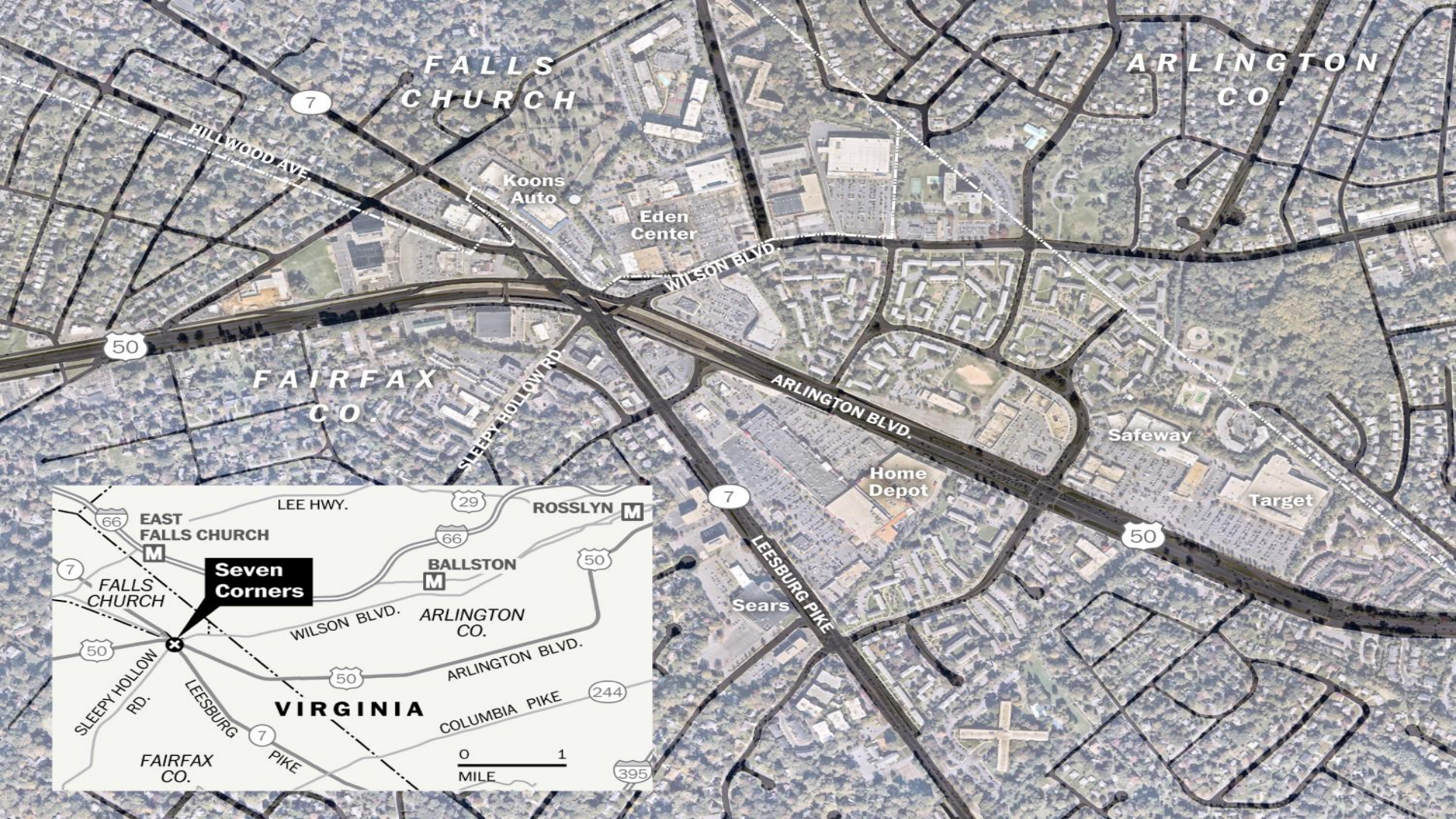
An Independent Traffic Analysis of the Seven Corners Interchange

Michelle Yun

50% of traffic injuries per year in the U.S. are due to intersections

Of all traffic fatalities, 1 in 4 happen at an intersection

3% of Americans are involved in traffic accidents annually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WILSON BLVD.
FAIRFAX CO.
SLEEPY HOLLOW RD
ARLINGTON BLVD.
Safeway
Home Depot
Target
LEESBURG PIKE
Sears
LEE HWY.
EAST FALLS CHURCH
ROSSLYN
BALLSTON
Seven Corners
FALLS CHURCH
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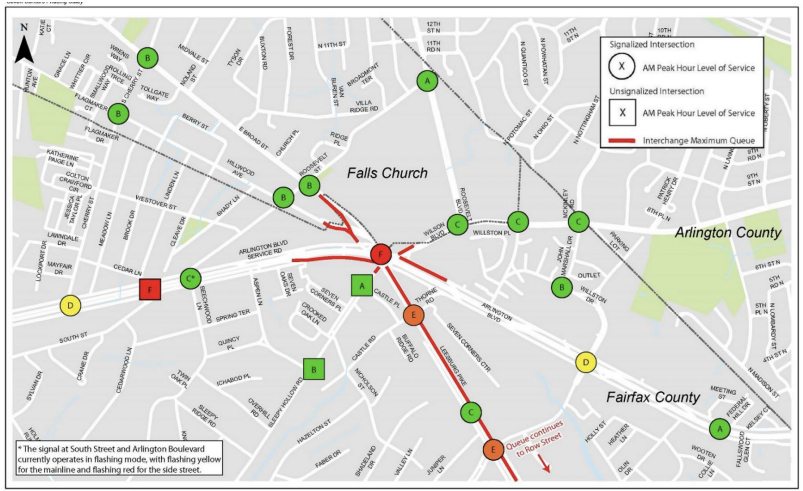
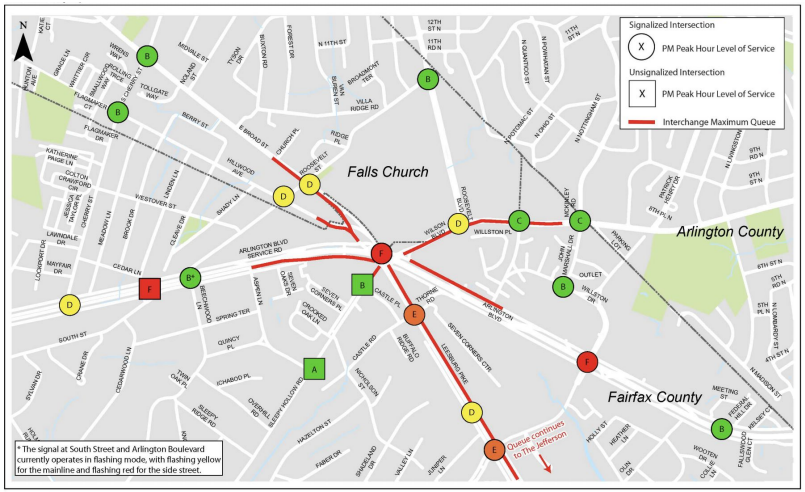


