Appendix D—Alternatives Traffic Analysis Technical Memo

Part 2

Appendix D—Generalized LOS Tables

TABLE 7

Generalized **Peak Hour Directional** Volumes for Florida's **Urbanized Areas**[1]

12/18/12

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Class I (40 mph or higher posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	830	880	**
2	Divided	*	1,910	2,000	**
3	Divided	*	2,940	3,020	**
4	Divided	*	3,970	4,040	**

Class II (35 mph or slower posted speed limit)

Lanes	Median	B	C	D	E
1	Undivided	*	370	750	800
2	Divided	*	730	1,630	1,700
3	Divided	*	1,170	2,520	2,560
4	Divided	*	1,610	3,390	3,420

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
1	Divided	Yes	No	+5%
1	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding directional volumes in this table by 1.2

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E
0-49%	*	150	390	1,000
50-84%	110	340	1,000	>1,000
85-100%	470	1,000	>1,000	**

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	*	*	140	480
50-84%	*	80	440	800
85-100%	200	540	880	>1,000

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	> 5	≥ 4	≥ 3	≥ 2
85-100%	> 4	≥ 3	≥ 2	≥ 1

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
2	2,260	3,020	3,660	3,940
3	3,360	4,580	5,500	6,080
4	4,500	6,080	7,320	8,220
5	5,660	7,680	9,220	10,360
6	7,900	10,320	12,060	12,500

Freeway Adjustments

Auxiliary Lane	Ramp Metering
+ 1,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
1	Undivided	420	840	1,190	1,640
2	Divided	1,810	2,560	3,240	3,590
3	Divided	2,720	3,840	4,860	5,380

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
1	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

[1]Values shown are presented as peak hour directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual and the Transit Capacity and Quality of Service Manual.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

* Cannot be achieved using table input value defaults.

** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
www.dot.state.fl.us/planning/systems/sm/los/default.shtm

TABLE 7

Generalized **Peak Hour Directional** Volumes for Florida's **Urbanized Areas**[1]

10/4/10

STATE SIGNALIZED ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Lanes	Median	B	C	D	E
1	Undivided	510	820	880	***
2	Divided	1,560	1,890	1,960	***
3	Divided	2,400	2,860	2,940	***
4	Divided	3,240	3,830	3,940	***

Class II (2.00 to 4.50 signalized intersections per mile)

Lanes	Median	B	C	D	E
1	Undivided	**	560	810	860
2	Divided	**	1,330	1,770	1,870
3	Divided	**	2,080	2,680	2,830
4	Divided	**	2,830	3,590	3,780

Class III/IV (more than 4.50 signalized intersections per mile)

Lanes	Median	B	C	D	E
1	Undivided	**	270	630	790
2	Divided	**	670	1,500	1,700
3	Divided	**	1,050	2,330	2,570
4	Divided	**	1,440	3,170	3,450

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Major City/County Roadways	- 10%
Other Signalized Roadways	- 35%

State & Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Divided/Undivided & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding volumes in this table by 1.20.

FREEWAYS

Lanes	B	C	D	E
2	2,200	3,020	3,720	4,020
3	3,300	4,580	5,580	6,200
4	4,400	6,080	7,420	8,400
5	5,500	7,680	9,320	10,580
6	7,560	10,220	12,080	12,780

Freeway Adjustments

Auxiliary Lanes	Ramp Metering
+ 1,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
1	Undivided	400	800	1,140	1,440
2	Divided	1,770	2,560	3,320	3,760
3	Divided	2,660	3,840	4,980	5,650

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/ Bicycle Lane Coverage	B	C	D	E
0-49%	**	170	650	>650
50-84%	130	200	>200	***
85-100%	340	>340	***	***

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	**	**	270	770
50-84%	**	100	600	1000
85-100%	**	610	1000	>1000

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	>5	≥4	≥3	≥2
85-100%	>4	≥3	≥2	≥1

[1] Values shown are presented as hourly directional volumes for levels of service and are for the automobile/truck modes unless specifically stated. To convert to annual average daily traffic volumes, these volumes must be divided by appropriate D and K factors. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

** Cannot be achieved using table input value defaults.

*** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450

TABLE 7
(continued)

Generalized **Peak Hour Directional** Volumes for Florida's
Urbanized Areas

9/4/09

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities								
				State Arterials						Class II		
	Freeways	Highways		Class I		Class II		Class III		Bicycle	Pedestrian	Bus
ROADWAY CHARACTERISTICS												
Area type (l,o)	l	l	l	l	l	l	l	l	l	l	l	l
Number of through lanes	2-6	1	2-3	1	2-4	1	2-4	1	2-4	2	2	
Posted speed (mph)	65	50	50	45	50	45	45	35	35	45	45	
Free flow speed (mph)	70	55	55	50	55	50	50	40	40	50	50	
Aux, meter, or accel/decel ≥1500 (n,y)	n											
Median (n, nr, r)		n	r	n	r	n	r	n	r	r	r	
Terrain (l,r)	l	l	l									
% no passing zone		80										
Exclusive left turn lanes /[impact](n, y)		[n]	y	y	y	y	y	y	y	y	y	
Exclusive right turn lanes (n, y)				n	n	n	n	n	n	n	n	
Paved shoulder/bicycle lane (n, y)										n, 50%,y	n	
Outside lane width										t	t	
Pavement condition										t		
Sidewalk (n, y)											n, 50%,y	n,y
Sidewalk/roadway separation (a, t, w)											t	
Sidewalk protective barrier (n, y)											n	
Obstacle to bus stop (n, y)												n
Facility length (mi)	4	5	5	2	2	2	2	2	2	2	2	2
Number of segments	4											
TRAFFIC CHARACTERISTICS												
Planning analysis hour factor (K)	0.092	0.094	0.094	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	
Peak hour factor (PHF)	0.95	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	
Base saturation flow rate (pcphpl)		1700	2100	1950	1950	1950	1950	1950	1950	1950	1950	
Heavy vehicle percent	4.0	2.0	2.0	2.0	2.0	2.0	2.0	1.5	1.5	2.0	2.0	
Local adjustment factor	0.98	1.0	0.98									
% left turns				12	12	12	12	12	12	12	12	
% right turns				12	12	12	12	12	12	12	12	
Bus span of service												15
CONTROL CHARACTERISTICS												
Number of signals				2	2	6	6	10	10	6	6	
Arrival type (1-6)				3	3	4	4	4	4	4	4	
Signal type (a, s, p)				a	a	s	s	s	s	s	s	
Cycle length (C)				120	120	120	120	120	120	120	120	
Effective green ratio (g/C)				0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highway Segments		State & Non-State Signalized Arterials			Bicycle	Pedestrian	Bus
		Two-Lane	Multilane	Class I	Class II	Class III			
	Density	%ffs	Density	ats	ats	ats	Score	Score	Buses per hr.
B	≤17	≥0.833	≤18	> 34 mph	> 28 mph	> 24 mph	≤2.5	≤2.5	≥4
C	≤24	>0.750	≤26	> 27 mph	> 22 mph	> 18 mph	≤3.5	≤3.5	≥3
D	≤31	>0.667	≤35	> 21 mph	> 17 mph	> 14 mph	≤4.5	≤4.5	≥2
E	≤39	>0.583	≤41	> 16 mph	> 13 mph	> 10 mph	≤5.5	≤5.5	≥1

% ffs = Percent free flow speed ats = Average travel speed

7.7.1.4 Vertical Alignment

Maximum grades for vertical alignment cannot be as definitively expressed as for highway mainline. The minimum grade is 0.50%. General values of limiting gradient for upgrades are shown in Exhibit 7-26, but for any one ramp the selected gradient is dependent upon a number of factors including:

- The flatter the gradient on the ramp, the longer it will be.
- The steepest gradients should be designed for the center part of the ramp. Landing areas or storage platforms at at-grade intersections with ramps should be as flat as possible.
- Downgrades on ramps should follow the same guidelines as upgrades. They may, however, safely exceed these values by 2 percent, with 8 percent considered the desired maximum grade.
- Ramp gradients and lengths can be significantly impacted by the angle of intersection between the two highways and the direction and amount of gradient on the two mainlines.
- K values and desirable stopping sight distance should meet the minimum design values for vertical curves.

Exhibit 7-26
Ramp Gradient Guidelines

	Ramp Design Speed (mph)			
	20 to 25	25 to 30	30 to 45	45 to 50
Maximum Desirable Grades (%)	6-8	5-7	4-6	3-5

Source: MassHighway

7.7.2 Capacity

Exhibit 7-27 provides the volumes for a given ramp design speed and level of service. Although the exhibit indicates that up to 1,700 passenger car equivalents per hour (pcph) can be accommodated on a single-lane ramp, freeway/ramp junctions are not capable of handling this volume; therefore, 1,500 pcph should be used as a threshold to warrant a two-lane ramp.

Exhibit 7-27
Approximate Service Volumes for Single-lane Ramps

	Ramp Design Speed (mph)				
LOS	≤ 20	20 - 30	30 - 45	45 - 50	≥50
A	--	--	--	--	700
B	--	--	--	1,000	1050
C	--	--	1,125	1,250	1,300
D	--	1,025	1,200	1,325	1,500
E	1,250	1,450	1,600[1]	1,650[1]	1,700[1]
F	--Widely Variable --				

Source, Highway Capacity Manual, Washington DC 2000
Note: Based on Peak Hour Factor of 1.0, service volumes expressed in passenger cars per hour.
1 For two-Lane Ramps, Multiply Above Values By 1.7 for < 20 mph, 1.8 for 20-30 mph & 45-50 mph, 1.9 for 30-45 mph, and 2.0 for ≥50 mph
-- LOS not achievable due to restricted design speeds

The minimum radius of a two-lane ramp should be 1,000 feet. The capacity of a loop ramp is about 1,250 pcph; however, two-lane loop ramps are very undesirable because of their restrictive geometry. Therefore, if a left-turn movement will exceed 1,250, a directional or semi-directional connection may be needed. Ramps must be designed with sufficient capacity to avoid backups on the main line. The *Highway Capacity Manual* further discusses the capacity of ramps.

7.8 Ramp/Minor Road Intersections

At service interchanges the ramp or loop normally intersects the minor road at-grade at approximately a 90-degree angle. This intersection should be treated as described in Chapter 6. This will involve a consideration of the necessary traffic control devices, capacity, and the physical geometric design elements such as sight distance, angle of intersection, grade, channelization, and turning lanes. However, the following points warrant special attention in the design of the ramp/minor road intersection:

- **Capacity** – In urban areas where traffic volumes may be high, inadequate capacity of the ramp/minor road intersection can adversely affect the operation of the ramp/freeway junction. In a worst case situation the safety and operation of the mainline itself may be impaired by a back-up onto the freeway. Therefore, special attention should be given to providing sufficient capacity and storage for an at-grade intersection with the minor road. This could lead to the addition of lanes at the intersection or on the ramp

Appendix E—Interchange Capacity Screening Inputs and Results

Exit 101 Interchange	Alternative	Existing Interstate EB/SB	Existing Interstate WB/NB	Existing Ramps EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	Existing Arterial EB/SB	Existing Arterial WB/NB
Existing	Lanes	3	3	1	-	1	1	1	-	1	1	2	2
	AM Peak Vol	4,455	2,327	134	-	262	847	275	-	352	127	1,106	976
	AM LOS	C	B	B	-	B	B	B	-	B	B	D	D
	PM Peak Vol	2,900	4,868	88	-	117	837	401	-	661	229	1,048	1,431
	PM LOS	B	D	B	-	B	B	B	-	C	B	D	D
AO45 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,455	2,327	396	-	-	847	627	-	-	127	1,106	976
	AM LOS	C	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	2,900	4,868	205	-	-	837	1,062	-	-	229	1,048	1,431
	PM LOS	B	D	B	-	-	B	C	-	-	B	D	D
AO44 - Roundabout Intersections	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,455	2,327	396	-	-	847	627	-	-	127	1,106	976
	AM LOS	C	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	2,900	4,868	205	-	-	837	1,062	-	-	229	1,048	1,431
	PM LOS	B	D	B	-	-	B	C	-	-	B	D	D
AO43 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,455	2,327	396	-	-	847	627	-	-	127	1,106	976
	AM LOS	C	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	2,900	4,868	205	-	-	837	1,062	-	-	229	1,048	1,431
	PM LOS	B	D	B	-	-	B	C	-	-	B	D	D

Annual Growth Rate	1.00%
Design Year	2040
Arterial Class	III/IV

Exit 101		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	1	1	1	-	1	1	2	2
	AM Peak Vol	5,771	3,015	174	-	340	1,098	357	-	456	165	1,433	1,265
	AM LOS	E	B	B	-	B	C	B	-	B	B	D	D
	PM Peak Vol	3,757	6,306	114	-	152	1,085	520	-	857	297	1,358	1,854
	PM LOS	C	F	B	-	B	C	B	-	D	B	D	F
AO45 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,771	3,015	513	-	-	1,098	813	-	-	165	1,433	1,265
	AM LOS	E	B	B	-	-	C	B	-	-	B	D	D
	PM Peak Vol	3,757	6,306	266	-	-	1,085	1,376	-	-	297	1,358	1,854
	PM LOS	C	F	B	-	-	C	E	-	-	B	D	F
AO44 - Roundabout Intersections	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,771	3,015	513	-	-	1,098	813	-	-	165	1,433	1,265
	AM LOS	E	B	B	-	-	C	B	-	-	B	D	D
	PM Peak Vol	3,757	6,306	266	-	-	1,085	1,376	-	-	297	1,358	1,854
	PM LOS	C	F	B	-	-	C	E	-	-	B	D	F
AO43 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,771	3,015	513	-	-	1,098	813	-	-	165	1,433	1,265
	AM LOS	E	B	B	-	-	C	B	-	-	B	D	D
	PM Peak Vol	3,757	6,306	266	-	-	1,085	1,376	-	-	297	1,358	1,854
	PM LOS	C	F	B	-	-	C	E	-	-	B	D	F

Exit 101 (Broad River Road) Capacity Assessment															
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps				
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build (AO51)	Existing	AM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
		PM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
	2040	AM	Near	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
		PM	Under	Over	Under	Over	Under	-	Under	Under	Under	-	Under	Under
AO43 (DDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Near	-	-	Under
AO44 (Roundabout)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Near	-	-	Under
AO45 (TUDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Near	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: Diverging Diamond				Third: Displaced Left			

Exit 102		Existing Interstate		Existing Ramps								Existing Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	1	1	1	-	1	1	2	2
	AM Peak Vol	4,906	2,838	319	-	247	716	287	-	467	243	1,347	1,082
	AM LOS	D	B	B	-	B	B	B	-	C	B	D	D
	PM Peak Vol	3,532	5,416	193	-	62	757	351	-	606	409	1,191	1,507
	PM LOS	C	D	B	-	B	B	B	-	C	B	D	E
AO42 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,906	2,838	566	-	-	716	754	-	-	243	1,347	1,082
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	C
	PM Peak Vol	3,532	5,416	255	-	-	757	957	-	-	409	1,191	1,507
	PM LOS	C	D	B	-	-	B	B	-	-	B	C	D
AO41 - Roundabout Intersections	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,906	2,838	566	-	-	716	754	-	-	243	1,347	1,082
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	C
	PM Peak Vol	3,532	5,416	255	-	-	757	957	-	-	409	1,191	1,507
	PM LOS	C	D	B	-	-	B	B	-	-	B	C	D
AO40 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	4,906	2,838	566	-	-	716	754	-	-	243	1,347	1,082
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	C
	PM Peak Vol	3,532	5,416	255	-	-	757	957	-	-	409	1,191	1,507
	PM LOS	C	D	B	-	-	B	B	-	-	B	C	D

Annual Growth Rate	**Design Year**	**Arterial Class**
1.00%	2040	II

Exit 102		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	1	1	1	-	1	1	2	2
	AM Peak Vol	6,355	3,676	414	-	320	928	372	-	605	315	1,745	1,402
	AM LOS	F	C	B	-	B	B	B	-	C	B	F	D
	PM Peak Vol	4,575	7,016	250	-	81	981	455	-	785	530	1,543	1,952
	PM LOS	C	F	B	-	B	B	B	-	D	B	E	F
AO42 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,355	3,676	734	-	-	928	977	-	-	315	1,745	1,402
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,575	7,016	331	-	-	981	1,240	-	-	530	1,543	1,952
	PM LOS	C	F	B	-	-	B	C	-	-	B	D	F
AO41 - Roundabout Intersections	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,355	3,676	734	-	-	928	977	-	-	315	1,745	1,402
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,575	7,016	331	-	-	981	1,240	-	-	530	1,543	1,952
	PM LOS	C	F	B	-	-	B	C	-	-	B	D	F
AO40 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,355	3,676	734	-	-	928	977	-	-	315	1,745	1,402
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,575	7,016	331	-	-	981	1,240	-	-	530	1,543	1,952
	PM LOS	C	F	B	-	-	B	C	-	-	B	D	F

Exit 102 (Lake Murray Boulevard) Capacity Assessment														
			Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
Alternative	Year	Peak Hour	EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build (AO50)	Existing	AM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
		PM	Under	Under	Under	Near	Under	-	Under	Under	Under	-	Under	Under
	2040	AM	Over	Under	Over	Under	Under	-	Under	Under	Under	-	Under	Under
		PM	Under	Over	Near	Over	Under	-	Under	Under	Under	-	Under	Under
AO40 (DDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Under	-	-	Under
AO41 (Roundabout)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Under	-	-	Under
AO42 (TUDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Under	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: Displaced Left				Third: Diverging Diamond			

Exit 103		Existing Interstate		Existing Ramps								Existing Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	1	-	1	1	2	2
	AM Peak Vol	5,056	3,156	105	-	-	586	481	-	481	163	783	915
	AM LOS	D	B	B	-	-	B	B	-	C	B	D	D
	PM Peak Vol	4,034	5,748	372	-	-	853	800	-	800	468	1,431	1,419
	PM LOS	C	E	B	-	-	B	B	-	D	B	D	D
AO35 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,056	3,156	105	-	-	586	481	-	-	163	783	915
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,034	5,748	372	-	-	853	800	-	-	468	1,431	1,419
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO37 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,056	3,156	105	-	-	586	481	-	-	163	783	915
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,034	5,748	372	-	-	853	800	-	-	468	1,431	1,419
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO38 0 5-leg roundabout	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,056	3,156	105	-	-	586	481	-	-	163	783	915
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,034	5,748	372	-	-	853	800	-	-	468	1,431	1,419
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO36 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,056	3,156	105	-	-	586	481	-	-	163	783	915
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,034	5,748	372	-	-	853	800	-	-	468	1,431	1,419
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D

Annual Growth Rate
1.00%
Design Year
2040
Arterial Class
III/IV

Exit 103		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	-	-	1	1	2	2
	AM Peak Vol	6,549	4,088	137	-	-	760	-	-	624	212	1,015	1,186
	AM LOS	F	C	B	-	-	B	-	-	C	B	D	D
	PM Peak Vol	5,226	7,446	482	-	-	1,105	-	-	1,037	607	1,854	1,838
	PM LOS	D	F	B	-	-	C	-	-	E	B	F	F
AO35 - Tight Urban Diamond	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,549	4,088	137	-	-	760	624	-	-	212	1,015	1,186
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,226	7,446	482	-	-	1,105	1,037	-	-	607	1,854	1,838
	PM LOS	D	F	B	-	-	C	C	-	-	B	F	F
AO37 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,549	4,088	137	-	-	760	624	-	-	212	1,015	1,186
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,226	7,446	482	-	-	1,105	1,037	-	-	607	1,854	1,838
	PM LOS	D	F	B	-	-	C	C	-	-	B	F	F
AO38 0 5-leg roundabout	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,549	4,088	137	-	-	760	624	-	-	212	1,015	1,186
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,226	7,446	482	-	-	1,105	1,037	-	-	607	1,854	1,838
	PM LOS	D	F	B	-	-	C	C	-	-	B	F	F
AO36 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,549	4,088	137	-	-	760	624	-	-	212	1,015	1,186
	AM LOS	F	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,226	7,446	482	-	-	1,105	1,037	-	-	607	1,854	1,838
	PM LOS	D	F	B	-	-	C	C	-	-	B	F	F

Exit 103 (Harbison Boulevard) Capacity Assessment														
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build (AO49)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	Under	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	Under	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	-	-	Under	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	-	-	Near	Under
AO35 (TUDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO36 (DDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO37 (SPUI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO38 (Roundabout	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO39 (Offset SPUI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: Displaced Left				Third: SPUI			

Exit 104 Interchange	Alternative	Existing Interstate EB/SB	Existing Interstate WB/NB	Existing Ramps EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	Existing Arterial EB/SB	Existing Arterial WB/NB
Existing	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,537	3,552	319	-	-	716	287	-	-	243	973	978
	AM LOS	D	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,515	6,028	193	-	-	757	351	-	-	409	856	1,373
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO32 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,537	3,552	319	-	-	716	287	-	-	243	973	978
	AM LOS	D	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,515	6,028	193	-	-	757	351	-	-	409	856	1,373
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO33 - Roundabouts	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,537	3,552	319	-	-	716	287	-	-	243	973	978
	AM LOS	D	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,515	6,028	193	-	-	757	351	-	-	409	856	1,373
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO31 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,537	3,552	319	-	-	716	287	-	-	243	973	978
	AM LOS	D	C	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	4,515	6,028	193	-	-	757	351	-	-	409	856	1,373
	PM LOS	C	E	B	-	-	B	B	-	-	B	D	D
AO30 - Existing - with improvements	Lanes	3	3	1	-	-	1	1	-	-	1	3	3
	AM Peak Vol	5,537	3,552	319	-	-	716	287	-	-	243	973	978
	AM LOS	D	C	B	-	-	B	B	-	-	B	C	C
	PM Peak Vol	4,515	6,028	193	-	-	757	351	-	-	409	856	1,373
	PM LOS	C	E	B	-	-	B	B	-	-	B	C	D

Annual Growth Rate	**Design Year**	**Arterial Class**
1.00%	2040	III/IV

Exit 104		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	7,172	4,601	414	-	-	928	372	-	-	315	1,261	1,267
	AM LOS	F	D	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,849	7,808	250	-	-	981	455	-	-	530	1,109	1,779
	PM LOS	E	F	B	-	-	B	B	-	-	B	D	F
AO32 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	7,172	4,601	414	-	-	928	372	-	-	315	1,261	1,267
	AM LOS	F	D	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,849	7,808	250	-	-	981	455	-	-	530	1,109	1,779
	PM LOS	E	F	B	-	-	B	B	-	-	B	D	F
AO33 - Roundabouts	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	7,172	4,601	414	-	-	928	372	-	-	315	1,261	1,267
	AM LOS	F	D	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,849	7,808	250	-	-	981	455	-	-	530	1,109	1,779
	PM LOS	E	F	B	-	-	B	B	-	-	B	D	F
AO31 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	7,172	4,601	414	-	-	928	372	-	-	315	1,261	1,267
	AM LOS	F	D	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,849	7,808	250	-	-	981	455	-	-	530	1,109	1,779
	PM LOS	E	F	B	-	-	B	B	-	-	B	D	F
AO30 - Existing - with improvements	Lanes	3	3	1	-	-	1	1	-	-	1	3	3
	AM Peak Vol	7,172	4,601	414	-	-	928	372	-	-	315	1,261	1,267
	AM LOS	F	D	B	-	-	B	B	-	-	B	D	D
	PM Peak Vol	5,849	7,808	250	-	-	981	455	-	-	530	1,109	1,779
	PM LOS	E	F	B	-	-	B	B	-	-	B	D	D

Exit 104 (Piney Grove Road) Capacity Assessment														
			Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
Alternative	Year	Peak Hour	EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	Under	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	Under	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	-	-	Under	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	-	-	Near	Under
AO30 (Improve Existing)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO31 (DDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO32 (SPUI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO33 (Roundabout	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO34 (Split Diamond)	Existing	AM (103)	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		AM (104)			Under	Under	Under	-	-	Under	Under	-	-	Under
		PM (103)	Under	Over	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM (104)			Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM (103)	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		AM (104)			Under	Under	Under	-	-	Over	Under	-	-	Under
		PM (103)	Under	Over	Over	Over	Under	-	-	Near	Near	-	-	Under
		PM (104)			Under	Under	Near	-	-	Over	Near	-	-	Under
CAP-X Results			First: Diverging Diamond				Second: Displaced Left				Third: Partial Cloverleaf			

Existing Interstate		Existing Ramps								Existing Arterial		**Annual Growth Rate**
EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB	
3	5	1	1	-	1	1	-	1	1	3	3	1.00%
6,321	4,496	81	909	-	1,180	764	-	363	183	973	978	**Design Year**
F	B	B	D	-	C	B	-	B	B	C	C	
5,023	6,783	287	890	-	696	409	-	627	281	856	1,373	
D	C	B	D	-	B	B	-	C	B	C	D	
3	5	1	-	-	1	1	-	-	1	3	3	2040
6,321	4,496	81	-	-	2,089	1,127	-	-	183	973	978	**Arterial Class**
F	B	B	-	-	F	C	-	-	B	C	C	
5,023	6,783	287	-	-	1,586	1,036	-	-	281	973	978	III/IV
D	C	B	-	-	E	C	-	-	B	C	C	
3	5	1	-	-	1	1	-	1	1	3	3	
6,321	4,496	81	-	-	2,089	764	-	363	183	973	978	
F	B	B	-	-	F	B	-	B	B	C	C	
5,023	6,783	287	-	-	1,586	409	-	627	281	856	1,373	
D	C	B	-	-	E	B	-	C	B	C	D	
3	3	1	-	-	1	1	-	-	1	2	2	
6,321	4,496	81	-	-	2,089	1,127	-	-	183	973	978	
F	C	B	-	-	F	C	-	-	B	D	D	
5,023	6,783	287	-	-	1,586	1,036	-	-	281	856	1,373	
D	F	B	-	-	E	C	-	-	B	D	D	
3	3	1	-	-	1	1	-	-	1	2	2	
6,321	4,496	81	-	-	2,089	1,127	-	-	183	973	978	
F	C	B	-	-	F	C	-	-	B	D	D	
5,023	6,783	287	-	-	1,586	1,036	-	-	281	856	1,373	
D	F	B	-	-	E	C	-	-	B	D	D	
3	3	1	-	-	1	1	-	-	1	2	2	
6,321	4,496	81	-	-	2,089	1,127	-	-	183	973	978	
F	C	B	-	-	F	C	-	-	B	D	D	
5,023	6,783	287	-	-	1,586	1,036	-	-	281	856	1,373	
D	F	B	-	-	E	C	-	-	B	D	D	
3	3	1	-	-	1	1	-	-	1	2	2	
6,321	4,496	81	-	-	2,089	1,127	-	-	183	973	978	
F	C	B	-	-	F	C	-	-	B	D	D	
5,023	6,783	287	-	-	1,586	1,036	-	-	281	856	1,373	
D	F	B	-	-	E	C	-	-	B	D	D	

Future Interstate		Future Ramp								Future Arterial	
EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
3	5	1	1	-	1	1	-	1	1	3	3
8,188	5,824	105	1,178	-	1,529	990	-	471	238	1,261	1,267
F	C	B	E	-	E	B	-	C	B	D	D
6,507	8,786	372	1,153	-	902	530	-	813	364	1,109	1,779
F	D	B	E	-	B	B	-	D	B	D	D
3	5	1	-	-	1	1	-	-	1	3	3
8,188	5,824	105	-	-	2,706	1,460	-	-	238	1,261	1,267
F	C	B	-	-	F	E	-	-	B	D	D
6,507	8,786	372	-	-	2,055	1,342	-	-	364	1,261	1,267
F	D	B	-	-	F	E	-	-	B	D	D
3	5	1	-	-	1	1	-	1	1	3	3
8,188	5,824	105	-	-	2,706	990	-	471	238	1,261	1,267
F	C	B	-	-	F	B	-	C	B	D	D
6,507	8,786	372	-	-	2,055	530	-	813	364	1,109	1,779
F	D	B	-	-	F	B	-	D	B	D	D
3	3	1	-	-	1	1	-	-	1	2	2
8,188	5,824	105	-	-	2,706	1,460	-	-	238	1,261	1,267
F	E	B	-	-	F	E	-	-	B	D	D
6,507	8,786	372	-	-	2,055	1,342	-	-	364	1,109	1,779
F	F	B	-	-	F	E	-	-	B	D	F
3	3	1	-	-	1	1	-	-	1	3	3
8,188	5,824	105	-	-	2,706	1,460	-	-	238	1,261	1,267
F	E	B	-	-	F	E	-	-	B	D	D
6,507	8,786	372	-	-	2,055	1,342	-	-	364	1,109	1,779
F	F	B	-	-	F	E	-	-	B	D	D
3	3	1	-	-	1	1	-	-	1	3	3
8,188	5,824	105	-	-	2,706	1,460	-	-	238	1,261	1,267
F	E	B	-	-	F	E	-	-	B	D	D
6,507	8,786	372	-	-	2,055	1,342	-	-	364	1,109	1,779
F	F	B	-	-	F	E	-	-	B	D	D
3	3	1	-	-	1	1	-	-	1	3	3
8,188	5,824	105	-	-	2,706	1,460	-	-	238	1,261	1,267
F	E	B	-	-	F	E	-	-	B	D	D
6,507	8,786	372	-	-	2,055	1,342	-	-	364	1,109	1,779
F	F	B	-	-	F	E	-	-	B	D	D

Exit 106 (St Andrews Road) Capacity Assessment														
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Over	Under	Under	Under	Under	Under	-	Under	Under	-	Under	Under
		PM	Under	Under	Under	Under	Under	Under	-	Under	Under	-	Under	Under
	2040	AM	Over	Under	Under	Under	Under	Near	-	Near	Under	-	Under	Under
		PM	Over	Under	Under	Under	Under	Near	-	Under	Under	-	Under	Under
AO11 (DDA)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	-	Under
		PM	Under	Over	Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM	Over	Near	Under	Under	Under	-	-	Over	Near	-	-	Under
		PM	Over	Over	Under	Over	Under	-	-	Over	Near	-	-	Under
AO12 (Flyover)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	-	Under
		PM	Under	Over	Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM	Over	Near	Under	Under	Under	-	-	Over	Near	-	-	Under
		PM	Over	Over	Under	Under	Under	-	-	Over	Near	-	-	Under
AO13 (SPUI)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	-	Under
		PM	Under	Under	Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Over	Near	-	-	Under
		PM	Over	Under	Under	Under	Under	-	-	Over	Near	-	-	Under
AO14 (Modified DDI)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	-	Under
		PM	Under	Over	Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM	Over	Near	Under	Under	Under	-	-	Over	Near	-	-	Under
		PM	Over	Over	Under	Under	Under	-	-	Over	Near	-	-	Under
AO15 (DDI - Frontage Rd)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	-	Under
		PM	Under	Over	Under	Under	Under	-	-	Near	Under	-	-	Under
	2040	AM	Over	Near	Under	Under	Under	-	-	Over	Near	-	-	Under
		PM	Over	Over	Under	Under	Under	-	-	Over	Near	-	-	Under
AO16 (Roundabout)	Existing	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	Under	Under
		PM	Under	Under	Under	Under	Under	-	-	Near	Under	-	Under	Under
	2040	AM	Over	Under	Under	Under	Under	-	-	Over	Under	-	Under	Under
		PM	Over	Under	Under	Under	Under	-	-	Over	Under	-	Under	Under
CAP-X Results			First: Partial Cloverleaf				Second: Diverging Diamond				Third: Displaced Left			

Exit 107/64		Existing Interstate		Existing Ramps								Existing Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	5	5	1	1	1	1	1	1	1	1	-	-
	AM Peak Vol	8,329	3,816	480	800	1,410	1,300	620	640	460	1,120	-	-
	AM LOS	D	B	B	D	F	D	B	C	B	C	-	-
	PM Peak Vol	6,322	6,693	750	560	1,240	560	700	570	1,190	1,410	-	-
	PM LOS	C	C	B	C	E	B	B	C	E	E	-	-

Annual Growth Rate
1.00%
Design Year
2040
Arterial Class
-

Exit 107/64		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	5	5	1	1	1	1	1	1	1	1	-	-
	AM Peak Vol	10,789	4,943	622	1,037	1,827	1,684	804	829	596	1,451	-	-
	AM LOS	F	B	B	E	F	F	B	D	C	E	-	-
	PM Peak Vol	8,189	8,670	972	726	1,607	726	907	739	1,542	1,827	-	-
	PM LOS	D	D	B	C	F	B	B	C	F	F	-	-

Exit 108		Existing Interstate		Existing Ramps								Existing Arterial		**Annual Growth Rate**
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB	
Existing	Lanes	5	4	1	1	-	-	2	1	-	-	2	2	1.00%
	AM Peak Vol	8,539	3,455	176	512	-	-	655	152	-	-	1,424	783	**Design Year**
	AM LOS	D	B	B	C	-	-	B	B	-	-	D	D	
	PM Peak Vol	5,452	3,942	301	600	-	-	932	247	-	-	962	1,881	
	PM LOS	B	B	B	C	-	-	B	B	-	-	D	F	
AO23 - Offset Diamond_2213	Lanes	5	4	1	-	-	1	1	-	-	1	2	2	2040
	AM Peak Vol	8,539	3,455	176	-	-	512	655	-	-	152	1,424	783	**Arterial Class**
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	5,452	3,942	301	-	-	600	932	-	-	247	962	1,881	III/IV
	PM LOS	B	B	B	-	-	B	B	-	-	B	D	F	
I-126_I-20_Connector_BushRiver	Lanes	4	2	1	1	-	-	1	-	-	1	2	2	
	AM Peak Vol	8,539	3,455	1,359	1042	-	-	243	-	-	809	1,424	783	
	AM LOS	F	D	E	E	-	-	B	-	-	B	D	D	
	PM Peak Vol	5,452	3,942	1,359	1042	-	-	243	-	-	809	962	1,881	
	PM LOS	C	E	E	E	-	-	B	-	-	B	D	F	
roundabouts	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	
	AM Peak Vol	8,539	3,455	176	-	-	512	655	-	-	152	1,424	783	
	AM LOS	F	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	5,452	3,942	301	-	-	600	932	-	-	247	962	1,881	
	PM LOS	D	B	B	-	-	B	B	-	-	B	D	F	
DDI	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	
	AM Peak Vol	8,539	3,455	176	-	-	512	655	-	-	152	1,424	783	
	AM LOS	F	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	5,452	3,942	301	-	-	600	932	-	-	247	962	1,881	
	PM LOS	D	B	B	-	-	B	B	-	-	B	D	F	
Partial Cloverleaf	Lanes	3	4	1	1	-	-	-	-	1	1	2	2	
	AM Peak Vol	8,539	3,455	176	512	-	-	-	-	655	152	1,424	783	
	AM LOS	F	B	B	C	-	-	-	-	C	B	D	D	
	PM Peak Vol	5,452	3,942	301	600	-	-	-	-	932	247	962	1,881	
	PM LOS	D	B	B	C	-	-	-	-	D	B	D	F	

Exit 108		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	5	4	1	1	-	-	2	1	-	-	2	2
	AM Peak Vol	11,061	4,476	228	664	-	-	849	197	-	-	1,845	1,015
	AM LOS	F	C	B	C	-	-	B	B	-	-	F	D
	PM Peak Vol	7,062	5,106	390	778	-	-	1,208	320	-	-	1,247	2,437
	PM LOS	C	C	B	D	-	-	B	B	-	-	D	F
AO23 - Offset Diamond_2213	Lanes	5	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	11,061	4,476	228	-	-	664	849	-	-	197	1,845	1,015
	AM LOS	F	C	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	7,062	5,106	390	-	-	778	1,208	-	-	320	1,247	2,437
	PM LOS	C	C	B	-	-	B	C	-	-	B	D	F
I-126_I-20_Connector_BushRiver	Lanes	4	2	1	1	-	-	1	-	-	1	2	2
	AM Peak Vol	11,061	4,476	1,761	1,350	-	-	315	-	-	1,048	1,845	1,015
	AM LOS	F	F	F	F	-	-	B	-	-	C	F	D
	PM Peak Vol	7,062	5,106	1,761	1,350	-	-	315	-	-	1,048	1,247	2,437
	PM LOS	D	F	F	F	-	-	B	-	-	C	D	F
roundabouts	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	11,061	4,476	228	-	-	664	849	-	-	197	1,845	1,015
	AM LOS	F	C	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	7,062	5,106	390	-	-	778	1,208	-	-	320	1,247	2,437
	PM LOS	F	C	B	-	-	B	C	-	-	B	D	F
DDI	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	11,061	4,476	228	-	-	664	849	-	-	197	1,845	1,015
	AM LOS	F	C	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	7,062	5,106	390	-	-	778	1,208	-	-	320	1,247	2,437
	PM LOS	F	C	B	-	-	B	C	-	-	B	D	F
Partial Cloverleaf	Lanes	3	4	1	1	-	-	-	-	1	1	2	2
	AM Peak Vol	11,061	4,476	228	664	-	-	-	-	849	197	1,845	1,015
	AM LOS	F	C	B	C	-	-	-	-	D	B	F	D
	PM Peak Vol	7,062	5,106	390	778	-	-	-	-	1,208	320	1,247	2,437
	PM LOS	F	C	B	D	-	-	-	-	E	B	D	F

