

STARS

STRATEGICALLY TARGETED AND
AFFORDABLE ROADWAY SOLUTIONS

US-11/SOUTH MAIN ST STUDY ERICKSON AVE & PEAR STREET DESIGN

***Meeting #3 – Future Analysis/Detailed Alternative Concepts
December 3rd, 2019***



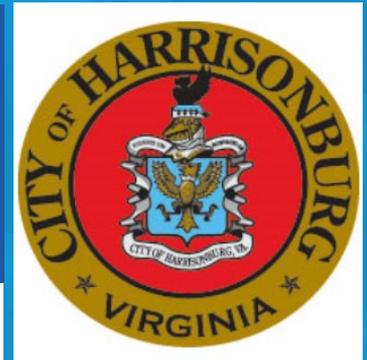
Agenda



- Study to Date Recap
- Alternative Options & Future Conditions Analysis
- Breakout Session
- Next Steps/Decision Point
- Public Involvement Planning

VDOT STARS S Main St-Erickson Ave PROJECT Points of Contact:

- STARS Program Manager – Bill Guiher
 - william.guiher@vdot.virginia.gov
- VDOT Project Manager – Brad Reed
 - brad.reed@vdot.virginia.gov
- ATCS Team Manager – Nathan Umberger
 - numberger@atcsplc.com



STUDY TO DATE RECAP

Study Intersections/Segments

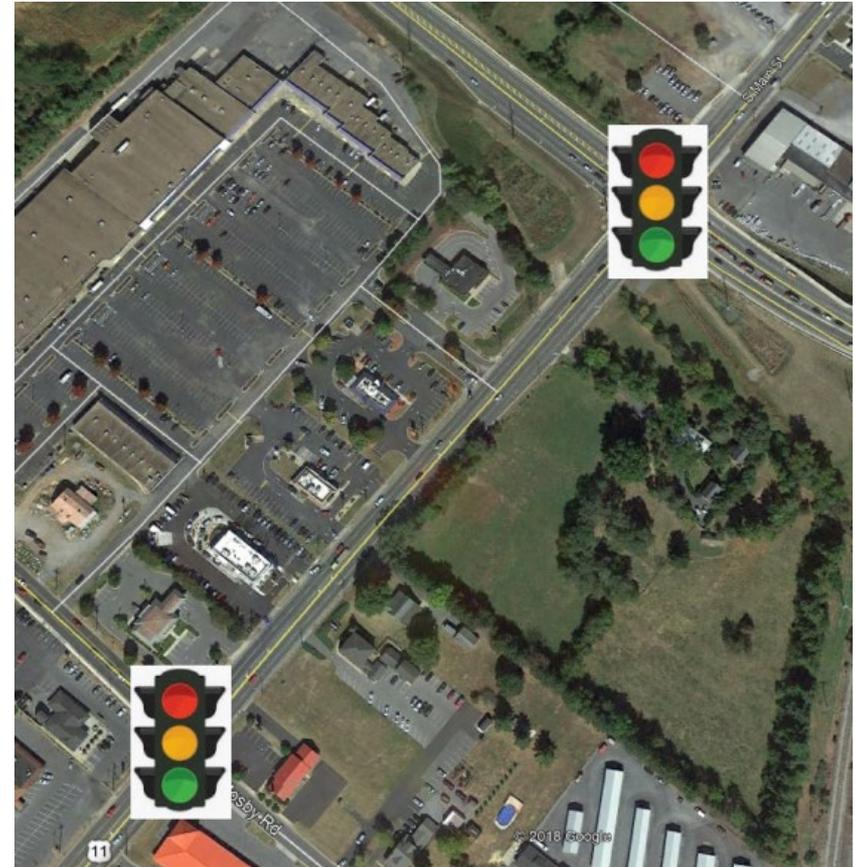


Intersections

- US-11 @ Stone Spring/Erickson
- US-11 @ Mosby Road
- Open Access Segment

Targeted Safety Needs

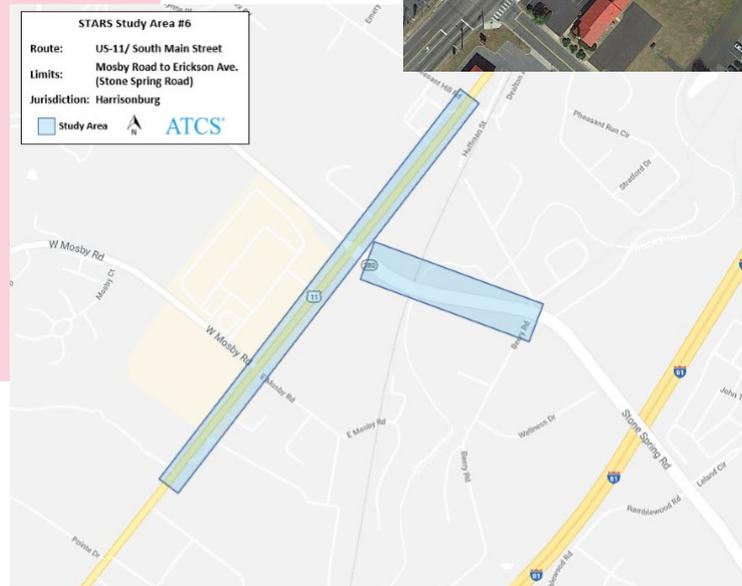
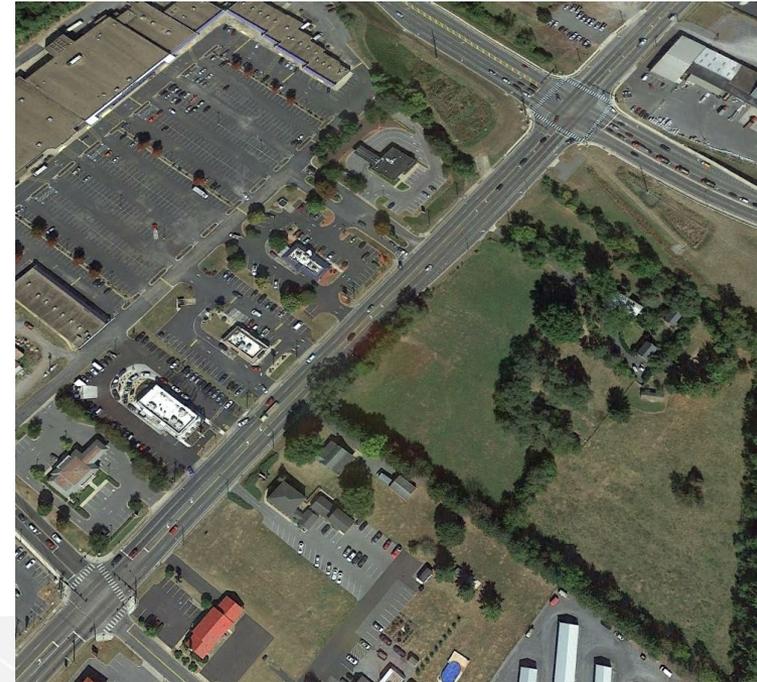
- Within #5 ranked PSI segment in VDOT Staunton District (Pleasant Hill Rd to Covenant Dr)
- S Main St/Mosby Rd #3 ranked PSI intersection



Corridor Overview

US-11/S Main Street

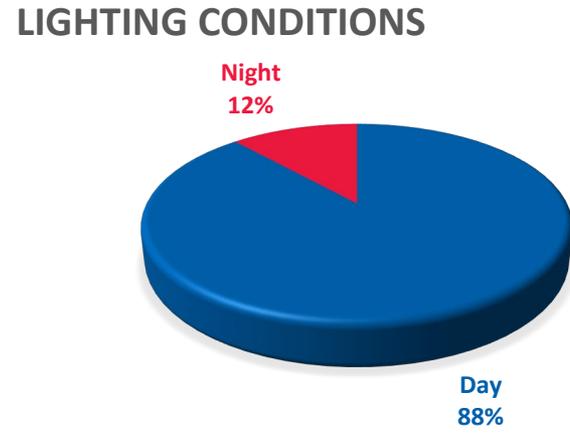
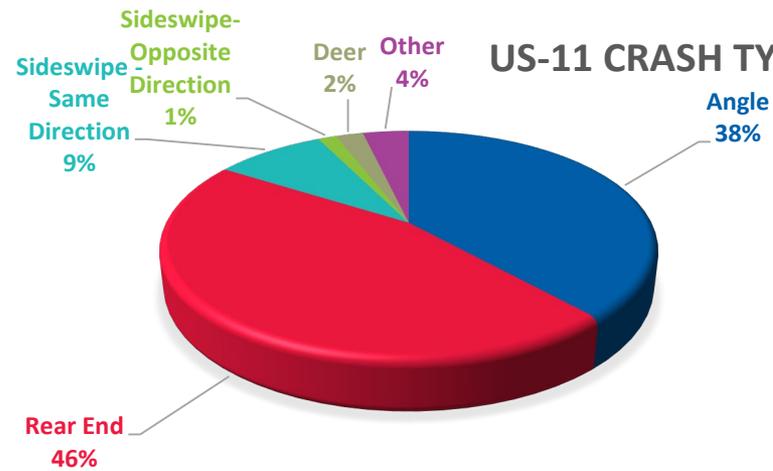
- Classified as Minor Arterial throughout study section
- Average Daily Traffic 21,000 vehicles/day South of Stone Spring, 19,000 vehicles/day North of Stone Spring
- Approximately 3-3.5% Heavy Vehicles
- Two primary signalized Intersections
- Five-lane typical section
 - Generally Open/Full Access Entrances
 - Includes Bike Lanes throughout
 - Sidewalk on W side of alignment
 - Pedestrian accommodations at signals



