

Impact of Superstreet Operations on Pedestrians and Bicyclists

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Research Objective:

To modify current superstreet design and operations in North Carolina to better serve pedestrians and bicyclists.

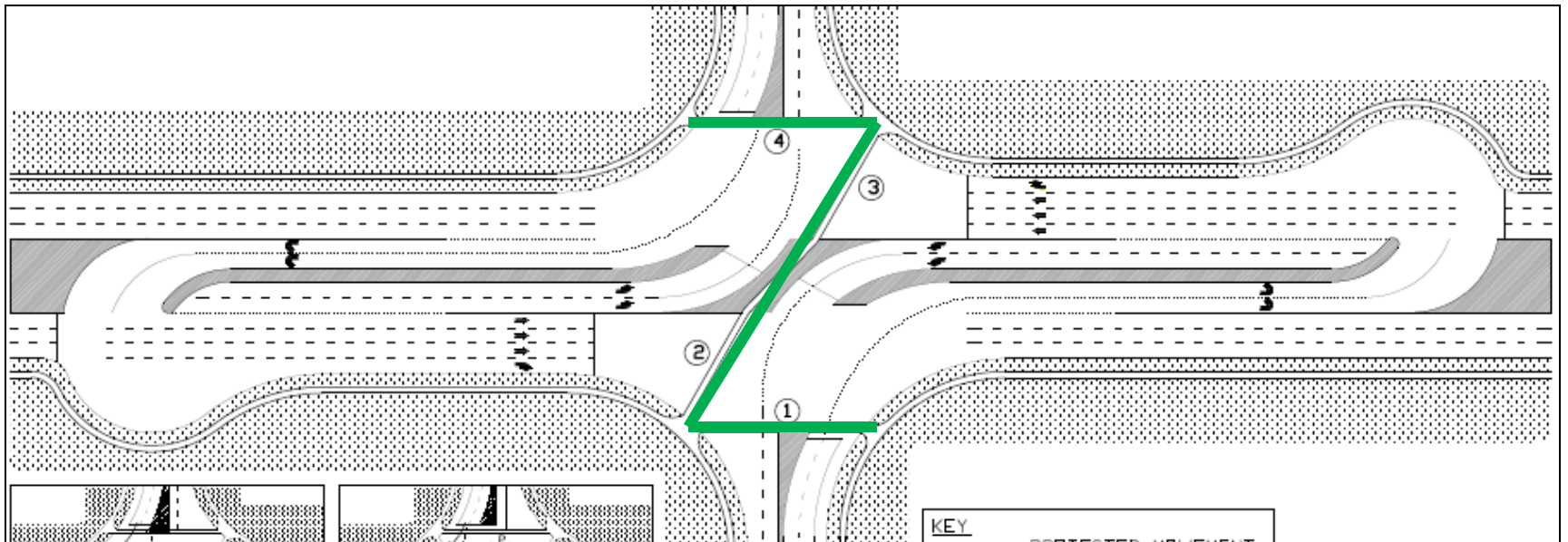


