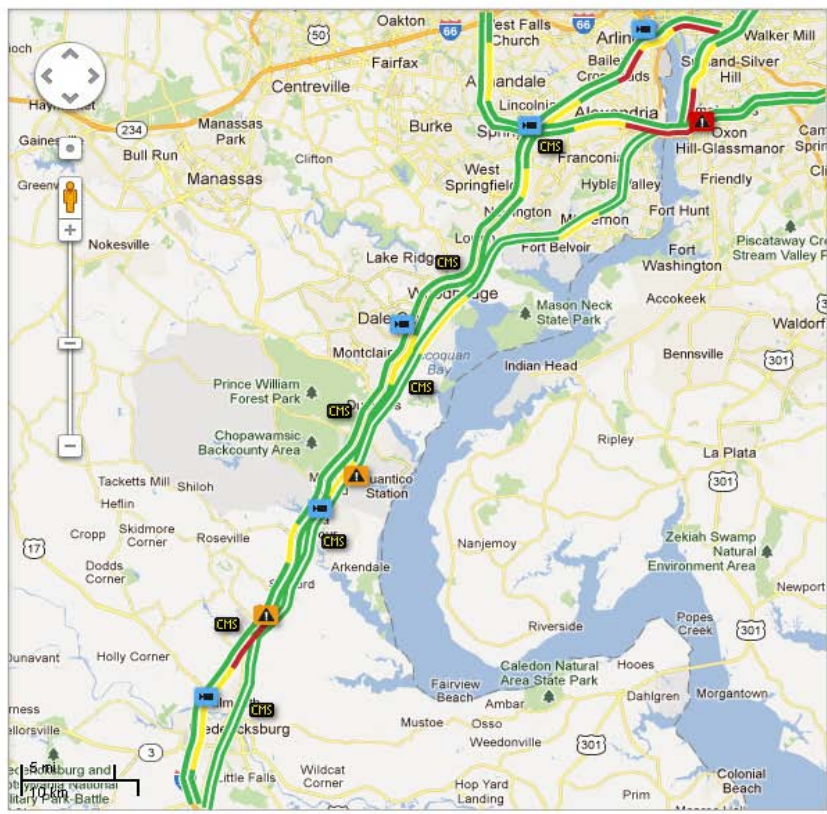


## I-95 / I-395 Traveler Information Portal



- REAL-TIME CONDITIONS
- TRIP PLANNER
- LINKS
- ABOUT
- CONTACT

- ROADWAYS
- TRANSIT
- PARKING
- ACTIVE TRAFFIC MANAGEMENT



- ZOOM TO SEGMENT OF I-95 / I-395**
- SEGMENT 1 US 1/17 to Route 610 [ZOOM MAP](#)
  - SEGMENT 2 Route 610 to I-495 [ZOOM MAP](#)
  - SEGMENT 3 I-495 to 14th Street [ZOOM MAP](#)

- LEGEND**
- Traffic Speeds
    - 50+ mph
    - 25 - 49 mph
    - 0 - 24 mph
  - Incidents
    - incident
    - sigalert
    - cameras
    - CMS cms
  - Transit Lines
    - Select Transit Provider ▼
  - Parking
    - Select Parking Provider ▼
  - Active Traffic Management
    - hard shoulder running
    - variable speed limits

- DETAILS**
- Traffic Accident [ZOOM / DETAILS](#)  
NORTHBOUND I-95 AT GARRISONVILLE RD.
  - Debris in the Roadway [ZOOM / DETAILS](#)  
NORTHBOUND I-95 AT ROUTE 619
  - SigAlert [ZOOM / DETAILS](#)  
EASTBOUND I-495 AT I-295