S Main St Crash Activity



Year of CRASH_DT (copy) +	Pedestrians Killed	Pedestrians Injured	Persons Killed	A People	B People	C People	Fatal Crashes	A Crash	B Crash	C Crash	Injury Crashes	Pdo Crash	TOTAL CRASH
2013	0.0	0.0	0	0.0	8.0	1.0	0	0.0	4.0	0.0	4.0	16.0	20
2014	0.0	0.0	0	0.0	5.0	0.0	0	0.0	2.0	0.0	2.0	22.0	24
2015	0.0	0.0	0	0.0	5.0	1.0	0	0.0	4.0	0.0	4.0	13.0	17
2016	0.0	0.0	0	0.0	3.0	1.0	0	0.0	3.0	1.0	4.0	24.0	28
2017	0.0	0.0	0	0.0	5.0	1.0	0	0.0	5.0	0.0	5.0	14.0	19
2018	0.0	0.0	0	0.0	2.0	1.0	0	0.0	2.0	1.0	3.0	19.0	22
2019	0.0	0.0	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	6.0	6
Grand Total	0.0	0.0	0	0.0	28.0	5.0	0	0.0	20.0	2.0	22.0	114.0	136



OVERALL SCHEDULE AND MAJOR MILESTONES

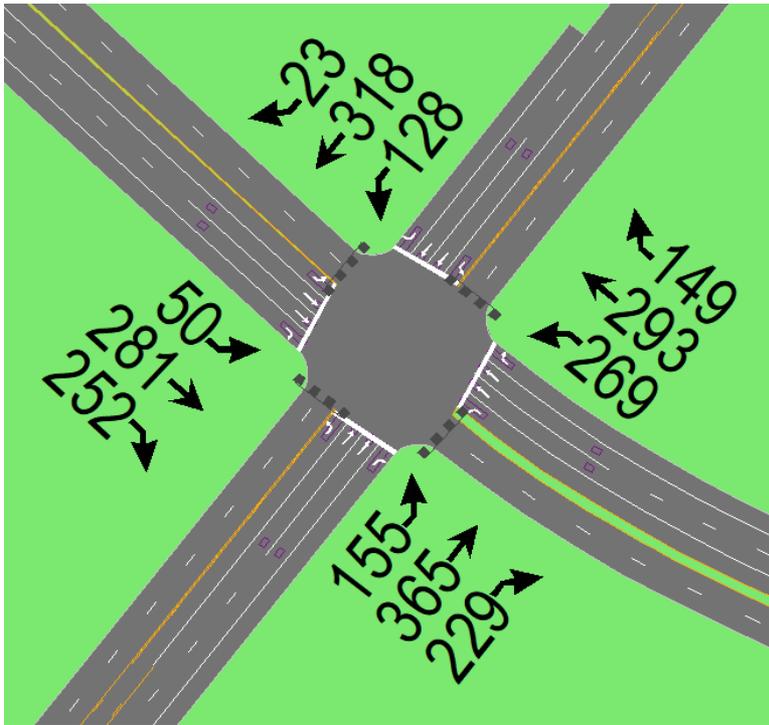
- **June** – Kick-Off Meeting
- **August/September** – Scoping, Data Collection and Existing Conditions
- **October/November** – Forecasting, No-Build Conditions, Concept Development, and Screening
- **December/January** – Cost Estimates, Schedules, Reporting
- **January/February** – Public Involvement
- **March/April** – Final Report

SMART SCALE portal opens in March

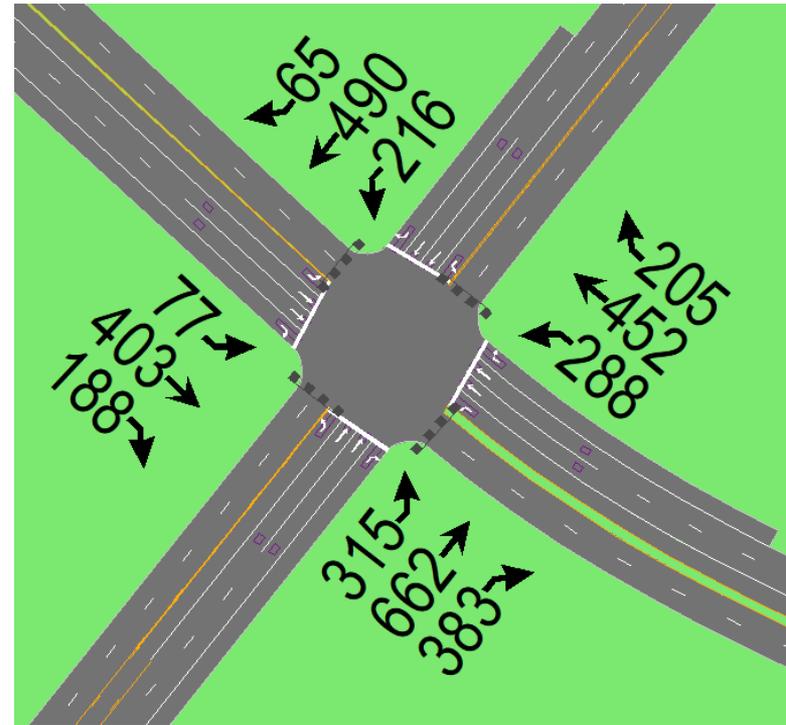
ALTERNATIVES & FUTURE CONDITIONS ANALYSIS

Traffic Impact Study Provided Results – 2028 Out Year

Existing Conditions Analysis – South Main Street and Stone Spring Road

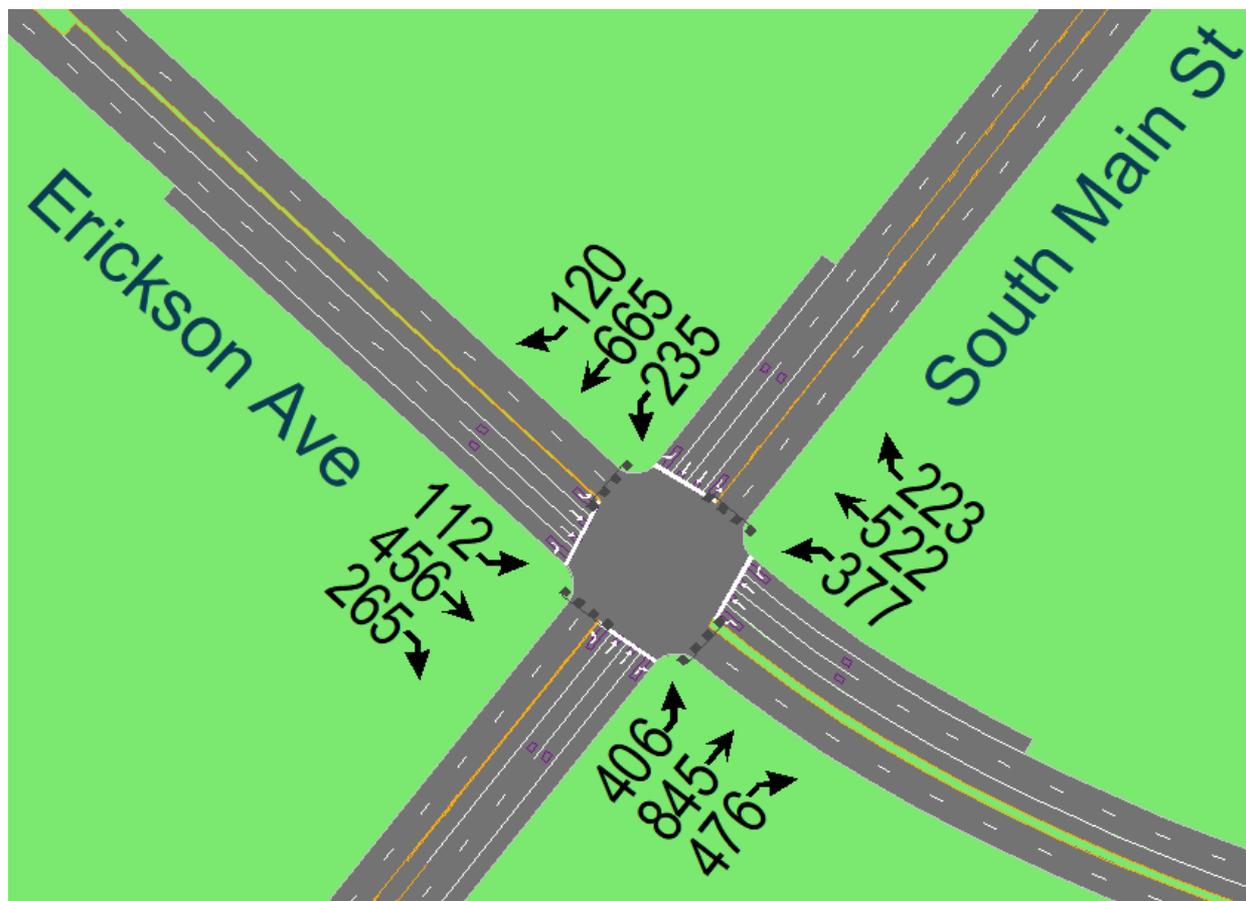


AM Peak Hour Volumes



PM Peak Hour Volumes

Future Alternatives Analysis – South Main Street and Stone Spring Road



2028 PM Peak Hour Volumes from High School TIA

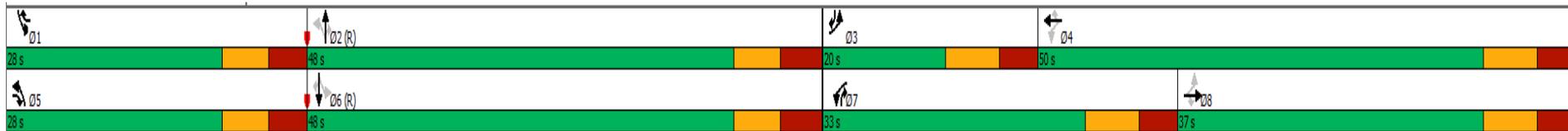
Existing Conditions Analysis – South Main Street and Stone Spring Road

- Heavy delay for the through and left turn movements.

