

# THE VDOT STARS PROGRAM

## AN OVERVIEW FOR DESIGNERS

*Integrating Transportation  
Planning, Project Development,  
and Project Programming*

# STARS

STRATEGICALLY TARGETED AND  
AFFORDABLE ROADWAY SOLUTIONS



**March 21, 2017**



# AGENDA

- Program Overview
- Project Development
- Project Types and Deliverables
- Project Examples
- Questions



# *THE VDOT STARS PROGRAM*

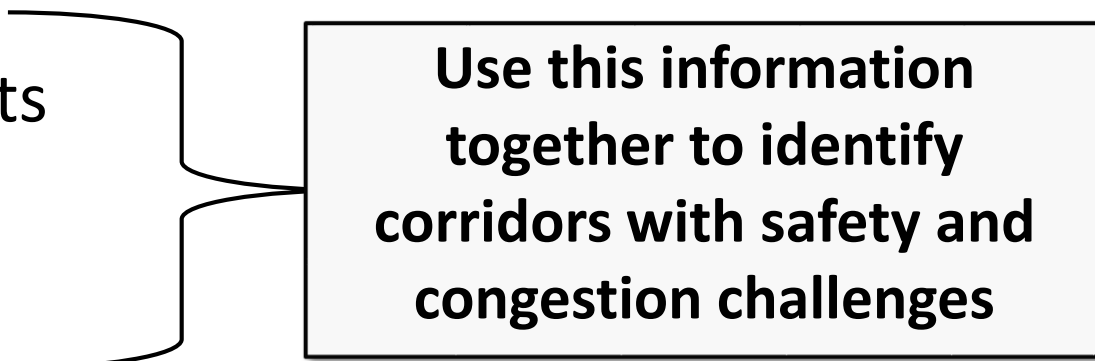
## Program Overview



# WHAT IS THE STARS PROGRAM?

Program to develop solutions to reduce crashes and congestion bottlenecks using a data-driven approach

Crash hotspots  
Speed data  
AADT data



A diagram consisting of a light gray rectangular box on the right with a black border. To its left, the text 'Crash hotspots', 'Speed data', and 'AADT data' is listed vertically. A large, thin black curly bracket groups these three items and points its right side towards the gray box.

**Use this information  
together to identify  
corridors with safety and  
congestion challenges**

**Overall goal of STARS is to develop solutions  
that can be programmed in the VDOT  
Six-Year Improvement Program (SYIP)**



# VDOT BUSINESS PLAN

## STARS Program

- Performance measure: Maximize the programming and construction of STARS Program recommendations
- Goal: Continue advancing 50% or more of the STARS recommendations as projects in the SYIP

### PUBLIC SAFETY

Identify opportunities early in the planning process to reduce fatal and serious injury crashes that occur on Virginia's highways.

### ACTION ITEMS



1.3.1 Maximize the programming and construction of Strategically Targeted Affordable Roadway Solutions (STARS) program recommendations to address safety and congestion challenges on high fatality and serious injury incident corridors and intersections, based on available funding.



# THE STARS TEAM



## VDOT Districts and Residencies

- Coordinate with localities, MPOs, and PDCs
- Submit STARS applications
- Lead STARS projects
- Coordinate with consultant team

## VDOT Central Office

- Provides program oversight, data analysis, and application review

## Consultants

- Provide project support





# STARS BRIDGING THE GAP

- Planning linked to operations/ITS, safety and design
- Localities engaged early in the planning process
- Project risks identified
- Readiness improved for project implementation





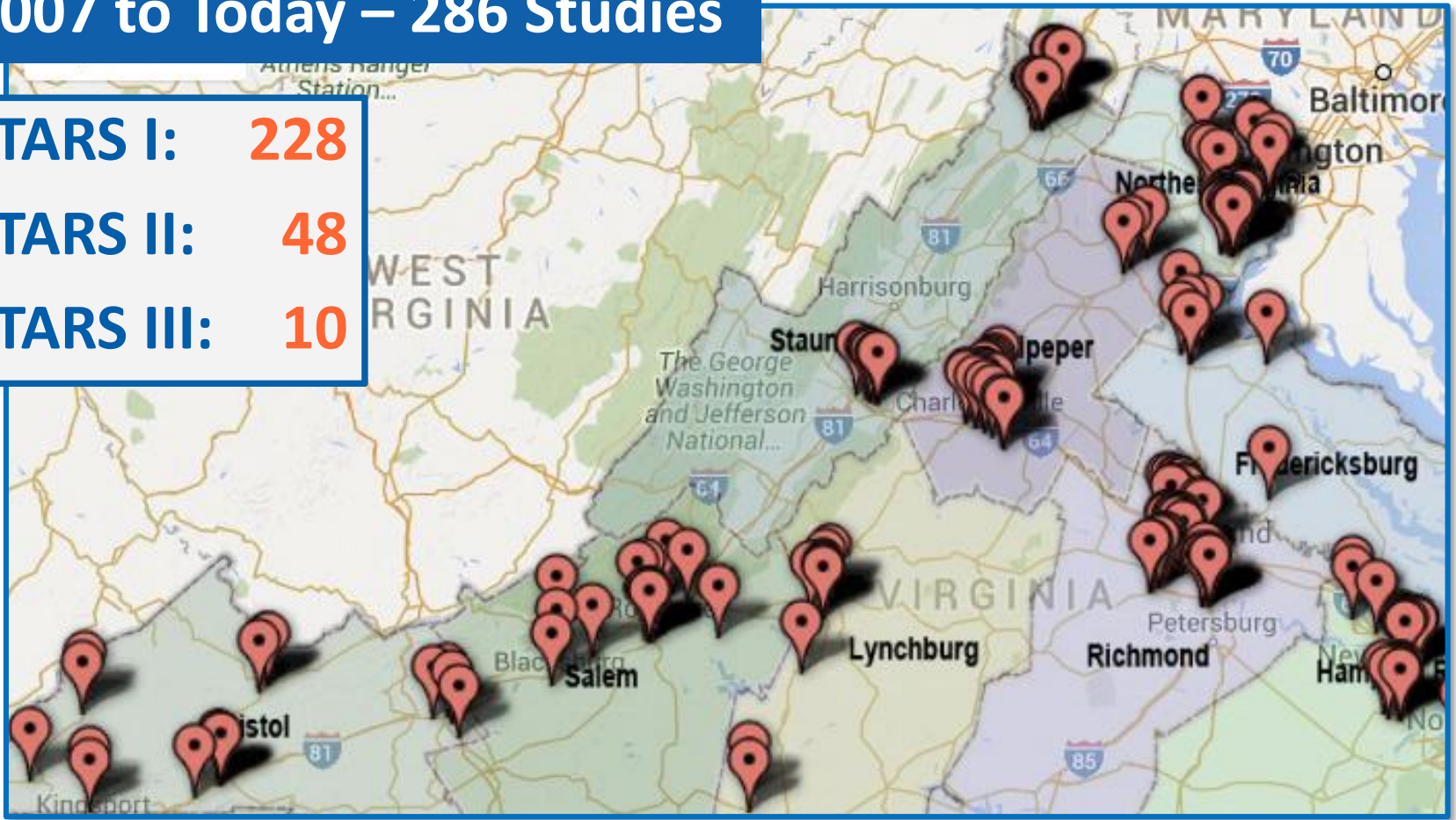
# STARS PROJECTS

2007 to Today – 286 Studies

STARS I: 228

STARS II: 48

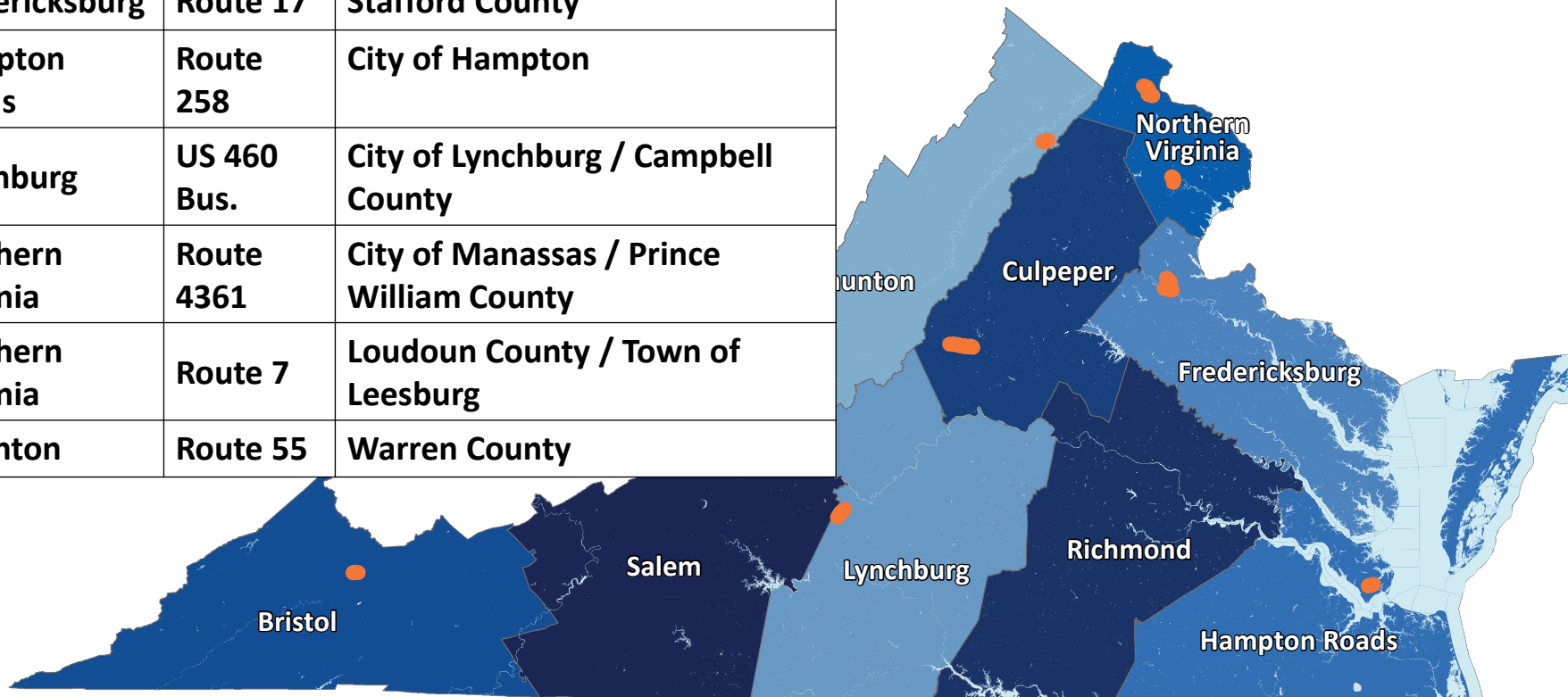
STARS III: 10





# 2016 STARS PROJECTS


District	Route	Jurisdiction
Bristol	US 460	Tazewell County
Culpeper	US 250	Albemarle County
Fredericksburg	Route 3	City of Fredericksburg
Fredericksburg	Route 17	Stafford County
Hampton Roads	Route 258	City of Hampton
Lynchburg	US 460 Bus.	City of Lynchburg / Campbell County
Northern Virginia	Route 4361	City of Manassas / Prince William County
Northern Virginia	Route 7	Loudoun County / Town of Leesburg
Staunton	Route 55	Warren County





# PROGRAM WEBSITE


<http://www.virginiadot.org/projects/stars.asp>


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REPORT A ROAD PROBLEM  
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## STARS

The objective of STARS (Strategically Targeted Affordable Roadway Solutions) Program is to develop comprehensive, innovative transportation solutions to relieve congestion bottlenecks and solve critical traffic and safety challenges throughout the commonwealth.


The program, led by the VDOT Transportation and Mobility Planning Division, brings together planners, traffic engineers, safety engineers, roadway design engineers and maintenance specialists, along with local stakeholders, to jointly identify cost-effective measures aimed at improving safety and reducing congestion. This multidiscipline approach, from the inception of the project through the completion, helps to:

- Develop innovative, cost-effective solutions
- Evaluate potential solutions more thoroughly
- Identify potential project risks and costs
- Build stakeholder consensus
- Improve readiness for project implementation

VDOT District offices can leverage Statewide Planning and Research funding to help identify, plan, conceptually design, and ultimately program projects that reduce congestion and improve safety. STARS projects typically result in a number of recommended improvements that may be eligible for funding and implementation under maintenance budgets, applications in the House Bill 2 process, applications for the Highway Safety Improvement Program (HSIP), State of Good Repair budgets, and/or applications for revenue sharing.

The STARS project development process was created to provide a continuous pipeline of projects prepared for implementation. Many elements of the process are on an annual cycle; however, the conduct study and design phase will follow an appropriate schedule based on the nature and complexity of each STARS project. Advancement of STARS projects will be tracked as a measure of performance.

