Proposed Operational Improvements to the I-285 & I-20 West Interchange

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Sponsored By:

GDOT
Georgia Department of Transportation

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Why Operational Improvements at I-285 & I-20 W?

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Major Mobility Improvements Program (MMIP)

- What is it?
  - $11 billion program that covers 11 major roadway construction projects
- When?
  - Collectively expected to be completed by 203
- Why?
  - Effort to reduce delay and travel time by 5%
  - Improve passenger and freight movement

Interchange Reconstruction:

1. [redacted]
2. [redacted]
3. I-285/I-20 East Interchange

Express Lanes:

4. Revive 285 Express Lanes
   I-75 to I-85
5. SR 400 Express Lanes
   I-285 to McFarland Pkwy.
6. I-285 East Wall Express Lanes
   I-85 to I-20
7. I-285 West Wall Express Lanes
   I-20 to I-75

Interstate Widening:

8. I-85 North Widening
   Hamilton Mill Rd. to SR 211
9. I-16 Widening
   I-95 to I-516
10. I-85 North Widening
    SR 211 to US 129

Commercial Vehicle Lanes:

11. Commercial Vehicle Lanes
    SR 155 to I-475

The Team

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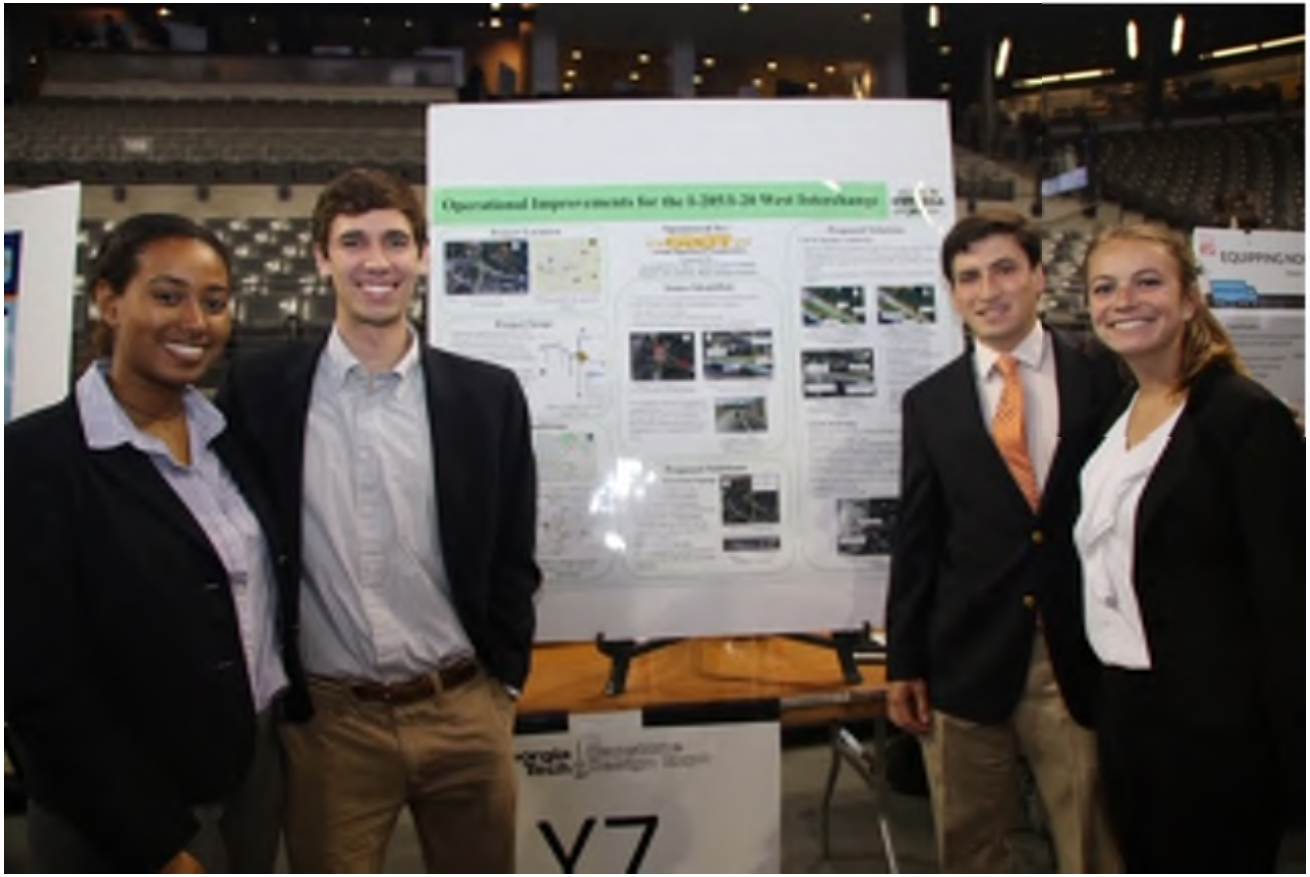
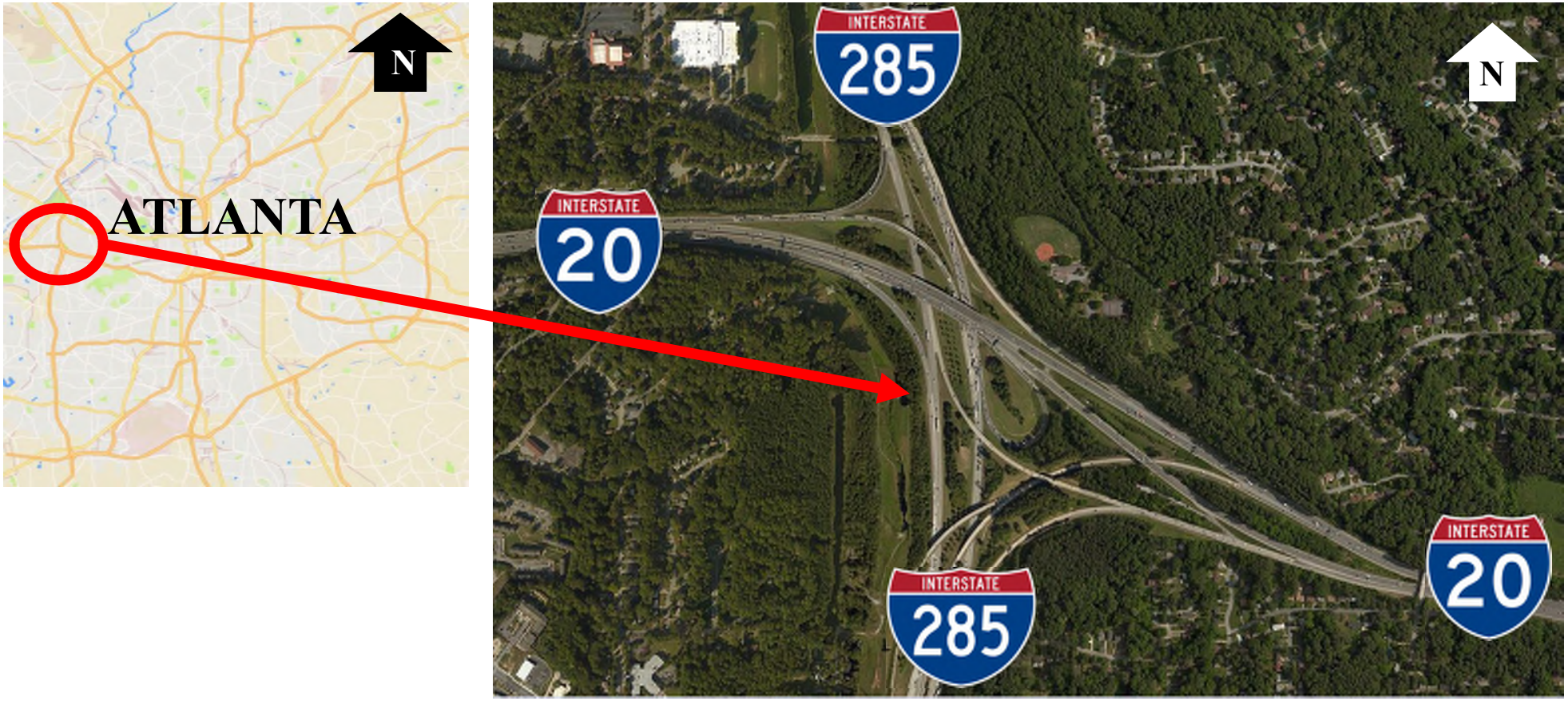