2018/2019 AM Peak Hour (7:30 AM - 8:30 AM)
Level of Service and Queue



2018/2019 PM Peak Hour (5:00 PM - 6:00 PM)
Level of Service and Queue

Performance Measure	Weekday AM	Weekday PM
Average Delay (seconds)	154.8	201.7
Vehicle Arrival (vehicles)	20,222	20,131
Latent Demand (vehicles)	55	390

WJLA

https://wjla.com › news › local › busy-and-confusing-fai...

'Busy and Confusing': Fairfax County DOT moves closer to ...

Feb 4, 2021 – **The Seven Corners area get busy, backed up and confusing**. "It tends to be slow. It will take five or ten minutes to get through," Faga said.

Reddit · r/nova

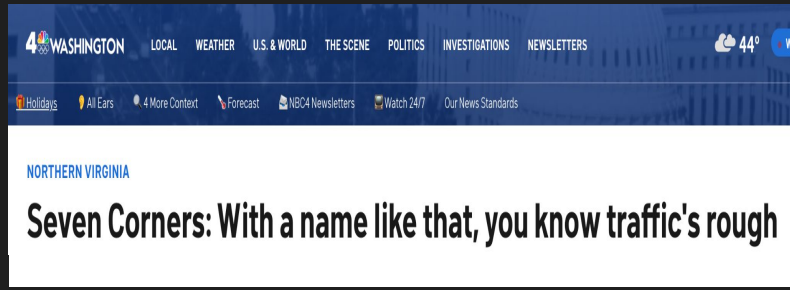
40+ comments · 4 years ago

Seven Corners is my least favorite intersection just about ...

Driving through **Seven Corners** mainly requires a good deal of patience. The trick is not to use the ramps leading off of Rt. 50 during rush hour.

What is Seven Corners, VA known for?

Seven Corners is known around NOVA for its **chaotic intersection**, where Arlington Boulevard converges with Leesburg Pike, Hillwood Avenue, Sleepy Hollow Road and Wilson Boulevard.



Seven Corners

Located in Fairfax County

$519,314 Average Value | **$400** Averag

One of NOVA's best-known intersections

Notorious for its chaotic traffic circle, Seven Corners

Is 7 Corners the worst intersection in NOVA?

Reddit · r/nova · 80+ comments · 4 months ago

Worst in NoVA? It might be the worst in this time zone!

More ›

Top answer · 279 votes · 4...

Absolutely. It's

51 votes · 4 mon

Research question:
How can traffic engineering principles be applied to evaluate the Seven Corners intersection and assess proposed solutions for improving efficiency and safety?

WELLS + ASSOCIATES

1

Secured internship

- Wells + Associates
- Synchro license

2

Learned Synchro

- Signal timing
- LOS analysis

3

BASIS McLean case study

- First real analysis
- LOS F → LOS A

4

Seven Corners analysis

- Timing tests
- Ring Road validation

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MAP

SCENARIO MANAGER

Westbranch Drive/Basis Independent Driveway & Jones Branch Drive

BDM Way

BASIS Independent McLean

Independent Driveway

Jones Branch Drive

Westbranch Drive

Jones Branch Drive

Lark Ln

Hanover

Tysons Overlook

21 748 110

21 6 19

17 617 87

75 3 56

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PM

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MAP | SCENARIO MANAGER

1 Westbranch Drive/Basis Independent Driveway & Jones Branch Drive

Node Settings

Node #	1
ATMS.now Controller ID	0
Import from ATMS.now	Import
Export to ATMS.now	Export
Zone	9175
X East (ft)	13065
Y North (ft)	16035
Z Elevation (ft)	0
Description	
Control Type	Actd-Uncrd
Cycle Length (s)	100.0
Lock Timings	
Optimize Cycle Length	Optimize
Optimize Splits	Optimize
Actuated Cycle(s)	60.2
Natural Cycle(s)	65.0
Max v/c Ratio	0.67