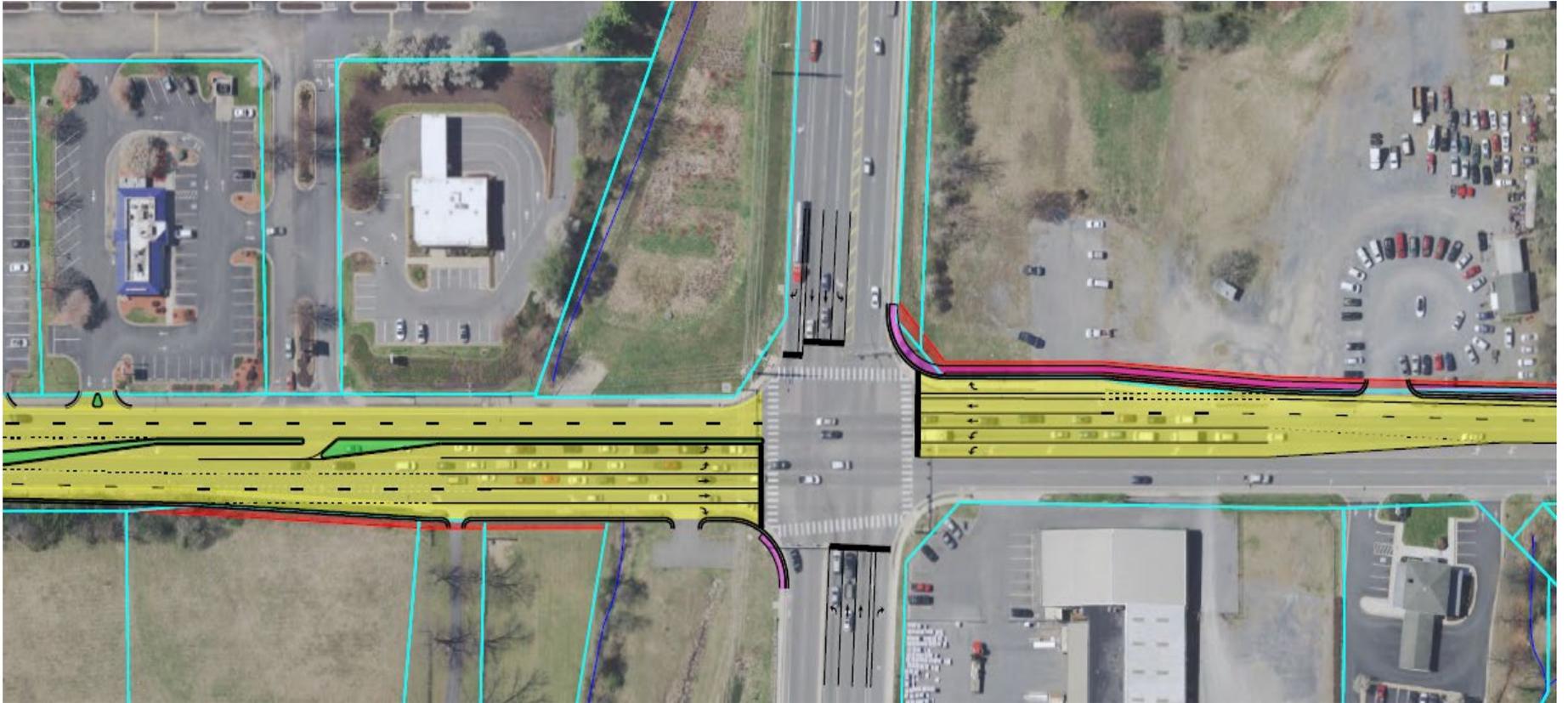
2019 Existing - LOS and Queue Summary								
Intersection	Roadway	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (Route 11) and Stone Spring Road	South Main Street	NBL	42.7	D	211	55.5	E	281
		NBT	50.7	D	242	50.5	D	315
		NBR	57.2	E	96	9.9	A	96
	South Main Street	SBL	41.9	D	113	55.4	E	287
		SBT	53.5	D	225	49.1	D	341
		SBR	34.1	C	3	32.0	C	45
	Erickson Avenue	EBL	24.3	C	50	32.7	C	81
		EBT	41.2	D	169	54.8	D	264
		EBR	32.2	C	104	34.0	C	79
	Stone Spring Road	WBL	31.1	C	234	47.6	D	296
		WBT	30.9	C	151	42.9	D	265
WBR		22.4	C	20	27.7	C	110	
Overall			40.7	D	-	43.0	D	-

Note: LOS and Delay generated using HCM 2000 methods, queues represent 95th percentile

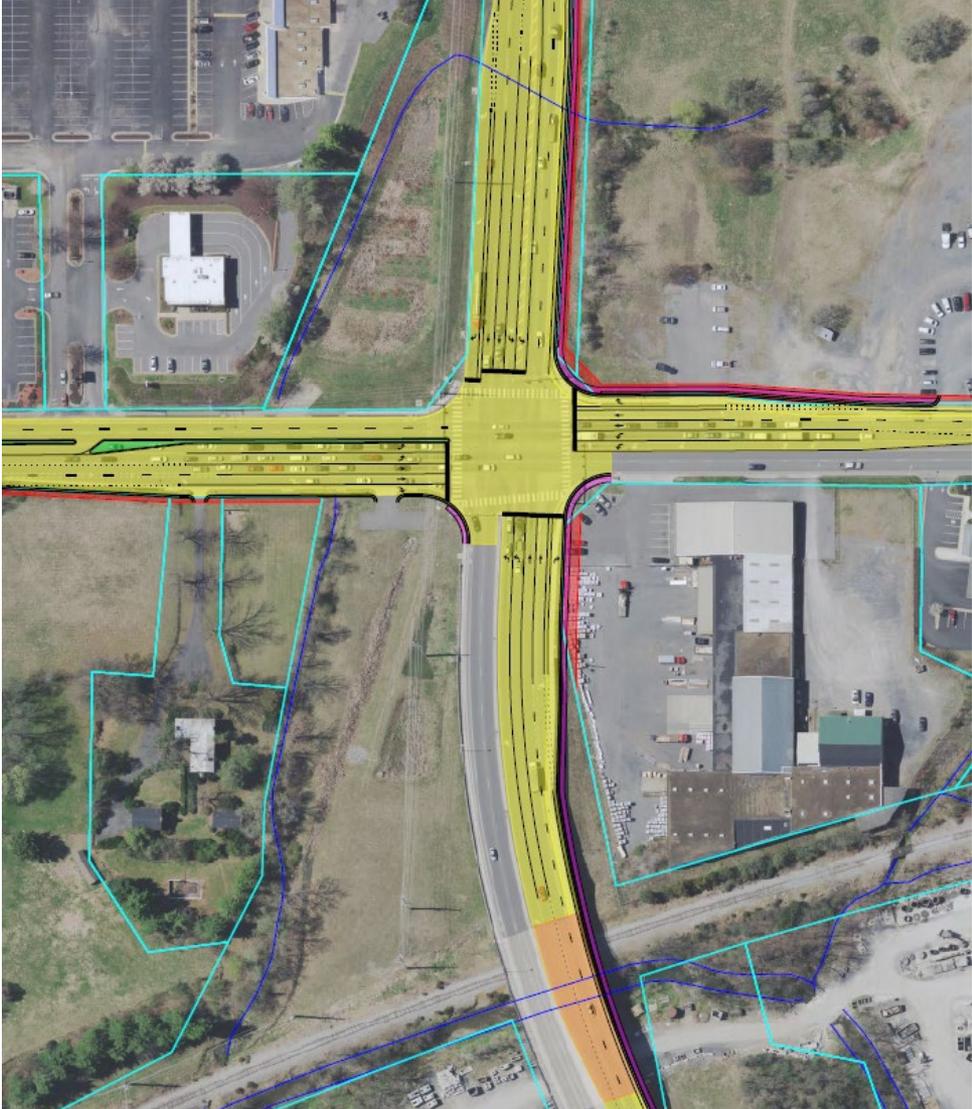
PM Timing Plan for Route 11 and Erickson/Stone Spring



