

SELECTING AN ALTERNATIVE INTERSECTION DESIGN OVER A TRADITIONAL INTERSECTION

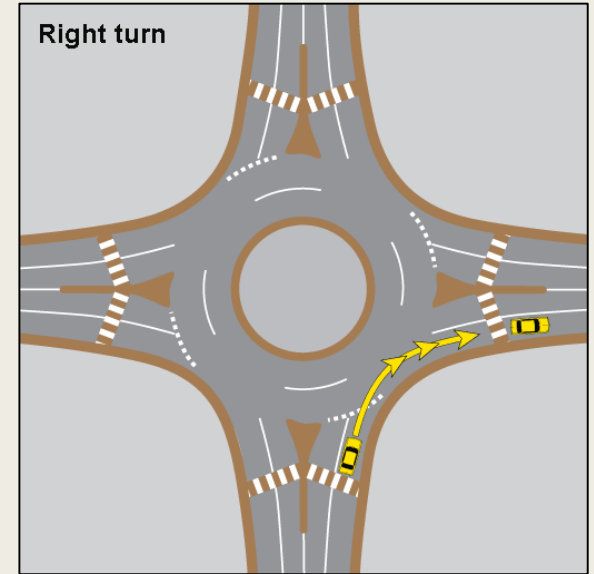


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T3 Design Corporation

ALTERNATIVE INTERSECTION DESIGNS



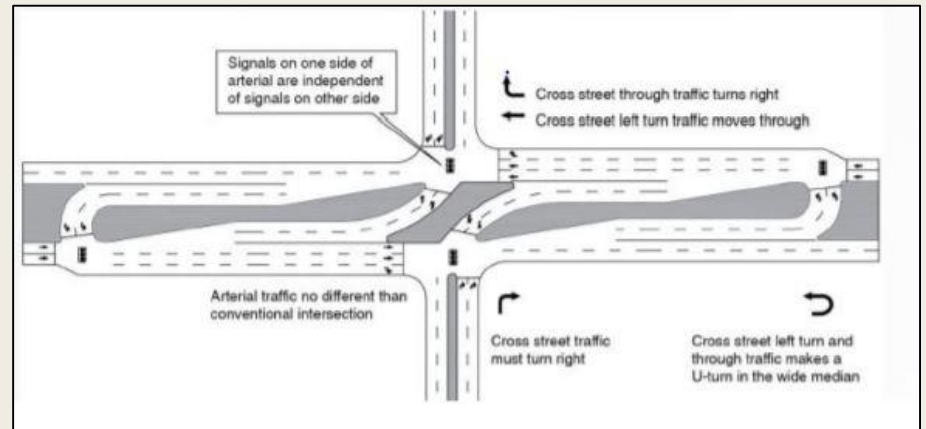
Continuous Green T



Roundabout

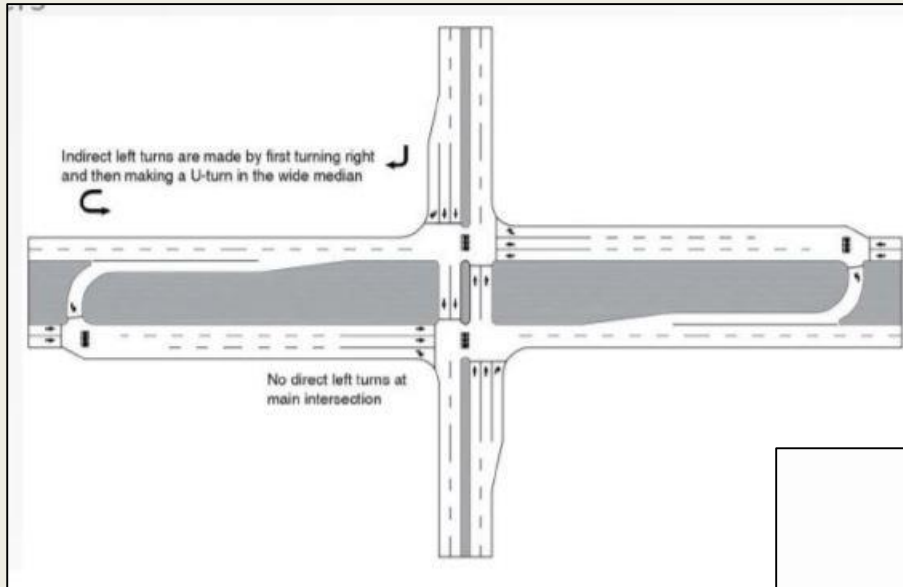


Quadrant Roadway Intersection

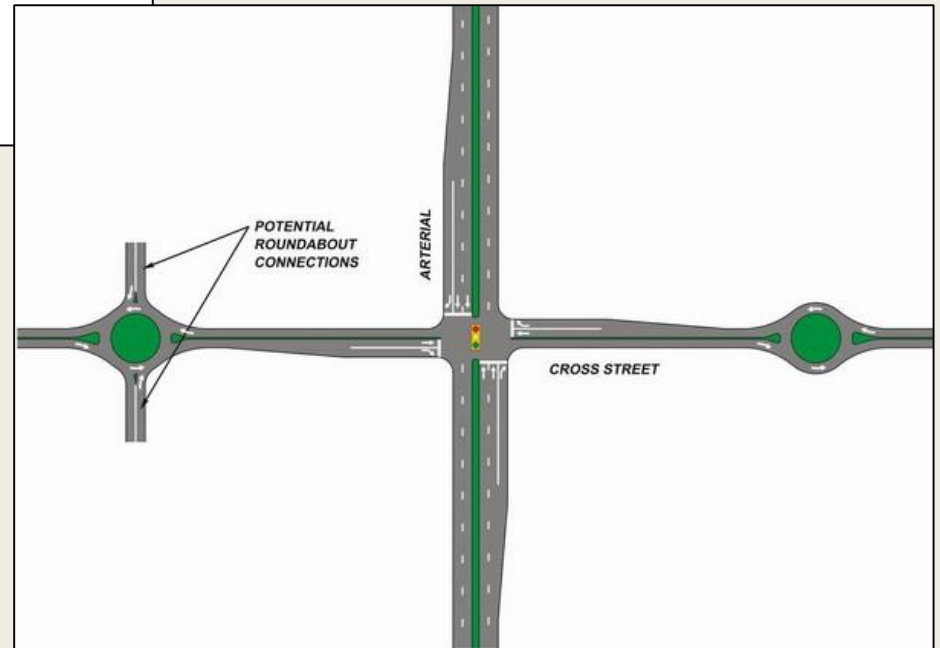


Restricted Crossing U-Turn (RCUT)