### STARS Project Stakeholders





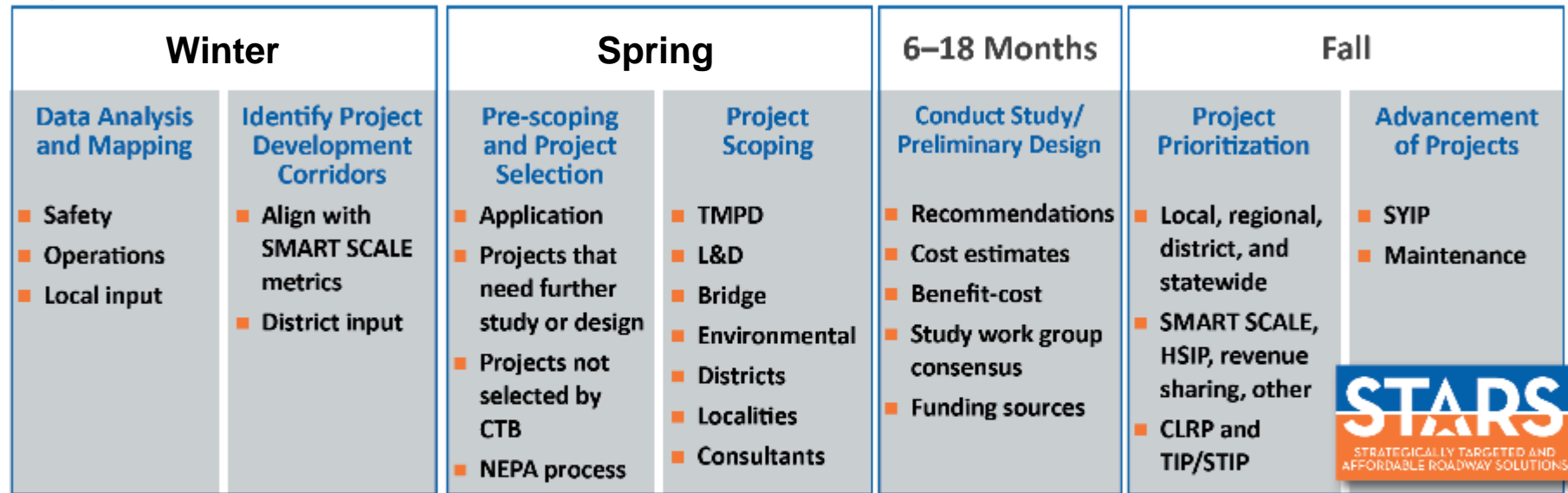
# *THE VDOT STARS PROGRAM*

Project Development



# STARS PROJECT DEVELOPMENT CYCLE

MULTIDISCIPLINE APPROACH THROUGHOUT



STARS Project 1

STARS Project 2

Continually Advancing Projects to SYIP



VDOT SIX-YEAR IMPROVEMENT PROGRAM

Year 1

Year 2

Year 3

...



# WHY IS STARS IMPORTANT TO PROJECT DELIVERY?

**VDOT** Virginia Department of Transportation *Six-Year Improvement Program*

Home User's Guide About

All Projects Major Projects MPO Fund Reports

## All Projects

Program: FY14 FINAL District: Richmond Jurisdictions: Richmond Residencies: Road System: All

☐ Only Show Projects with Programmed Allocations

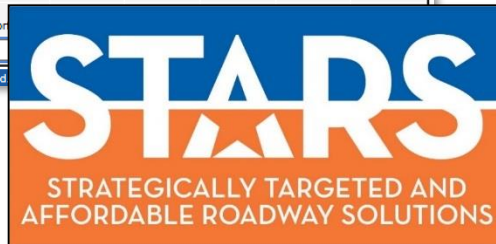
Route: ZIP: UPC: Keyword: Search Reset

Project Search Results (89 Projects found) Export Project List

UPC	Description	Route	District	Road System	Estimate	Previous	FY15-19	Balance
					(Values in Thousands of Dollars)			
78245	VIRGINIA CAPITAL TRAIL - WESTERN SECTION	0005	Richmond	Primary	\$1,323	\$2,245	\$0	(\$922)
97840	LANDSCAPE INTERSTATE I-95 GATEWAYS INTO THE CITY OF RICHMOND	EN10	Richmond	Enhancement	\$1,707	\$2,568	\$0	(\$861)
105055	I-95/I-64 OVERLAP ISSUES	0095	Richmond	Interstate	\$62,000	\$0	\$0	\$45,000
93087	RTE 195 - BRIDGE REPLACEMENT OVER RTE 76, CSX, RAMP S	0195	Richmond	Interstate	\$21,390	\$0	\$0	\$21,390
92609	POCAHONTAS PARKWAY - T895 - VDOT OVERSIGHT	0895	Richmond	Interstate	\$75	\$150	\$0	(\$75)
104891	VIRGINIA PORT AUTHORITY - CRANE PROCUREMENT	0000	Richmond	Miscellaneous	\$4,200	\$1,130	\$484	\$2,570
104892	GREEN OPERATOR (GO) RICHMOND DRAYAGE TRUCK REPLACEMENT PROG	0000	Richmond	Miscellaneous	\$1,543	\$0	\$543	\$1,000
T10724	PORT OPPORTUNITY ZONE IMPROVEMENTS	9999	Richmond	Miscellaneous	\$14,781	\$0	\$0	\$1,237
80510	CN OF TRANSPORTATION ENHANCE & INFRASTRUCTURE OF VMFA PROJECT	SLEN	Richmond	Miscellaneous	\$852	\$896	\$0	(\$43)
T1811	CITY OF RICHMOND: EMPLOYEE TRIPREDUCTION PROGRAM	TRIP	Richmond	Public Transport				

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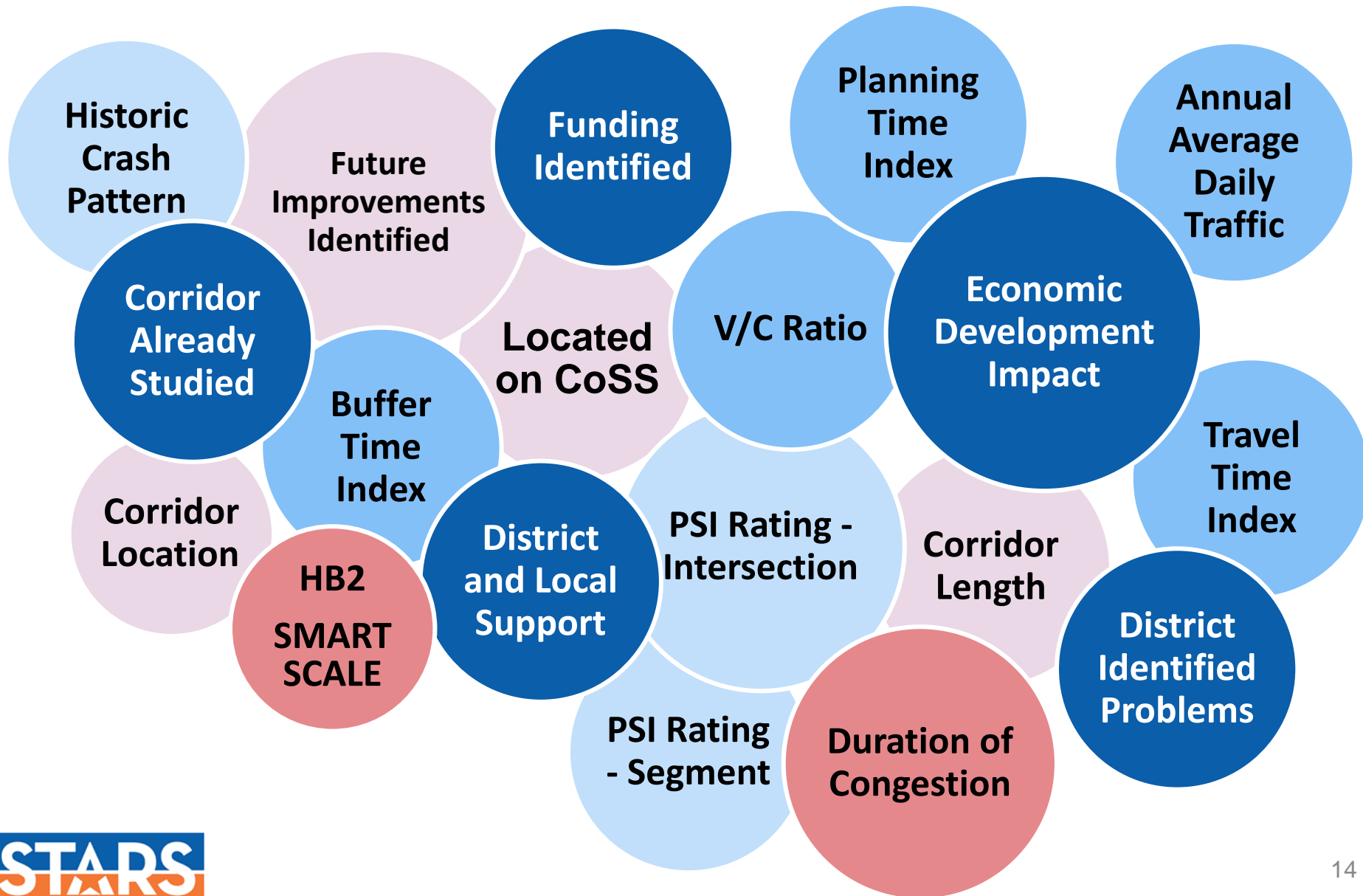
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- Data driven process
- Prepares a source of current data
- Develops solutions that can be funded in the SYIP
  - SMART SCALE, HSIP, CMAQ, RSTP, Revenue Sharing
- Improves accuracy of cost estimates and schedules



# WHAT DATA IS USED?



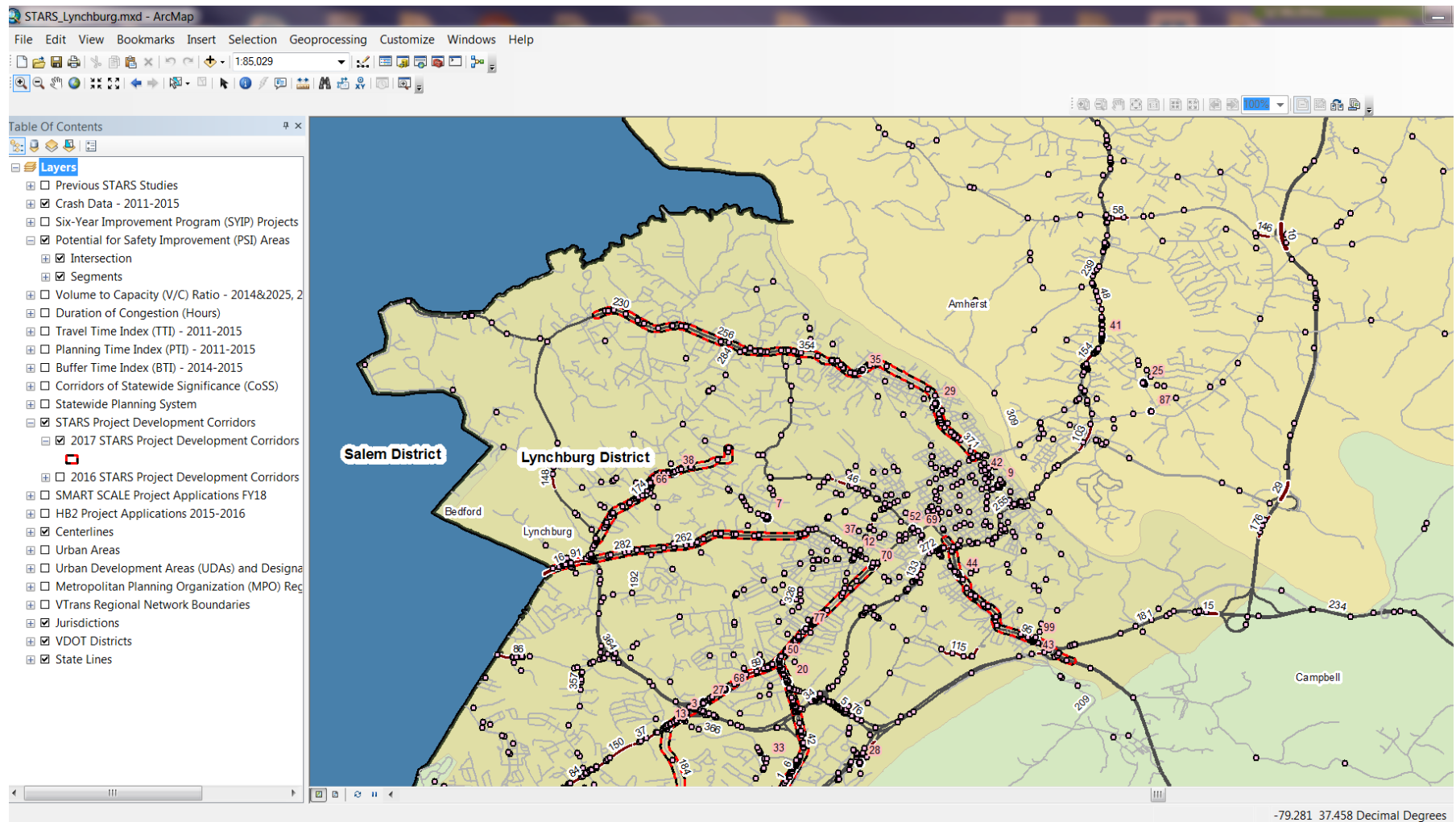


# CORRIDOR SELECTION CRITERIA

Category	Indicator	Measure	Criteria
Planning Designations	Corridor Length	Yes/No	0.5 - 10 miles
	Located on CoSS	Yes/No	
	Area Type	Urbanized / Urban Cluster / Rural	
	Future Improvements Identified	Yes/No	SYIP Project
		Yes/No	In Long Range Transportation Plan
		Yes/No	In State Highway Plan
		Yes/No	NEPA Study
Safety	Historic Crash Pattern		Approximate number of crashes
	PSI Rating - Segment	Rank	1 - Highest ranking
	PSI Rating - Intersection	Rank	1 - Highest ranking
Operations	Annual Average Daily Traffic		Average along the corridor
	V/C Ratio	Ratio	Highest ratio
	Travel Time Index	Percentiles	Highest percentile for corridor
	Planning Time Index	Percentiles	Highest percentile for corridor
	Buffer Time Index	Percentiles	Highest percentile for corridor
District Coordination	Corridor Already Studied	Yes/No	What type of study conducted
	District Identified Problems	Yes/No	Description of problems/concerns
	District Administration Support	Yes/No	
	Local / MPO Support	Yes/No	
	Funding Identified	Yes/No	Source(s)
	Economic Development Impact	Yes/No	Supporting details needed