Project Location



Project Scope

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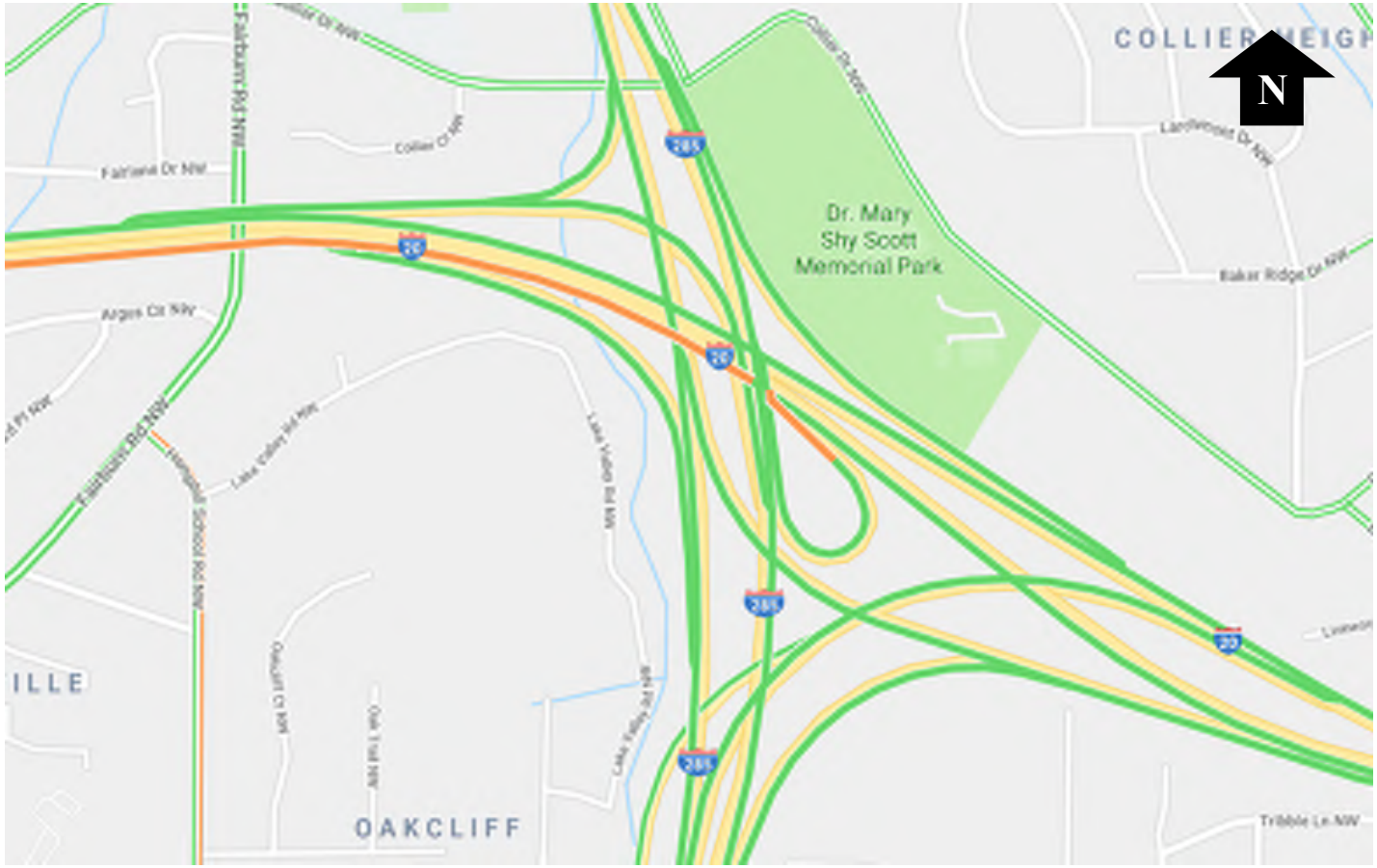
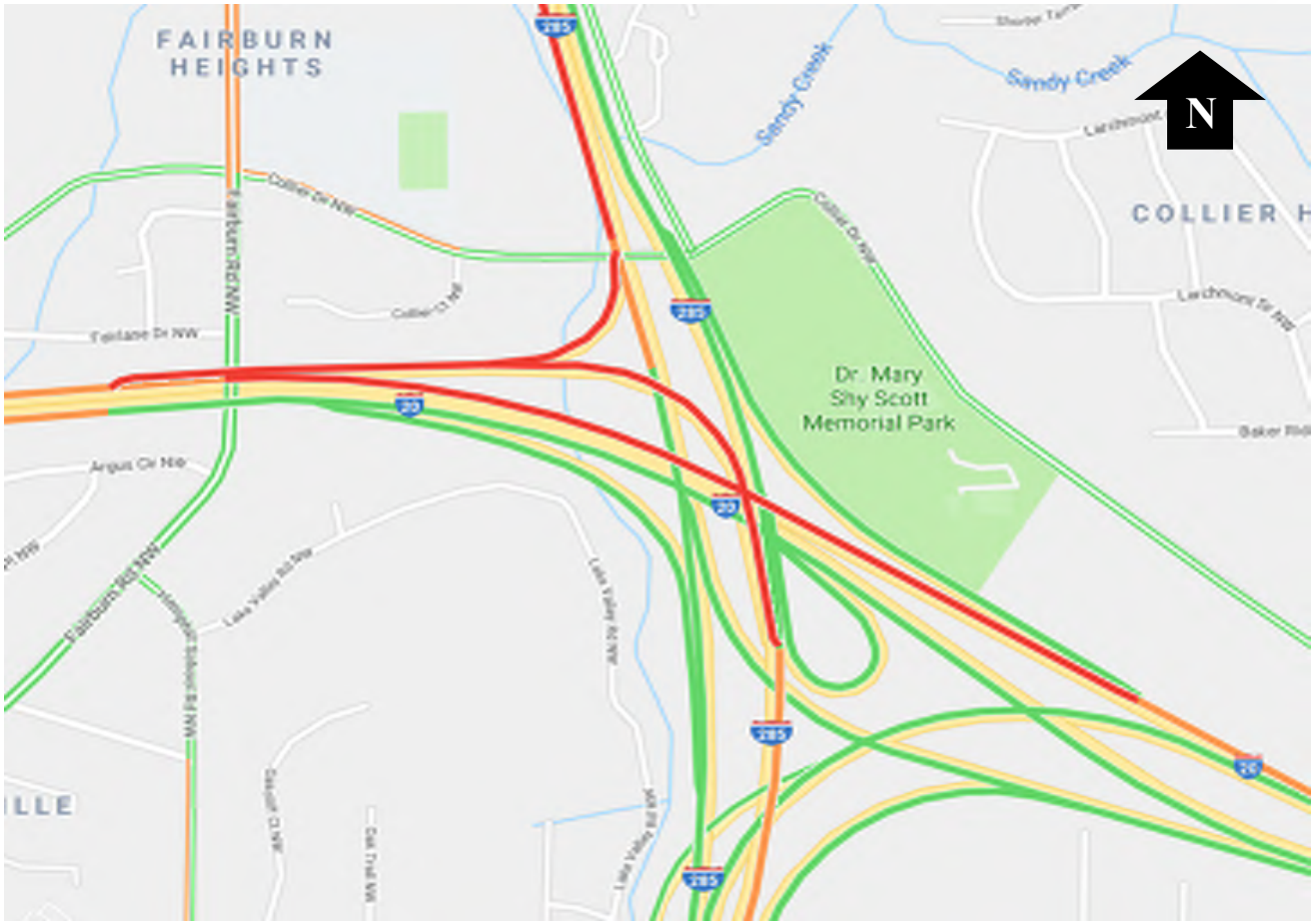
- Existing conditions analysis of the I-285 and I-20 interchange on the west side
- Operational improvements
  - Short-term, low-cost alternative proposal: prior to MMIP reconstruction
  - Long-term alternative proposal: in case of MMIP delay
- Budget
  - Short-term alternative: ~$5 million
  - Long-term alternative: ~$15 million
- Alternatives should limit potential rework from future reconstruction

