

Orlando, FL

November 7-8, 2024



2024 TRANSPORTATION SYMPOSIUM

Identification of Left Turn Protected Only TOD

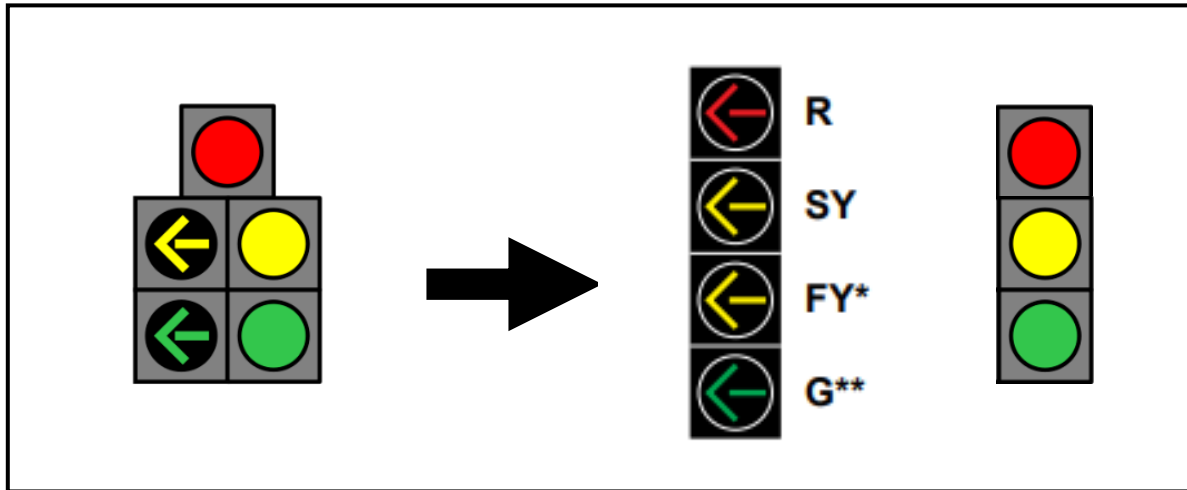


Cody Ko, PhD, PE

Traffic Operations, FDOT District 2

① Objective & Background

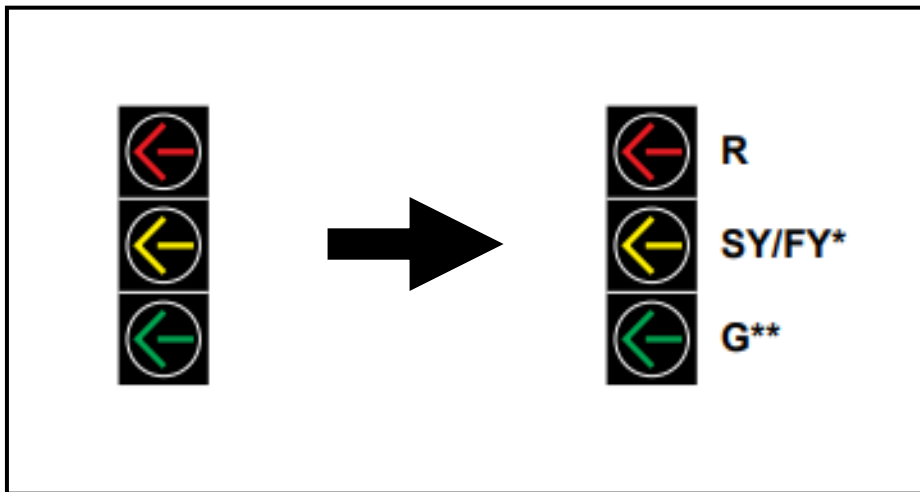
Left turn Protected Only by TOD (4 Section FYA Head)



- Enhanced Driver Comprehension
- Higher Visibility (Signal Head per Lane)
- Yellow Trap Avoidance (lead-lag LT)
- Protected Only by Time Of Day (TOD)
- Protected Only by Cycle (FYA Omit)

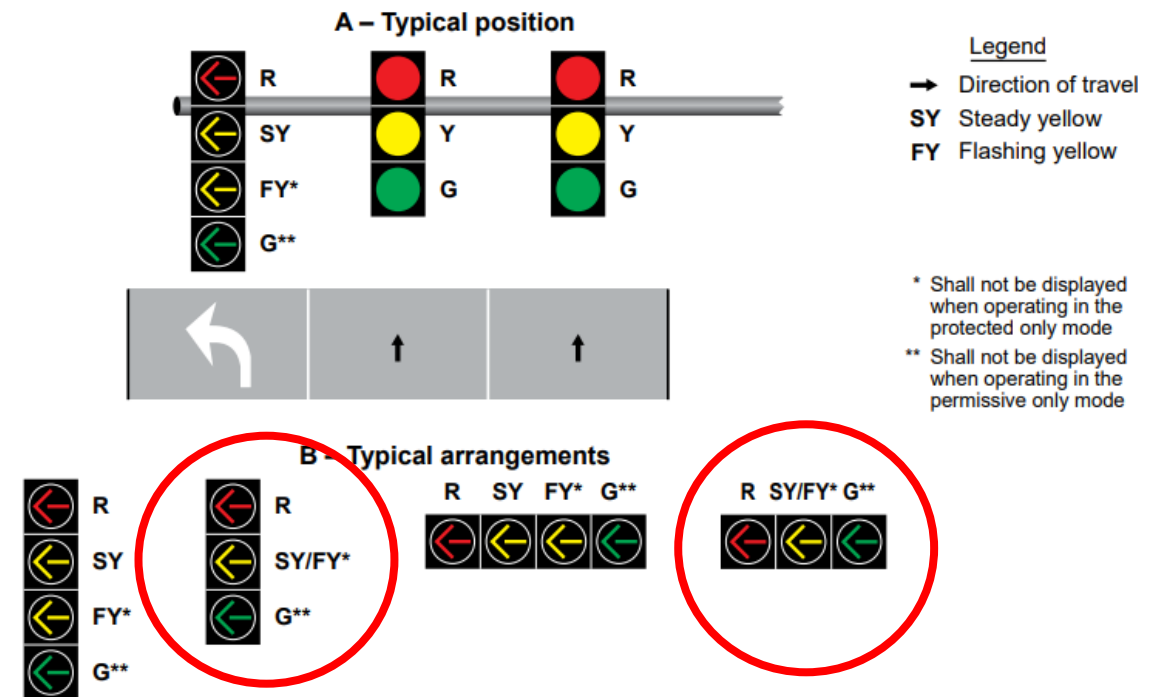


Left turn Protected Only by TOD (3 Section FYA Head)



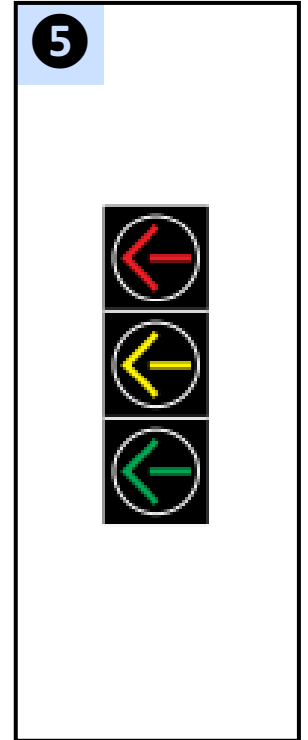
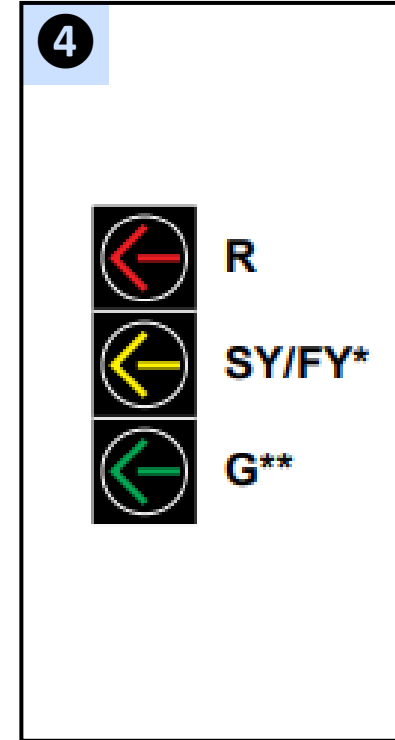
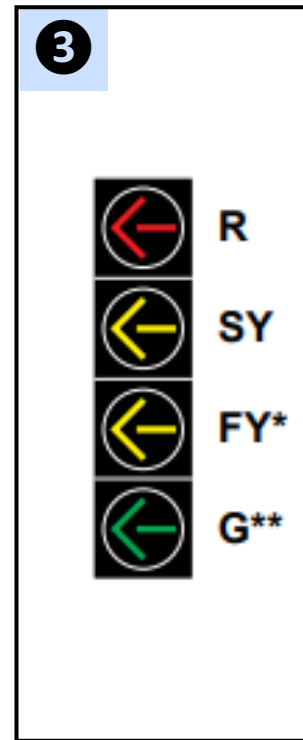
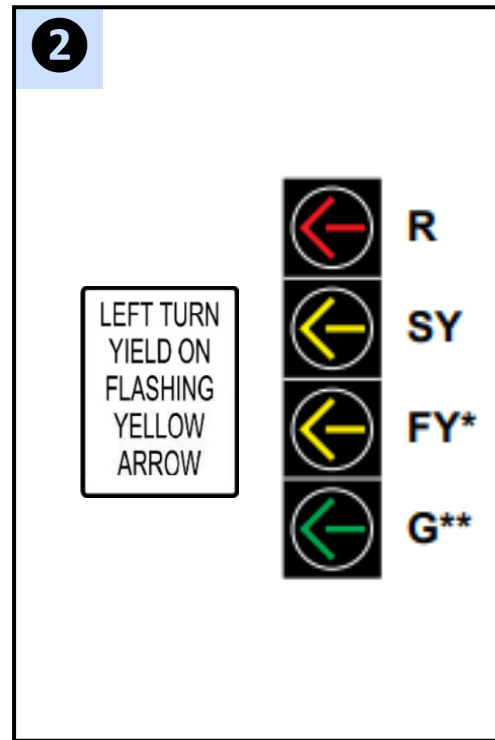
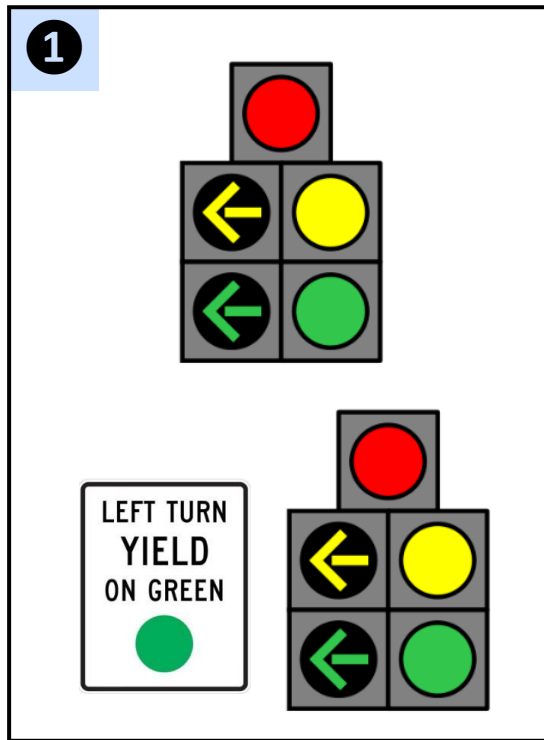
- MUTCD Interim Approval (IA-17, 2014)
- Request for Interim Approval
- Included in the new 11th MUTCD
- Easy to allow permissive LT TOD
- Vertical Signal Clearance (17')