# Visualization – Transit Info



REAL-TIME CONDITIONS

TRIP PLANNER

LINKS

ABOUT

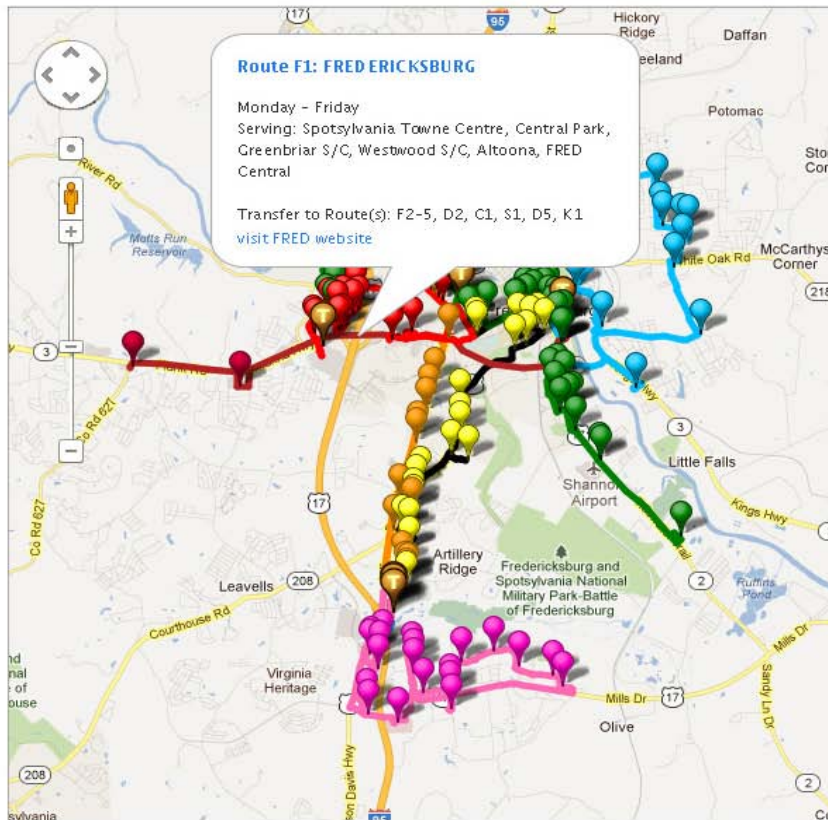
CONTACT

ROADWAYS

TRANSIT

PARKING

ACTIVE TRAFFIC MANAGEMENT



### ZOOM TO SEGMENT OF I-95 / I-395

- SEGMENT 1 US1/17 to Route 610 [ZOOM MAP](#)
- SEGMENT 2 Route 610 to I-495 [ZOOM MAP](#)
- SEGMENT 3 I-495 to 14th Street [ZOOM MAP](#)

### LEGEND

- Traffic Speeds
  - 50+ mph
  - 25 - 49 mph
  - 0 - 24 mph
- Incidents
  - ▲ incident
  - sigalert
  - cameras
  - CHS cms
- Transit Lines
  - Fredericksburg Regional Transit (FRED)
- Parking
  - Select Parking Provider
- Active Traffic Management
  - hard shoulder running
  - variable speed limits

### DETAILS

ROUTE F1	ON TIME	<a href="#">ZOOM / DETAILS</a>
ROUTE F2	ON TIME	<a href="#">ZOOM / DETAILS</a>
ROUTE F3	ON TIME	<a href="#">ZOOM / DETAILS</a>
ROUTE F4	<b>LATE (4 MINUTES)</b>	<a href="#">ZOOM / DETAILS</a>
ROUTE F5	ON TIME	<a href="#">ZOOM / DETAILS</a>
ROUTE S1	ON TIME	<a href="#">ZOOM / DETAILS</a>

# Visualization – Parking Info



REAL-TIME CONDITIONS

TRIP PLANNER

LINKS

ABOUT

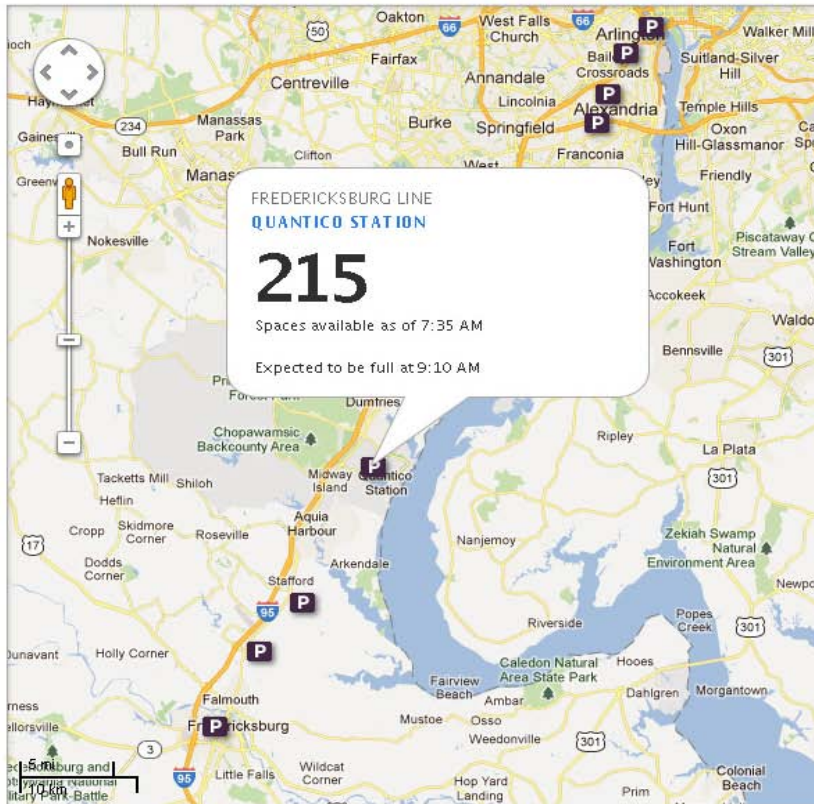
CONTACT

ROADWAYS

TRANSIT

**PARKING**

ACTIVE TRAFFIC MANAGEMENT



### ZOOM TO SEGMENT OF I-95 / I-395

- SEGMENT 1 US 1/17 to Route 610 [ZOOM MAP](#)
- SEGMENT 2 Route 610 to I-495 [ZOOM MAP](#)
- SEGMENT 3 I-495 to 14th Street [ZOOM MAP](#)