US-17 in Leland, NC
Courtesy of NCDOT

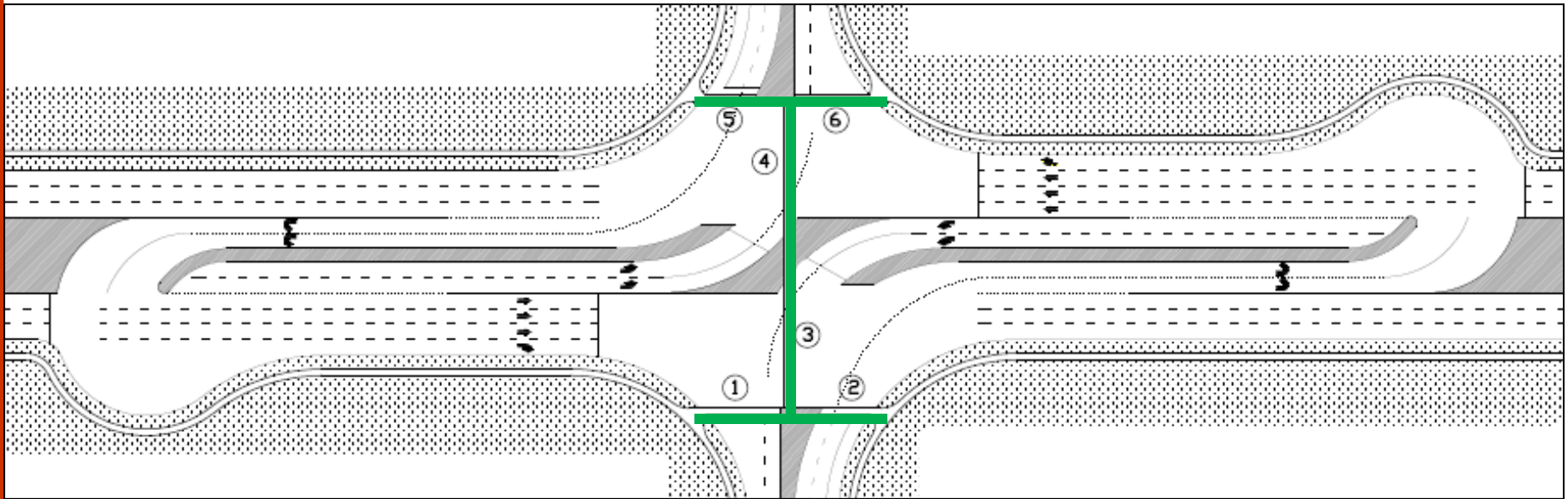
Crossing Alternatives

- Pedestrian
 - Diagonal Cross
 - Median Cross
 - Two Stage - Barnes Dance Cross
 - Midblock Cross
- Bicycle
 - Bicycle U-Turn Cross
 - Bicycle Direct Cross
 - Midblock Cross