# PROJECT GIS DATA – ARCMAP MAPPAKS





# LYNCHBURG DISTRICT PROJECT DEVELOPMENT CORRIDOR A (US 60)

Corridor F—US 60—MP 232.71 - 239.55, From Williamsburg Village Drive to Route 132

Planning	Corridor Length (mi)	6.83
	CoSS Corridor	Yes
	Urban or Rural	Urbanized
Safety	SYIP Project/HB2 Project/SMART SCALE	Yes
	2011-2015 Crashes	538
	Max PSI Segment Rank	187
	Max PSI Intersection Rank	87
Operations	Max V/C Ratio (2015/2030)	0.56/0.7
	Max TTI Percentile (2015 AM/PM Weekday)	0.82/0.93
	Max TTI Percentile (2015 AM/PM Weekend)	0.8/0.99
	Duration of Congestion (Hours)	0

**District Coordination**

Notes:SYIP DESIGN UNDERWAY (89062): Ironbound Rd & Longhill Road Intersection Improvements  
SYIP CONSTRUCTION COMPLETED (102947): Richmond Road Intersection Improvements @ Rte 199 West Ramp  
SYIP DESIGN UNDERWAY (106714): Rebuild Existing Traffic Signal  
Rte 60 @ Prime Outlet  
SYIP CONSTRUCTION COMPLETED (107803): Richmond Rd. Resurfacing  
SYIP FUTURE PROJECT (109416): #SGR Bypass Road (Rte 60) Repaving  
SMART SCALE: Ironbound Road Phase 2 (V)  
SMART SCALE: Ironbound Road Phase 3 (V)

**Location Map - Hampton Roads District**  
James City County/ City of Williamsburg/ York County



**PSI District Ranking**

Segments  
Intersections

**V/C - 2030**

0 - 0.25  
> 0.25 - 0.50  
> 0.50 - 0.75  
> 0.75 - 1.00  
> 1.00 - 1.25  
> 1.25

**Duration of Congestion (Hours)**

0 - 1  
> 1 - 2  
> 2

**VDOT Projects**

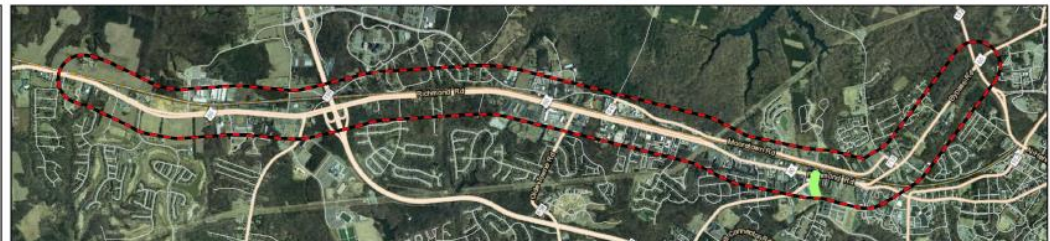
**SYIP**  
Segments  
Intersections

**HB2**  
Not Funded  
Funded

**SMART SCALE**  
Not Funded  
Funded

**Project Development Corridor**

0 0.5 1 2 Miles





# STARS REVIEW AND SELECTION COMMITTEES

## STARS Review Committee

- Purpose: Review applications for consistency and accuracy and verify that the STARS program intent is met
- Participation: Central Office, Districts, and Consultants

## STARS Selection Committee




- Purpose: Prioritize applications for funding and consider statewide resource allocations and needs
- Participation: Central Office, Districts, and Virginia Transportation Research Council



# IMPORTANCE OF CORRIDOR IDENTIFICATION

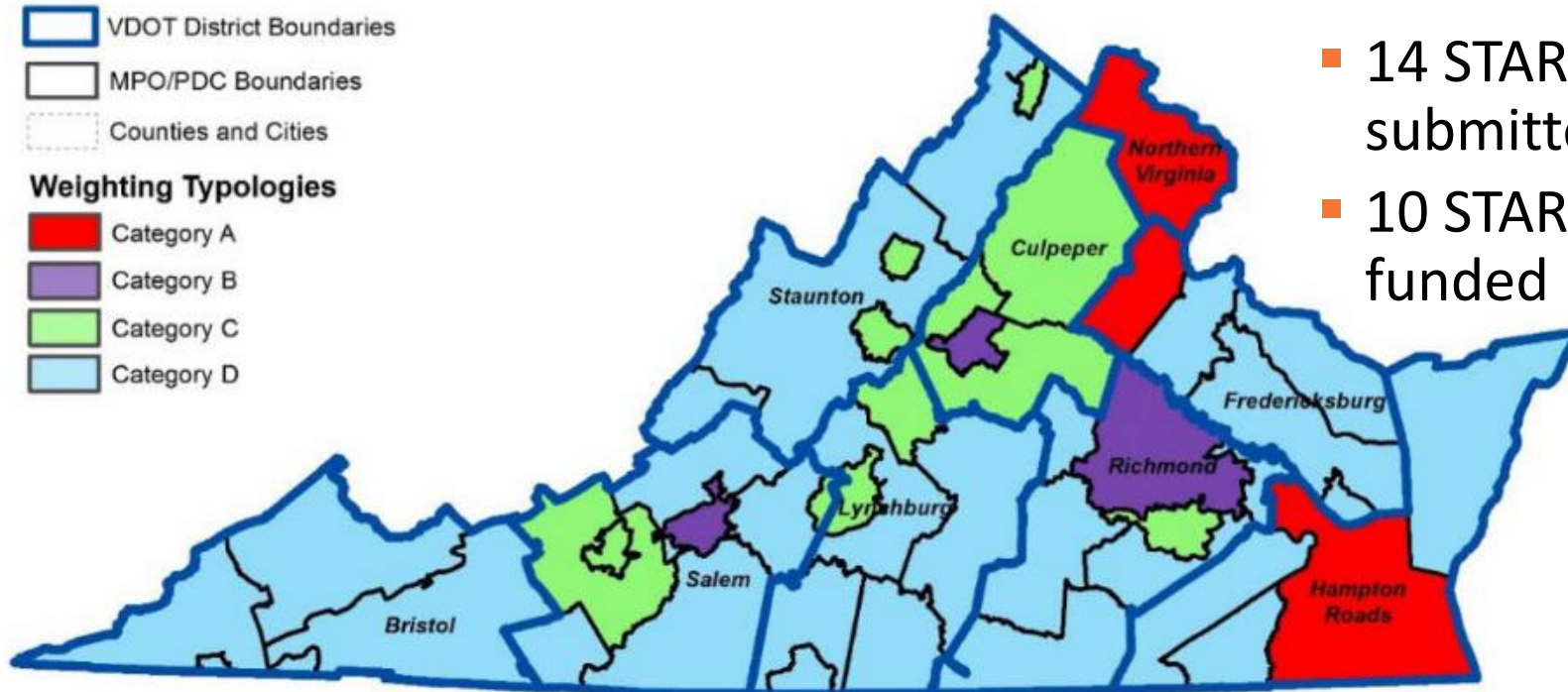
Factor	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality	Land Use
Category A	45%	5%	15%	5%	10%	20%
Category B	15%	20%	25%	20%	10%	10%
Category C	15%	25%	25%	25%	10%	-
Category D	10%	35%	15%	30%	10%	-

## Legend

-  VDOT District Boundaries
-  MPO/PDC Boundaries
-  Counties and Cities

## Weighting Typologies

-  Category A
-  Category B
-  Category C
-  Category D



**70% funded**

- 14 STARS projects submitted
- 10 STARS projects funded



# *THE VDOT STARS PROGRAM*

Project Types and Deliverables



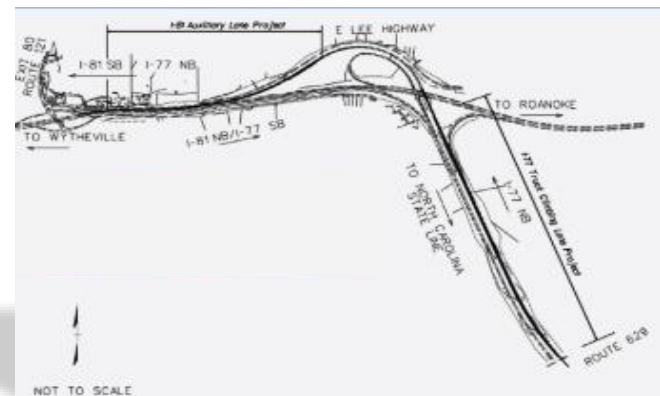
# STARS PROJECT TYPES

## Preliminary Design

- Roadway survey and design
- Subsurface utility investigations
- Drainage design
- Environmental investigation
- Phase 1 structural design


## Corridor Studies

- Access management
- Roadway safety assessment
- Congestion management
- Alternatives analysis





# STARS DESIGN SCOPING USING MODIFIED LD-436



**2012 LD-436**  
**Quality Control Checklist**

**ROADWAY DESIGN**

UPC Number: State Project Number:

VDOT District: Project Location:

ProjectType:

Project Manager	Project Manager	Project Manager	Project Manager	Project Manager
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Designed by:	Designed by:	Designed by:	Designed by:	Designed by:
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Review Date

Review Date

Review Date

Review Date

Review Date

Reviewer Initials

Reviewer Initials

Reviewer Initials

Reviewer Initials

Reviewer Initials

PFI

PH

FI

RW

PCR /ADV

Show All Stages

Show All Items

Rating Methodology

Applicable and Correct

Applicable and Incorrect or Not Included

Not Applicable

PFI

PH

FI

RW

ADV

**I. SEALING AND SIGNING OF PLANS AND DOCUMENTS**

A. Signing and Sealing responsibilities have been fulfilled based on the requirements of IIM-243 and the Code of Virginia §54.1-402.1

Click Here for Link to IIM-243

Link to Signing & Sealing Division Memos

Applies ?

Applies ?

Applies ?

Applies ?

**II. ALL SHEETS**

A. Project and Route Number(s) are shown where applicable (Verify against iPM) (RDM - 2C)

B. Sheet Numbers are shown correctly (RDM - 2C)

C. North Arrow and Scale are shown where applicable (RDM - 2C)

D. Applicable legends are shown (Patterning, Easement Linestyles, etc.) (CADD Manual - App. D)

E. Project Manager/Supervisor/Designer/Surveyor names, District, if applicable, and phone numbers are shown (RDM - 2C)

F. Limited Access note (RDM - 2E)

G. Stationing shown correctly and in agreement with plans (RDM - 2C)

H. Match Lines and Stationing are properly indicated (RDM - 2C)

I. Design intent is legible and clearly shown (RDM - 2C)

J. Compliance with all approved Scoping and F.I. recommendations (RDM - 2F)

K. Check project limits on plan sheets (RDM - 2D)

L. CI/SSI Note (IIM - 236)

Applies?

Applies ?

Applies ?

Applies ?

**III. TITLE SHEET**

A. Federal Aid Number and Project Termini agrees with iPM (RDM - 2E)



# PROJECT SCOPES AND DELIVERABLES

- Data collection
- Traffic analysis
- Safety analysis
- Cost estimates (PCES)
- Schedule
- Conceptual design (varies up to 30%)
- Phasing and funding recommendations
- Study Work Group meetings (and Citizen information)
- Report
- Project summary





# STARS PROJECT SUMMARY SHEET

## STARS Project Summary Sheets

The STARS one-page project summary sheets have proven to be an effective tool for summarizing several important project features, especially those factors that are required in many of the potential funding applications.