Exit 108 (Bush River Road) Capacity Assessment															
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Under	Under	Under	Under	Under	Under	-	-	Under	Under	-	-
		PM	Under	Under	Under	Over	Under	Under	-	-	Under	Under	-	-
	2040	AM	Over	Under	Over	Under	Under	Under	-	-	Under	Under	-	-
		PM	Under	Under	Under	Over	Under	Under	-	-	Under	Under	-	-
AO23 (Offset Diamond)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Over	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			Not Evaluated				Not Evaluated				Not Evaluated			

108B		Existing Interstate		Existing Ramps								Existing Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	4	4	2	1	3	-	2	2	1	1	-	-
	AM Peak Vol	8,363	3,455	3,127	270	5,236	-	2,280	1,074	310	520	-	-
	AM LOS	E	B	D	B	D	-	D	E	B	B	-	-
	PM Peak Vol	5,151	3,942	2,790	560	2,361	-	2,690	2,756	1,000	320	-	-
	PM LOS	C	B	C	C	B	-	E	F	D	B	-	-

Annual Growth Rate
1.00%
Design Year
2040
Arterial Class
-

108B		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	4	4	2	1	3	1	1	1	1	1	-	-
	AM Peak Vol	10,833	4,476	4,051	350	6,782	-	2,954	1,392	402	674	-	-
	AM LOS	F	C	F	B	F	B	F	F	B	B	-	-
	PM Peak Vol	6,672	5,106	3,614	726	3,059	-	3,485	3,570	1,296	415	-	-
	PM LOS	D	C	D	C	B	B	F	F	F	B	-	-

Exit 110		Existing Interstate		Existing Ramps								Existing Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	3,909	3,506	978	-	-	681	901	-	-	850	2,010	1,786
	AM LOS	C	C	B	-	-	B	B	-	-	B	F	F
	PM Peak Vol	3,950	3,908	783	-	-	826	901	-	-	820	1,838	1,844
	PM LOS	C	C	B	-	-	B	B	-	-	B	F	F
AO46 - Sunset Blvd Exit	Lanes	4	3	2	-	-	1	1	-	-	1	2	2
	AM Peak Vol	3,909	3,506	978	-	-	681	901	-	-	850	2,010	1,786
	AM LOS	B	C	B	-	-	B	B	-	-	B	F	F
	PM Peak Vol	3,950	3,908	783	-	-	826	901	-	-	820	1,838	1,844
	PM LOS	B	C	B	-	-	B	B	-	-	B	F	F
AO47 - Hospital Connector	Lanes	4	3	2	-	-	1	1	-	-	1	2	2
	AM Peak Vol	3,909	3,506	978	-	-	681	901	-	-	850	2,010	1,786
	AM LOS	B	C	B	-	-	B	B	-	-	B	F	F
	PM Peak Vol	3,950	3,908	783	-	-	826	901	-	-	820	1,838	1,844
	PM LOS	B	C	B	-	-	B	B	-	-	B	F	F

Annual Growth Rate
1.00%
Design Year
2040
Arterial Class
III/IV

Exit 110		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,064	4,542	1,267	-	-	883	1,168	-	-	1,101	2,604	2,314
	AM LOS	D	C	D	-	-	B	C	-	-	C	F	F
	PM Peak Vol	5,117	5,062	1,015	-	-	1,070	1,168	-	-	1,063	2,381	2,389
	PM LOS	D	D	C	-	-	C	C	-	-	C	F	F
AO46 - Sunset Blvd Exit	Lanes	4	3	2	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,064	4,542	1,267	-	-	883	1,168	-	-	1,101	2,604	2,314
	AM LOS	C	C	B	-	-	B	C	-	-	C	F	F
	PM Peak Vol	5,117	5,062	1,015	-	-	1,070	1,168	-	-	1,063	2,381	2,389
	PM LOS	C	D	B	-	-	C	C	-	-	C	F	F
AO47 - Hospital Connector	Lanes	4	3	2	-	-	1	1	-	-	1	2	2
	AM Peak Vol	5,064	4,542	1,267	-	-	883	1,168	-	-	1,101	2,604	2,314
	AM LOS	C	C	B	-	-	B	C	-	-	C	F	F
	PM Peak Vol	5,117	5,062	1,015	-	-	1,070	1,168	-	-	1,063	2,381	2,389
	PM LOS	C	D	B	-	-	C	C	-	-	C	F	F

Exit 110 (Sunset Boulevard - US 378) Capacity Assessment														
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
	2040	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
AO46 (EB Ramp Extension)	Existing	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
	2040	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
AO47 (EB Direct Hospital Access)	Existing	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
	2040	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: DDI				Third: Displaced Left			

Exit 63 Interchange	Alternative	Existing Interstate EB/SB	Existing Interstate WB/NB	Existing Ramps EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	Existing Arterial EB/SB	Existing Arterial WB/NB	Annual Growth Rate
Existing	Lanes	3	4	1	1	-	1	1	-	-	1	2	2	1.00%
	AM Peak Vol	5,145	2,693	911	359	-	96	528	-	-	354	1,374	726	**Design Year**
	AM LOS	D	B	B	B	-	B	B	-	-	B	D	D	
	PM Peak Vol	3,245	4,388	675	417	-	130	484	-	-	780	1,300	1,608	
	PM LOS	B	B	B	B	-	B	B	-	-	B	D	E	
AO7 - Offset Diamond	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	2040
	AM Peak Vol	5,145	2,693	911	-	-	455	528	-	-	354	1,374	726	**Arterial Class**
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	3,245	4,388	675	-	-	547	484	-	-	780	1,300	1,608	III/IV
	PM LOS	B	B	B	-	-	B	B	-	-	B	D	E	
AO10 - Single Point Urban Interchange	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	
	AM Peak Vol	5,145	2,693	911	-	-	455	528	-	-	354	1,374	726	
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	3,245	4,388	675	-	-	547	484	-	-	780	1,300	1,608	
	PM LOS	B	B	B	-	-	B	B	-	-	B	D	E	
AO9 - Roundabouts	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	
	AM Peak Vol	5,145	2,693	911	-	-	455	528	-	-	354	1,374	726	
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	3,245	4,388	675	-	-	547	484	-	-	780	1,300	1,608	
	PM LOS	B	B	B	-	-	B	B	-	-	B	D	E	
AO6 - Diverging Diamond Interchange	Lanes	3	4	1	-	-	1	1	-	-	1	2	2	
	AM Peak Vol	5,145	2,693	911	-	-	455	528	-	-	354	1,374	726	
	AM LOS	D	B	B	-	-	B	B	-	-	B	D	D	
	PM Peak Vol	3,245	4,388	675	-	-	547	484	-	-	780	1,300	1,608	
	PM LOS	B	B	B	-	-	B	B	-	-	B	D	E	
AO8 - Partial Cloverleaf	Lanes	3	4	1	1	-	-	-	-	1	1	2	2	
	AM Peak Vol	5,145	2,693	911	455	-	-	-	-	528	354	1,374	726	
	AM LOS	D	B	B	B	-	-	-	-	C	B	D	D	
	PM Peak Vol	3,245	4,388	675	547	-	-	-	-	484	780	1,300	1,608	
	PM LOS	B	B	B	C	-	-	-	-	C	B	D	E	

Exit 63		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	4	1	1	-	1	1	-	-	1	2	2
	AM Peak Vol	6,665	3,489	1,180	465	-	125	684	-	-	459	1,780	941
	AM LOS	F	B	C	C	-	B	B	-	-	B	F	D
	PM Peak Vol	4,204	5,684	875	541	-	169	627	-	-	1,011	1,684	2,083
	PM LOS	C	C	B	C	-	B	B	-	-	C	E	F
AO7 - Offset Diamond	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,665	3,489	1,180	-	-	590	684	-	-	459	1,780	941
	AM LOS	F	B	C	-	-	B	B	-	-	B	F	D
	PM Peak Vol	4,204	5,684	875	-	-	709	627	-	-	1,011	1,684	2,083
	PM LOS	C	C	B	-	-	B	B	-	-	C	E	F
AO10 - Single Point Urban Interchange	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,665	3,489	1,180	-	-	590	684	-	-	459	1,780	941
	AM LOS	F	B	C	-	-	B	B	-	-	B	F	D
	PM Peak Vol	4,204	5,684	875	-	-	709	627	-	-	1,011	1,684	2,083
	PM LOS	C	C	B	-	-	B	B	-	-	C	E	F
AO9 - Roundabouts	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,665	3,489	1,180	-	-	590	684	-	-	459	1,780	941
	AM LOS	F	B	C	-	-	B	B	-	-	B	F	D
	PM Peak Vol	4,204	5,684	875	-	-	709	627	-	-	1,011	1,684	2,083
	PM LOS	C	C	B	-	-	B	B	-	-	C	E	F
AO6 - Diverging Diamond Interchange	Lanes	3	4	1	-	-	1	1	-	-	1	2	2
	AM Peak Vol	6,665	3,489	1,180	-	-	590	684	-	-	459	1,780	941
	AM LOS	F	B	C	-	-	B	B	-	-	B	F	D
	PM Peak Vol	4,204	5,684	875	-	-	709	627	-	-	1,011	1,684	2,083
	PM LOS	C	C	B	-	-	B	B	-	-	C	E	F
AO8 - Partial Cloverleaf	Lanes	3	4	1	1	-	-	-	-	1	1	2	2
	AM Peak Vol	6,665	3,489	1,180	590	-	-	-	-	684	459	1,780	941
	AM LOS	F	B	C	C	-	-	-	-	C	B	F	D
	PM Peak Vol	4,204	5,684	875	709	-	-	-	-	627	1,011	1,684	2,083
	PM LOS	C	C	B	C	-	-	-	-	C	C	E	F

Exit 63 (Bush River Road) Capacity Assessment														
			Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
Alternative	Year	Peak Hour	EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Under	Under	Under	Under	Under	Under	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Near	Under	Under	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	Under	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Over	Under	Under	-	Under	Under	-	-	Under
AO 6 (DDI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Over	Under	-	-	Under	Under	-	-	Under
AO 7 (Offset Diamond)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Over	Under	-	-	Under	Under	-	-	Under
AO 8 (Partial Cloverleaf)	Existing	AM	Under	Under	Under	Under	Under	Under	-	-	-	-	Under	Under
		PM	Under	Under	Under	Near	Under	Under	-	-	-	-	Under	Under
	2040	AM	Over	Under	Over	Under	Under	Under	-	-	-	-	Under	Under
		PM	Under	Under	Near	Over	Under	Under	-	-	-	-	Under	Under
AO 9 (Roundabout)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Over	Under	-	-	Under	Under	-	-	Under
AO 10 (SPUI)	Existing	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Under	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Over	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: SPUI				Third: Displaced Left			

Exit 65 Interchange	Alternative	Existing Interstate EB/SB	Existing Interstate WB/NB	Existing Ramps EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	Existing Arterial EB/SB	Existing Arterial WB/NB
Existing	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	D	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	D	B	-	-	B	B	-	-	B	E	E
AO4 - Stacked Diamond - Asymmetrical	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	D	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	D	B	-	-	B	B	-	-	B	E	E
AO3 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	D	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	D	B	-	-	B	B	-	-	B	E	E
AO2 - Roundabouts	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	D	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	D	B	-	-	B	B	-	-	B	E	E
AO1 - Diverging Diamond Interchange	Lanes	3	4	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	C	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	C	B	-	-	B	B	-	-	B	E	E
AO5 - Stacked Diamond - Offset Lefts	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	4,779	4,622	363	-	-	988	1,254	-	-	305	2,085	904
	AM LOS	D	D	B	-	-	B	B	-	-	B	F	D
	PM Peak Vol	3,927	5,490	266	-	-	993	1,352	-	-	280	1,590	1,591
	PM LOS	C	D	B	-	-	B	B	-	-	B	E	E

Annual Growth Rate	1.00%
Design Year	2040
Arterial Class	III/IV

Exit 65		Future Interstate		Future Ramp								Future Arterial	
Interchange	Alternative	EB/SB	WB/NB	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On	EB/SB	WB/NB
Existing	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F
AO4 - Stacked Diamond - Asymmetrical	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F
AO3 - Single Point Urban Interchange	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F
AO2 - Roundabouts	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F
AO1 - Diverging Diamond Interchange	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F
AO5 - Stacked Diamond - Offset Lefts	Lanes	3	3	1	-	-	1	2	-	-	1	2	2
	AM Peak Vol	6,191	5,987	471	-	-	1,280	1,625	-	-	396	2,701	1,171
	AM LOS	E	E	B	-	-	D	B	-	-	B	F	D
	PM Peak Vol	5,087	7,111	345	-	-	1,287	1,752	-	-	363	2,060	2,061
	PM LOS	D	F	B	-	-	D	B	-	-	B	F	F

Exit 65 (Broad River Road) Capacity Assessment														
Alternative	Year	Peak Hour	Freeway Segment		Arterial		EB/SB Ramps				WB/NB Ramps			
			EB (SB)	WB (NB)	EB (SB)	WB (NB)	EB/SB Off	EB/SB Loop On	EB/SB Loop Off	EB/SB On	WB/NB Off	WB/NB Loop On	WB/NB Loop Off	WB/NB On
Existing No-Build	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO1 (DDI)	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO2 (Roundabout)	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO3 (SPUI)	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO4 (Stacked Diamond)	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
AO5 (Offset Left)	Existing	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under
	2040	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
		PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under
CAP-X Results			First: Partial Cloverleaf				Second: Displaced Left				Third: SPUI			

Appendix F—Summary of Link Flow, Speed, and Observed Queues

Carolina Crossroads
Link Flows Comparison

EB Ramp Volume							
	7:15 - 8:15 AM				Condition Range Target		Within Range
Ramp Location	Segment	Input	Output	GEH			
I-26							
Exit 101 (Broad River Road) off ramp (WB)	4758	127	116	0	227	27	TRUE
Exit 101 (Broad River Road) off ramp (EB)	4754	256	238	1	356	156	TRUE
Exit 101 (Broad River Road) on ramp	4747	847	1,141	5	974	720	FALSE
Exit 102 (Lake Murray Boulevard) off ramp (WB)	4749	319	289	1	419	219	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (EB)	4735	247	294	1	347	147	TRUE
Exit 102 (Lake Murray Boulevard) on ramp	4724	720	810	2	828	612	TRUE
Exit 103 (Harbison Boulevard) off ramp	4556	105	127	1	205	5	TRUE
Exit 103 (Harbison Boulevard) on ramp	4713	586	599	0	686	486	TRUE
Exit 104 (Piney Grove Road) off ramp	4582	134	158	1	234	34	TRUE
Exit 104 (Piney Grove Road) on ramp	4686	906	959	1	1,042	770	TRUE
Exit 106 (St. Andrews Road) off ramp	4671	81	139	3	181	-19	TRUE
Exit 106 (St. Andrews Road) EB on	4664	909	875	1	1,045	773	TRUE
Exit 106 (St. Andrews Road) on ramp	4648	1,120	1,196	1	1,288	952	TRUE
Exit 107 (to WB I-20) off ramp	4655	480	550	2	580	380	TRUE
Exit 107 (from WB I-20) on ramp	4640	790	917	2	909	672	FALSE
Exit 107 (to EB I-20) off ramp	4644	1,410	1,554	2	1,622	1,199	TRUE
Exit 107 (from EB I-20) on ramp	6214	1,300	1,293	0	1,495	1,105	TRUE
Exit 108 (Bush River Road) off ramp	4620	324	350	1	424	224	TRUE
Exit 108 (Bush River Road) on ramp	8584	512	580	1	612	412	TRUE
Exit 108 (from/to I-126) off ramp	8583	270	441	5	370	170	FALSE
Exit 110 (US 378 - Sunset Boulevard) off ramp	6179	978	935	1	1,125	831	TRUE
Exit 110 (US 378 - Sunset Boulevard) on ramp	6168	702	737	1	807	597	TRUE
I-20							
Exit 61 (US 378 - Sunset Boulevard) off ramp	2827	864	823	1	994	734	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (WB)	2833	674	675	0	774	574	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (EB)	2821	1,163	1,136	0	1,337	989	TRUE
Exit 63 (Bush River Road) off ramp	2849	911	918	0	1,048	774	TRUE
Exit 63 (Bush River Road) on ramp	2862	99	93	0	199	-1	TRUE
Exit 63 (Bush River Road) on ramp (EB)	2853	367	349	0	467	267	TRUE
Exit 64 (to EB I-26) off ramp	6214	1,300	1,293	0	1,495	1,105	TRUE
Exit 64 (from EB I-26) on ramp	4644	1,410	1,554	2	1,622	1,199	TRUE
Exit 64 (to WB I-26) off ramp	6224	640	615	0	740	540	TRUE
Exit 64 (from WB I-26) on ramp	6203	619	621	0	719	519	TRUE
Exit 65 (Broad River Road) off ramp	6235	363	438	2	463	263	TRUE
Exit 65 (Broad River Road) on ramp	6240	1,014	971	1	1,166	862	TRUE
Exit 68 (Monticello Road) off ramp	6252	736	781	1	846	626	TRUE
Exit 68 (Monticello Road) on ramp	7270	530	460	2	630	430	TRUE
I-126							
From WB I-26 / to WB I-26/I-20	8581	589	657	1	689	489	TRUE
From / To Colonial Life Boulevard	4592	530	471	1	630	430	TRUE
Greystone Boulevard off ramps	4580	588	530	1	688	488	TRUE
Greystone Boulevard on ramps	4571	530	474	1	630	430	TRUE

Carolina Crossroads
Link Flows Comparison

WB Ramp Volume							
	7:15 - 8:15 AM				Condition Range		Within
Ramp Location	Segment	Input	Output	GEH	Target		Range
I-26							
Exit 101 (Broad River Road) off ramp (WB)	4752	362	396	1	462	262	TRUE
Exit 101 (Broad River Road) off ramp (EB)	4740	287	232	2	387	187	TRUE
Exit 101 (Broad River Road) on ramp	4759	132	120	1	232	32	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (WB)	4731	484	439	1	584	384	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (EB)	4734	348	346	0	448	248	TRUE
Exit 102 (Lake Murray Boulevard) on ramp	4743	243	249	0	343	143	TRUE
Exit 103 (Harbison Boulevard) off ramp	4709	472	606	3	572	372	FALSE
Exit 103 (Harbison Boulevard) on ramp	4596	158	106	2	258	58	TRUE
Exit 104 (Piney Grove Road) off ramp	4680	617	700	2	717	517	TRUE
Exit 104 (Piney Grove Road) on ramp	4699	251	381	4	351	151	FALSE
Exit 106 (St. Andrews Road) off ramp	4652	764	690	1	879	649	TRUE
Exit 106 (St. Andrews Road) WB off ramp	4658	342	374	1	442	242	TRUE
Exit 106 (St. Andrews Road) on ramp	4674	188	171	1	288	88	TRUE
Exit 107 (to WB I-20) off ramp	4645	460	509	1	560	360	TRUE
Exit 107 (from WB I-20) on ramp	4647	1,122	1,070	1	1,290	954	TRUE
Exit 107 (to EB I-20) off ramp	6203	619	621	0	719	519	TRUE
Exit 107 (from EB I-20) on ramp	6224	640	615	0	740	540	TRUE
Exit 108 (Bush River Road) off ramp	6080	655	458	4	755	555	FALSE
Exit 108 (Bush River Road) on ramp	4607	462	604	3	562	362	FALSE
Exit 108 (from/to I-126) off ramp	8581	520	657	3	620	420	FALSE
Exit 110 (US 378 - Sunset Boulevard) off ramp	6162	901	922	0	1,036	766	TRUE
Exit 110 (US 378 - Sunset Boulevard) on ramp	6173	832	916	1	957	707	TRUE
I-20							
Exit 61 (US 378 - Sunset Boulevard) off ramp	2841	1,104	1,137	0	1,270	938	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (WB)	2824	191	206	1	291	91	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (EB)	2820	138	143	0	238	38	TRUE
Exit 63 (Bush River Road) off ramp	2861	528	611	2	628	428	TRUE
Exit 63 (Bush River Road) on ramp	2851	342	406	2	442	242	TRUE
Exit 64 (to EB I-26) off ramp	4647	1,122	1,070	1	1,290	954	TRUE
Exit 64 (from EB I-26) on ramp	4655	480	550	2	580	380	TRUE
Exit 64 (to WB I-26) off ramp	4640	790	917	2	909	672	FALSE
Exit 64 (from WB I-26) on ramp	4645	460	509	1	560	360	TRUE
Exit 65 (Broad River Road) off ramp	6244	1,210	1,312	1	1,392	1,029	TRUE
Exit 65 (Broad River Road) on ramp	6233	307	266	1	407	207	TRUE
Exit 68 (Monticello Road) off ramp	6262	441	469	1	541	341	TRUE
Exit 68 (Monticello Road) on ramp	6250	484	503	0	584	384	TRUE
I-126							
From WB I-26 / to WB I-26/I-20	4602	332	405	2	432	232	TRUE
To SB (EB) I-26	6184	316	442	3	416	216	FALSE
From / To Colonial Life Boulevard	4597	243	326	2	343	143	TRUE
Greystone Boulevard off ramps	4568	449	466	0	549	349	TRUE
Greystone Boulevard on ramps	4585	321	429	3	421	221	FALSE

Carolina Crossroads
Link Flows Comparison

EB Mainline Volume							
	7:15 - 8:15 AM				Condition Range		Within
Mainline Location	**Segment**	**Input**	**Output**	**GEH**	Target		Range
I-26							
W of Exit 101	8784	4,509	4,366	1	4,909	4,109	TRUE
Exit 101-Exit 102	4748	4,960	5,146	1	5,360	4,560	TRUE
Exit 102-Exit 103	4720	5,110	5,094	0	5,510	4,710	TRUE
Exit 103-Exit 104	4707	5,591	5,345	2	5,991	5,191	TRUE
Exit 104-Exit 106	8552	6,375	5,849	3	6,775	5,975	FALSE
Exit 106-Exit 107	4650	8,383	7,611	4	8,783	7,983	FALSE
Exit 107-Exit 108	4624	8,539	7,668	5	8,939	8,139	FALSE
I-26 to I-26	4612	3,062	2,640	4	3,462	2,662	FALSE
I-26 to Exit 110	8553	3,322	3,596	2	3,722	2,922	TRUE
E of Exit 110	6152	3,035	3,355	3	3,435	2,635	TRUE
I-20							
W of Exit 61	2807	4,158	4,353	1	4,558	3,758	TRUE
Exit 61-Exit 63	8542	5,145	5,304	1	5,545	4,745	TRUE
Exit 63-Exit 64	6216	4,689	4,808	1	5,089	4,289	TRUE
Exit 64-Exit 65	6208	4,779	5,055	2	5,179	4,379	TRUE
Exit 65-Exit 68	8659	5,404	5,545	1	5,804	5,004	TRUE
E of Exit 68	6259	4,968	5,198	2	5,368	4,568	TRUE
I-126							
I-126 Split to Colonial Life Blvd	4609	4,790	4,662	1	5,190	4,390	TRUE
Colonial Life Blvd to Greystone Blvd	4578	5,320	5,768	3	5,720	4,920	FALSE
Greystone to Huger St.	8560	5,320	5,705	3	5,720	4,920	TRUE

Carolina Crossroads
Link Flows Comparison

WB Mainline Volume							
	7:15 - 8:15 AM				Condition Range Target		Within Range
Mainline Location	Station	Input	Output	GEH			
I-26							
W of Exit 101	4761	2,667	2,510	2	3,067	2,267	TRUE
Exit 101-Exit 102	4739	3,167	3,052	1	3,567	2,767	TRUE
Exit 102-Exit 103	4726	3,678	3,597	1	4,078	3,278	TRUE
Exit 103-Exit 104	4701	3,996	4,098	1	4,396	3,596	TRUE
Exit 104-Exit 106	4677	4,392	4,432	0	4,792	3,992	TRUE
Exit 106-Exit 107	4651	5,336	5,339	0	5,736	4,936	TRUE
Exit 107-Exit 108	6200	4,683	4,799	1	5,083	4,283	TRUE
I-26 to I-26	4604	2,280	2,452	2	2,622	1,938	TRUE
I-26 to Exit 110	6175	3,455	3,579	1	3,855	3,055	TRUE
E of Exit 110	8773	3,506	3,592	1	3,906	3,106	TRUE
I-20							
W of Exit 61	2814	1,664	1,728	1	1,914	1,414	TRUE
Exit 61-Exit 63	8539	2,439	2,524	1	2,805	2,073	TRUE
Exit 63-Exit 64	2859	2,613	2,730	1	3,005	2,221	TRUE
Exit 64-Exit 65	6230	3,563	3,663	1	3,963	3,163	TRUE
Exit 65-Exit 68	8658	4,512	4,729	2	4,912	4,112	TRUE
E of Exit 68	8770	4,469	4,731	2	4,869	4,069	TRUE
I-126							
I-126 Split to Colonial Life Blvd	4601	2,494	2,149	4	2,868	2,120	TRUE
Colonial Life Blvd to Greystone Blvd	4587	2,737	2,929	2	3,137	2,337	TRUE
Greystone to Huger St.	4566	2,863	2,966	1	3,263	2,463	TRUE

Carolina Crossroads
Link Flows Comparison

EB Ramp Volume							
	4:45 - 5:45 PM				Condition Range		Within
Ramp Location	Segment	Input	Output	GEH	Target		Range
I-26							
Exit 101 (Broad River Road) off ramp (WB)	4758	88	81	0	188	-12	TRUE
Exit 101 (Broad River Road) off ramp (EB)	4754	117	108	0	217	17	TRUE
Exit 101 (Broad River Road) on ramp	4747	837	756	1	963	711	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (WB)	4749	193	189	0	293	93	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (EB)	4735	62	58	0	162	-38	TRUE
Exit 102 (Lake Murray Boulevard) on ramp	4724	757	636	2	871	643	FALSE
Exit 103 (Harbison Boulevard) off ramp	4556	372	276	3	472	272	TRUE
Exit 103 (Harbison Boulevard) on ramp	4713	857	711	3	986	728	FALSE
Exit 104 (Piney Grove Road) off ramp	4582	272	179	3	372	172	TRUE
Exit 104 (Piney Grove Road) on ramp	4686	780	823	1	897	663	TRUE
Exit 106 (St. Andrews Road) off ramp	4671	287	339	1	387	187	TRUE
Exit 106 (St. Andrews Road) EB on	4664	890	723	3	1,024	757	FALSE
Exit 106 (St. Andrews Road) on ramp	4648	696	648	1	796	596	TRUE
Exit 107 (to WB I-20) off ramp	4655	750	784	1	863	638	TRUE
Exit 107 (from WB I-20) on ramp	4640	560	574	0	660	460	TRUE
Exit 107 (to EB I-20) off ramp	4644	1,240	1,206	0	1,426	1,054	TRUE
Exit 107 (from EB I-20) on ramp	6214	560	683	2	660	460	FALSE
Exit 108 (Bush River Road) off ramp	4620	340	444	3	440	240	FALSE
Exit 108 (Bush River Road) on ramp	8584	638	684	1	738	538	TRUE
Exit 108 (from/to I-126) off ramp	8583	560	607	1	660	460	TRUE
Exit 110 (US 378 - Sunset Boulevard) off ramp	6179	783	603	3	900	666	FALSE
Exit 110 (US 378 - Sunset Boulevard) on ramp	6168	826	809	0	950	702	TRUE
I-20							
Exit 61 (US 378 - Sunset Boulevard) off ramp	2827	315	307	0	415	215	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (WB)	2833	493	367	3	593	393	FALSE
Exit 61 (US 378 - Sunset Boulevard) on ramp (EB)	2821	709	609	2	815	603	TRUE
Exit 63 (Bush River Road) off ramp	2849	675	589	2	775	575	TRUE
Exit 63 (Bush River Road) on ramp	2862	130	149	1	230	30	TRUE
Exit 63 (Bush River Road) on ramp (EB)	2853	419	452	1	519	319	TRUE
Exit 64 (to EB I-26) off ramp	6214	560	683	2	660	460	FALSE
Exit 64 (from EB I-26) on ramp	4644	1,240	1,206	0	1,426	1,054	TRUE
Exit 64 (to WB I-26) off ramp	6224	570	560	0	670	470	TRUE
Exit 64 (from WB I-26) on ramp	6203	700	670	1	805	595	TRUE
Exit 65 (Broad River Road) off ramp	6235	266	427	4	366	166	FALSE
Exit 65 (Broad River Road) on ramp	6240	1,018	899	2	1,171	865	TRUE
Exit 68 (Monticello Road) off ramp	6252	478	469	0	578	378	TRUE
Exit 68 (Monticello Road) on ramp	7270	609	522	2	709	509	TRUE
I-126							
From WB I-26 / to WB I-26/I-20	8581	280	269	0	380	180	TRUE
From / To Colonial Life Boulevard	4592	308	285	1	408	208	TRUE
Greystone Boulevard off ramps	4580	503	407	2	603	403	TRUE
Greystone Boulevard on ramps	4571	535	538	0	635	435	TRUE

Carolina Crossroads
Link Flows Comparison

WB Ramp Volume							
	4:45 - 5:45 PM				Condition Range Target		Within Range
Ramp Location	Segment	Input	Output	GEH			
I-26							
Exit 101 (Broad River Road) off ramp (WB)	4752	661	527	3	761	561	FALSE
Exit 101 (Broad River Road) off ramp (EB)	4740	401	333	2	501	301	TRUE
Exit 101 (Broad River Road) on ramp	4759	229	193	1	329	129	TRUE
Exit 102 (Lake Murray Boulevard) off ramp (WB)	4731	606	478	3	706	506	FALSE
Exit 102 (Lake Murray Boulevard) off ramp (EB)	4734	351	314	1	451	251	TRUE
Exit 102 (Lake Murray Boulevard) on ramp	4743	409	234	5	509	309	FALSE
Exit 103 (Harbison Boulevard) off ramp	4709	800	628	3	920	680	FALSE
Exit 103 (Harbison Boulevard) on ramp	4596	468	369	2	568	368	TRUE
Exit 104 (Piney Grove Road) off ramp	4680	693	592	2	793	593	FALSE
Exit 104 (Piney Grove Road) on ramp	4699	413	429	0	513	313	TRUE
Exit 106 (St. Andrews Road) off ramp	4652	470	370	2	570	370	FALSE
Exit 106 (St. Andrews Road) WB off ramp	4658	632	527	2	732	532	FALSE
Exit 106 (St. Andrews Road) on ramp	4674	256	214	1	356	156	TRUE
Exit 107 (to WB I-20) off ramp	4645	1,190	1,083	2	1,369	1,012	TRUE
Exit 107 (from WB I-20) on ramp	4647	1,410	1,372	1	1,622	1,199	TRUE
Exit 107 (to EB I-20) off ramp	6203	700	670	1	805	595	TRUE
Exit 107 (from EB I-20) on ramp	6224	570	560	0	670	470	TRUE
Exit 108 (Bush River Road) off ramp	6080	932	750	3	1,072	792	FALSE
Exit 108 (Bush River Road) on ramp	4607	1,247	1,084	2	1,434	1,060	TRUE
Exit 108 (from/to I-126) off ramp	8581	280	269	0	380	180	TRUE
Exit 110 (US 378 - Sunset Boulevard) off ramp	6162	787	740	1	905	669	TRUE
Exit 110 (US 378 - Sunset Boulevard) on ramp	6173	820	899	1	943	697	TRUE
I-20							
Exit 61 (US 378 - Sunset Boulevard) off ramp	2841	1,737	1,353	5	1,998	1,476	FALSE
Exit 61 (US 378 - Sunset Boulevard) on ramp (WB)	2824	355	302	1	455	255	TRUE
Exit 61 (US 378 - Sunset Boulevard) on ramp (EB)	2820	209	202	0	309	109	TRUE
Exit 63 (Bush River Road) off ramp	2861	460	564	2	560	360	FALSE
Exit 63 (Bush River Road) on ramp	2851	840	770	1	966	714	TRUE
Exit 64 (to EB I-26) off ramp	4647	1,410	1,372	1	1,622	1,199	TRUE
Exit 64 (from EB I-26) on ramp	4655	750	784	1	863	638	TRUE
Exit 64 (to WB I-26) off ramp	4640	560	574	0	660	460	TRUE
Exit 64 (from WB I-26) on ramp	4645	1,190	1,083	2	1,369	1,012	TRUE
Exit 65 (Broad River Road) off ramp	6244	1,556	1,482	1	1,789	1,323	TRUE
Exit 65 (Broad River Road) on ramp	6233	284	377	3	384	184	TRUE
Exit 68 (Monticello Road) off ramp	6262	358	374	0	458	258	TRUE
Exit 68 (Monticello Road) on ramp	6250	776	708	1	892	660	TRUE
I-126							
From WB I-26 / to WB I-26/I-20	4602	828	559	5	952	704	FALSE
To SB (EB) I-26	6184	560	609	1	660	460	TRUE
From / To Colonial Life Boulevard	4597	812	734	1	934	690	TRUE
Greystone Boulevard off ramps	4568	645	641	0	745	545	TRUE
Greystone Boulevard on ramps	4585	634	615	0	734	534	TRUE

Carolina Crossroads
Link Flows Comparison

EB Mainline Volume							
	4:45 - 5:45 PM				Condition Range Target		Within Range
Mainline Location	Segment	Input	Output	GEH			
I-26							
W of Exit 101	8784	2,900	3,046	1	3,300	2,500	TRUE
Exit 101-Exit 102	4748	3,532	3,650	1	3,932	3,132	TRUE
Exit 102-Exit 103	4720	4,034	4,064	0	4,434	3,634	TRUE
Exit 103-Exit 104	4707	4,515	4,521	0	4,915	4,115	TRUE
Exit 104-Exit 106	8552	5,023	5,220	1	5,423	4,623	TRUE
Exit 106-Exit 107	4650	6,322	6,317	0	6,722	5,922	TRUE
Exit 107-Exit 108	4624	5,452	5,473	0	5,852	5,052	TRUE
I-26 to I-26	4612	2,790	2,531	3	3,190	2,390	TRUE
I-26 to Exit 110	8553	3,950	3,604	3	4,350	3,550	TRUE
E of Exit 110	6152	3,993	3,906	1	4,393	3,593	TRUE
I-20							
W of Exit 61	2807	2,452	2,482	0	2,820	2,084	TRUE
Exit 61-Exit 63	8542	3,144	3,204	1	3,544	2,744	TRUE
Exit 63-Exit 64	6216	3,228	3,207	0	3,628	2,828	TRUE
Exit 64-Exit 65	6208	3,639	3,895	2	4,039	3,239	TRUE
Exit 65-Exit 68	8659	4,391	4,374	0	4,791	3,991	TRUE
E of Exit 68	6259	4,522	4,439	1	4,922	4,122	TRUE
I-126							
I-126 Split to Colonial Life Blvd	4609	2,681	2,401	3	3,083	2,279	TRUE
Colonial Life Blvd to Greystone Blvd	4578	3,037	2,994	0	3,437	2,637	TRUE
Greystone to Huger St.	8560	3,069	3,121	0	3,469	2,669	TRUE