### LEGEND

- Traffic Speeds
  - 50+ mph
  - 25 - 49 mph
  - 0 - 24 mph
- Incidents
  - ▲ incident
  - ▲ sigalert
  - cameras
  - CMS cms
- Transit Lines
 

Select Transit Provider
- Parking
 

Virginia Railway Express (VRE)
- Active Traffic Management
  - hard shoulder running
  - variable speed limits

### DETAILS

FREDERICKSBURG STATION	210
LEELAND ROAD STATION	150
BROOKE STATION	<b>FULL</b>
QUANTICO STATION	215
RIPPON STATION	120
WOODBRIDGE STATION	95

# Visualization – Trip Planner (new and pre-selected trips)



Virginia.gov Online Services | Commonwealth Sites | Help | Governor

Search Virginia.gov GO



## I-95 / I-395 Traveler Information Portal



REAL-TIME CONDITIONS

TRIP PLANNER

LINKS

ABOUT

CONTACT

A TO B

POPULAR TRIPS

MY TRIPS

**From:**  **To:**   
**From City:** [optional]  **To City:** [optional]

I want to  Leave  Arrive on   
at  :

### Transportation Mode Preferences

Train  Bus  Driving  Drive to Transit  
 Bicycling  Walking

### Transportation Options

I prefer directions that:

I prefer to walk no more than:

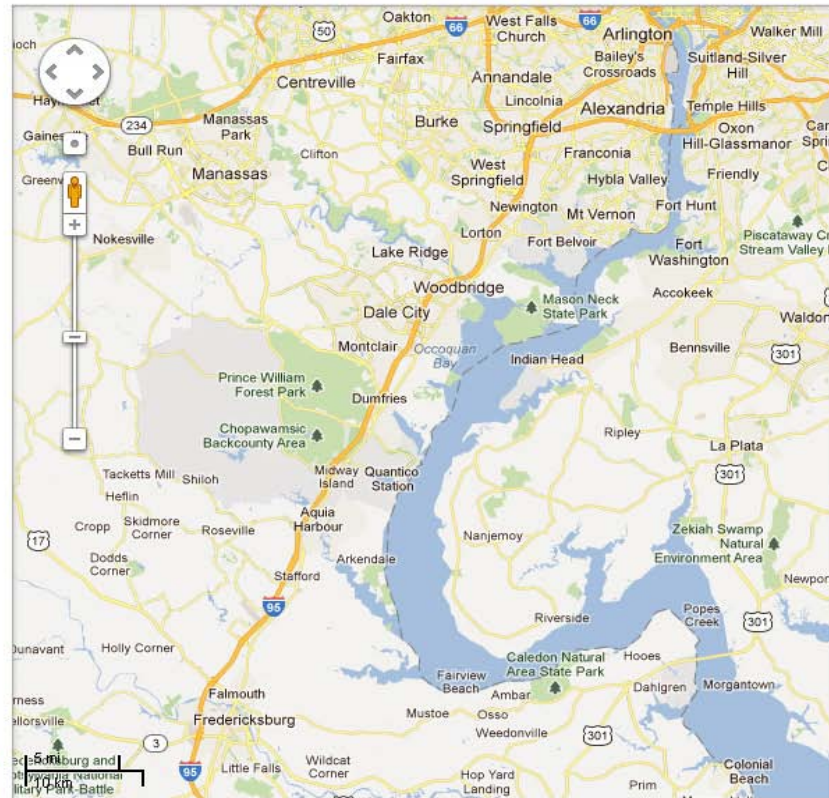
I prefer accessible services:  Yes  No

I prefer stations with parking facilities:  Yes  No

### Driving Options

I prefer to avoid  Toll  Highway

PLAN TRIP





# Visualization – Generate Itinerary



REAL-TIME CONDITIONS

TRIP PLANNER

LINKS

ABOUT

CONTACT

A TO B

POPULAR TRIPS

MY TRIPS

### From Occoquan VA to Mark Center

#### A Occoquan, VA

Drive/Taxi to Woodbridge Amtrak

About 8 mins (2.3 mi)

210 Parking Spaces Available at 7:30 AM  
Expected to be full at 9:10 AM

#### Woodbridge Amtrak

Northeast Regional Train 86 towards Boston  
South Station

7:30am - 7:47am (17 mins, 1 stop)

#### Alexandria Amtrak

Walk to 1921 King St

About 2 mins (16 mins to make transfer)

#### 1921 King St

AT 2-W Bus towards Westbound

8:03am - 8:21am (18 mins, 25 stops)

#### 5021 Seminary Rd

Walk to United States

About 6 mins (0.3 mi)

#### B Mark Center

United States

Travel time: about **1 hour 5 mins**