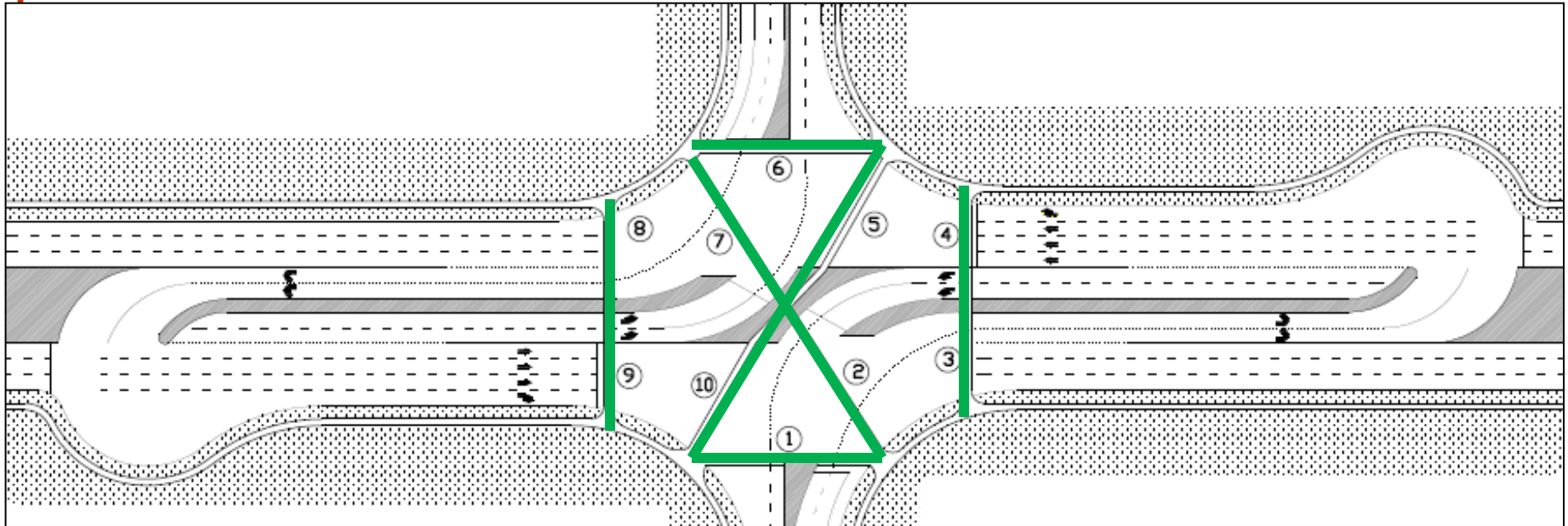
Diagonal Cross



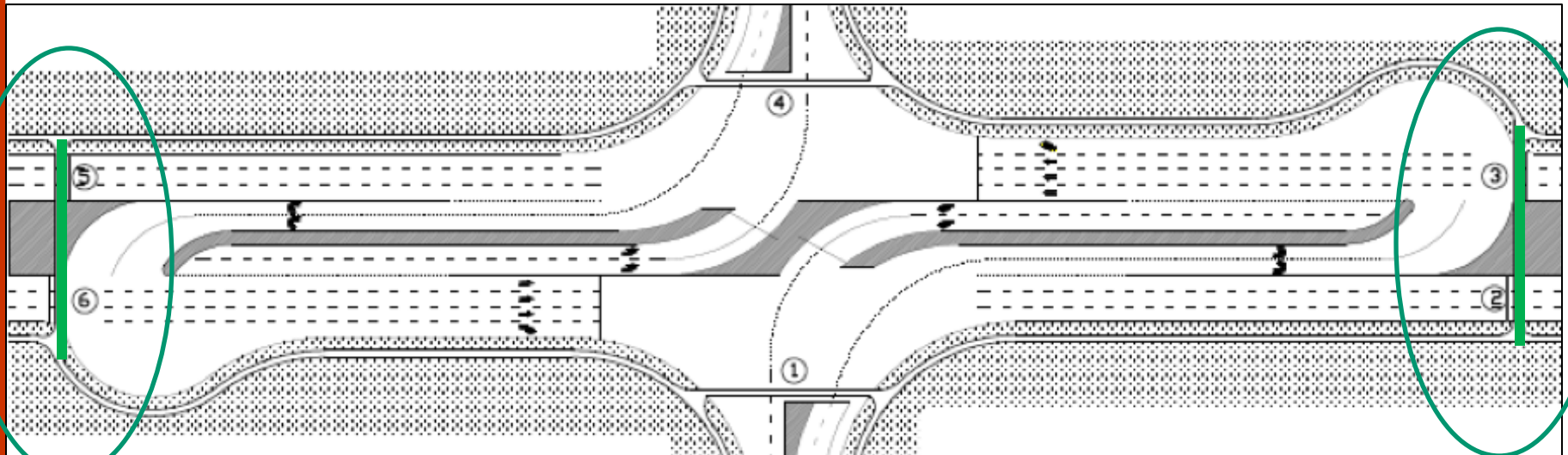
Median Cross



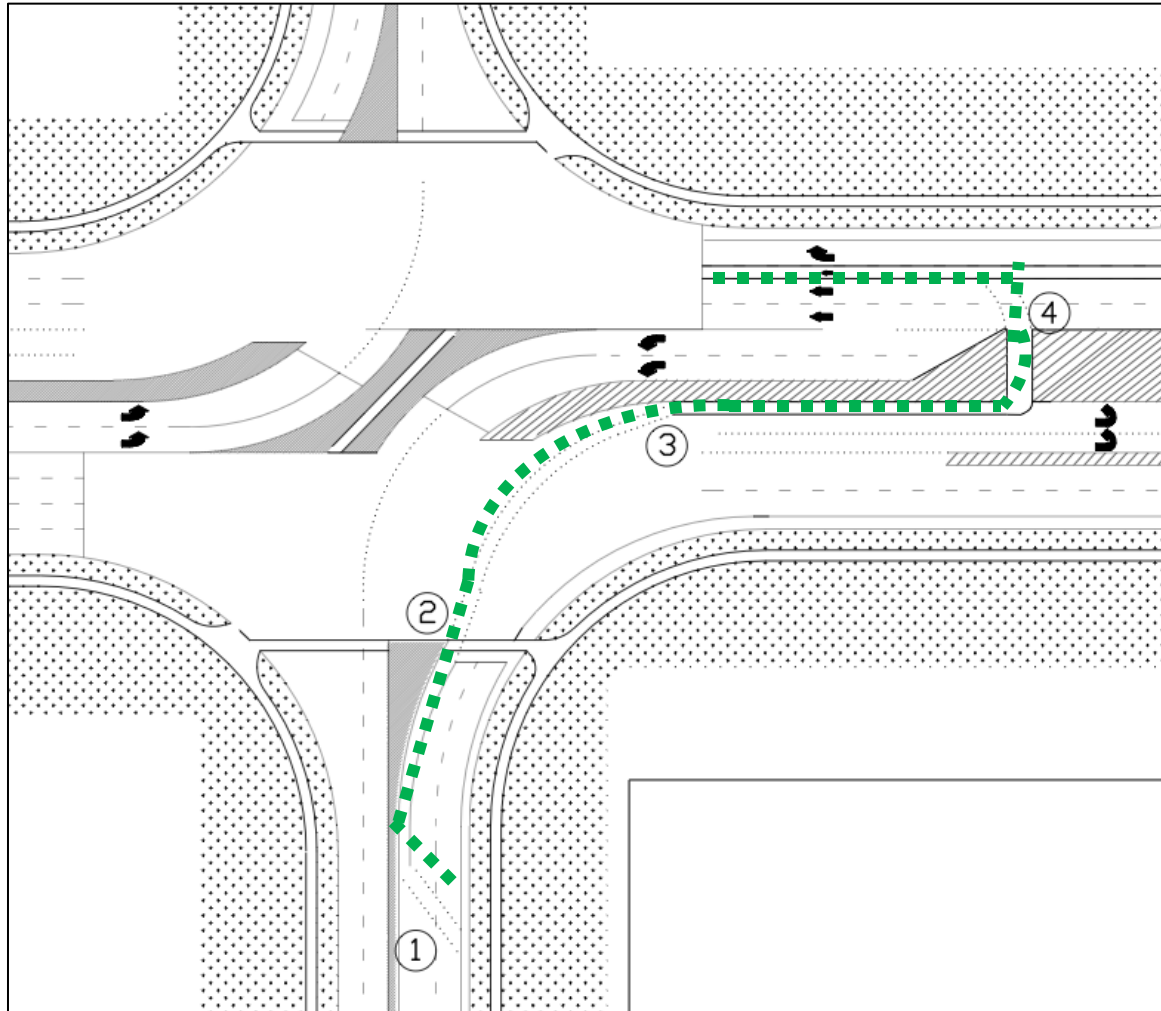
Two Stage - Barnes Dance Cross



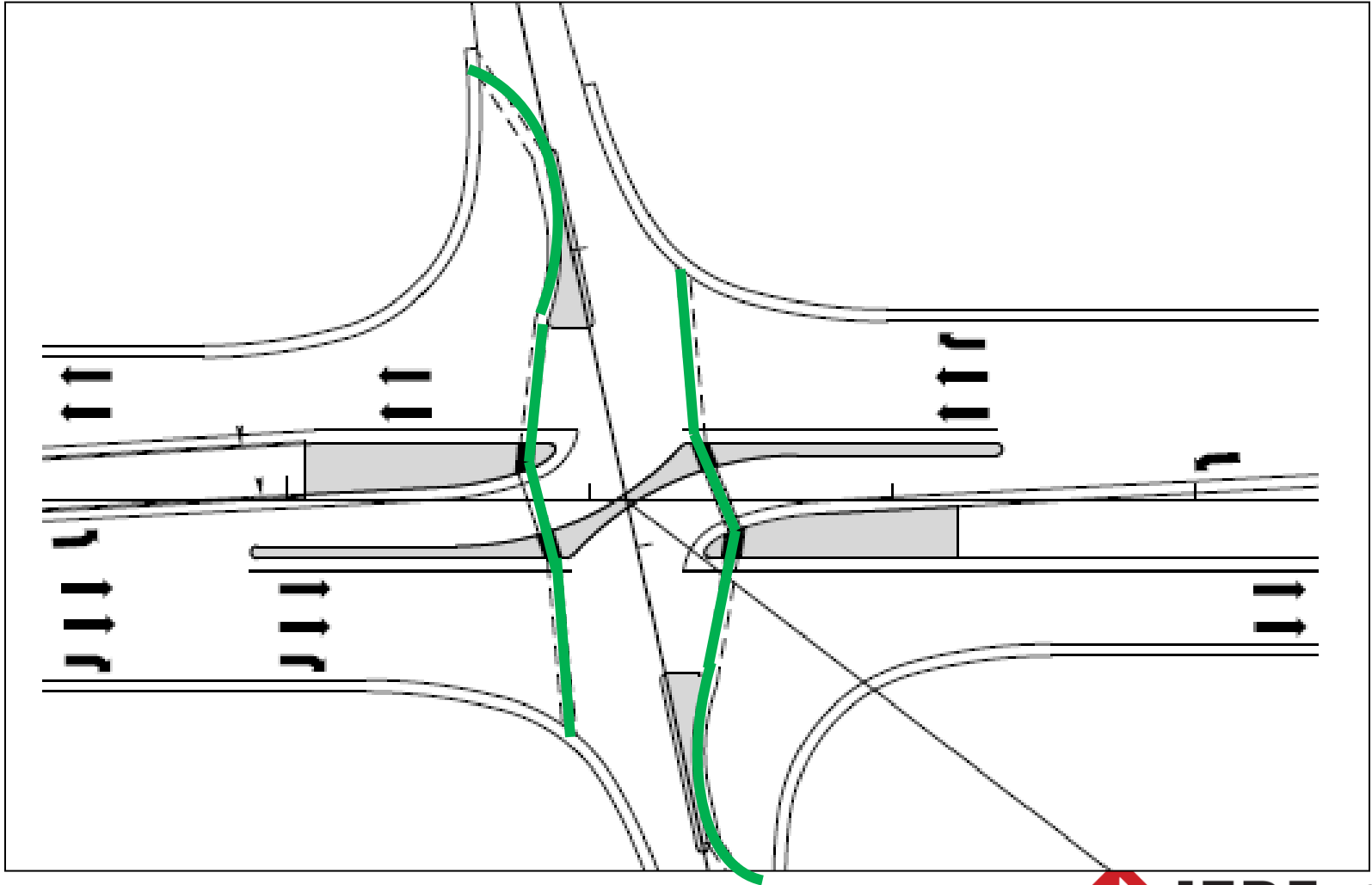
Midblock Cross



Bike U-Turn Cross



Bicycle Direct Cross

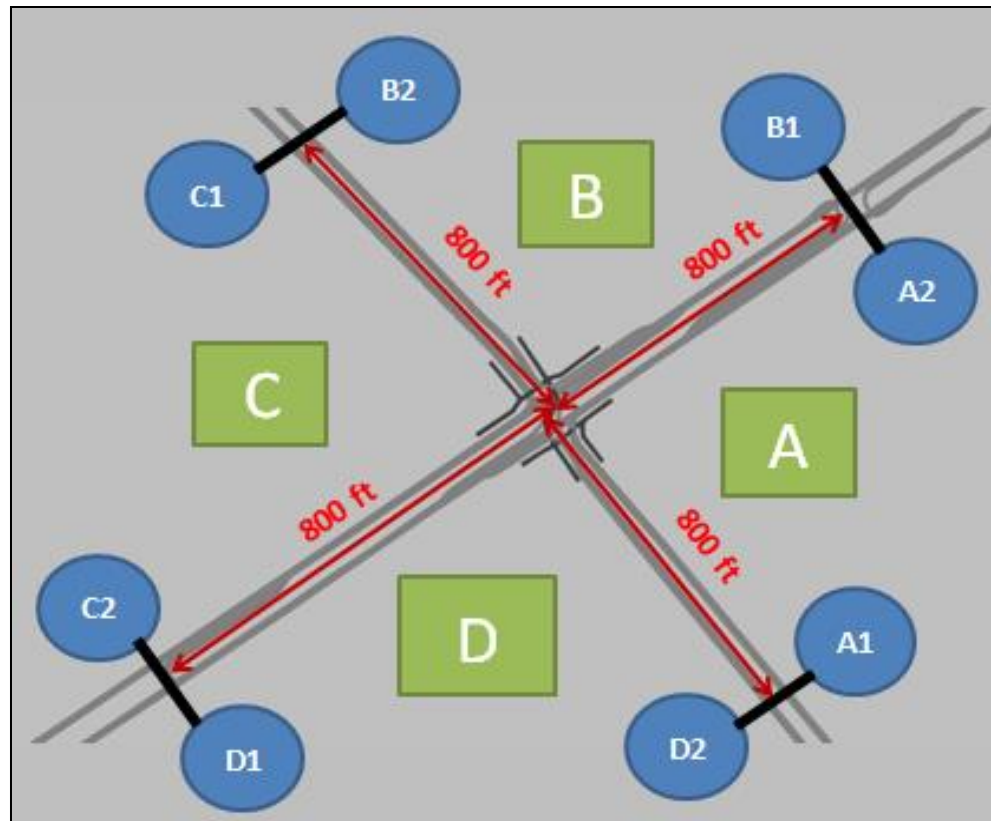


Field Data

Type	Number of Observations	Ave (fps)	25 th % (fps)	75 th % (fps)
Pedestrian (walk)	1,277 (91%)	5.0	4.3	5.5
Pedestrian (runner)	121 (9%)	9.6	8.4	11.0
Bicyclist	118	15.6	12.0	18.9