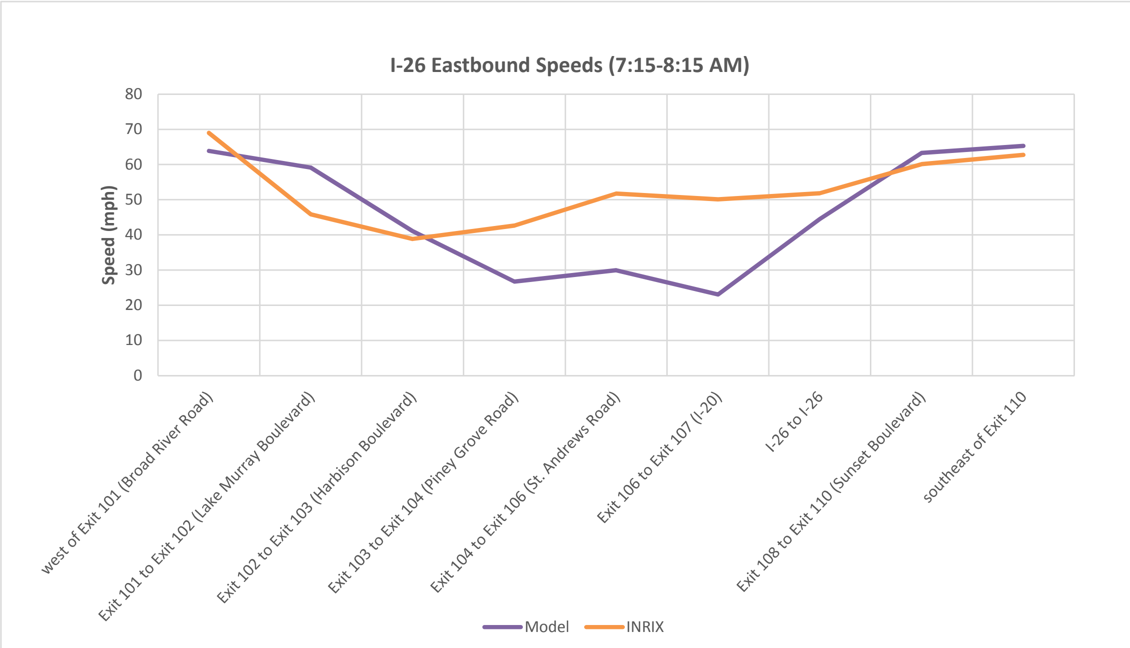
Carolina Crossroads
Link Flows Comparison

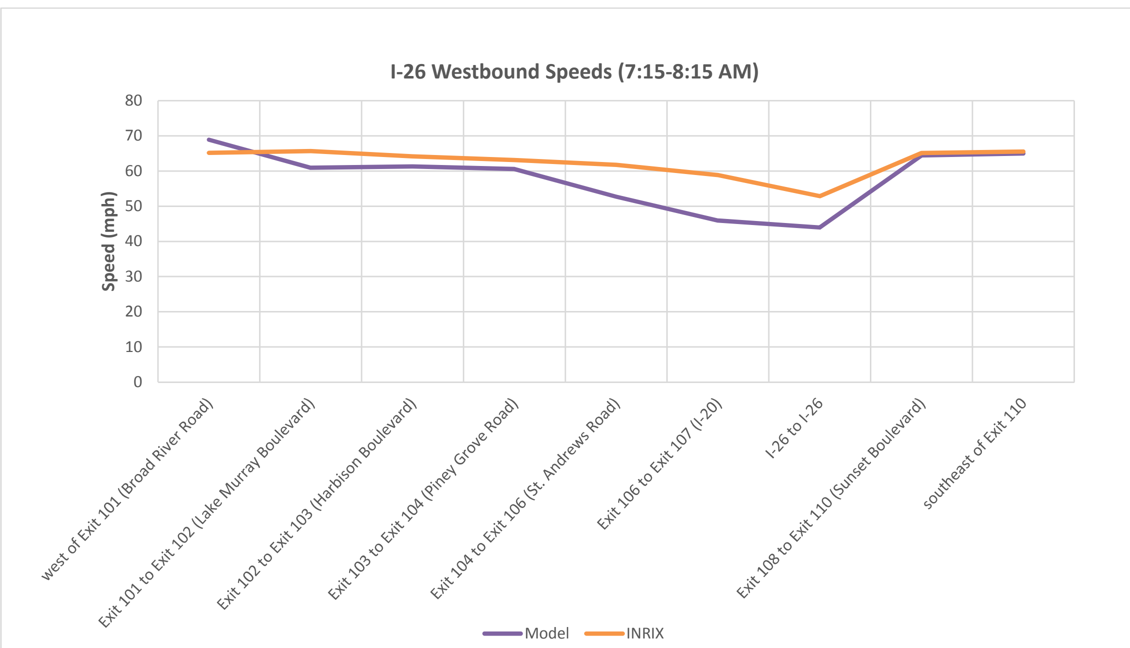
WB Mainline Volume							
	4:45 - 5:45 PM				Condition Range		Within
Mainline Location	Station	Input	Output	GEH	Target		Range
I-26							
W of Exit 101	4761	5,083	4,135	7	5,483	4,683	FALSE
Exit 101-Exit 102	4739	5,916	5,034	6	6,316	5,516	FALSE
Exit 102-Exit 103	4726	6,464	5,696	5	6,864	6,064	FALSE
Exit 103-Exit 104	4701	6,796	5,967	5	7,196	6,396	FALSE
Exit 104-Exit 106	4677	7,076	6,128	6	7,476	6,676	FALSE
Exit 106-Exit 107	4651	6,306	6,832	3	6,706	5,906	FALSE
Exit 107-Exit 108	6200	6,216	6,811	4	6,616	5,816	FALSE
I-26 to I-26	4604	2,690	2,545	1	3,094	2,287	TRUE
I-26 to Exit 110	6175	3,942	3,968	0	4,342	3,542	TRUE
E of Exit 110	8773	4,023	4,026	0	4,423	3,623	TRUE
I-20							
W of Exit 61	2814	3,422	3,490	1	3,822	3,022	TRUE
Exit 61-Exit 63	8539	4,558	4,434	1	4,958	4,158	TRUE
Exit 63-Exit 64	2859	4,547	4,198	3	4,947	4,147	TRUE
Exit 64-Exit 65	6230	4,577	4,415	1	4,977	4,177	TRUE
Exit 65-Exit 68	8658	5,649	5,677	0	6,049	5,249	TRUE
E of Exit 68	8770	5,231	5,389	1	5,631	4,831	TRUE
I-126							
I-126 Split to Colonial Life Blvd	4601	5,364	3,910	11	5,764	4,964	FALSE
Colonial Life Blvd to Greystone Blvd	4587	6,099	5,690	3	6,499	5,699	FALSE
Greystone to Huger St.	4566	6,110	6,054	0	6,510	5,710	TRUE

I-26 Segment Speed Comparison

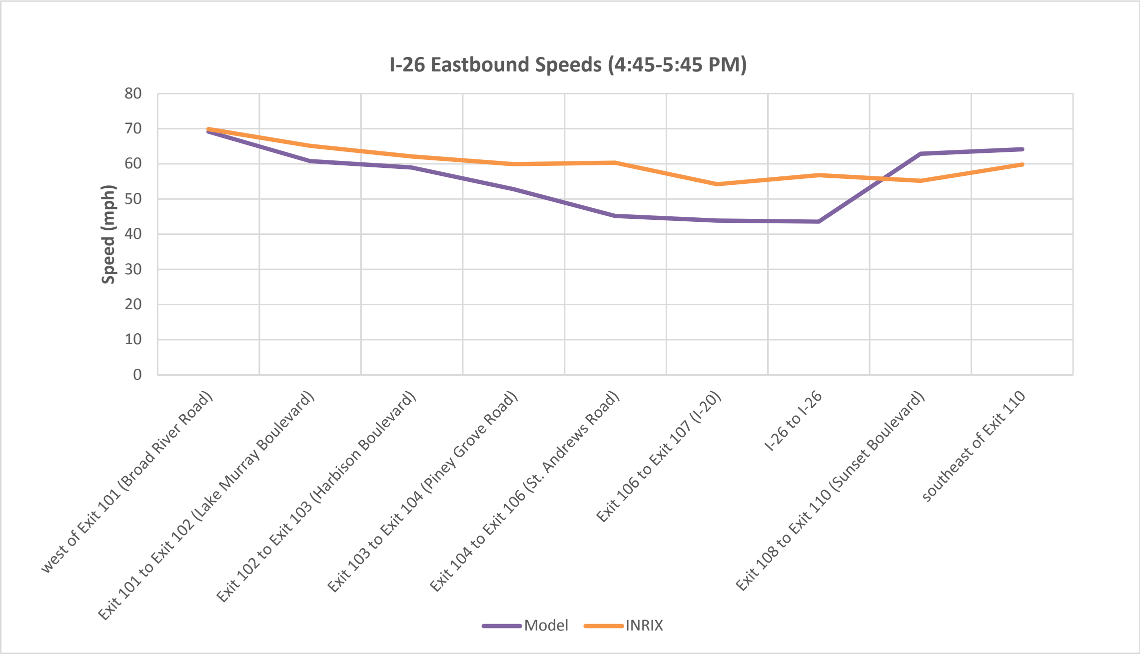
Location	Eastbound					Westbound				
	Segment	AM Peak		PM Peak		Segment	AM Peak		PM Peak	
	ID	INRIX	Model	INRIX	Model	ID	INRIX	Model	INRIX	Model
west of Exit 101 (Broad River Road)	4768	69	64	70	69	8783	65	69	63	66
Exit 101 to Exit 102 (Lake Murray Boulevard)	4748	46	59	65	61	4739	66	61	64	61
Exit 102 to Exit 103 (Harbison Boulevard)	4720	39	41	62	59	4726	64	61	62	53
Exit 103 to Exit 104 (Piney Grove Road)	4707	43	27	60	53	4701	63	61	50	54
Exit 104 to Exit 106 (St. Andrews Road)	8552	52	30	60	45	4677	62	53	24	43
Exit 106 to Exit 107 (I-20)	4650	50	23	54	44	4651	59	46	24	17
I-26 to I-26	4612	52	45	57	44	4604	53	44	20	14
Exit 108 to Exit 110 (Sunset Boulevard)	8553	60	63	55	63	6175	65	64	32	41
southeast of Exit 110	6152	63	65	60	64	8773	66	65	59	64

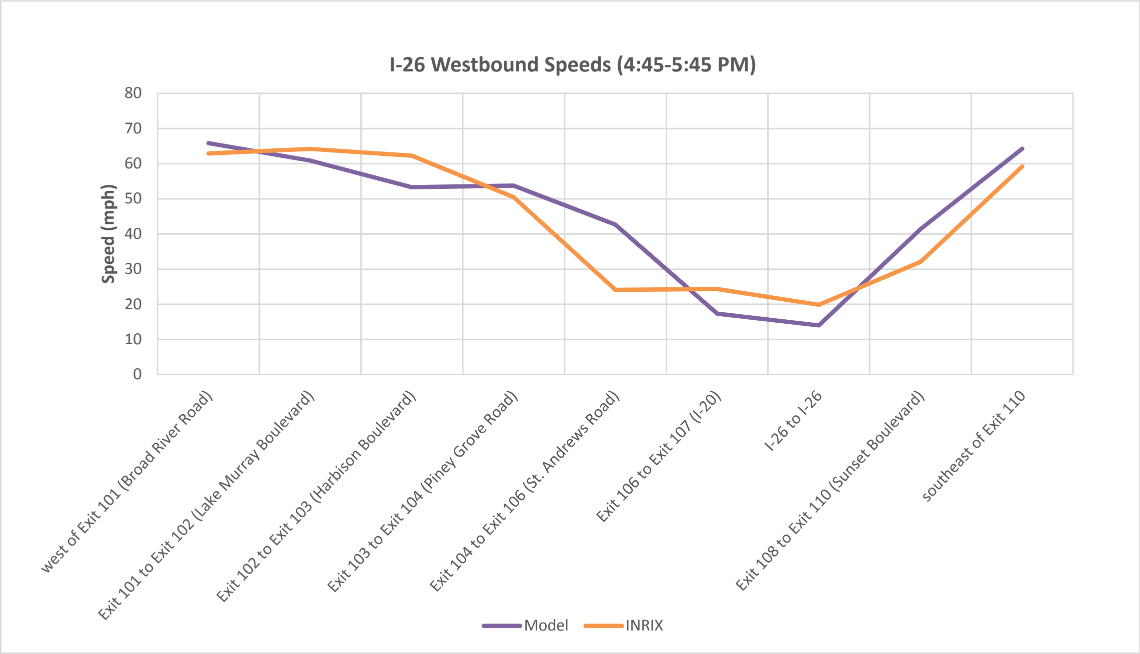
I-26 Segment Speed Comparison





I-26 Segment Speed Comparison

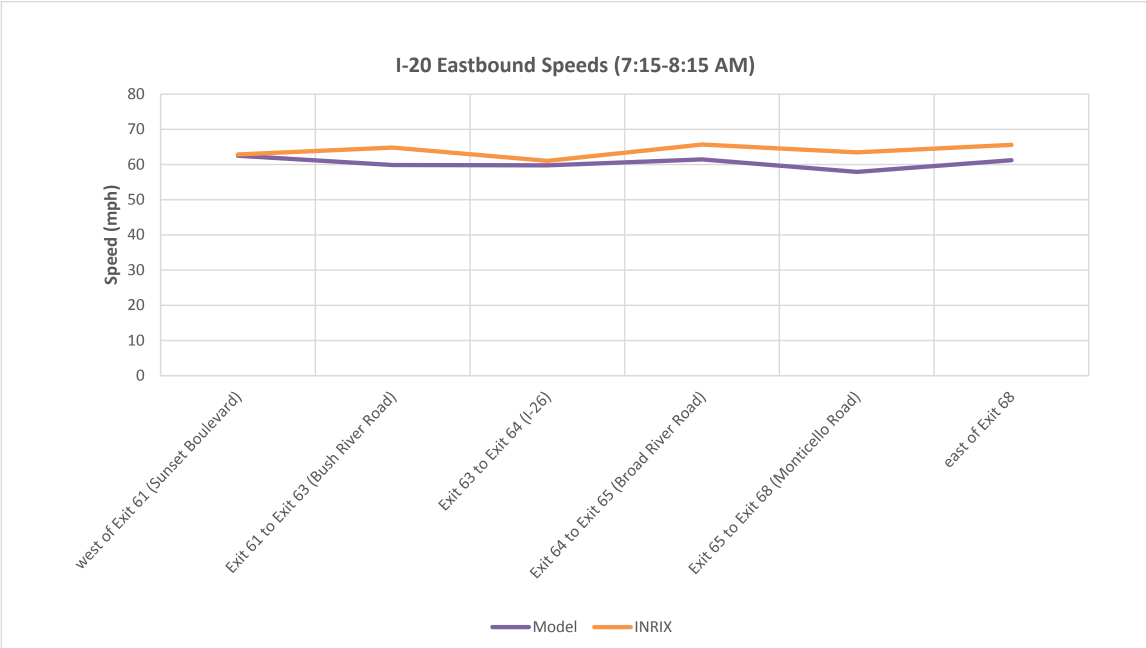


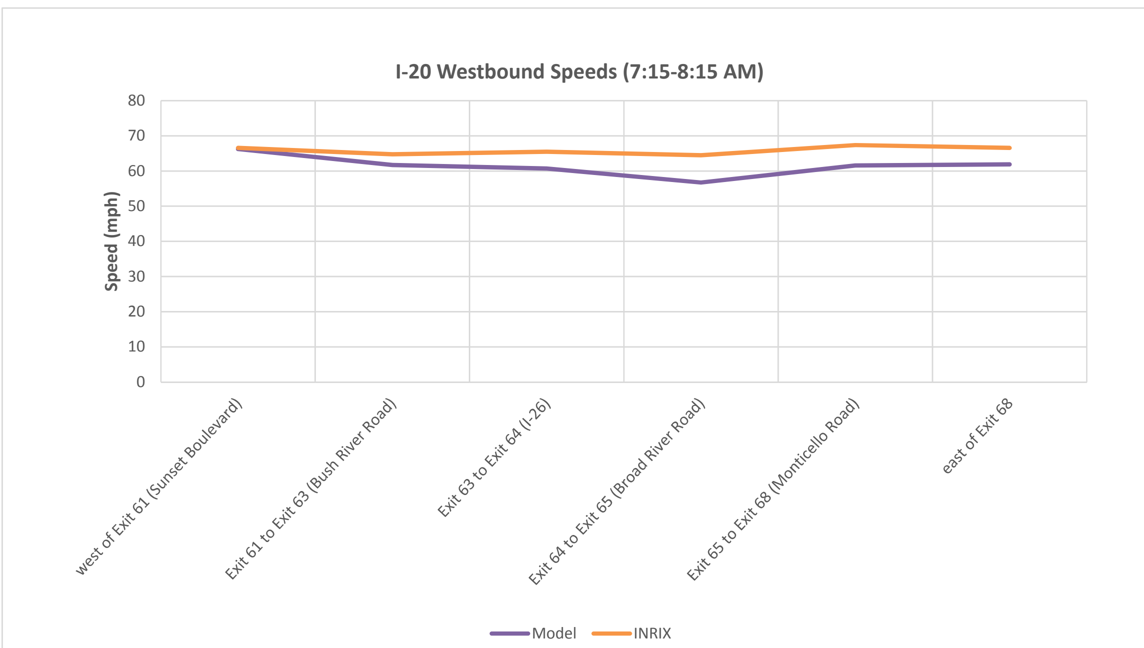


I-20 Segment Speed Comparison

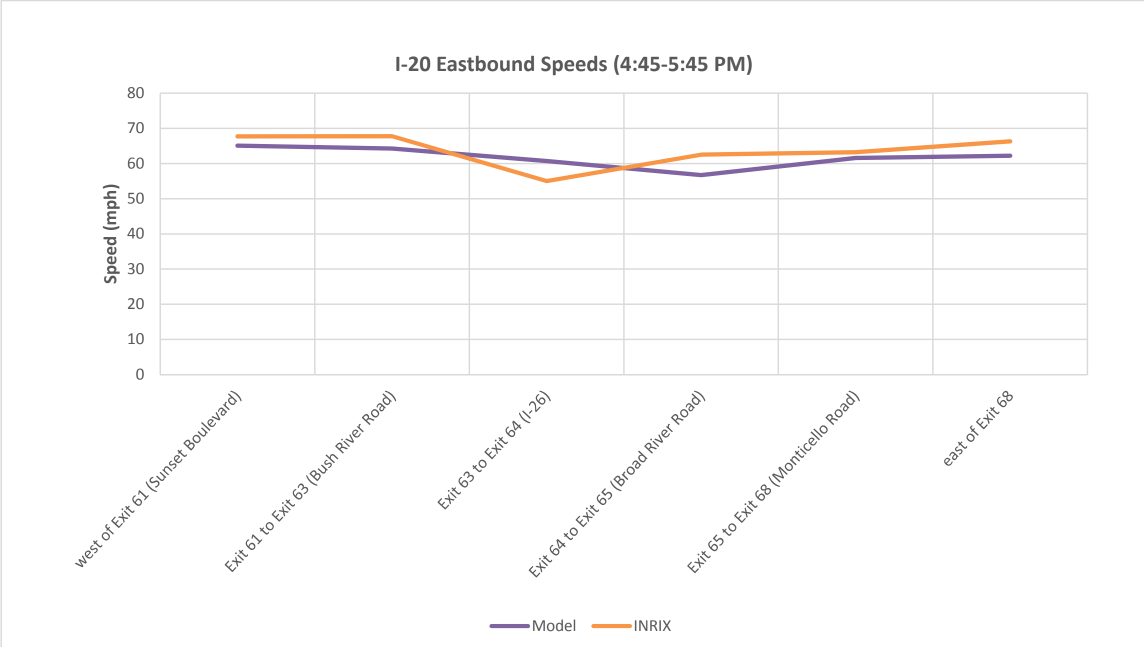
Location	Eastbound					Westbound				
	Segment	AM Peak		PM Peak		Segment	AM Peak		PM Peak	
	ID	INRIX	Model	INRIX	Model	ID	INRIX	Model	INRIX	Model
west of Exit 61 (Sunset Boulevard)	2807	63	63	68	65	2814	67	66	52	52
Exit 61 to Exit 63 (Bush River Road)	8542	65	60	68	64	8539	65	62	41	56
Exit 63 to Exit 64 (I-26)	6216	61	60	55	61	2859	65	61	45	57
Exit 64 to Exit 65 (Broad River Road)	6208	66	61	63	57	6230	64	57	43	38
Exit 65 to Exit 68 (Monticello Road)	8659	63	58	63	62	8658	67	62	54	48
east of Exit 68	6259	66	61	66	62	8770	67	62	52	59

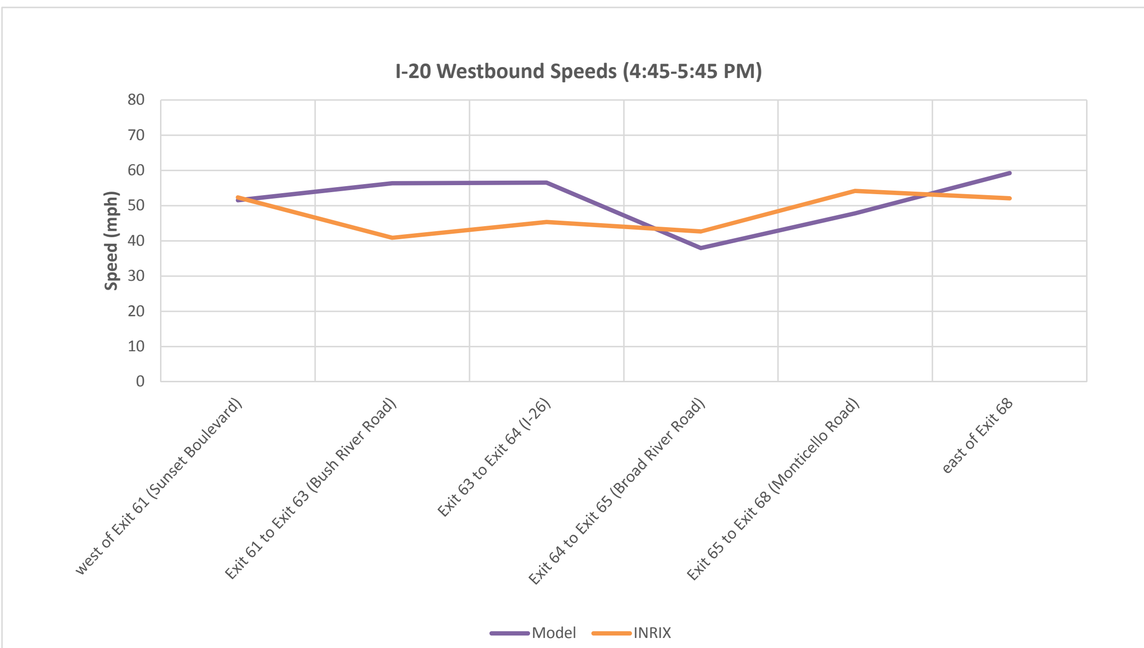
I-20 Segment Speed Comparison





I-20 Segment Speed Comparison

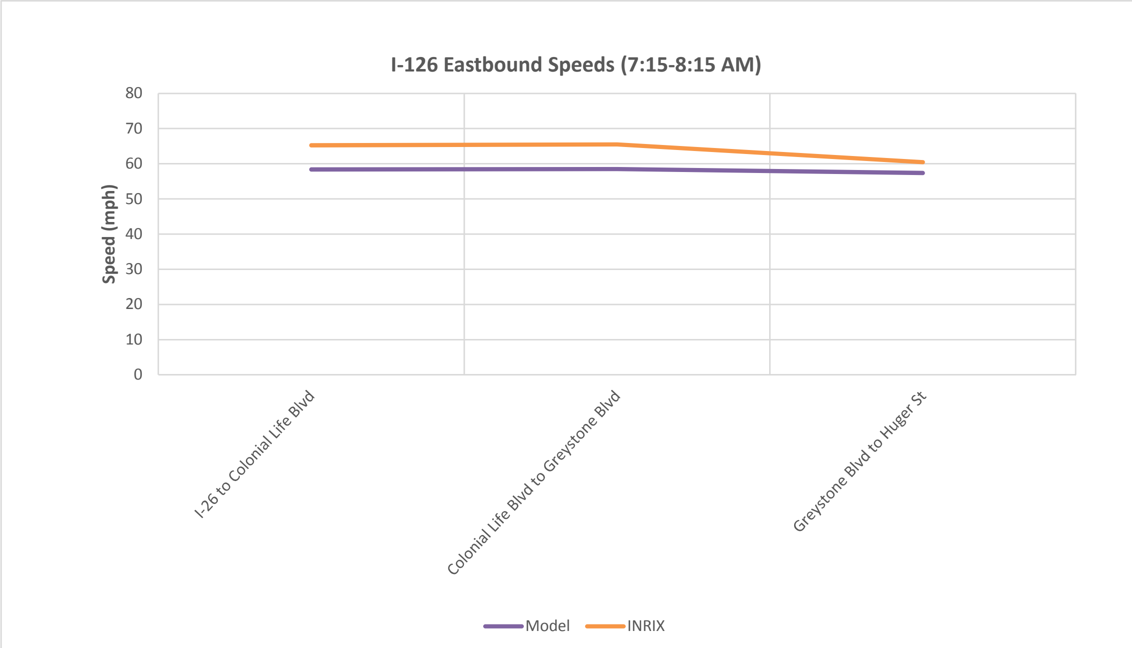


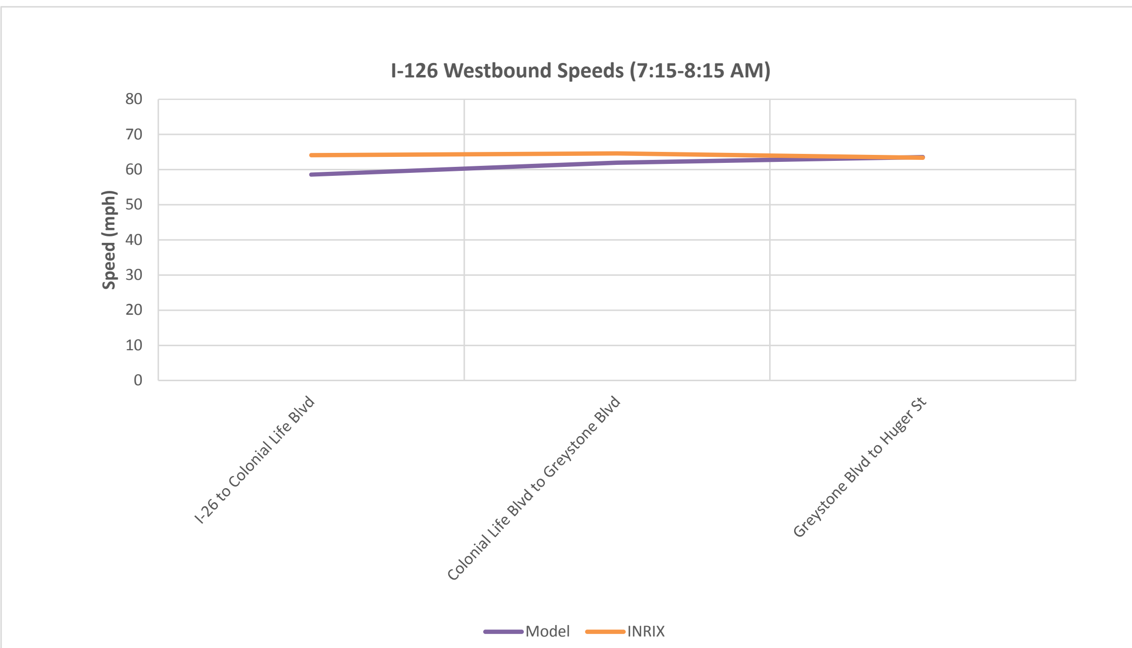


I-126 Segment Speed Comparison

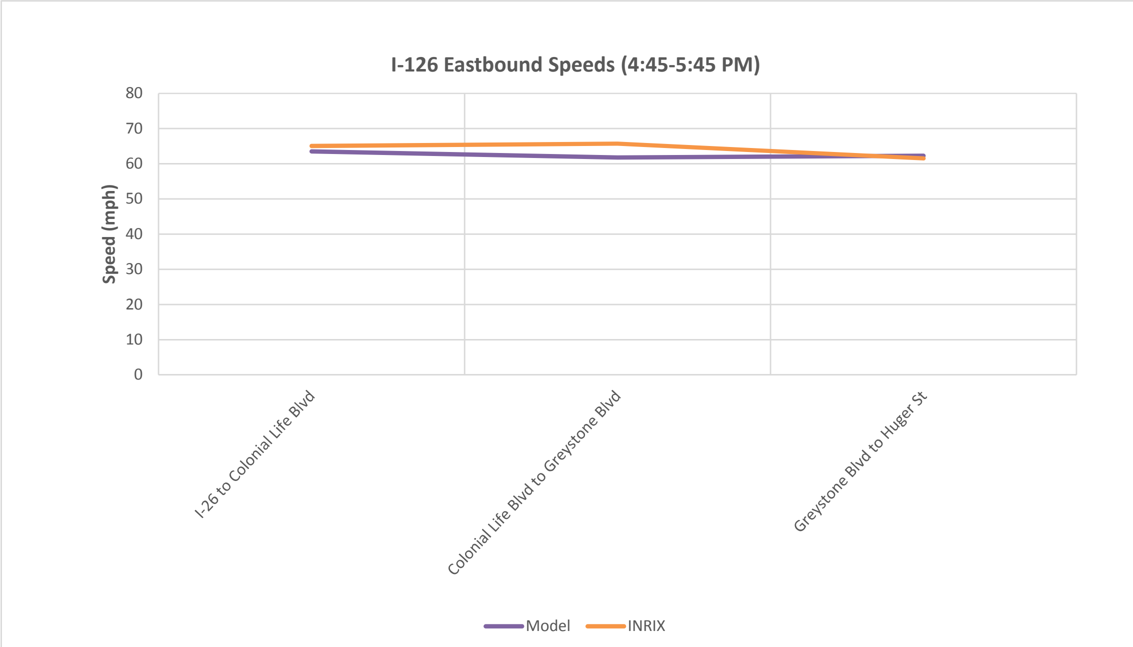
	Eastbound					Westbound				
	Segment	AM Peak		PM Peak		Segment	AM Peak		PM Peak	
Location	ID	INRIX	Model	INRIX	Model	ID	INRIX	Model	INRIX	Model
I-26 to Colonial Life Blvd	4594	65	58	65	64	4599	64	59	23	22
Colonial Life Blvd to Greystone Blvd	4578	66	59	66	62	4587	65	62	39	35
Greystone Blvd to Huger St	8560	60	57	62	62	4566	63	64	61	61

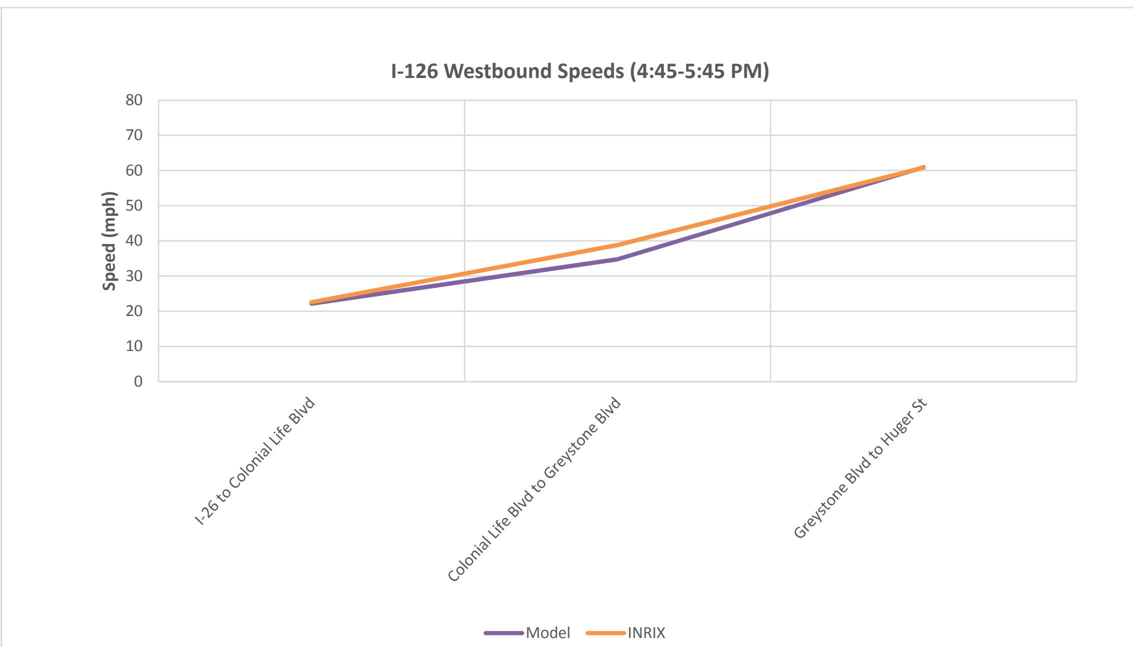
I-126 Segment Speed Comparison





I-126 Segment Speed Comparison





Observations from the I-20/26/77 Corridor Management Plan Study

Interstate Segment		Eastbound Observations	Westbound Observations
I-26	Columbia Avenue to US 176	--	--
I-26	US 176 to US 76/US 176	--	AM Peak: Traffic is moving at free flow speeds. But the ramp merging area is not being utilized. Recent construction extended the lane but traffic is merging too quickly. Most WB traffic get in fast lane to avoid ramp traffic. PM Peak: --
I-26	US 76/US 176 to Lake Murray Boulevard	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 30-40 mph. PM Peak: --	AM Peak: -- PM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 30-40 mph.
I-26	Lake Murray Boulevard to Harbison Boulevard	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 20-30 mph. PM Peak: --	AM Peak: -- PM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 20-30 mph.
I-26	Harbison Boulevard to Piney Grove Road	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 20-30 mph. PM Peak: --	AM Peak: -- PM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 20-30 mph.
I-26	Piney Grove Road to Saint Andrews Road	AM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 15-20 mph. PM Peak: --	AM Peak: -- PM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 15-20 mph.
I-26	Saint Andrews Road to I 20	AM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 15-20 mph. PM Peak: Within the past year congested has started heavily in the middle lane, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph.	AM Peak: -- PM Peak: Heavily congested stop and go traffic.
I-26	I-20 to Bush River Road	AM Peak: Heavily Congested traffic, but is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph. PM Peak: Within the past year congested has started heavily in the middle lane, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph.	AM Peak: -- PM Peak: Heavily congested stop and go traffic. Ramp to Bush River Rd. backs up as well bu may just be a timing issue.

Observations from the I-20/26/77 Corridor Management Plan Study

Interstate Segment		Eastbound Observations	Westbound Observations
I-26	Bush River Road to I-126	AM Peak: Heavily Congested traffic, but is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph. PM Peak: Within the past year congested has started heavily in the middle lane, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph. Merge on-ramp to I-26 EB from Bush River Rd. backs up about half the length of the ramp.	AM Peak: -- PM Peak: Heavily congested stop and go traffic.
I-26	I-126 to Sunset Boulevard	AM Peak: Heavily Congested traffic, but is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph. PM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 30-40 mph. Off-ramp to Sunset Blvd backs up about the full length of the ramp.	AM Peak: -- PM Peak: Heavily congested stop and go traffic from the beginning of the bridge through the fly over to I-26 WB.
I-26	Sunset Boulevard to Augusta Road	AM Peak: -- PM Peak: Off-ramp to WB August Rd backs up on about half or the ramp.	--

Observations from the I-20/26/77 Corridor Management Plan Study

Interstate Segment		Eastbound Observations	Westbound Observations
I-20	Sunset Boulevard to Bush River Road	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 40-50 mph PM Peak: --	AM Peak: -- PM Peak: Congestion starts at Bush River Rd and is stop and goes all the way to the Sunset Blvd. interchange. This is due in part from the lane drop around MM 61.5. There are plans to begin construction in the next 4 months to add the third lane from MM 61.5 to MM 49.
I-20	Bush River Road to I-26	AM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 40-50 mph. PM Peak: --	AM Peak: -- PM Peak: Congested after on-ramps from I-26, but traffic is not typically stop and go . Traffic is approimately moving at 30-40 mph.
I-20	I-26 to Broad River Road	AM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 40-50 mph. PM Peak: --	AM Peak: -- PM Peak: Heavily congested traffic is typically stop and go. On-ramp to I-26 WB backs up onto I-20.
I-20	Broad River Road to Monticello Road	AM Peak: Congested traffic is not typically stop and go. Traffic moves less than free flow speed, approximately 40-50 mph. The off-ramp to Monticello Rd backs up but it under construction to widened the ramp to two lanes. PM Peak: --	AM Peak: -- PM Peak: Congested to about a mile west of Monticello Rd., but not stop and go. Typically traffic is not at free-flow speed but moving at appromiately 40-50 mph. Off-ramp to Broad River Rd. can get congested due to traffic on Broad River Rd.