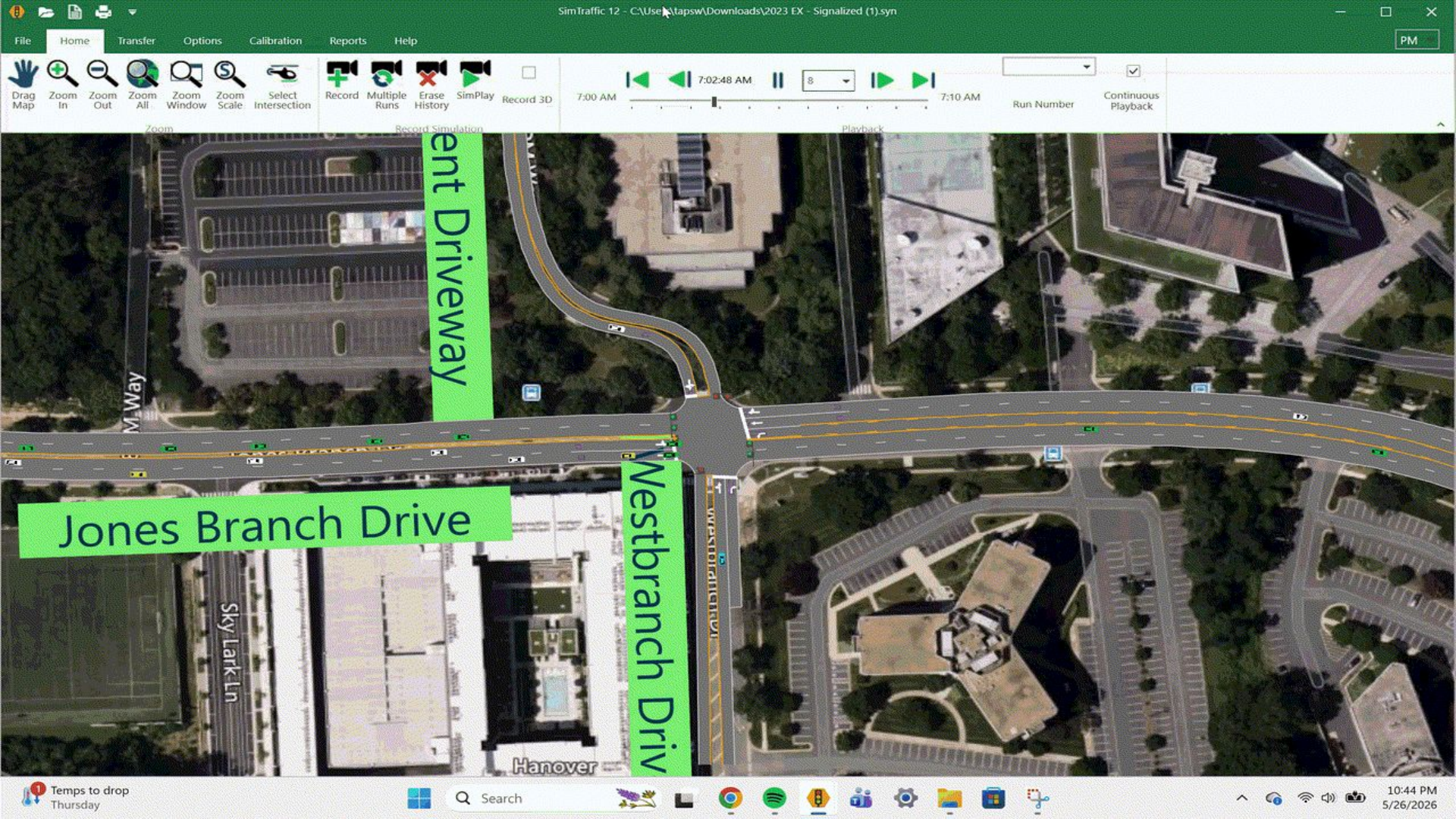
Timing Settings

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	PED	HOLD
Lanes and Sharing (#RL)													—	—
Traffic Volume (vph)	17	617	87	110	748	21	56	3	75	21	6	19	—	—
Future Volume (vph)	17	617	87	110	748	21	56	3	75	21	6	19	—	—
Turn Type	Perm	—	—	pm+pt	—	—	Perm	—	pm+ov	Perm	—	—	—	—
Protected Phases		2	—	1	6	—		8	1		4	—		
Permitted Phases	2			6			8		8	4			—	—
Permitted Flashing Yellow	—	—	—	☑	—	—	—	—	—	—	—	—	—	—
Detector Phases	2	2		1	6		8	8	1	4	4		—	—
Switch Phase	0	0	0	0	0	0	0	0	0	0	0	0	—	—
Leading Detector (ft)	—	100	—	20	100	—	—	100	20	—	100	—	—	—
Trailing Detector (ft)	—	0	—	0	0	—	—	0	0	—	0	—	—	—
Minimum Initial (s)	20.0	20.0	—	7.0	20.0	—	10.0	10.0	7.0	10.0	10.0	—	—	—
Minimum Split (s)	26.0	26.0	—	13.0	26.0	—	24.0	24.0	13.0	24.0	24.0	—	—	—
Total Split (s)	58.0	58.0	—	15.0	73.0	—	27.0	27.0	15.0	27.0	27.0	—	—	—
Yellow Time (s)	4.0	4.0	—	4.0	4.0	—	4.0	4.0	4.0	4.0	4.0	—	—	—
All-Red Time (s)	2.0	2.0	—	2.0	2.0	—	2.0	2.0	2.0	2.0	2.0	—	—	—
Lost Time Adjust (s)	—	0.0	—	0.0	0.0	—	—	0.0	0.0	—	0.0	—	—	—

Ø1 15 s | Ø2 58 s | Ø4 27 s | Ø6 73 s | Ø8 27 s

Westbranch Drive/Basis Independent Driveway & Jones Branch Drive (13065 16035)