ALTERNATIVE INTERSECTION DESIGN

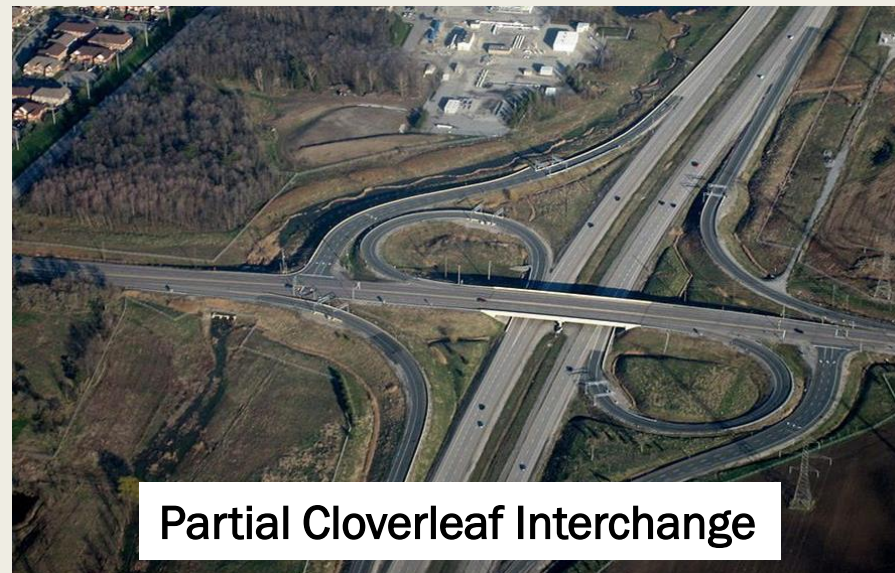
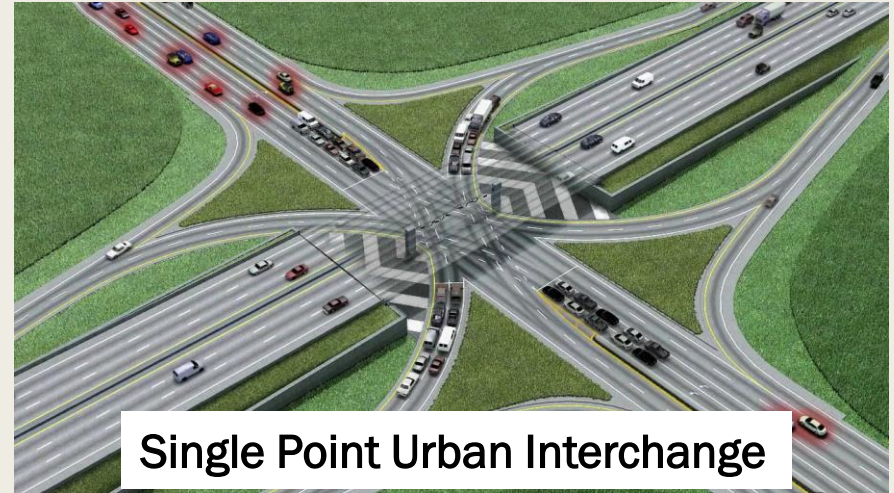


Median U-Turn



Bowtie Intersection

INNOVATIVE INTERCHANGE DESIGN



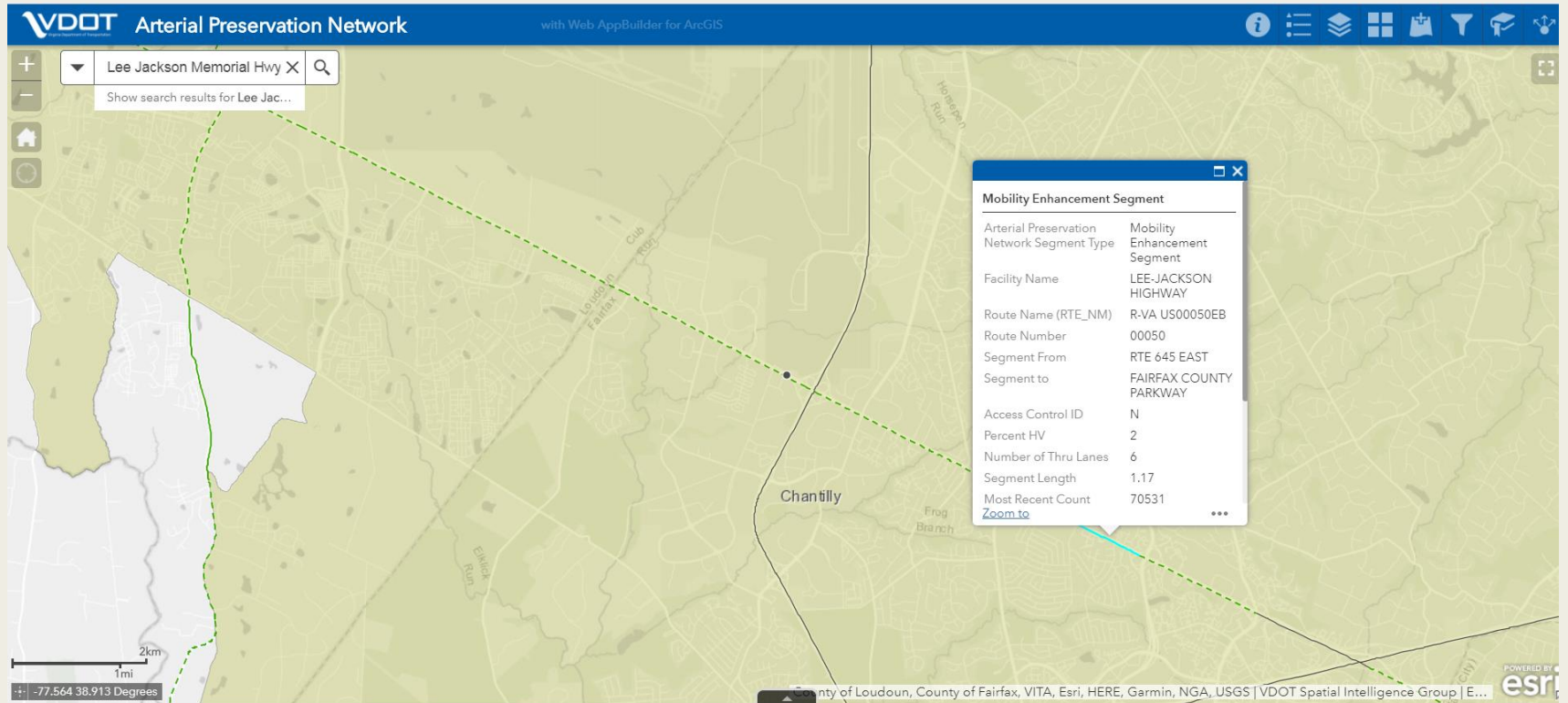
WHY CONSIDER AN ALTERNATIVE?