Observations from the I-20/26/77 Corridor Management Plan Study

Interstate Segment		Eastbound Observations	Westbound Observations
I-126	I-26 to Colonial Life Boulevard	AM Peak: Heavily Congested traffic, but is not typically stop and go. Traffic moves less than free flow speed, approximately 10-15 mph. PM Peak: --	AM Peak: -- PM Peak: Heavily congested stop and go traffic.
I-126	Colonial Life Boulevard to Greystone Boulevard	AM Peak: Heavily Congested traffic, but is not typically stop and go. Traffic moves less than free flow speed, approximately 20-30 mph. PM Peak: --	AM Peak: -- PM Peak: Heavily congested stop and go traffic.
I-126	Greystone Boulevard to Huger Street/Elmwood Avenue	AM Peak: Heavily Congested traffic is typically stop and go from the river to Elmwood Avenue. PM Peak: --	

Observations from the I-20/26/77 Corridor Management Plan Study

Roadway	Observations
Longs Pond Road	Significant congestion in AM from Two Notch Road that backs up to fork with Barr Road. PM congestion as well at fork of Two Notch Road and Barr Road that backs up to ramp off I-20. This may warrent a signal it is currently stop control.
South Lake Drive	No significant congestion issues.
Sunset Boulevard at I-20	AM peak hour EB congestionfrom Northside Blvd. through to Cromer Rd PM peak hour congestion WB from the I-20 WB off-ramp traffic.
Bush River Road at I-20	PM peak hour congestion in the WB direction.
Broad River Road at I-20	PM peak hour congestion near the I-20 ramps.
Monticello Road	No significant congestion issues.
Columbia Avenue	No significant congestion issues.
US 176	No significant congestion issues.
US 76/US 176 at I-26	No significant congestion issues.
Lake Murray Boulevard	No significant congestion issues.
Harbison Boulevard	AM stop and go NB traffic through the interchange. PM stop and go NB and SB traffic, this may be a timing issue.
Piney Grove Road	Am peak hour congestion to get to EB on-ramp. Merge on ramp causes back ups, a two lane ramp may help alleviate some issues. PM peak hour congestion on WB off-ramp with short merging lane.
Saint Andrews Road	No significant congestion issues.
Bush River Road at I-26	Slight PM peak hour congestion from WB traffic.
Sunset Boulevard at I-26	PM peak hour congestion on ramps from short signal time and hospital traffic.
Colonial Life Boulevard	No significant congestion issues.
Greystone Boulevard	No significant congestion issues.
Huger Street/Elmwood Avenue	AM peak hour EB congestion to Assembly Street. PM peak hour congestion on Huger Street at Laruel Street that may be a timing issue.

Appendix G—Choke Point Review

Reasonable Alternative 1 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	At	As shown in new .KMZ file, the westbound on-ramp acceleration lane from Exit 103 will be extended to the westbound off-ramp at Exit 102 which will increase capacity.
Exit 103-104	Under	Under	Under	Over	Additional weaving issues with the westbound off-ramp to Harbison Boulevard closer to the westbound on-ramp from Piney Grove Road; may have to consider extending westbound on-ramp acceleration lane to the westbound off-ramp lane, creating a westbound weaving section between Piney Grove
Exit 104-106	Over	Under	Over	Over	Overcapacity in EB direction due to Exit ramp queue back up toward I-20 in both the AM and PM peak hours. (Additional through lane on I-26 EB necessary (as shown in new .KMZ file). Heavy PM queuing at on-ramp merge from Exit 106
Exit 106-107	Under	Under	Under	At	Heavy volume in the westbound direction during the PM peak hour. However, flow is steady
Exit 107-108	Under	Under	Under	At	Heavy volume in the westbound direction during the PM peak hour. However, flow is steady
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	At	Under	At	Under	Heavy volume along I-126 eastbound after the on-ramp from I-20. Merge causes slow down. New .KMZ file maintains four lanes.
Exit 63-64	Under	Under	Under	Under	Will update (as shown in new .KMZ file)
Exit 64-65	Under	Under	Under	Under	Will update (as shown in new .KMZ file)

Interchanges

Exit		AM		PM		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
Exit 101	Par.Clo.	Under	Under	Under	Under	
Exit 102	Par.Clo.	Under	Under	Under	Under	
Exit 103	AO35	Under	Under	Under	At	WB off-ramp experiences queuing on arterial. However, flow is steady.
Exit 104	AO30	At	Under	Under	Under	Eastbound on-ramp experiences queuing on arterial. However, flow is steady.
Exit 106	AO13	Over	Under	Under	Over	Eastbound on-ramp experiences heavy queuing on arterial from the west during AM peak hour. Eastbound on-ramp experiences heavy queuing on arterial from the east during the PM peak hour.
Exit 107/Exit 64	AO17	At	Under	Under	Under	Heavy weaving/merging from I-26 eastbound on-ramp from I-20.
Exit 108 – I-126	AO24	At	Under	Under	At	Heavy volume along I-126 eastbound after the on-ramp from I-20 during the AM peak hour. New .KMZ file maintains four lanes. Heavy volume along I-126 westbound before merge to I-26. New .KMZ file maintains three lanes.
Exit 110	AO46	Under	Under	Over	At	Arterial experiences heavy queuing causing backup on both eastbound and westbound off-ramps.
Colonial Life	AO17	Under	Under	Under	Under	Will update (as shown in new .KMZ file)

<u>Interchanges</u> - continued

Exit		AM		PM		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
Exit 63	AO6	At	Over	At	Over	Although not shown in simulation, Bush River Road arterial experiences heavy queuing. Currently, DDI signals are clustered with the Berryhill Road signal; this adds additional delay to the operation of the DDI. Westbound off-ramp queue extends to I-20.
Exit 65	AO3	At	Under	Over	Over	The southbound left turn onto I-20 eastbound experiences moderate queuing during the AM peak hour. Broad River Road experiences heavy northbound queuing causing backup on the westbound off-ramps. The eastbound off ramp experiences heavy queuing. Traffic control modifications may be necessary to alleviate off-ramp queuing.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations. The gray linework is the revised design which will be incorporated into the simulation model.

- Exit 101 (Par.Clo) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
    - AM Peak Hour – See **Figure 1** – interchange operates at under capacity
    - PM Peak Hour – See **Figure 2** – interchange operates at under capacity

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

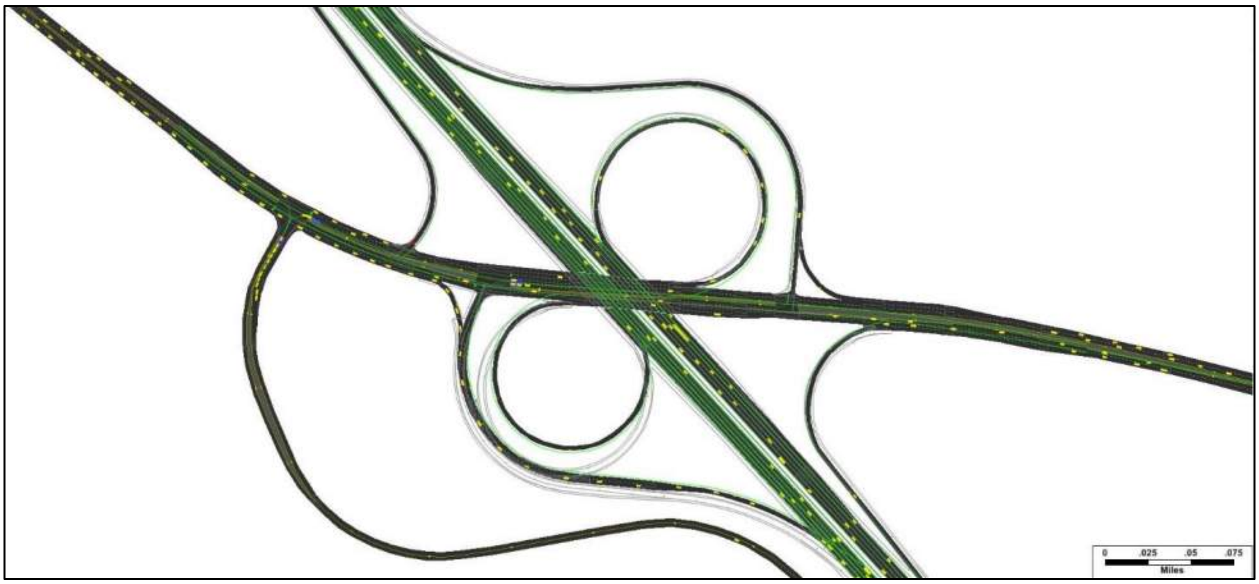
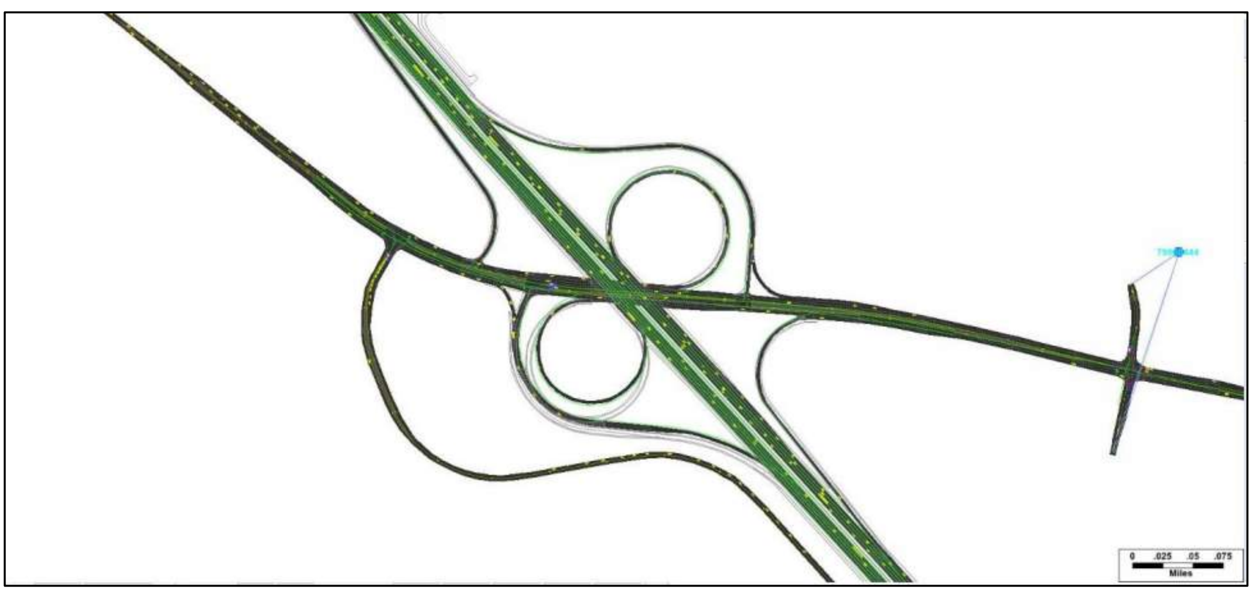


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
    - AM Peak Hour – See **Figure 3** – interchange operates at under capacity
    - PM Peak Hour – See **Figure 4** – interchange operates at under capacity

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

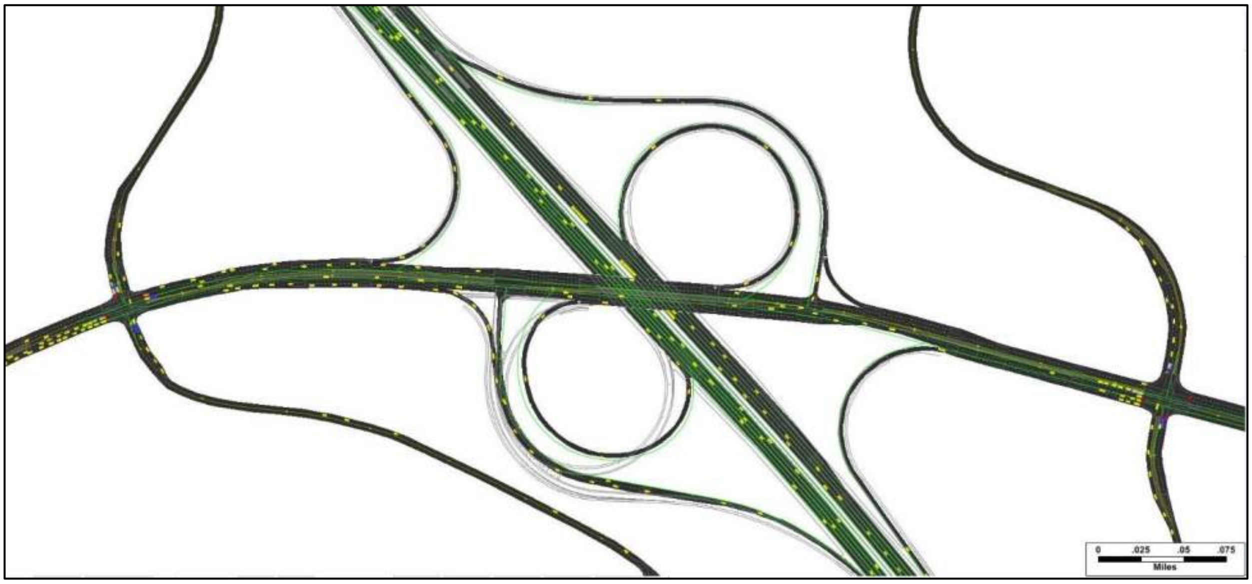
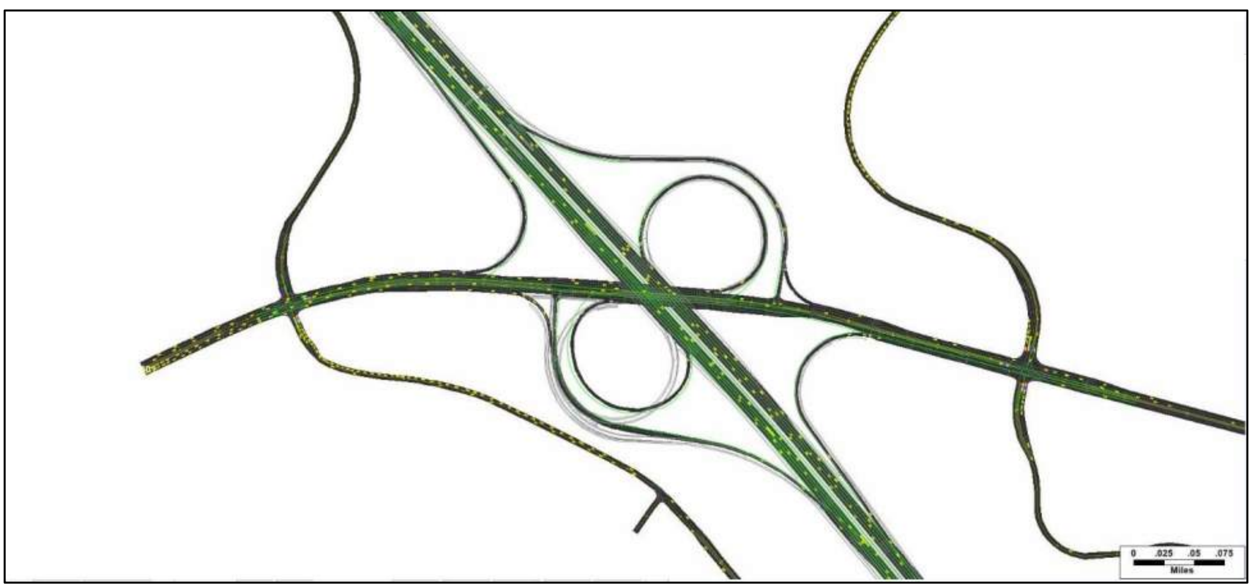


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO35) – Interchange design differs in new .KMZ file, but there should be no significant impact to operations with these changes as capacity remains the same.
    - AM Peak Hour – See **Figure 5** – interchange operates at under capacity
    - PM Peak Hour – See **Figure 6** – interchange operates at capacity at the westbound ramps intersection.

Figure 5 - Exit 103 (AO35) Simulation - AM Peak Hour

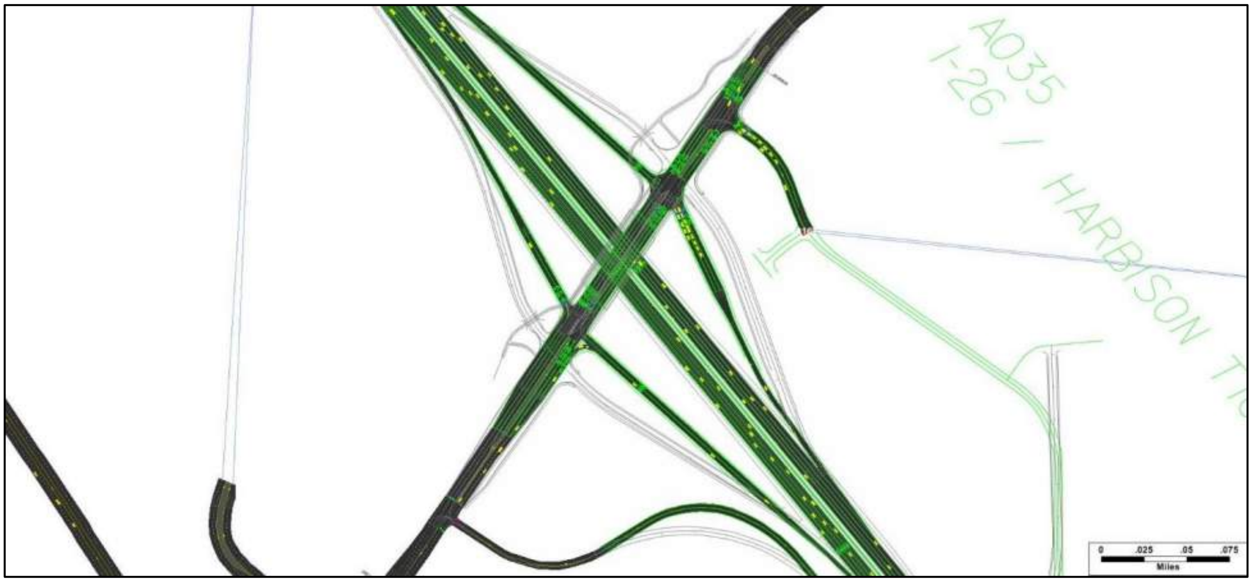
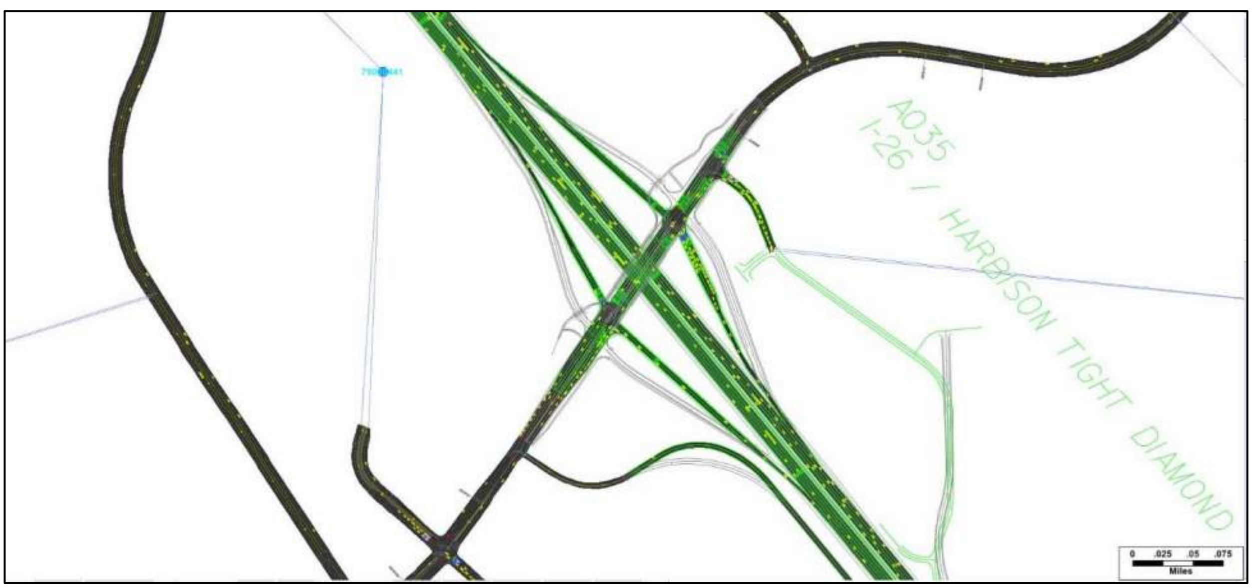


Figure 6 - Exit 103 (AO35) Simulation - PM Peak Hour



- Exit 104 (AO30) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
  - AM Peak Hour – See **Figure 7** – interchange operates at capacity at the eastbound ramps intersection. I-26 eastbound is over capacity due to off-ramp queuing toward I-20 and Exit 106. New design incorporates additional lane for collector-distributor off-ramp.
  - PM Peak Hour – See **Figure 8** – interchange operates under capacity

Figure 7 - Exit 104 (AO30) Simulation - AM Peak Hour

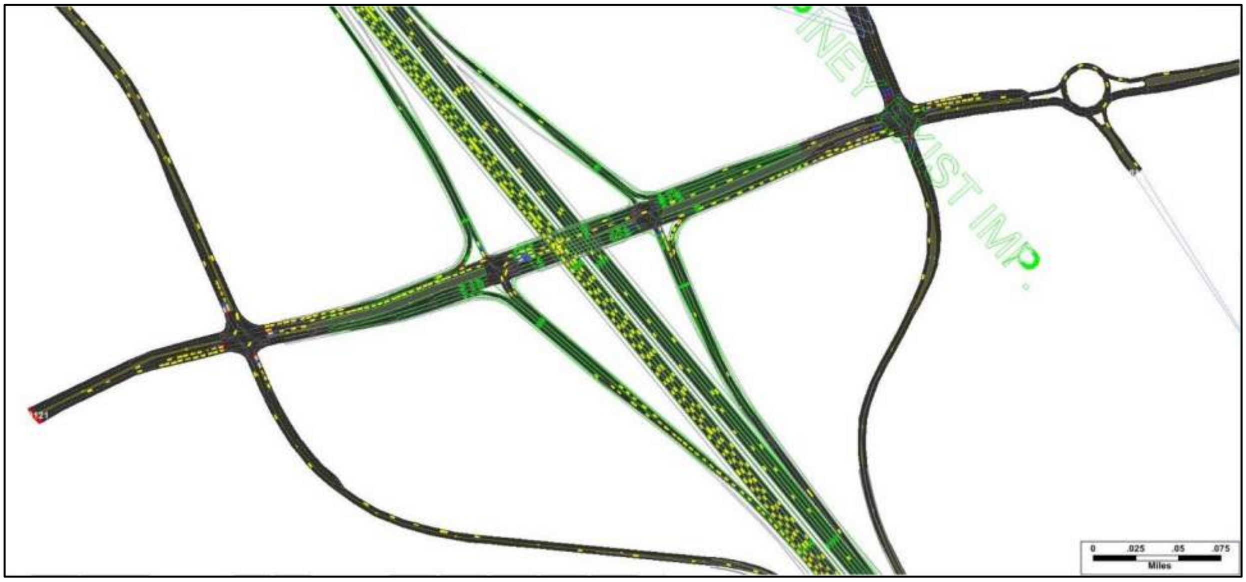
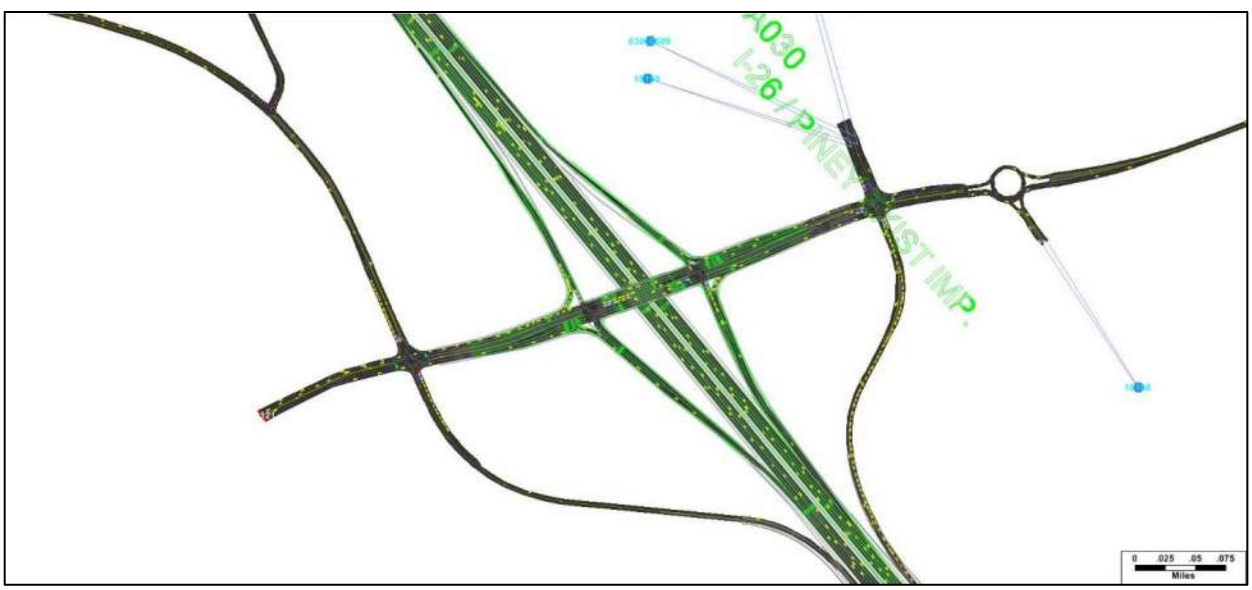


Figure 8 - Exit 104 (AO30) Simulation - PM Peak Hour



- Exit 106 (AO13) – Interchange design differs in new .KMZ file. Revised runs will need to be completed to see if there are any additional capacity issues. Fernandina/Burning Tree existing configuration maintained in current simulation. New .KMZ file includes widened arterial.
    - AM Peak Hour – See **Figure 9** – interchange operates over capacity at the eastbound ramps intersection. Additional right turn lane onto EB I-26 was added for capacity. Interchange operates at capacity at the westbound ramps intersection.
    - PM Peak Hour – See **Figure 10** – interchange operates over capacity at the WB left turns onto I-26 eastbound.

Figure 9 - Exit 106 (AO13) Simulation - AM Peak Hour

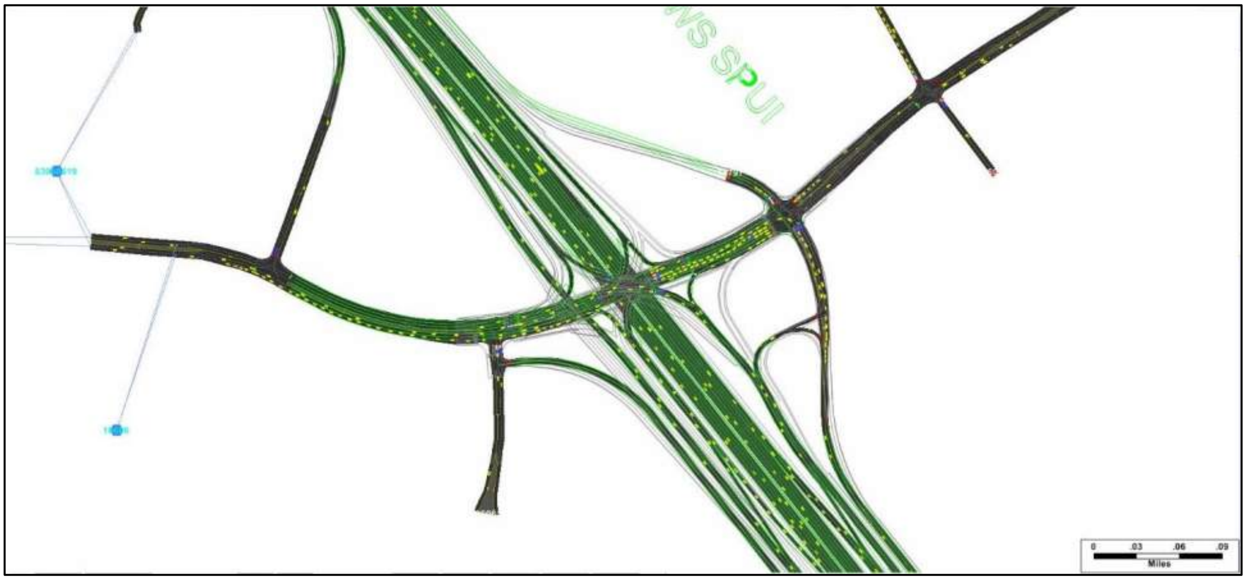
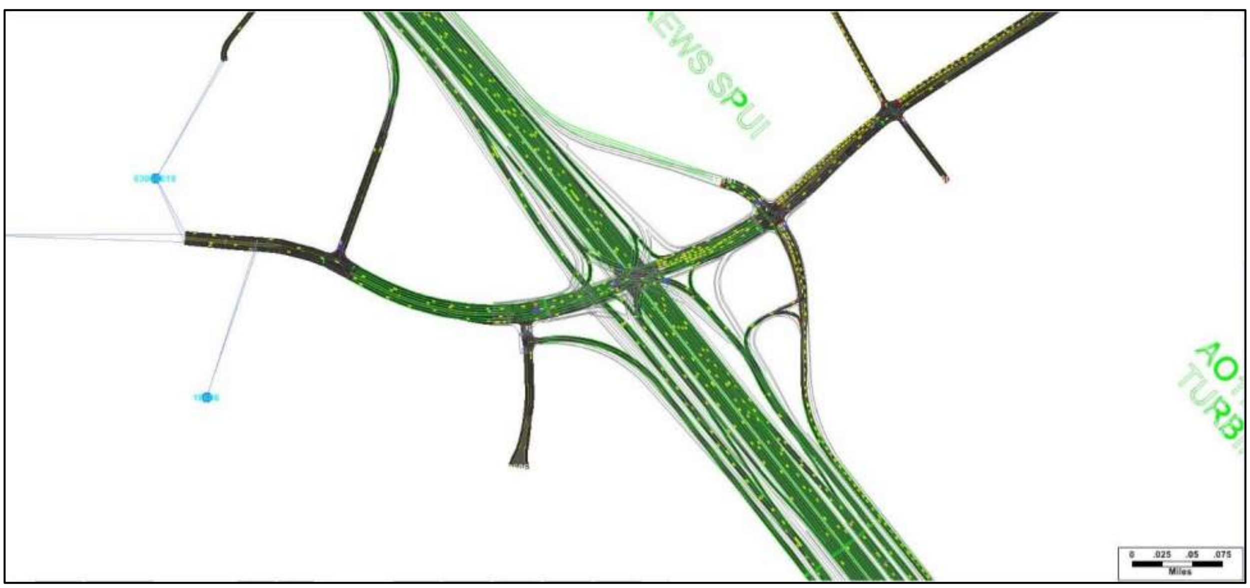


Figure 10 - Exit 106 (AO13) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO17) – Interchange design slightly differs in new .KMZ file. Revised runs will need to be completed to see if there are any additional capacity issues.
    - AM Peak Hour – See **Figure 11** – The I-26 eastbound on-ramp from I-20 is at capacity but experiences weaving issues.
    - PM Peak Hour – See **Figure 12** – interchange operates under capacity.

Figure 11 - Exit 107/Exit 64 (AO17) Simulation - AM Peak Hour

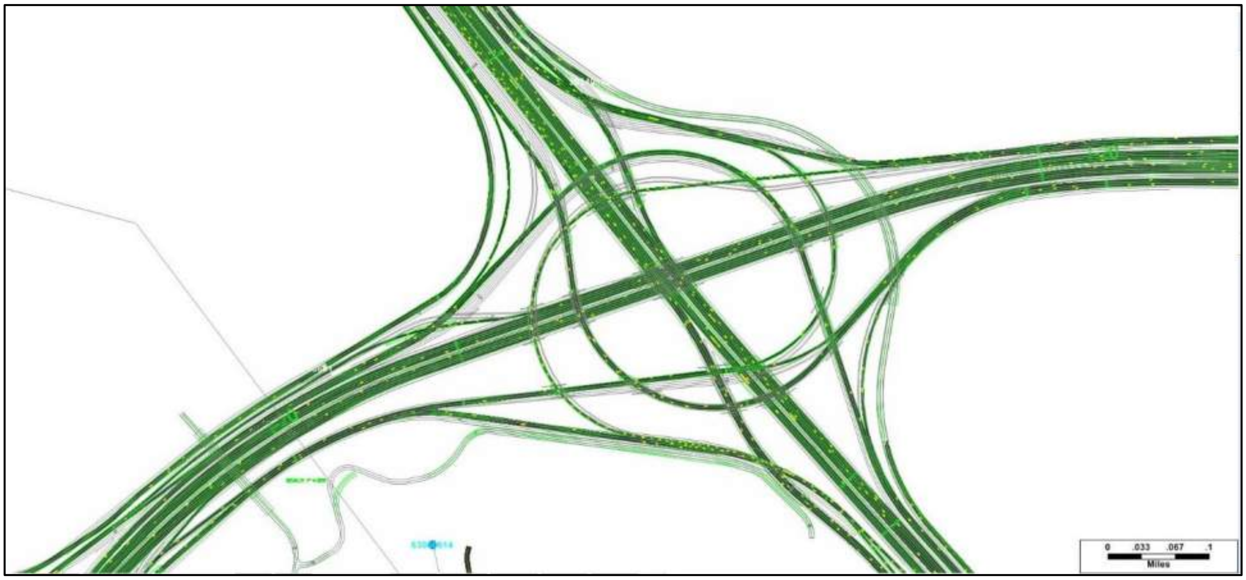


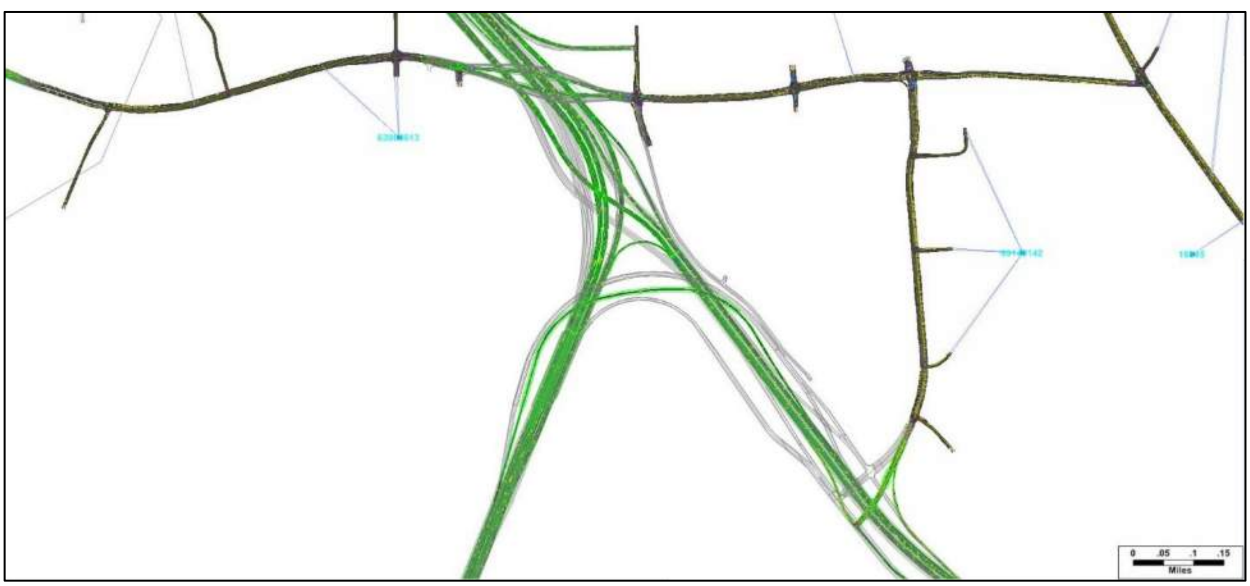
Figure 12 - Exit 107/Exit 64 (AO17) Simulation - PM Peak Hour

Exit 108 (I-126) – The revised KMZ file shows significant modifications to the ramp alignments and split locations. Revised runs will need to be completed to see if there are any additional capacity issues.