Figure 4F-7. Typical Position and Arrangements of Separate Signal Faces with Flashing Yellow Arrow for Protected/Permissive Mode and Variable Mode Left Turns



MUTCD 11th Edition (2023)

Driver Expectation



Permissive
Every Cycle



No Permissive

② Left Turn Phasing Determinants

Left Turn Protected Only Application (TEM 3.2.2)

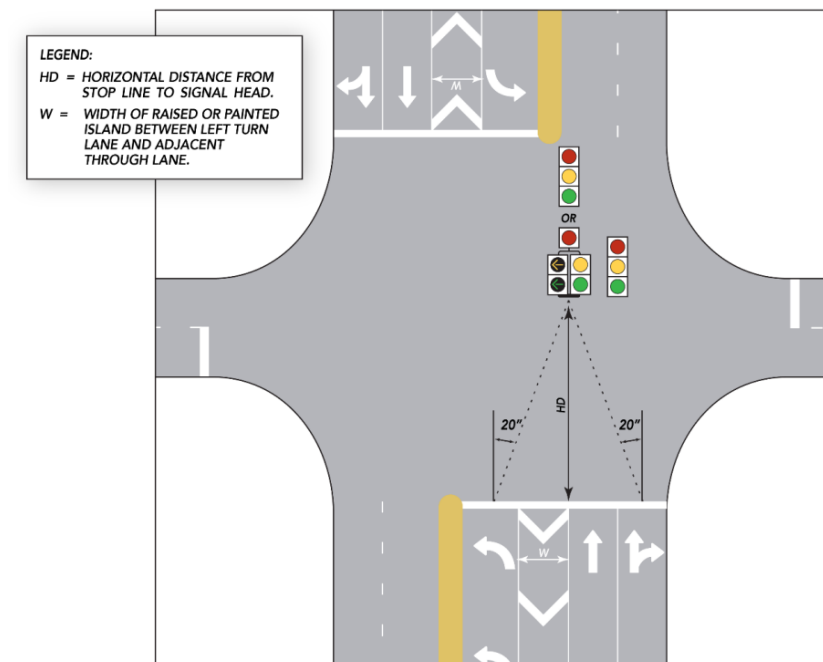
Apply Protected Only Mode with following condition

- Two or more Left-Turn-Only Lanes
- Geometric conditions with Deficient Sight Distance
- Lead approach at Lead/Lag intersection
- Offset Left Turn Lanes without cone of vision

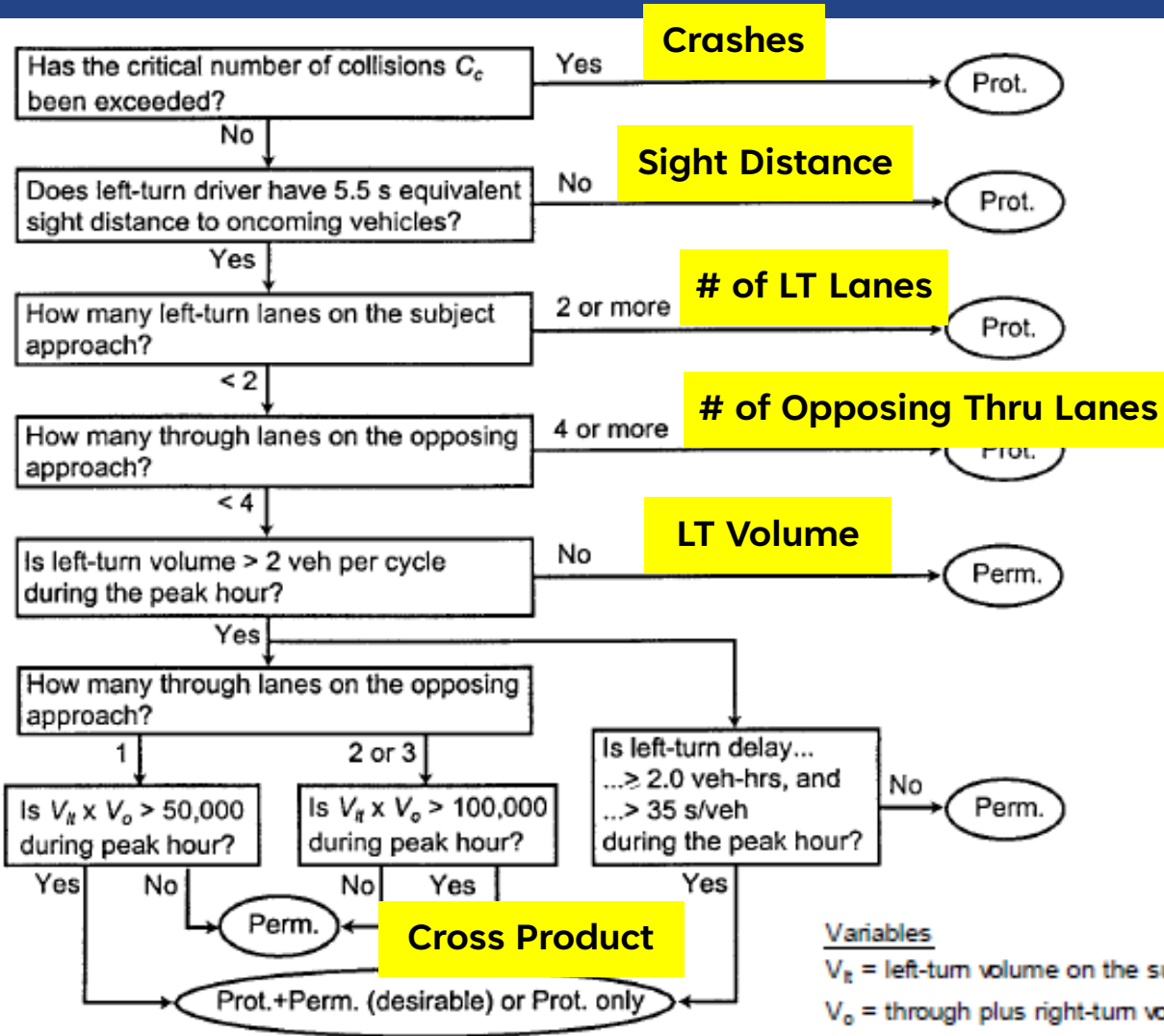
Consider Protected Only Mode with following condition

- Opposing Traffic Speed of 50 mph or higher
- Three or more Lanes of Opposing Thru Traffic
- Seven or more LT Angle crashes (12-month period)
- Geometric conditions with Restricted Sight Distance

Figure 3.2-1. Signal Head/Left-Turn Treatment



Guidelines for Left Turn Phase Selection (TTI, FHWA)



Number of Left-turn Movements on Subject Road	Period During Which Crashes are Considered (years)	Critical Left-Turn-Related Crash Count When Considering Protected-only, C_{pt} (crashes/period)	When Considering Prot.+Perm., C_{p+p} (crashes/period)
One	1	6	4
One	2	11	6
One	3	14	7
Both	1	11	6
Both	2	18	9
Both	3	26	13

Oncoming Traffic Speed Limit (mph)	Minimum Sight Distance to Oncoming Vehicles, SD_c (ft)
25	200
30	240
35	280
40	320
45	360
50	400
55	440
60	480

Variables

V_L = left-turn volume on the subject approach, veh/h

V_O = through plus right-turn volume on the approach opposing the subject left-turn movement, veh/h

Left Turn Protected Only Considerations (VDOT, 2015)

① Traffic Volume

- Left Turn Volume $\geq 240 \sim 300$ during peak hr
- Cross Product (Left Turn Volume X Opposing Thru Volume)
 - $\geq 50,000$ during peak hr (1 Opposing Thru Lanes)
 - $\geq 100,000$ during peak hr (2 or more Opposing Thru Lanes)
- High Pedestrian Volume

< Minnesota >

Speed 45 MPH or greater AND a peak hour left-turn volume greater than 240 vehicles or a peak hour cross-product greater than 80,000 (100,000 if two opposing lanes).

Left Turn Protected Only Considerations (VDOT, 2015)

② Left Turn Crashes

- Left Turn Crashes in 12 month $\geq 3 \sim 6$

< Texas >

- ✓ ≥ 5 in any 12 months in 3 years
- ✓ ≥ 4 in any 12 months
- ✓ ≥ 6 in any 2 Consecutive years
- ✓ ≥ 8 in 3 Consecutive years

< Arizona >

Following are crash thresholds for consideration of left-turn phasing:

	One Year Period	Two Year Period
One Approach	4	6
Two Opposing Approaches	6	10

Left Turn Protected Only Considerations (VDOT, 2015)

③ Number of Left Turn Lanes

- 2 or more Lanes

④ Opposing Speed Limit

- 50 mph or Higher

⑤ Number of Opposing Thru Lanes

- 3 or more Lanes

< Georgia >

Left-turn movements where opposing through traffic is approaching in three or more lanes at speeds greater than or equal to 45 mph.

< Washington >

- ✓ Peak Hour LT Volume exceeds Storage and Opposing Speed Limit of 50 or Higher
- ✓ Peak Hour LT Volume exceeds Storage and 3 or more Opposing Thru Lanes

Left Turn Protected Only Considerations (VDOT, 2015)

⑥ Sight Distance

- Limited Sight Distance due to Geometry
- Limited Sight Distance due to Opposing Left Turning Vehicles

< FHWA_Traffic Signal Timing Manual >

<u>Oncoming Traffic Speed Limit (mph)</u>	<u>Minimum Sight Distance to Oncoming Vehicles, SD_c (ft)</u>
25	200
30	240
35	280
40	320
45	360
50	400
55	440
60	480

< Texas >

- ✓ Sight Distance < 250 ft
(Opposing Speed < 35 mph)
- ✓ Sight Distance < 400 ft
(Opposing Speed \geq 35 mph)

Left Turn Protected Only Considerations (VDOT, 2015)

7 Intersection Geometry

- Unusual Geometry
- Existing Geometry creates a conflicting Left Turn Path

8 Existing Sequence

- Left Turn Lead Lag Sequence
(Not needed with Flashing Yellow Arrow)

9 Left Turn Delay

- 2.0 or more vehicle hours
- Average 35 seconds per vehicle

10 Left Turn Conflicts

11 Traffic Gap for Left Turn

③ Left Turn Protected Only TOD Selection Method Examples

Left Turn Protected Only TOD Selection (PennDOT)

VARYING TIME-OF-DAY OPERATIONS

PennDOT Publication 149, Traffic Signal Design Handbook, provides design criteria for establishing left-turn phasing, with the primary criteria being the "conflict factor". The conflict factor is the product of the left-turn volume and the opposing through traffic volume for any one-hour period on a normal weekday. Depending on the traffic demand of a left-turning movement and the opposing traffic volumes, protected/prohibited phasing is warranted when two or more separate one-hour periods in a day meet the conflict criteria established in Publication 149. As a result, protected/prohibited phasing may be installed for the traffic demands of a couple hours of a day whereas the remainder of the day doesn't need a protect/prohibited phase.

Consider Protected/Prohibited Left Turn Phasing (must have a separate turn lane)

When:

- a) One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 67,500.
- b) Two opposing lanes exist; then two or more one-hour period conflict factors (CF) need to be greater than 90,000.

Left Turn Protected Only TOD Selection (MNDOT)

Is there any opposing LT movement? (Y/N): Y N If the answer is no, there is no SD problem

Input	
# opposing lanes ¹	2
Opposing speed limit (mph)	40
LT offset X_0 (ft)	-8
Intersection Length, L (ft)	100
OTHL _w (ft)	12
OLTL _w (ft)	13
Y_i (ft) ²	0
V_w (ft)	7
lateral position of OLT vehicle x_i (ft) ³	1.5
x_i (ft) ⁴	3.5
Y_a (ft)	92
x_r (ft)	4.5
vehicle offset (ft)	7

Required SD (ft):	352
Available SD (ft):	230

* Y_i is negative in this figure because the driver's eye is behind the end of the median at the time of making decision.