**CONCEPT C - CANDLERS MOUNTAIN ROAD AUXILIARY LANES AND RAMP REALIGNMENT**  
INSTALL AUXILIARY LANES AND REALIGN NORTHBOUND ENTRANCE RAMP AT CANDLERS MOUNTAIN ROAD INTERCHANGE

**PROJECT DESCRIPTION**

**PROJECT SCHEDULE**

**SUMMARY PLANNING LEVEL COST ESTIMATE**

**BENEFITS OF THE PROJECT**

**PROJECT GRAPHIC**

**LOCATION MAP**

- ★ *Key existing safety and/or congestion issues identified*
- ★ *Project description with a graphical representation of the improvement*
- ★ *Project schedule summarized in three categories: preliminary engineering, right-of-way and utilities, and construction*
- ★ *Summarized planning level cost estimate*
- ★ *Benefits of the project in terms of safety improvement and/or congestion relief*



# STARS PROJECT SUMMARY

## I-64 / Northampton Boulevard Interchange Operations Analysis

### Preferred Interim Improvement, Year 2024 (Alternative 4)

#### Existing Conditions:

The interchange of I-64 / Northampton Blvd, as well as segments of Northampton Blvd experience significant congestion and crashes during peak periods. I-64 on-ramps do not meet current AASHTO standards, and off-ramps do not have enough capacity to process the vehicle demand. Given the short-term planned development for the Lake Wright area and surrounding areas, short-to-interim term improvements are needed to manage the existing and projected traffic volumes as well as improve safety throughout the corridor.

#### Estimated Cost:

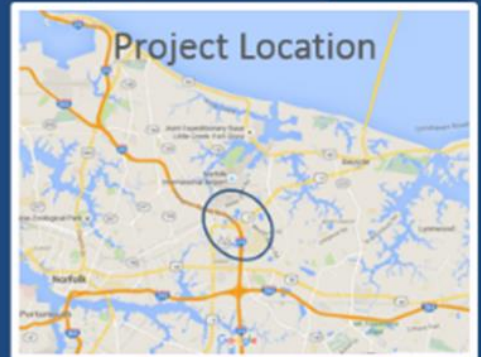
Preliminary Engineering: \$ 1,000,000  
ROW and Utilities: \$ 200,000  
Construction: \$ 7,100,000

#### Crash Reduction Analysis

No-Build 2024 Expected Crashes	Interim Alt 4 2024 Expected Crashes	
103	94	9% reduction



#### Project Location



#### Safety Improvements

Improvements specific to the project corridor include:

- Trim vegetation in designated areas
- Signage modifications and installation
- Traffic signal backplates
- Lighting level evaluation
- Bicycle lane evaluation

#### Queuing Results (ft)

		No-Build 2024			Alt 4 2024		
		Left	Right	Channel Right	Left	Right	Channel Right
I-64 EB Off-Ramp	Max	--	330	--	210	240	--
	Avg	--	50	--	80	120	--
	95 <sup>th</sup> %	--	200	--	160	260	--
I-64 WB Off-Ramp	Max	150	150	7440	550	690	570
	Avg	60	80	8060	150	350	170
	95 <sup>th</sup> %	110	130	8850	470	640	640

#### Operational Results (LOS)

	Ramp	No-Build 2024 CORSIM Ramp Junctions		Alt 4 2024 CORSIM Ramp Junctions	
		AM	PM	AM	PM
I-64 Eastbound	Off Ramp to Northampton Blvd	C	D	C	C
	On Ramp from Northampton Blvd	E	D	C	C
	Off Ramp to I-264	C	C	C	C
I-64 Westbound	On Ramp from I-264	D	D	D	D
	Off Ramp to Northampton Blvd	C	D	C	C
	On Ramp from Northampton Blvd	D	E	C	C
	Off Ramp to Robin Hood Rd	C	D	C	C
	On Ramp from N Military Hwy	C	C	C	C



# *THE VDOT STARS PROGRAM*

## Project Examples



# I-95/I-64 OVERLAP STUDY EXAMPLE

## ■ HB2

- Franklin Street interchange (Exit 74) ramp improvement
- Belvidere Street interchange (Exit 76) safety improvement
- Belvidere Street interchange (Exit 76) acceleration lane
- Hermitage Street interchange (Exit 78) deceleration lane
- Laburnum Avenue interchange (Exit 186) ramp improvement
- Corridor-wide overhead sign upgrades

## ■ SMART SCALE

- Corridor-wide lighting
- Emergency pull-offs (5)
- Northbound I-95 lane shift
- Southbound I-95 lane shift
- Ramp Improvements in the City of Richmond (5 roundabouts)



# I-95/I-64 OVERLAP STUDY EXAMPLE

## I-195/Laburnum Interchange - Roundabout



### ESTIMATED PROJECT COSTS

Preliminary Engineering	\$440,000
ROW and Utility Relocation	\$0
Construction	\$1,770,000
<b>Total Cost =</b>	<b>\$2,210,000</b>

### ESTIMATED BENEFITS

Traffic Operations Measures*	AM and PM Peak Hour Intersection Delay* (Seconds)
2022 No-Build	22.2
2022 Build	16.8
Reduction in Delay	5.4
Annual Cost Savings	\$15,000
Benefit-to-Cost Ratio	0.07

\*Results reported for both intersections: NB and SB Exit Ramps at Laburnum

	Maximum Queue Length (Feet)	
	SB Exit Ramp	NB Exit Ramp
2022 No-Build	AM = 422, PM = 738	AM = 63, PM = 246
2022 Build	AM = 278, PM = 466	AM = 18, PM = 0

Safety Measure	# of Related Crashes
Between 2007 - 2009	4
Crash Reduction Factor	0.72
Reduction in Crashes	3

### EXISTING CONDITIONS

The existing I-195 off-ramps to Laburnum experience queuing during the peak hours, as noted in the table above.

### PROJECT BENEFIT

This project proposes to reduce queuing on the northbound and southbound I-195 exit ramps during the peak hours as well as improve the overall safety of the intersections.

### PROJECT PHOTOS



Photograph 1 - I-195 SB Exit Ramp to Laburnum - Proposed Roundabout Location



Photograph 2 - Looking East from I-195 Exit Ramp - Sight Distance Impacted by Vegetation

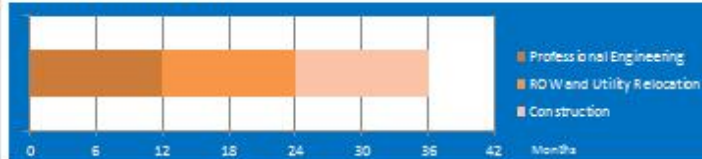


Photograph 3 - I-195 NB Exit Ramp to Laburnum Ave Proposed Free-Flow Right-Turn Lane

### PROJECT GRAPHIC



### ANTICIPATED SCHEDULE



### PROJECT DESCRIPTION

**SB I-195 Off-Ramp at Laburnum Avenue** - construct a one-lane roundabout to accommodate the heavy conflicting SB left turns (AM = 309, PM = 398) and WB left turns (AM = 281, PM = 323). This improvement will require a lane drop of the rightmost WB through lane prior to the roundabout, which can be done using signing and pavement markings.

**NB I-195 Off-Ramp at Laburnum Avenue** - drop the rightmost EB through lane using signing and pavement markings just west of the off-ramp. Convert the NB right-turn movement (AM = 390, PM = 378) to free flow by using the rightmost EB through lane. This improvement can be accomplished using existing pavement since there are minimal NB left turns (AM = 24, PM = 4) and NB throughs (AM = 19, PM = 0) requiring minimal storage. A short left-turn lane, approximately 50 to 100 feet, and an exclusive right-turn lane can be striped out using the existing pavement. This option will require the restriction of EB left turns and SB left turns to/from the office park on the north side of Laburnum, which could be enforced with some minor median improvements.



# I-95/I-64 OVERLAP STUDY EXAMPLE

## I-95/I-64 Corridor - Emergency Pull-Offs



### ESTIMATED PROJECT COSTS

Proposed Location	Preliminary Engineering	ROW and Utility Relocation	Construction	Total
Bryan Park Interchange – NB Direction	\$390,000	\$95,000	\$1,560,000	\$2,045,000
Bryan Park Interchange – SB Direction	\$390,000	\$95,000	\$1,560,000	\$2,045,000
Just south of Boulevard – NB Direction	\$390,000	\$100,000	\$1,560,000	\$2,050,000
Just north of Belvidere – NB Direction	\$155,000	-	\$1,560,000	\$1,715,000
Just north of Belvidere – SB Direction	\$155,000	-	\$1,560,000	\$1,715,000
<b>Total Cost =</b>	<b>\$1,480,000</b>	<b>\$290,000</b>	<b>\$7,800,000</b>	<b>\$9,570,000</b>

### EXISTING CONDITIONS

- The I-95/I-64 study corridor has minimal left and right shoulders; some sections have no shoulders
- There are no designated emergency pull off areas within the study corridor

### PROJECT DESCRIPTION

Create emergency pull-off areas throughout the I-95/I-64 overlap section.

Frequently-spaced pull-off areas increase the likelihood that they will be used; therefore, proposed locations were considered throughout the study corridor. Selected locations were primarily determined based on available right-of-way and constructability.

### PROJECT BENEFITS

Improve incident management and safety throughout the corridor.

- Allows motorists experiencing problems to exit the roadway without blocking through traffic. Reduces the duration of traffic congestion and related crashes that occur due to a disabled vehicle.
- Provides a designated area for crash clearing and/or investigation. When crashes occur, vehicles need to be cleared to the shoulder quickly in order to minimize the amount of upstream traffic congestion. Additionally, a pull-off area may provide emergency response vehicles with adequate space to aid victims after a crash without taking up a traffic lane.
- Provides areas for law enforcement officers to apprehend non-compliant motorists.
- Provide area for law enforcement officers and incident management personnel to respond to a crash that has been moved out of the travel lanes.

### ANTICIPATED SCHEDULE



### PROJECT GRAPHIC





# I-95/I-64 OVERLAP STUDY EXAMPLE

## Overhead Guide Signs with Option Lane Issue



### ESTIMATED PROJECT COSTS

Proposed Location	Preliminary Engineering	ROW and Utility Relocation	Construction	Total
NB I-95 to WB I-64/SB I-195	\$52,000	-	\$258,000	\$310,000
SB I-95 to WB I-64	-	-	-	-
SB I-95 to EB I-64	\$52,000	-	\$258,000	\$310,000
EB I-64 to NB I-95/SB I-195	\$52,000	-	\$258,000	\$310,000
WB I-64 to NB I-95/SB I-95	\$52,000	-	\$258,000	\$310,000
<b>Total Cost =</b>	<b>\$208,000</b>	<b>\$0</b>	<b>\$1,032,000</b>	<b>\$1,240,000</b>

\* Cost for this guide sign was not included because it will be replaced as part of a statewide directive to remove all signing from bridge structures.

### EXISTING CONDITIONS

- There are 5 guide signs with option lanes located within the study corridor. An option lane is defined as a lane from which both the exit destination and the mainline destination can be reached.
- Existing signing creates expectancy problems for drivers who are unfamiliar with the area.
- The existing guide signs with option lanes issue do not meet current standards and should be upgraded to meet the Manual on Uniform Traffic Control Devices (MUTCD) Overhead Arrow-per-Lane standard.

### PROJECT PHOTOS



Photograph 1: SB I-95 to EB I-64



Photograph 2: NB I-95 to WB I-64/SB I-195



Photograph 3: WB I-64 to NB I-95/SB I-95



Photograph 4: EB I-64 to NB I-95/SB I-195

### ANTICIPATED SCHEDULE



### PROJECT BENEFIT

- Guide signs with lane use arrows shown for each lane will provide a clearer message to motorists as to downstream geometry; thereby, improving safety throughout the corridor.

### PROJECT DESCRIPTION

- Upgrade the 5 non-standard guide signs with option lane issues to meet the MUTCD Overhead Arrow-per-Lane standard.
- In addition to new guide signs new sign assemblies are assumed including overhead sign bridges, foundations, and sign lighting.



Photograph 5: SB I-95 to WB I-64

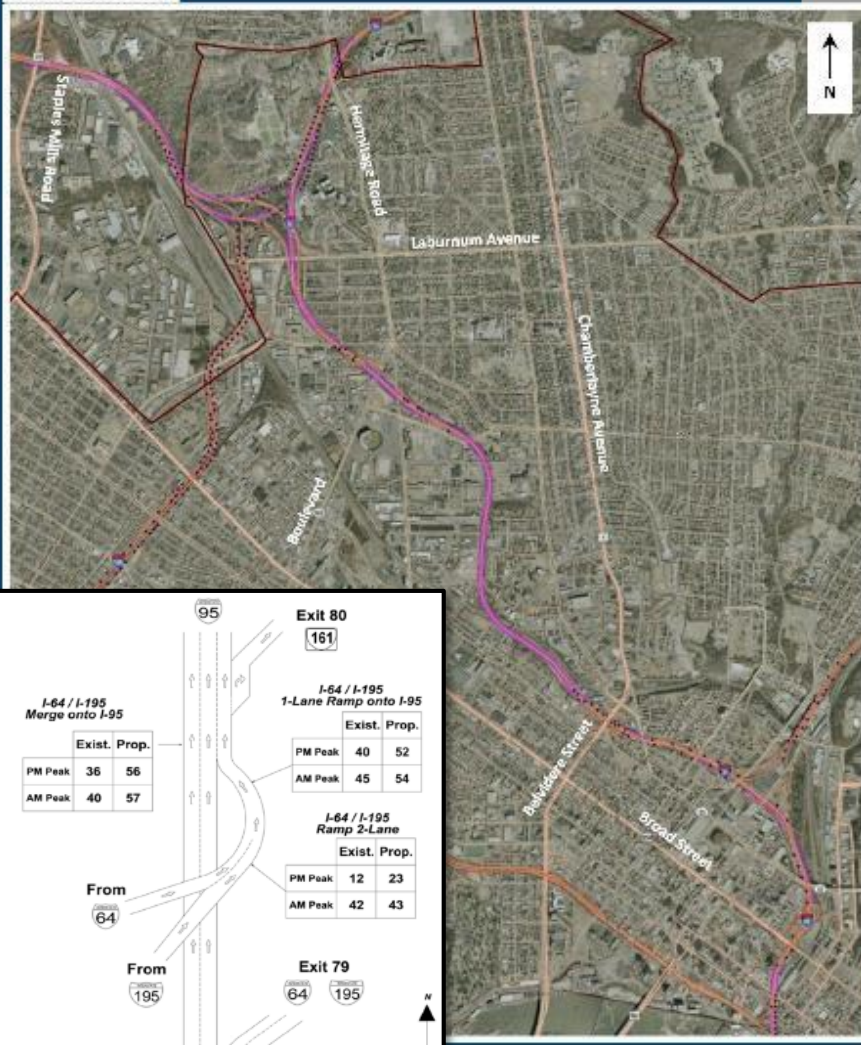


# I-95/I-64 OVERLAP STUDY EXAMPLE

## I-95/I-64 Corridor – Continuous Roadway Lighting



### PROJECT GRAPHIC



### ESTIMATED PROJECT COSTS

Preliminary Engineering	\$3,110,000
ROW and Utility Relocation	50
Construction	\$12,450,000
<b>Total Cost =</b>	<b>\$15,560,000</b>

### EXISTING CONDITIONS

- Both high mast and conventional roadway lighting exist along the I-95/I-64 study corridor
- Existing lighting is primarily concentrated around interchanges

### PROJECT DESCRIPTION

Remove existing corridor lighting and upgrade to continuous corridor wide high mast lighting.