- AM Peak Hour – See **Figure 13** – I-126 eastbound operates at capacity. Additional lane added in new .kmz file.
- PM Peak Hour – See **Figure 14** – I-126 westbound operates at capacity. Additional lane added in new .kmz file.

Figure 13 - Exit 108 (I-126) Simulation - AM Peak Hour

Figure 14 - Exit 108 (I-126) Simulation - PM Peak Hour



- Exit 110 (AO46)
    - AM Peak Hour – See **Figure 15** – Interchange operates at capacity.
    - PM Peak Hour – See **Figure 16** – Interchanges operates over capacity at the I-26 eastbound off-ramp due to the arterial queuing along US 378.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour

- I-126 at Colonial Life Boulevard – The revised KMZ file shows significant interchange modifications at Colonial Life Boulevard. Revised runs will need to be completed to see if there are any additional capacity issues.
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity with installation of signal.
    - PM Peak Hour – See **Figure 18** – Interchanges operates at capacity with installation of signal. Without signal, the Colonial Live Boulevard arterial in the southbound direction will queue to Bush River Road.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

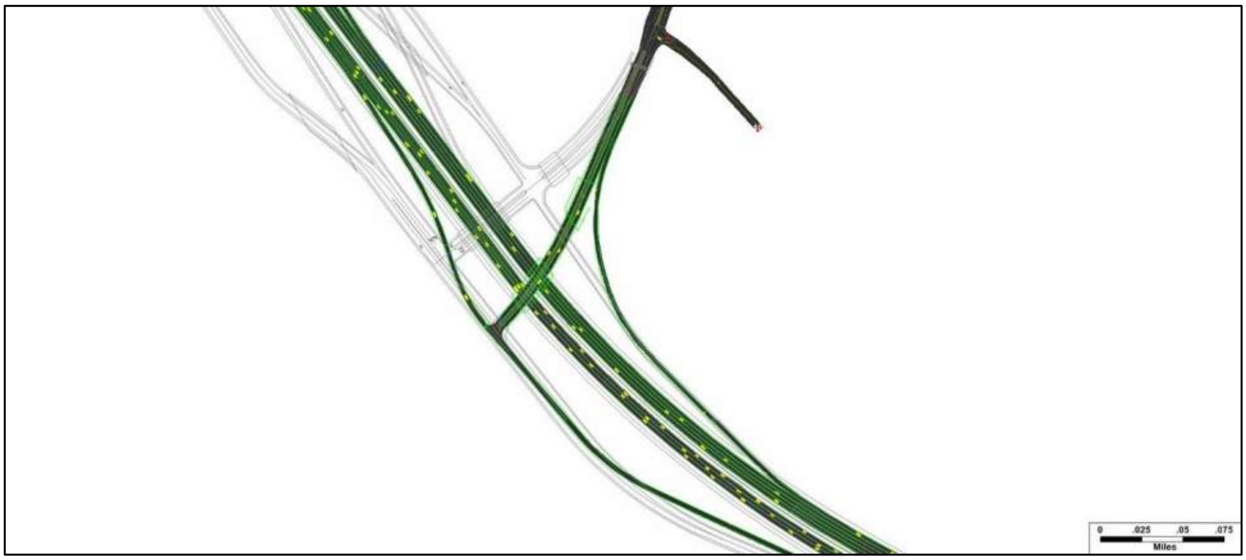
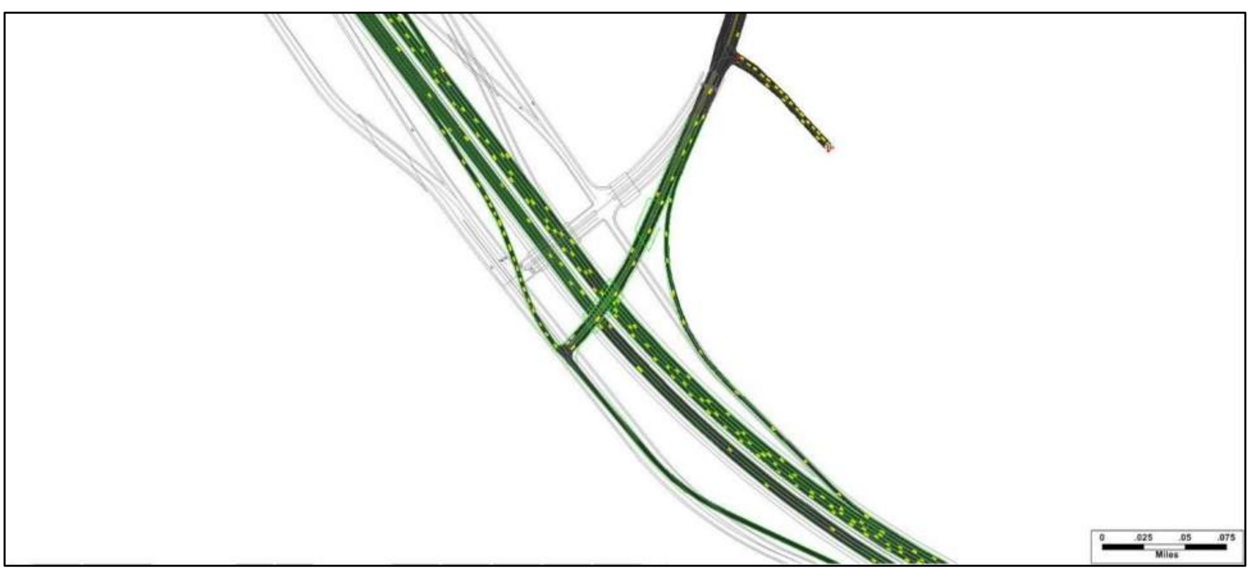


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO6) – Interchange design similar to new .KMZ file. However, slip-ramp connection to BerryHill Road will seem beneficial to DDI design. Currently, DDI signals are clustered with the Berryhill Road signal; this adds additional delay to the operation of the DDI.
    - AM Peak Hour – See **Figure 19** – interchange operation at capacity
    - PM Peak Hour – See **Figure 20** – interchange operates over capacity Major queuing in both directions along Bush River Road and on the I-20 westbound off-ramp

Figure 19 - Exit 63 (AO6) Simulation - AM Peak Hour

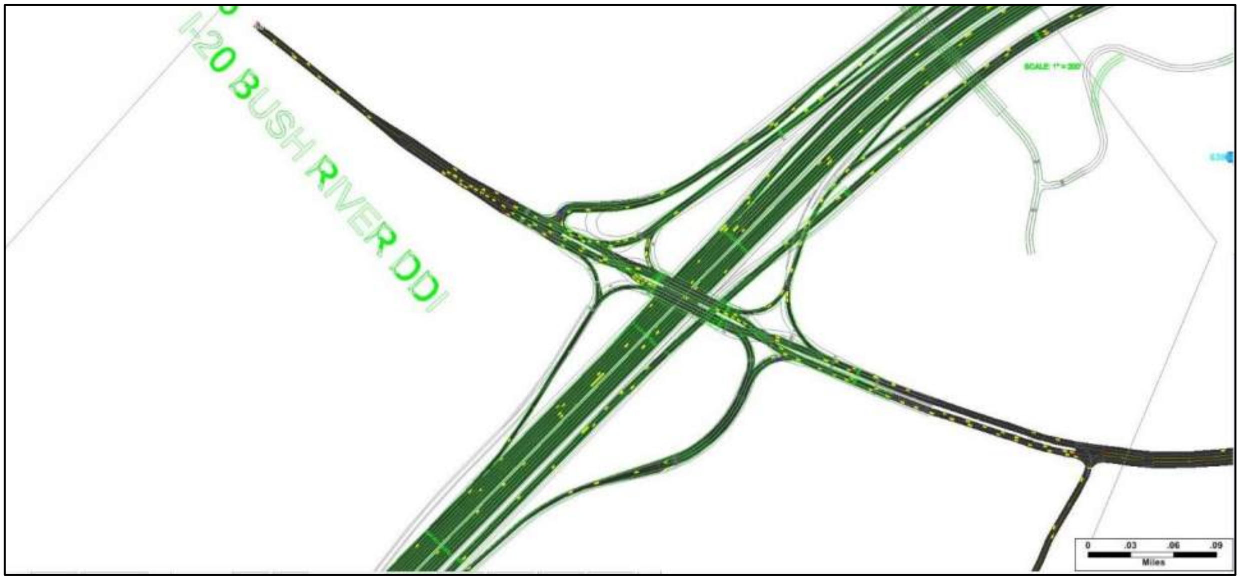
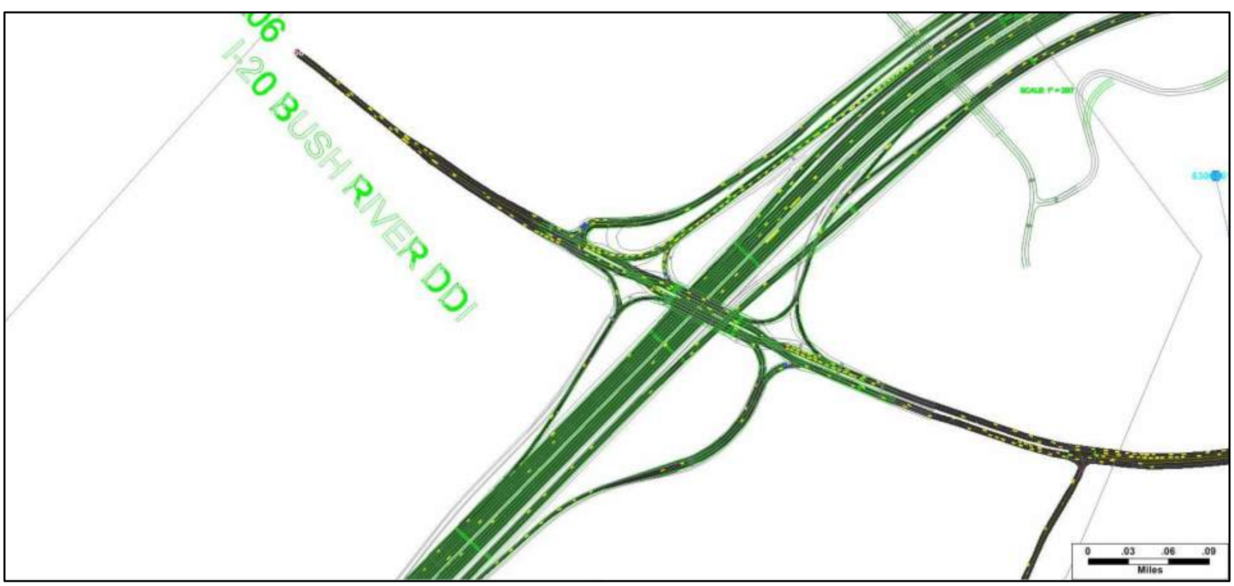


Figure 20 - Exit 63 (AO6) Simulation - PM Peak Hour



- Exit 65 (AO3) – The revised KMZ file shows significant interchange modifications at Broad River Road. Revised runs will need to be completed to see if there are any additional capacity issues.
    - AM Peak Hour – See **Figure 21** – interchange operates at capacity. The southbound left turn onto I-20 eastbound experiences moderate queuing.
    - PM Peak Hour – See **Figure 22** – interchange operates over capacity. Major queuing on the I-20 eastbound off-ramp.

Figure 21 - Exit 65 (AO6) Simulation - AM Peak Hour

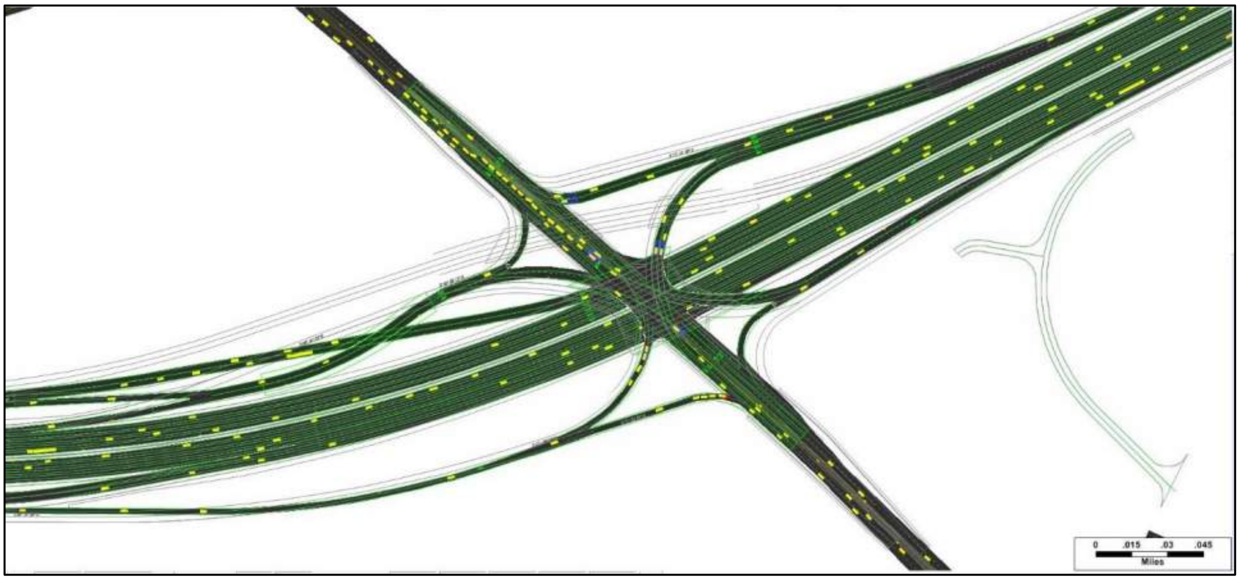
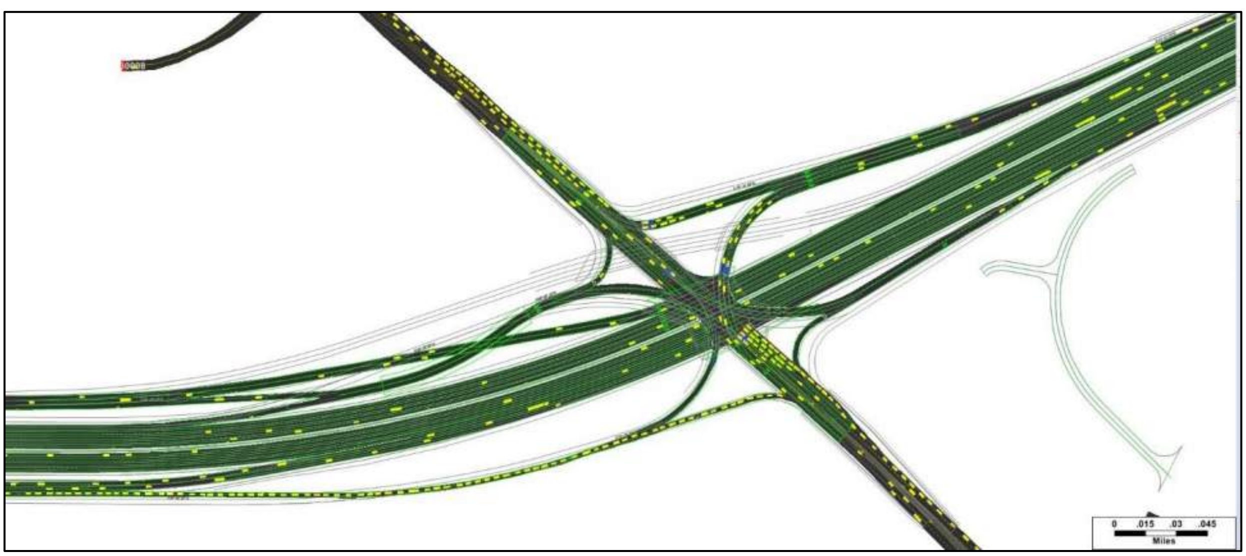
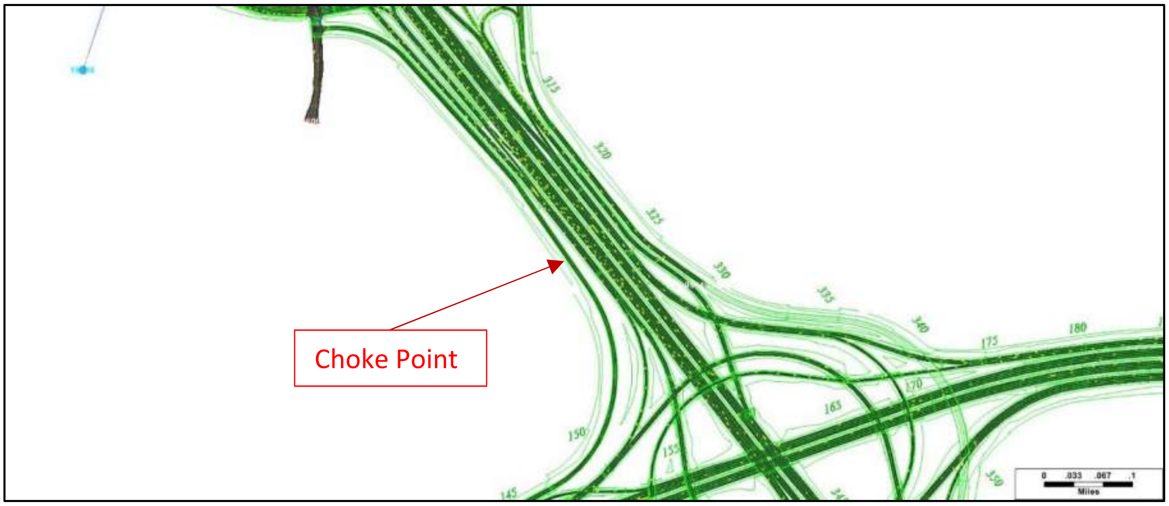


Figure 22 - Exit 65 (AO3) Simulation - PM Peak Hour

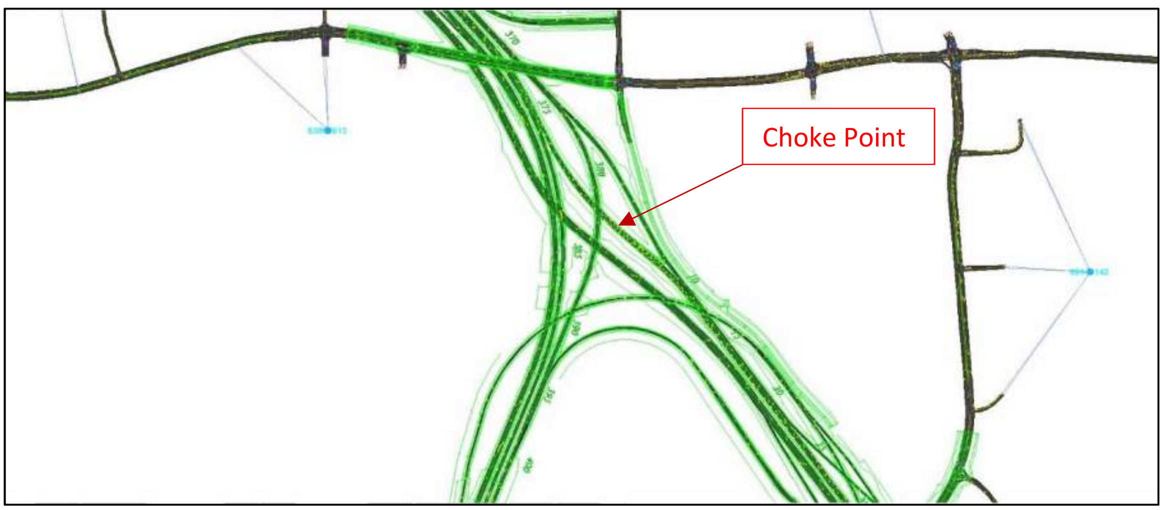


RA1 Specific Issues/Choke Points:

1. I-26 EB weaving and slow down between Exit 106 on-ramp and I-26/I-126 EB split



2. I-126 WB lane drop prior to merge with I-26 WB



Reasonable Alternative 2 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM EB	AM WB	PM EB	PM WB	Comment
Exit 101-102	Under	Under	Under	Over	Heavy volume in the PM from the westbound off-ramp. Additional signal timing changes may improve the operations of the ramp.
Exit 102-103	Over	Under	Under	Under	Heavy volume in the AM from the off-ramp at exit 103 due to congestion along Park Terrace/Bower stemming from Exit 104 congestion
Exit 103-104	Over	Under	Under	Over	Heavy volume in the AM from the off-ramp at exit 104 due to congestion along Piney Grove turning onto Jamil. Heavy WB PM congestion from the off-ramp at Exit 103 due to the arterial congestion. Improvements at adjacent interchanges may help this deficiency.
Exit 104-106	Over	Under	Over	Over	Heavy EB congestion from the split with the CD road in the AM and PM. Heavy WB PM congestion stems from the Exit 103 off-ramp.
Exit 106-107	Under	Under	Under	At	While the PM density showed the WB at capacity, the simulation showed good operations.
Exit 107-108	Under	Under	Under	At	While the PM density showed the WB at capacity, the simulation showed good operations.
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	At	Under	Under	At	AM volume slows a little at the merge point from WB I-26 to EB I-126. PM WB operations were slowed from the off-ramp to EB I-26. Revised KMZ may alleviate this issue.
Exit 63-64	Under	Under	Under	Under	
Exit 64-65	Under	Under	Under	Under	

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	AO45	Under	Over	Over	Over	There were cycle failures for the WB ramp in the AM, further signal timing changes may alleviate this. Heavy volume in the PM from the WB off-ramp. Additional signal timing changes may improve the operations of the ramp. EB Off-ramp simulation operates better than the densities indicate.
Exit 102	AO42	Over	Over	Under	Over	Simulation shows better results at the ramp termini in the AM and the PM than the density indicates.
Exit 103	AO37	Over	Over	Under	Under	Heavy arterial congestion associated with the left turn onto Park Terrace is degrading the performance of the ramps in the AM and PM. May need to revise timings/paths to better understand the deficiencies.
Exit 104	AO31	Over	Under	At	Under	Heavy arterial congestion associated with the left turn onto Jamil is degrading the performance of the ramps in the AM. May need to revise timings/paths to better understand the deficiencies. In the PM, the simulation operates better than the density indicates.
Exit 106	AO16	Under	Over	Under	Over	Heavy arterial congestion associated with the closely spaced intersections is causing the ramp to severely back up in the AM and PM. The revised KMZ may alleviate this issue.
Exit 107/Exit 64	AO18	Under	Under	Under	Under	
Exit 108	AO24	Over	Under	Over	Under	Simulation showed ramp was heavy but moving steadily in the AM.
Exit 110	AO47	Over	Under	Over	Under	There are signal cycle failures in the AM but the ramp

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
						congestion does not extend to the mainline. PM operations show significant queuing on the off-ramps which is stemming from the EB left turn onto McSwain Dr. Additional investigation may be needed into why this volume is so high.
Colonial Life		Under	Under	Under	At	In the PM, the simulation operates better than the density indicates. The higher density recorded from the simulation implies the simulation operation would appear more congested. Additional investigation will be performed as to why this is occurring.
Exit 63	AO10	Over	Over	Over	Over	The tightly spaced intersection of the Berryhill Rd causes congestion along the arterial but the simulation shows better ramp operations than the density indicates in the AM. The WB ramp operates better than the densities indicate in the PM. The possible disconnect between the measured densities and the simulation visualization will be checked into further. The EB ramp shows heavy congestion. Additional turn lane as shown in the new KMZ may help alleviate this issue.
Exit 65	AO5	Over	Under	Over	Under	Broad River Road congestion is spilling back onto the eastbound off-ramp in the AM and PM. Additional arterial improvements may solve this issue.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations. The gray linework is the revised design which will be incorporated into the simulation model.

- Exit 101 (AO45)
  - Eastbound Broad River Road Right turn onto I-26 EB on-ramp converted to double right
  - WB I-26 off ramp provides for double left turn movement
  - Based on the latest file, adjustments are needed at the ramp termini including the channelized right turn at the EB I-26 on-ramp which should improve operations.
  - Significant queuing WB I-26 off-ramp in the PM peak hour.
  - **See Figure 1 and 2**

Figure 1 - Exit 101 (AO45) Simulation - AM Peak Hour

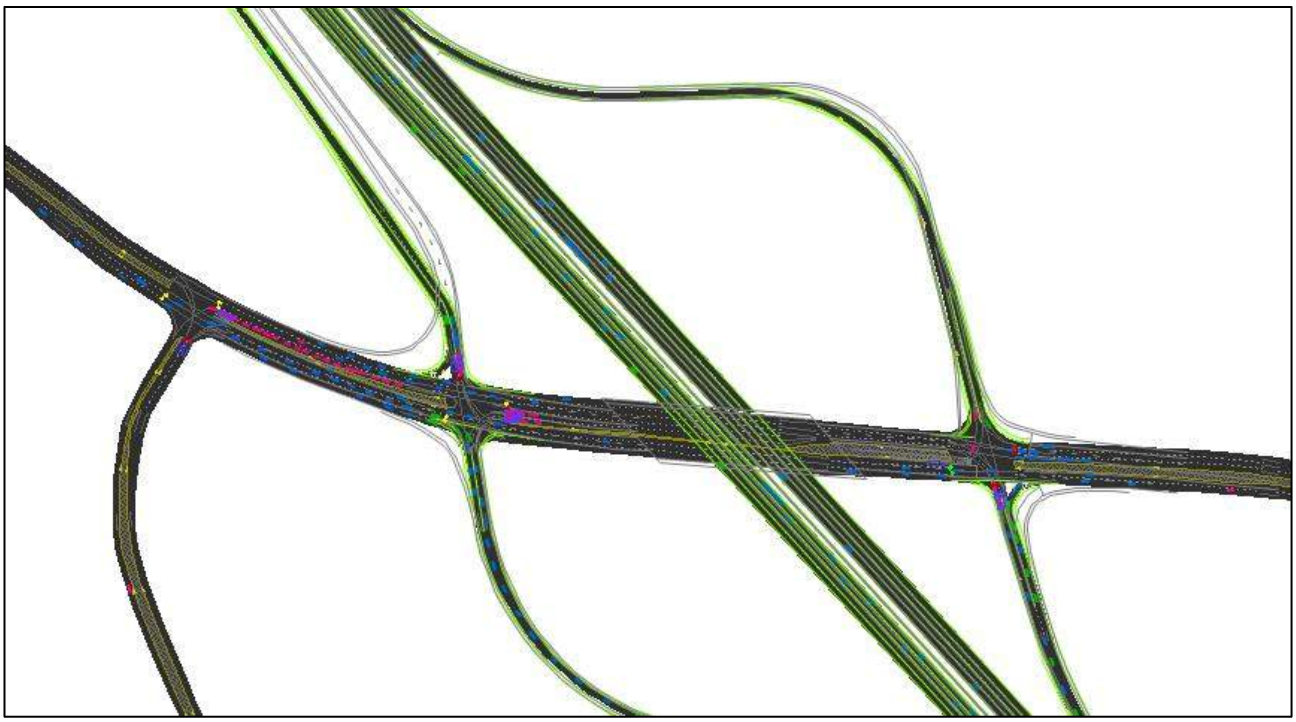
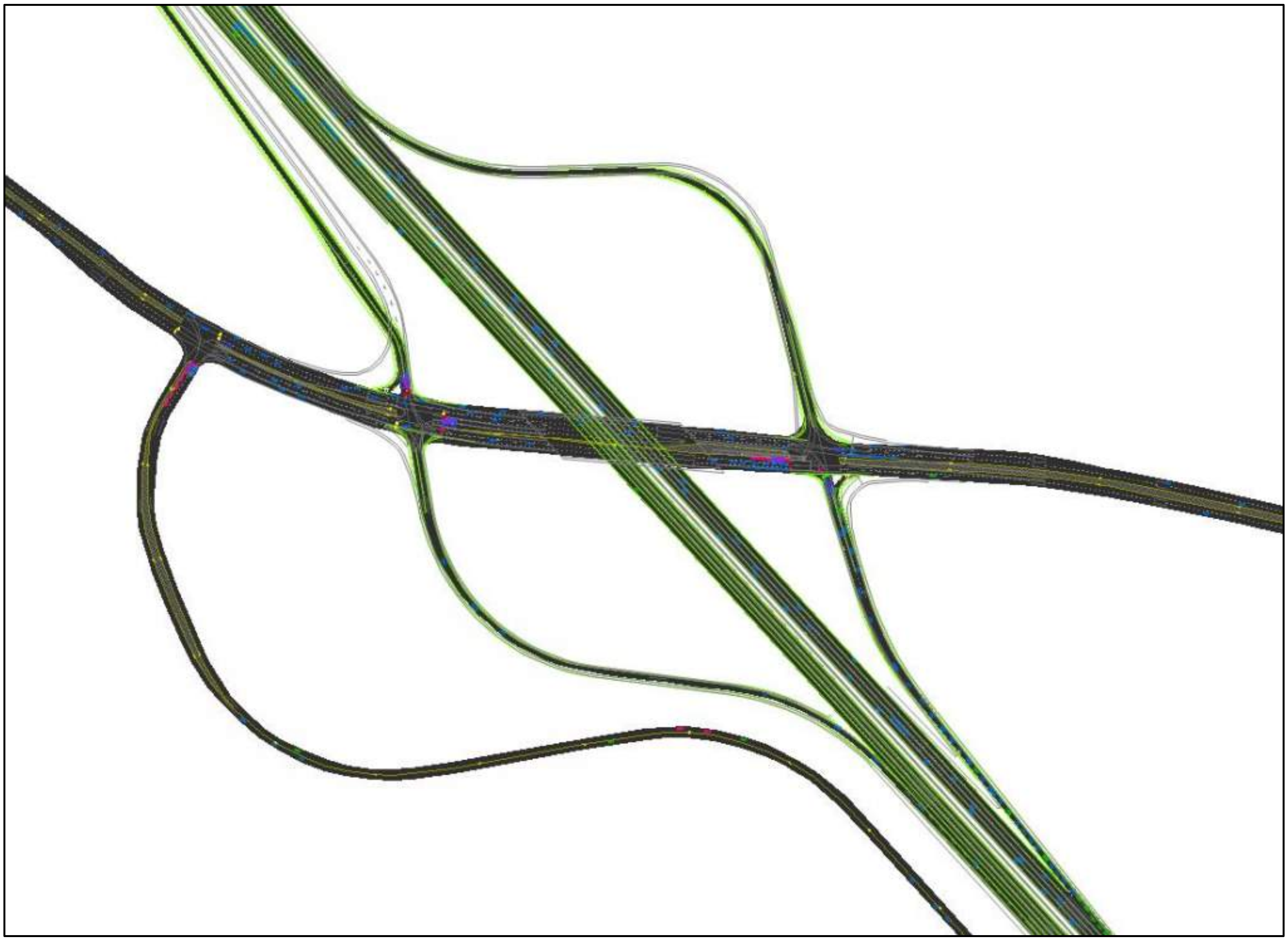


Figure 2 - Exit 101 (AO45) Simulation - PM Peak Hour



- Exit 102 (AO42) - No geometry changes made from original concept.
    - AM operations are good.
    - PM operations have queuing along the EB arterial, Ramp termini have good PM operations.
    - **See Figure 3 and 4**

Figure 3 - Exit 102 (AO42) Simulation - AM Peak Hour

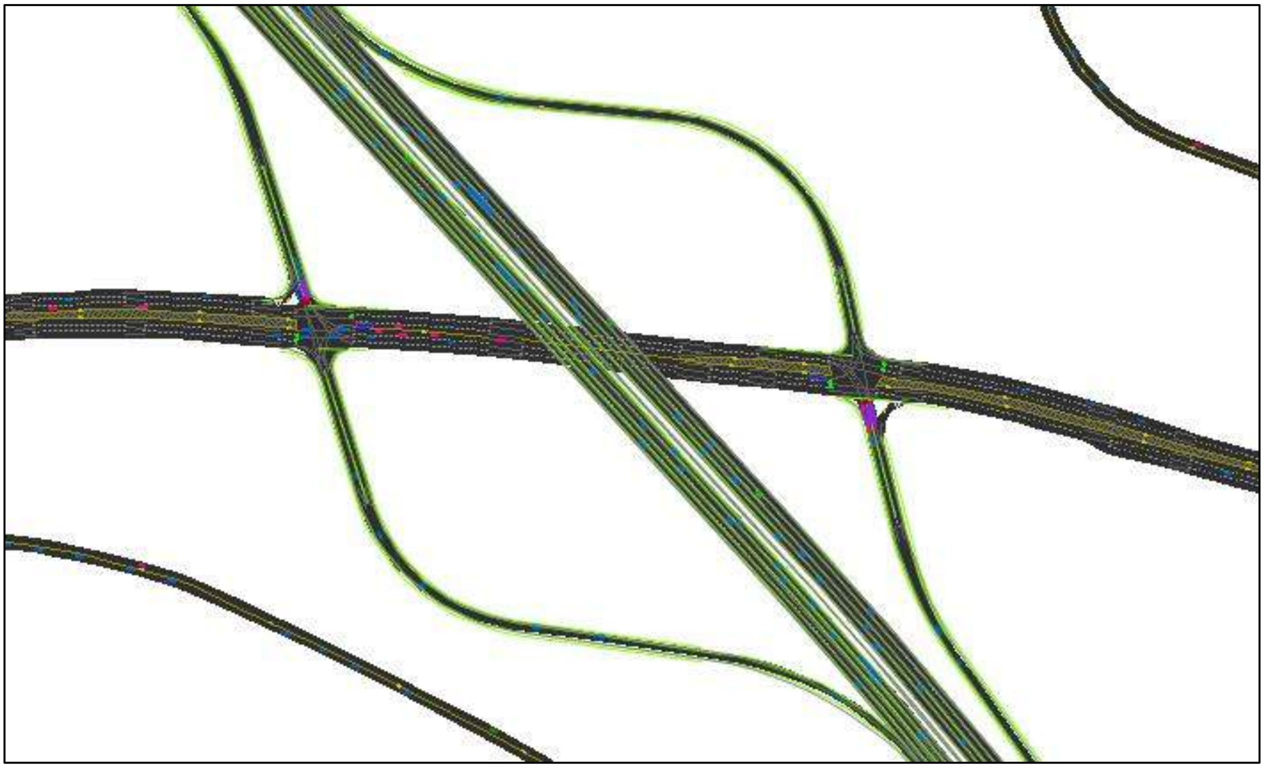
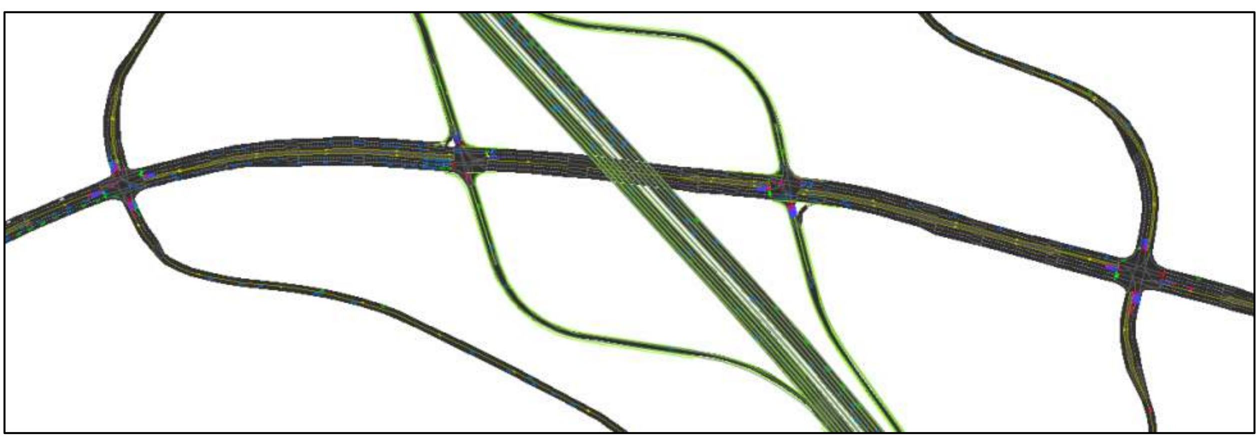