- Conventional signalized intersection is sometime insufficient to solve congestion and safety problems
- Alternative intersection design may solve congestion and safety issues
- Improve safety for pedestrians and bicyclists
- Can be cost effective

VDOT – SIGNAL JUSTIFICATION REPORT (SJR)

- VDOT's IIM-TE-387.0; July 2017
- To prioritize mobility and safety for all modes of transportation on an arterial
- Certain roadways within Virginia are designated as “Arterial Preservation Network”
 - *Mobility Preservation Segments*
 - *Mobility Enhancement Segments*

ARTERIAL PRESERVATION NETWORK



VDOT – SIGNAL JUSTIFICATION REPORT (SJR)

- SJR has basic requirements
 - *Traffic signal shall not be installed without prior approval of an SJR*
 - *Considerations for roundabout and other alternative designs. Viable alternative intersection shall be evaluated using VJuST*

VDOT JUNCTION SCREENING TOOL

- A sketch level level tool developed by VDOT to assist transportation engineers/planners when considering alternative intersection design
- VDOT altered Cap-X tool
- Includes 26 alternative intersections/interchange design

VDOT JUNCTION SCREENING TOOL

- VJuST Scoring System
 - Congestion
 - Pedestrians
 - Safety
- Input Parameters
 - Traffic volume
 - Lane Configuration

CONGESTION CALCULATION

- Congestion – Indicated in terms of volume/capacity ratio (v/c)
- V/C varies with lane configuration and traffic volume
- Alternative intersection/interchange designs are divided into different zones and v/c for each zone is calculated




INPUT WORKSHEET

VDOT Junction Screening Tool

Input Worksheet

Project Title:	<i>Rte 28 Improvements</i>
E-W Facility:	<i>Rte 28 Improvements</i>
N-S Facility:	<i>US 17</i>
Date:	

Traffic Volume Demand

Direction	Volume (veh/hr)			Truck Percent (%)
	U-Turn / Left	Through	Right	
				
Eastbound	235	390	215	2.00%
Westbound	100	725	80	2.00%
Northbound	305	720	50	2.00%
Southbound	175	1220	130	2.00%
Adjustment Factor	0.80	0.95	0.85	
Suggested	U - 0.8	L - 0.95	0.85	
Truck to PCE Factor	Suggested = 2.00			2.00
Critical Lane Volume				1600

SAFETY

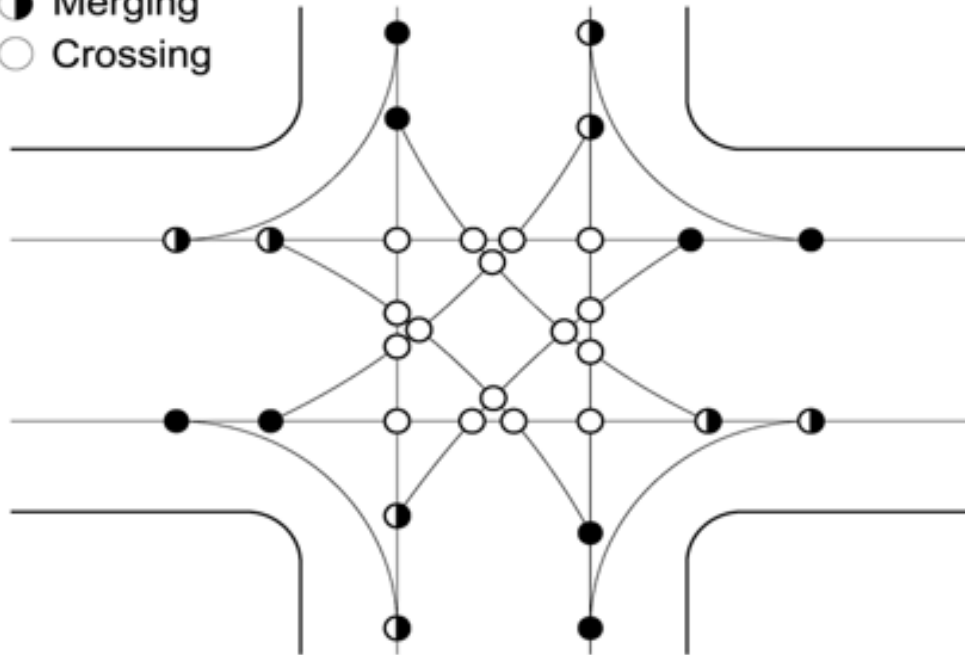
- For each alternative design conflict points are weighted for;
 - Crossing
 - Merging
 - Diverging
- Conflict points are weighted based on the cost of each conflict point in VA