* If the opposing approach has a significant horizontal/vertical curve ending at intersection, this worksheet cannot be used to calculate the available SD. The required SD can still be calculated by this worksheet; but for the available SD you should use the real sight plan. Google map would be an easy way to approximate the available SD.

1) the number of lanes that a left-turning vehicle has to cross to complete a left-turn maneuver, including the right-turn lane unless the right turn lane is channelized as a free right turn. **SD Problem**

2) Y_i is positive if the driver's eye is beyond the tip of median (or stop bar) at the decision time. It is negative if the driver is behind the tip of median/stop bar.

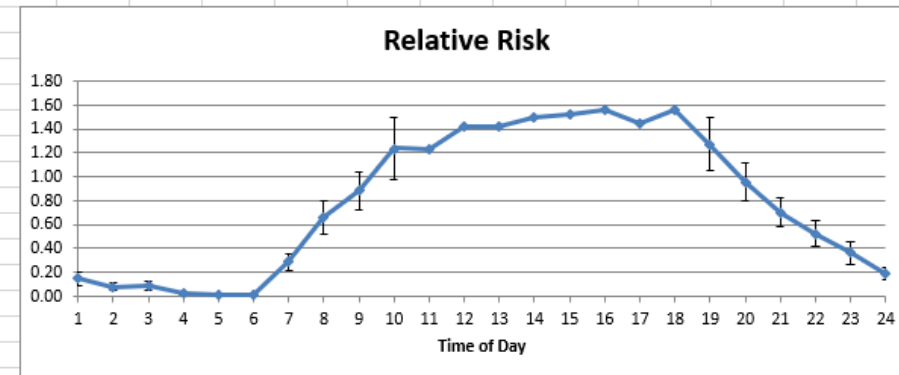
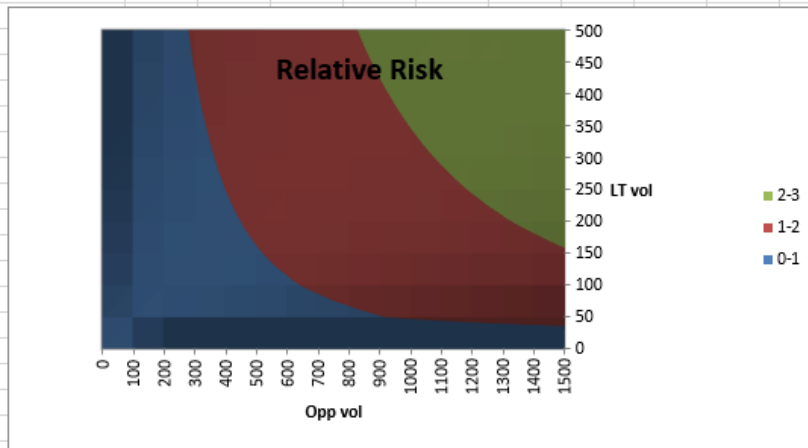
3) This parameter can be between .5 to 2.5 feet depending on the OLTL_w and opposing median condition. Keep it at 1.5 ft unless you have a good reason.

4) This parameter can be between 2.5 to 4.5 feet depending on the LTL_w and median condition. Keep it at 3.5 ft unless you have a good reason.

Left Turn Protected Only TOD Selection (MNDOT)

Protected/Permitted left turn phasing, Speed limit <45 mph, Sight Distance Problem

Model Parameters		Base Condition																										
beta 1:	0.33	LT vol	250	<input type="button" value="Run"/>																								
beta 2:	0.64	Opp vol	400																									
Sampled hours	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
LT vol											73	90	70	85	81	96	74	96										
Opp vol											1046	1173	1334	1317	1369	1311	1327	1319										
Estimated 24-hour turning movement volumes																												
LT vol	5	2	3	1	6	14	42	66	71	83	73	90	70	85	81	96	74	96	69	46	37	24	16	9				
LT st. deviation	4.4	1.7	4.1	1.7	9.0	13.3	24.6	31.3	22.3	36.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	12.0	10.9	10.4	10.0	5.7				
Opp vol	156	102	81	16	1	1	142	417	628	986	1046	1173	1334	1317	1369	1311	1327	1319	1134	888	616	488	339	173				
Opp st. deviation	37.2	24.9	20.3	5.4	1.0	1.0	34.0	95.5	142.8	222.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	256.1	201.0	140.1	111.4	78.2	40.8				
Relative Risk	0.15	0.08	0.09	0.02	0.01	0.01	0.29	0.66	0.88	1.24	1.23	1.42	1.42	1.50	1.52	1.56	1.44	1.56	1.27	0.96	0.70	0.52	0.36	0.19				
RR sd	0.05	0.03	0.04	0.01	0.01	0.01	0.07	0.14	0.16	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.16	0.12	0.11	0.09	0.05				



④ D2 LT Protected Only TOD Selection Method

Left Turn Protected Only TOD Determinants (D2)

Determinant	Time Variant	Review Result	LT TOD Guide (District 2)
Traffic Volume	●	Critical, Mostly Available	●
LT Crashes	●	Critical, Available	●
# of LT Lanes		Requirement for LT Prot Only 24/7	Sub Condition For LT Prot Only 24/7
Opposing Speed Limit		Consideration for LT Prot Only 24/7	
# of Opposing Thru Lane		Consideration for LT Prot Only 24/7	
Sight Distance	●	Considered by LT Crash	
Intersection Geometry		Considered by LT Crash	
Existing Sequence		Requirement for LT Prot Only 24/7	
LT Delay	●	Considered by Traffic Volume	
LT Conflicts	●	Considered by LT Crashes	
LT Gap	●	Considered by Traffic Volume	

Left Turn Protected Only TOD Selection Guide (D2)

Consideration for LT Protected Only 24/7 (Crash)

- ≥ 7 Crashes in a 12-month period, or
- ≥ 6 Crashes in two 12-month periods
& ≥ 50 mph Opposing Thru Speed Limit, or
 ≥ 3 or more Opposing Thru Lanes
(add one Lane if LT offset is negative)
- ≥ 5 Crashes in three 12-month periods
& ≥ 50 mph Opposing Thru Speed Limit, or
 ≥ 3 or more Opposing Thru Lanes
(add one Lane if LT offset is negative)

I. Fully Protected Only from Protected-Permissive Phasing

Check at least recent 5 years of crash data for weekday plans

1. Protected only phasing may be considered when:

- a) *There are 7 or more left turn crashes for a direction of travel for at least 1 twelve-month period of the past 5 years*
OR
- b) *There are 6 or more left turn crashes for a direction of travel for at least 2 twelve-month periods of the past 5 years AND meets any condition in I.2.*
OR
- c) *There are 5 or more left turn crashes for a direction of travel for at least 3 twelve-month periods of the past 5 years AND meets any condition in I.2.*

2. Conditions

- a) *Speed limit of opposing traffic is higher than 45 mph*
 - b) *Left turn traffic must cross three or more lanes of opposing through traffic*
- (1) Opposing left turn lane is counted as an opposing through lane if there is a negative left turn offset

Left Turn Protected Only TOD Selection Guide (D2)

Intersection	SR XX and XXXX Rd						Direct	SB	County	Duval			
Weekday/Weekend	Weekday		Creator		Cody		Date	11/1/2024					
Opposing Speed Limit of 50mph or Higher?								Yes					
Negative Left Turn Offset? (Considered as 1 Opposing Thru Lane)								No					
Three or more Opposing Thru Lanes?								No					
Month	2019		2020		2021		2022		2023		Sum		
	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	Fatality	Serious Injury
January			1						1		2		
February							1		1		2		
March													
April					1,1						2		
May	1	9					1	6			2		
June							1				1		
July					1	1					2	2	
August													
September	1, 1								2		4		
October	3, 1						2				6		
November													
December	1	1							1		3		1
Total	8	1	1		3	1	5		5		24	2	1

Meeting Lefty Turn Protected Only 24/7 Criteria? Yes

Blue font indicates weekend crash.
 Boxed numbers indicate the number of left turn crashes over a 12 month period
 Red Boxes indicate 12 month periods

Left Turn Protected Only TOD Selection Guide (D2)

Consideration for LT Protected Only TOD (for each Hour) (Volume, Crash, Weekday)

- LT Volume ≥ 240
- Product of LT and Opposing Thru Volume
 $\geq 50,000$ (1 Opposing Thru Lane)
 $\geq 100,000$ (2 or more Opposing Thru Lanes)
- LT Crashes ≥ 2 for 5 Yrs
(including Weekend Crashes)
- One hour before and after the hours justified
(by Volume or Crash criteria)

* Count 2 Crashes for 1 Fatal or Serious Injury Crash

- II. Protected by Time of Day from Protected-Permissive Phasing
- Check at least recent 5 years of crash data for weekday plans and 10 years for weekend plans
- Review Hourly Left Turn and Opposing Through Volumes within previous 7 years
1. Protected by Time of Day may be considered when:
 - a) Full Protected Left Turn Phase is justified by I.1, and there are certain time periods during which protected only phase may not be appropriate based on traffic volumes and/or crash history
OR
 - b) Specific Hour of day meets any condition in II.2.
 2. Conditions
 - a) Left Turn Volume for the approach is equal to or greater than 240 Vehicles for the Hour
 - b) Product of Left Turn Volume and Opposing Through Vehicle Volume is:
 - (1) Equal to or greater than 50,000 Vehicles for the Hour with 1 opposing lane
 - (2) Equal to or greater than 100,000 Vehicles for the Hour with 2 or more opposing lanes
 - c) Total 2 or more crashes for 5-year period for the Hour (for weekday plan)
Two or more weekend crashes for 10-year period for the Hour (for weekend plan)
 - d) Any time period up to 1 Hour right before or after the selected Hours by II.2.a), b), or c).

Left Turn Protected Only TOD Selection Guide (D2)

Intersection		SR XX and XXXX Rd									County		Duval		
Direction		SB	Weekday/Weekend		Weekday		Creator		Cody		Date	11/1/2024			
Hour	2019		2020		2021		2022		2023		Sum		Volumes		
	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	FSI Crash	#	Fatality	Serious Injury	Left Turn	Cross Product
12-1														12	375
1-2														12	631
2-3														0	2
3-4														0	4
4-5														0	2
5-6							1				1			27	9,396
6-7														55	64,064
7-8	1										1			58	136,822
8-9					1		1		1		3			68	154,632
9-10														131	162,236
10-11														196	208,274
11-12									1		1			193	236,651
12-1							1		1		2			167	235,637
1-2														121	164,197
2-3														177	243,772
3-4	1		1				1,1		1		5			243	374,033
4-5	1				1	1					3	2		179	276,555
5-6	1	1									2		1	171	263,340
6-7					1						1			119	124,683
7-8	1								1		2			132	114,840
8-9	1										1			73	41,983
9-10	1,1										2			104	50,108
10-11														73	25,502
11-12														57	2,342
Total	8	1	1		3	1	5		5		24	2	1	2,368	2,890,078

- Blue Font indicates weekend crash
- Red Circle indicates hours meeting crash criteria
- Red Rectangle indicates hours to recommend protected-only phasing
- 100,000 - 149,999
- 150,000 - 199,999
- >200,000
- Hours meeting Left Turn Volume Criteria

Left Turn Protected Only TOD Selection Guide (D2)

Consideration for LT Protected Only TOD (for each Hour) (Volume, Crash, Weekend)

- LT Volume ≥ 240
- Product of LT and Opposing Thru Volume
 $\geq 50,000$ (1 Opposing Thru Lane)
 $\geq 100,000$ (2 or more Opposing Thru Lanes)
- **LT Crashes ≥ 2 for 10 Yrs**
(Only Weekend Crashes)
- One hour before and after the hours justified
(by Volume or Crash criteria)

* **Count 2 Crashes for 1 Fatal or Serious Injury Crash**

Left Turn Protected Only TOD Selection Guide (D2)

III. Left Turn Phasing Considerations Other Than Crash and Volumes

Check out any other Factors that help making better left turn phasing decision when appropriate. The factors may include, but not limited to below.

