



NORTH CAROLINA

Department of Transportation



U-5769 – Widening of NC 16 from Rea Rd to Waxhaw Pkwy

Travis Preslar, NCDOT Project Manager

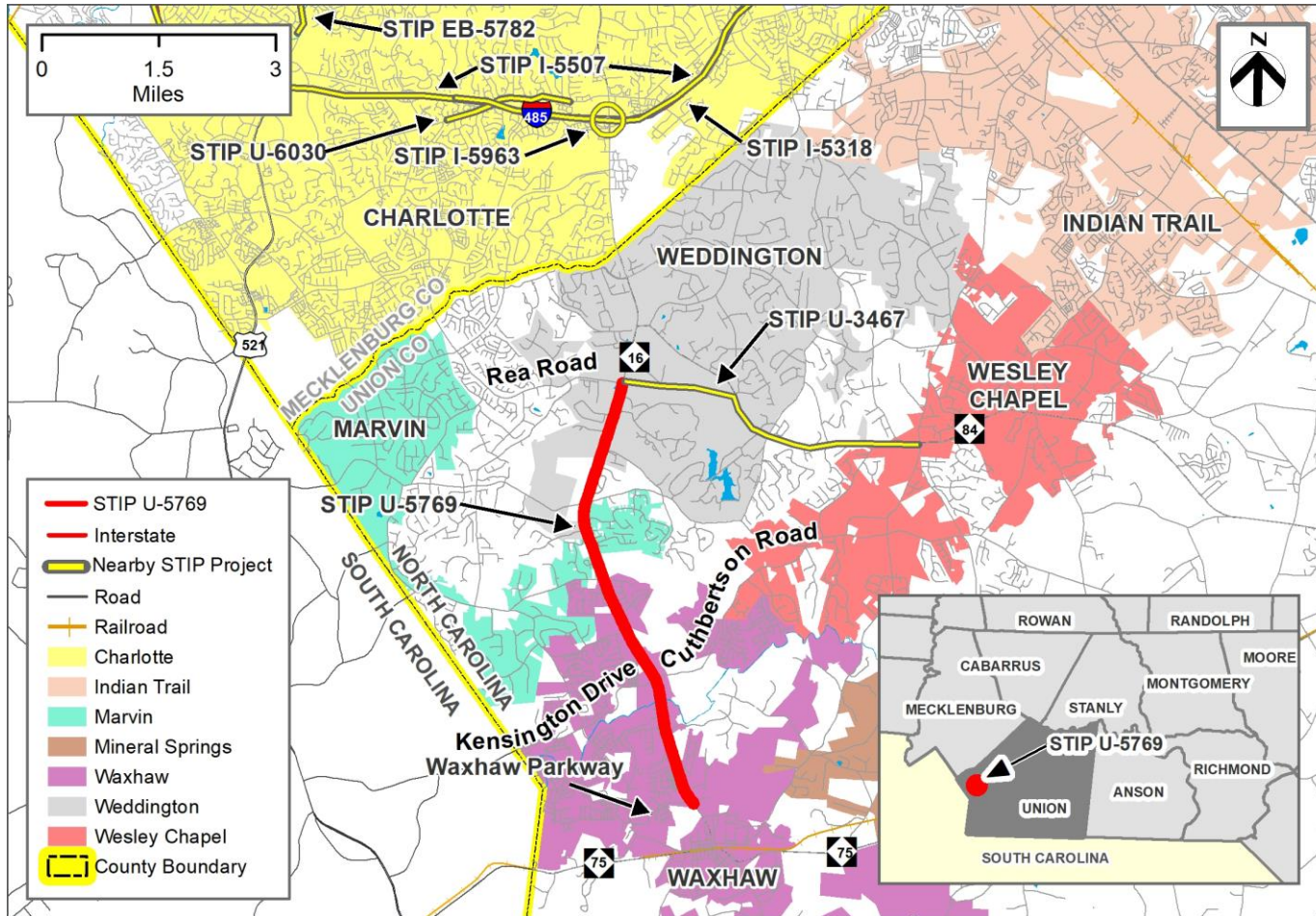
December 6, 2018

U-5769

- Scope - Widening of NC 16 between Rea Rd and Waxhaw Pkwy
- ROW – FY 2021
- Construction – FY 2023
- Traffic Analysis
 - Conventional intersection median divided widening (Alt 1)
 - Superstreet intersection median divided widening (Alt 2)

Project Context

Nearby STIP Projects



Project Context

Design Data/Existing Conditions

- **Functional Classification:**
Urban Minor Arterial
- **CTP Designation (Facility Type):**
Boulevard / Major Thoroughfare
- **Type of Access Control:**
None



NC 16 at New Town Rd

Project Context

Design Data/Existing Conditions

- **Typical Section:**
Two to Three Lanes
- **Right of Way:**
Varies approx. 60'-90'
- **Posted Speed:**
35 / 45 mph

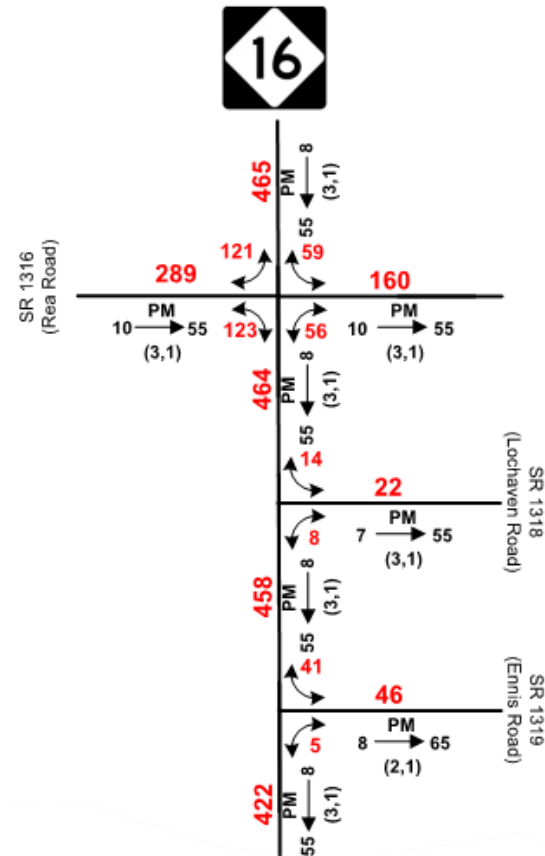


NC 16 at Kensington Dr / Cuthbertson Rd

Project Description and Purpose

NCDOT Proposes:

- To improve Providence Road South (NC 16) by widening to a four lane divided facility with a hybrid of conventional / superstreet typical sections.
- To relieve congestion and improve traffic operations.
- To improve safety as traffic volumes increase in the future.