SAFETY



Safety - Conflict Point Diagram

- Diverging
- ◐ Merging
- Crossing



Conflict Type	Count
Crossing	16
Merging	8
Diverging	8
Total	32

Conflict Type	Weight
Crossing	2
Merging	1
Diverging	1

Weighted Total Conflict Points

48

EXAMPLE - INTERSECTION

ROUTE 28 AT US 17

Conventional Signalized Intersection

Project Name:	Rte 28 Improvements	Critical Lane Volume Sum			
EW Facility:	Rte 28 Improvements	< 1200	1200 - 1399	1400 - 1599	≥ 1600
NS Facility:	US 17	VOLUME / CAPACITY RATIO:		1.13	
Date:					

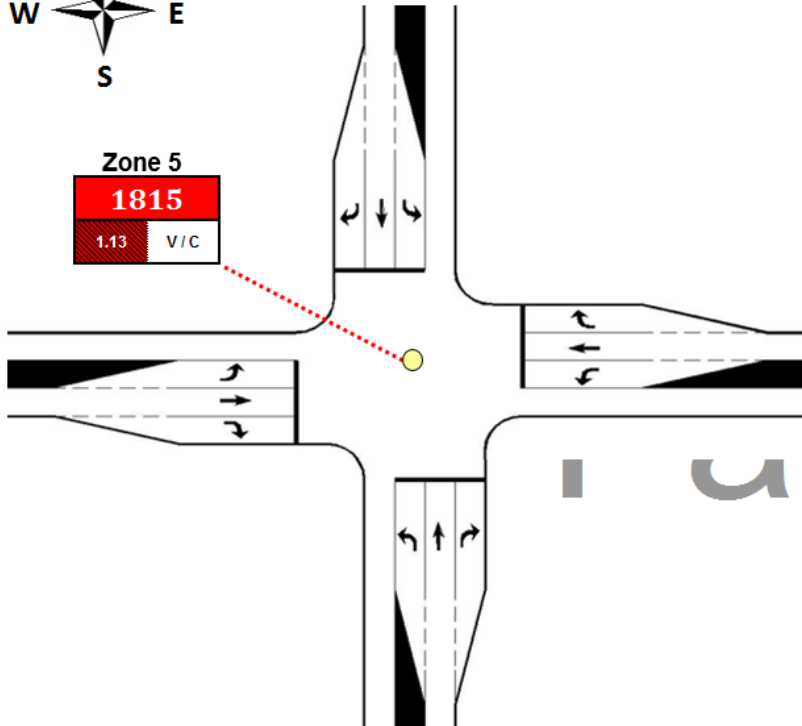


Zone 5

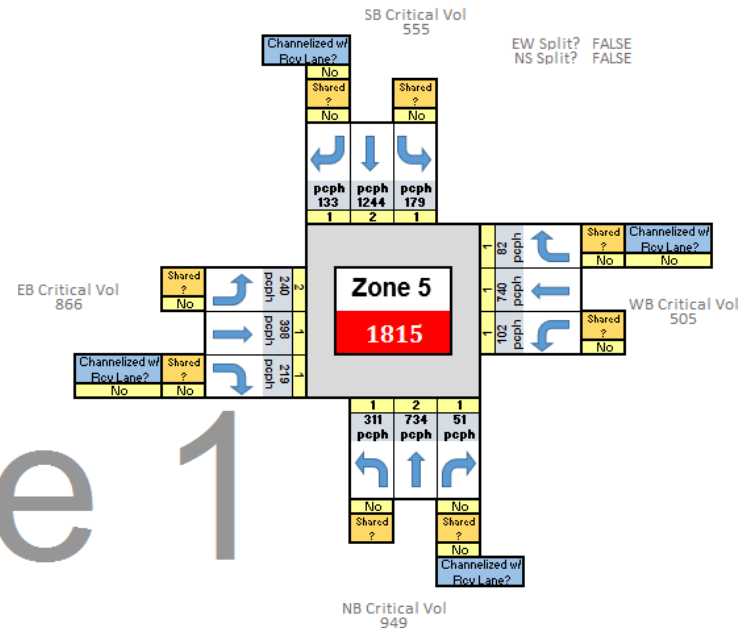
1815

1.13

V/C

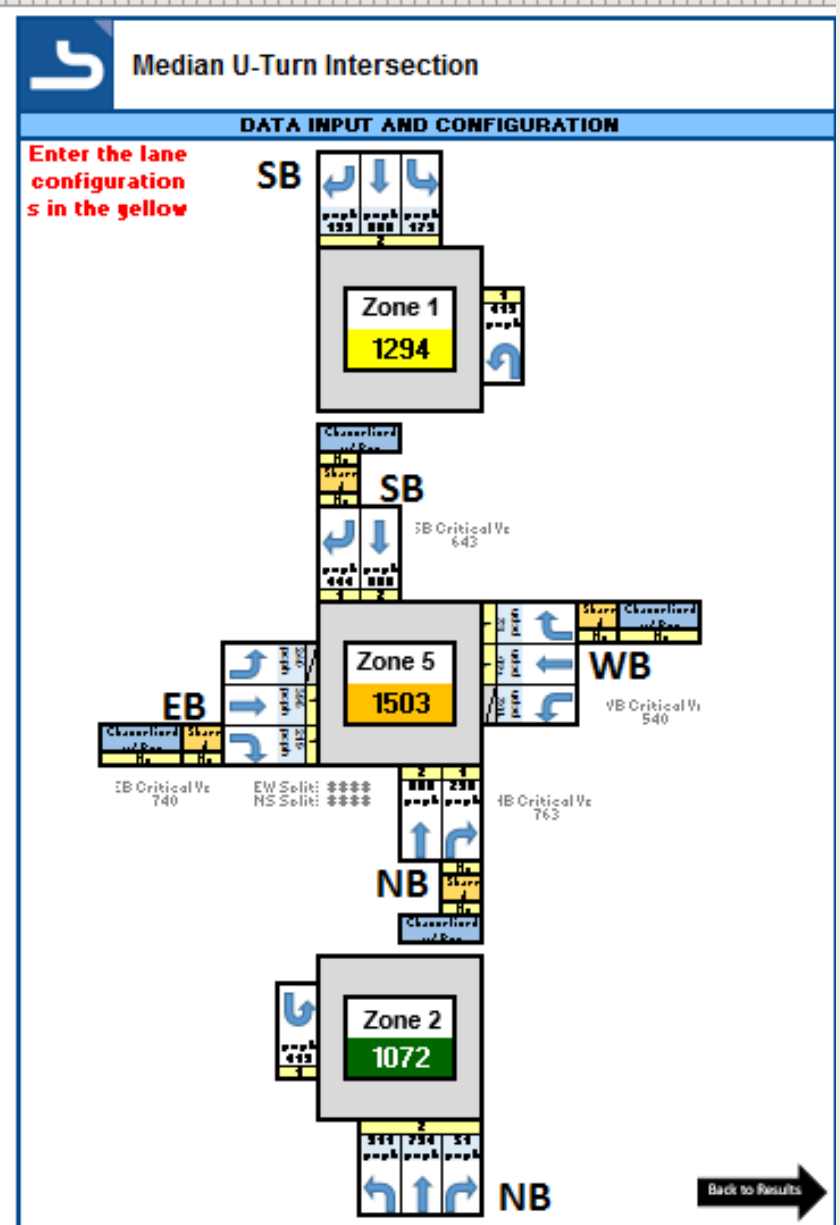
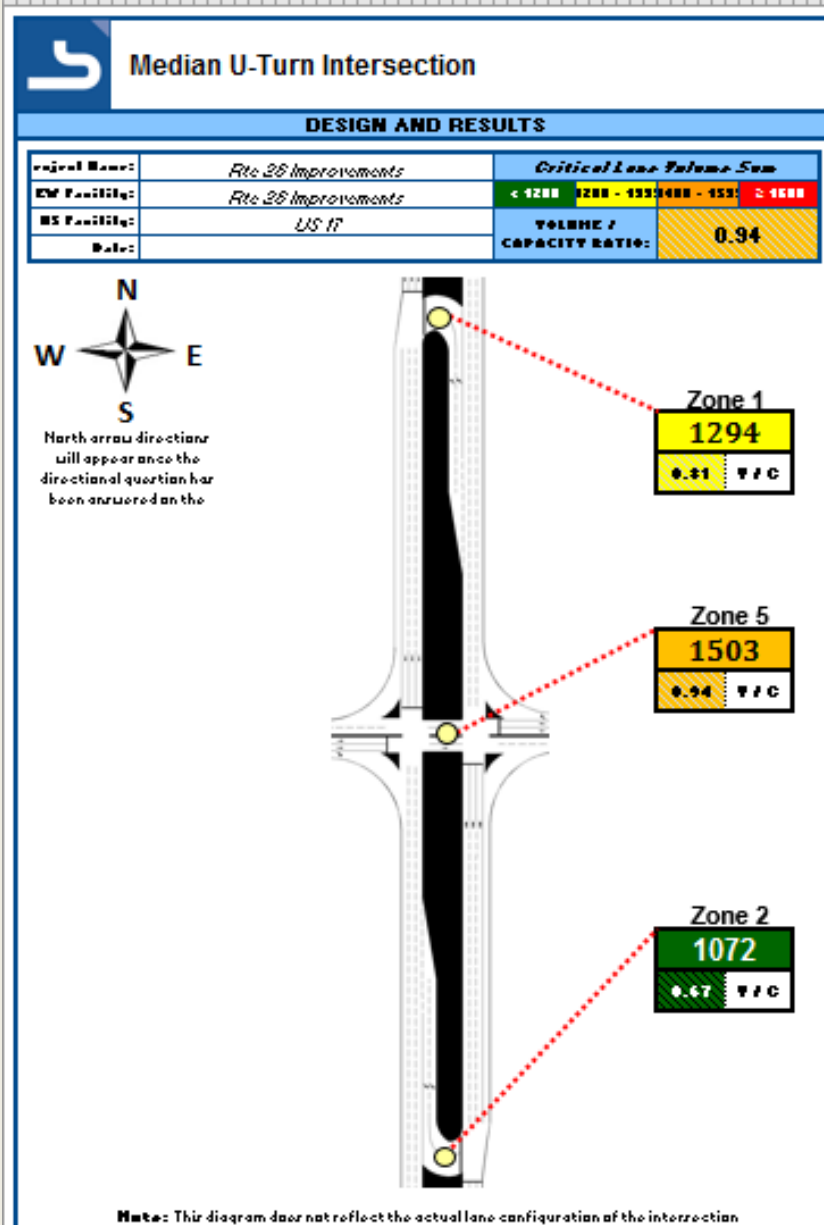


Enter the lane configurations in the yellow cells.