1. Geometric and Traffic Conditions

- a) *Left Turn Offset*
- b) *U Turn Volume*
- c) *Left Turn Distance*
- d) *Left Turn Angle*
- e) *Left Turn Phase Split*
- f) *Opposing Through Vehicles Travel Speed*
- g) *Left Turn Truck Traffic Percentage*
- h) *Left Turn Approach Grade*

2. Planning and Development History

- a) *Previous / Future Projects*
- b) *Previous / Future Events*
- c) *Developments around the Area*

3. Consequences of Conversion to Left Turn Protected Only

- a) *Left Turn Spillback from excessive Delay*
- b) *Public Complaints on unnecessary delay during non-Peak Hours*
- c) *Increase in Left Turn Red Light Running Behavior*

Left Turn Protected Only TOD Consideration (D2)



US 1 & Old St.
Augustine Rd,
Duval County

TRANSPORTATION
SYMPOSIUM

Left Turn Protected Only TOD Consideration (D2)

Hour	2016	2017	2018	2019	2020	Sum			Volumes	
	NB	NB	NB	NB	NB	Total	Fatal	Injury	NB Left Turn	Cross Product
12-1			1			1		2	0	5
1-2									13	292
2-3									13	257
3-4									26	431
4-5									13	827
5-6									79	13,062
6-7	2	2	1	1		6		7	277	88,553
7-8				1	1	2		0	312	186,576
8-9		2				2		1	370	237,540
9-10									211	98,265
10-11			1		1	1, 1		0, 2	461	213,709
11-12	1	2		1		3, 1		2, 0	435	238,535
12-1			2			2		2	199	95,918
1-2									214	124,120
2-3			1			1		1	264	180,346
3-4			1			1		0	422	353,802
4-5			1			1		2	527	547,995
5-6					1, 1	1, 1		2, 3	206	240,608
6-7	1	1	1		2	3, 2		1, 0	254	188,722
7-8			1		1, 1	1, 2		0, 0	171	63,463
8-9					2	2		2	119	40,851
9-10	2		1		1	3, 1		2, 2	145	38,697
10-11									92	13,636
11-12				1		1		0	40	3,152
Total	6	7	11	4	11	39		31		

Weekday

US 1 & Old St.
Augustine Rd,
Duval County



Left Turn Crash History

Hour	2016	2017	2018	2019	2020	Sum			Volumes	
	WB	WB	WB	WB	WB	Total	Fatal	Injury	WB Left Turn	Cross Product
12-1					1	1		0	1	46
1-2									0	10
2-3									1	21
3-4									0	8
4-5									9	130
5-6			1			1		0	19	3,756
6-7			1			1		0	49	20,178
7-8									40	31,760
8-9									61	46,482
9-10			1			1		0	42	26,000
10-11									46	31,183
11-12									77	66,220
12-1		1				1		0	68	66,844
1-2									55	53,185
2-3	1					1		0	57	58,169
3-4			1			1		0	69	83,425
4-5			1			1		0	70	90,090
5-6			1			1		2	73	89,279
6-7									45	40,770
7-8			1			1		1	34	17,795
8-9									29	12,339
9-10					1	1		1	18	6,347
10-11									9	1,934
11-12	1					1		0	7	167
Total	2	1	7		2	12		4		

**US 17 & N 9th St,
Putnam County**

Overnight Left Turn Operation - 01

Hour	2015		2016		2017		2018		2019 (S4)		Sum		
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NS	Fatal	Injury
12 - 1													
1 - 2													
2 - 3													
3 - 4													
4 - 5													
5 - 6													
6 - 7						1					1		2
7 - 8								1			1		1
8 - 9		1									1		1
9 - 10								1			1		0
10 - 11			1								1		0
11 - 12						1		1			2		1
12 - 13		1				1					2		0
13 - 14		1	1			1					3		3, 1
14 - 15		1				1				1	3		4
15 - 16		1		1							2		2
16 - 17				1				1			2		2
17 - 18						1		1			2		1, 5
18 - 19													
19 - 20													
20 - 21						1					1	1	
21 - 22													
22 - 23													
23 - 24													
Total		5	2	2		7		5		1	22	1	23

US 17 & Wabash Ave,
Duval County

Overnight Left Turn Operation - 02

Hour	2018		2019		2020		2021		2022		Sum			Volumes	
		NB		NB		NB		NB		NB	Fatal	Injury	NB Left Turn	Cross Product	
12-1													4	400	
1-2													5	400	
2-3													4	4	
3-4													9	9	
4-5									1	1		1	32	1,280	
5-6													76	6,080	
6-7				1		1						2	3	205	61,705
7-8						1						1	2	169	152,100
8-9		1		1					1	3		5	174	169,998	
9-10		1								1			145	136,155	
10-11		1								1			204	351,696	
11-12		1				1				2		1	249	414,336	
12-1				2		1				3		5	205	324,720	
1-2						1		1		1, 1		2, 1	272	394,672	
2-3		1				1		3, 1		1		5, 2	258	404,286	
3-4		1		1						1		3	4	376	768,920
4-5		1, 1		2						3, 1		6, 2	280	516,600	
5-6													238	430,542	
6-7				1		1				2		3	283	480,817	
7-8		1, 1		2		1				4, 1		6	149	188,187	
8-9		1		1, 1				1		1		4, 1	7	137	126,314
9-10				1						1		3	64	53,888	
10-11		2								2		3	37	25,234	
11-12				1				1		2			25	16,050	
Total		13		14		8		7		5		47			

SR 121 & SW 20th Ave,
Alachua County

FDOT Traffic engineering Manual (3.10.3)

3.10.3 OPERATIONAL REQUIREMENTS

The following design and operational requirements apply, according to [MUTCD Section 4D.20](#), when a separate left-turn signal phase operates in a protected/permmissive left-turn mode and a flashing left-turn yellow arrow signal is provided.

Left-Turn Operation Mode(s):

The FYA signal may be displayed to indicate a permmissive left-turn movement in either protected/permmissive or permmissive-only modes.

Engineers may vary the left-turn operation mode (i.e., permmissive-only, protected-only, or protected/permmissive) during different periods of the day when the following conditions apply:

- The calculated critical gap is a minimum of 7 seconds during non-peak hours. The Department's [Manual on Uniform Traffic Studies \(MUTS\)](#) provides additional guidance on conducting vehicular critical gap studies.
- Fewer than 240 vehicles turn left per hour, or the product of left-turning vehicles and opposing through vehicles is fewer than 50,000 (one opposing through lane) or 100,000 (two opposing through lanes). Product being defined as the multiplication of one hour of left-turning volume times the corresponding opposing through hourly volume.
- There are no fatalities and two or fewer left-turn crashes per year attributed to permmissive left-turning movement.

Permissive Left Turn Volume and Percentage

Atlantic Blvd & Highland Ave, Duval County

Weekday	Hour	2015		2016		2017		2018 (S4)		2019 (S4)		Sum		Volumes					
		WB		WB		WB		WB		WB		WB	Fatal	Injury	WB Left Turn	Cross Product	Perm LT	Prot LT	Perm %
	12-1													10	567				
	1-2													3	130				
	2-3													0	7				
	3-4													3	83				
	4-5													24	1,807				
	5-6									1	1		1	51	11,536				
	6-7													156	63,594				
Weekday	7-8							1			1			356	237,452	141	166	0.46	
	8-9													356	257,388	84	234	0.26	
	9-10							1			1		3	257	193,521	175	46	0.79	
	10-11			1		1				1	2, 1		3	257	176,302	164	35	0.82	
	11-12									1	1			293	242,018	168	64	0.72	
	12-1			1		1		1			2, 1		3, 1	306	266,220	154	84	0.65	
	1-2													270	233,820	149	69	0.68	
	2-3		1		1			1			2, 1		5	235	205,155	125	45	0.74	
	3-4				3, 1						3, 1		1, 2	256	303,616	107	117	0.48	
	4-5						1, 1				1	2, 1		1, 1	297	402,138	130	105	0.55
	5-6		1, 1									1, 1		1	251	429,210	63	168	0.27
	6-7		1									1			241	234,734	130	66	0.66
	7-8													122	56,275				
	8-9		1								1			119	59,411				
	9-10		1								1		1	65	19,784				
	10-11		1								1			61	14,352				
	11-12													20	2,511				
	Total		7		7		4		4		4	26		4,010	3,411,632	1,590	1,199	0.57	

5 Evaluation of Effectiveness of D2 LT Protected Only TOD Selection Method

Effectiveness of Protected Left turn TOD (D2)

Consider a protected-only mode under any of the following conditions:

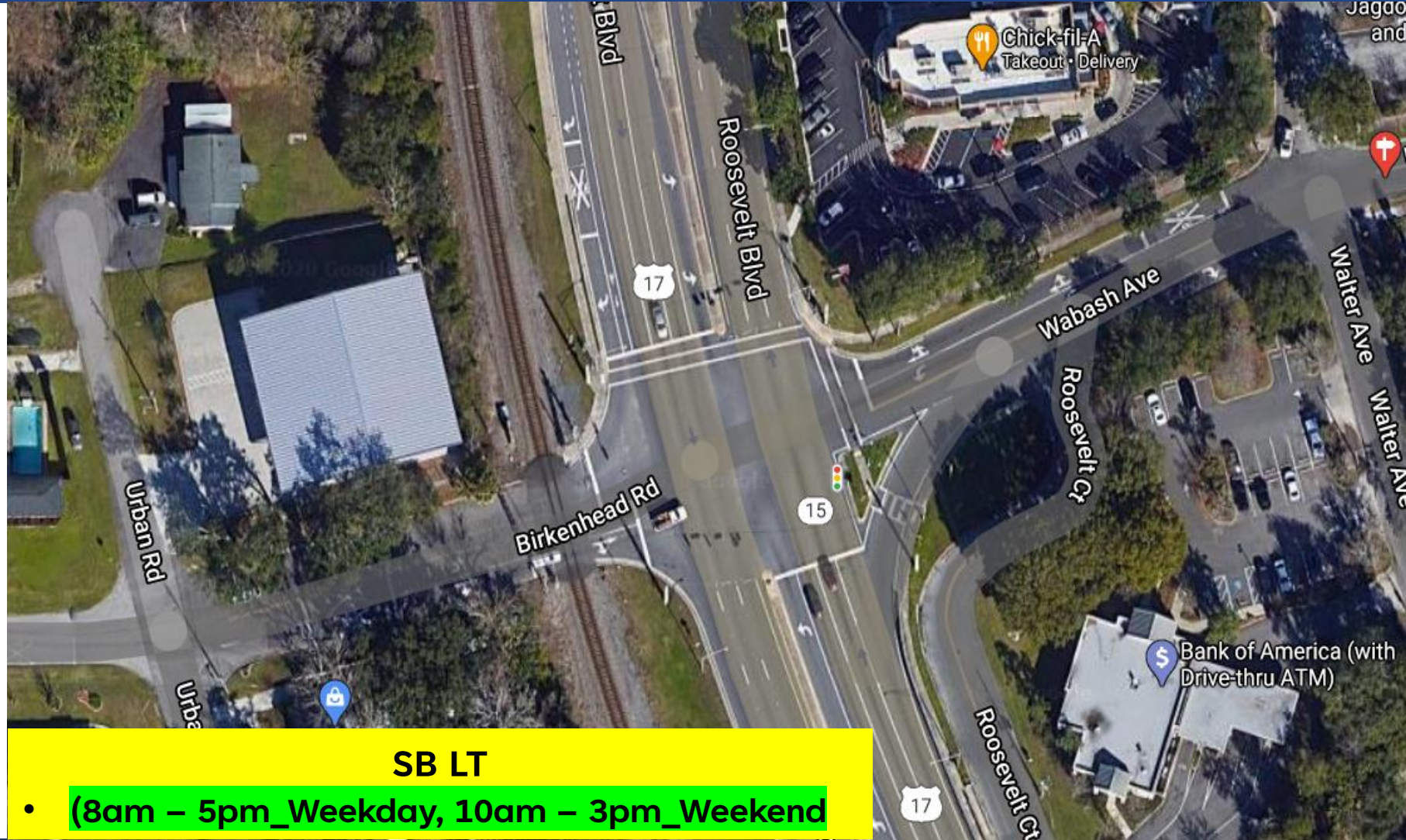
TEM 3.2.2

- Opposing traffic speed limit is higher than 45 mph.
- Left-turning traffic must cross three or more lanes of opposing through traffic.
- A protected/permissive mode is in use, and there are more than six left-turn angle crashes caused by left-turning drivers on the approach within a 12-month period.
- Unusual intersection geometry, such as restricted sight distance, makes permissive left turning confusing or hazardous.