Simulations

Routes



Simulations

Setup

- Cycle Lengths
 - 90 second
 - 180 second
- Splits
 - 75/25
 - 60/40
- Midblock locations
 - 600'
 - 800'
- Signal Timing (arrival of platoons)
 - Simultaneous
 - Offset

Simulations

Setup

- (4) Pedestrian Types
 - Slow Compliant
 - Fast Compliant
 - Slow Non-Compliant
 - Fast Non-Compliant
- (1) Bicycle Type
 - All compliant

Simulations

Outputs

- Average # of Stops per route
- Average Stopped Delay per route (sec)
- Average Travel Time per route (sec)

Results

Pedestrians

Geometry	Mean Stopped Delay (sec)	Mean Number of Stops
Two Stage -Barnes Dance Cross	92.1	1.3
Diagonal Cross	120	1.8
Median Cross	147	1.9
Midblock Cross	111	1.5

*All geometries are significantly different for all MOEs.

Results

Pedestrians

Geometry	Mean Travel Time (sec)	Free Flow Travel Time (sec)	Total Delay (sec)
Two Stage -Barnes Dance Cross	422	320	102
Diagonal Cross	465	333	132
Median Cross	487	327	160
Midblock Cross	479	363	116

*All geometries are significantly different for all MOEs.

Results

Bicycles

Geometry	Mean Stopped Delay (sec)	Mean Number of Stops
Bicycle U-Turn Cross	336	14
Bicycle Direct Cross	133	4.8
Bicycle Midblock Cross	183	7.0
Vehicle U-Turn	98	5.0

*All geometries are significantly different for all MOEs.

Results

Bicycles

Geometry	Mean Travel Time (sec)	Free Flow Travel Time (sec)	Total Delay (sec)
Bicycle U-Turn Cross	542	139	403
Bicycle Direct Cross	328	118	210
Bicycle Midblock Cross	428	146	282
Vehicle U-Turn	564	144	420

*All geometries are significantly different for all MOEs.