2040 Average Annual Daily Traffic
(In 100s)

Median Divided Roadways vs. Two-Way Left-Turn Lanes (TWLTL)



1920s/30s Roads

1930 fatal rate 21.83 fatalities/100 MVMT

1920s/30s



1940s/50s Roads

1945 fatal rate 12.77 fatalities/100 MVMPT

1920s/30s 1940s/50s



1960s/70s Roads

1965 fatal rate 6.89 fatalities/100 MVMT

1920s/30s 1940s/50s 1960s/70s



1980s Roads

1985 fatal rate 2.97 fatalities/100 MVMPT

1920s/30s

1940s/50s

1960s/70s

1980s



5-Lane Roads: What we saw then (1970/80s)

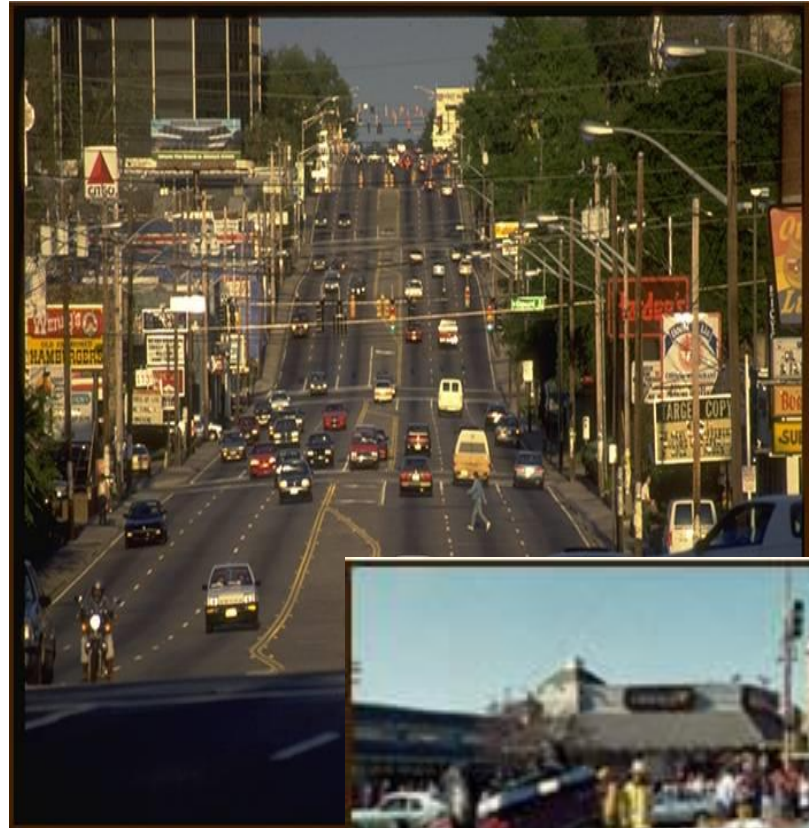
- A TWLTL is easier to construct than a median
- Don't need to keep installing left-turn lanes in the median
- Left-turn access provided to all properties



5-Lane Roads: What we know

- Through capacity greatly affected on thoroughfares
- Difficult for pedestrians to cross
- Encourages strip commercial dev't
- As roadway volumes increase, significant increase in crashes, especially severe crashes

now



5-Lane Roads: Perception vs. Reality

- *“The TWLTL is just fine, why do we need the inconvenience of a median? Medians are unsafe.”*
 - NC research indicates a median has safety advantages over a TWLTL for all locations except where mostly high density business/office land uses at lower traffic volumes less than about 22,000 vpd (NCSU, 2004)
 - Converting a TWLTL to a median can reduce the crash rate 37% and the injury rate 48% (TRB Access Management Manual, 2003)
 - Drivers often enter TWLTL from side street or driveway to merge into traffic. These drivers are traveling in the “wrong” direction in the TWLTL, creating a potentially dangerous conflict



5-Lane Roads: Perception vs. Reality

- *“People won’t be able to get to my business and I will have to close if I don’t have direct access.”*
 - Recent NC research indicates most businesses do statistically as well or better after median installation (NCSU, 2010)
 - FL, IA, MN, and TX studies indicate that the vast majority of businesses do as well or better along highways after access management projects are completed (FHWA, 2006)
 - Access can be improved via U-turns, service roads, frontage roads, connectivity to adjacent properties



5-Lane Roads: Perception vs. Reality

- *“U-turns are dangerous and unsafe.”*
 - U-turns are 25% safer than a direct left turn from a side street or other access point (Florida DOT, 2001)
- *“NCDOT hates TWLTLs.”*
 - Medians preferred on highways and thoroughfares
 - TWLTLs considered on local access roads



Today's Roads

2005 fatal rate 1.61 fatalities/100 MVMT

1920s/30s

1940s/50s

1960s/70s

1980s

1990s/2000s

TODAY



U-5769

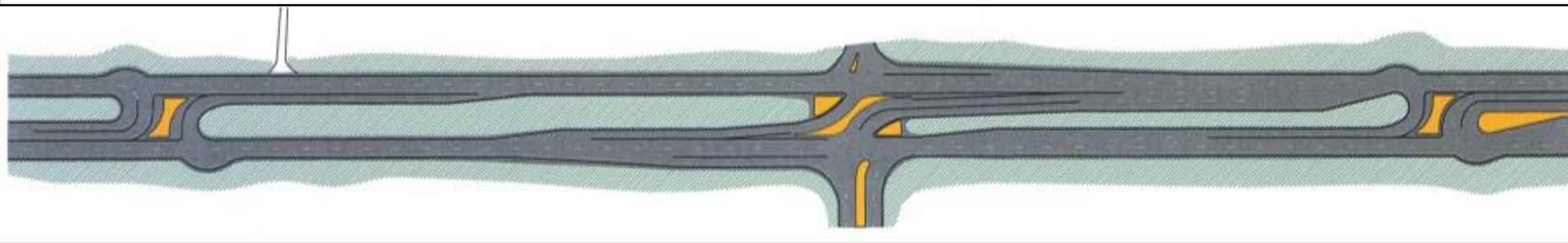
- Traffic Analysis
 - Conventional median divided widening (Alt 1)
 - Superstreet median divided widening (Alt 2)
- Conventional Full Movement Concept at the main intersections
- Superstreet concept with signalized uturns at main intersections
- Michigan lefts at main intersections with signalized uturns
 - Rea Rd and NC16
 - New Town Rd at NC16
 - Kensington/Cuthbertson at NC16

Previous Staff Input

May 16, 2018

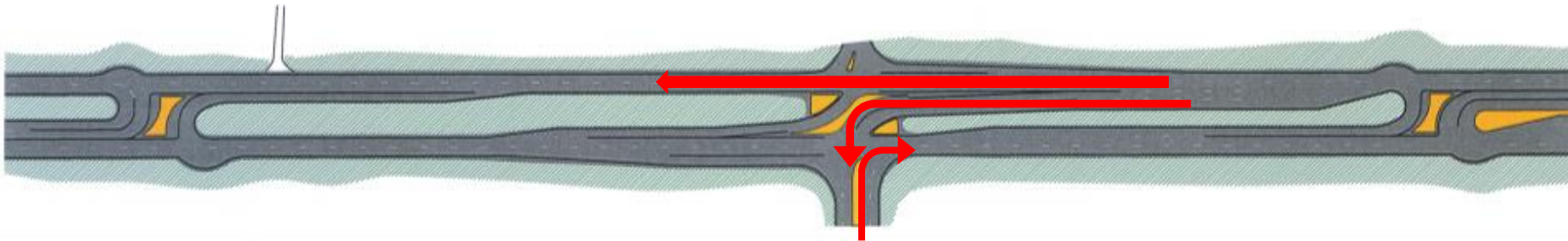
- Met with Staff from Weddington, Marvin, Waxhaw and Union County. Concerns shared:
 - Adding U-turn bulbs on NC 16 for Rea Rd intersection.
 - Concern that volumes at New Town Road were too low. Not allowing thru traffic could be problematic. Requested Michigan Left be investigated at New Town Rd intersection.
 - Did forecast account for future development near Waxhaw Parkway and Marvin Gardens off New Town Road.
 - Requested Michigan Left be investigated at Kensington Rd/ Cuthbertson Rd intersection.

Introduction to Superstreet Intersections



A type of intersection in which minor cross-street traffic is redirected from straight through or left at a divided roadway intersection.