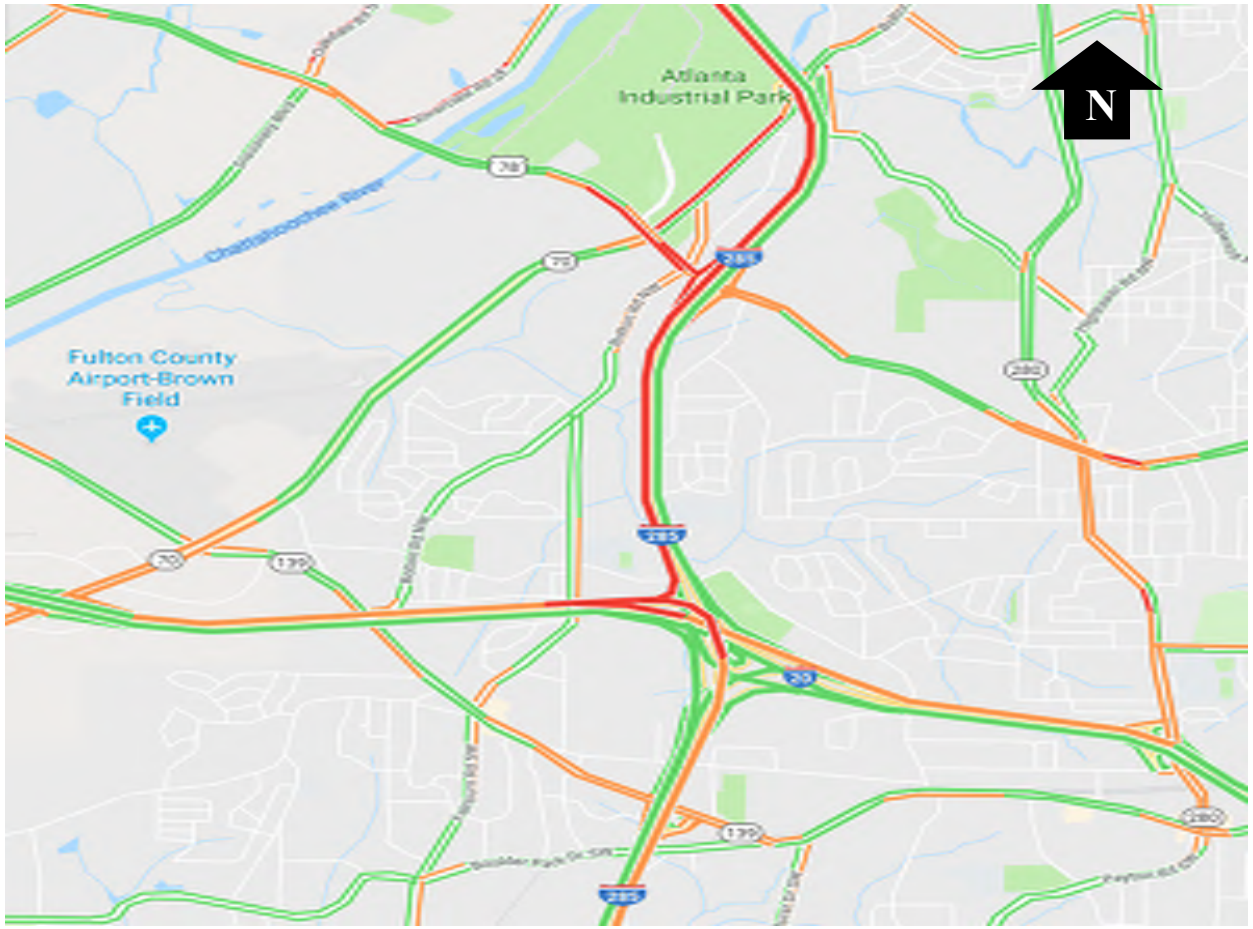
AM Peak Traffic Conditions



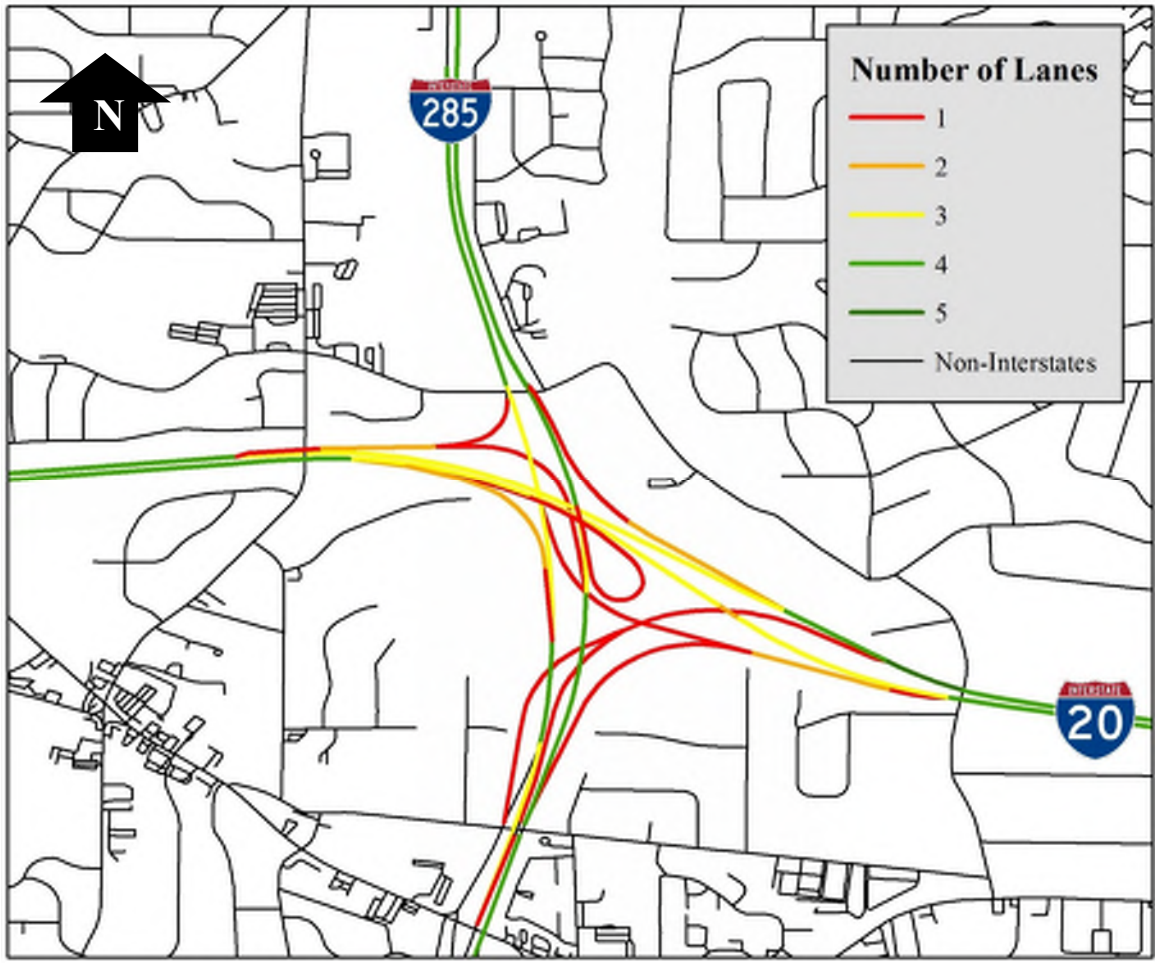
PM Peak Traffic Conditions



PM Peak Traffic Conditions

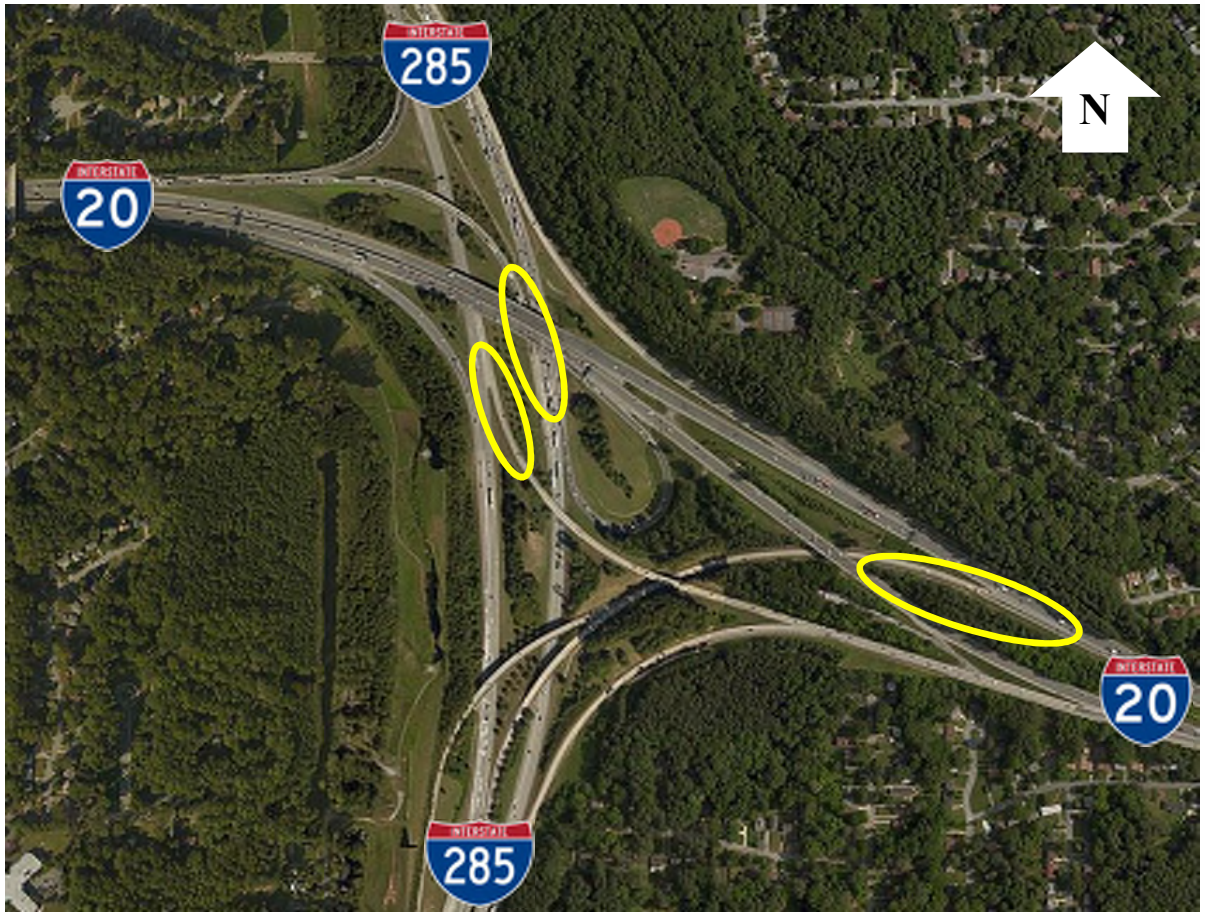


Existing Lane Configurations

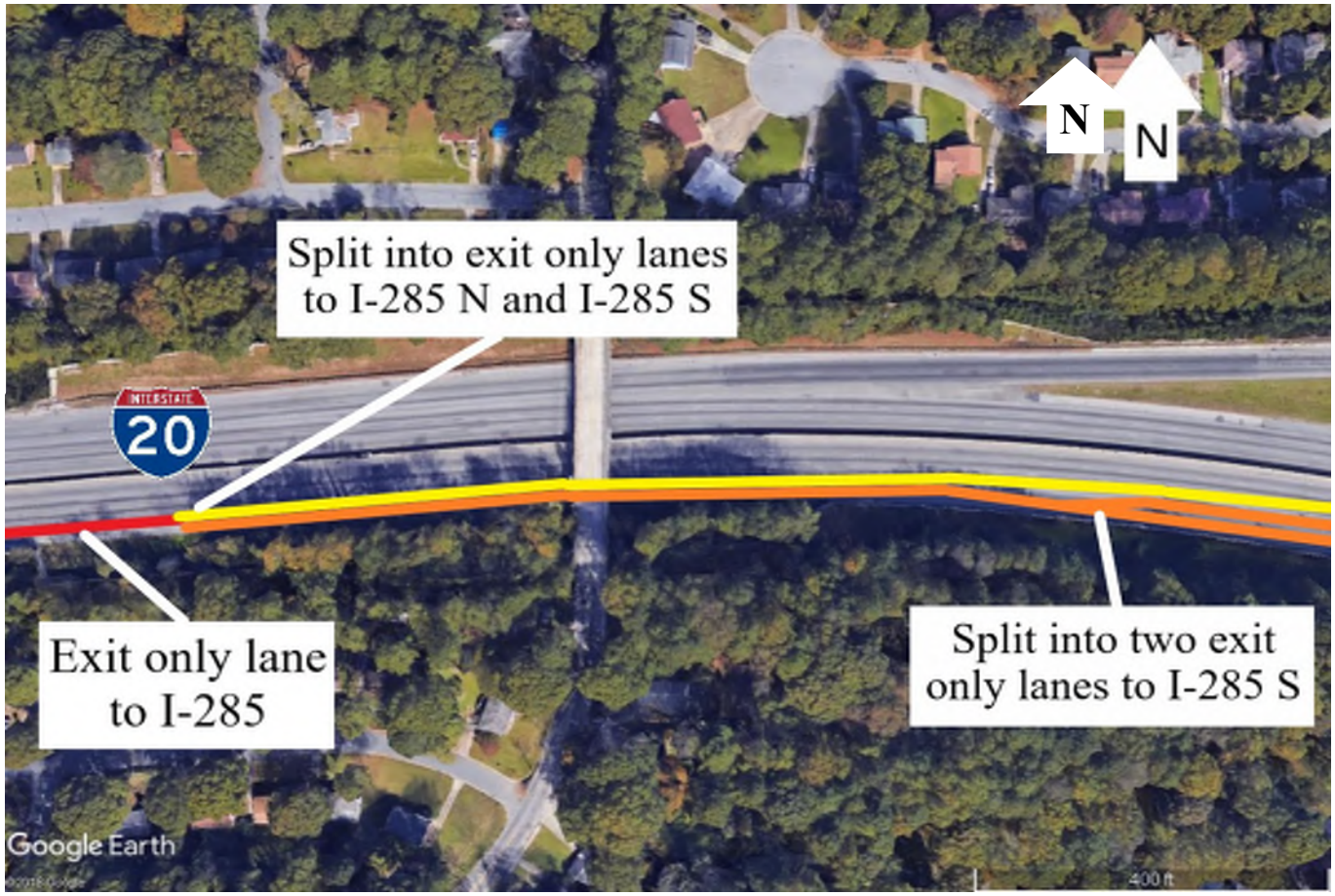


Left Hand Exits

- I-285 S to I-20 W
- I-285 N to I-20 W
- I-20 S to I-285 S
- Driver expectancy violation
- Abrupt merges due to uncommon configuration