v/c ok | Mins ok | v12.3.1.19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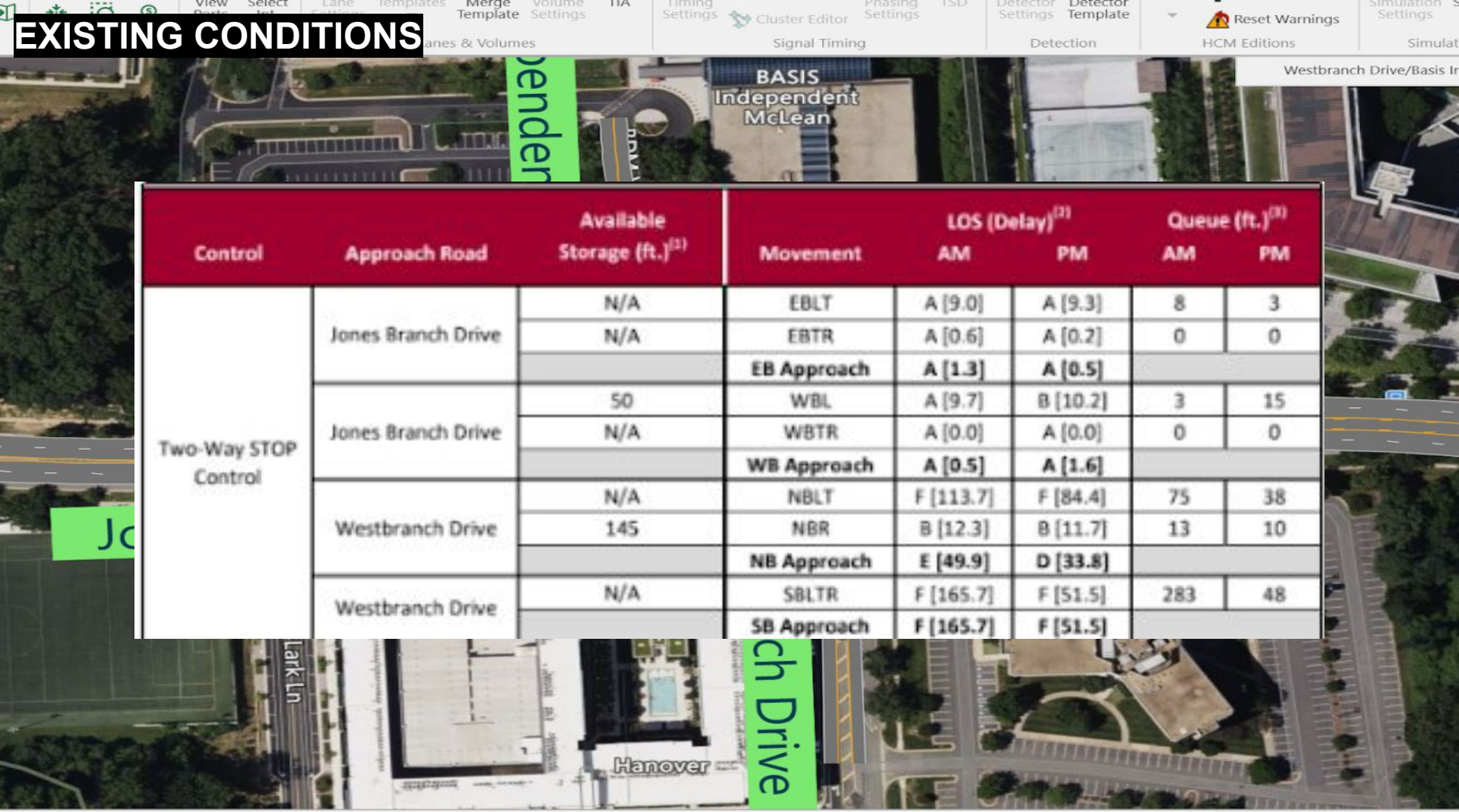
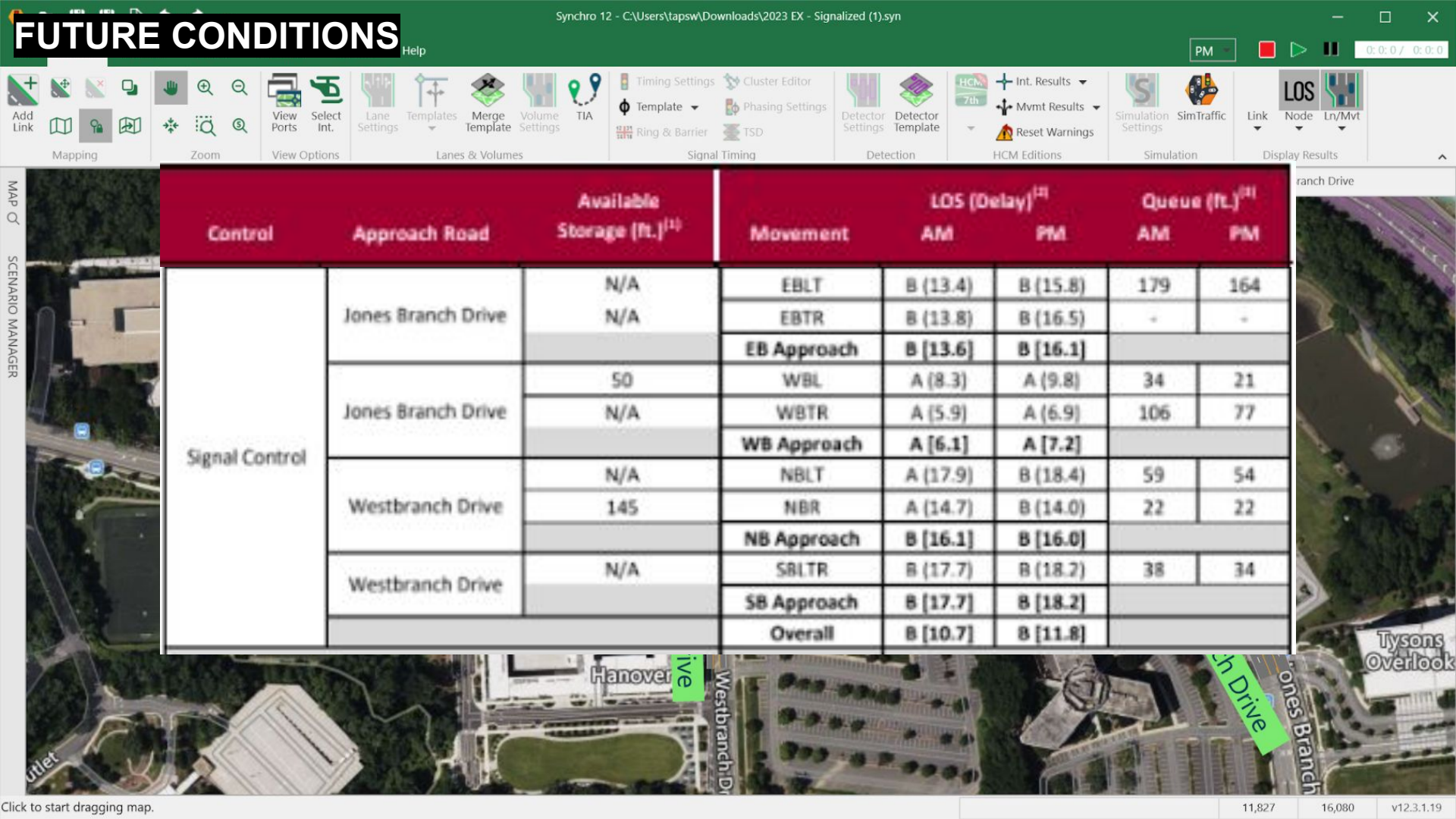
EXISTING CONDITIONS