ALTERNATIVE 1 – SOUTH MAIN CONVENTIONAL



ALTERNATIVE 1 – SOUTH MAIN CONVENTIONAL IN ALL DIRECTIONS



ALTERNATIVE 2A – NW QUADRANT ROADWAY



ALTERNATIVE 2B – NW QUADRANT ROADWAY



Future Alternatives Analysis – South Main Street and Stone Spring Road

PM Peak Hour Delay, LOS, and Queue Summary											
Intersection	Roadway	Lane Group	2019 Existing Configuration			2028 No-Build			2028 Alternative 1		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (US 11) and Stone Spring Road/Erickson Avenue	South Main Street	NBL	55.5	E	281	92.6	F	828	65.2	E	330
		NBT	50.5	D	315	77.3	E	644	52.0	D	570
		NBR	9.9	A	96	33.1	C	376	23.3	C	222
	South Main Street	SBL	55.4	E	287	65.7	E	441	98.9	F	219
		SBT	49.1	D	341	85.7	F	572	65.4	E	535
		SBR	32.0	C	45	50.7	D	16	42.4	D	9
	Erickson Avenue	EBL	32.7	C	81	44.2	D	141	40.7	D	136
		EBT	54.8	D	264	85.5	F	375	85.7	F	376
		EBR	34.0	C	79	39.3	D	201	50.5	D	116
	Stone Spring Road	WBL	47.6	D	296	95.7	F	638	69.1	E	592
		WBT	42.9	D	265	54.0	D	351	51.2	D	345
		WBR	27.7	C	110	36.8	D	156	36.1	D	110
Overall			43.0	D	-	69.0	E	-	55.9	E	-

*Queues are 95th Percentile

- Severe degradation in performance for No-Build by 2028.
- Alternative 1 lessens the overall delay slightly
- Reduces overall queue lengths, especially Northbound Left Turns

Future Alternatives Analysis – South Main Street and Stone Spring Road

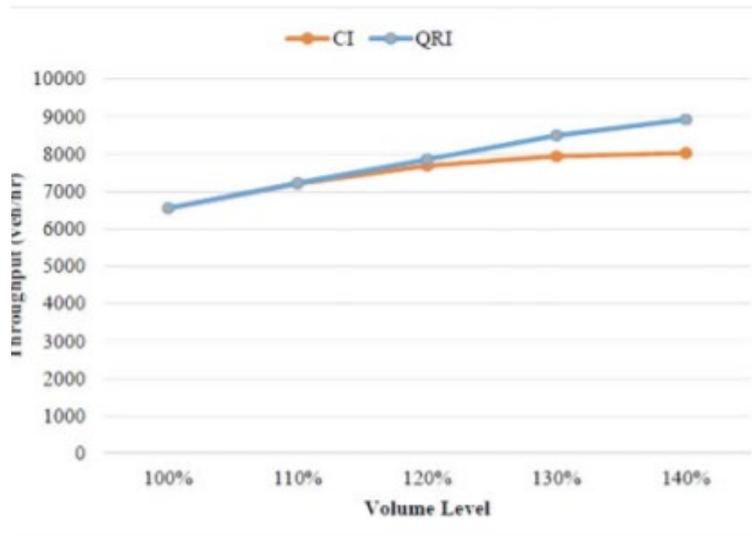
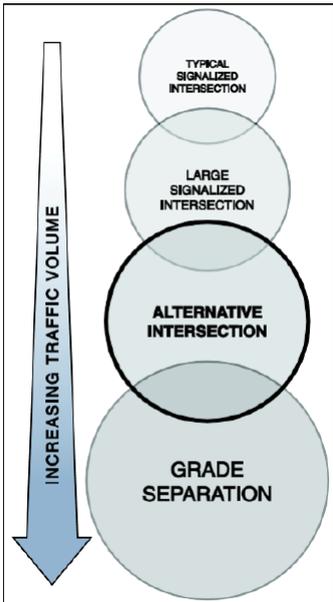
- Quadrant roadway alternatives provide for a significant decrease in overall delay metrics.

PM Peak Hour Delay, LOS, and Queue Summary											
Intersection	Roadway	Lane Group	2028 No-Build			2028 Alternative 2A			2028 Alternative 2B		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (US 11) and Stone Spring Road/Erickson Avenue	South Main Street	NBL	92.6	F	828	N/A			N/A		
		NBT	77.3	E	644	10.3	B	254	5.6	A	158
		NBR	33.1	C	376	8.0	A	158	5.5	A	153
	South Main Street	SBL	65.7	E	441	N/A			N/A		
		SBT	85.7	F	572	11.4	B	363	5.0	A	203
		SBR	50.7	D	16	5.9	A	45	2.6	A	30
	Erickson Avenue	EBL	44.2	D	141	N/A			N/A		
		EBT	85.5	F	375	42.3	D	364	55.7	E	394
		EBR	39.3	D	201	35.0	D	154	43.0	D	241
	Stone Spring Road	WBL	95.7	F	638	N/A			N/A		
		WBT	54.0	D	351	65.6	E	638	66.6	E	435
		WBR	36.8	D	156	51.5	D	277	61.6	E	300
Overall			69.0	E	-	27.8	C	-	27.9	C	-
South Main Street (US 11) and Quadrant Roadway	South Main Street	NBL	N/A			20.6	C	366	18.0	B	316
		NBT				0.8	A	24	1.1	A	42
	South Main Street	SBT				38.2	D	495	38.2	D	495
		SBR				20.8	C	40	20.8	C	40
	Quadrant Roadway	EBL				70.6	E	181	77.0	E	176
		EBR				28.8	C	205	36.3	D	250
	Overall					21.1	C	-	22.0	C	-
Erickson Avenue and Quadrant Roadway	Erickson Avenue	EBL	14.2	B	71	14.2	B	71			
		EBT	7.8	A	219	7.8	A	210			
	Erickson Avenue	WBT	13.1	B	497	11.9	B	508			
		WBR	0.1	A	0	60.1	E	130			
	Quadrant Roadway	SBL	70.2	E	318	71.9	E	319			
		SBR	24.0	C	247	25.5	C	254			
	Overall			16.8	B	-	26.0	C	-		

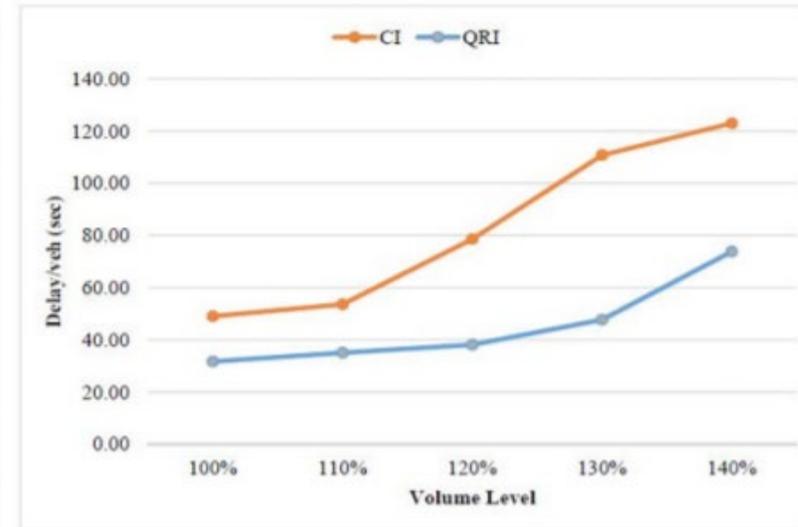
*Queues are 95th Percentile



QUADRANT ROADWAY – CASE STUDY/RESEARCH



(a) Volume Level versus Hourly Throughput



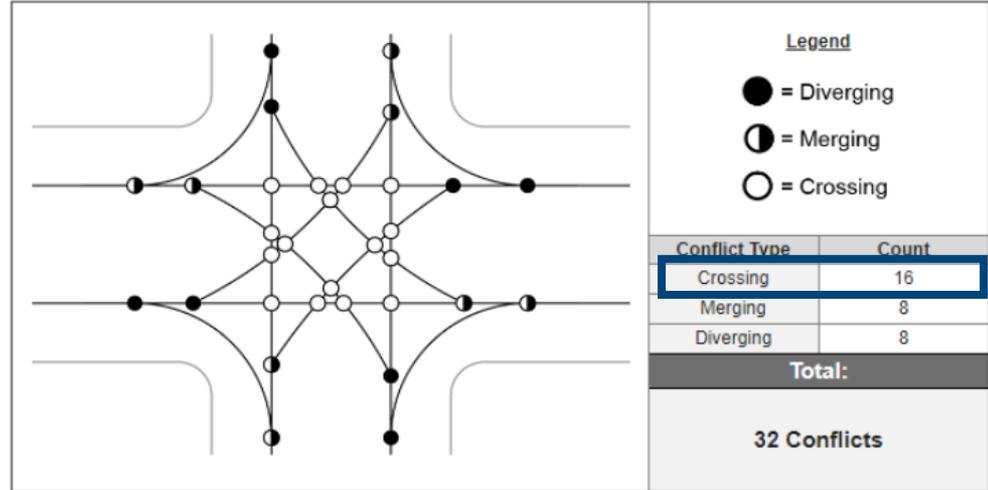
(b) Volume Level versus Delay

- 12% Increase in Throughput, 48% improvement in travel speed, 66% reduction in delay as volumes increase