Exit Lane Configurations: I-20 E to I-285



Exit Lane Configurations: I-285 N to I-20 W

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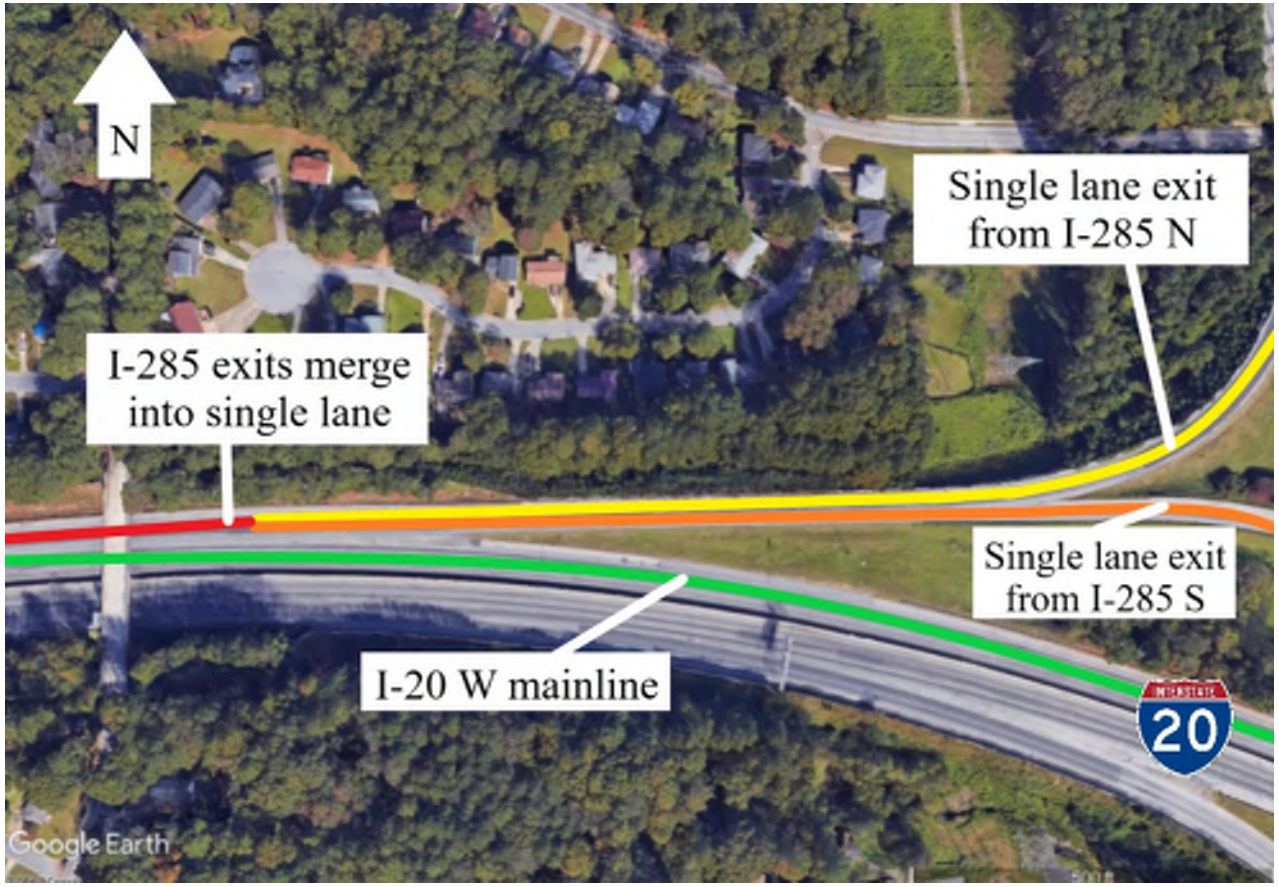
- Four mainline lanes split into three through lanes and an exit only lane

Exit Lane Configurations: I-20W to I-285 S

- Leftmost lane on the mainline widens and then splits into through and exit only lanes

Exit Lane Configurations: I-285 to I-20 W

- Two exit lanes from I-285 merge into a single lane that merges with rightmost lane on I-20 W



Steep Grade Exit I-285 S to I-20 W

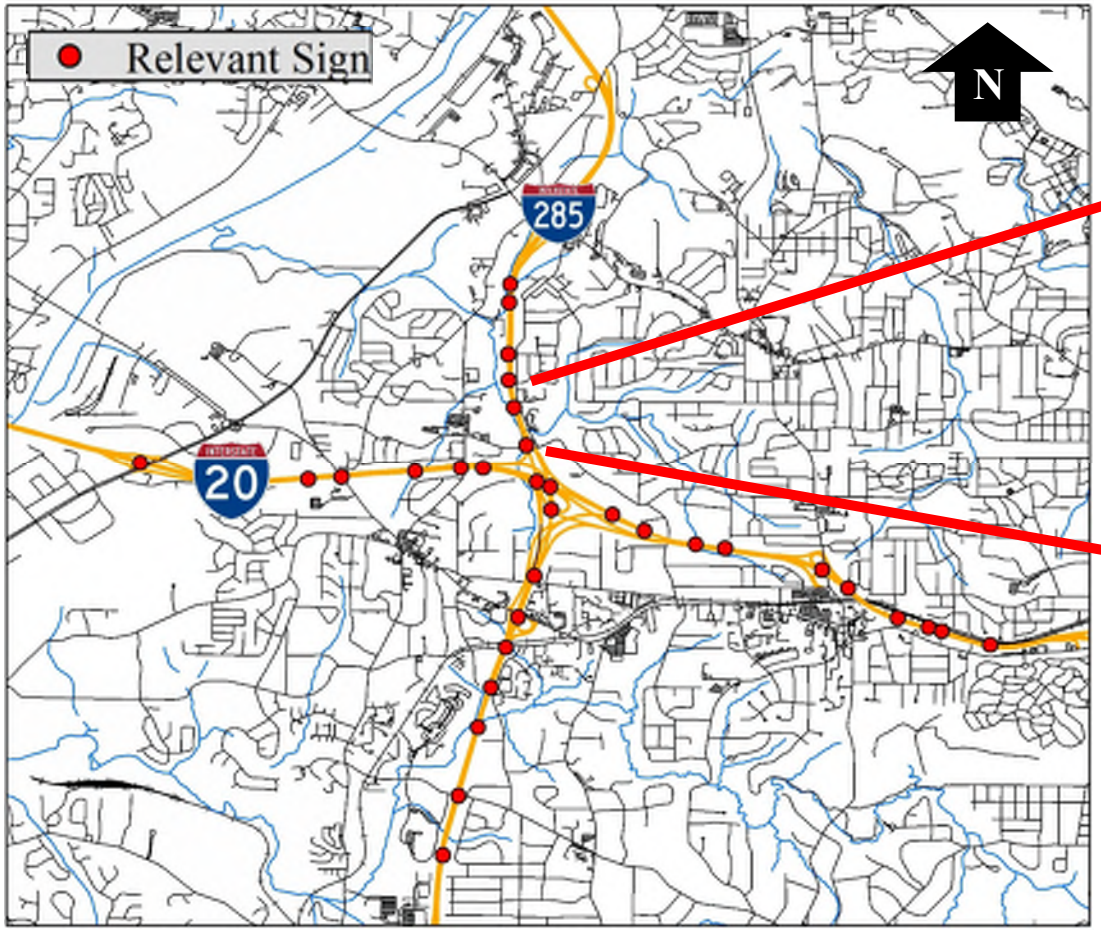
- Heavy vehicles struggle in stop and go traffic

Existing Traffic Volumes

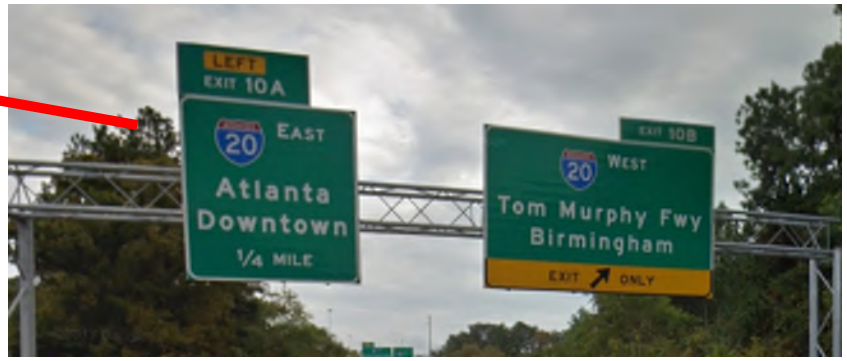
- GEOCOUNTS
  - Permanent Stations
  - Hourly volume distribution
  - PM peak
- 2015 and 2018 data
- Total volume distributions for 4 directions
- Assumptions at portable stations on ramps

Location of Permanent Stations

Existing Signage



I-285 South approaching I-20



I-285 South at Exit 10B to I-20 West

Existing Heavy Vehicle Volumes

- High percentage of heavy vehicles
- Compounded congestion and grading issues

Table 1. Percent Heavy Vehicle Traffic for Each Mainline Approach

Vehicle Approach	Heavy Vehicle Per Hour (%)
I-20 West	5.5
I-20 East	5.85
I-285 North	15.2
I-285 South	15.75

VISSIM Modeling

- Constructed a VISSIM model to evaluate the interchange performance before and after implementation of alternatives

- Based on existing conditions data:
  - PM Peak Volumes
    - 2:00 PM to 6:00 PM
  - % Heavy Vehicles
  - Vehicle Distributions
  - Existing Speed Limits
    - Unknown speed limits?