Control	Approach Road	Available Storage (ft.)[1]	Movement	LOS (Delay)[2] AM	LOS (Delay)[2] PM	Queue (ft.)[3] AM	Queue (ft.)[3] PM
Two-Way STOP Control	Jones Branch Drive	N/A	EBLT	A [9.0]	A [9.3]	8	3
		N/A	EBTR	A [0.6]	A [0.2]	0	0
			EB Approach	**A [1.3]**	**A [0.5]**		
	Jones Branch Drive	50	WBL	A [9.7]	B [10.2]	3	15
		N/A	WBTR	A [0.0]	A [0.0]	0	0
			WB Approach	**A [0.5]**	**A [1.6]**		
	Westbranch Drive	N/A	NBLT	F [113.7]	F [84.4]	75	38
		145	NBR	B [12.3]	B [11.7]	13	10
			NB Approach	**E [49.9]**	**D [33.8]**		
	Westbranch Drive	N/A	SBLTR	F [165.7]	F [51.5]	283	48
			SB Approach	**F [165.7]**	**F [51.5]**		

FUTURE CONDITIONS



Control	Approach Road	Available Storage (ft.)[1]	Movement	LOS (Delay)[2] AM	LOS (Delay)[2] PM	Queue (ft.)[2] AM	Queue (ft.)[2] PM
Signal Control	Jones Branch Drive	N/A	EBLT	B (13.4)	B (15.8)	179	164
		N/A	EBTR	B (13.8)	B (16.5)	-	-
			EB Approach	**B [13.6]**	**B [16.1]**		
	Jones Branch Drive	50	WBL	A (8.3)	A (9.8)	34	21
		N/A	WBTR	A (5.9)	A (6.9)	106	77
			WB Approach	**A [6.1]**	**A [7.2]**		
	Westbranch Drive	N/A	NBLT	A (17.9)	B (18.4)	59	54
		145	NBR	A (14.7)	B (14.0)	22	22
			NB Approach	**B [16.1]**	**B [16.0]**		
	Westbranch Drive	N/A	SBLTR	B (17.7)	B (18.2)	38	34
			SB Approach	**B [17.7]**	**B [18.2]**		
			Overall	**B [10.7]**	**B [11.8]**		

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Scenario 1

Add Link | Mapping | Zoom | View Ports | Select Int. | View Options | Lane Settings | Templates | Merge Template | Volume Settings | TIA | Lanes & Volumes | Timing Settings | Cluster Editor | Template | Phasing Settings | Ring & Barrier | TSD | Signal Timing | Detector Settings | Detector Template | Detection | HCM 7th | Int. Results | Mvmt Results | Reset Warnings | HCM Editions | Simulation Settings | SimTraffic | Simulation | Link | Node | Ln/Mvt | Display Results

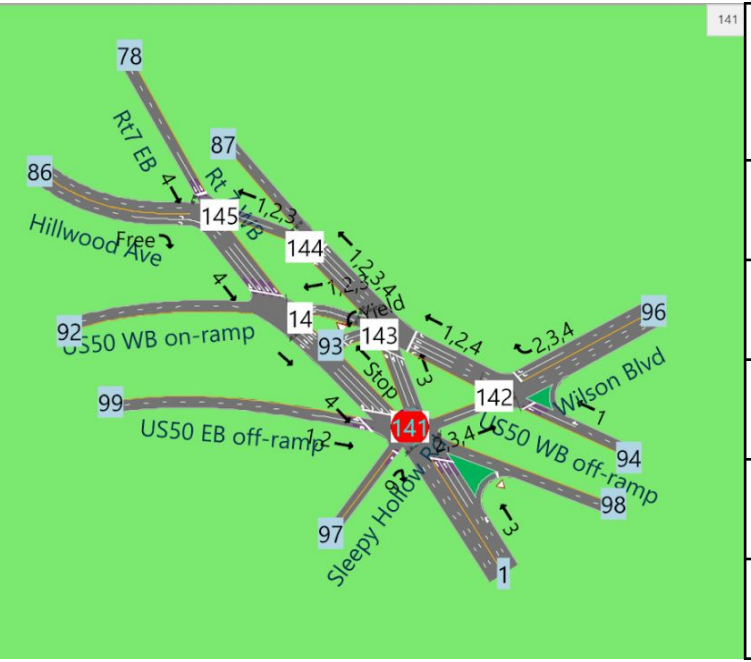
MAP | SCENARIO MANAGER

Click to start dragging map.