Figure 4 - Exit 102 (AO42) Simulation - PM Peak Hour



- Exit 103 (AO37) - No geometry changes made from the original concept.
    - AM operations show heavy queuing for the eastbound and westbound I-26 off ramps. Much of this queuing is stemming from congestion at Exit 106. The congestion at Exit 106 forces traffic to other routes such as Saturn Parkway and Park Terrace Drive (Exit 106 congestion will need to be fixed to get a truer look at the Exit 103 operations.
    - Significant queuing present along the WB arterial as well as the WB I-26 off-ramp in the PM peak hour.
    - Latest KMZ file shows slight ramp alignment adjustments but that should not impact the operations.
    - **See Figure 5 and 6**

Figure 5 - Exit 103 (AO37) Simulation - AM Peak Hour

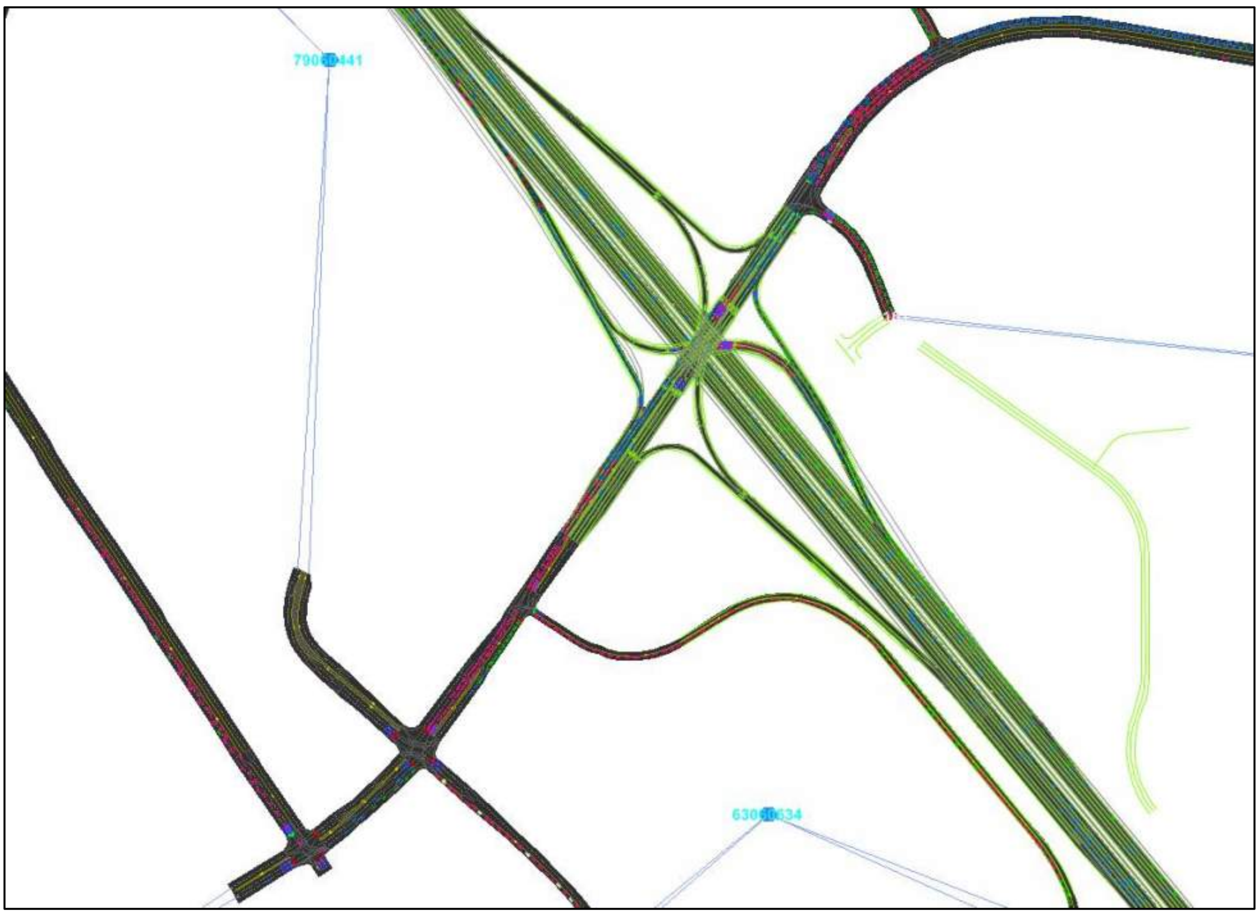
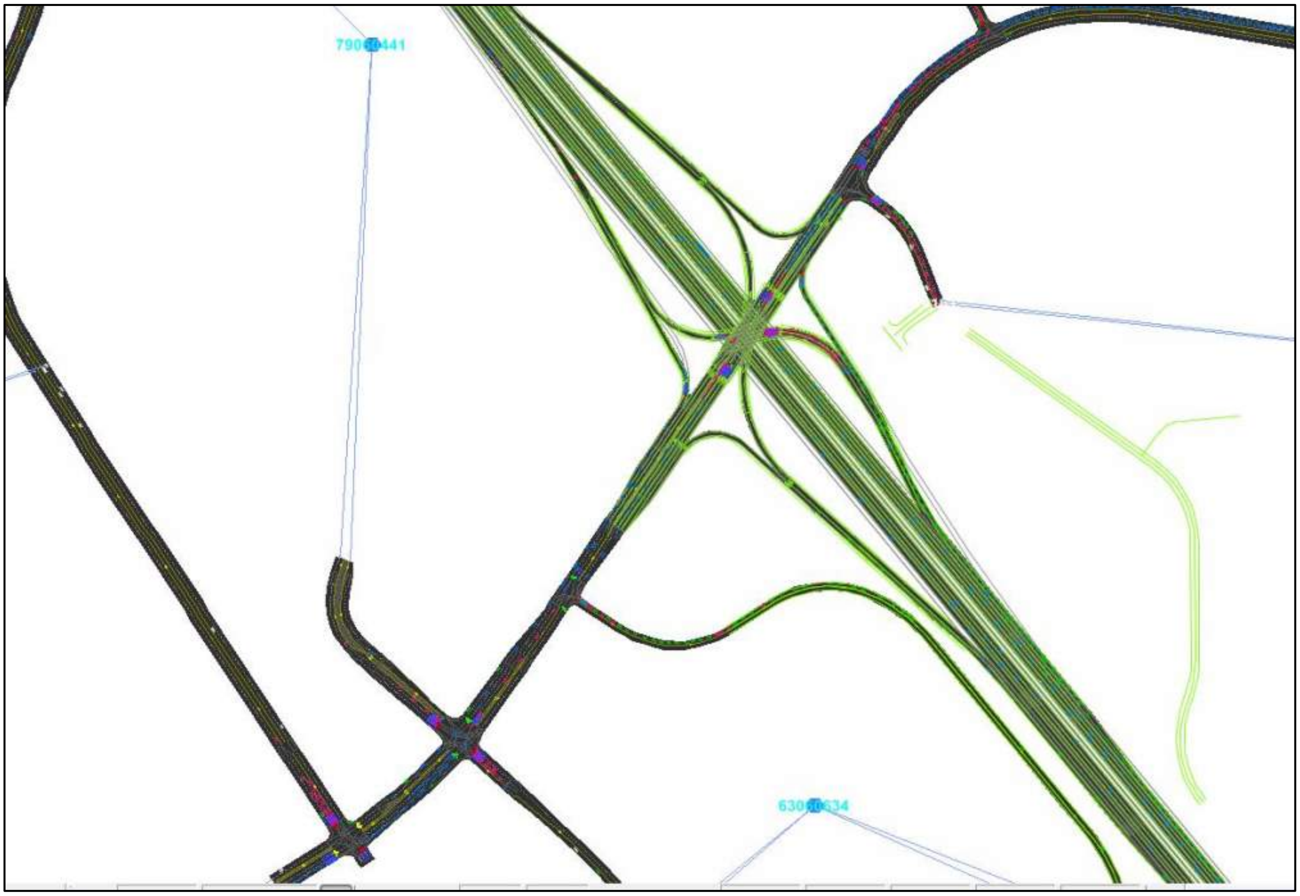


Figure 6 - Exit 103 (AO37) Simulation - PM Peak Hour



- Exit 104 (AO31) - No geometry changes made from the original concept.
    - AM operations show heavy queuing for the EB I-26 off ramp and all of the approaches to Jamil Road. The queuing results from congestion at Exit 106 causing traffic to seek other routes in the network. Exit 106 will need to be fixed in order to get a truer look at the Exit 104 operations. Otherwise the AM operations look good.
    - PM operations show significant queuing on the EB I-26 on-ramp which stems from congestion at the split at the CD road just before Exit 106.
    - Latest KMZ file shows slight alignment adjustments and longer left turn bays for the EB Piney Grove left turn at Fernandina Road but there should be no significant impact to operations with these changes.
    - **See Figure 7 and 8**

Figure 7 - Exit 104 (AO31) Simulation - AM Peak Hour

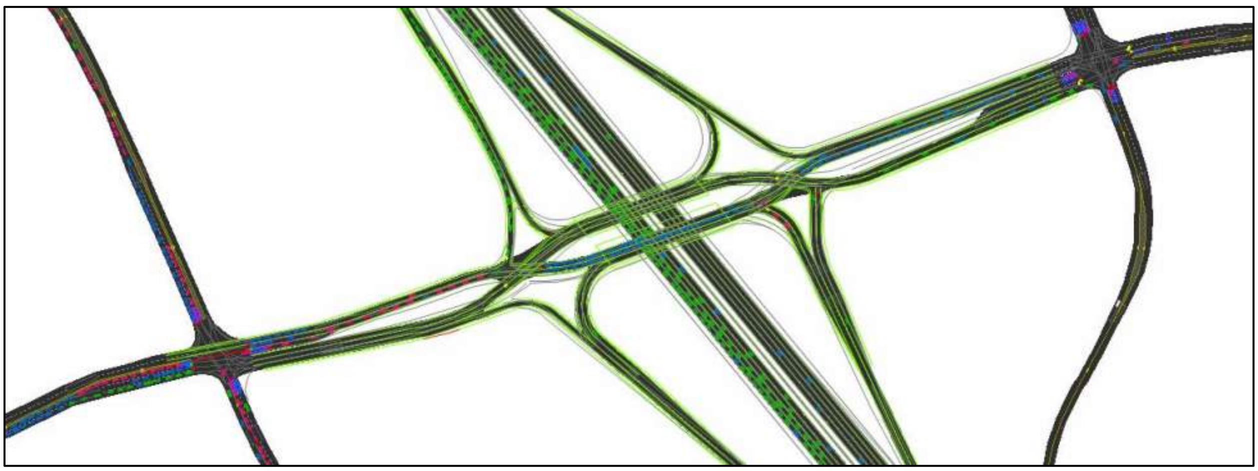
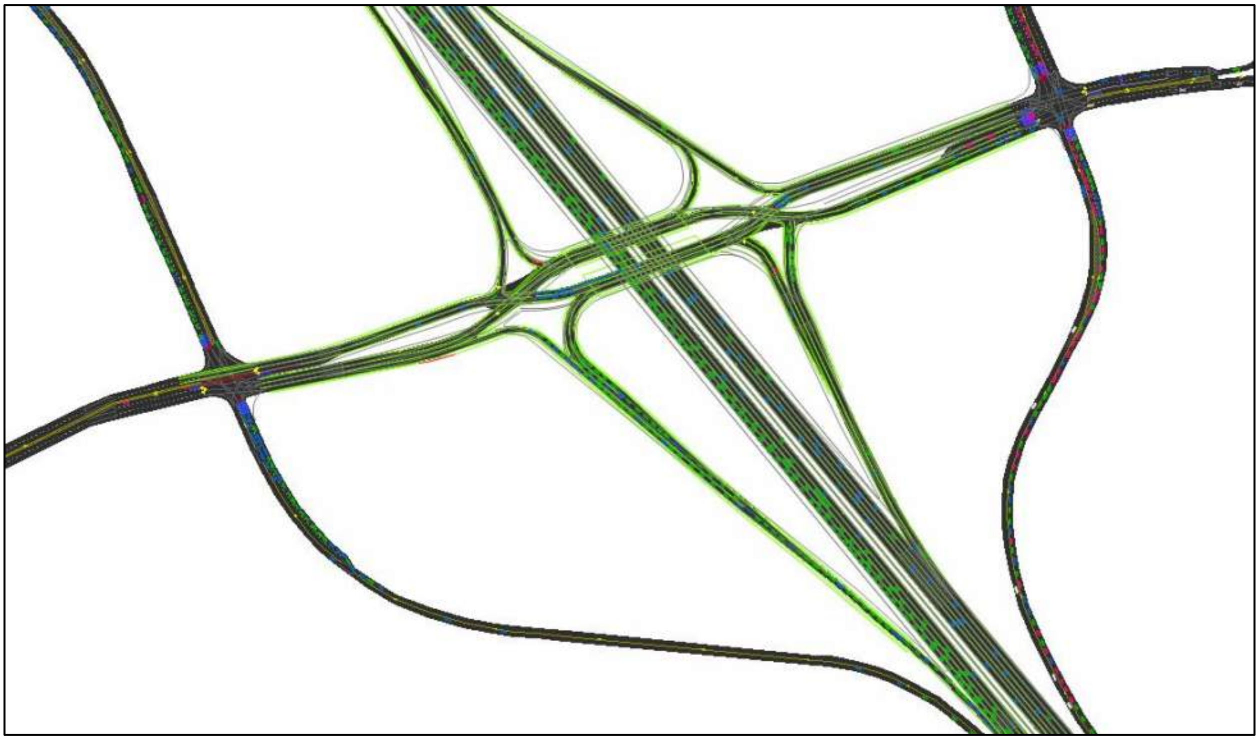


Figure 8 - Exit 104 (AO31) Simulation - PM Peak Hour



- Exit 106 (AO16)
    - Added second left turn lane to the WB I-26 off-ramp
    - Added unsignalized EB Right turn lane onto the EB I-26 on-ramp
    - Due to the closely spaced intersections with the DDI in the original design, the microsimulation had heavy arterial queuing which created gridlock in the system. In additionally there was heavy queuing along the EB CD road that runs parallel to EB I-26.
    - PM peak hour operations show issues with the WB I-26 off–ramp and WB St. Andrews Road operations. The proposed revised alignment shown in the revised KMZ file may provide improvements to the corridor operations and in turn the ramp operations.
    - The revised KMZ file may improve the operation of the arterial, which in turn should have a positive impact on the operation of the Exit 103 and 104 interchanges. This will be tested as the microsimulation network is revised to reflect the revised KMZ file.
    - **See Figure 9 and 10**

Figure 9 - Exit 106 (AO16) Simulation - AM Peak Hour

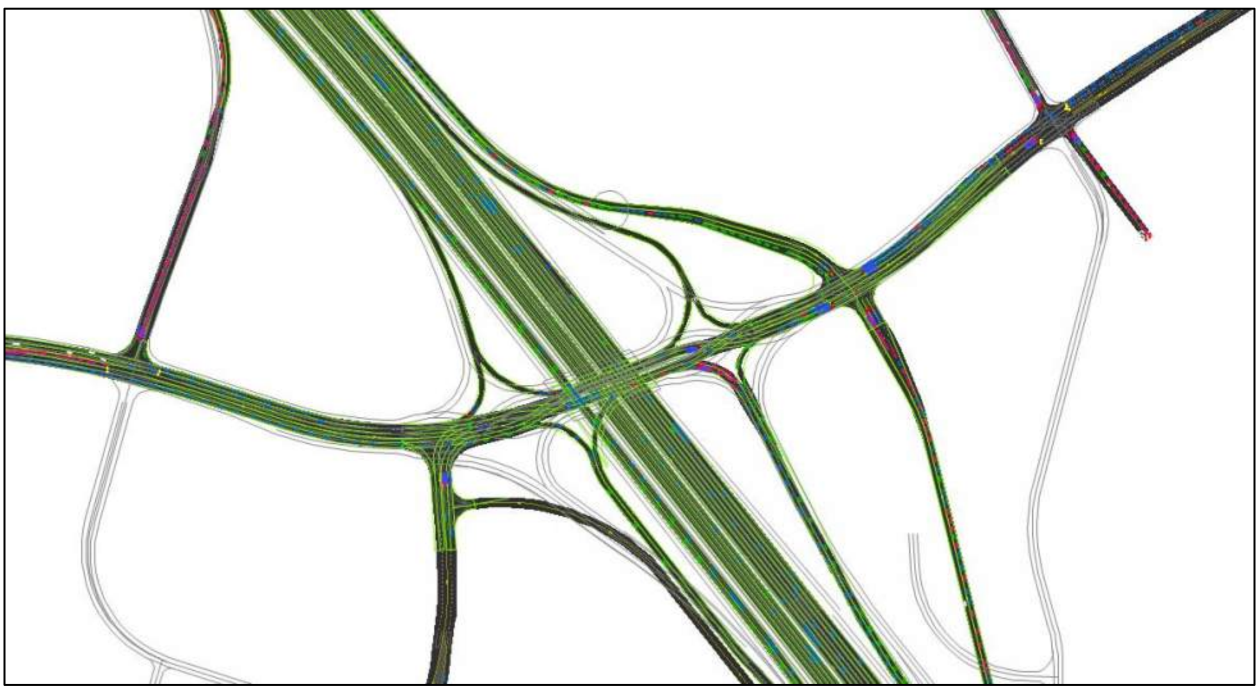


Figure 10 - Exit 106 (AO16) Simulation - PM Peak Hour

- Exit 107 (AO18)
    - Added an additional lane along the EB I-26 CD road from the on-ramp at Exit 106 to the split between I-126 and I-26 to deal with excessive queuing.
    - In the AM, the ramp from WB I-20 to EB I-26 is showing significant queuing due to the weaving area with the ramp from EB I-26 to I-126 and EB I-20 to EB I-26.
    - PM operations appear to be working well.
    - The revised KMZ file shows significant modifications to the ramp alignments and split locations. Revised runs will need to be completed to see if there are any additional capacity issues.
    - **See Figure 11 and 12**

Figure 11 - Exit 107 (AO18) Simulation - AM Peak Hour

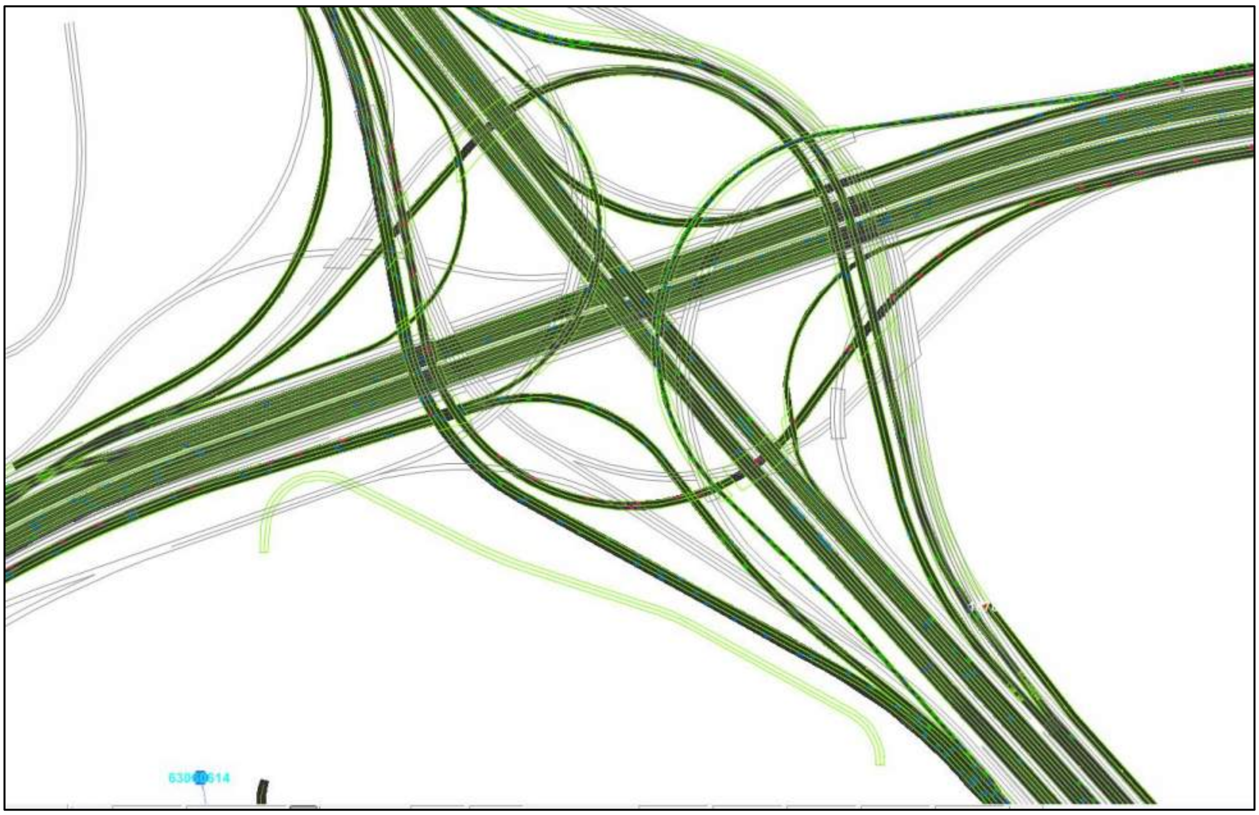
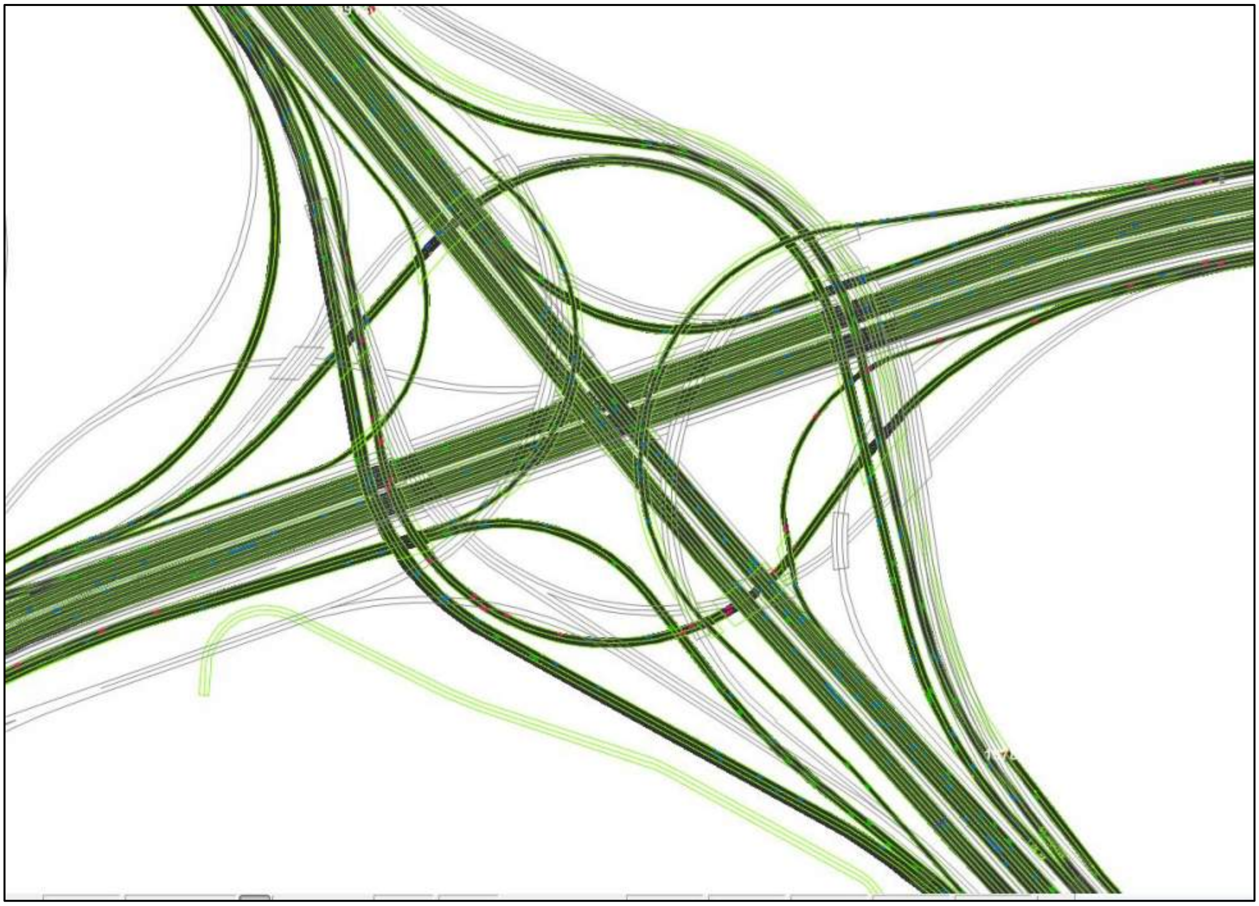


Figure 12 - Exit 107 (AO18) Simulation - PM Peak Hour



- Exit 108 (AO24)
    - No significant changes at this interchange other than ramp realignments between I-26 and I-126.
    - SB Morninghill Dr. changed to double left turn to accommodate heavy left turn volumes.
    - There is congestion in the AM on the mainline ramp from EB I-26 to EB I-126 from where it merges with the ramp from WB I-26 to EB I-126
    - **See Figure 13 and 14**

Figure 13 - Exit 108 (AO24) Simulation - AM Peak Hour

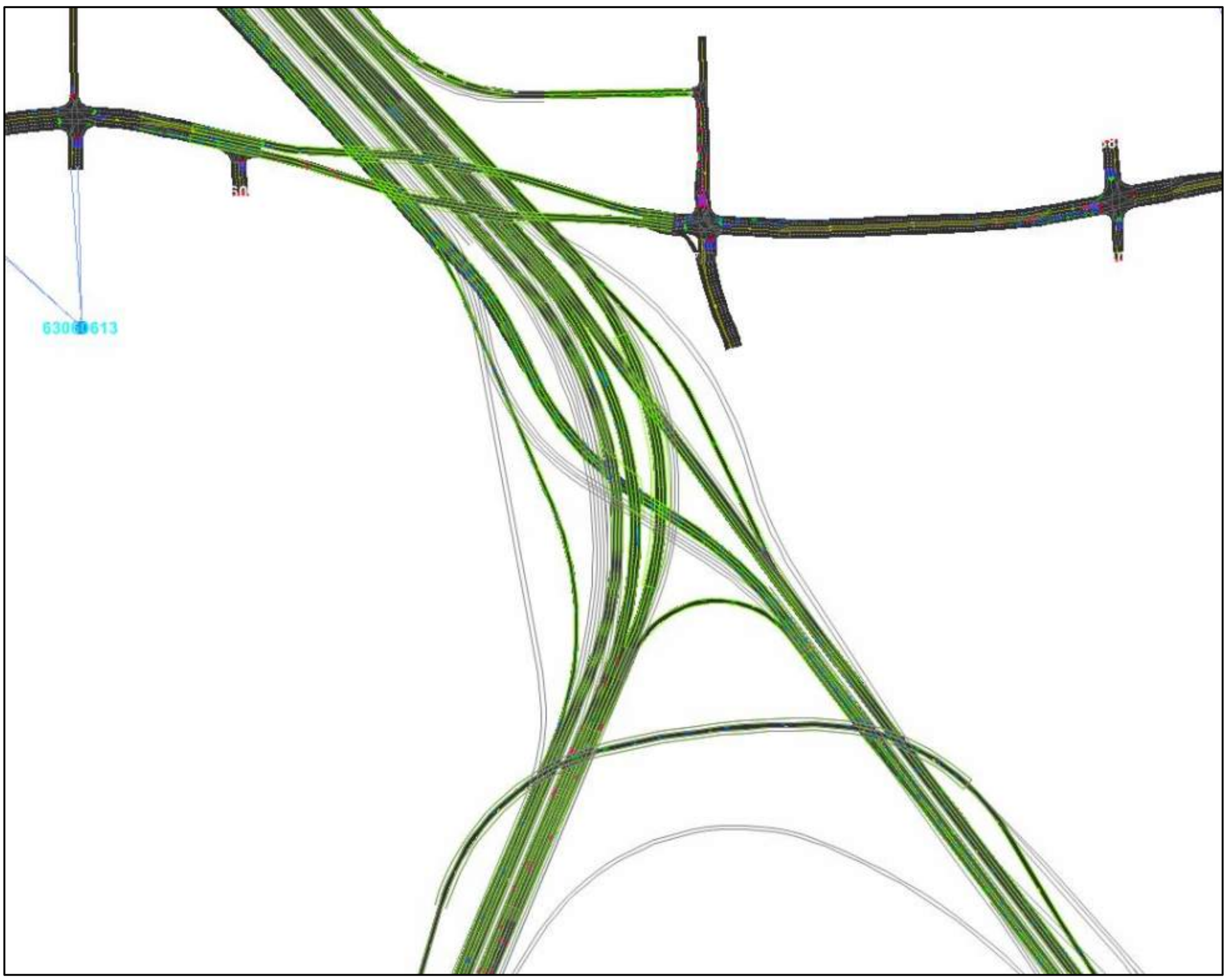
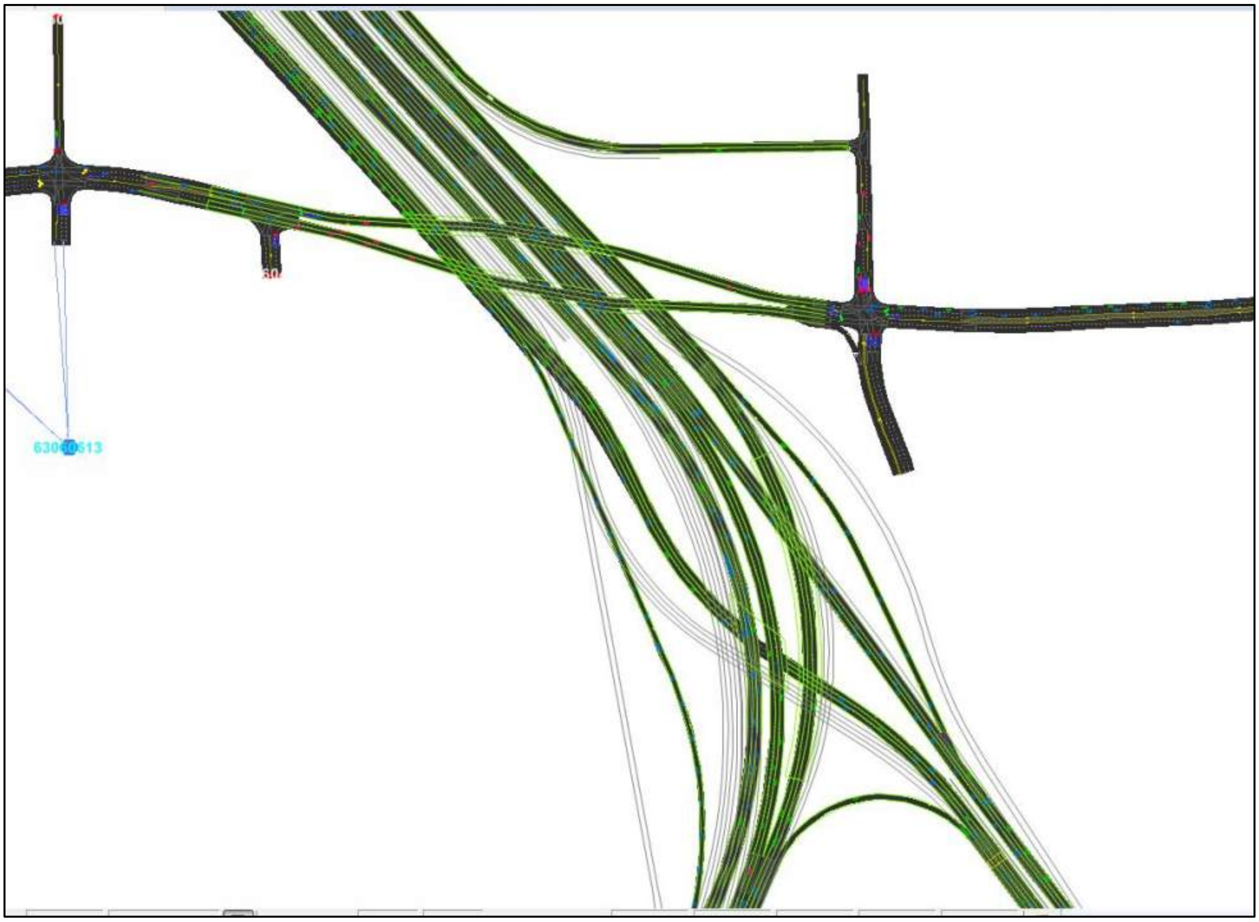


Figure 14 - Exit 108 (AO24) Simulation - PM Peak Hour



- Exit 110 (AO47)
    - No changes at this interchange
    - PM operations show significant queuing on the off-ramps which is stemming from the EB left turn onto McSwain Dr. additional investigation may be needed into why this volume is so high.
    - **See Figure 15 and 16**