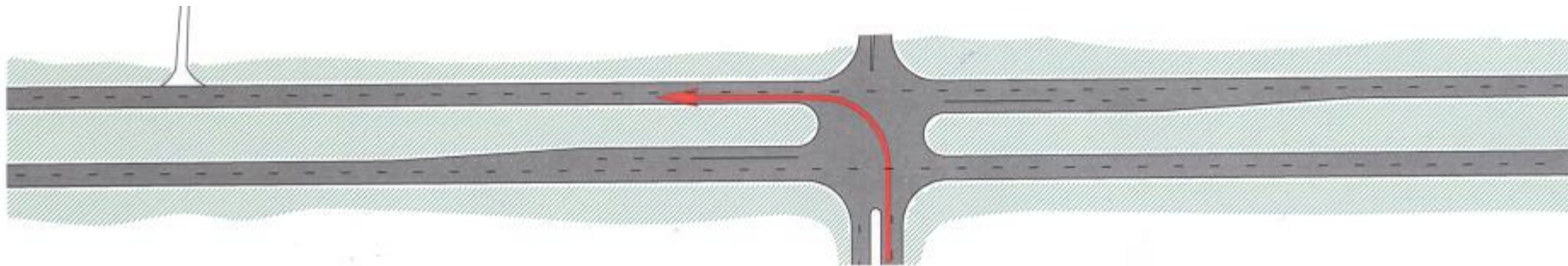
How a Superstreet Intersection Works



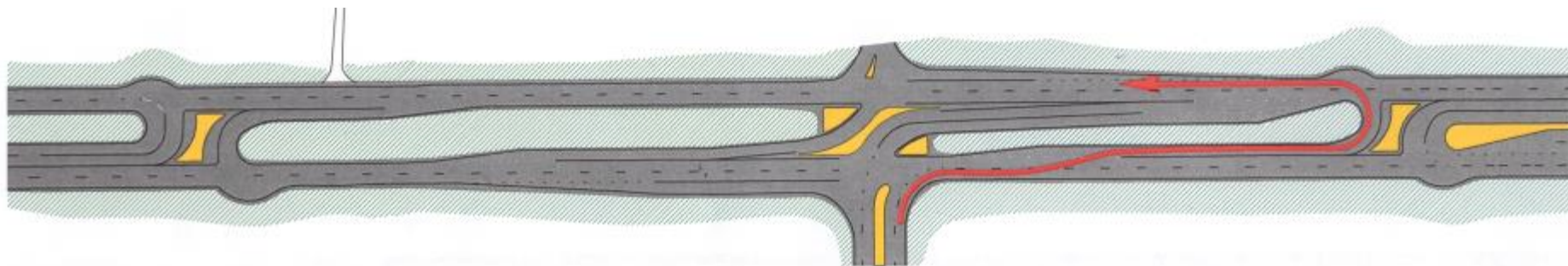
- **Allows direct left turns into the side street**
- **Left turns-in overlap with right turns-out**