11,866,573 | 7,003,785 | v12.3.1.19

Sleepy Hollow Rd & US50 EB off-ramp

Node 141: Southern end

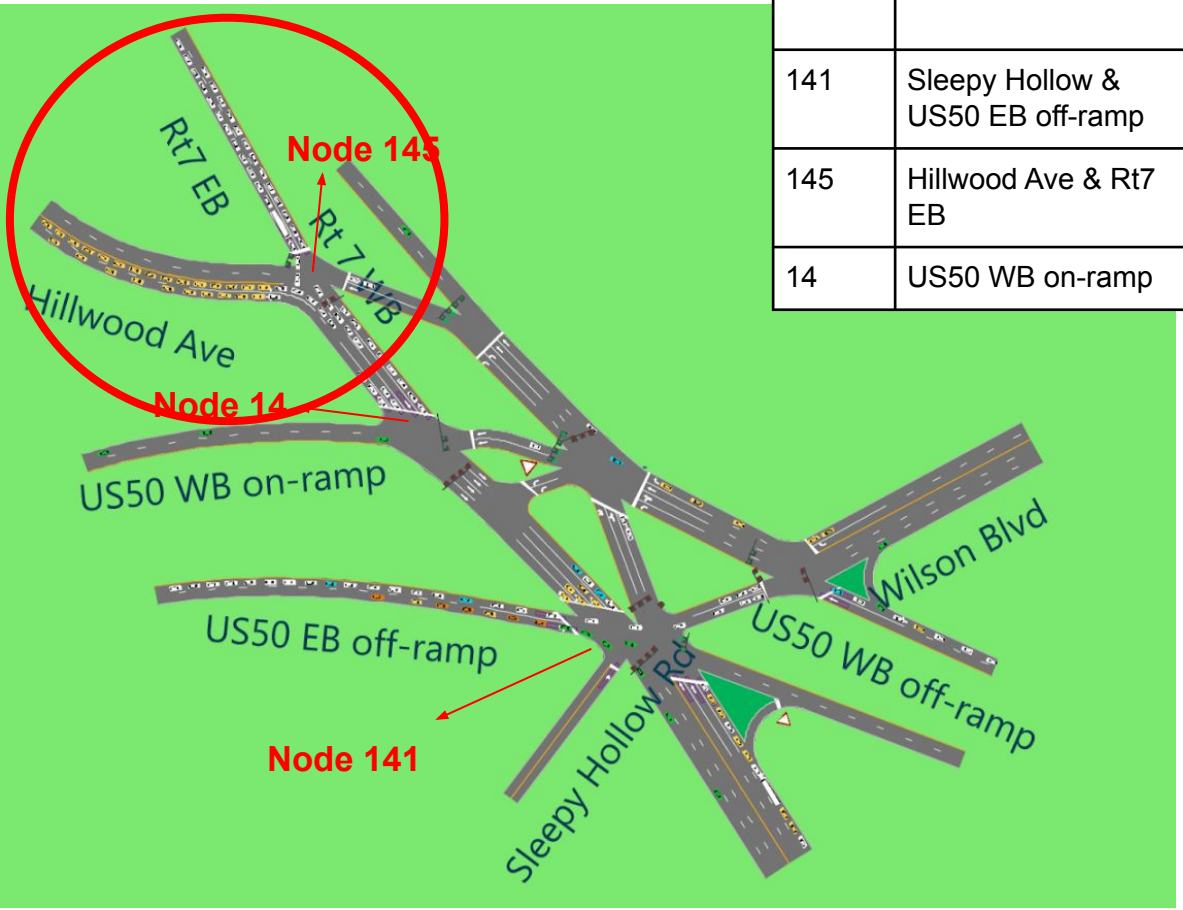


Movement	Direction	LOS	Delay (s)	95th Percentile Queue (ft)
EBT	Eastbound Through	F	129	1,114
EBR	Eastbound Right	E	55	419
NBT	Northbound Through	F	104	951
SET	Southeast Through	F	342	1,204
SER	Southeast Right	F	142	632

Cycle length: 251s | Max v/c ratio: 1.69 | LOS: F

Other Failing Intersections

Node	Location	Cycle	Intersection Delay	Intersection LOS	ICU
141	Sleepy Hollow & US50 EB off-ramp	251s	105s	F	1.65
145	Hillwood Ave & Rt7 EB	251s	59.6s	E	0.59
14	US50 WB on-ramp	251s	74.9s	E	0.47



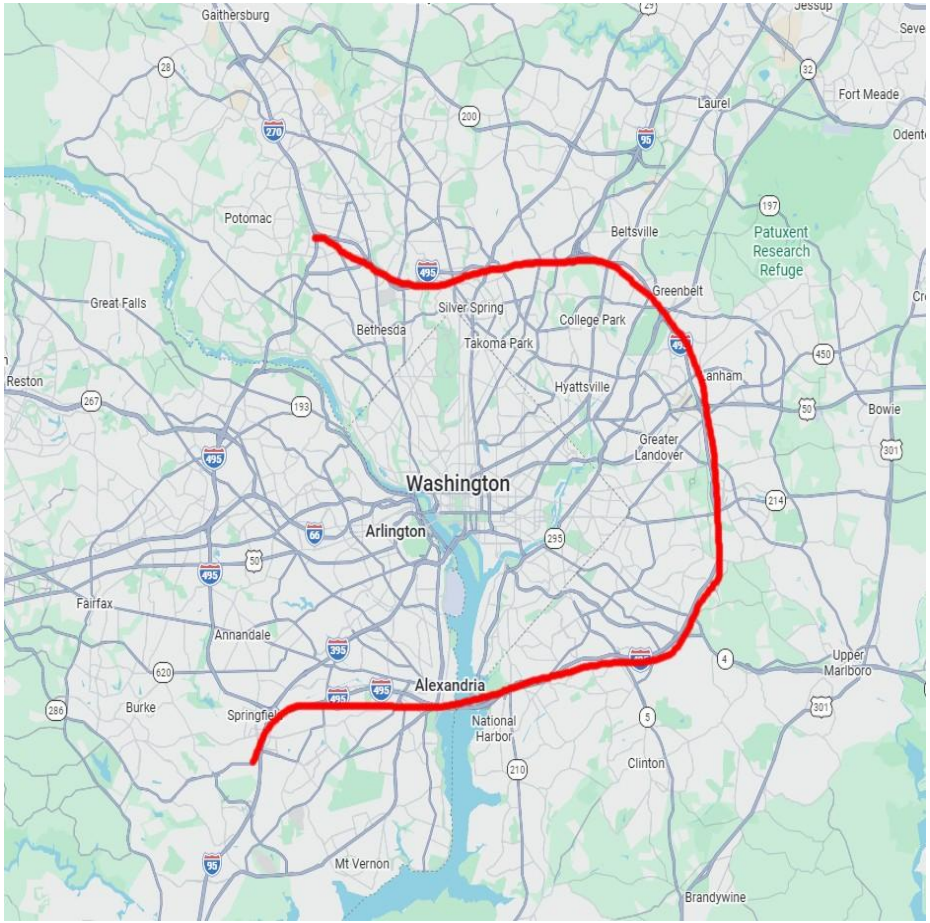
Node 141 Signal Timing Optimization Test