Page 1

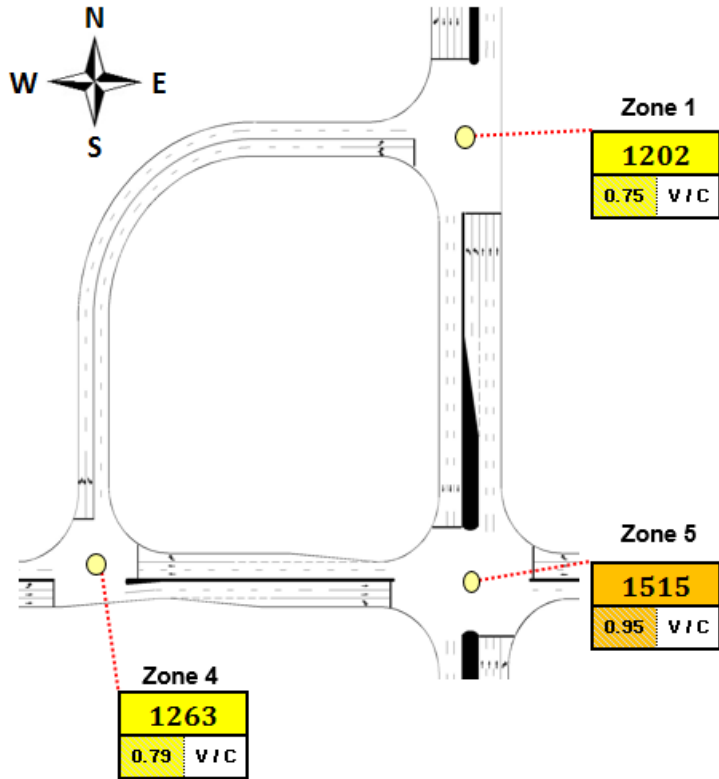
MEDIAN U-TURN - CONGESTION



QUADRANT ROADWAY INTERSECTION

DESIGN AND RESULTS

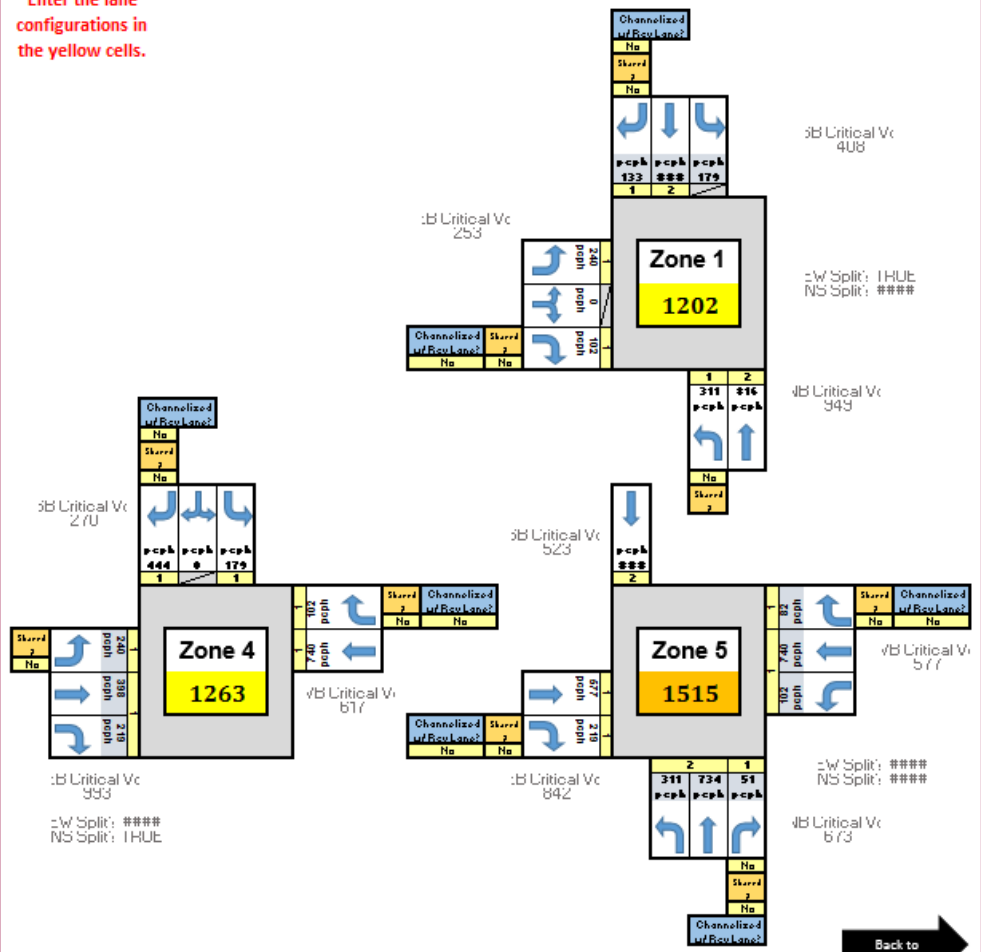
Project Name:	File 28 Improvements	Critical Lane Volume Sum	
EW Facility:	File 28 Improvements	< 1200	200 - 1393400 - 159: ≥ 1600
MS Facility:	LIS 17	VOLUME / CAPACITY RATIO: 0.95	
Date:			



Note: This diagram does not reflect the actual lane configuration of the intersection

DATA INPUT AND CONFIGURATION

Enter the lane configurations in the yellow cells.



DIVERGING DIAMOND INTERCHANGE



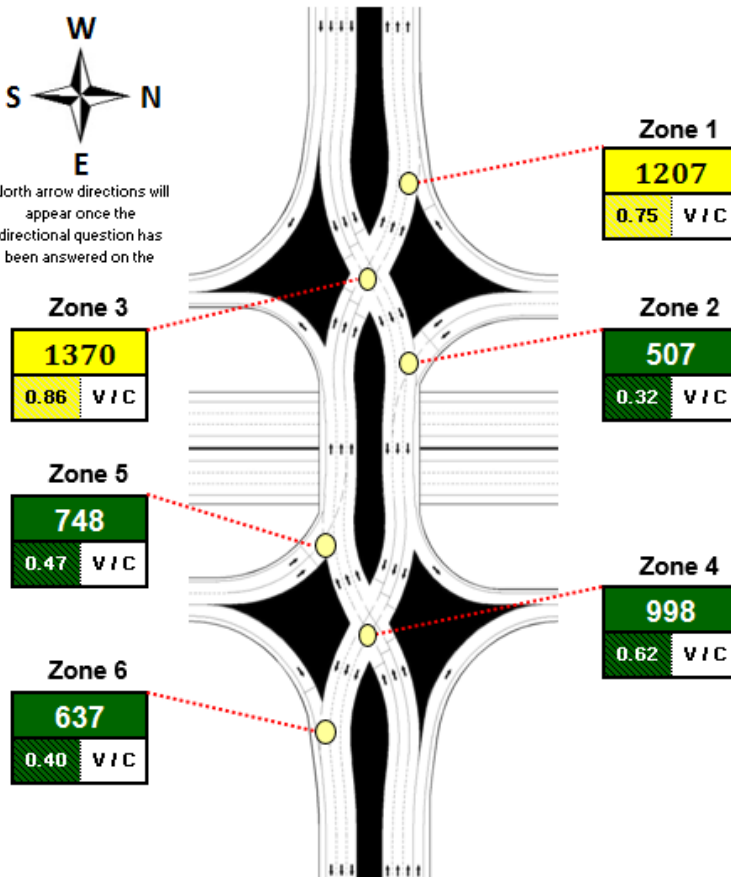
Diverging Diamond Interchange (DDI)