Left Turn Crashes counted in the effectiveness evaluation
(Left Turner at Fault Crashes)

- ✓ Permissive Left Turn Crashes
- ✓ Left Turner Red Light Running(RLR) Crashes
- ✓ Red Light Running(RLR) Crashes involving Left Turner
(who is at fault unknown)

Effectiveness of Protected Left turn TOD (D2) - 01



**US 17 &
Wabash Ave,
Duval County**



**Hours Converted
From Prot Perm
to Protected Only**

**TRANSPORTATION
SYMPOSIUM**

Effectiveness of Protected Left turn TOD (D2) - 01

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - 9/7/2024 (3.17 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
8am - 5pm	13	1	0	1	2.60	3	0	0	0	0.95	0.36
Other Hours	7	2	1	1	1.40	0	0	0	0	0.00	0.00
Total	20	3	1	2	4.00	3	0	0	0	0.95	0.24
CMF	0.24										

Weekday

US 17 & Wabash Ave, Duval County

LT Protected Permissive



LT Protected Only TOD

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - 9/7/2024 (3.17 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
10am - 3pm	1	0	0	0	0.20	1	0	0	0	0.32	1.58
Other Hours	1	0	0	0	0.20	0	0	0	0	0.00	0.00
Total	2	0	0	0	0.40	1	0	0	0	0.32	0.79
CMF	0.79										

Weekend

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 02



SR 13 & Julington
Creek Rd, Duval
County

Hours Converted
From Prot Perm
to Protected Only

TRANSPORTATION
SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 02

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - 9/7/2024 (3.17 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
7am - 8pm	14	2	1	1	2.80	0	0	0	0	0.00	0.00
Other Hours	4	0	0	0	0.80	1	0	0	0	0.32	0.39
Total	18	2	1	1	3.60	1	0	0	0	0.32	0.09
CMF	0.09										

Weekday

SR 13 & Julington Creek Rd, Duval County

LT Protected Permissive

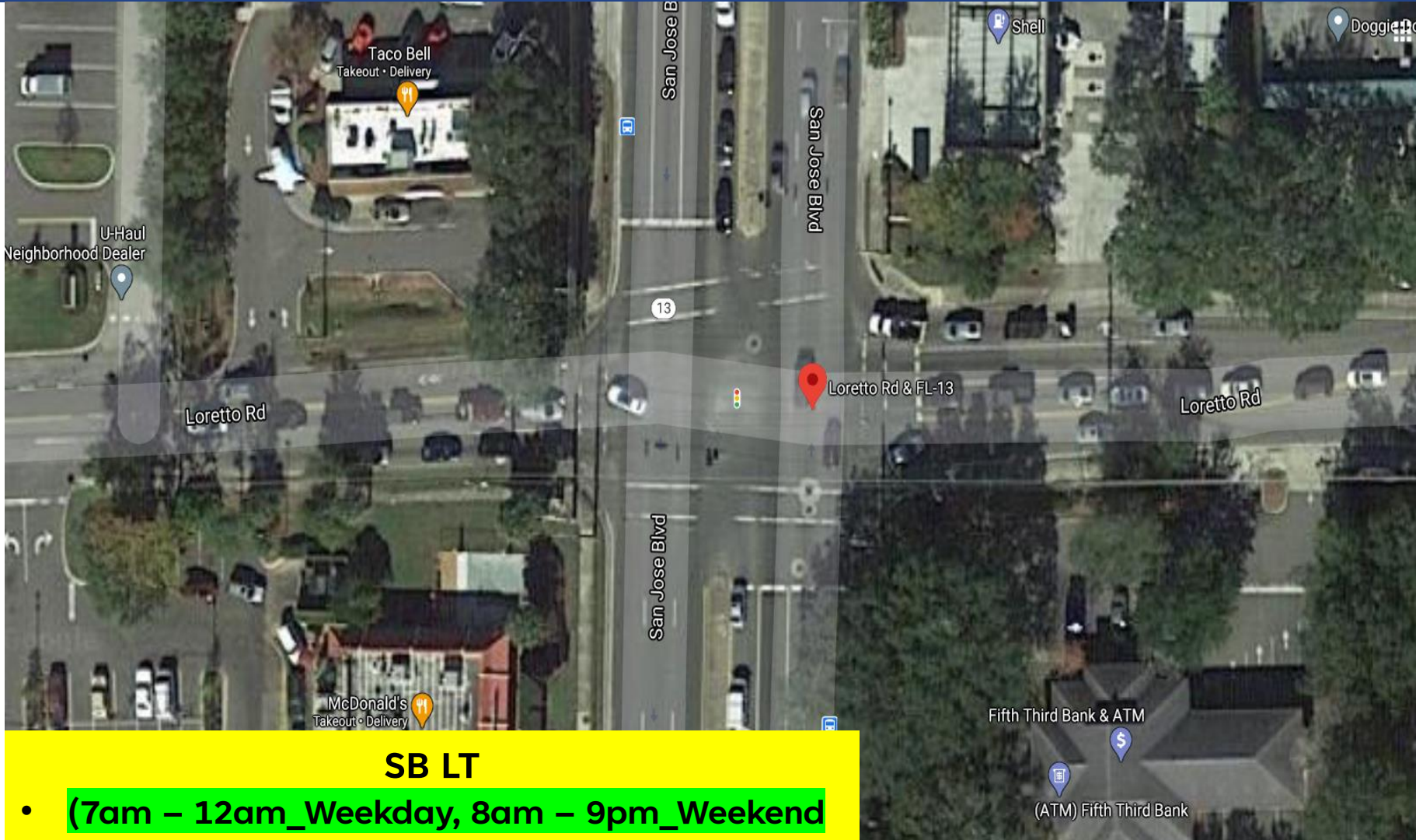


LT Protected Only TOD

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - 9/7/2024 (3.17 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
8am - 7pm	2	0	0	0	0.40	0	0	0	0	0.00	0.00
Other Hours	0	0	0	0	0.00	1	0	0	0	0.32	NA
Total	2	0	0	0	0.40	1	0	0	0	0.32	0.79
CMF	0.79										

Weekend

Effectiveness of Protected Left turn TOD (D2) - 03



SR 13 & Loretto Rd, Duval County



Hours Converted From Prot Perm to Protected Only

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 03

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - up to now (3.175 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
7am - 12am	23	3	3	1	4.60	1	0	0	0	0.31	0.07
Other Hours	0	0	0	0	0.00	0	0	0	0	0.00	NA
Total	23	3	3	1	4.60	1	0	0	0	0.31	0.07
CMF	0.07										

Weekday

SR 13 & Loretto Rd, Duval County

LT Protected Permissive



LT Protected Only TOD

Period	Before Period					After Period					
Duration	5/10/2016 - 5/9/2021 (5 years)					7/10/2021 - up to now (3.175 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
8am - 9pm	3	0	0	0	0.60	0	0	0	0	0.00	0.00
Other Hours	1	0	0	0	0.20	3	0	0	0	0.94	4.72
Total	4	0	0	0	0.80	3	0	0	0	0.94	1.18
CMF	1.18										

Weekend

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 04



NW 13th St & NW 16th Ave, Alachua County

Hours Converted From Prot Perm to Protected Only

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 04

Period	Before Period					After Period					
Duration	8/12/2018 - 8/11/2023 (5 years)					10/12/2023 - 9/7/2024 (0.91 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
5pm -9pm	6	0	0	0	1.20	0	0	0	0	0.00	0.00
Other Hours	4	0	0	0	0.80	0	0	0	0	0.00	0.00
Total	10	0	0	0	2.00	0	0	0	0	0.00	0.00
CMF	0.00										

Weekday (NB)

NW 13th St & NW 16th Ave, Alachua County

LT Protected Permissive



LT Protected Only TOD

Period	Before Period					After Period					
Duration	8/12/2018 - 8/11/2023 (5 years)					10/12/2023 - 9/7/2024 (0.91 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
Total	2	0	0	0	0.40	1	0	0	0	1.10	2.75
CMF	2.75										

Weekend (NB)

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 04

Period	Before Period					After Period					
Duration	8/12/2018 - 8/11/2023 (5 years)					10/12/2023 - 9/7/2024 (0.91 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
3pm - 7pm	6	0	0	0	1.20	0	0	0	0	0	0.00
Other Hours	2	0	0	0	0.40	0	0	0	0	0	0.00
Total	8	0	0	0	1.60	0	0	0	0	0	0.00
CMF	0.00										

Weekday (SB)

NW 13th St & NW 16th Ave, Alachua County

LT Protected Permissive



LT Protected Only TOD

Period	Before Period					After Period					
Duration	8/12/2018 - 8/11/2023 (5 years)					10/12/2023 - 9/7/2024 (0.91 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
Total	0	0	0	0	0.00	0	0	0	0	0.00	NA
CMF	NA										

Weekend (SB)

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 05



**SR 13 & Roberts
Rd, St.Johns
County**

**Hours Converted
From Prot Perm
to Protected Only**

**TRANSPORTATION
SYMPOSIUM**

Effectiveness of Protected Left turn TOD (D2) - 05

Period	Before Period					After Period					
Duration	3/21/2014 - 3/20/2019 (5 years)					5/21/2019 - 5/20/2024 (5 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
7am - 6pm	4	0	0	0	0.80	1	0	0	0	0.20	0.25
6pm - 8pm	4	0	0	0	0.80	3	0	0	0	0.60	0.75
Other Hours	4	0	0	0	0.80	2	0	0	0	0.40	0.50
Total	12	0	0	0	2.40	6	0	0	0	1.20	0.50
CMF	0.50										

Weekday

SR 13 & Roberts Rd, St.Johns County

Period	Before Period					After Period					
Duration	3/21/2014 - 3/20/2019 (5 years)					5/21/2019 - 5/20/2024 (5 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
8am - 11am	2	0	0	0	0.40	0	0	0	0	0.00	0.00
11am - 7 pm	5	0	0	0	1.00	0	0	0	0	0.00	0.00
7pm - 9pm	1	0	0	0	0.20	3	0	0	0	0.60	3.00
Other Hours	0	0	0	0	0.00	2	0	0	0	0.40	NA
Total	8	0	0	0	1.60	5	0	0	0	1.00	0.63
CMF	0.63										