VISSIM Modeling: Vehicle Distributions

Approach	Movement	Vehicle Distribution (%)
I-20 (WB)	To I-285 N	18.6%
	Through I-20 W	62.1%
	To I-285 S	13.3%
	To MLK Jr Drive NW	6.0%
I-20 (EB)	To I-285 S	19.6%
	Through I-20 E	57.4%
	To I-285 N	23.0%
I-285 (NB)	To I-20 E	10.0%
	Through I-285 N	77.4%
	To I-20 W	12.6%
I-285 (SB)	To I-20 W	12.5%
	Through I-285 S	78.7%
	To I-20 E	8.7%

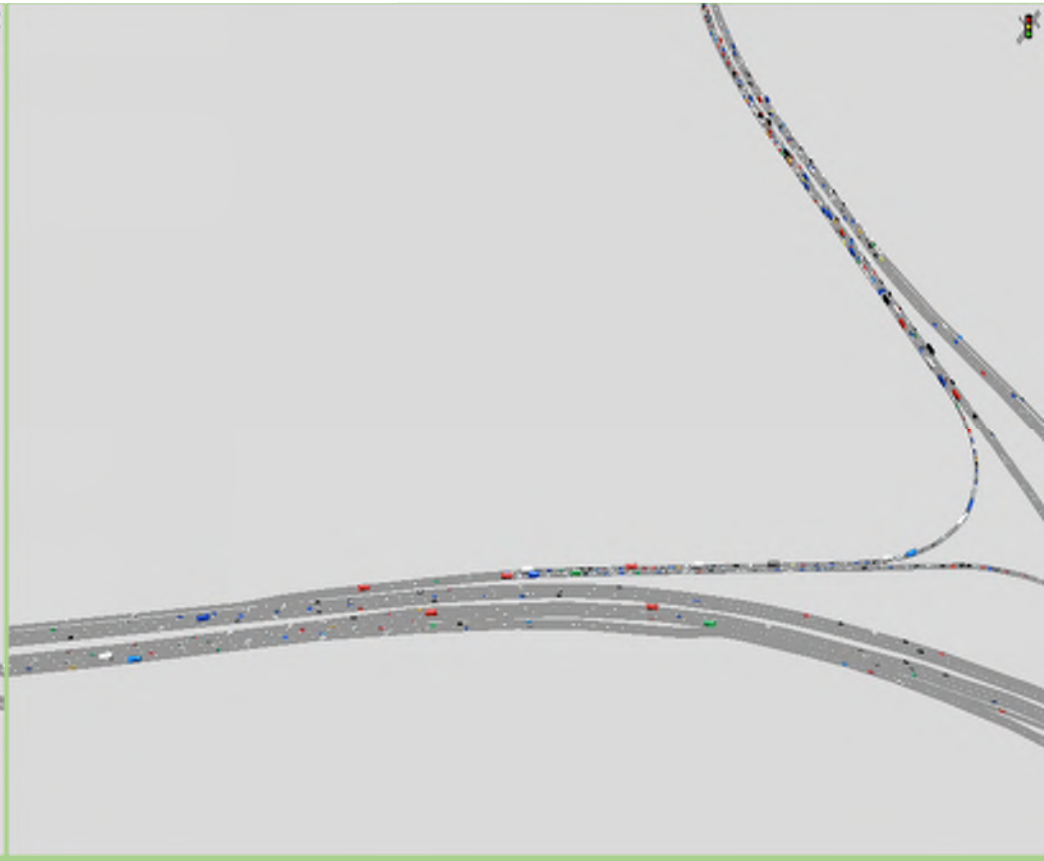
VISSIM Modeling: Simulations

- Each VISSIM model ran 5 times
- Applied 1.045% annual vehicular volume increase

	No Build Design (2018)	**Short Term Alternative (2023)**	**Long Term Alternative (2028)**
2018 Traffic Volumes	X	X	X
2023 Traffic Volumes	X	X	
2028 Traffic Volumes	X		X

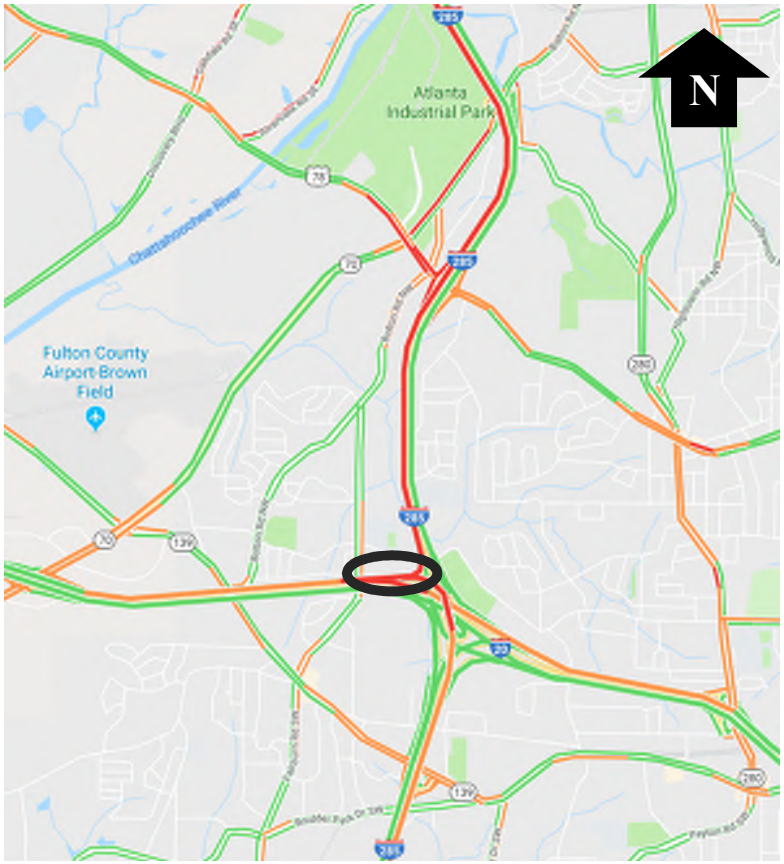
VISSIM Modeling: Existing Conditions

Interchange with 2018 Volumes

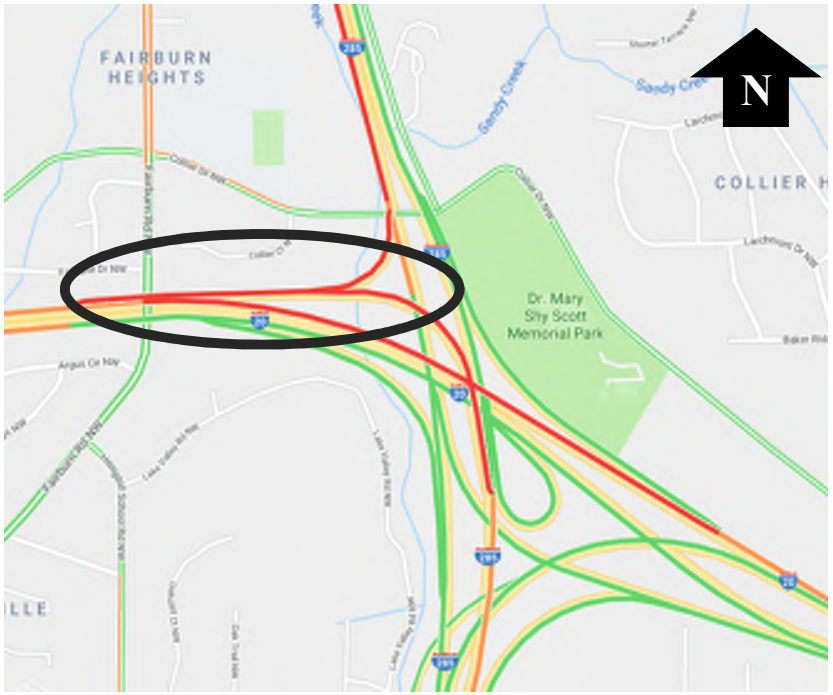


I-285 to I-20 West

Project Focus: I-285 to I-20 W Bottleneck



Location of the Bottleneck in context of Surrounding Network



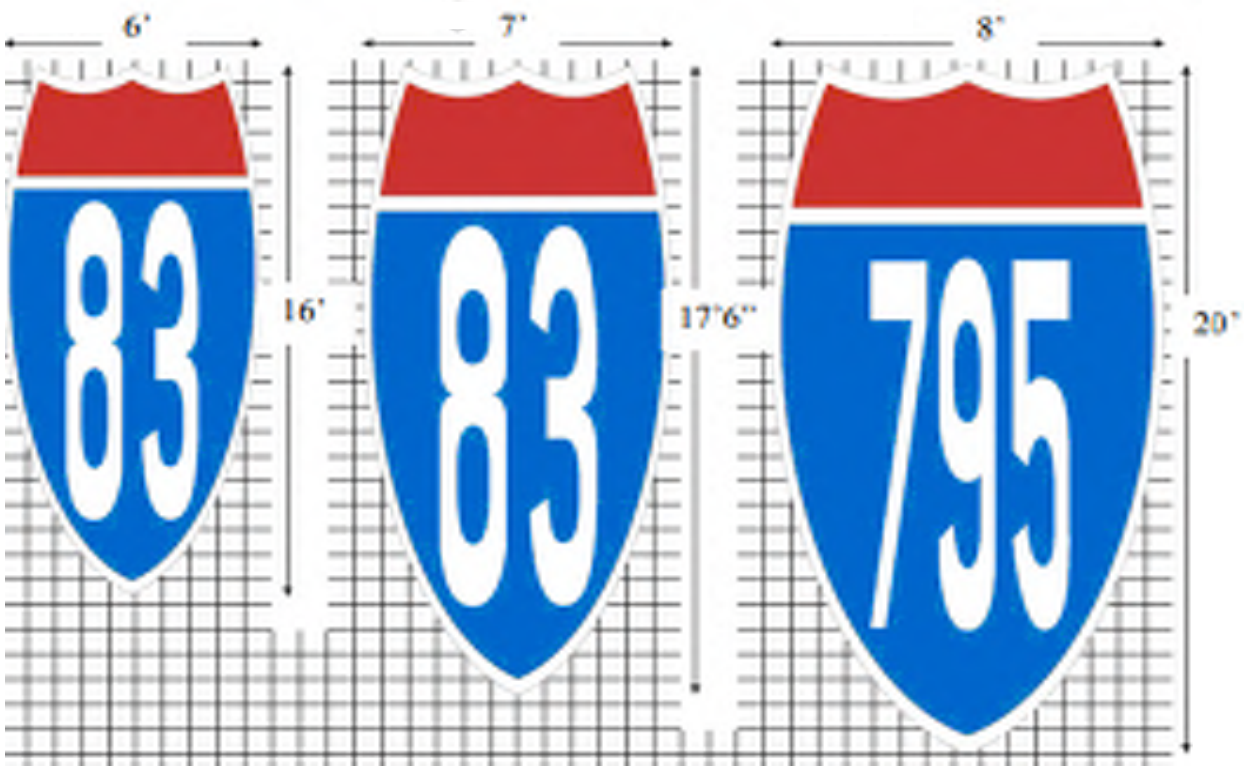
Location of the Bottleneck within the Interchange