DESIGN AND RESULTS

Project Name:	File 28 Improvements	Critical Lane Volume Sum	
EW Facility:	File 28 Improvements	< 1200	200 - 1393 400 - 1591 ≥ 1600
NS Facility:	LIS 17	VOLUME / CAPACITY RATIO: 0.86	
Date:			



North arrow directions will appear once the directional question has been answered on the



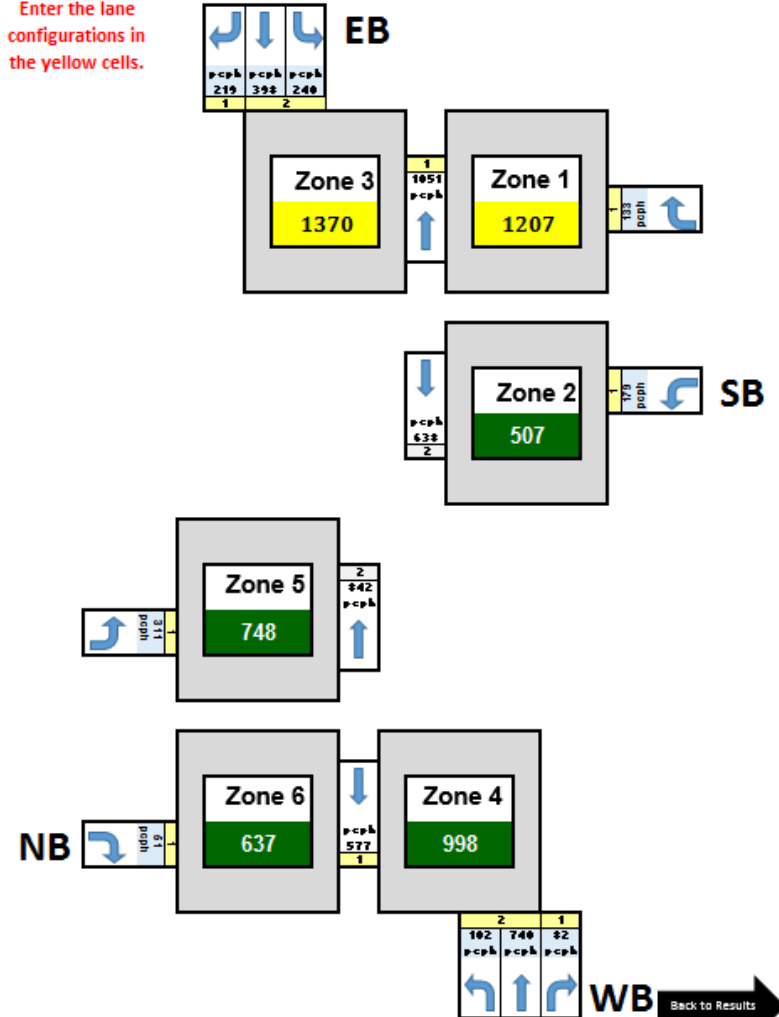
Note: This diagram does not reflect the actual lane configuration of the intersection



Diverging Diamond Interchange (DDI)