Cycle length: 251s to 175s

Movement	Before LOS	Before Delay (s)	After LOS	After Delay (s)
EBT	F	129	F	168
EBR	E	55	D	44
NBT	F	104	F	230
SET	F	342	F	195
SER	F	142	D	44
Max V/C		1.69		1.83

Reducing cycle length improved some movements but increased congestion on the highest-volume approaches


Central Interchange
Ring Road (East)
Ring Road (West)
Ring Road (South)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Patuxent Research Refuge
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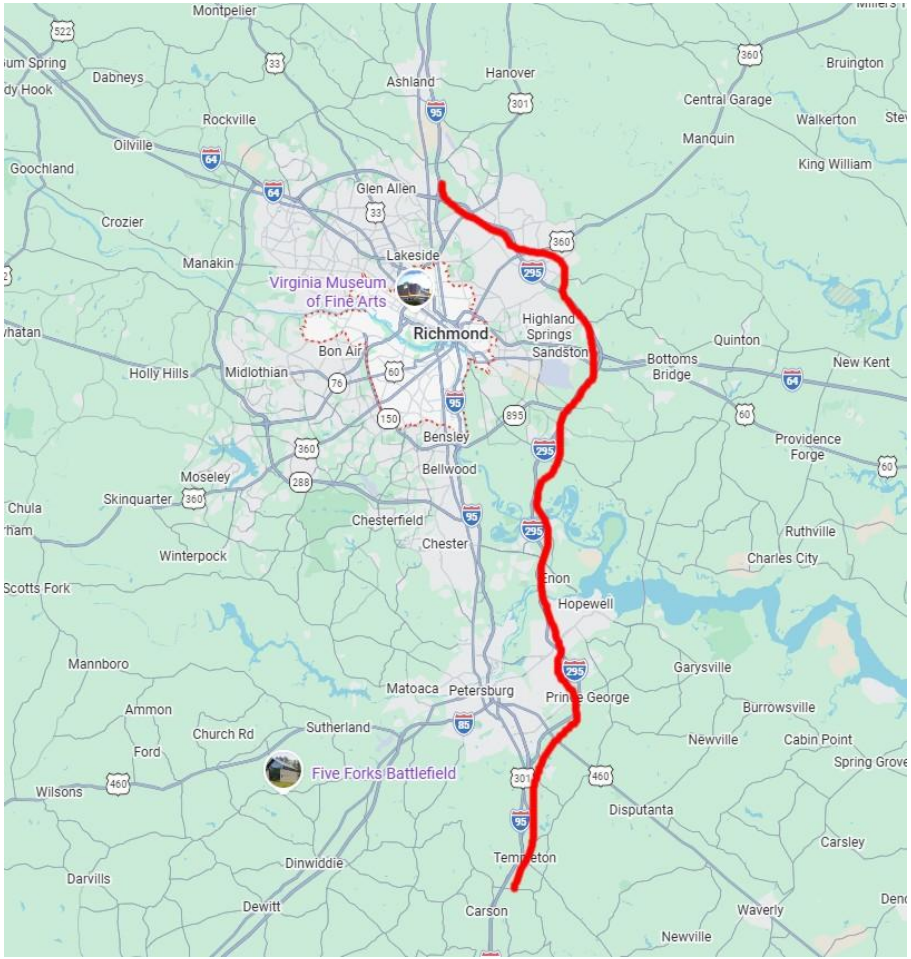
Greater Landover
Bowie
Washington
Arlington
Alexandria
Fairfax
Annandale
Springfield
Burke
National Harbor
Clinton
Upper Marlboro
Mt Vernon
Brandywine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Hopewell
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Matoaca
Petersburg
Prince George
Ammon
Church Rd
Sutherland
Ford
Five Forks Battlefield
Wilsons
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Darvills
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New Kent
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Ruthville
Charles City
Garysville
Burrowsville
Newville
Cabin Point
Spring Grove
Carsley