Redirected Left Turn

CONVENTIONAL INTERSECTION

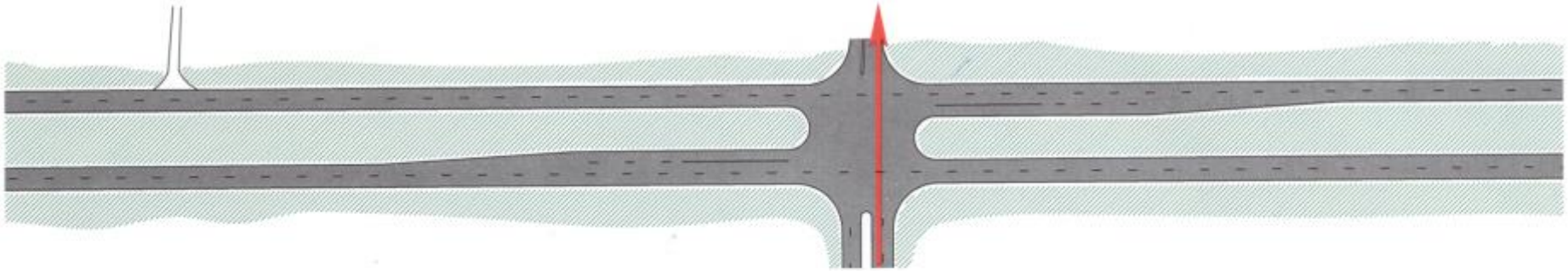


SUPERSTREET INTERSECTION

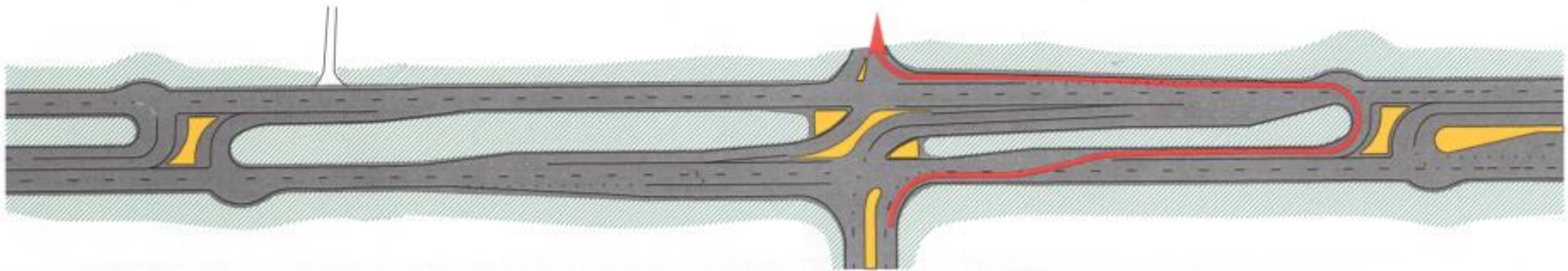


Redirected Through Movement

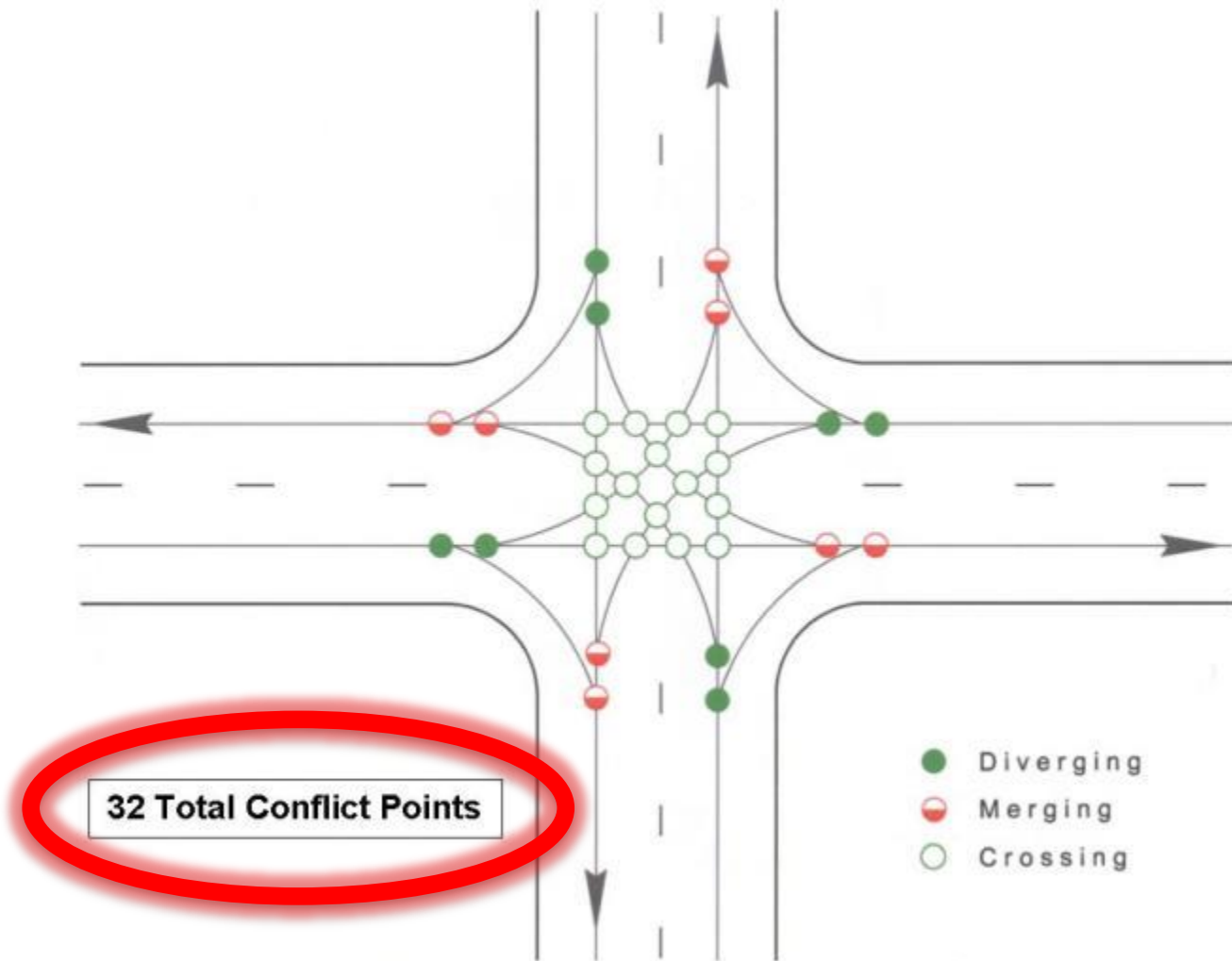
CONVENTIONAL INTERSECTION