Weekend

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 06

Previous

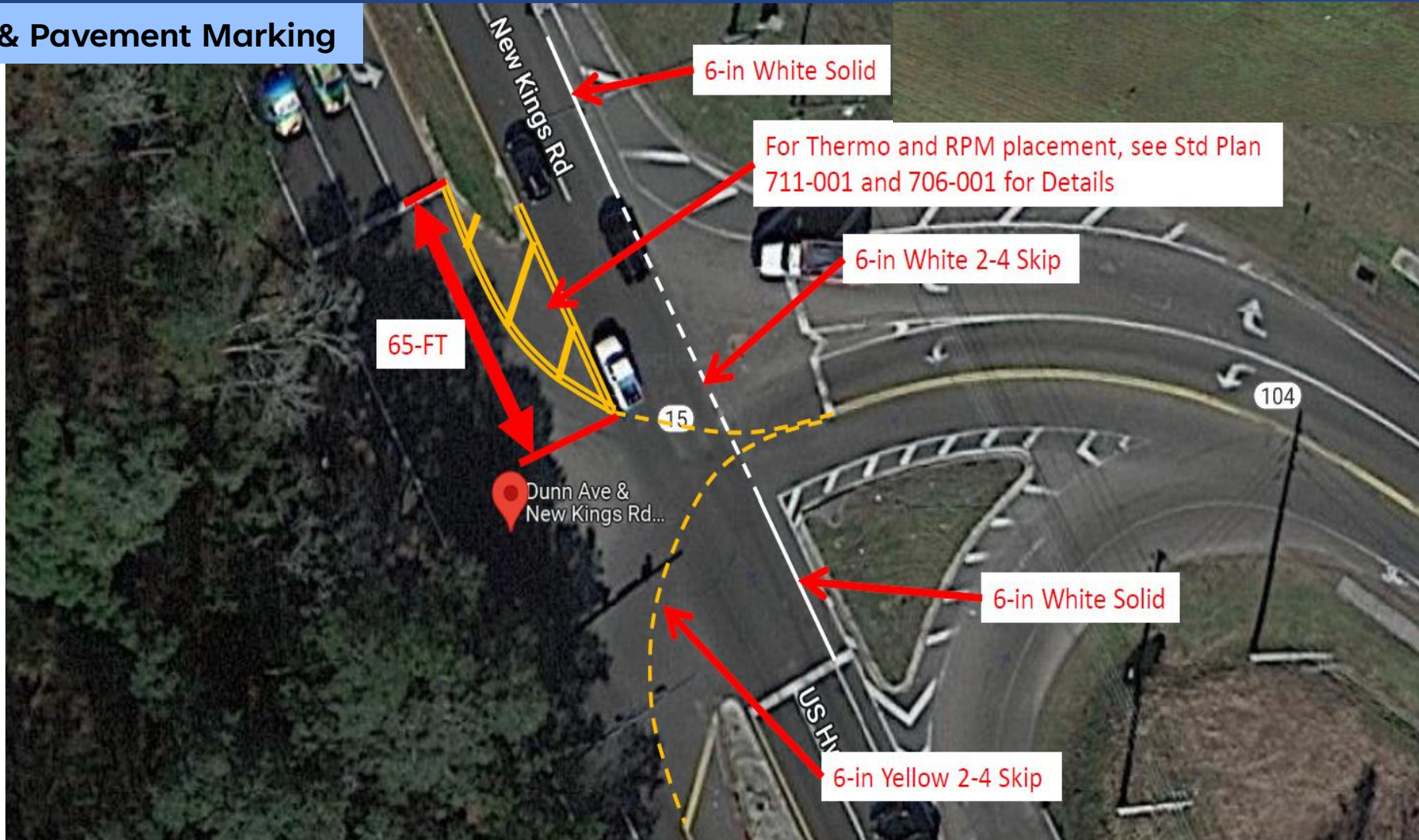


US 1 & Dunn
Ave, Duval
County

TRANSPORTATION
SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 06

Sign & Pavement Marking



**US 1 & Dunn
Ave, Duval
County**

**TRANSPORTATION
SYMPOSIUM**

Effectiveness of Protected Left turn TOD (D2) - 06

Existing



US 1 & Dunn
Ave, Duval
County

Hours Converted
From Prot Perm
to Protected Only

TRANSPORTATION
SYMPOSIUM

SB LT

- 5am - 9pm_Weekday, 12pm - 9pm_Weekend

Effectiveness of Protected Left turn TOD (D2) - 06

Period	Before Period					After Period (Maintenance Work Order)						After Period (LT TOD)					
Duration	9/25/2017 - 9/24/2022 (5 years)					10/25/2022 - 3/31/2024 (1.43 year)						4/2/2024 - 9/7/2024 (0.44 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
5am - 9pm	9	0	0	0	1.80	2	0	0	0	1.40	0.78	0	0	0	0	0.00	0.00
Other Hours	1	0	0	0	0.20	0	0	0	0	0.00	0.00	0	0	0	0	0.00	NA
Total	10	0	0	0	2.00	2	0	0	0	1.40	0.70	0	0	0	0	0.00	0.00
CMF	0.70											0.00					

Weekday

US 1 & Dunn Ave, Duval County

LT Protected Permissive



Sign & Pavement Marking



LT Protected Only TOD

Period	Before Period					After Period (Maintenance Work Order)						After Period (LT TOD)					
Duration	9/25/2017 - 9/24/2022 (5 years)					10/25/2022 - 3/31/2024 (1.43 year)						4/2/2024 - 9/7/2024 (0.44 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
12pm - 9pm	1	0	0	0	0.20	3	0	0	0	2.10	10.49	1	0	0	0	2.27	1.08
Other Hours	0	0	0	0	0.00	1	0	0	0	0.70	NA	0	0	0	0	0.00	NA
Total	1	0	0	0	0.20	4	0	0	0	2.80	13.99	1	0	0	0	2.27	0.81
CMF	13.99											0.81					

Weekend

TRANSPORTATION SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 07

Previous



**US 1 & SR 206,
St. Johns County**

**TRANSPORTATION
SYMPOSIUM**

Effectiveness of Protected Left turn TOD (D2) - 07

Left Turn Offset



**US 1 & SR 206,
St.Johns County**

**TRANSPORTATION
SYMPOSIUM**

Effectiveness of Protected Left turn TOD (D2) - 07

Existing



US 1 & SR 206,
St.Johns County

Hours Converted
From Prot Perm
to Protected Only

SB LT

- 6am – 7pm_Weekday, 8am – 6pm_Weekend

TRANSPORTATION
SYMPOSIUM

Effectiveness of Protected Left turn TOD (D2) - 07

Period	Before Period					After Period (Left Turn Offset)						After Period (LT TOD)					
Duration	1/1/2014 - 4/23/2017 (3.312 years)					6/24/2017 - 8/15/2022 (5.145 years)						10/1/2022 - 9/7/2024 (1.940 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
6am - 7pm	12	1	0	1	3.62	9	1	0	1	1.75	0.48	0	0	0	0	0.00	0.00
Other Hours	2	1	0	1	0.60	2	1	0	1	0.39	0.64	0	0	0	0	0.00	0.00
Total	14	2	0	2	4.23	11	2	0	2	2.14	0.51	0	0	0	0	0.00	0.00
CMF	0.51											0.00					

Weekday

**US 1 & SR 206,
St.Johns County**

**LT Protected
Permissive**



Left Turn Offset



**LT Protected
Only TOD**

Period	Before Period					After Period (Left Turn Offset)						After Period (LT TOD)					
Duration	1/1/2014 - 4/23/2017 (3.312 years)					6/24/2017 - 8/15/2022 (5.145 years)						10/1/2022 - 9/7/2024 (1.940 years)					
Time of Day	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF	LT Crashes	FSI Crashes	Fatality	Serious Injury	Crash Rate (per Year)	CMF
8am - 6pm	1	0	0	0	0.30	2	0	0	0	0.39	1.29	0	0	0	0	0.00	0.00
Other Hours	1	0	0	0	0.30	1	0	0	0	0.19	0.64	0	0	0	0	0.00	0.00
Total	2	0	0	0	0.60	3	0	0	0	0.58	0.97	0	0	0	0	0.00	0.00
CMF	0.97											0.00					

Weekend

**TRANSPORTATION
SYMPOSIUM**

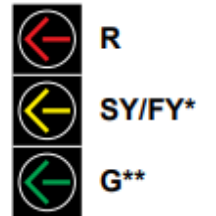
⑥ Conclusions & Considerations

Conclusions

- 1) Use of LT TOD crash history works great on efficiently improving safety.**
 - ✓ Total 5 years of crash data is a good representation of weekday LT Crash Occurrence TOD trend
 - ✓ More years of crash data is required to identify weekend LT Crash Occurrence TOD trend
 - Total 2 or more weekend crashes for 10 years can be used for crash justification
- 2) More focus on High severity crash TOD should be offered.**
 - ✓ Count each Fatal or serious Injury Crash as 2 Crashes
- 3) Driver education on Protected LT only TOD operation is necessary.**
 - ✓ Protected LT Only by TOD, by Cycle, FYA Delay
 - ✓ 3 section FYA signal

Considerations

- 1) Protected LT TOD safety improvement should be made proactively**
 - ✓ High Permissive LT Crash locations during off peak hours
 - ✓ High fatal or Serious Injury Permissive LT Crash locations during off peak hours
 - ✓ High Permissive LT Crash locations involving Motorcyclist
- 2) Protected LT Only (24/7 or TOD) is recommended in following conditions**
 - ✓ High U Turn movement locations
 - ✓ High Truck Traffic Turning locations
 - ✓ Signalized intersection with high speed limits (55, 60mph)
- 3) Three section FYA signal is suitable for night-time only FYA operation**
 - ✓ Three section arrow Signal Head meets driver expectations at locations with Left Turn protected only for all daytime.



Considerations

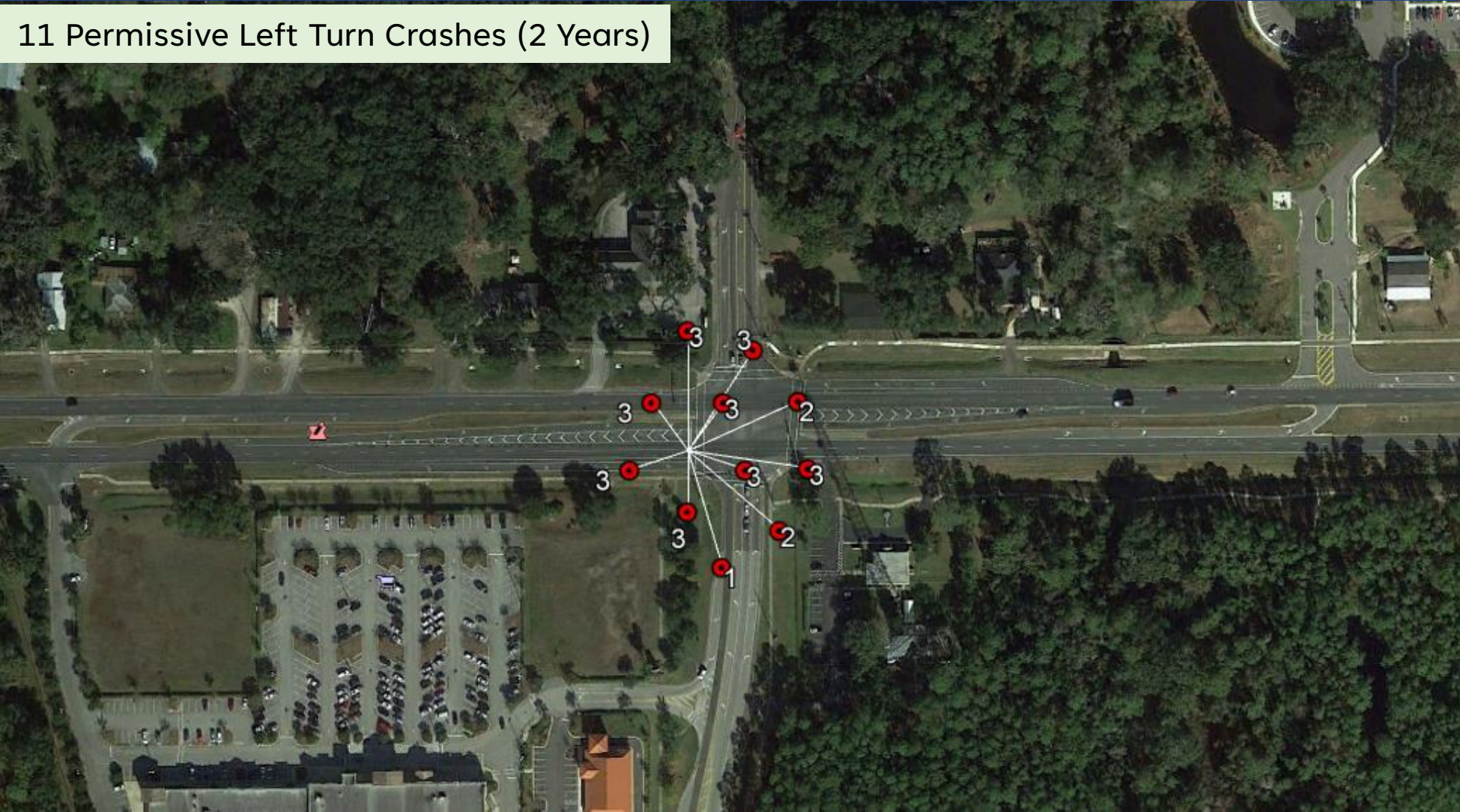
- 4) It is recommended to develop a Permissive Left Turn Crash identifier (at signalized Left Turn Locations) in Signal Four.