Short-Term Design Alternatives

Two proposed short-term design alternatives – projected for 2023:

- In-pavement Interstate Shields
- Changes to the mainline configuration of I-20 W to drop a lane prior to the I-285 to I-20 W exit

In-Pavement Interstate Shields

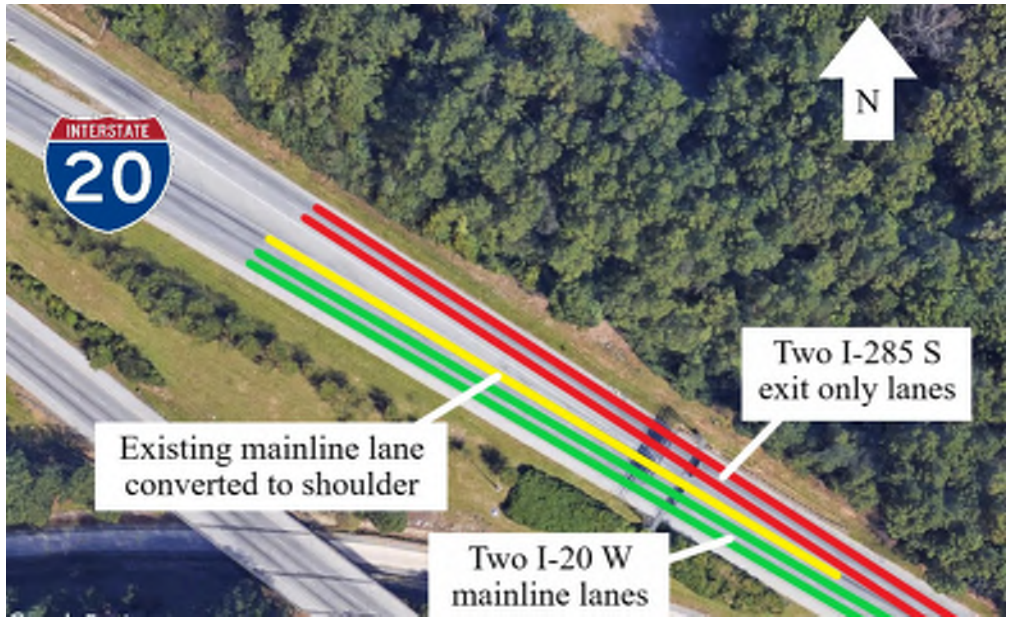


Type A Type B Type C

- Texas A&M Study
- Used in:
  - Texas
  - Tennessee
  - Florida
  - Georgia
    - Tom Moreland Interchange
- Location Placement
  - After overhead sign
  - > 500 feet, but < 1000 feet