Works Cited

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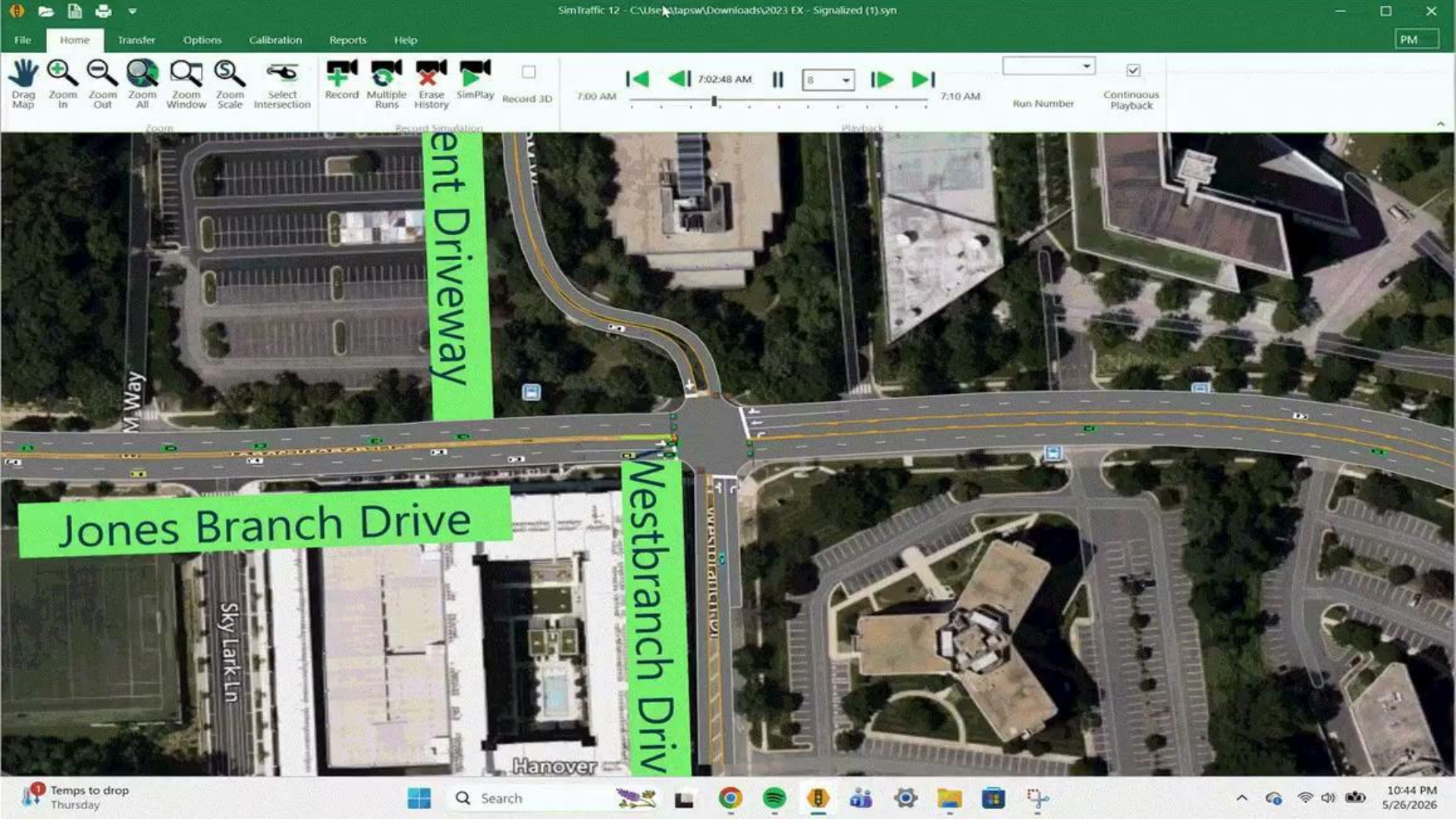
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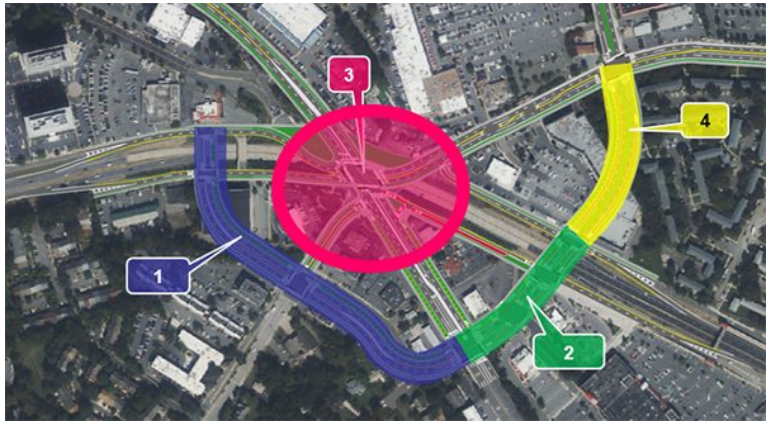
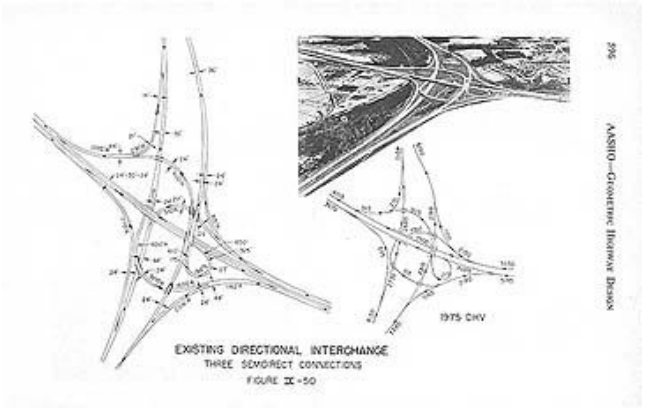


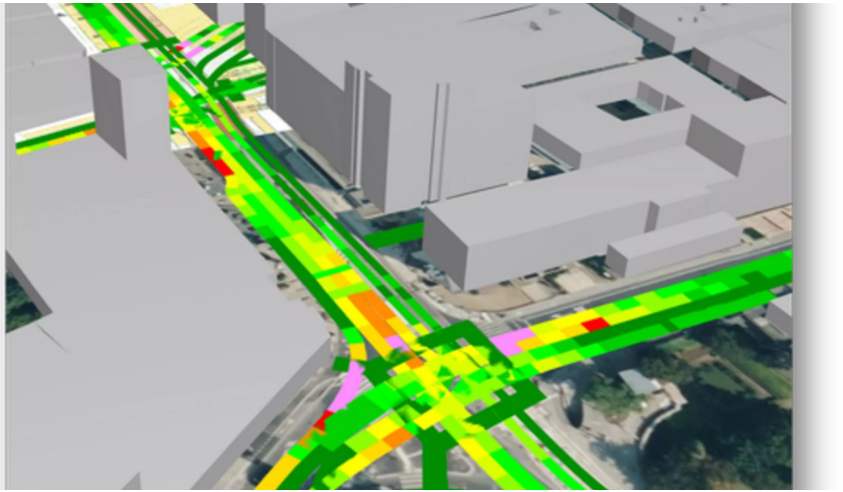


Research Gap

- Existing:
  - County's Ring Road plan
  - Other intersection plans
    - Springfield
- Missing:
  - No comparison to alternatives
- My project:
  - Independent analysis
  - Evaluations

Methodology

1. Research existing requirements & design standards
2. Analyze Fairfax County's proposal in depth
3. Learn engineering software (VISSIM, AutoCAD)
4. Create & model alternatives
5. Run traffic simulations & compare



Problems

1. Software challenges
    a. Complex tools
    b. Limited time
2. Data challenges
    a. Accessing safety data
    b. Interpreting reports

Final Product

1. Traffic software model
    a. Detailed designs of finalized intersection alternative

2. Traffic simulation analysis
    a. Qualitative comparisons
        i. Level of Service (LOS)
        ii. Queue/delay time
        iii. Safety metrics

3. Technical report