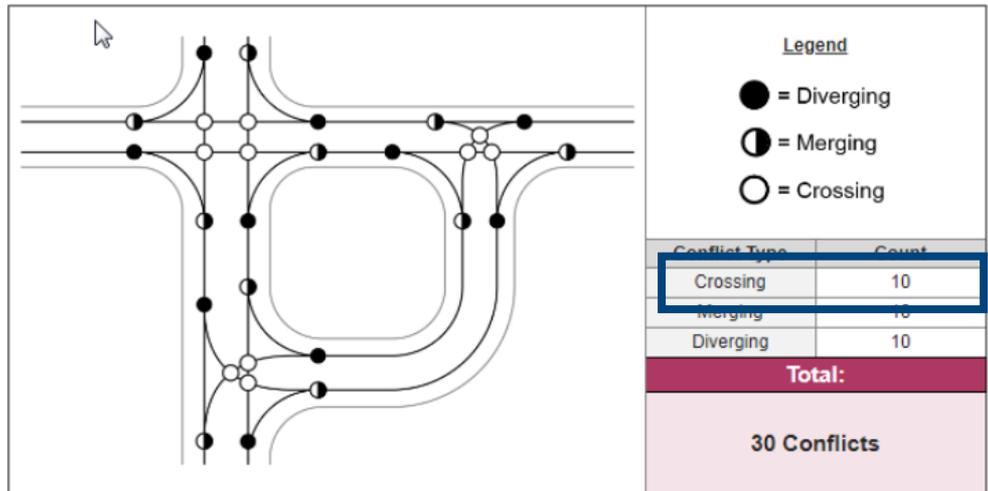
QUADRANT ROADWAY – SAFETY BENEFIT

- **Quadrant Roadway Design reduces total number of Conflict Points by 2 and Crossing Conflicts by 6**

Conventional Intersection: Conflict Points



QR: Conflict Points



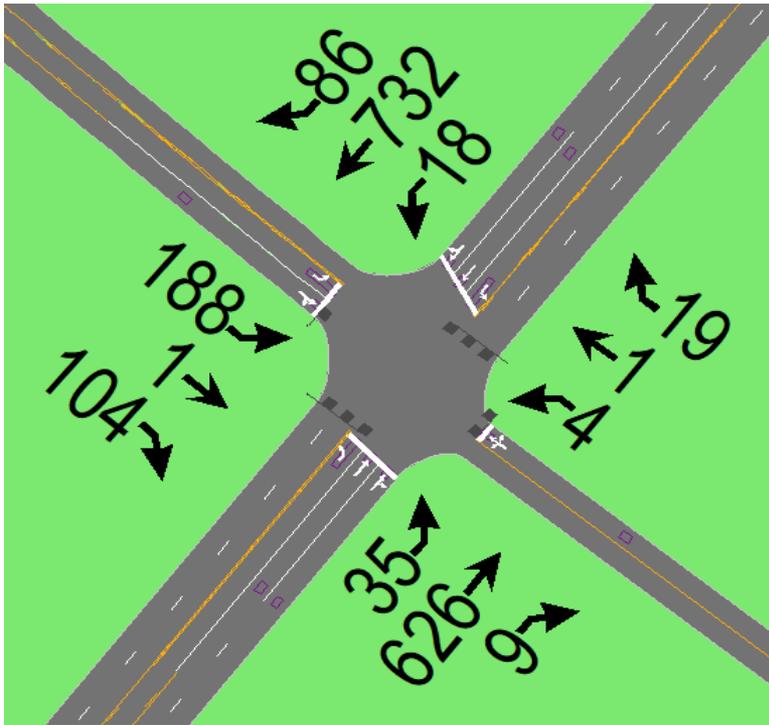
Future Alternatives Analysis – South Main Street and Stone Spring Road

- **Alternative 1 provides for the shortest overall travel time through the existing and proposed intersections in 2028.**
- **Alternative 1 performance is expected to degrade significantly by 2040, well below the performance of the quadrant roadway alternatives. (Modeled assuming a 1% growth from 2028-2040)**
- **Alternative 2A & 2B needs additional modeling within new signal parameters**

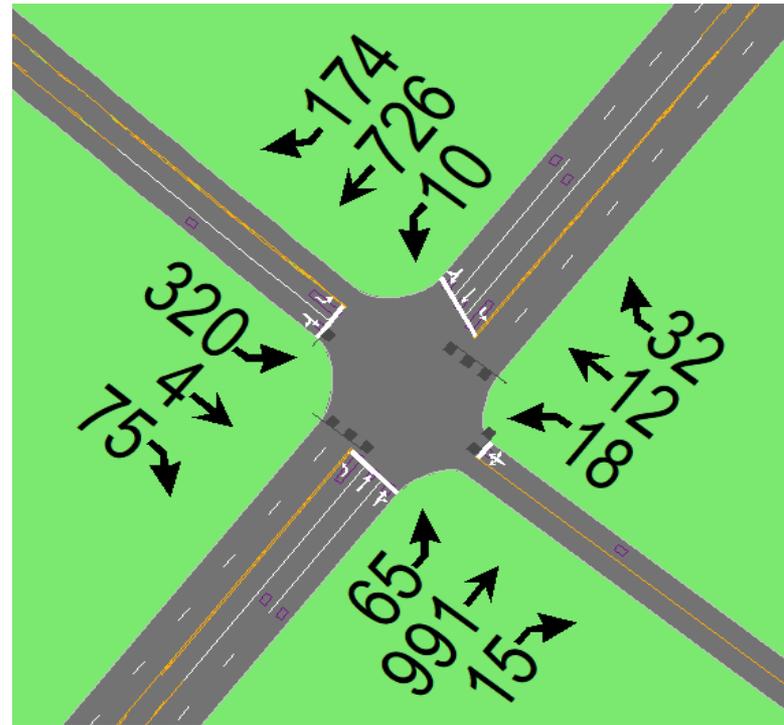
Network Measures of Effectiveness	2028 No-Build	2028 Alternative 1	2028 Alternative 2A	2028 Alternative 2B
Overall Network Delay (Hours)	150	68	67	68
Total Travel Time (Hours)	240	94	107	108

Network Measures of Effectiveness	2040 Alternative 1	2040 Alternative 2A	2040 Alternative 2B
Overall Network Delay (Hours)	199	83	118
Total Travel Time (Hours)	300	128	186

Existing Conditions Analysis – South Main Street and Mosby Road

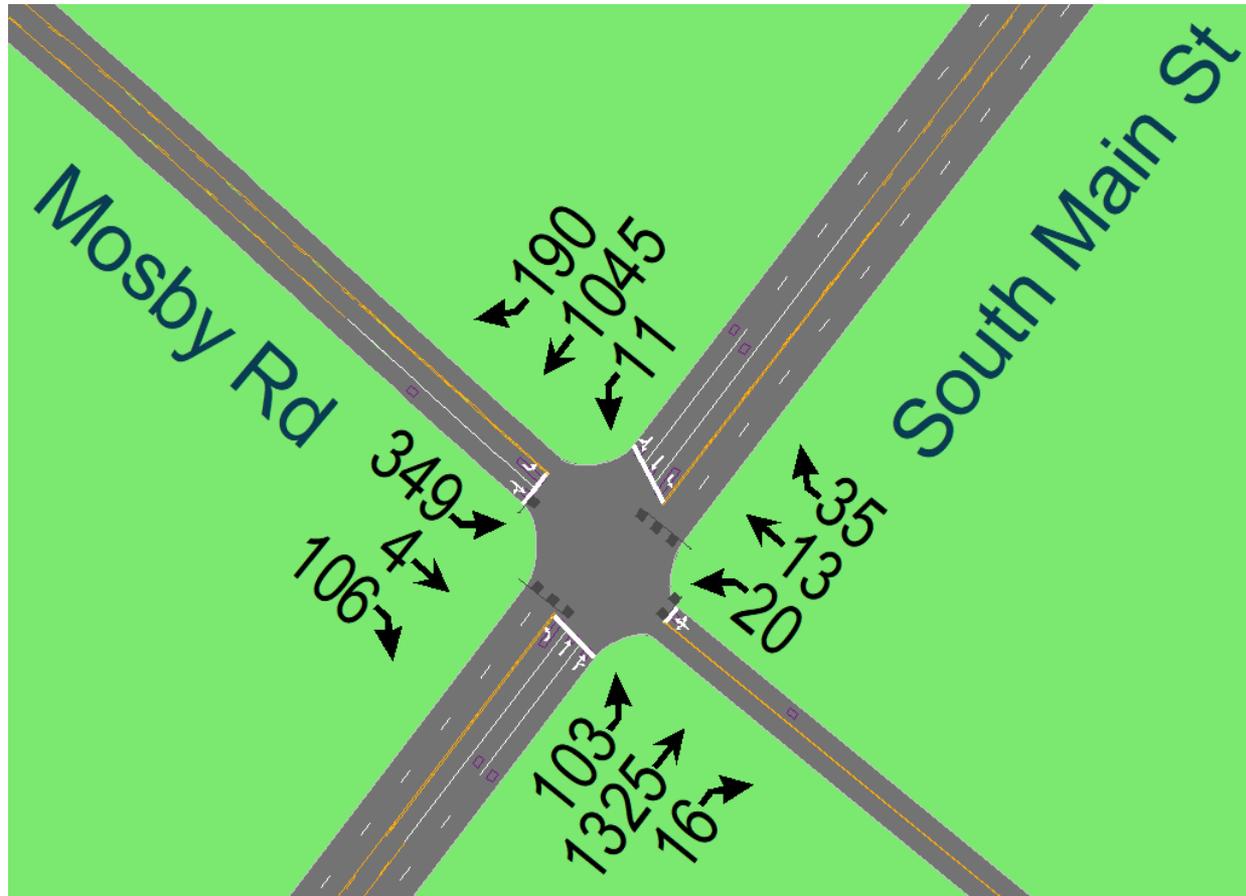


AM Peak Hour Volumes



PM Peak Hour Volumes

Future Alternatives Analysis – South Main Street and Mosby Road



2028 PM Peak Hour Volumes

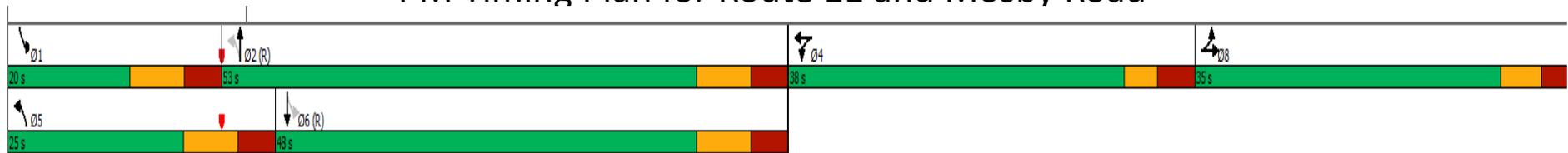
Existing Conditions Analysis – South Main Street and Mosby Road

- Heavy eastbound volume with only a single lane for left turning vehicles.
- Significant delays for all approaches.