Conclusions

Pedestrians

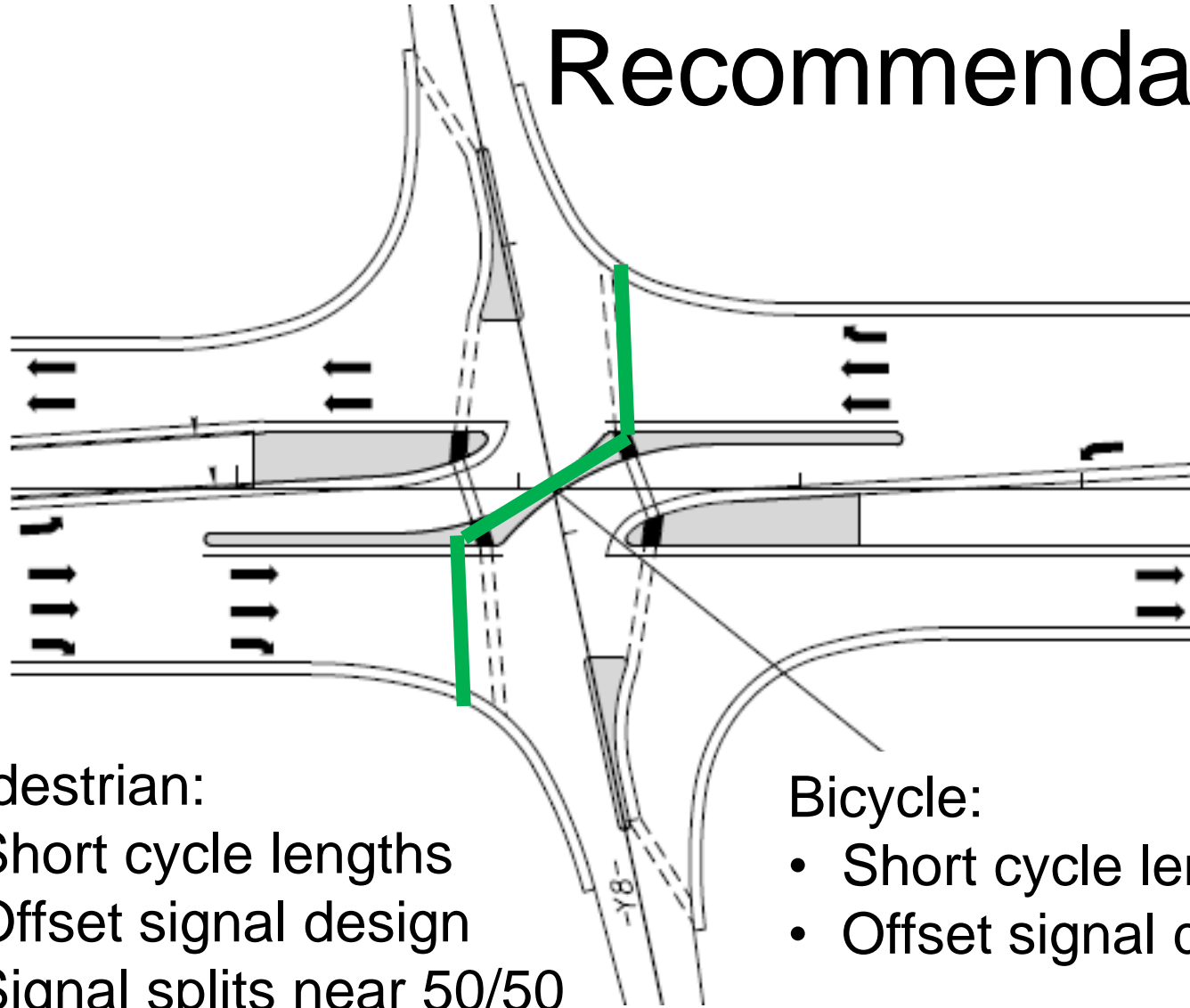
- Barnes Dance cross produced the lowest MOEs
- Factors that contributed to lower travel times for all geometries:
 - Offset signal design
 - 90 second cycle length
 - 60/40 signal split

Conclusions

Bicyclists

- Bicycle Direct cross: lowest average number of stops and lowest average travel time
- Vehicle U-Turn: lowest stopped delay
- Factors that contributed to lower travel times:
 - Offset signal design
 - 90 second cycle length
 - 75/25 signal split
 - 800' midblock locations (for the U-turn options*)

Recommendations



Pedestrian:

- Short cycle lengths
- Offset signal design
- Signal splits near 50/50

Bicycle:

- Short cycle lengths
- Offset signal design

Thank you!

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