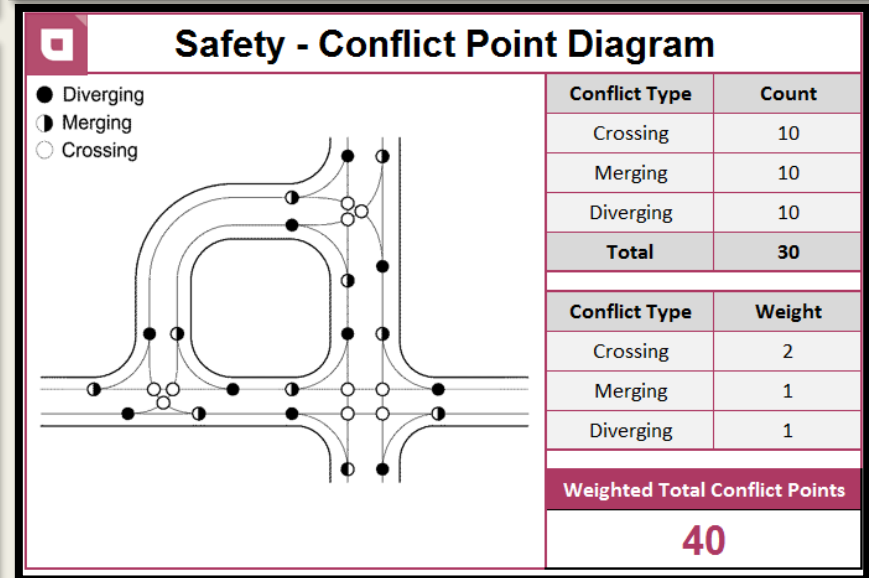
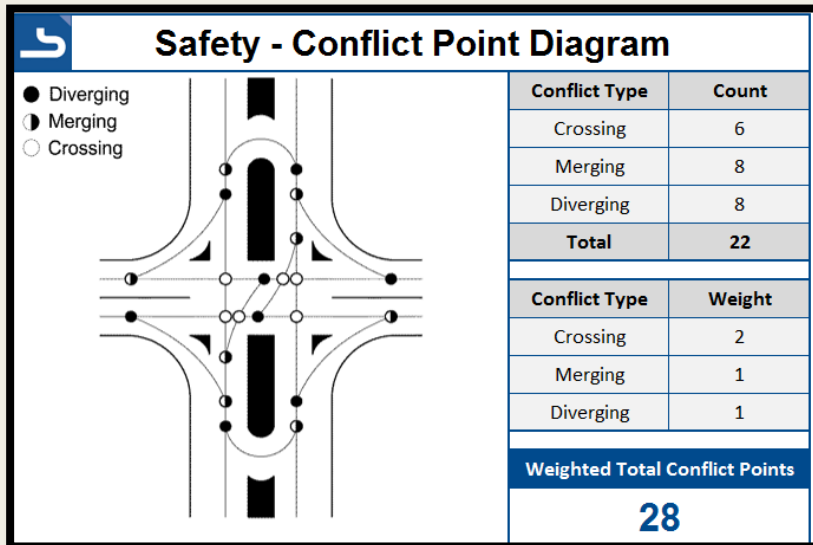
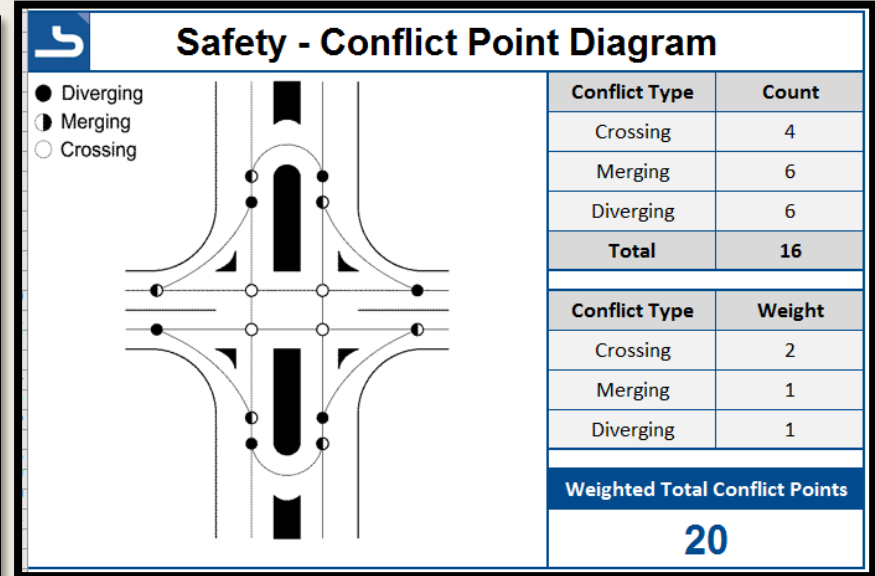
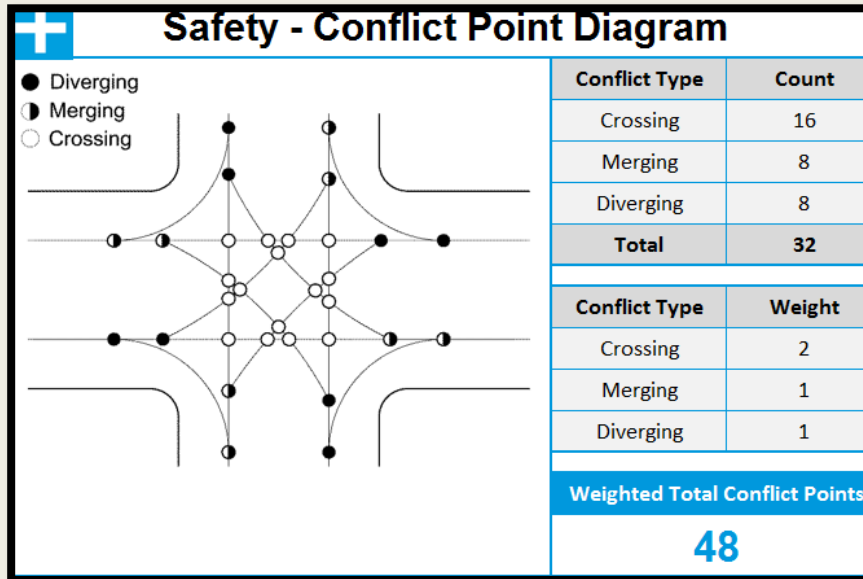
DATA INPUT AND CONFIGURATION

Enter the lane configurations in the yellow cells.



WB Back to Results

CONFLICT POINTS FOR ALTERNATIVES



RESULT WORKSHEET

Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	
Conventional	-	1.13		48	
Full Displaced Left Turn	-	0.85	-	40	
Median U-Turn	-	0.94	+	20	
Partial Displaced Left Turn	-	1.09	-	44	
Partial Median U-Turn	-	1.07	+	28	
Quadrant Roadway	N-W	0.95		40	
Restricted Crossing U-Turn	-	1.14		20	

Interchange Results

					Notes
Type	Dir	Maximum V/C	Accommodation Compared to Traditional Diamond	Weighted Total Conflict Points	
Diverging Diamond	-	0.86	-	20	
Single Point	-	0.83	-	32	

EXAMPLE -US 29 AT ROUTE 651

Intersection Results					
		Congestion	Pedestrian	Safety	Notes
Type	Dir	Maximum V/C	Accommodation Compared to Conventional	Weighted Total Conflict Points	
Conventional	-	0.52		48	
Continuous Green-T	-	0.45	-	12*	
Full Displaced Left Turn	-	0.48	-	40	
Median U-Turn	-	0.53	+	20	
Partial Displaced Left Turn	-	0.64	-	44	
Partial Median U-Turn	-	0.53	+	28	
Quadrant Roadway	N-E	0.49		40	
	S-W	0.52		40	
Restricted Crossing U-Turn	-	0.54		20	

*The continuous green-T is the only three-legged innovative intersection in this tool. To compare the continuous green-T to other innovative intersections, conflicts corresponding with the fourth leg must be removed. This has been done for the conventional intersection. Conflict point diagrams for three-legged and four-legged conventional intersections have been provided on the conventional intersection worksheet for reference.

SUMMARY

- To improve corridor mobility and safety, VDOT requires evaluating alternative designs
- VJuST is developed by VDOT to evaluate alternative intersections
- A sketch level tool that helps select a bunch of alternatives over a conventional signalized intersection
- A design can be compared for congestion, safety, pedestrian movements