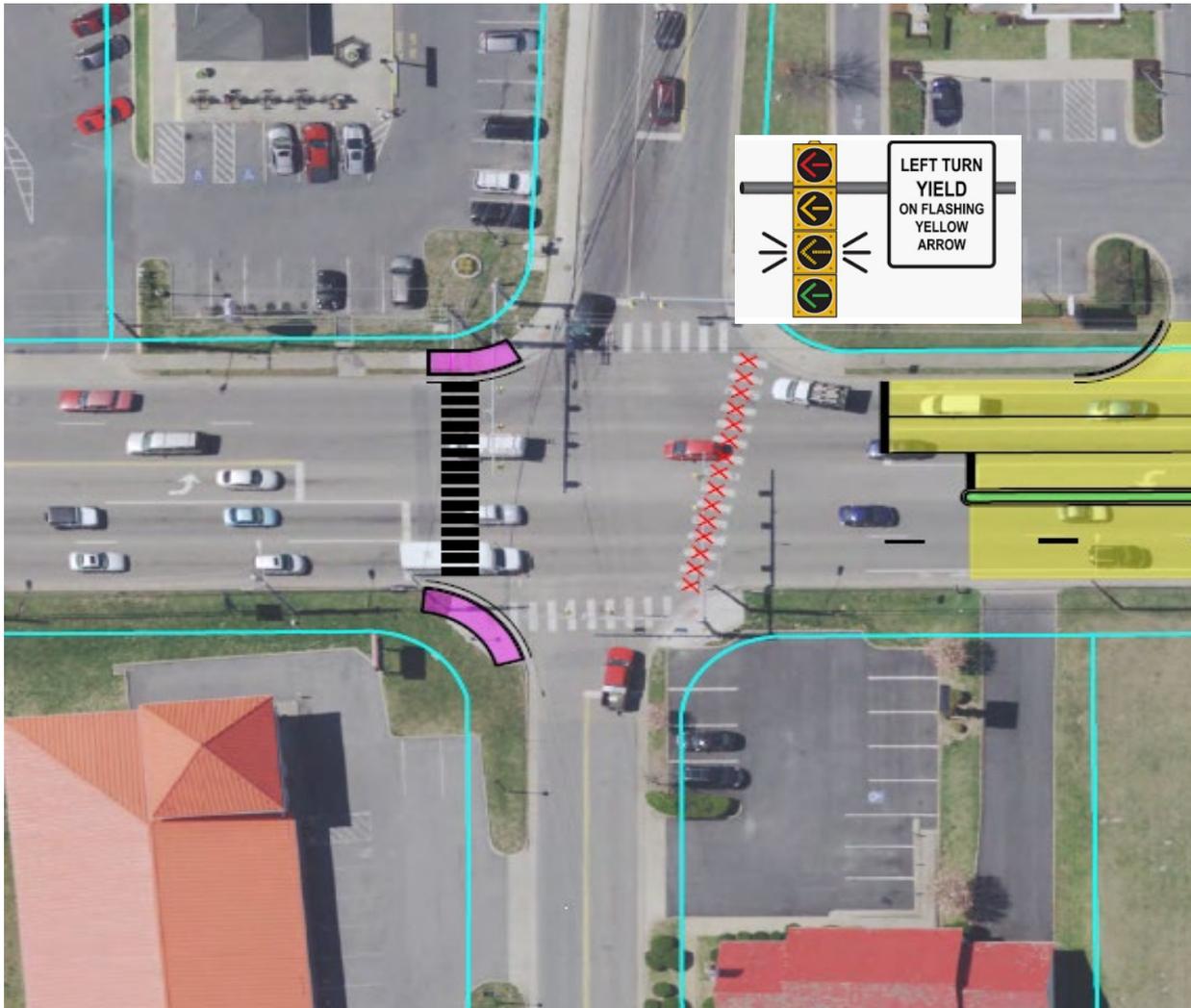
2019 Existing - LOS and Queue Summary								
Intersection	Roadway	Lane Group	AM Peak Hour			PM Peak Hour		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (Route 11) and Mosby Road	South Main Street	NBL	16.7	B	23	33.1	C	70
		NBTR	24.1	C	257	73.3	E	682
	South Main Street	SBL	8.6	A	6	33.3	C	12
		SBTR	30.6	C	421	39.6	D	593
	Mosby Road	EBL	33.6	C	212	55.6	E	541
		EBTR	24.8	C	0	38.9	D	0
	Mosby Road	WBLTR	33.8	C	1	63.6	E	63
	Overall			27.7	C	-	57.0	E

Note: LOS and Delay generated using HCM 2000 methods, queues represent 95th percentile

PM Timing Plan for Route 11 and Mosby Road



ALTERNATIVE – MOSBY RE-PHASING (ALT 3)



ALTERNATIVE – MOSBY WIDENING (ALT 4)



Future Alternatives Analysis – South Main Street and Mosby Road

- Possibility to reduce the overall delay at the intersection in the current year within the existing configuration by switching the side street phasing from split to concurrent.

PM Peak Hour Delay, LOS, and Queue Summary								
Intersection	Roadway	Lane Group	2019 Existing Configuration			2019 Alternative 3		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (US 11) and Mosby Road	South Main Street	NBL	33.1	C	70	21.0	C	55
		NBTR	73.3	E	682	34.2	C	522
	South Main Street	SBL	33.3	C	12	19.5	B	10
		SBTR	39.6	D	593	22.9	C	295
	Mosby Road	EBL	55.6	E	541	75.1	E	424
		EBTR	38.9	D	0	35.2	D	0
	Mosby Road	WBLTR	63.6	E	63	36.4	D	48
	Overall			57.0	E	-	35.1	D

*Queues are 95th Percentile

Future Alternatives Analysis – South Main Street and Mosby Road

- Alternative 4 will likely provide for less overall delay than Alternative 3 in 2028.
- Alternative 4 shows a significant 95th percentile queue for the southbound through traffic in 2028 that may block the left turn into the shopping center; 50th percentile queue is only projected at 178 feet.

PM Peak Hour Delay, LOS, and Queue Summary											
Intersection	Roadway	Lane Group	2028 No-Build			2028 Alternative 3			2028 Alternative 4		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
South Main Street (US 11) and Mosby Road	South Main Street	NBL	85.7	F	226	36.9	D	119	24.9	C	97
		NBTR	49.9	D	984	34.1	C	898	25.6	C	907
	South Main Street	SBL	20.1	C	4	51.1	D	9	21.4	C	5
		SBTR	47.2	D	863	32.2	C	456	16.0	B	815
	Mosby Road	EBL	73.7	E	797	92.5	F	618	91.1	F	304
		EBTR	52.7	D	68	47.8	D	54	72.8	E	72
	Mosby Road	WBLTR	86.2	F	111	48.6	D	83	86.2	F	111
	Overall			53.3	D	-	40.6	D	-	31.8	C

*Queues are 95th Percentile

Future Alternatives Analysis – US 11 Corridor

- **The two quadrant roadways provide for a significantly increased speed and reduced travel time on the northbound approach to Stone Spring Road/Erickson Avenue on US 11.**
- **Alternative 4 provides for increased speed and reduced travel time on US 11 on the southbound approach to Mosby Road.**

2028 Space Mean Speed and Travel Time on US 11 within the Study Area				
Alternative	NB Speed (MPH)	SB Speed (MPH)	NB TT (Seconds)	SB TT (Seconds)
No-Build	10	15	84.3	56.2
Alternative 1	14		60.2	
Alternative 2A	28		30.1	
Alternative 2B	33		25.6	
Alternative 3		16		52.7
Alternative 4		23		36.7

Study Area Crash Analysis



<i>Corridor Study Area</i>				
	Total	B	C	PDO
Angle	46	11	2	33
Rear End	56	5	0	51
Sideswipe	13	0	0	13
Other	6	1	0	5
<u>TOTAL</u>	<u>121</u>	<u>17</u>	<u>2</u>	<u>102</u>