High Permissive Left Turn Crash Location Identification

Period: 2017 – 2018 ※ CAR data only complete until 2018
Location: D2
Object: All Crashes
(1,847 crashes with 18 fatalities and 1,835 injuries)
Purpose: High Permissive Left Turn Crashes at Signal Location Identification
Subset : VHCL_MOVE_CD = '03' [Turning Left] &
FRST_DR_ACTN_CD = '03' [Fail To Yield] &
TRAF_CTRL_CD = '05' [Traffic Signal] &
TOT_OF_PEDST_NUM = 0 [No Pedestrian] &
TOT_OF_PEDLCYCL_NUM = 0 [No Bicyclist]

Protected Left Turn Only Systematic Improvement

11 Permissive Left Turn Crashes (2 Years)



SR 16 & Kenton
Morris Rd,
St.Johns County

Protected Left Turn Only on Specific Night Hours



**US 441 & I 75
NB, Alachua
County**

- (WB LT) 6pm – 12am_Weekday & Weekend
- (EB LT) 7pm – 10pm_Weekday & Weekend

**TRANSPORTATION
SYMPOSIUM**

Protected Left Turn Only on Specific Night Hours

WB LT

Hour	2016	2017	2018	2019	2020	Sum			Volumes	
	WB	WB	WB	WB	WB	Total	Fatal	Injury	WB Left Turn	Cross Product
12-1									2	36
1-2									1	16
2-3									2	19
3-4									1	18
4-5									2	5
5-6									9	1,311
6-7			1			1		0	27	14,207
7-8									46	47,656
8-9	1					1		1	63	52,416
9-10									43	24,059
10-11									40	18,697
11-12									61	33,049
12-1					1	1		2	70	45,255
1-2									56	32,833
2-3			1			1		3	47	32,101
3-4									56	41,608
4-5									51	38,301
5-6									45	37,440
6-7									40	18,754
7-8	1	1				1,1		1,2	20	6,369
8-9			1		2	3		2	19	4,962
9-10			1	1		1,1		2,0	12	2,630
10-11		1				1		0	8	1,271
11-12				1		1		0	5	88
Total	2	2	4	2	3	13		13		

US 441 & I 75
NB, Alachua
County

TRANSPORTATION
SYMPOSIUM

Protected Left Turn Only on Specific Night Hours

EB LT

Hour	2016	2017	2018	2019	2020	Sum			Volumes	
	EB	EB	EB	EB	EB	Total	Fatal	Injury	EB Left Turn	Cross Product
12-1									6	158
1-2									2	46
2-3									0	1
3-4									0	1
4-5									2	19
5-6									12	1,929
6-7									20	6,564
7-8									33	19,998
8-9									57	33,687
9-10									68	34,310
10-11									64	34,751
11-12									53	35,676
12-1									88	68,552
1-2			1			1		0	68	50,956
2-3									44	37,312
3-4									78	79,404
4-5									73	75,190
5-6									57	66,462
6-7				1		1		0	46	28,906
7-8				1		1		6	45	19,187
8-9		1	1	1		2		2,5	35	11,984
9-10		1				1		4	23	6,411
10-11									17	2,954
11-12		1				1		3	20	351
Total		3	2	3	0	8	0	20		

US 441 & I 75
NB, Alachua
County

Protected LT Only TOD for Motorcycle Crashes

Analysis - S4Analytics | ODgzMTQ0MDE | https://signal4analytics.com/analysis

SIGNAL FOUR ANALYTICS | EVENT ANALYSIS

Crash data available from **January 1, 2014 to October 20, 2024** (with some exceptions). Last data update completed October 22, 2024 at 1:59 AM.

Search Crashes

Crashes in Duval County
From 1/1/2019 - 10/20/2024

With Attributes

- ✓ Left Turn
- ✓ Motorcyclists

- ✓ Motorcycle
- ✓ LT Crashes
- ✓ Since 2019
- ✓ Duval

Charting

Crash Severity

Severity	Count
Fatal (within 30 days)	65
Incapacitating Injury	96
Non-Incapacitating Injury	214
Possible Injury	141
No Injury	71

Alcohol Involved

Alcohol Involved	Count
Yes	22
No	655

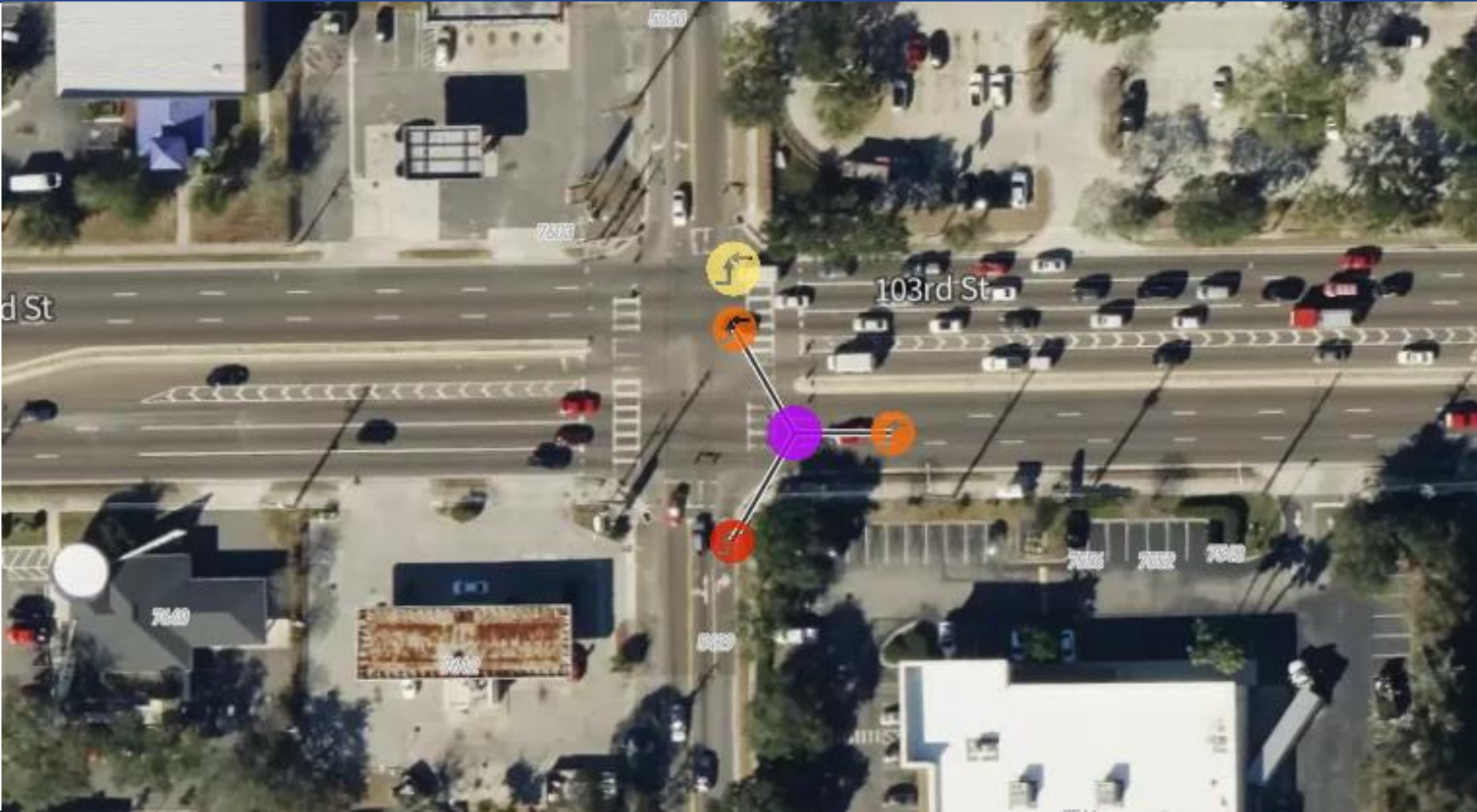
Day or Night

Injury Summary	Total	Fatal Crashes	Serious Injury Cras...	Injury Crashes	Property Damage ...
Crashes	577	55	96	355	71
Fatalities (within 30 Days)	59	59	0	0	0
Incapacitating Injuries	109	9	100	0	0
Non-Incapacitating Injuries	242	7	12	223	0
Possible Injuries	245	15	21	209	0
No Injuries	772	62	120	420	170
Non-Traffic Fatalities	0	0	0	0	0

Total records: 577 / Mapping Status: Mapped: 577 (Verified: 155 / Preliminary: 422) / Unmapped: 0