### PROJECT BENEFIT

Improve safety throughout the corridor by reducing night crashes.

### ESTIMATED BENEFITS

Safety Measure	# of Related Crashes <sup>a</sup>
Between 2007 - 2009	362
Crash Reduction Factor	0.50
Reduction in Crashes	181

### PROJECT PHOTOS

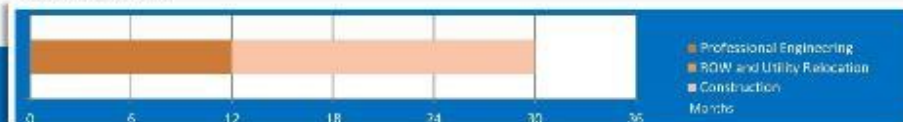


Photograph 1: I-95/EB I-64 East Interchange – High Mast Roadway Lighting



Photograph 2: I-64 West of Bryn Park Interchange – Conventional Roadway Lighting

### PROJECT BENEFIT





# I-95/I-64 OVERLAP STUDY EXAMPLE

## Southbound I-95 Exit Ramp at Franklin Street/15th Street (Exit 74B)



### ESTIMATED PROJECT COSTS

Preliminary Engineering	\$240,000
ROW and Utility Relocation	\$290,000
Construction	\$1,275,000
<b>Total Cost =</b>	<b>\$1,805,000</b>

### ESTIMATED BENEFITS

Traffic Operations Measures	AM and PM Peak Hour Intersection Delay (Seconds)
2022 No-Build	130.8
2022 Build	50.5
Reduction in Delay	80.3
Annual Cost Savings	\$166,000
Benefit-to-Cost Ratio	0.73

	Maximum Queue Length (Feet)
	SB I-95 Exit Ramp
2022 No-Build	AM = 1,489, PM = 127
2022 Build	AM = 277, PM = 40

Safety Measure	No. of Related Crashes
Between 2007 - 2009	4
Crash Reduction Factor	0.35
Reduction in Crashes	1

### EXISTING CONDITIONS

- Queuing from the existing southbound I-95 off-ramp to Franklin Street occurs on a daily basis especially during the AM peak hour, as shown in Photograph 2.
- Vehicles spill back onto mainline I-95 due to the 380-foot ramp length and are a safety issue due to the high-speed differential between the exit and mainline traffic.
- Geometric conditions of the ramp such as the change in grade provide poor intersection visibility to exiting drivers, as shown in Photograph 1.
- Vehicles on Franklin Street were observed during the AM peak hour stopping to drop off passengers to the Monroe Building located on the northwest quadrant of the intersection. This negatively impacted westbound thru traffic on Franklin contributing to the queuing issue on the ramp.

### PROJECT PHOTOS



Photograph 1 – SB I-95 Exit Ramp to Franklin Street/15<sup>th</sup> Street



Photograph 2 – SB I-95 Exit Ramp to Franklin Street/15<sup>th</sup> Street

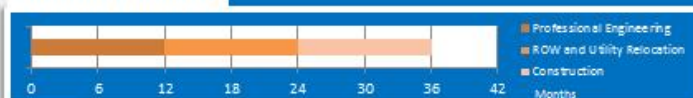


Photograph 3 – Looking North at SB I-95 Exit Ramp to Franklin Street/15<sup>th</sup> Street

### PROJECT GRAPHIC



### ANTICIPATED SCHEDULE



### PROJECT DESCRIPTION

- Widen the southbound approach from 2 lanes to 3 lanes. The additional lane will allow for more efficient signal timing operations and provide more storage for queued vehicles.
  - Install ramp pre-emption at the intersection. Once the SB queue reaches a specific point (e.g., 250 ft. from stop bar) then the intersection controller can prioritize demand from the ramp and clear the queue before it spills back onto I-95.
  - Install actuated pedestrian push buttons on each signal pole on each quadrant of the intersection.
- \* The NB approach of 15<sup>th</sup> street will be restriped from 2 NB lanes and 2 SB lanes to 3 SB lanes and 1 NB lane as shown in the project graphic above under a separate City of Richmond project.

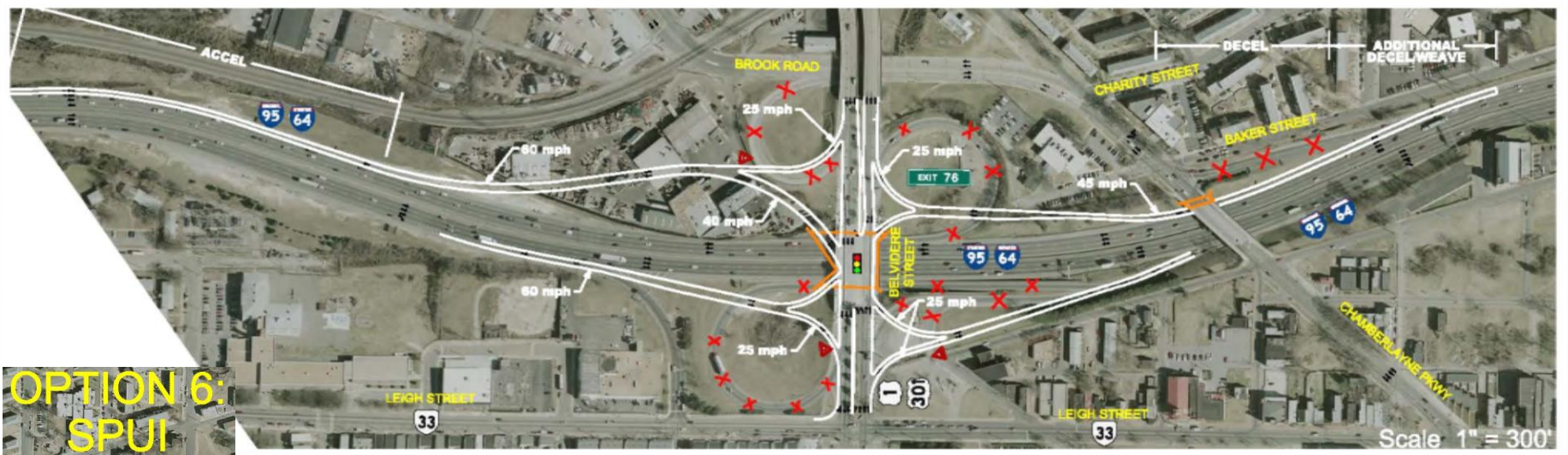
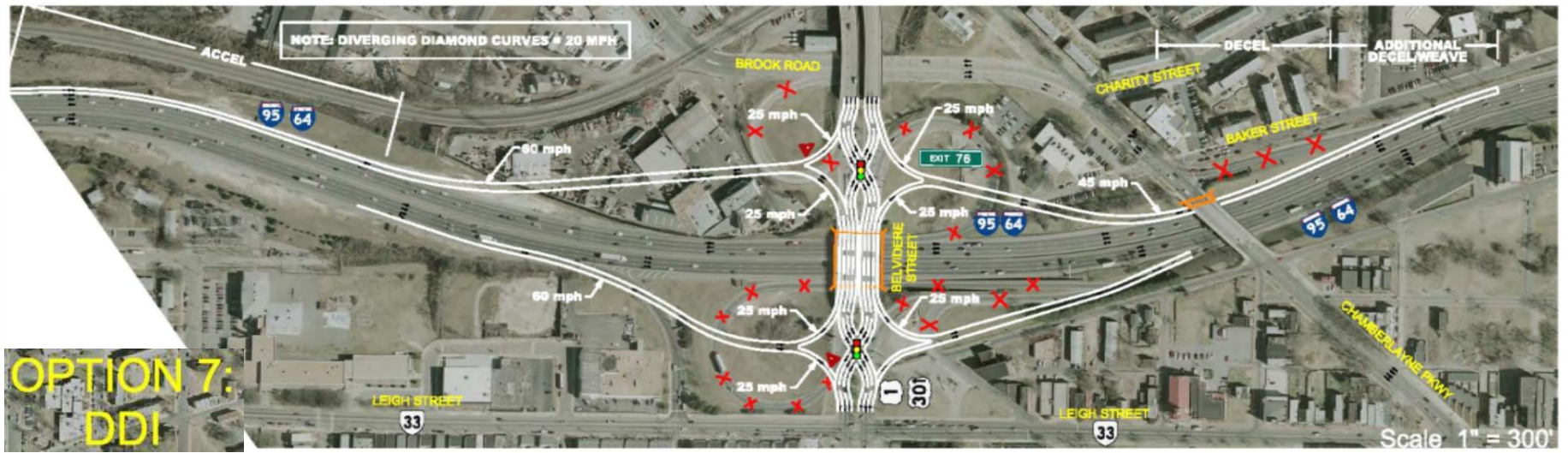
### PROJECT BENEFIT

This project proposes to reduce peak hour queuing on the southbound I-95 exit ramp, improve traffic flow on Franklin Street, and ultimately improve the overall safety and operation of the study area.



# NORTHBOUND I-95/I-64 AT BELVIDERE STREET (EXIT 76)

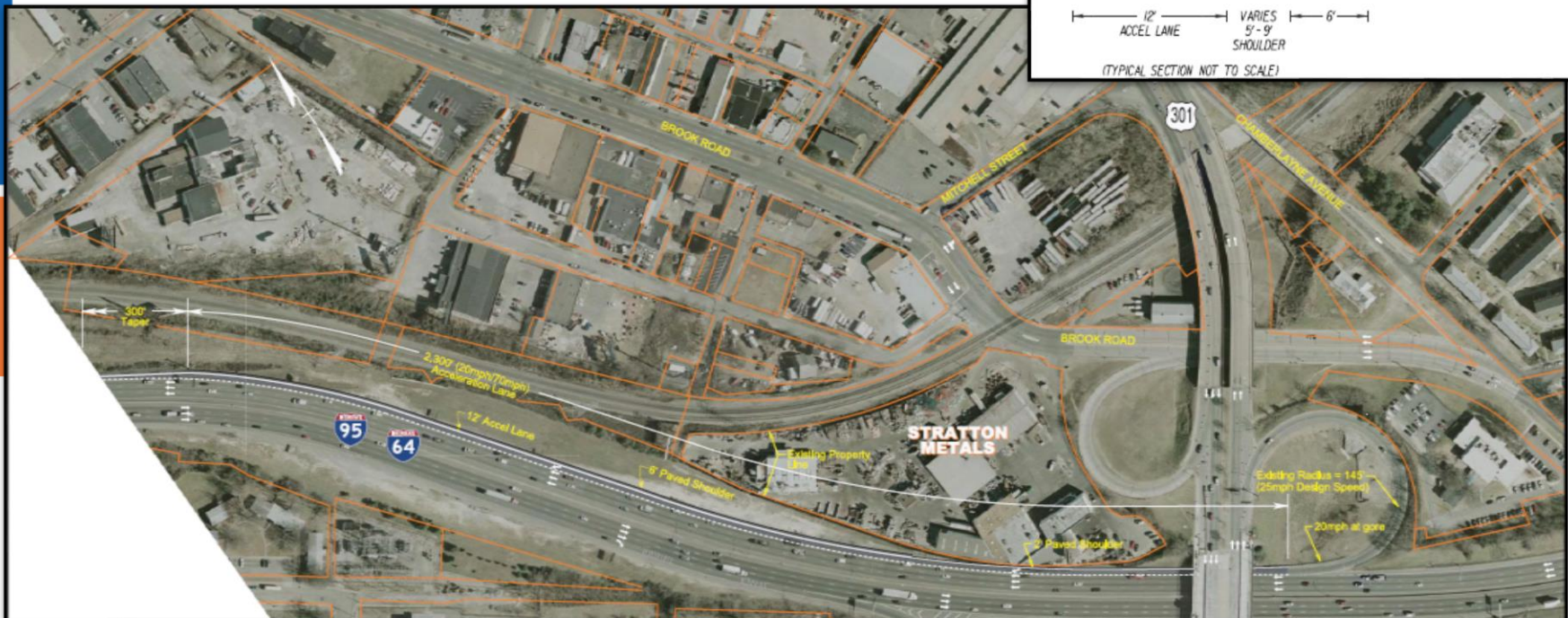
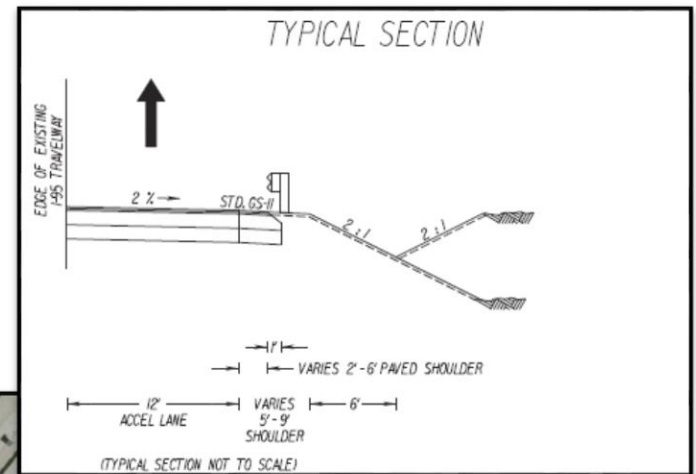
## ACCELERATION LANE: CITY OF RICHMOND