Figure 15 - Exit 110 (AO47) Simulation - AM Peak Hour

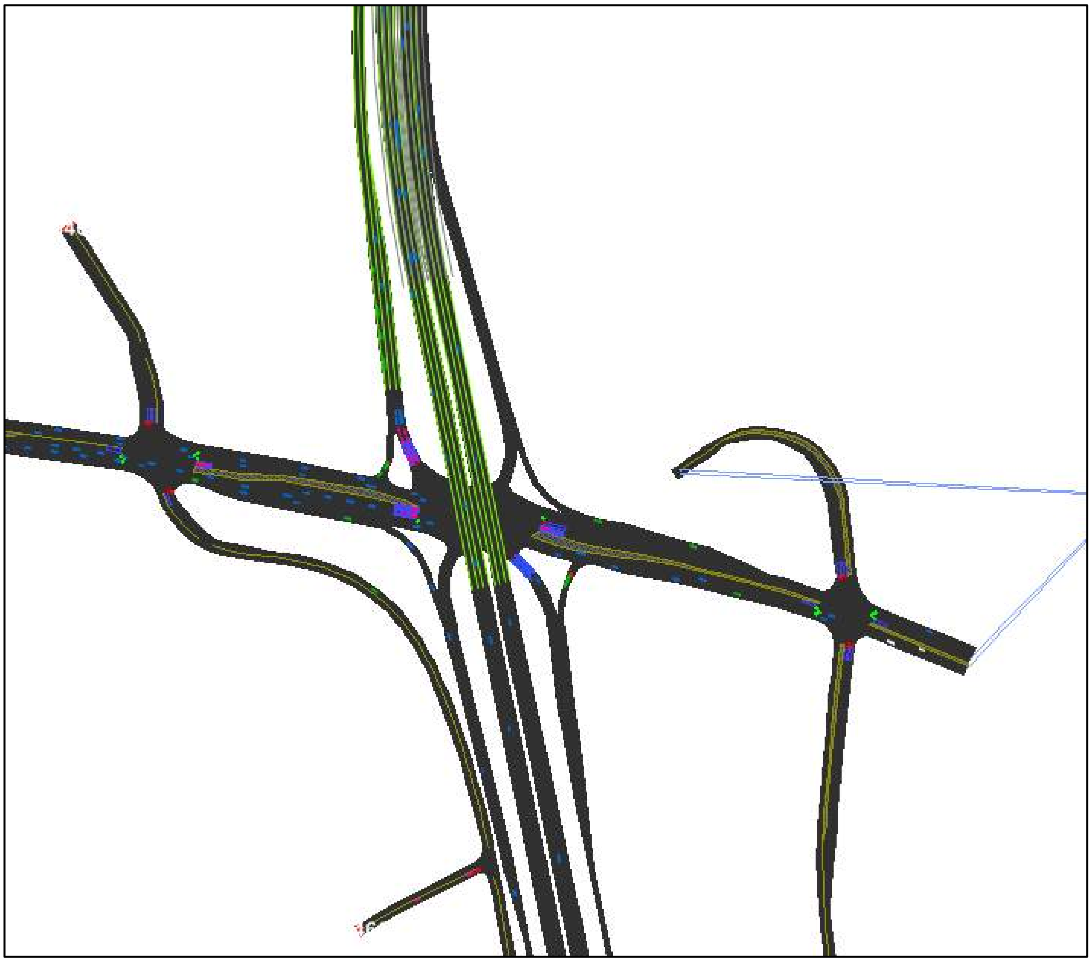
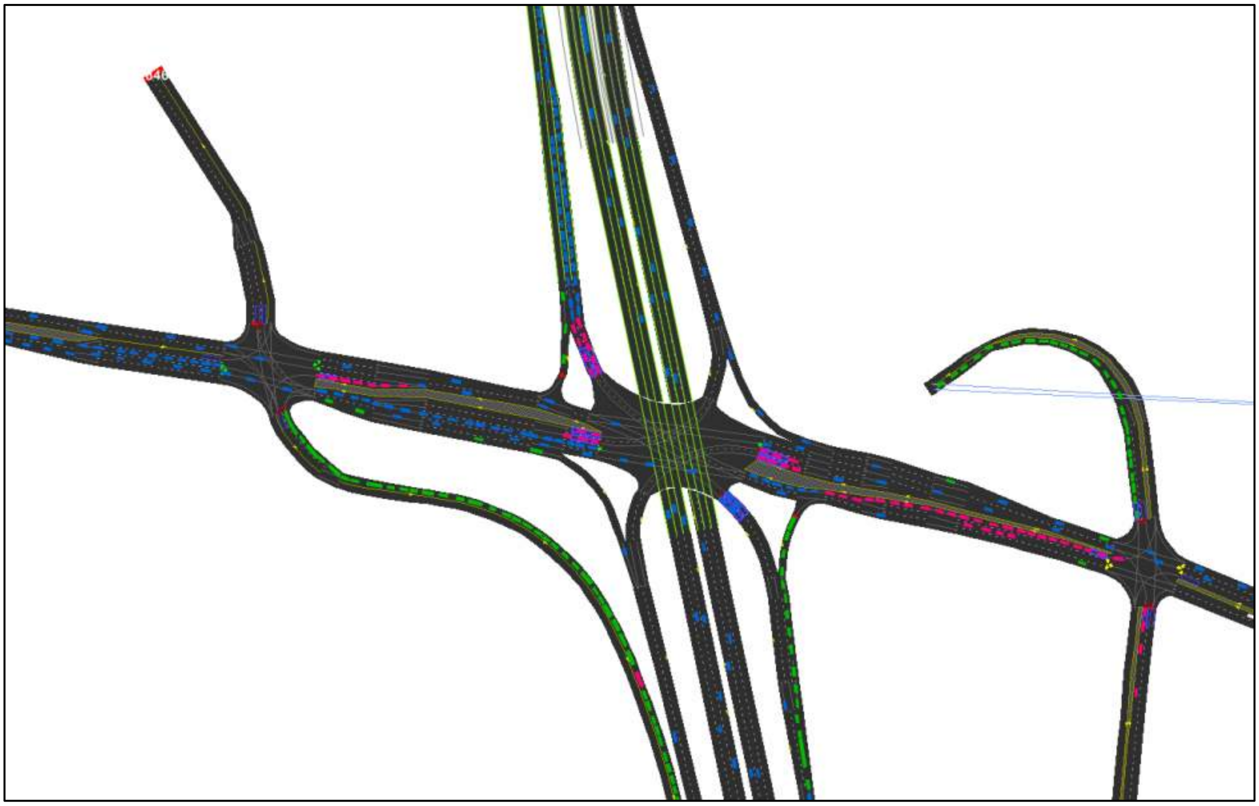


Figure 16 - Exit 110 (AO47) Simulation - PM Peak Hour



- I-126 at Colonial Life Blvd.
    - Existing interchange analyzed based on original KMZ file.
    - No operational issues were noted in the original analysis except that additional control was needed at the Greystone Blvd interchange to account for vehicles U-turning at the Greystone Blvd interchange to get back to Colonial Life Blvd. This should be resolved by modifying the microsimulation model to include the EB off-ramp to Colonial Life Blvd to match the new KMZ file.
    - PM operations show queuing along WB I-126 stemming from the Exit 108 interchange
    - New KMZ show significant changes to the interchange and will need to be reanalyzed.
    - **See Figure 17 and 18**

Figure 17 - I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

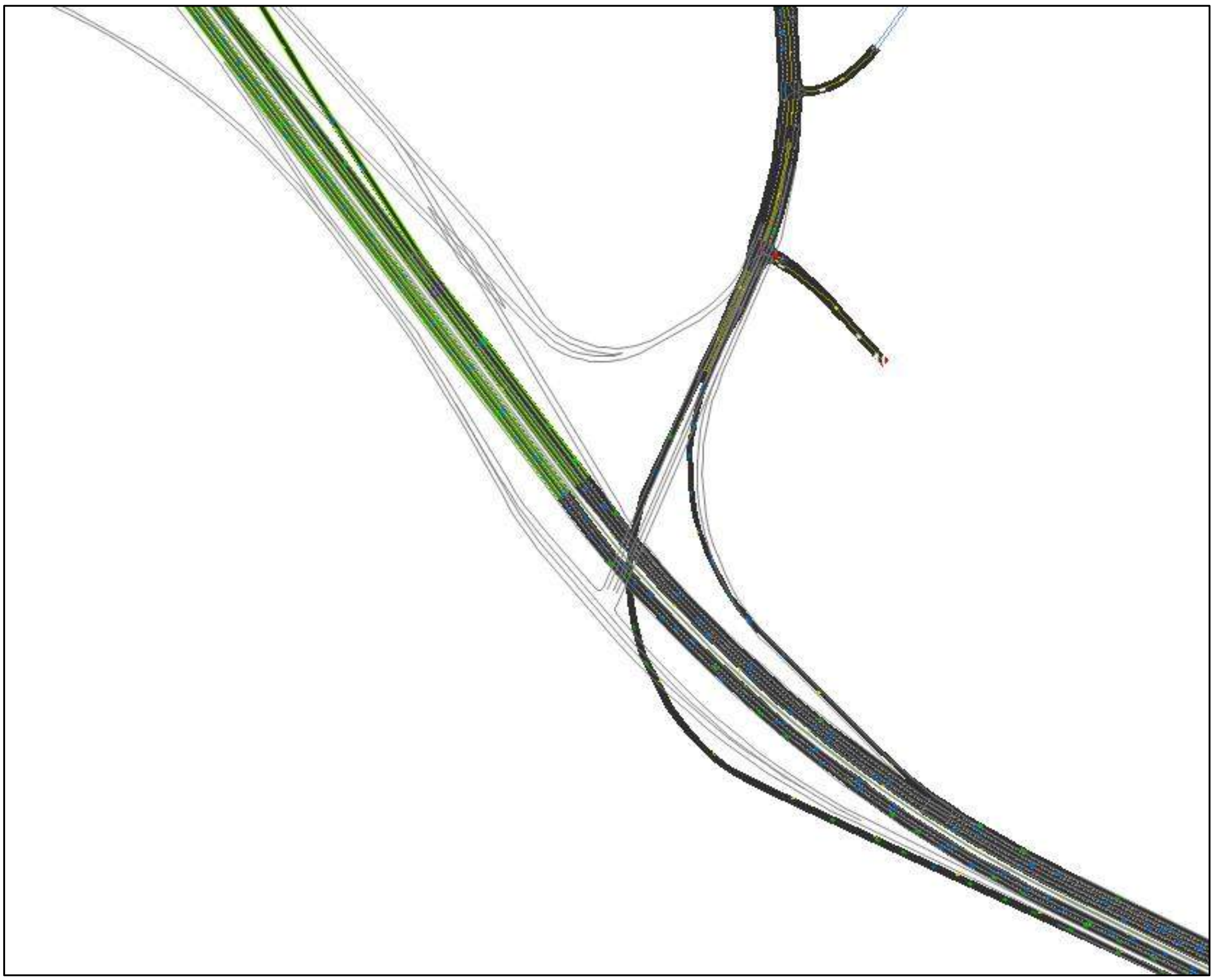
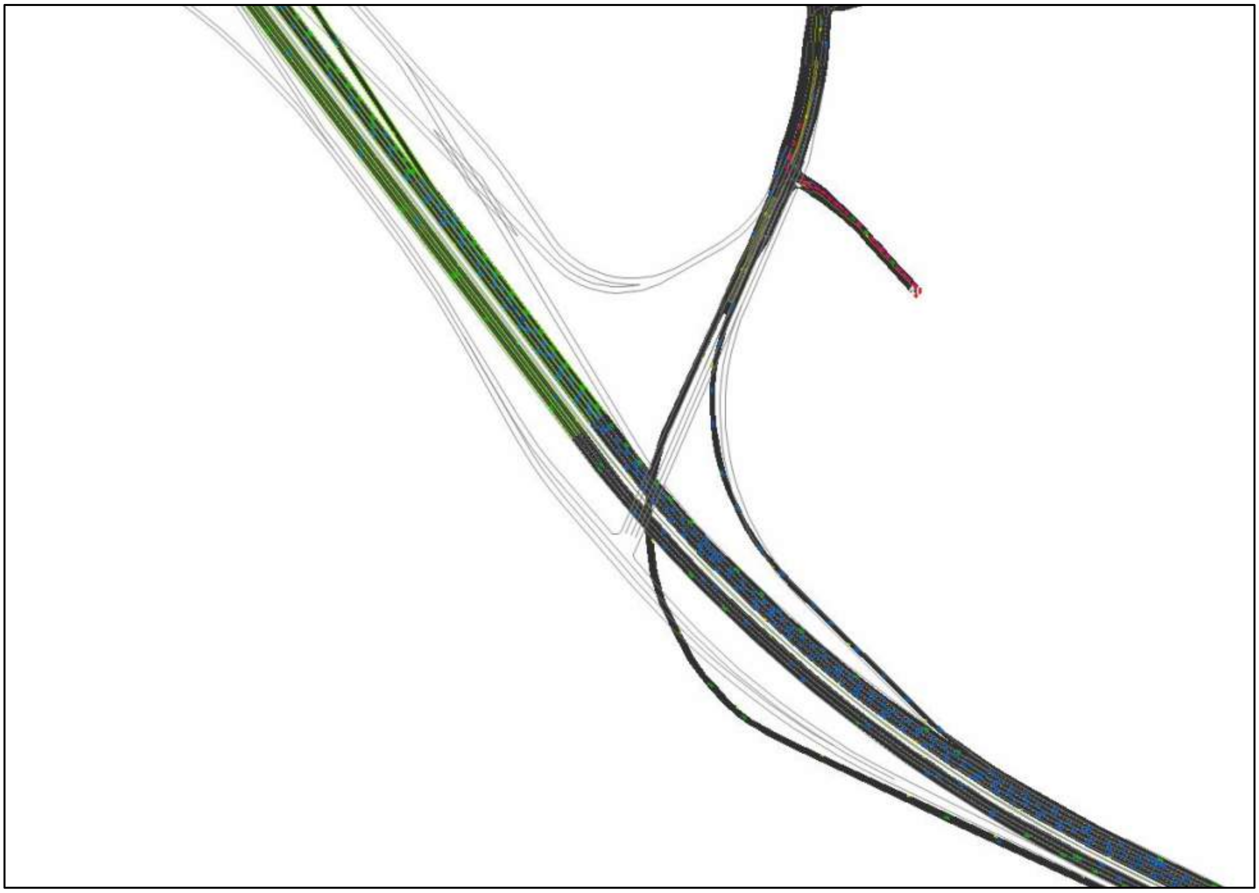


Figure 18 - I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO10)
  - No geometric changes made to this interchange.
  - Revised KMZ file shows significant changes to the ramp alignments and lane usages which will need to be reflected revisions to the microsimulation network.
  - No operation issues noted in the original design for the AM peak period other than queuing along Berryhill Road. Need to clarify how the frontage signal road ties in with the SPUI signal.
  - PM operations show significant queuing along Berryhill Road as well as the EB I-20 off-ramp. Revised KMZ geometry may allow for better signal timing which could resolve the off-ramp queuing issues but further analysis will be needed.
  - **See Figure 19 and 20**

Figure 19 - Exit 63 (AO10) Simulation - AM Peak Hour

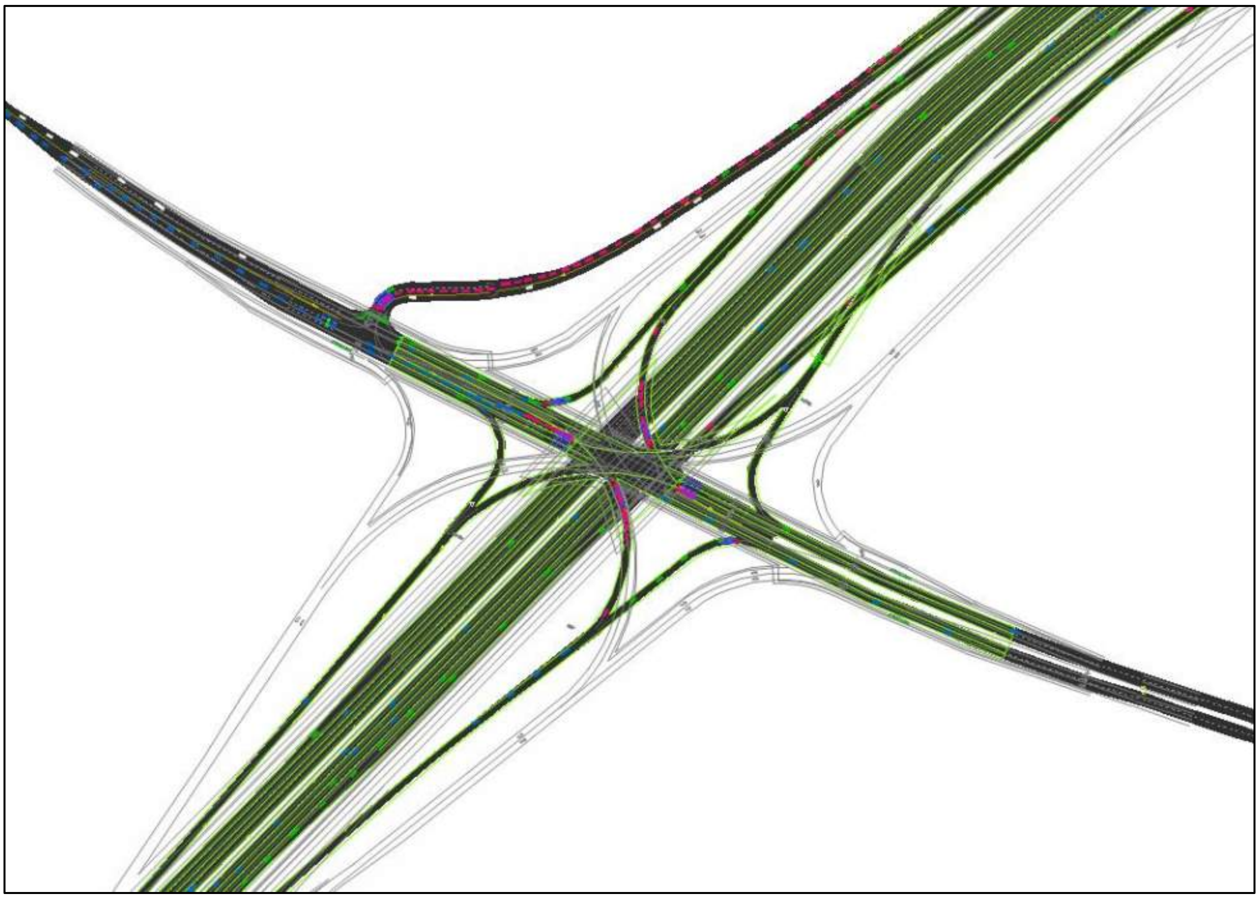
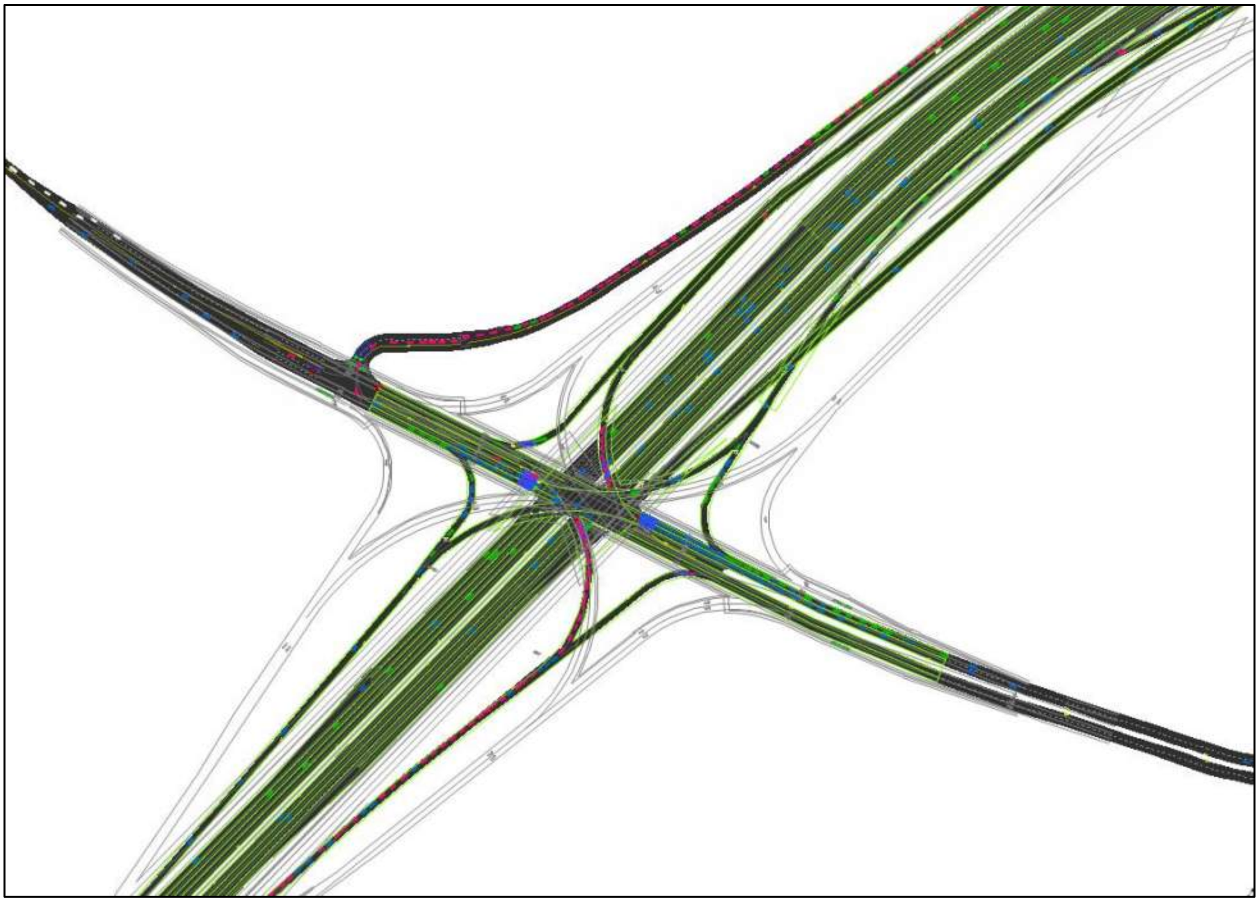


Figure 20 - Exit 63 (AO10) Simulation - PM Peak Hour



- Exit 65 (AO5)
    - Double left turn added to SB Broad River Road, however, significant queuing is still present along SB Broad River upstream from this interchange during the AM peak hour.
    - Revised KMZ file shows revised ramp alignments that will need to be re-run in the microsimulation model.
    - PM operations show significant queuing in the NB direction of Broad River Road which is impacting the EB I-20 off-ramp. Additional signal timing adjustments may improve this queuing.
    - **See Figure 21 and 22**

Figure 21 - Exit 65 (AO5) Simulation - AM Peak Hour

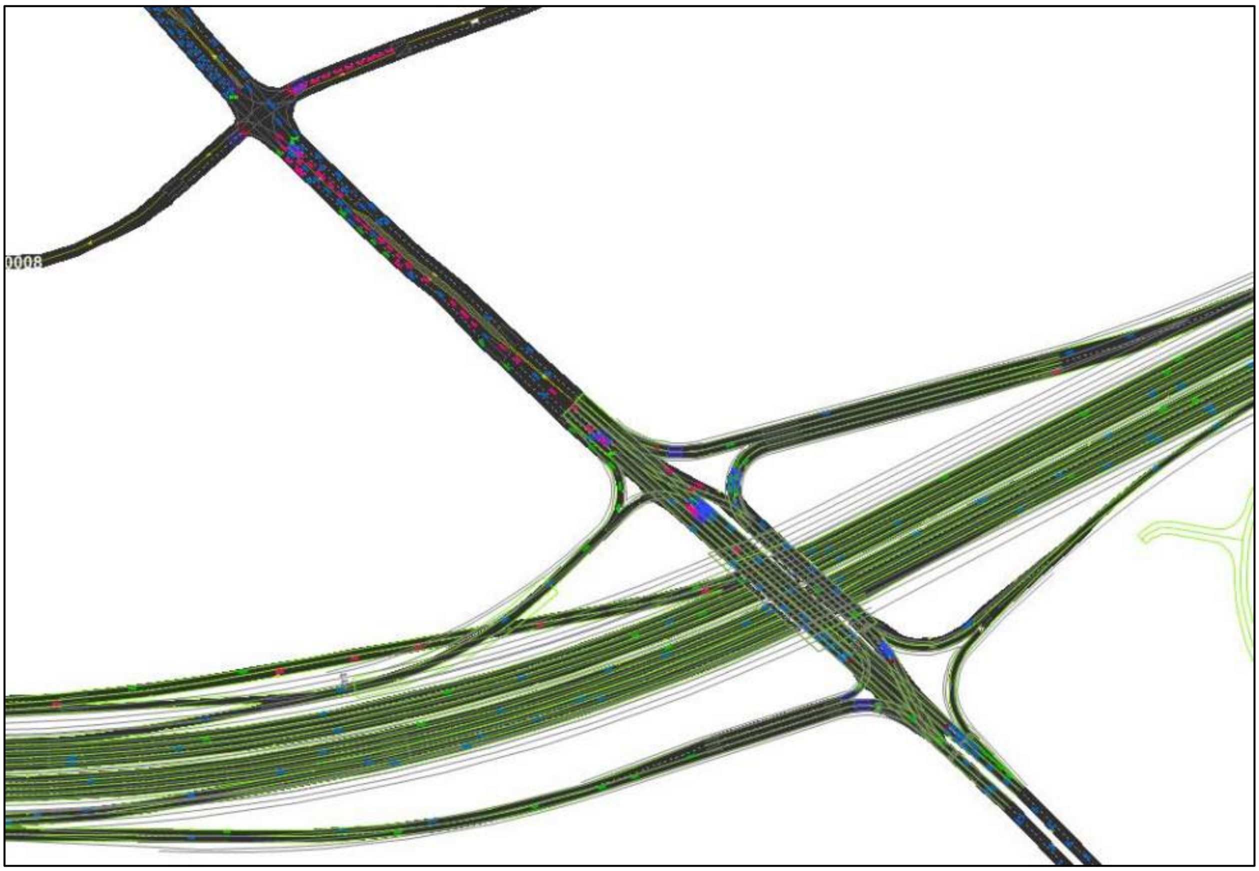
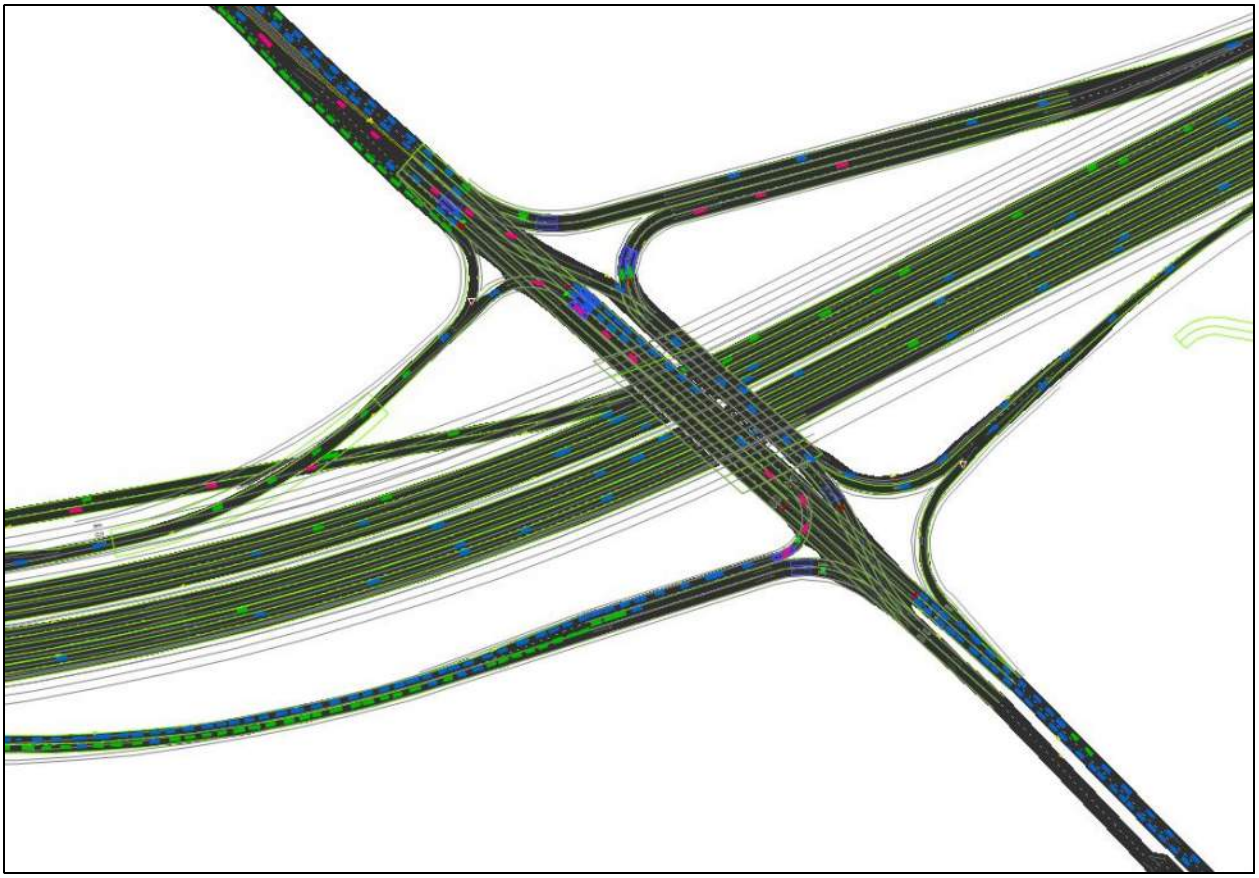
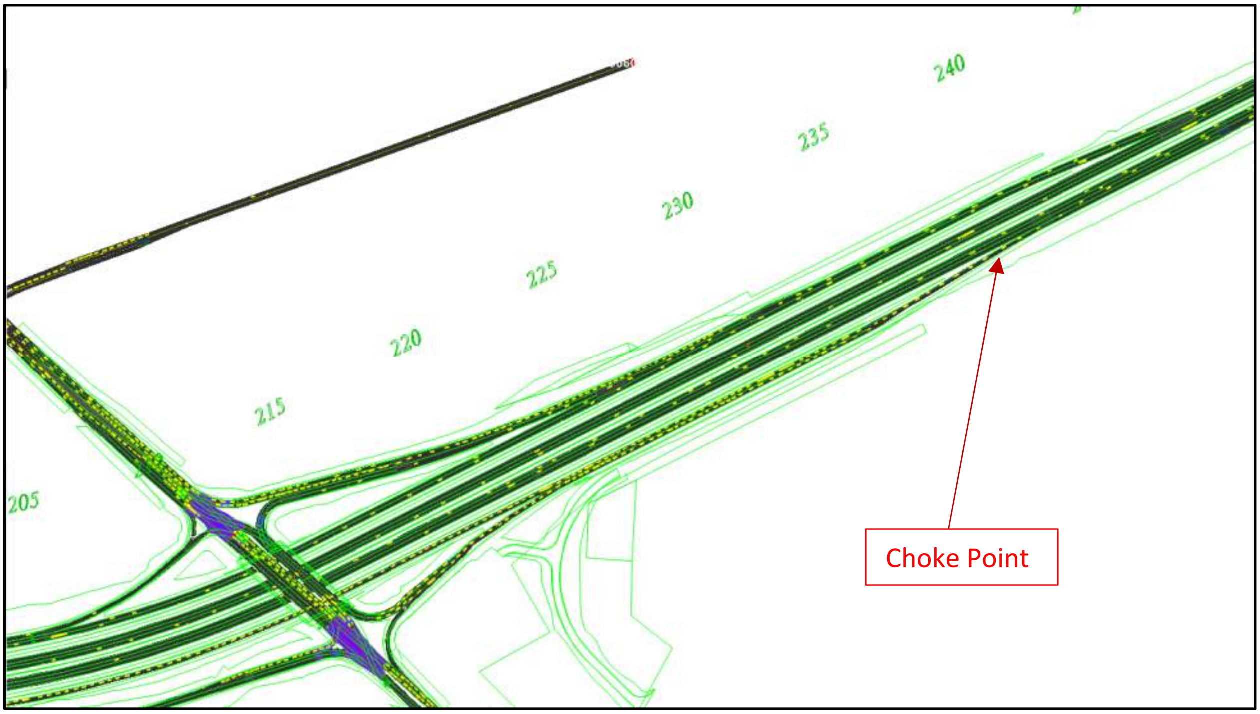


Figure 22 - Exit 65 (AO5) Simulation - PM Peak Hour

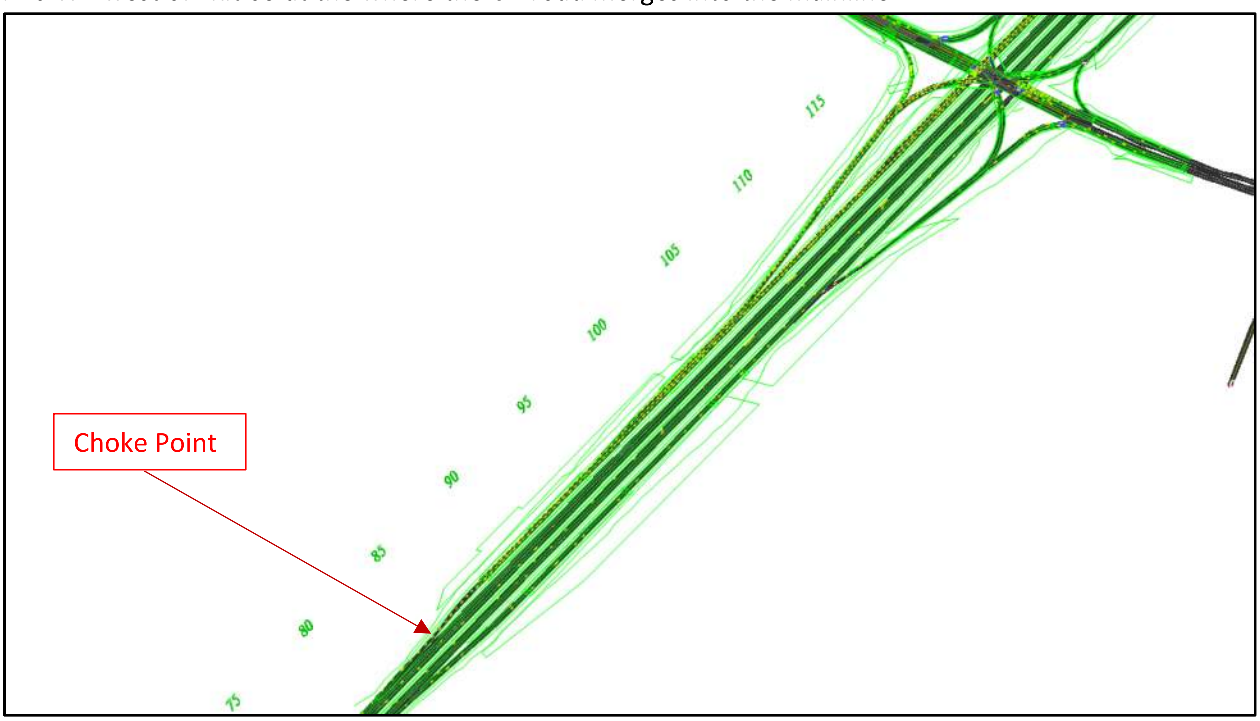


RA2 Specific Choke Points:

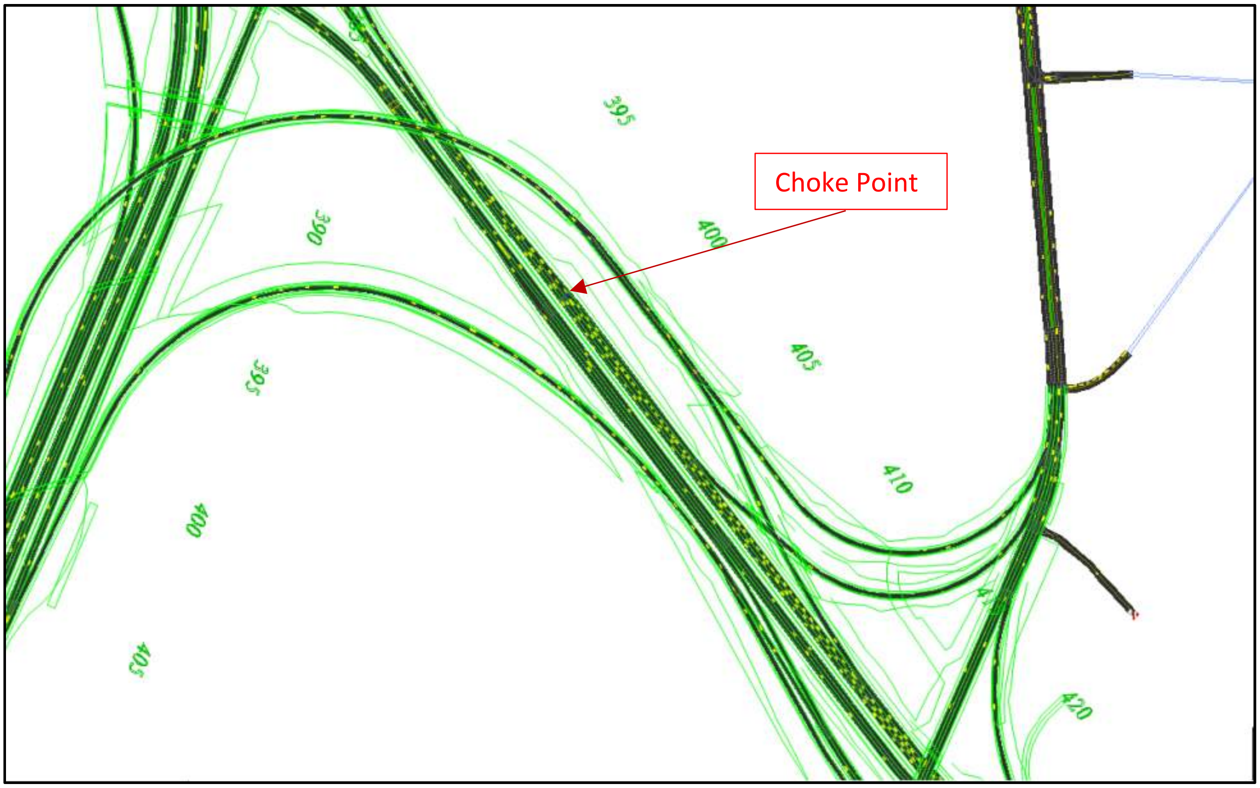
1. I-20 EB east of Exit 65 at the where the CD road merges into the mainline