I-20 W Mainline Drop/Add

Existing Lane Configuration of I-20 West to I-285 North Exit

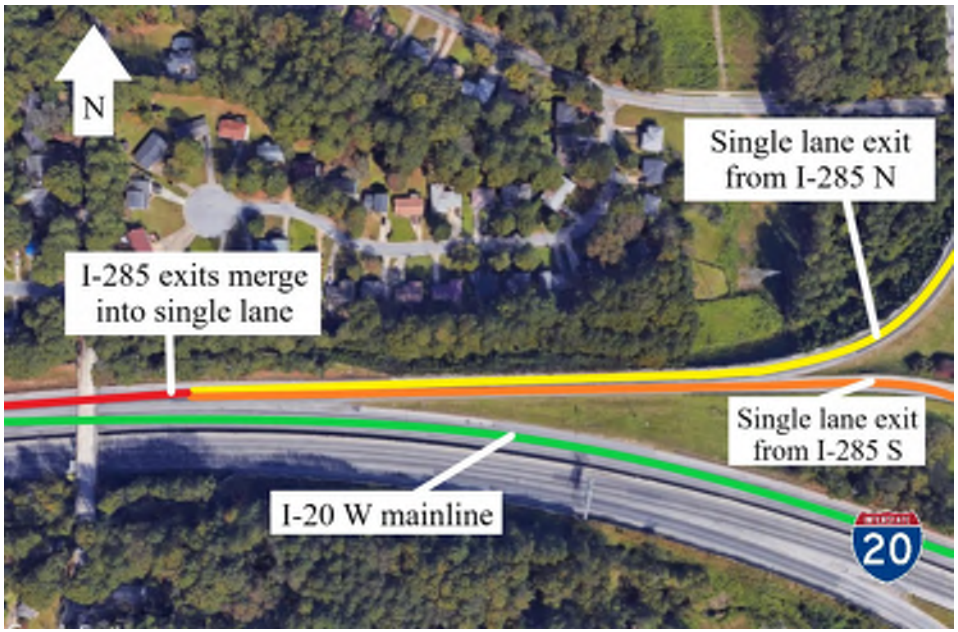


Proposed Configuration of I-20 West to I-285 North Exit

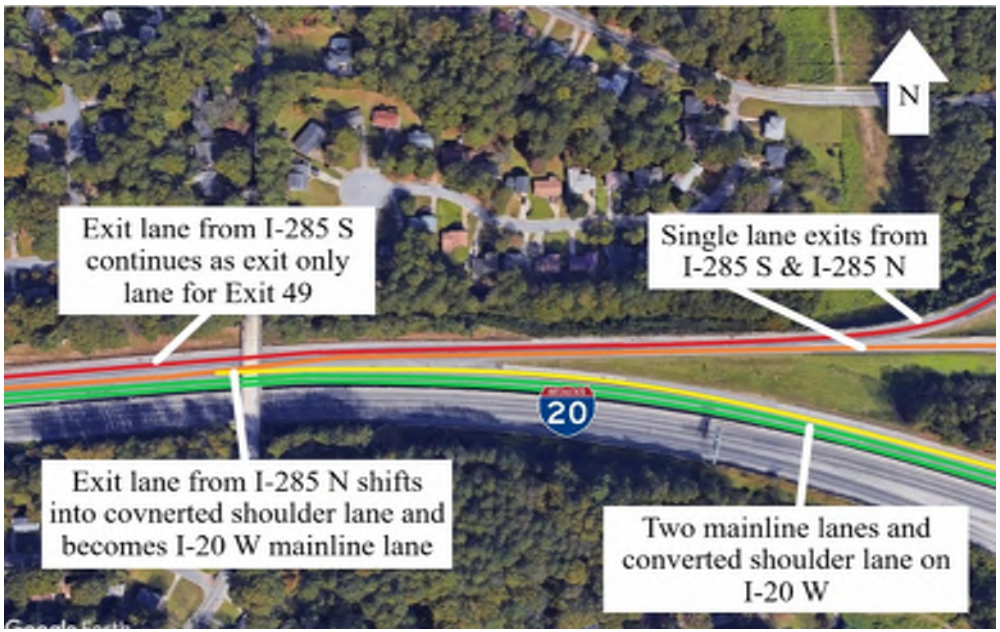
I-20 W Mainline Drop/Add

Proposed Lane Configuration of I-20 West
between Exit 51B and Exit From I-285

I-20 W Mainline Drop/Add

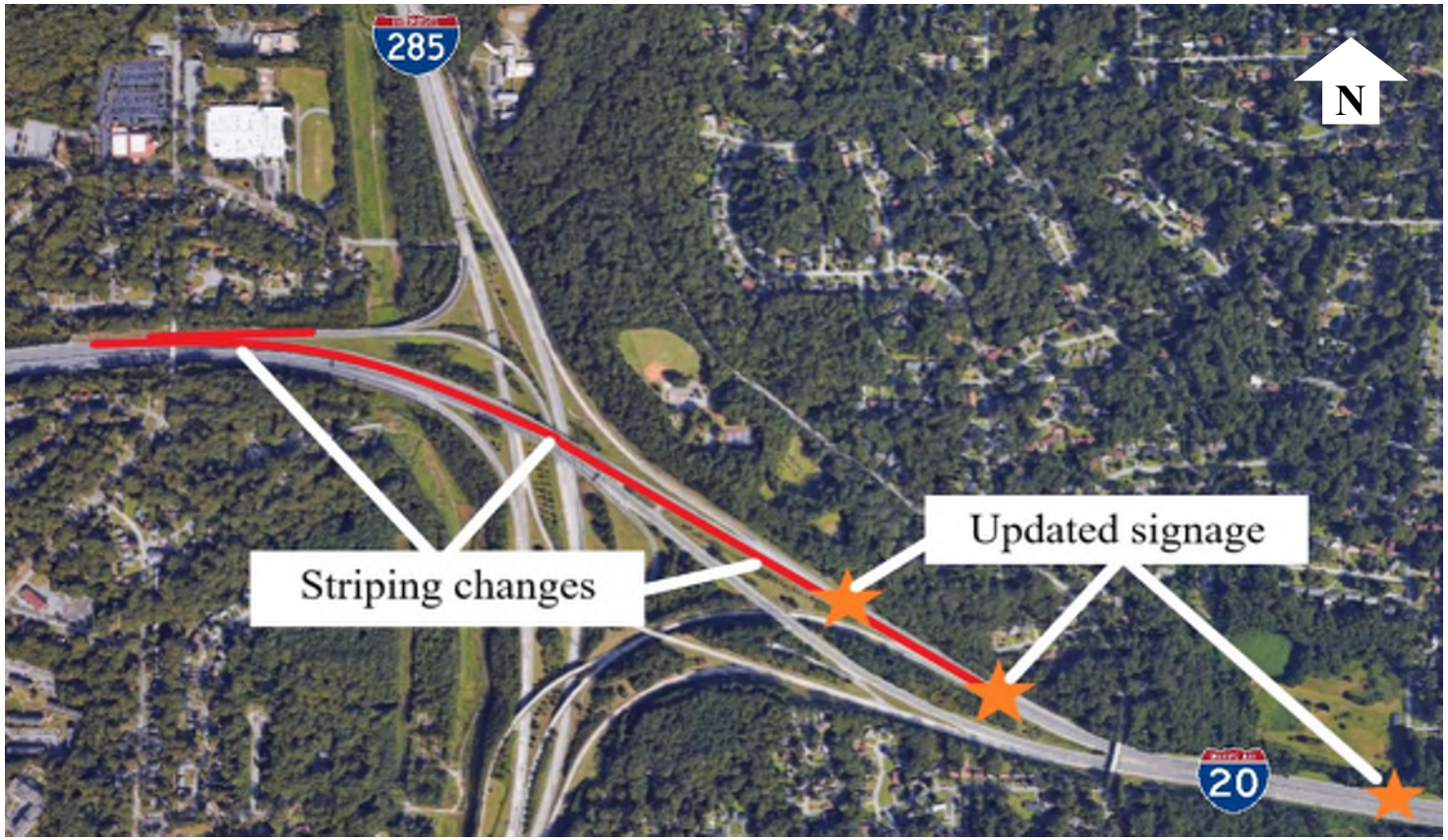


Lane Configuration of I-285 Exits to I-20 West



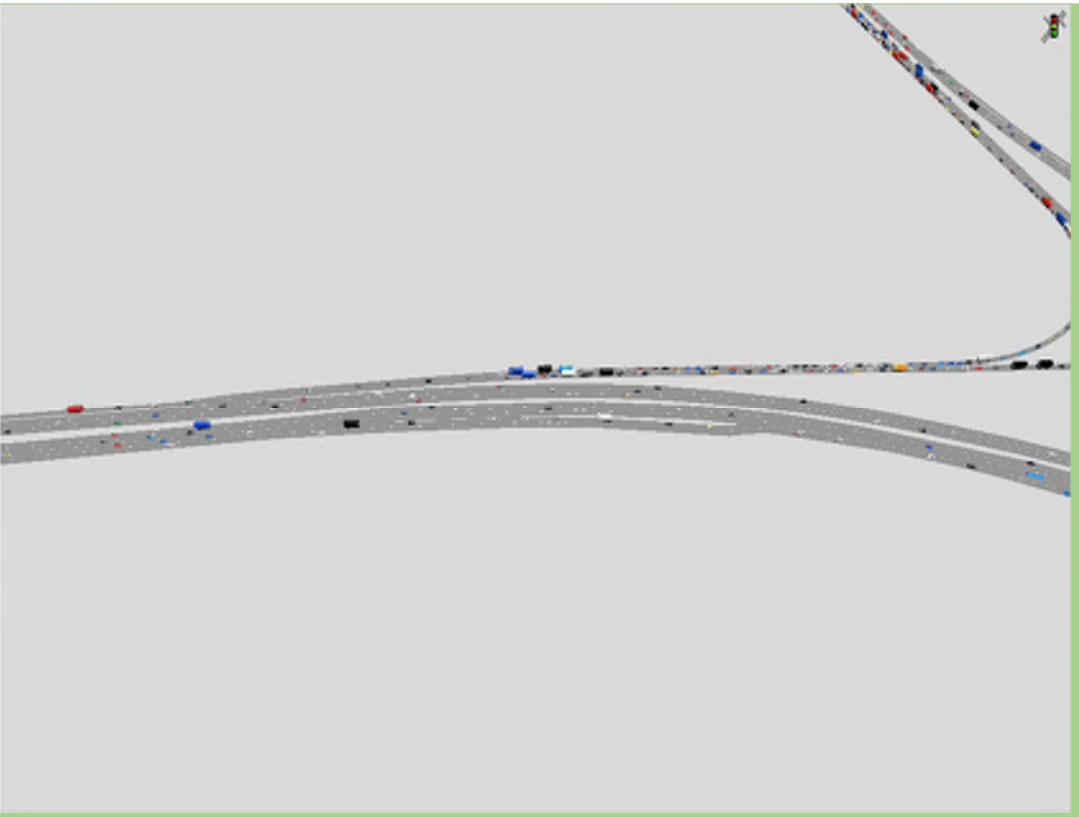
Proposed Lane Configuration of I-285 Exits to I-20 West Exit

I-20 W Mainline Drop/Add

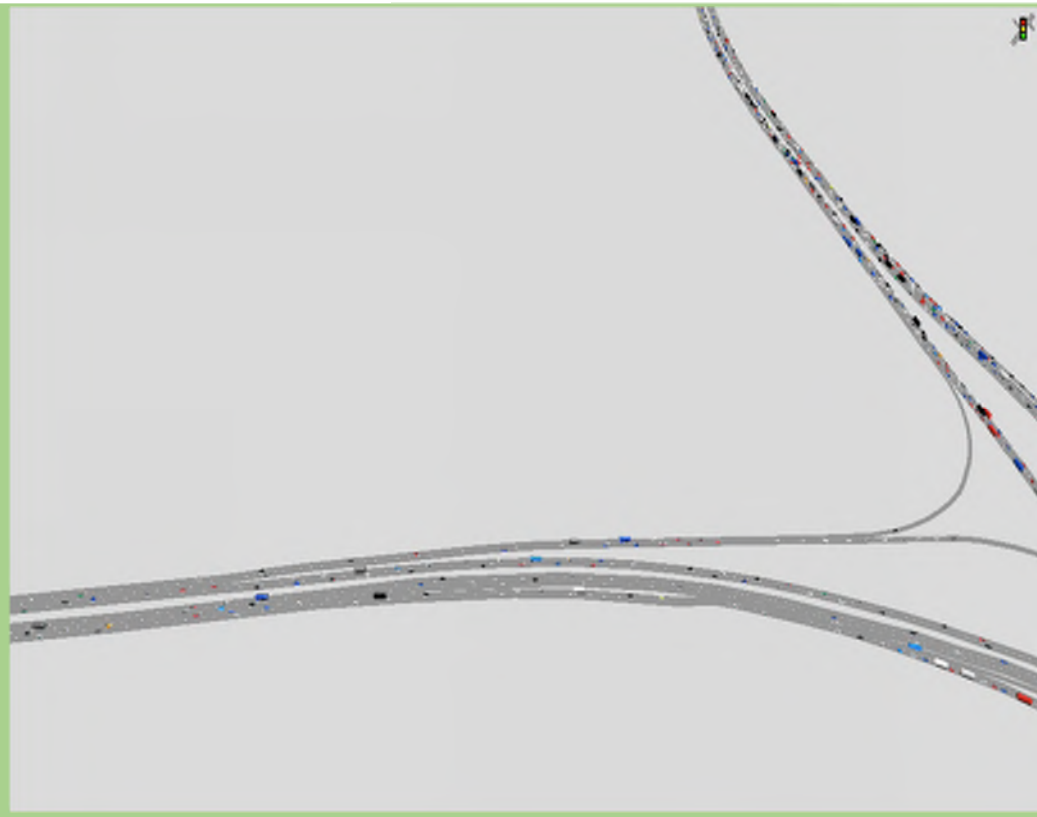


Mainline Drop/Add Alternative Change Locations

VISSIM Modeling: 2023 Conditions



No Build Alternative with 2023 Projected Volumes



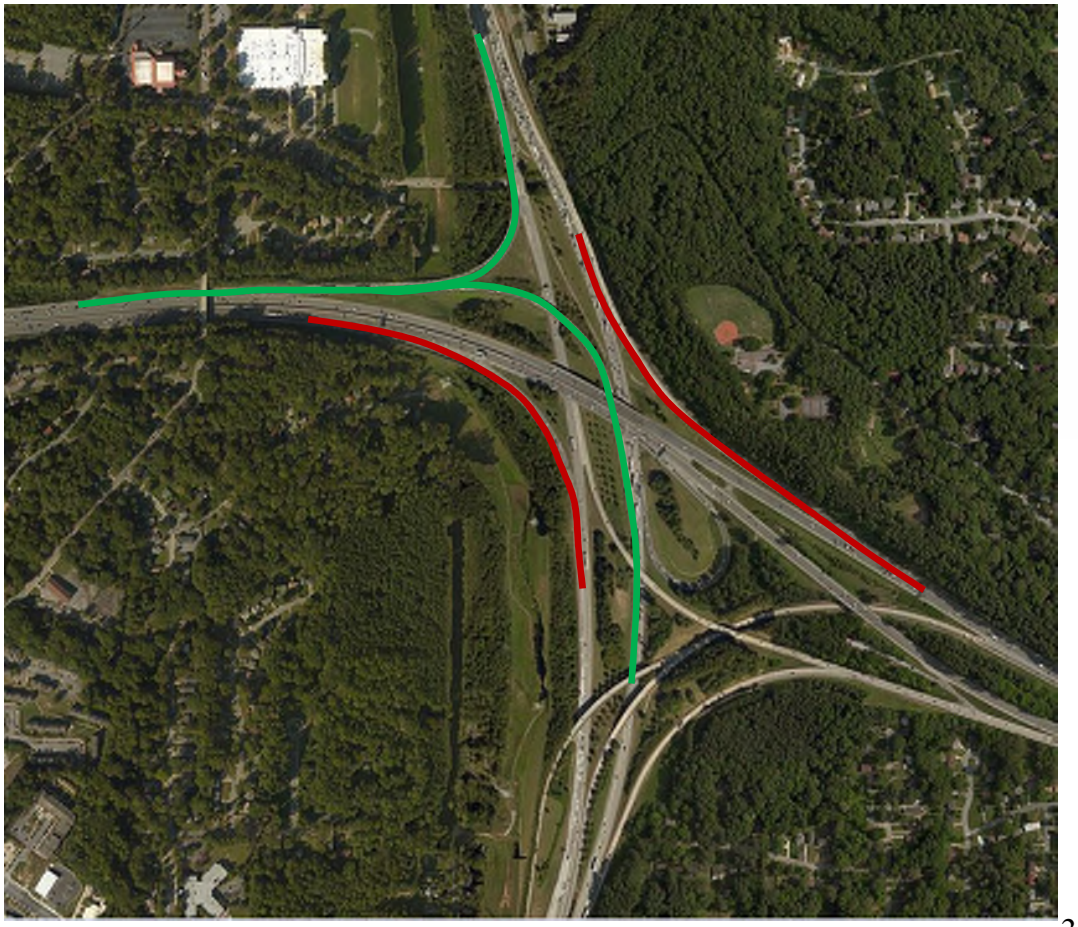
Short Term Alternative with 2023 Projected Volumes