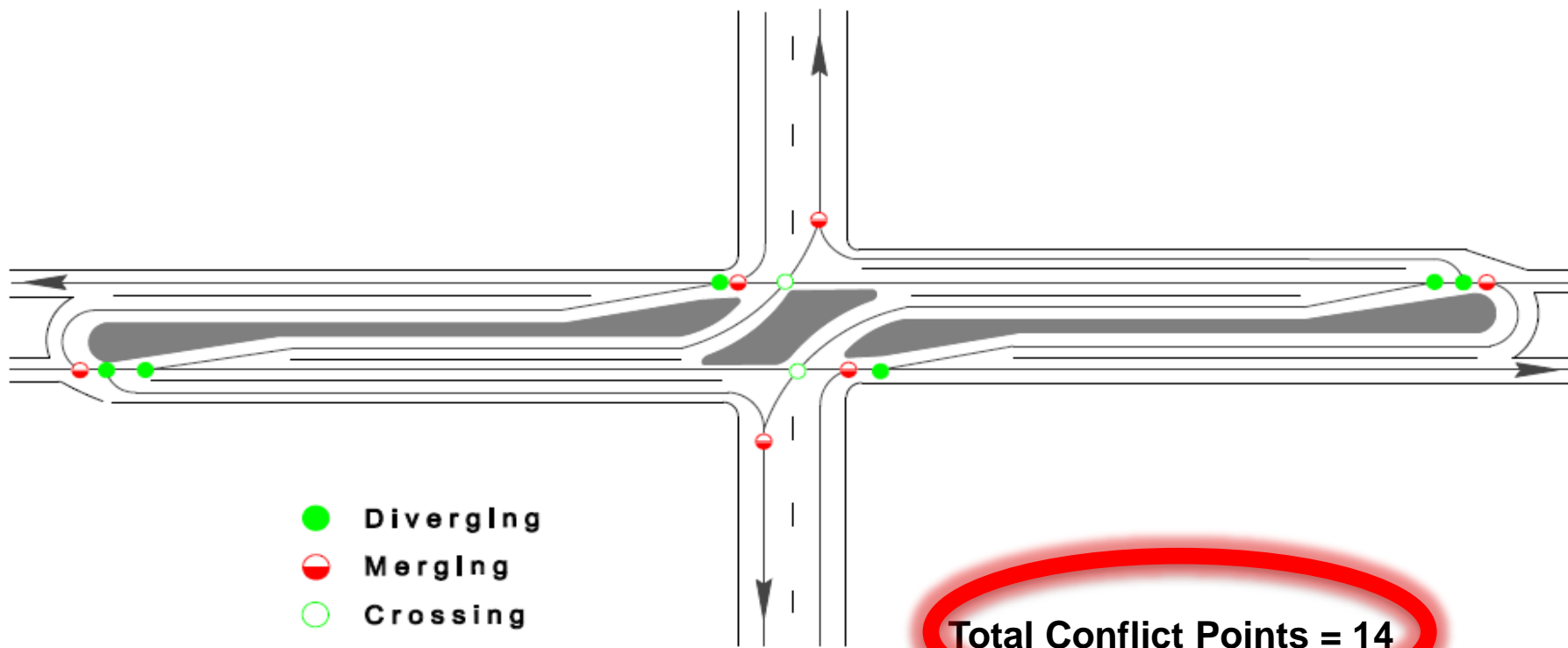
SUPERSTREET INTERSECTION



Traditional Intersection Conflict Points

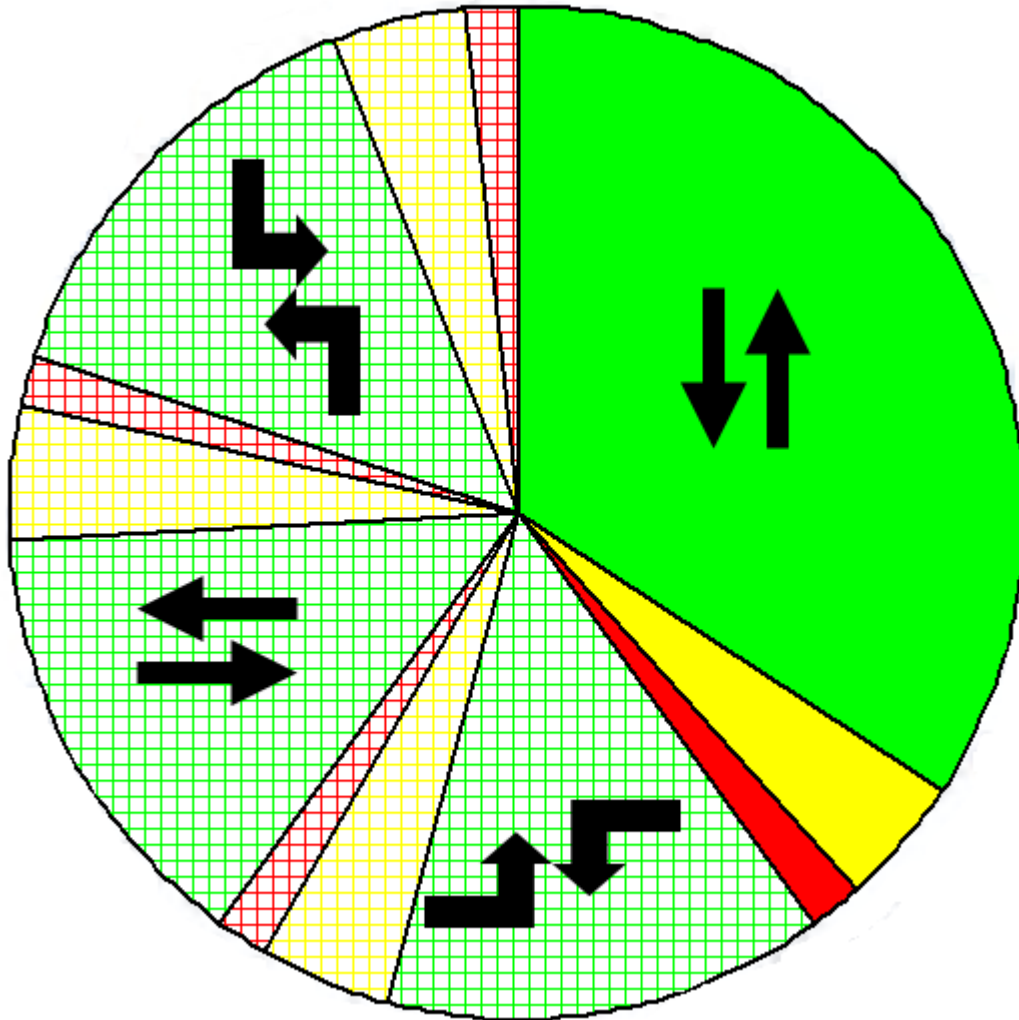


Superstreet Intersection Conflict Points

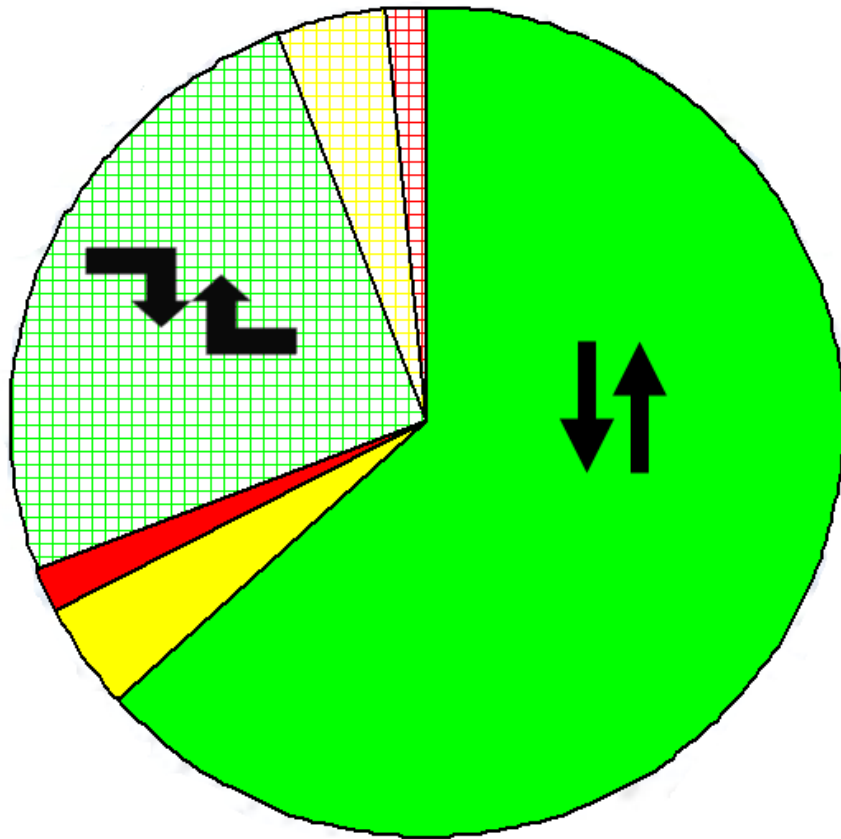