2014-2018 – 5 Year Analysis

- Access Management for full corridor would provide 60% reduction across crash types
- Reducing Crashes by 14-16/year and injuries from 4/year to less than 2/year
- Of the injury crashes, 4 occurred South of Mosby and 2 occurred North of Stone Spring
- SMART Scale benefit may be reduced depending on exact limits of median and analysis zones
- ****15 Crashes through July 2019, 1 B Injury Crash**

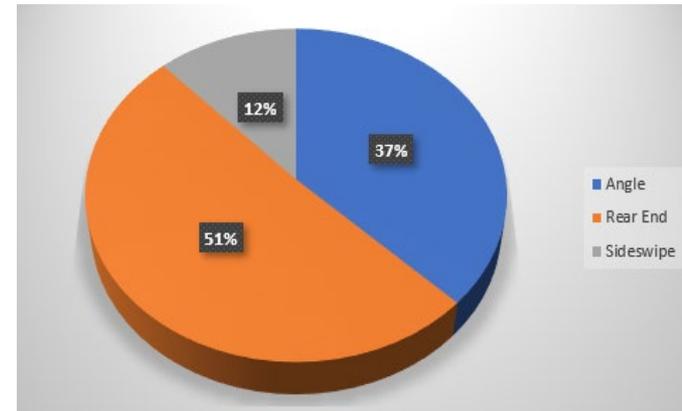
KEY SMART SCALE CMFs FOR SAFETY SCORING

Project Extent	Improvement Type/Features	F+I CMF
Intersections		
	Turn Lane(s)	
	<i>New Turn Lane (none present)</i>	0.85
	<i>Add Turn Lane (to existing)</i>	0.97
	<i>Extend Turn Lane</i>	0.97
	Access Management - Close median opening (allow right-in right-out only)	0.40
	Improve skew angle	
	<i>3 Leg Intersection</i>	0.70
	<i>4 Leg Intersection</i>	0.60
	Increase intersection radii	0.95

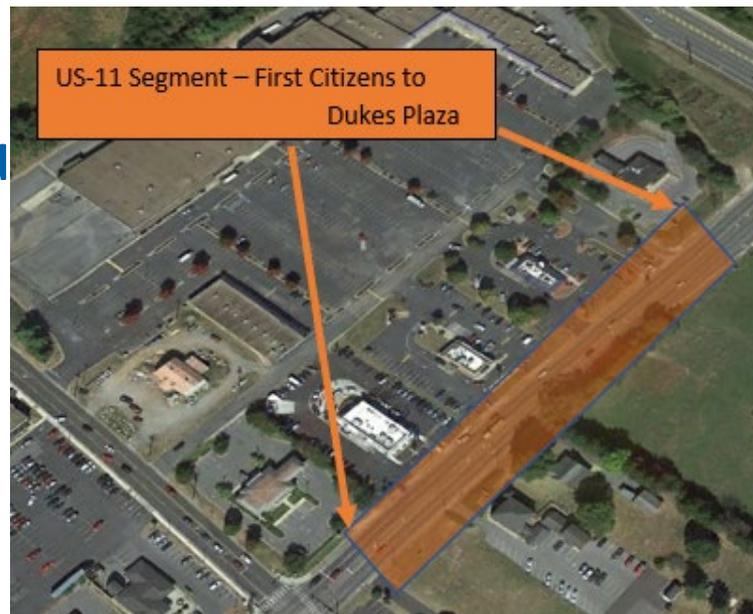
South Main Street Commercial Access Segment

January 2013 – May 2019

Commerical Access Segment - First Citizens to Dukes Plaza				
	Total	B	C	PDO
Angle	22	4	0	18
Rear End	30	2	0	28
Sideswipe	7	2	0	5

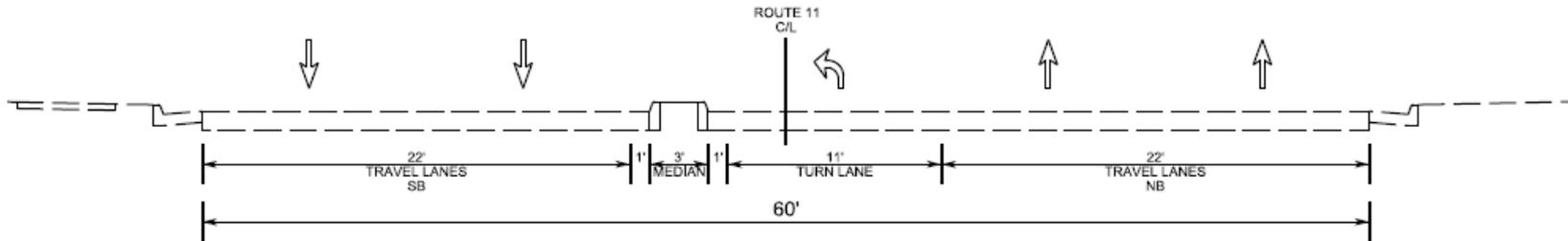


- 22 Crashes specifically mention ingress/egress from Commercial Accesses
- 6 Crashes specifically from conflicts in Two-Way Left Turn Lane
- 6 Crashes specifically from Southbound stopped vehicles at Mosby
- Majority of others due to Northbound congestion at Stone Spring