I-20 W Mainline Drop/Add VISSIM Results

Interchange Movement	Travel Time (min)	Vehicle Delay (min)
1: I-20 W through	+2.1	+1.7
2: I-20 W to I-285 N	+4.3	+3.8
3: I-20 W to I-285 S	+1.9	+1.5
4: I-20 E to I-285 S	+2.7	+2.6
5: I-20 E to I-285 N	+1.4	+1.3
6: I-20 E through	+0.7	+0.6
7: I-285 S to I-20 W	-7.4	-7.3
8: I-285 S through	+0.5	+0.6
9: I-285 to I-20 E	0.0	+0.1
10: I-285 N through	-0.9	-1.1
11: I-285 N to I-20 W	-10.6	-10.8
12: I-285 N to I-20 E	-0.4	-0.6
Total	**-5.8**	**-7.6**

I-20 W Mainline Drop/Add Results

Interchange Movement	Travel Time (min)	Vehicle Delay (min)
2: I-20 W to I-285 N	+4.3	+3.8
4: I-20 E to I-285 S	+2.7	+2.6
7: I-285 S to I-20 W	-7.4	-7.3
11: I-285 N to I-20 W	-10.6	-10.8



Long Term Alternative

One proposed long-term design alternative – projected for 2028:

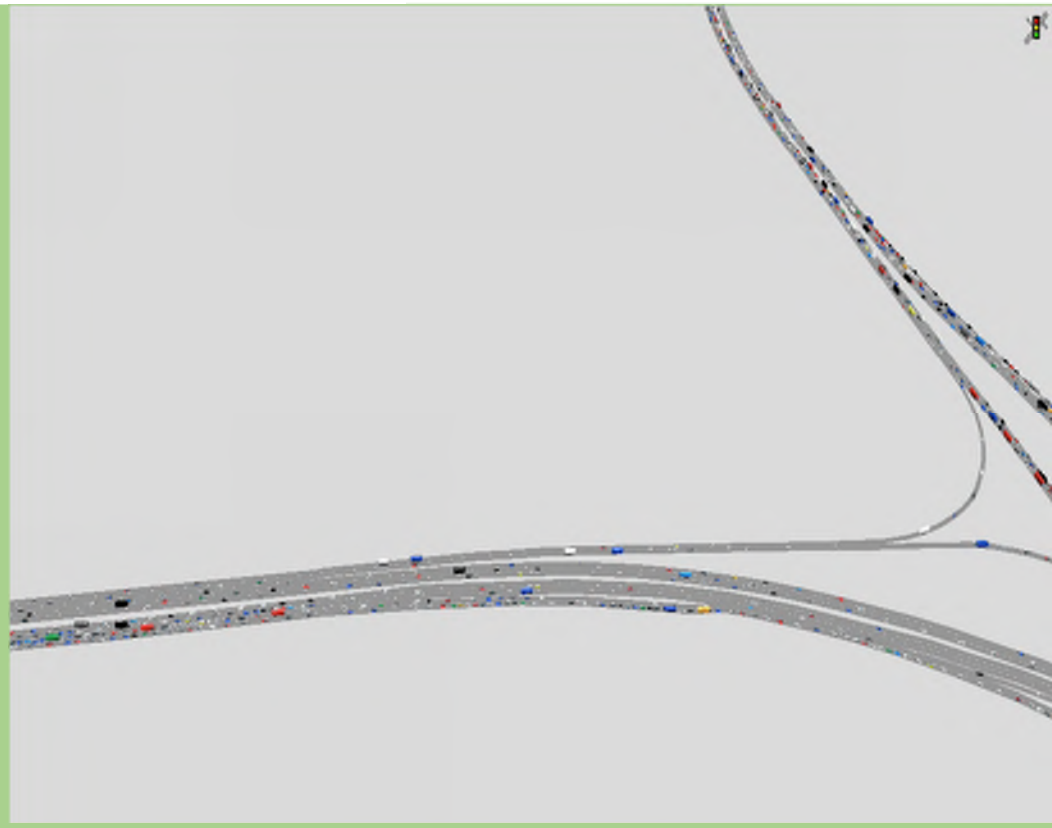
- Widening of I-20 W from Fairburn Road Bridge to Fulton Industrial Boulevard
  - 4 lanes to 5 lanes
  - 1.33 miles

- Single lane, self-supporting bridge over MLK Jr. Drive
  - Approximately 12,750 sq. ft

Long Term Alternative

VISSIM Modeling: 2028 Conditions

No Build Alternative with 2028 Projected Volumes



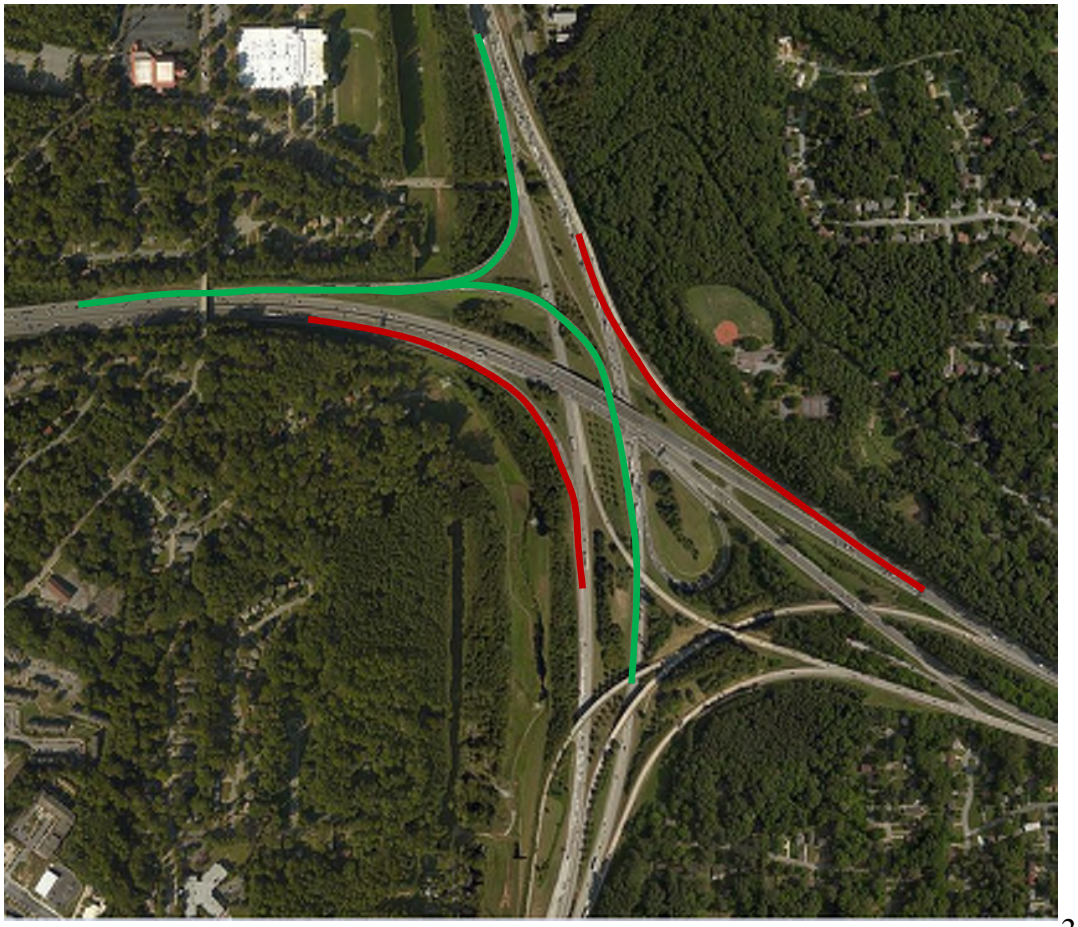
Long Term Alternative with 2028 Projected Volumes

I-20 Widening Alternative VISSIM Results

Interchange Movement	Travel Time (min)	Vehicle Delay (min)
1: I-20 W through	+1.08	+0.94
2: I-20 W to I-285 N	+7.12	+7.02
3: I-20 W to I-285 S	+0.73	+0.58
4: I-20 E to I-285 S	+4.34	+4.01
5: I-20 E to I-285 N	+2.73	+2.37
6: I-20 E through	+1.63	+1.27
7: I-285 S to I-20 W	-7.62	-7.48
8: I-285 S through	+0.40	+0.55
9: I-285 to I-20 E	+0.06	+0.08
10: I-285 N through	-1.01	-1.21
11: I-285 N to I-20 W	-11.18	-11.37
12: I-285 N to I-20 E	-0.48	-0.68
Total	**-2.32**	**-3.93**

I-20 Widening Alternative Results

Interchange Movement	Travel Time (min)	Vehicle Delay (min)
2: I-20 W to I-285 N	+7.12	+7.02
4: I-20 E to I-285 S	+4.34	+4.01
7: I-285 S to I-20 W	-7.62	-7.48
11: I-285 N to I-20 W	-11.18	-11.37



Project Limitations

- Assumptions for traffic counts and speed limits
- Traffic flow in 2023 and 2028
- Heavy vehicle volume changes
- Extent of VISSIM model does not capture greater network

Conclusion

- Primary focus:
  - Alleviate the bottleneck at the two I-285 to I-20 West ramps
- Short-term design alternatives
  - In-pavement signage at 9 locations
  - Lane drop along I-20 West
    - Saved 7 and 10 minutes on the two merging ramps
    - Decreases capacity along I-20 W mainline
- Long-term design alternative
  - Single lane, and bridge, addition to the rightmost lane of I-20 West
    - Saved 7 and 11 minutes on the two merging ramps
    - Maintains capacity along I-20 West

Lessons Learned

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- Sometimes solutions can be simple...and cheap
- Model creation is an iterative process
  - No perfect model exists
- “A jack of all trades is a master of none, but oftentimes better than a master of one”
- There is no “I” in team

Special Recognitions

- Team Members – Blane Solomon, Andrew Pofahl, and Alex Hare
- GDOT – Chris Rudd, Matthew Fowler, and Tim Matthews
- Georgia Tech – Dr. Kari Watkins, Dr. Michael Rodgers, and Dr. Lisa Rosenstein
- Kimley-Horn – Lance Ballard

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QUESTIONS?