Fewer—and less severe—crashes

Traditional Intersection Signal Cycle

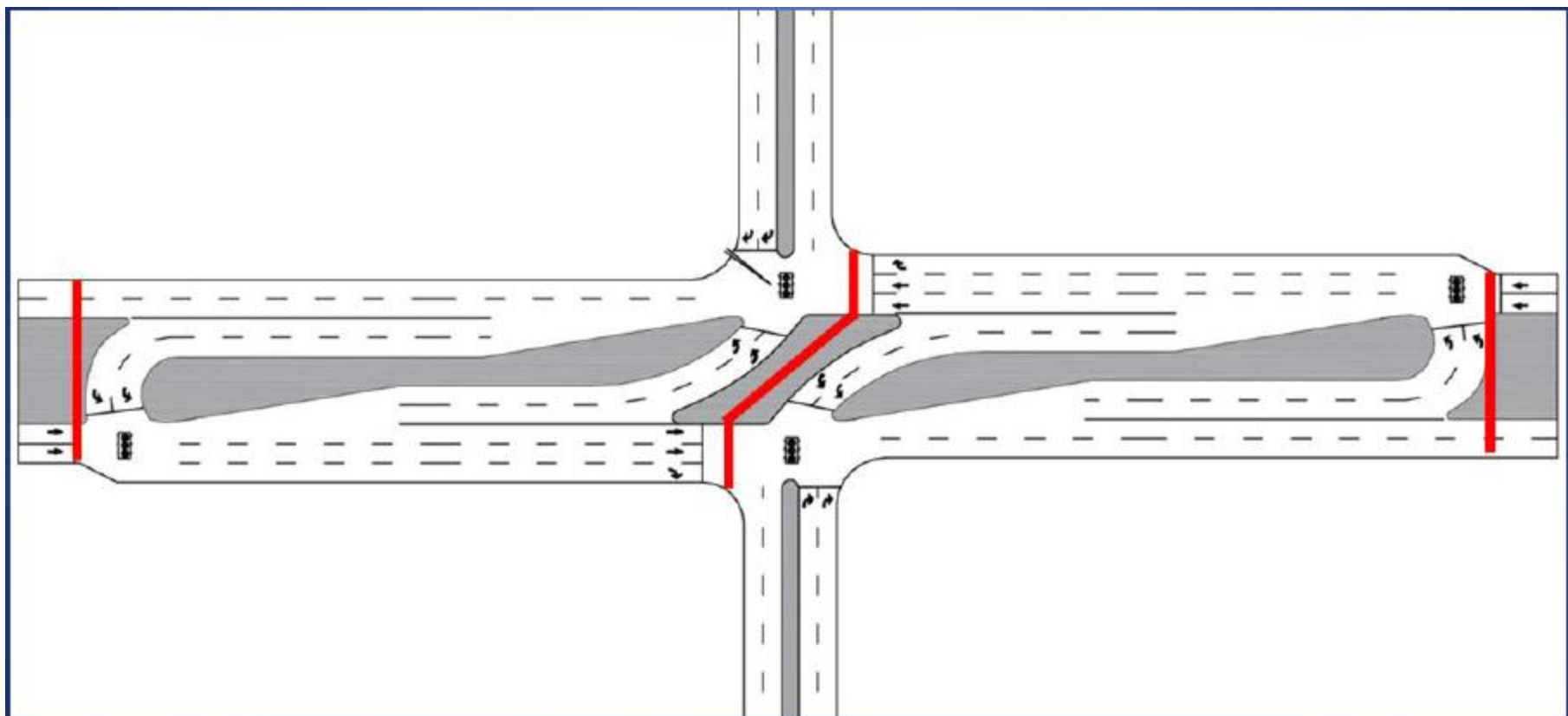


Superstreet Intersection Signal Cycle

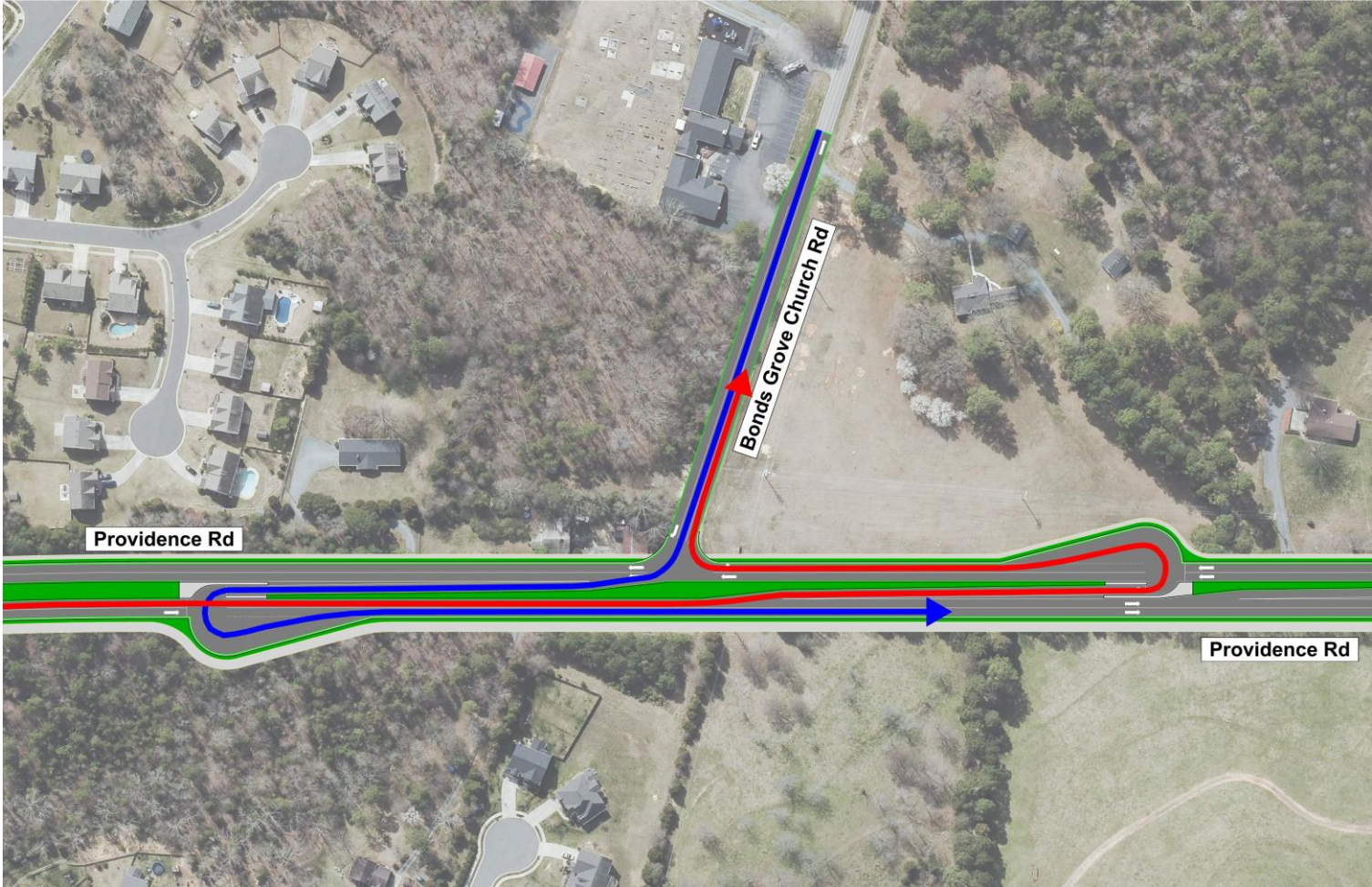


Superstreet Benefits

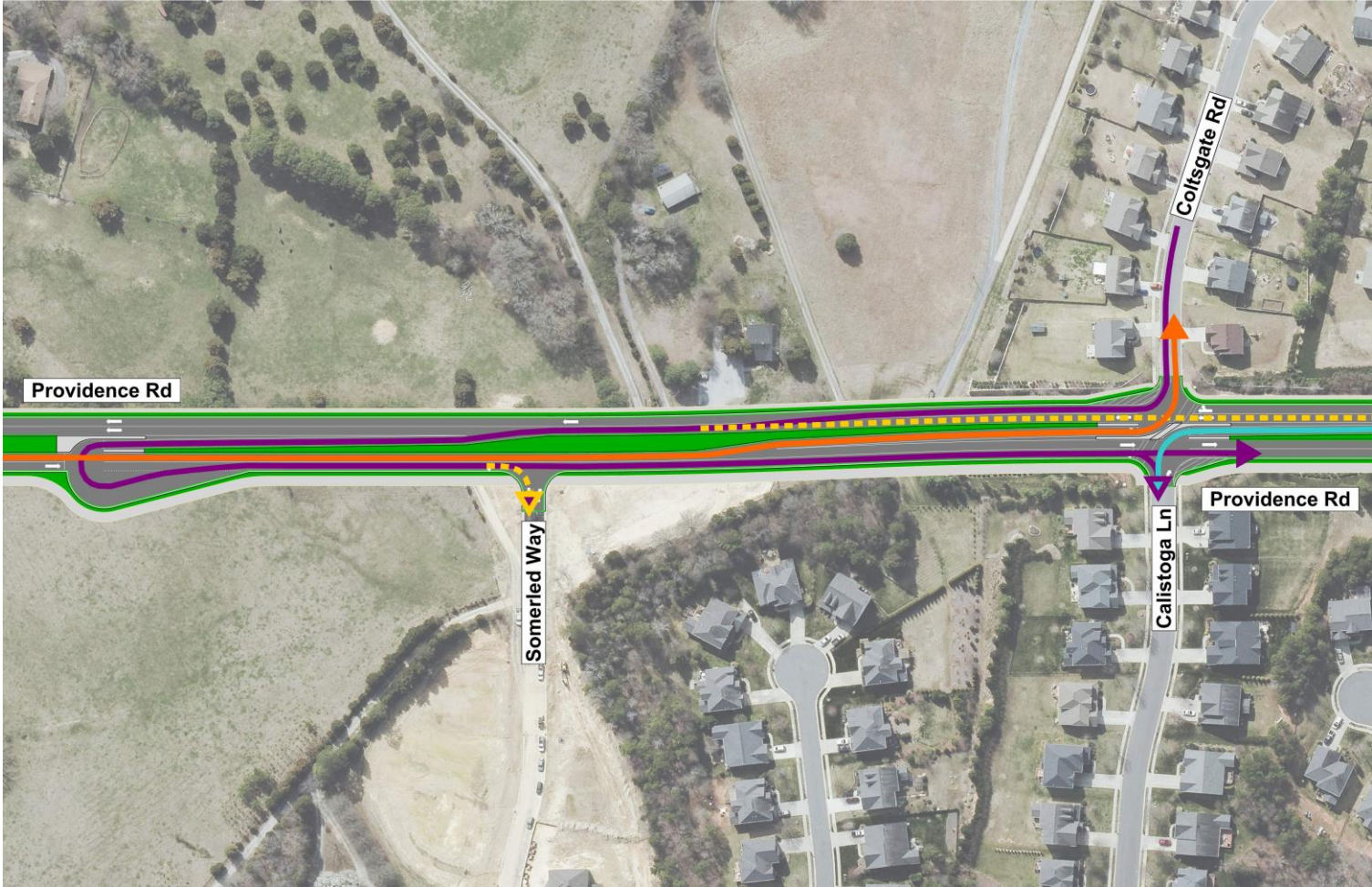
Pedestrians