# NORTHBOUND I-95/I-64 AT BELVIDERE STREET (EXIT 76) ACCELERATION LANE: CITY OF RICHMOND

- Acceleration lane extension
  - 2,300' full width
  - 300' taper
- Shoulder width waiver (2')
- Long-term alternatives

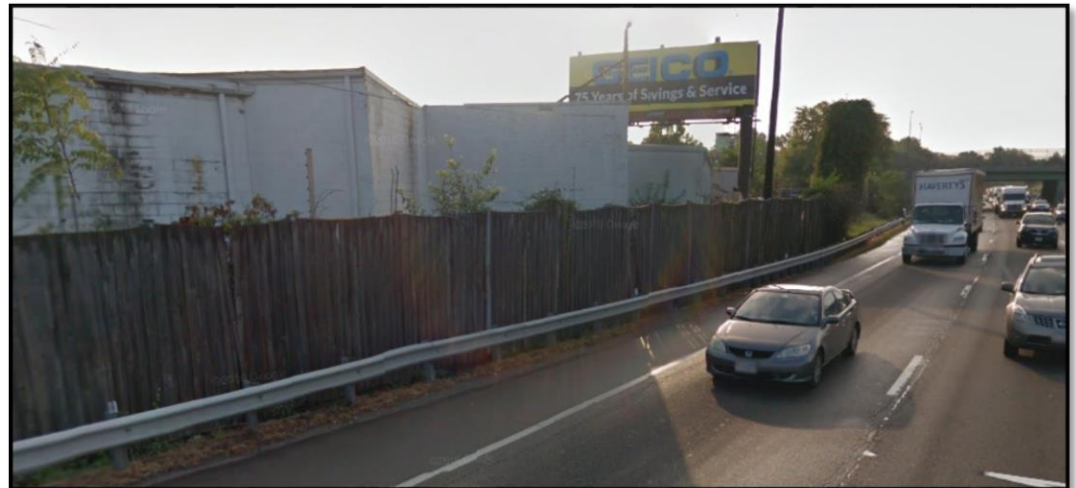




# NORTHBOUND I-95/I-64 AT BELVIDERE STREET (EXIT 76)

## ACCELERATION LANE: CITY OF RICHMOND

- Acceleration lane extension
- Appraisal for Stratton Metals (metal recycling facility)
  - Partial: \$1.5M
  - Full: \$3.5M





# NORTHBOUND I-95/I-64 AT BELVIDERE STREET (EXIT 76)

## ACCELERATION LANE: CITY OF RICHMOND

- SMART SCALE Dashboard
- Cost: \$5.8 M
- Schedule: PH: 5/19/17 and Advertisement: 8/24/20


### Project Detail


RTE 95 - EXTEND NB ACCEL LANE AT BELVIDERE ST

EXTEND THE LENGTH OF THE EXISTING BELVIDERE STREET ON-RAMP ACCELERATION LANE ONTO NB I-95/WB I-64.

#### PROJECT STATUS

##### Development:

 **On Time Status**  
On schedule.

 **On Budget Status**  
Project is on or under budget.

##### Delivery:

 **On Time Status**

 **On Budget Status**

#### PROJECT DETAILS

Route:	I-95N	Fiscal Year:	2017
Administered by:	VDOT	Locality:	Richmond
District:	Richmond	MPO:	Richmond:Richmond
Roadway Type:	Interstate	Residency:	ASHLAND
Project Status:	Active	Project Stage:	Development
UPC:	107797	Contact:	DavidA Steele <a href="mailto:DavidA.Steele@vdot.virginia.gov">DavidA.Steele@vdot.virginia.gov</a>
Project Cost (Budget/Current Estimate):	\$5,783,000 / \$3,203,300		



# MOUNT CROSS RD AT STONY MILL RD/TUNSTALL HIGH RD INTERSECTION IMPROVEMENT: PITTSYLVANIA COUNTY

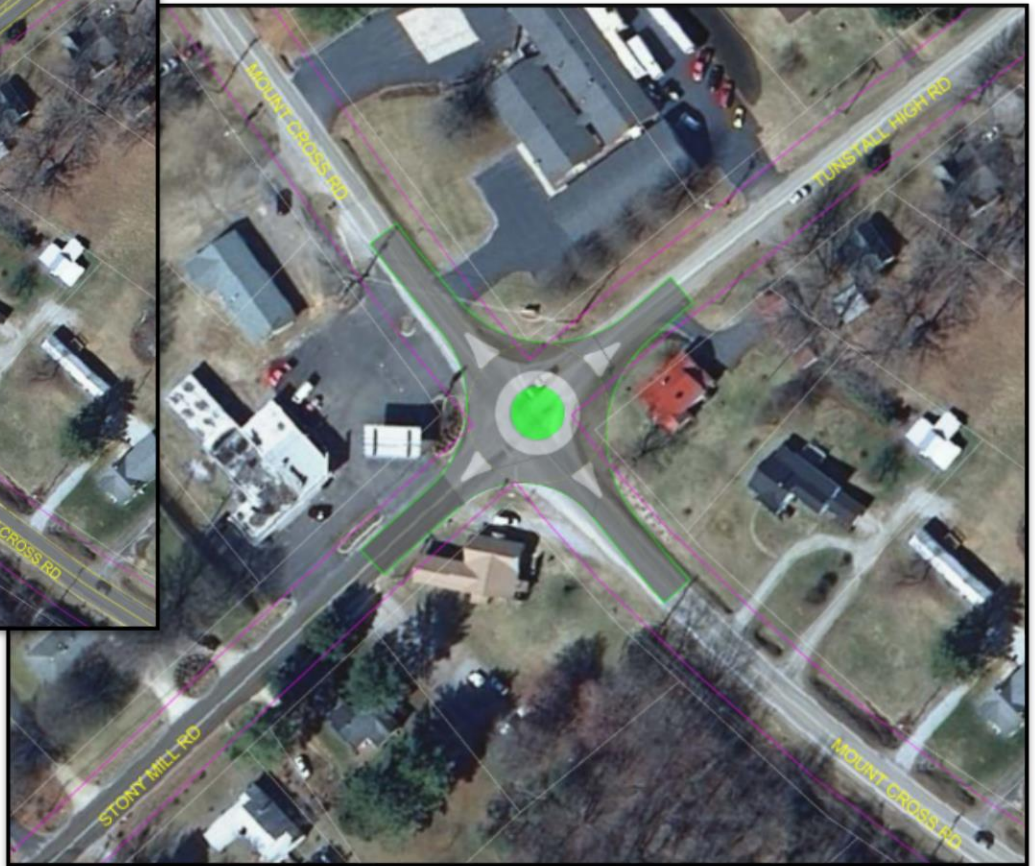
- Intersection alternatives
- Existing conditions
  - Sight distance
  - Access management
  - High school buses
  - Crash location





# MOUNT CROSS RD AT STONY MILL RD/TUNSTALL HIGH RD INTERSECTION IMPROVEMENT: PITTSYLVANIA COUNTY

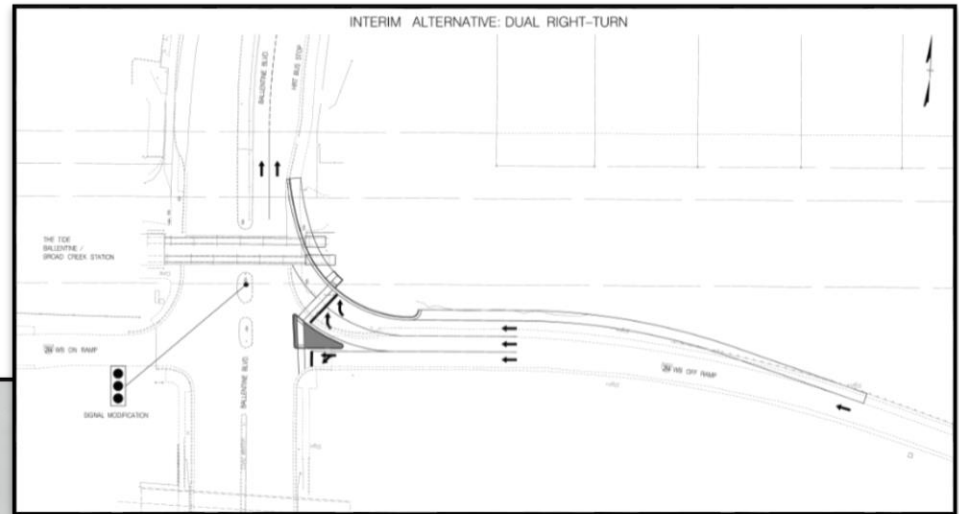
- Intersection alternatives: turn lanes vs. roundabout





# I-264 AT BALLENTINE BOULEVARD (EXIT 12) INTERCHANGE IMPROVEMENT: CITY OF NORFOLK

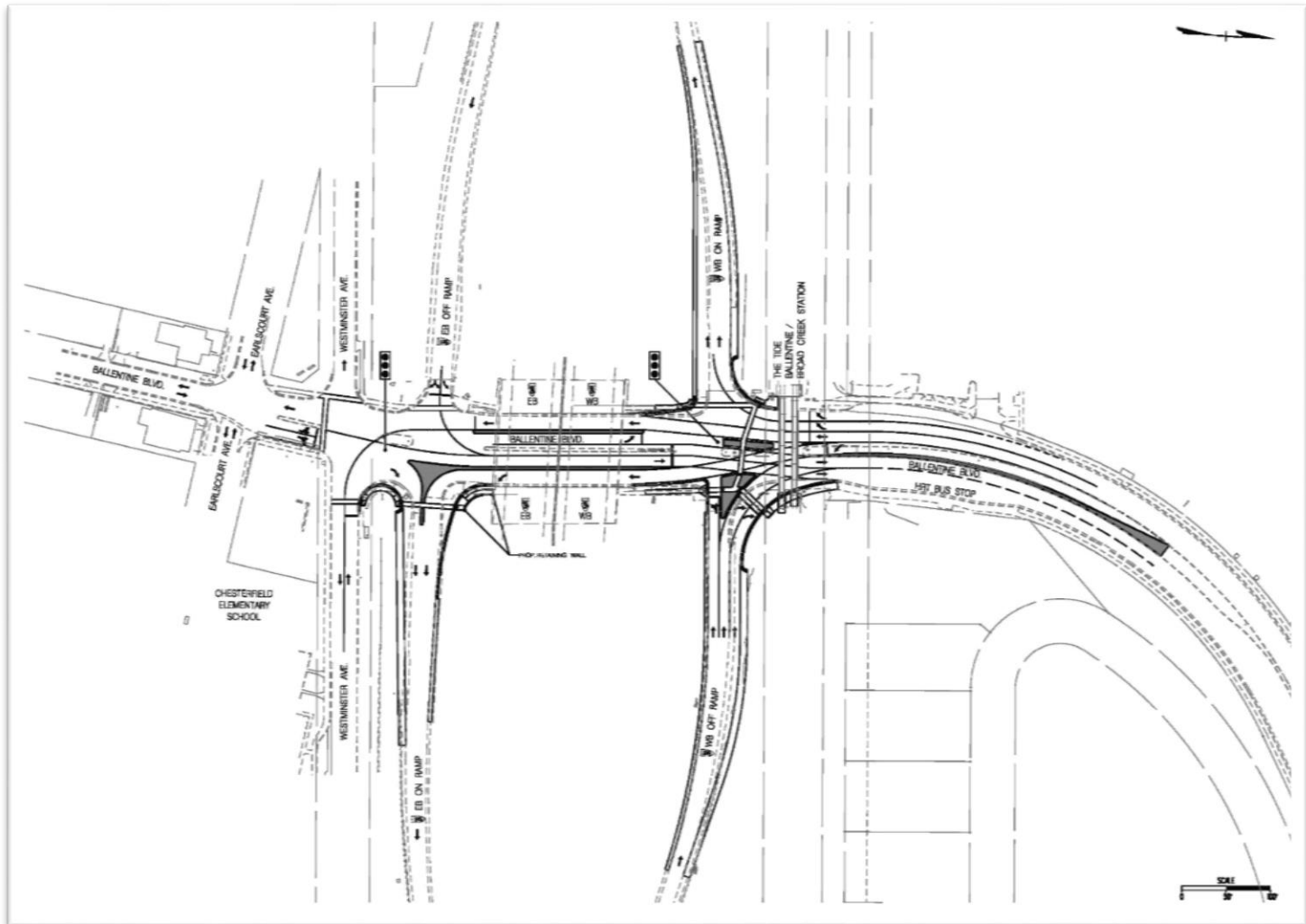
- Congestion hotspot
- Phased improvements
  - Dual right-turn lanes
  - SMART SCALE application: \$1.7M