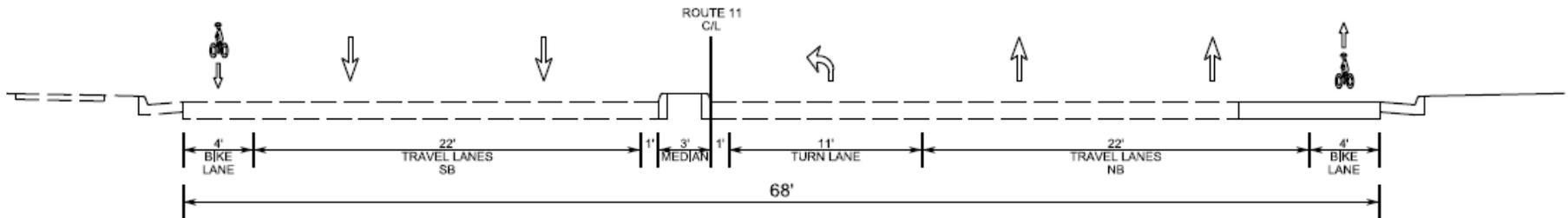


ALTERNATIVE – ACCESS MANAGEMENT SEGMENT

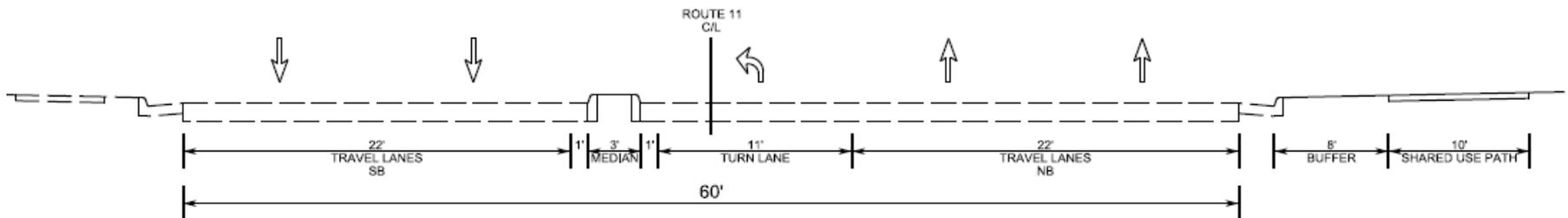
PROPOSED ACCESS MANAGEMENT WITH NO BIKE LANES



PROPOSED ACCESS MANAGEMENT WITH BIKE LANES



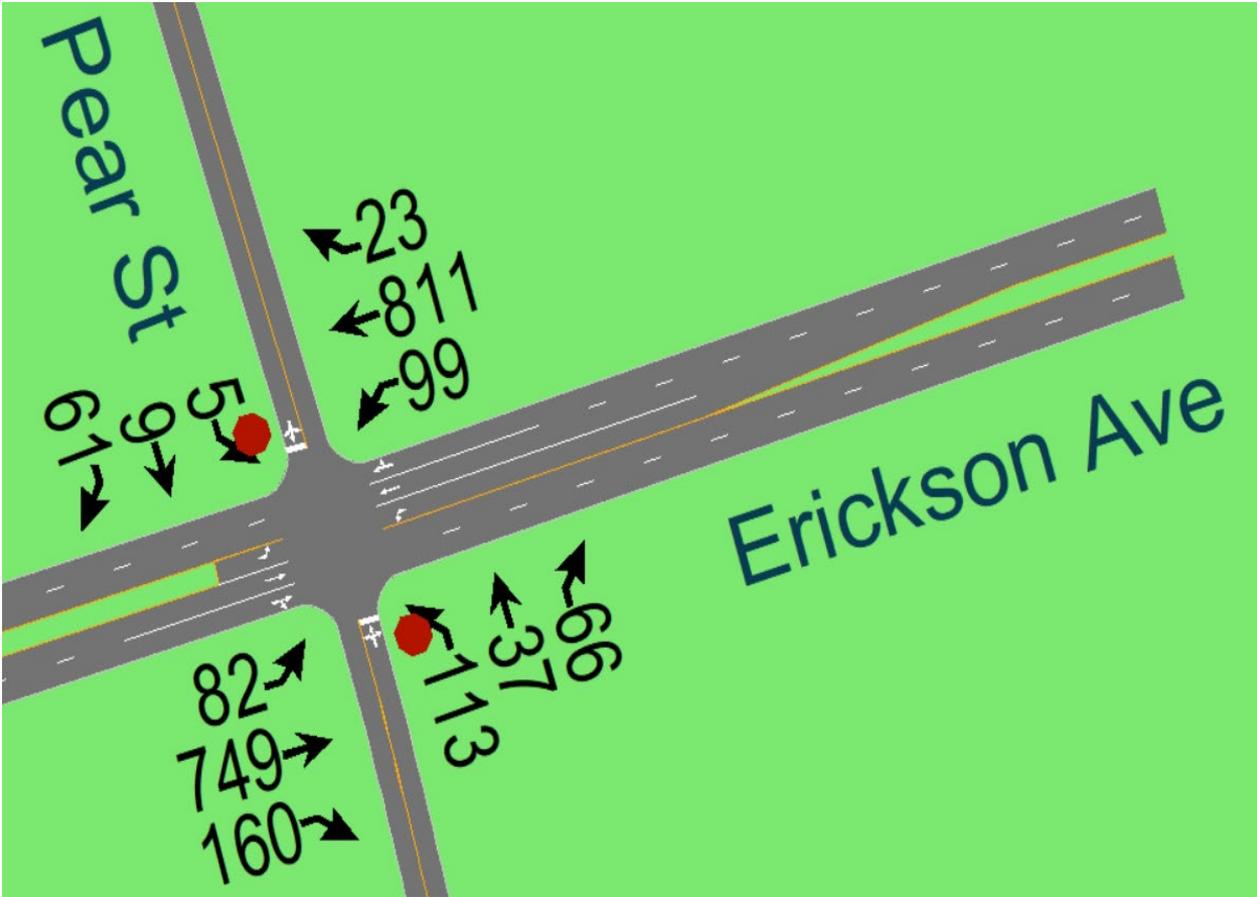
PROPOSED ACCESS MANAGEMENT WITH NO BIKE LANES



Erickson Avenue @ Pear Street

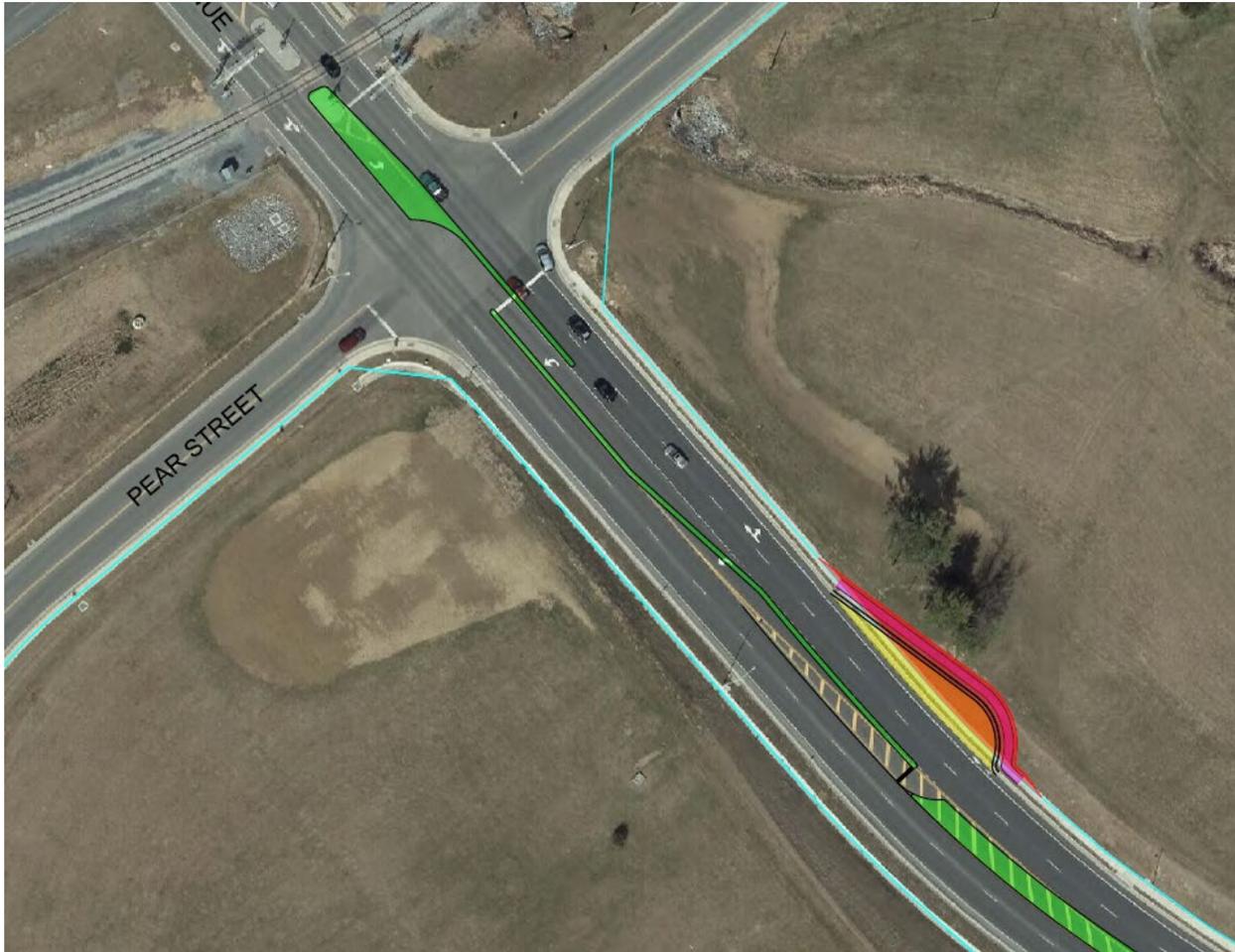


Future Alternatives Analysis – Erickson Avenue and Pear Street



2028 PM Peak Hour Volumes

Future Alternatives – Erickson Avenue and Pear Street



Future Alternatives Analysis – Erickson Avenue and Pear Street

- Pear Street approaches will degrade to undefinable levels in No-Build scenario.
- Signal-controlled intersection will improve side street approaches, but they will still not operate well overall and the mainline will see a reduction in performance.
- Signalized R-CUT alternative provides for the best overall performance.

PM Peak Hour Delay, LOS, and Queue Summary														
Intersection	Roadway	Lane Group	2017 Existing Configuration			2027 No-Build			2027 Build - Signal			2027 Build - RCUT		
			Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)	Delay (Sec/Veh.)	LOS	Queue Length (Feet)
Erickson Avenue and Pear Street	Erickson Avenue	EBL	9.9	A	8	10.4	B	10	21.2	C	55	N/A		
		EBTR	0.0	A	0	0.0	A	0	29.6	C	312	0.0	A	0
	Erickson Avenue	WBL	9.1	A	1	10.4	B	12	16.5	B	66	11.1	B	14
		WBTR	0.0	A	0	0.0	A	0	25.3	C	374	0.0	A	0
	Pear Street	NBLTR	264.7	F	207	300+	F	Undefined	72.5	E	297	13.3	B	40
	Pear Street	SBLTR	27.0	D	34	300+	F	Undefined	55.6	E	60	10.4	B	9
Overall			17.6	C	-	Undefined	F	-	32.2	C	-	1.9	B	-
Erickson Avenue R-Cut	Erickson Avenue	EBU	N/A			N/A			N/A			16.2	B	125
		EBT	N/A			N/A			N/A			0.0	A	0
	Erickson Ave.	WBT	N/A			N/A			N/A			6.1	A	156
	Overall			N/A			N/A			N/A			4.8	A

*Queues are 95th Percentile

DIALOGUE ON STUDY – KEY DECISION POINTS

- **Quadrant vs. Conventional?**
- **Design of Access Management?**
 - Limits of Median
 - Bike Lane Inclusion or Omission
- **Inclusion of Mosby?**
- **Public Involvement Planning**

BREAKOUT SESSION — REVIEW ALTERNATIVES

NEXT STEPS

- **Detailed Cost Estimating/Further Design Refinement based on Study Team Decision Points**
- **Public Involvement**
- **Final Meeting & Report**
- **SMART SCALE Opening**

STARS

STRATEGICALLY TARGETED AND
AFFORDABLE ROADWAY SOLUTIONS

QUESTIONS/COMMENTS?

Thank you!



<i>US-11 STARS Study</i>		Traffic Operations (Delay)		Safety		Construction Impacts		Planning Level Cost *No Contingency
		2028	2040	Conflicts	Congestion/Queuing	Right of Way	Utilities	
Stone Spring	No Build Alternative	↓	↓	○	↓	■	■	■
	Conventional Dual Lefts (Alt 1)	↑	○	○	↑	↓	↓	\$3.5-4.5m
	Quadrant Roadway (Alt 2A & 2B)	↑	↑	↑	↑	↓	↑	\$6.0-7.0m
US-11 Median	No Build Alternative	○	○	○	○	■	■	■
	Existing Footprint	○	○	↑	○	↑	↑	\$500-700k
	Widening/Multi-Use Path	○	○	↑	○	↓	↓	\$2.0-3.0m
Mosby	No Build Alternative	↓	↓	○	↓	■	■	■
	Re-phasing (Alt 3)	↑	○	↓	↑	↑	↑	\$75-100k
	Mosby Road Widening (Alt 4)	↑	↑	○	↑	↓	↓	\$1.5-2.5m

- Favorable – 
- Neutral – 
- Unfavorable – 