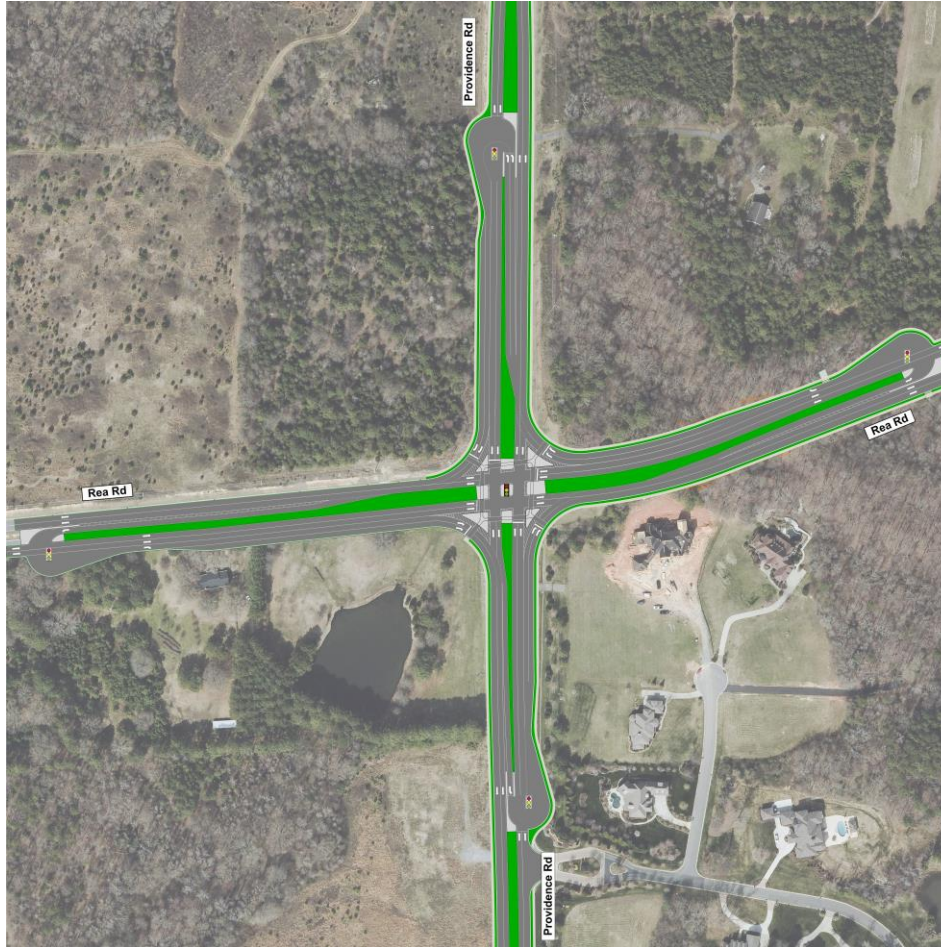
Design Concepts Superstreet Alignment



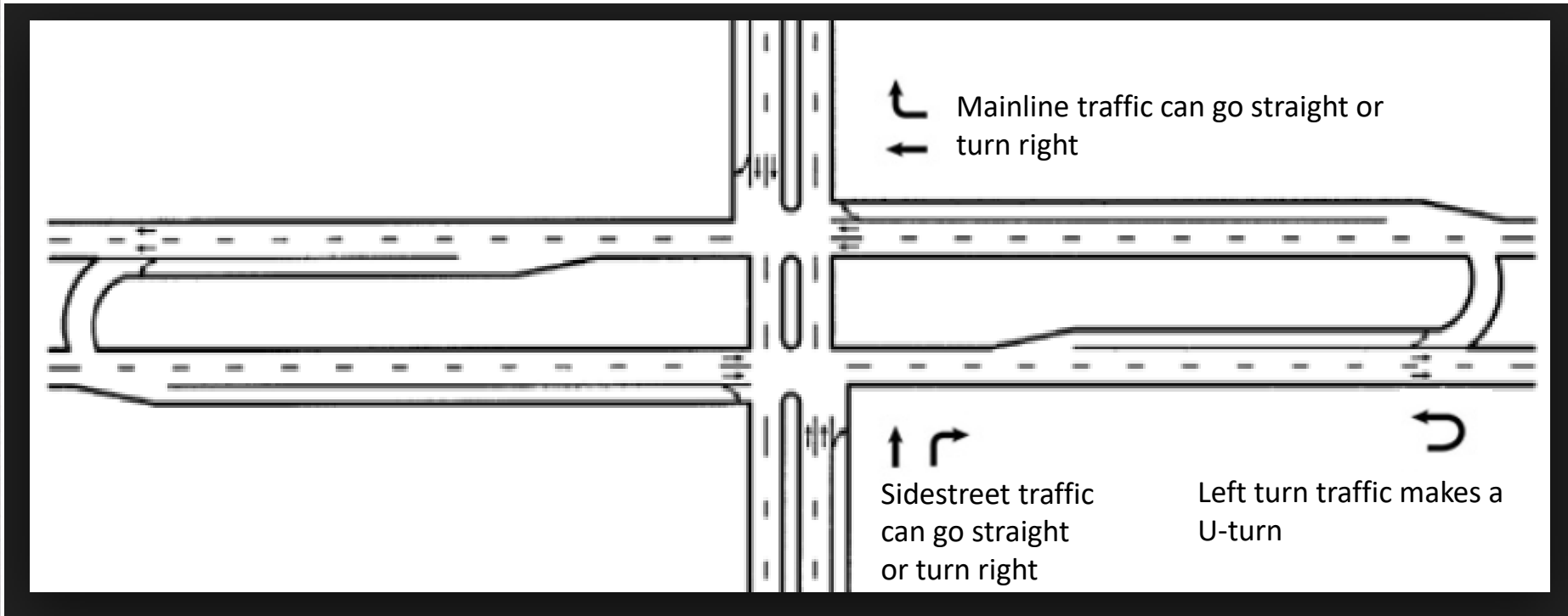
Design Concepts Superstreet Alignment



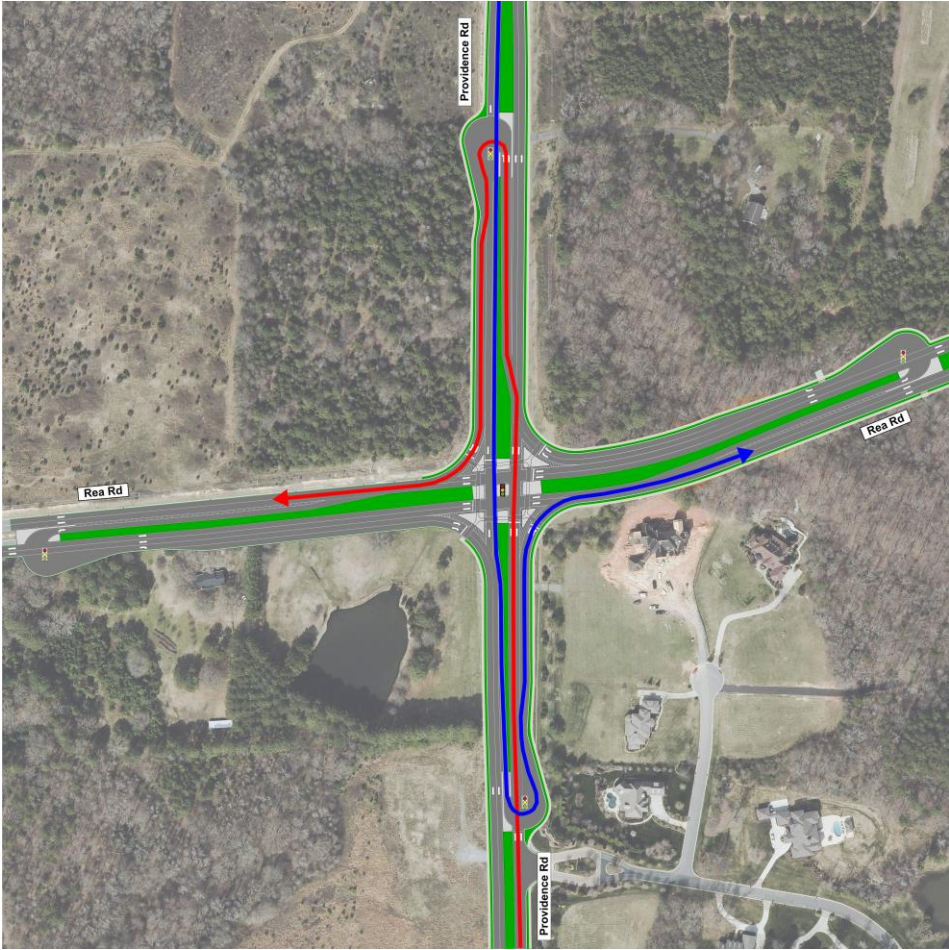
Design Concepts Michigan Left Intersection