7:53 AM
10/22/2024

Protected LT Only TOD for Motorcycle Crashes

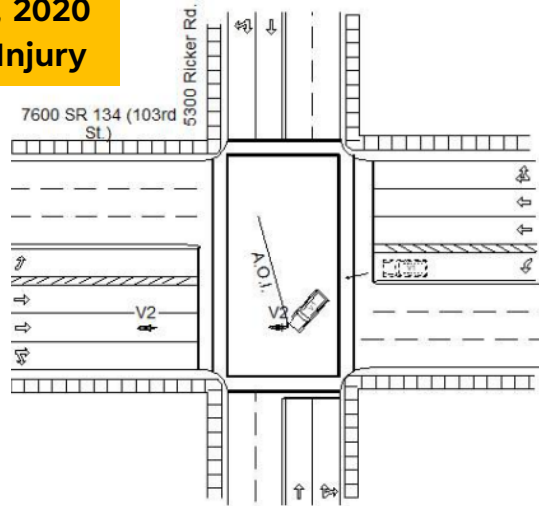


SR 134 & Ricker Rd, Duval County

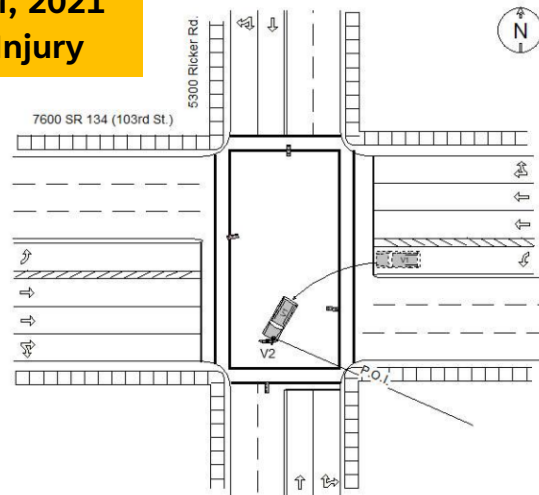
TRANSPORTATION SYMPOSIUM

Protected LT Only TOD for Motorcycle Crashes

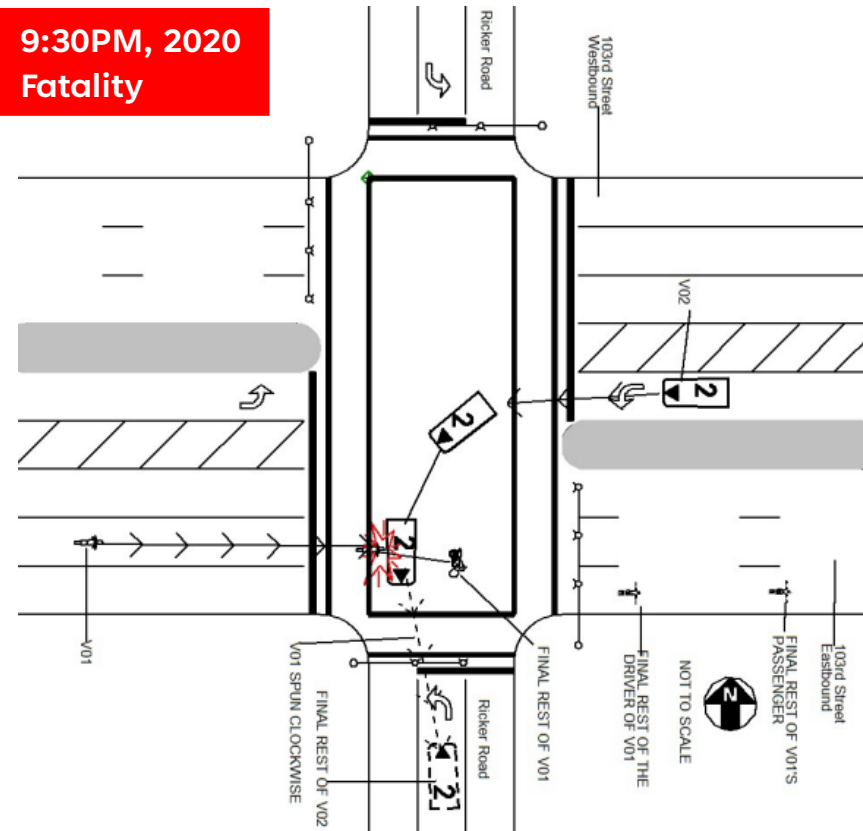
- ✓ 6:25AM, 2020
- ✓ Serious Injury



- ✓ 10:55PM, 2021
- ✓ Serious Injury

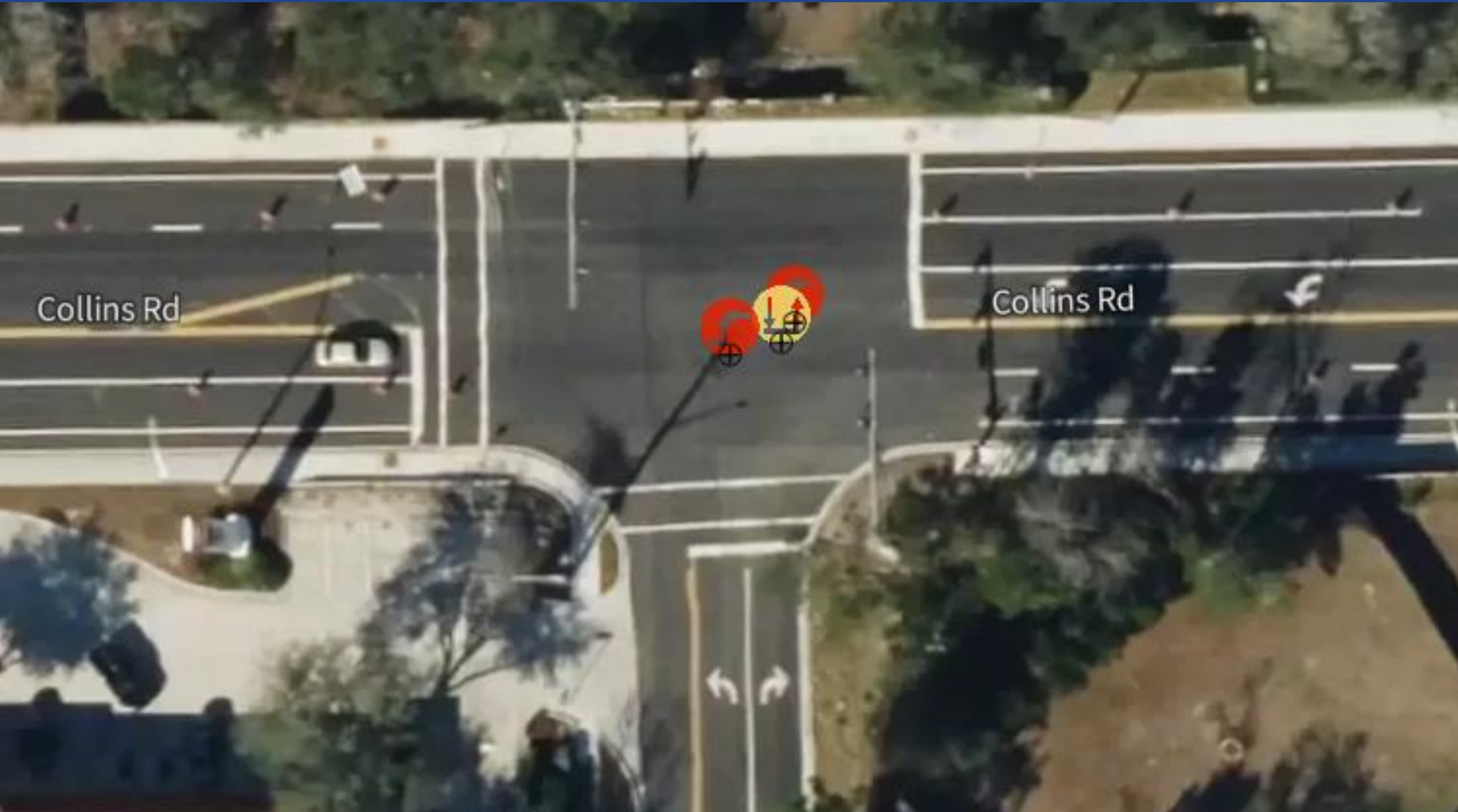


- ✓ 9:30PM, 2020
- ✓ Fatality



SR 134 & Ricker Rd, Duval County

Protected LT Only TOD for Motorcycle Crashes

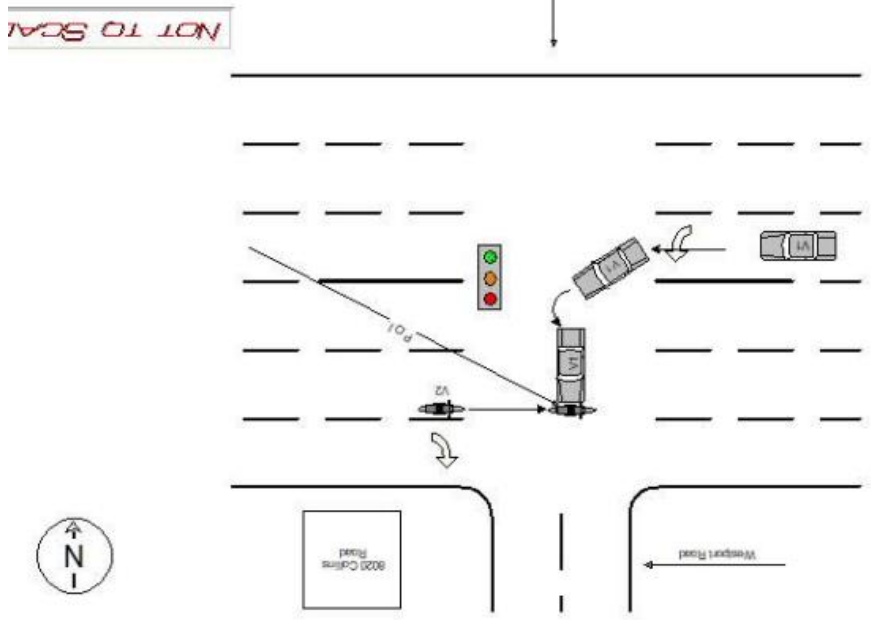


**Collins Rd &
Westport Rd,
Duval County**

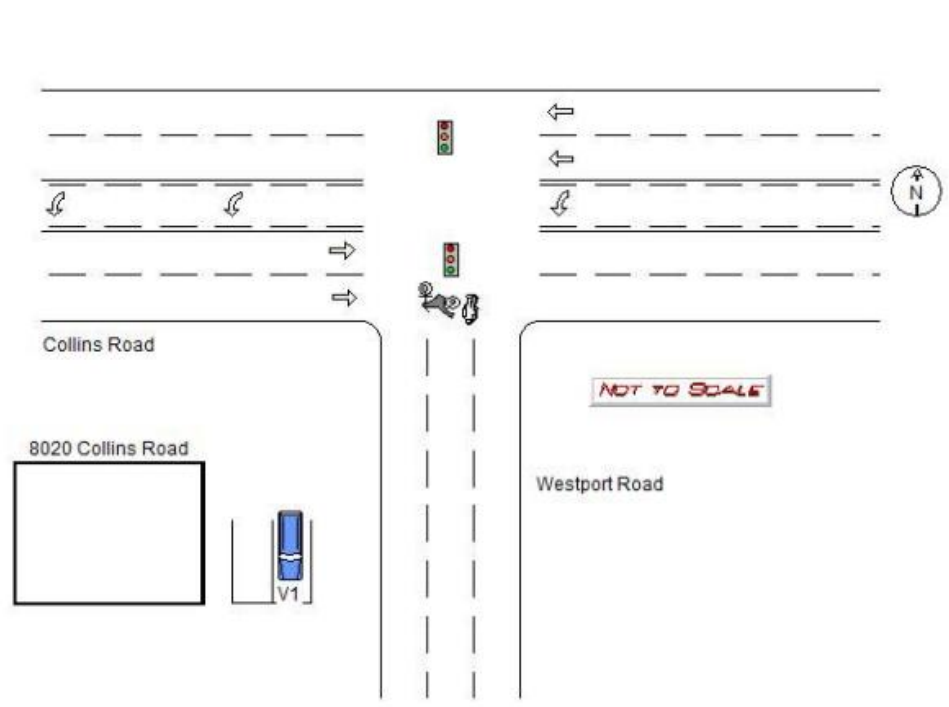
**TRANSPORTATION
SYMPOSIUM**

Protected LT Only TOD for Motorcycle Crashes

✓ 8:20PM, 2023
✓ Fatality

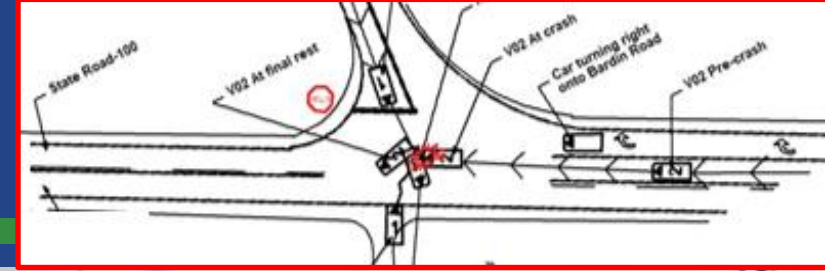


✓ 7:04PM, 2023
✓ Fatality



Collins Rd &
Westport Rd,
Duval County

Safety Message



Wait to make a left turn until the oncoming Right Turning Vehicle clears the intersection!!



Cody Ko, PhD, PE
cody.ko@dot.state.fl.us