# I-264 AT BALLENTINE BOULEVARD (EXIT 12) INTERCHANGE IMPROVEMENT: CITY OF NORFOLK

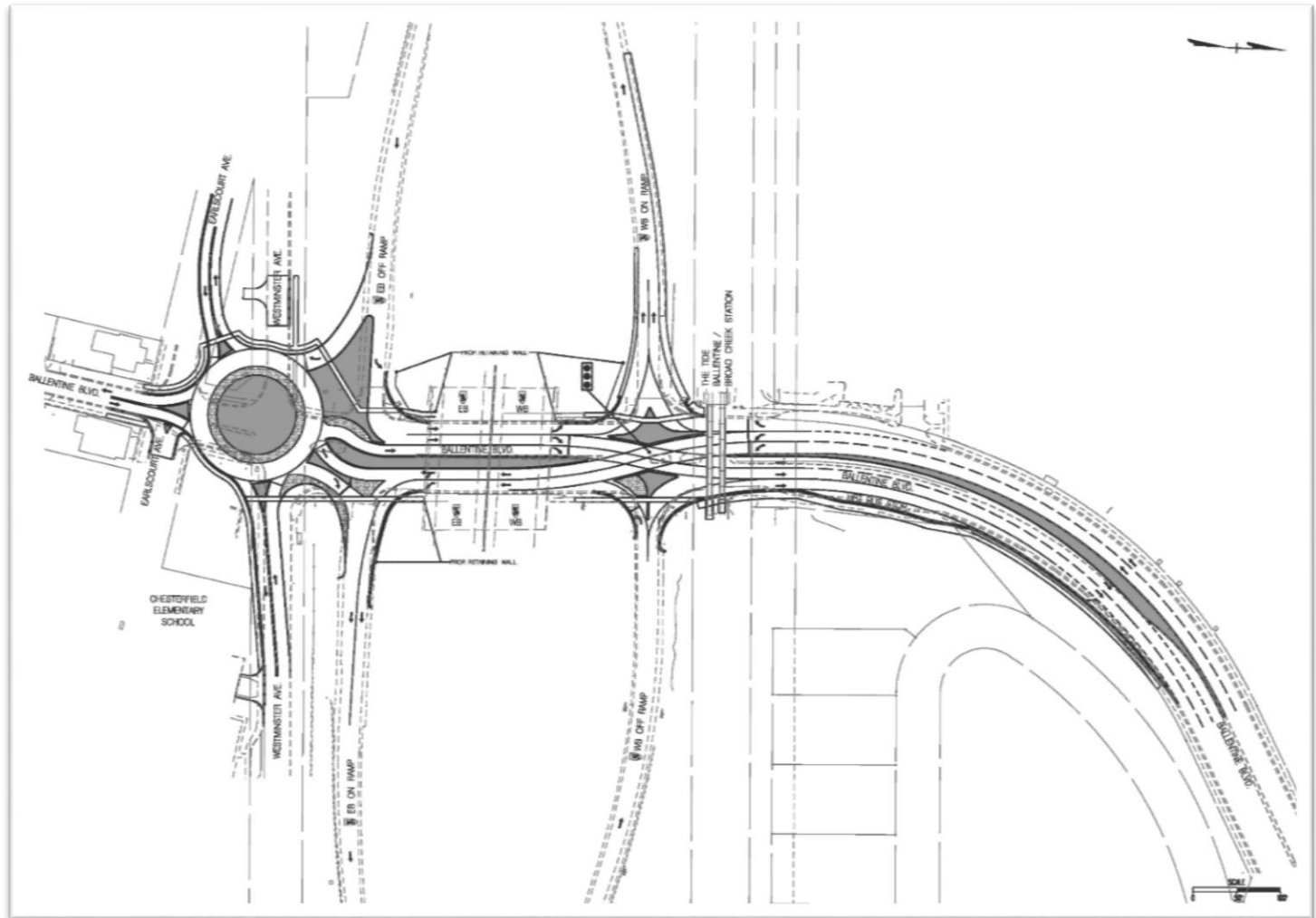
- Long-Term Alternative - Displaced Left, \$5.8M





# I-264 AT BALLENTINE BOULEVARD (EXIT 12) INTERCHANGE IMPROVEMENT: CITY OF NORFOLK

- Long-Term Alternatives - Modified DDI, \$9.6M

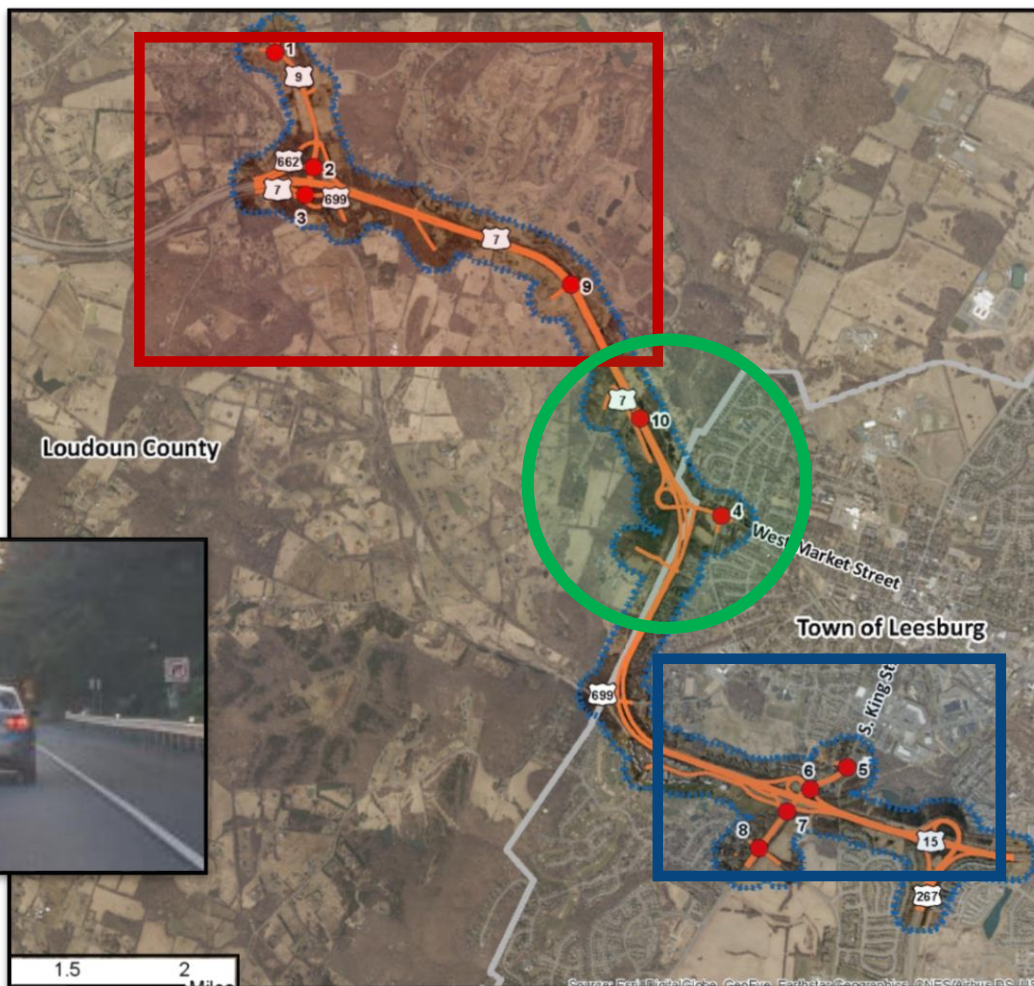




# ROUTE 7 CORRIDOR

## LOUDOUN COUNTY AND TOWN OF LEESBURG

- 5.7-mile corridor
- 10 study area intersections
- 3 distinct study areas

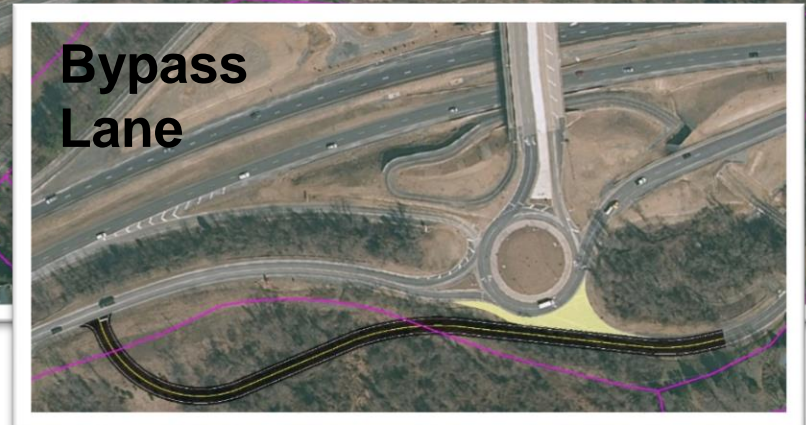
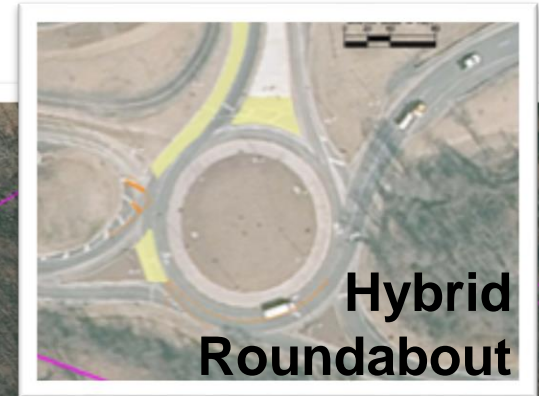
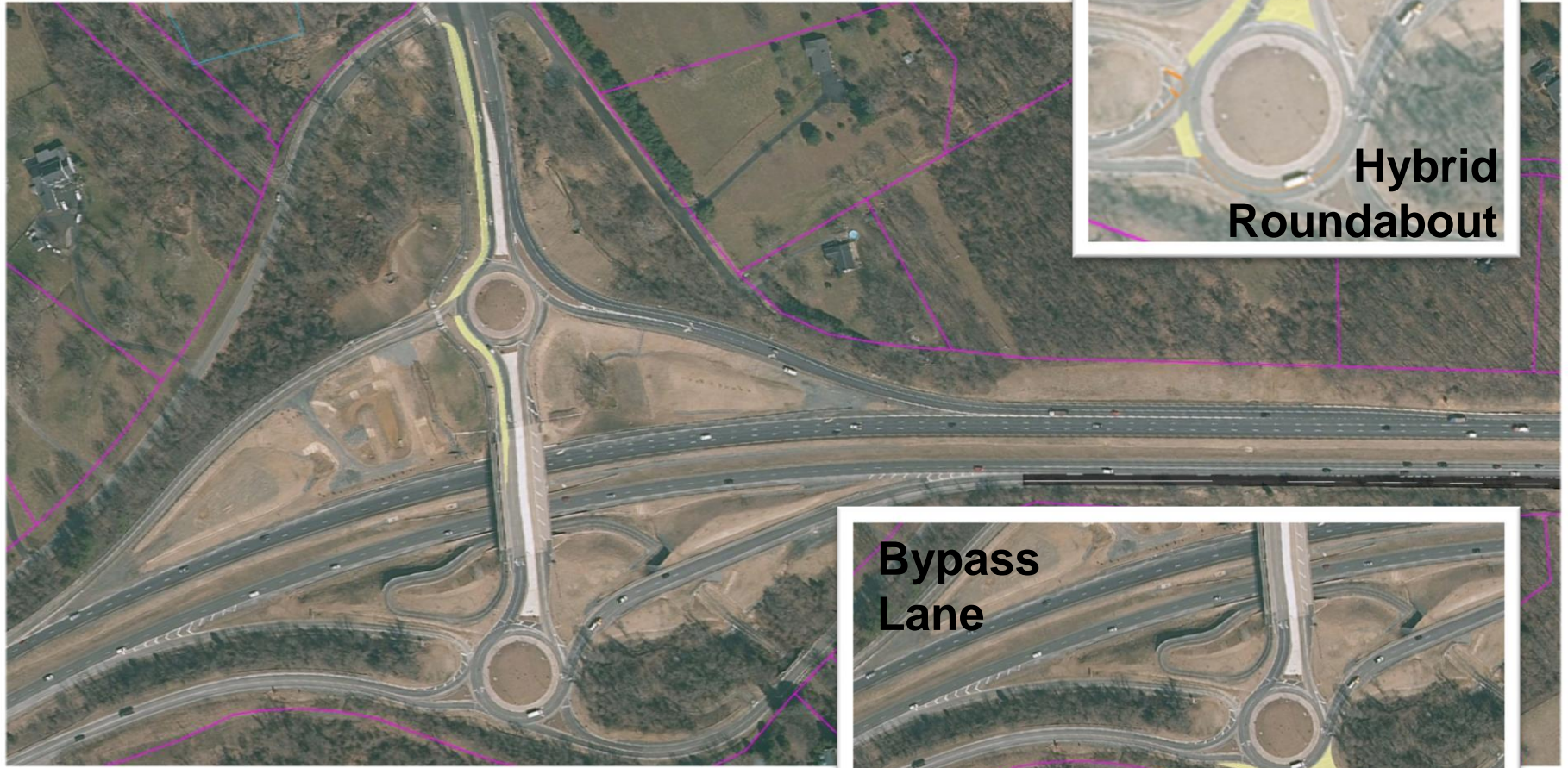