Michigan Left Layout



Design Concepts Michigan Left Intersection



Design Concepts Michigan Left Intersection



Superstreet Examples

US 17 – Leland, NC



Superstreet Examples

NC 55 – Holly Springs, NC



Superstreet Examples

NC 24/27 – Locust, NC



Superstreet Examples

US 74 – Indian Trail, NC (under construction)



Travel Delay

NC 16 (Providence Road) at:	LOS (AM/PM)			Average Delay (seconds)			Total Delay (hours)		
	No Build	Alt 1	Alt 2	No Build	Alt 1	Alt 2	No Build	Alt 1	Alt 2
Rea Road	E/E	D/D	C/C	66.4	49	28.1	647.4	610.46	362.57
New Town Road	E/F	D/D	NB (C/B) SB (B/C)	86.6	41.75	33.8	653.93	475.49	416.87
Bonds Grove Church Road*	D/E	C/C	B/A	47.2	23.65	24.38	356.9	271.98	293.85
Gray Byrum Road*	B/C	B/B	B/B	22.1	11.95	15.65	164.52	135.1	180.84
Cuthbertson Road / Kensington Drive	E/E	D/D	C/C	62	49.35	26.4	415.92	508.58	280.87
Prescott Village Parkway	B/B	A/A	B/B	14.3	9.1	13.05	91.04	90.24	132.68

* - Based on three legged intersection. Delay will change after fourth leg is added.

Travel Time along Corridor

Time Period	ID	Segment		Alternative 1				Alternative 2			
				Northbound		Southbound		Northbound		Southbound	
		From:	To:	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)	Travel Time (min)	Speed (mph)
AM	1	SR 1316 (Rea Rd.)	SR 1315 (New Town Rd.)	3.4	29	4.5	25	3.3	29	2.9	34
	2	SR 1315 (New Town Rd.)	SR 1307 (Bonds Grove Church Rd.)	2.2	25	2.1	26	2.0	24	1.8	34
	3	SR 1307 (Bonds Grove Church Rd.)	SR 1306 (Gray Byrum Rd.)	1.7	25	1.8	23	1.7	32	1.4	35
	4	SR 1306 (Gray Byrum Rd.)	SR 1305 (Kensington Dr.)	1.7	25	2.3	18	1.8	31	1.9	22
	5	SR 1305 (Kensington Dr.)	SR 3530 (Waxhaw Pkwy.)	4.7	23	3.7	29	4.5	23	3.3	32
	Total				13.6	26	13.2	26	13.1	27	11.2
PM	1	SR 1316 (Rea Rd.)	SR 1315 (New Town Rd.)	3.5	28	4.9	23	3.0	32	2.9	33
	2	SR 1315 (New Town Rd.)	SR 1307 (Bonds Grove Church Rd.)	2.1	26	2.1	25	1.9	26	2.1	29
	3	SR 1307 (Bonds Grove Church Rd.)	SR 1306 (Gray Byrum Rd.)	1.4	29	1.8	24	1.5	35	1.5	33
	4	SR 1306 (Gray Byrum Rd.)	SR 1305 (Kensington Dr.)	1.5	29	2.0	22	1.6	34	2.2	19
	5	SR 1305 (Kensington Dr.)	SR 3530 (Waxhaw Pkwy.)	3.8	29	3.9	28	3.9	26	3.3	32
	Total				12.2	29	13.0	26	12.0	29	12.0

NC 16 and New Town Road

- Approved development was included in forecast

Additional Analysis

NC 16 (Providence Road) at SR 1315 (New Town Road)
Standard Configuration versus Michigan Left Configuration

Volume Growth	NC 16 (Providence Road) at:	Standard Configuration						Michigan Left Configuration					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		Overall LOS	Delay	Max v/c	Overall LOS	Delay	Max v/c	Overall LOS	Delay	Max v/c	Overall LOS	Delay	Max v/c
Current 2040 Volumes	U-Turn north of New Town Road	B	19.3	0.77	B	15.6	0.77	B	16.9	0.80	B	17.7	0.88
	EB SR 1315 (New Town Road)	B	11.8	0.69	C	22.4	0.87	B	13.0	0.92	B	12.4	0.92
	WB SR 1315 (New Town Road)	C	21.5	0.87	B	11.9	0.68				B	12.1	0.76
	U-Turn south of New Town Road	B	11.0	0.81	B	15.2	0.72	B	13.2	0.86	B	12.1	0.76
50% Growth	U-Turn north of New Town Road	C	23.4	0.87	C	25.1	0.91	C	24.5	0.88	C	26.2	0.93
	EB SR 1315 (New Town Road)	B	13.7	0.82	D	43.6	1.06	C	23.7	1.00	C	22.9	1.01
	WB SR 1315 (New Town Road)	D	44.9	1.06	B	13.4	0.82				B	16.7	0.81
	U-Turn south of New Town Road	C	23.0	0.92	C	20.9	0.86	B	19.7	0.92	B	16.7	0.81
100% Growth	U-Turn north of New Town Road	D	35.8	0.99	D	37.2	0.98	D	40.0	0.99	D	42.9	1.01
	EB SR 1315 (New Town Road)	B	18.9	0.91	F	88.2	1.19	D	45.2	1.10	D	43.3	1.09
	WB SR 1315 (New Town Road)	F	89.9	1.22	B	18.2	0.90				C	28.2	0.96
	U-Turn south of New Town Road	D	36.8	0.99	C	31.6	0.97	C	28.2	0.96	C	24.1	0.88

NC 16 and New Town Road

- Additional Analysis Michigan Left vs. Conventional Intersection.

New Town Delay Comparison

Movement	Overall Delay (sec)			
	Conventional AM	Conventional PM	Michigan Left AM	Michigan Left PM
EBL	70.4	68.2	85.6	80.3
EBT	68.0	116.9	31.1	43.5
EBR	60.5	64.6	39.0	50.4
WBL	77.4	96.2	78.9	75.1
WBT	80.1	62.5	50.6	29.3
WBR	27.4	26.6	51.6	33.9
NBU	91.7	124.3	48.6	49.3
NBL	91.7	124.3	47.0	56.5
NBT	38.5	26.5	21.3	15.3
NBR	4.9	5.8	13.1	13.1
SBL	69.5	80.5	57.8	52.7
SBT	39.0	50.5	19.4	25.0
SBR	39.0	50.5	17.8	17.8
Overall	46.5	51.0	28.3	27.7



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Questions/Discussion