# ROUTE 7 CORRIDOR IMPROVEMENT STUDY

## LOUDOUN COUNTY AND TOWN OF LEESBURG

- Alternatives at Route 9 interchange





# ROUTE 7 CORRIDOR IMPROVEMENT STUDY

## LOUDOUN COUNTY AND TOWN OF LEESBURG

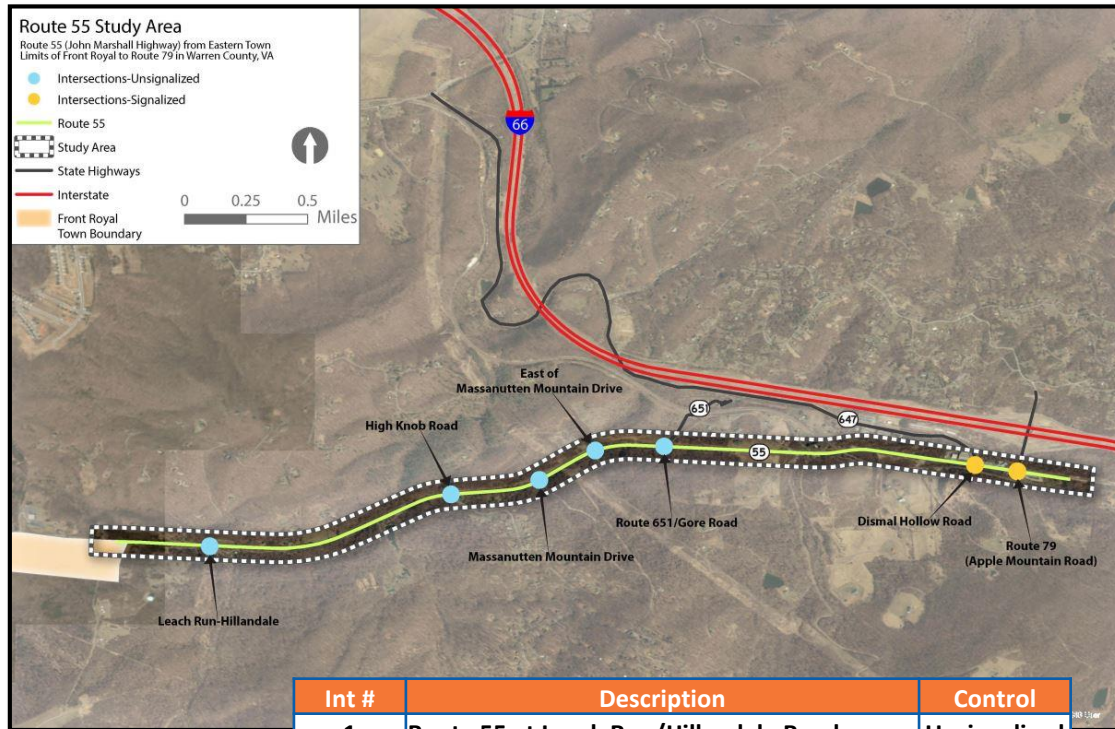
- Alternatives between Route 267 and S. King Street interchanges





# ROUTE 55

## WARREN COUNTY



Int #	Description	Control
1	Route 55 at Leach Run/Hillandale Road	Unsignalized
2	Route 55 at High Knob Road	Unsignalized
3	Route 55 at Massanutten Mountain Drive	Unsignalized
4	Route 55 at E Massanutten Mountain Drive	Unsignalized
5	Route 55 at Route 651 (Gore Road)	Unsignalized
6	Route 55 at Route 647 (Dismal Hollow Road)	Signalized
7	Route 55 at Route 79 (Apple Mountain Road)	Signalized

- 2.95-mile corridor: Front Royal to Route 79 (Apple Mtn Rd)
- 7 study intersections
- Spot locations with congestion concerns



# ROUTE 55

## WARREN COUNTY

- Roadway Characteristics
- Design speed and Typical Section
- Shoulder - Curb and Gutter
- Pavement Cross Slope
- Bridge – Width
- Vertical Clearance
- Design Vehicle – WB-67
- Traffic Data
- Horizontal Alignment, Superelevation and Curve Transitions
- Vertical Alignment and Stopping Sight Distance
- Bicycle and Pedestrian Accommodations





# CANDLERS MOUNTAIN ROAD LYNCHBURG

## PROJECT 3

### MURRAY PLACE AND RIVER RIDGE MALL CONTINUOUS GREEN T INTERSECTION IMPROVEMENTS

Project Conceptual Design Layout



Project Schedule



#### Project Description

This project improves operations on Candler Mountain Road in the vicinity of the Murray Place and River Ridge Mall intersections by eliminating signal phases and providing additional green time for vehicles.

- Construct a signalized continuous Green-T at Murray Place (west) intersection with a free-flow eastbound through movement
- Construct a signalized continuous Green-T at Murray Place/River Ridge Mall intersection with a free-flow westbound through movement
- Construct dual westbound left-turn lanes at Murray Place/River Ridge Mall intersection and add a third receiving lane to the mall entrance
- Close free-flow right entrance ramp to River Ridge Mall
- Construct sidewalk on both sides of Candler Mountain Road between the Lynchburg Expressway and Murray Place/River Ridge Mall intersection

#### Planning Level Cost Estimate

Phase	SYIP Cycle
	Estimate
Preliminary Engineering	\$1,000,000
ROW and Utility Relocation	\$980,000
Construction	\$4,230,000
<b>Total Cost =</b>	<b>\$6,230,000</b>

Note: Cost estimates reported in 2016 dollars

#### Traffic Operations Benefits

	AM	PM
<b>Candler Mountain Road at Murray Place (west intersection)</b>		
2040 No Build Intersection Delay	--	--
2040 Build Intersection Delay	4.2 sec/veh	38.2 sec/veh
Δ Intersection Delay	--	--
<b>Candler Mountain Road at Murray Place/River Ridge Mall</b>		
2040 No Build Intersection Delay	61.8 sec/veh	126.2 sec/veh
2040 Build Intersection Delay	13.4 sec/veh	32.5 sec/veh
Δ Intersection Delay	-48.4 sec/veh	-93.7 sec/veh

#### Safety Benefits

Improvement	Crash Reduction Factor	Total Applicable Crashes	Reduction	Adjusted Crashes
Convert four-leg intersection into two three-leg intersections	57	101	57.6	43.4
Install left-turn lane	25	7	1.8	5.2



# NORTHBOUND I-81 AUXILIARY LANE (EXIT 141 TO EXIT 143) MP 141 TO MP 143: ROANOKE COUNTY

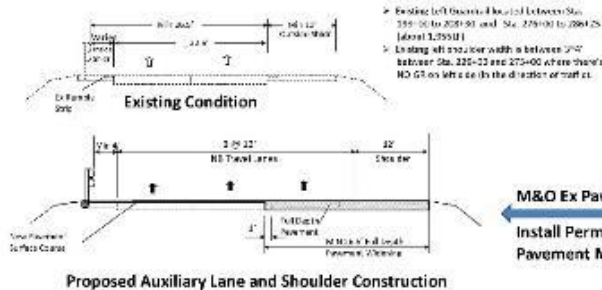
## I-81/I-581 Auxiliary Lane – MOT Alternatives

### I-81 NB Two-Lane Segment Existing Condition:

- Narrow Lanes (Average 11.2 ft)
- Narrow Left Shoulder with (Substandard) GR
- Rumble Strips @ both sides
- Ex. Left Shoulder Pavement is fair to poor condition.



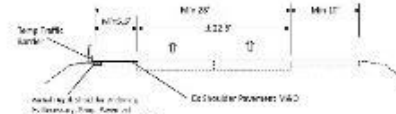
	ft	in
Total Project Length	610	114
Length to Lane 1	124	142
Left Shoulder Width (x4)	336	
Left Shoulder Width (x3)	620	
Left Shoulder Width (x2)	416	
Right Shoulder Width (x2)	240	
Right Shoulder Width (x1)	120	
Right Shoulder Width (x0)	0	
Right Shoulder Width (x-1)	0	



### Option 1: Left shoulder – M&O + (Partial Depth) Widening

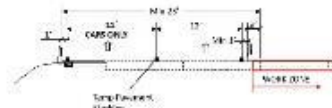
#### Phase 1 –

- M&O Existing Left Shoulder (Remove existing Rumble Strips);
- Increase Inside Paved Shoulder Width to Min 5.5 ft;
- Remove Existing GR & Install Temp Traffic Barrier As-necessary.  
About 930 ft GR needs to be removed; from Sta 199+00 to 208+30. Traffic barrier could be installed at graded unpaved shoulder and anchored to the ground wherever necessary.



#### Phase 2 –

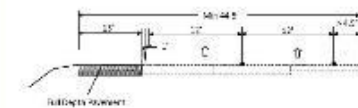
- Restripe Pavement and Shift Traffic Partially on to Left Shoulder;
- **No Truck Allowed on Left Lane.**
- Construct Auxiliary Lane and Right Shoulder.



### Option 2: Left Shoulder – Full Depth Widening

#### Phase 1 –

- Remove Existing Right Side Rumble Strip;
- Shift Traffic Partially on to Right Shoulder;
- Install Temp Traffic Barrier As-necessary.
- Construct FULL DEPTH Left Shoulder: 12 ft Wide (+1ft Tie-in)  
Eventually, the full depth left shoulder will be converted to part of 3<sup>rd</sup> thru lane in the future.

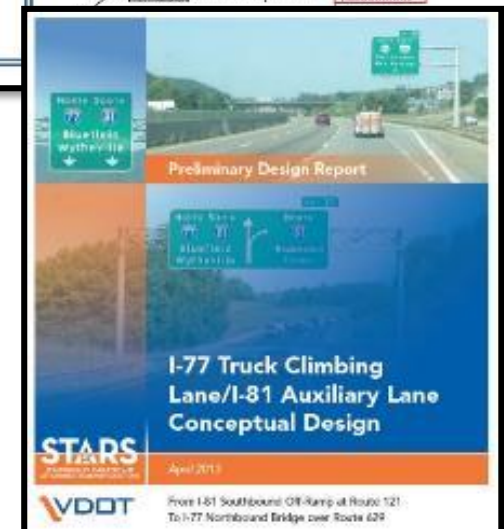


#### Phase 2 –

- Shift Traffic Partially on to Left Shoulder;
- Install Temp Traffic Barrier As-necessary;
- Construct Auxiliary Lane and Right Shoulder.



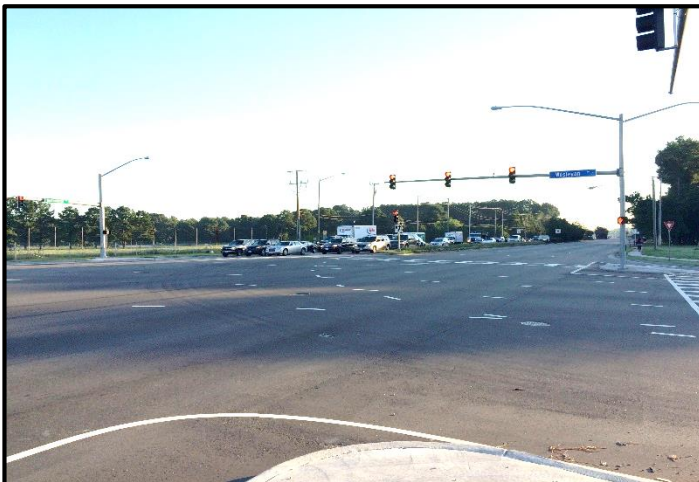
- Noise walls impact drainage design
- Flood plain
- Cost: \$29.8 M
- Schedule: PH: 7/18 and Advert.: 12/20





# I-64 / US 13 (NORTHAMPTON BLVD)

- 2-mile corridor: Military Hwy to Baker Rd
- Safety concerns and congestion bottlenecks
- Major development activities
- Cost: \$9.3 M
- Schedule: PH: 12/16/16 and Advertisement: 3/18/17





# US 258 (MERCURY BLVD) CITY OF HAMPTON

- 0.7-mile corridor:  
Aberdeen Rd to I-64
- 6 study intersections
- Spot safety and congestion with pedestrian improvements through interchange





# QUESTIONS?

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Transportation and Mobility Planning Division

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(804) 896-3762 – mobile

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