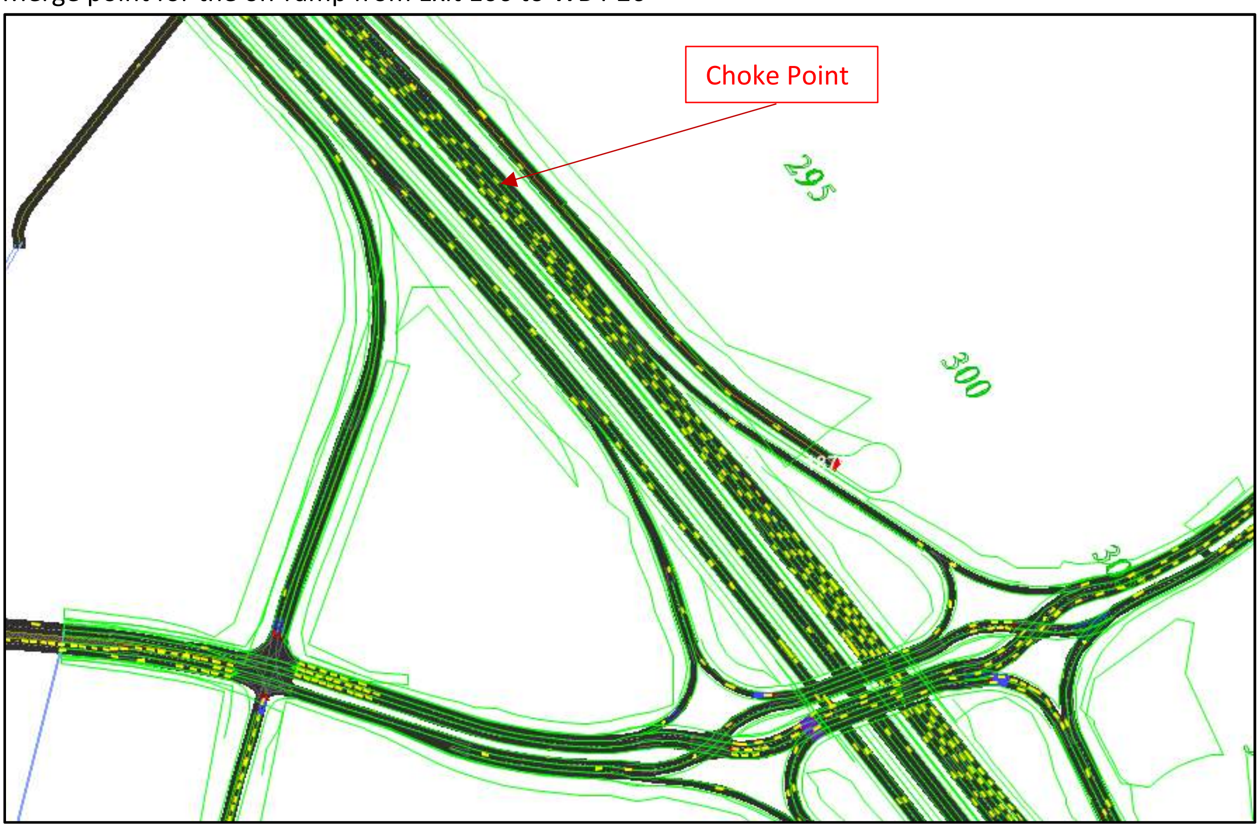
2. I-20 WB west of Exit 63 at the where the CD road merges into the mainline



3. Merge Point for on-ramp from Colonial Life Blvd to I-126 WB



4. Merge point for the on-ramp from Exit 106 to WB I-26



5. Weaving area at merge point between Exit 106 EB on-ramp and the CD road for EB I-26

Reasonable Alternative 3 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	Under	
Exit 103-104	Under	Under	Under	Under	
Exit 104-106	Over	Under	At	At	Heavy volume on the EB C-D road that exits to the I-20 WB/EB ramps during both peak hours. C-D road narrows from two lanes to one lane prior to merge with Exit 106 on-ramp volume. Maintaining two lanes may alleviate heavy queuing. Heavy PM queuing at WB on-ramp merge from Exit 106. However, flow is steady after exit on-ramp merge.
Exit 106-107	Over	Under	Under	At	Heavy queuing at the I-26 EB/I-126 EB split. Only two lanes are dedicated to I-126 resulting in major queue back up to Exit 104. Prior to I-26 EB/I-126 split, the Exit 106 EB on-ramp merges onto I-26, resulting in major weaving at the same location. Additional capacity may be required to improve traffic flow.
Exit 107-108	Under	Under	Under	Under	
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	At	Under	Under	Over	Heavy AM volume along I-126 EB after the traffic from the on-ramp from I-20 merge causes slower traffic flow. Heavy volume along I-126 WB prior merges from four lanes to two lanes prior to merge with I-26 WB, causing queuing back to Greystone Boulevard.
Exit 63-64	Under	Under	Under	Under	
Exit 64-65	Under	Under	Under	Under	

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	AO43	At	At	Under	At	During the AM peak hour, the eastbound on-ramp and the westbound off-ramp experience heavy delay. Although traffic signal timing modifications may alleviate queuing, an additional lane on the eastbound on ramp (similar to existing) and a second left turn lane on the westbound off ramp may be necessary.
Exit 102	Par.Clo.	Under	Under	Under	Under	
Exit 103	AO49	Under	At	Under	Over	During the PM peak hour, traffic exiting on the westbound off-ramp queues off the ramp and back to the mainline.
Exit 104	AO32	Under	At	Under	Under	During the AM peak hour, the westbound off-ramp queuing results from heavy queuing along the arterial.
Exit 106	AO16	Under	At	Under	Over	During both the AM and PM peak hours the westbound off-ramps intersection dual right turns experience major queuing while maneuvering to the far left lane on St. Andrews Road to access Fernandina Road. This closely spaced intersection of St. Andrews Road at Fernandina Road adds additional delay to the operation at both the westbound ramps and the intersection. Traffic signal timing modifications may improve queuing along the arterial and ramp.

Interchanges – continued

Exit		AM		PM		Comment
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	
Exit 107/Exit 64	AO21	Over	Under	Under	Under	Heavy queuing at the I-26 EB/I-126 EB split during the AM peak hour. Only two lanes are dedicated to I-126 resulting in major queue back up to Exit 104. Heavy AM volume along I-126 EB after the traffic from the on-ramp from I-20 merge causes slower traffic flow. Additional capacity may be required to improve traffic flow. In addition, there is moderate queuing on the I-20 EB C-D road to I-26 EB.
Exit 108 – I-126	AO26	Under	Under	At	Over	Heavy volume along I-126 WB prior to I-26 WB merge during the PM peak hour. Four lanes drop to two lanes prior to merge with I-26 WB causing queuing back to Greystone Boulevard. I-26 EB off-ramp to Bush River Road operates at capacity with stop-control at ramp-termini. The installation of a signal and/or additional capacity may alleviate queuing on ramp.
Exit 110	AO46	Over	At	Under	At	Arterial experiences heavy traffic and turning queues causing backups on the eastbound off-ramps during the AM peak hour and the westbound off-ramps during the PM peak hour. Further adjustments may be made to signals on US 378 to improve arterial operations.
Colonial Life	AO21	Under	Under	Under	Under	Heavy volume along I-126 WB prior to I-26 merge during the PM peak hour. Four lanes drop to two lanes prior to merge with I-26 WB.
Exit 63	AO6	Under	Under	Under	Under	
Exit 65	AO5	Under	Under	Under	Over	The westbound off-ramp is overcapacity during the PM peak hour, which results in queue spillback into the I-20 westbound mainline.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations.

- Exit 101 (AO43)
  - AM Peak Hour – See **Figure 1** – interchange operates at capacity. The eastbound on-ramp and the westbound off-ramp experience heavy delay. Although traffic signal timing modifications may alleviate queuing, an additional lane on the eastbound on ramp where the eastbound right turn and westbound left turn traffic meets (similar to existing conditions) and a second left turn lane on the westbound off-ramp may be necessary.
  - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (AO43) Simulation - AM Peak Hour

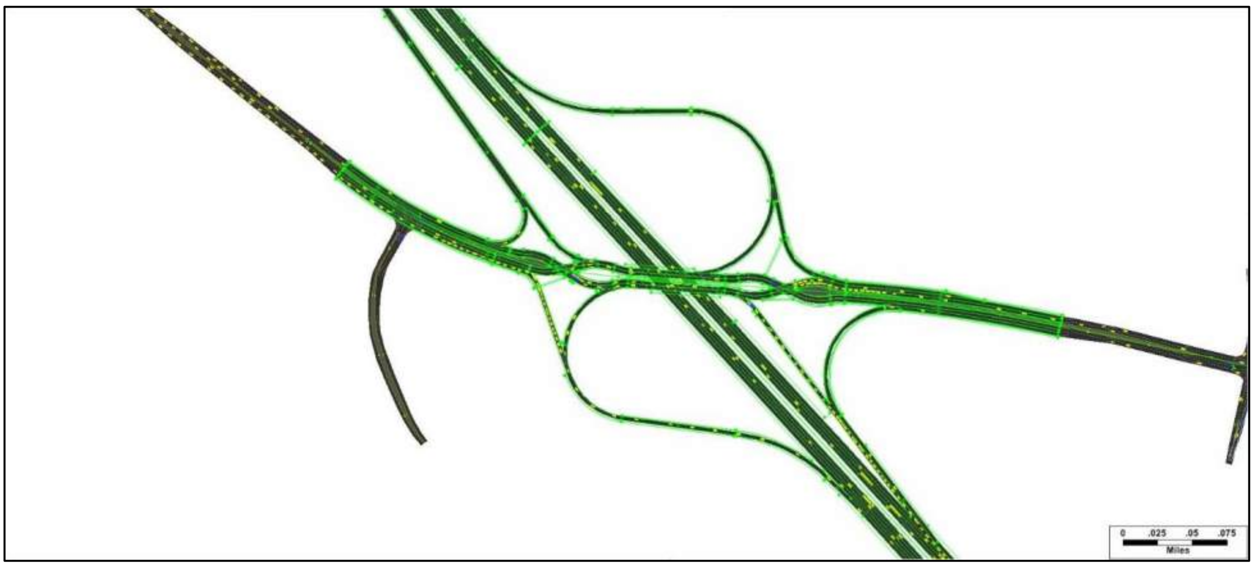
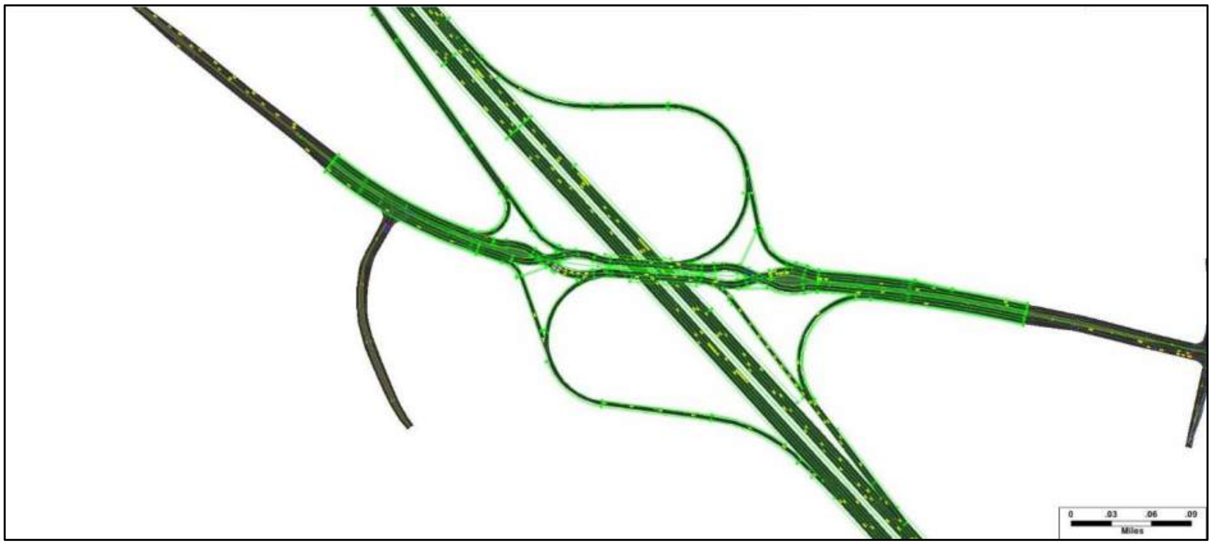


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo)
    - AM Peak Hour – See **Figure 3** – interchange operates under capacity
    - PM Peak Hour – See **Figure 4** – interchange operates under capacity

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

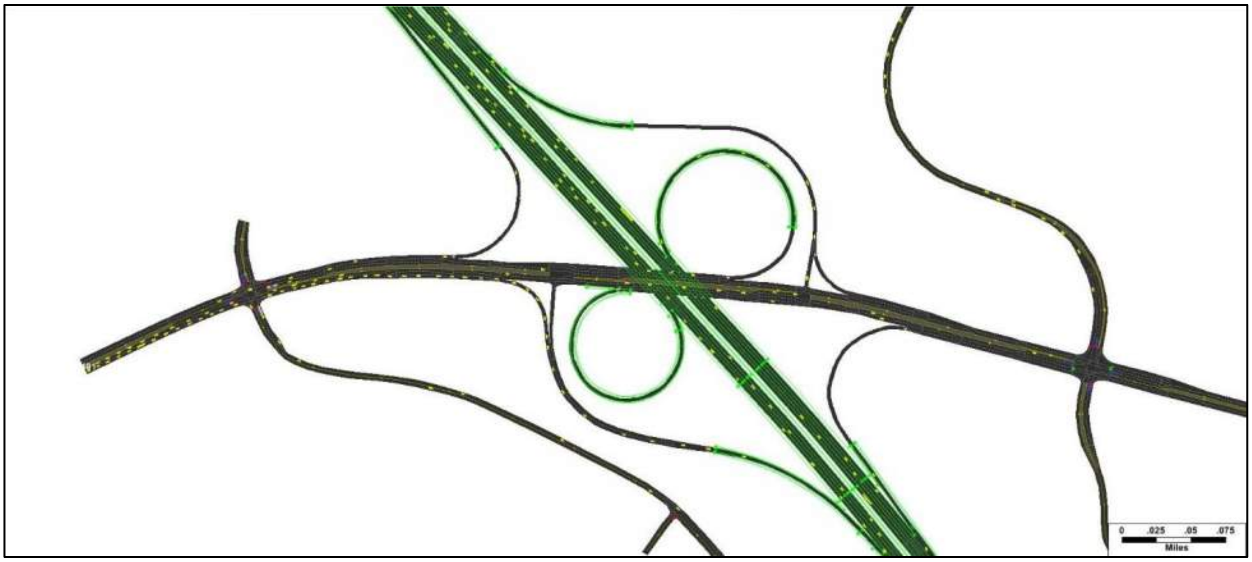
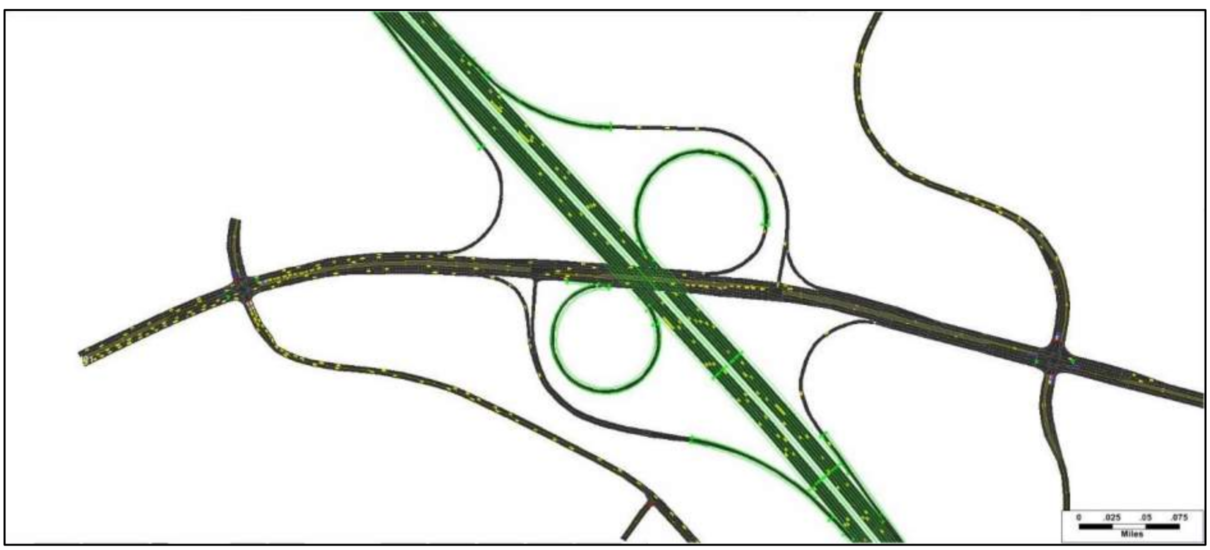


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO49)
    - AM Peak Hour – See **Figure 5** – interchange operates at capacity. The westbound off ramp intersection experiences heavy queuing for the westbound left turn movement from Woodcross Drive onto Harbison Boulevard. Traffic signal timing modifications may alleviate delay and queuing.
    - PM Peak Hour – See **Figure 6** – interchange operates over capacity. The westbound off-ramp volume queues back into the mainline and the northbound left turn onto I-26 WB operates heavily queues on the mainline. Traffic signal timing modifications may alleviate delay and queuing.

Figure 5 - Exit 103 (AO49) Simulation - AM Peak Hour

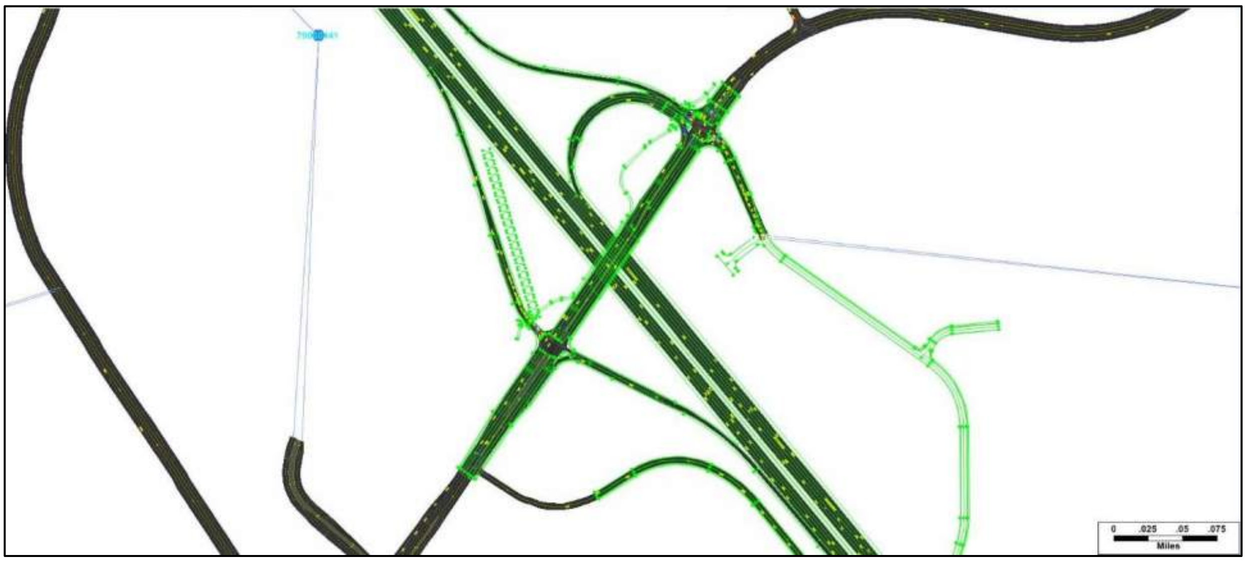
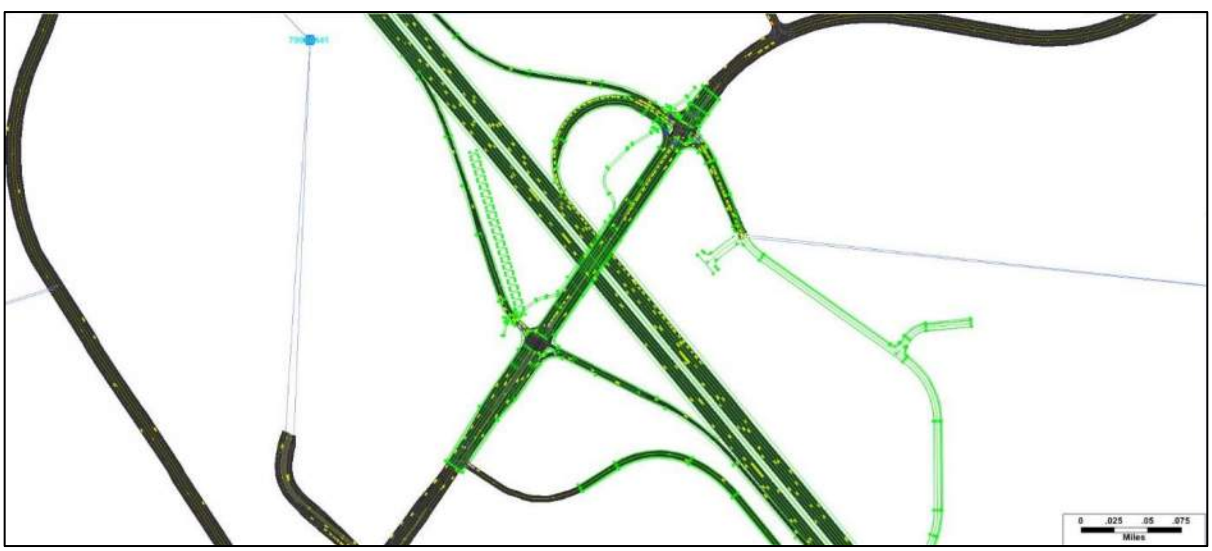


Figure 6 - Exit 103 (AO49) Simulation - PM Peak Hour



- Exit 104 (AO32)
  - AM Peak Hour – See **Figure 7** – interchange operates at capacity at the westbound ramps intersection. The eastbound off-ramp right turn experiences queuing due to heavy queuing along the arterial.
  - PM Peak Hour – See **Figure 8** – interchange operates under capacity. Heavy northbound left turn volume on Fernandina Road will require geometric and signal timing modifications to improve queuing and overall traffic operations.

Figure 7 - Exit 104 (AO32) Simulation - AM Peak Hour

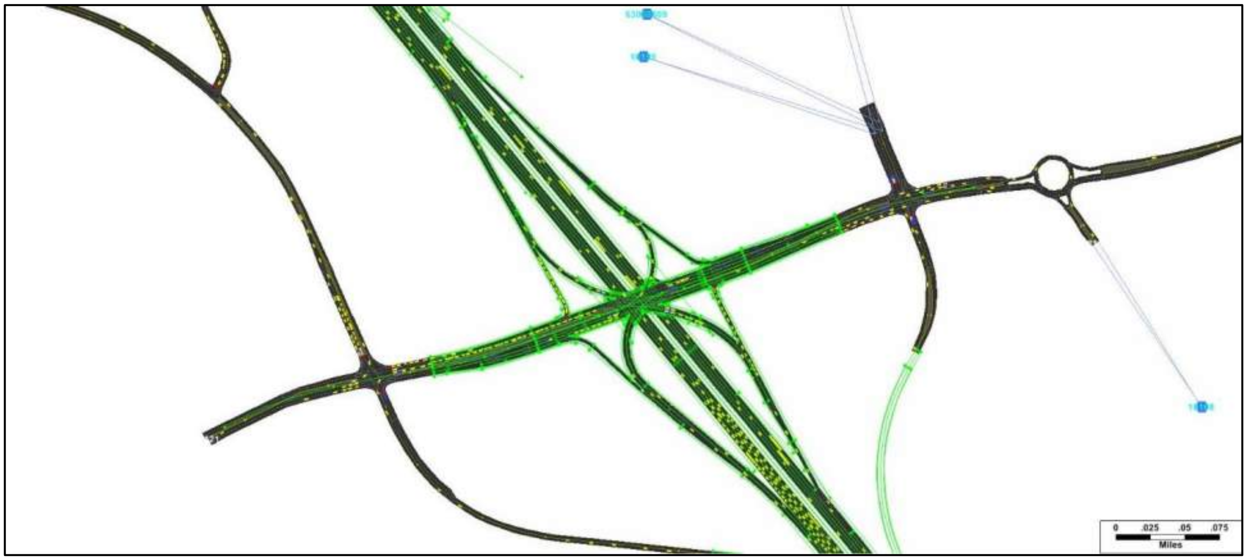
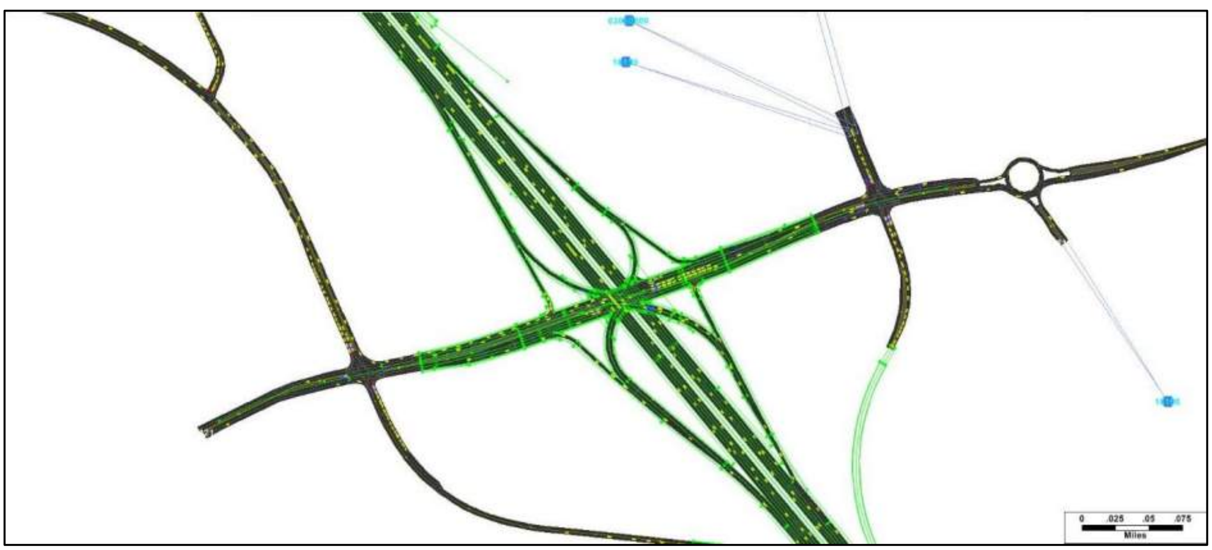


Figure 8 - Exit 104 (AO32) Simulation - PM Peak Hour



- Exit 106 (AO16) - In this alternative, access to Woodland Hills Road is converted to a RIRO intersection. Dedicated U-turn lanes/phasings have been provided which result in heavy arterial queuing.
    - AM Peak Hour – See **Figure 9** – interchange operates at capacity at the westbound off-ramps intersection. The dual right turns experience major queuing while maneuvering to the far left lane on St. Andrews Road to access Fernandina Road. This closely spaced intersection of St. Andrews Road at Fernandina Road adds additional delay to the operation at both the westbound ramps and the intersection. Traffic signal timing modifications may improve queuing along the arterial and ramp. Traffic entering the EB on-ramp backs up to the Jamil Road connection. Queuing from the system interchange at Exit 107 is evident on the EB mainline.
    - PM Peak Hour – See **Figure 10** – interchange operates over capacity at the westbound off ramps intersection. Similar to AM conditions, the dual right turns experience major queuing while maneuvering to the far left lane on St. Andrews Road to access Fernandina Road. In addition, demand volume from Burning Tree Road requires additional capacity and/or traffic signal timing modifications.

Figure 9 - Exit 106 (AO16) Simulation - AM Peak Hour

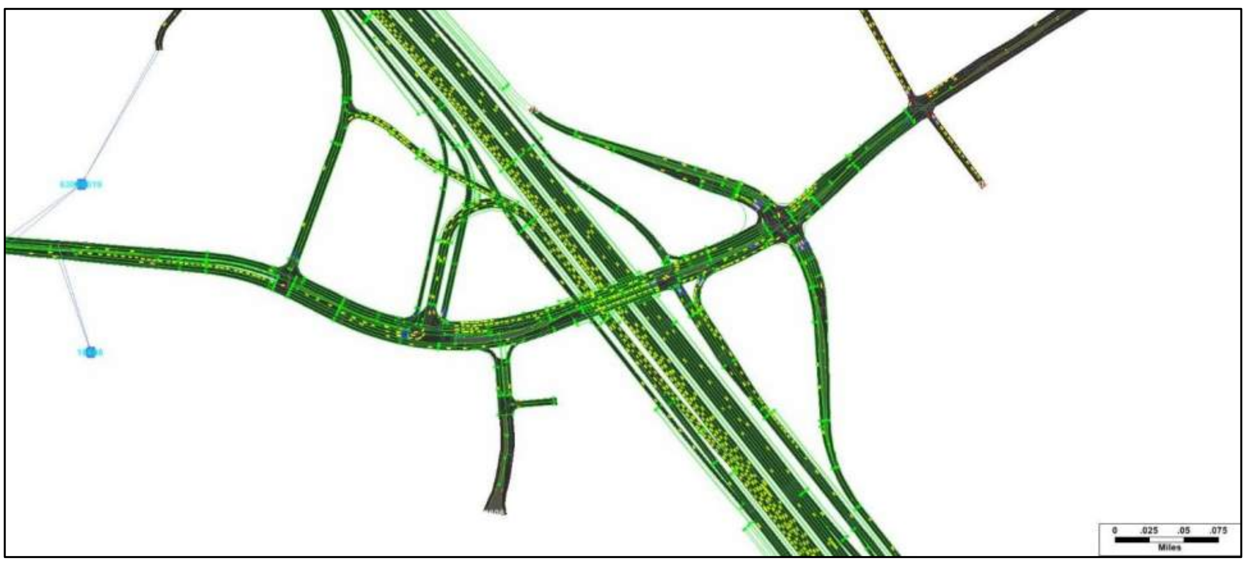
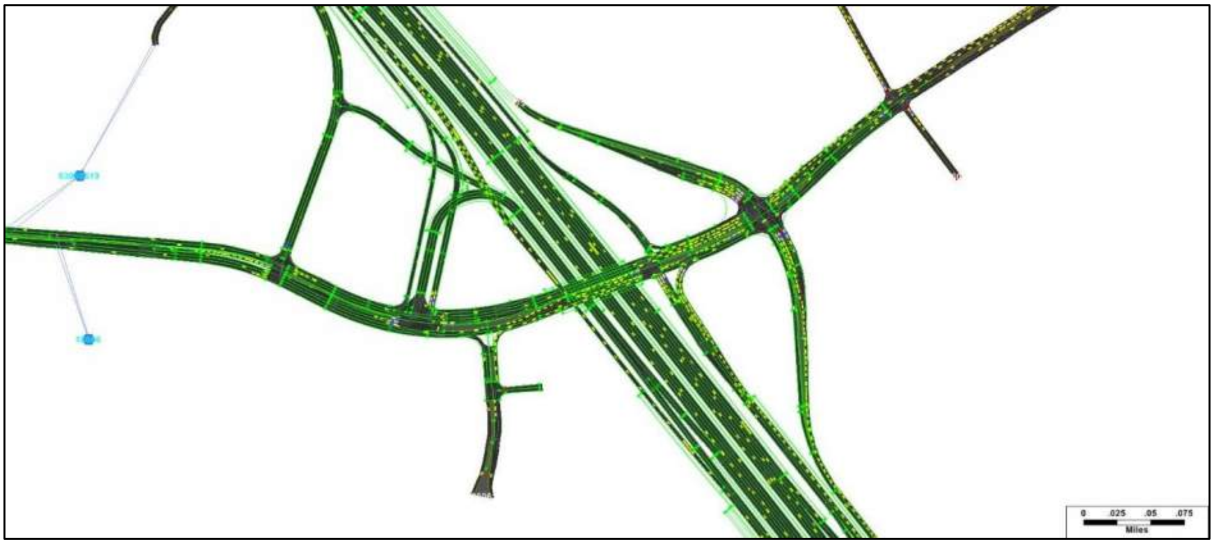


Figure 10 - Exit 106 (AO16) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO21)
    - AM Peak Hour – See **Figure 11** – interchange operates under capacity. The I-20 eastbound C-D ramp to I-26 EB/I-126 experiences moderate queuing however, flow is steady.
    - PM Peak Hour – See **Figure 12** – interchange operates under capacity.

Figure 11 - Exit 107/Exit 64 (AO21) Simulation - AM Peak Hour

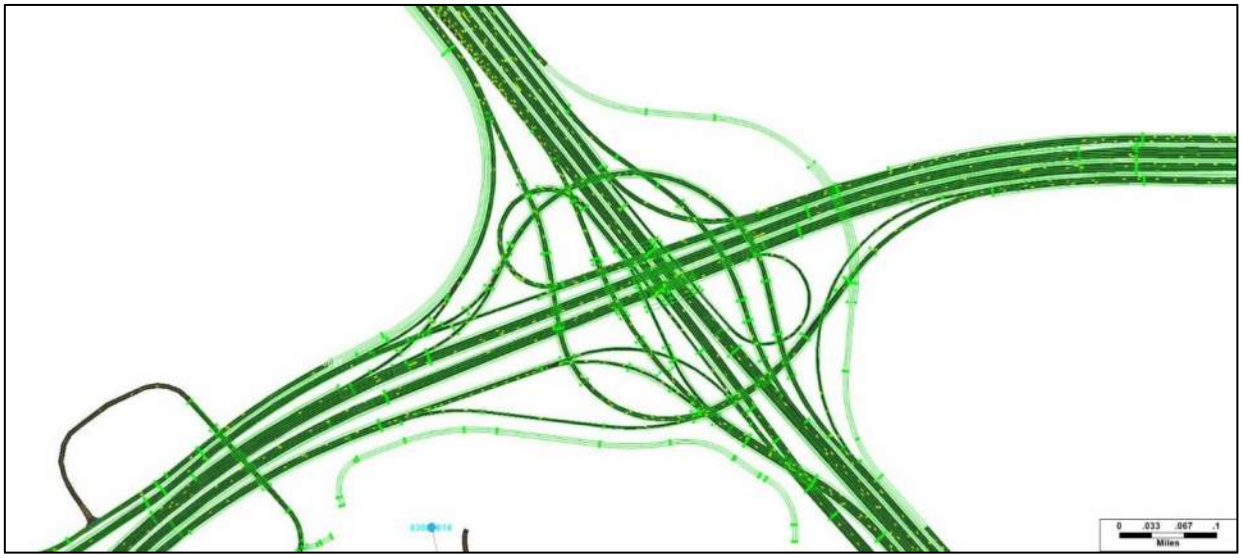
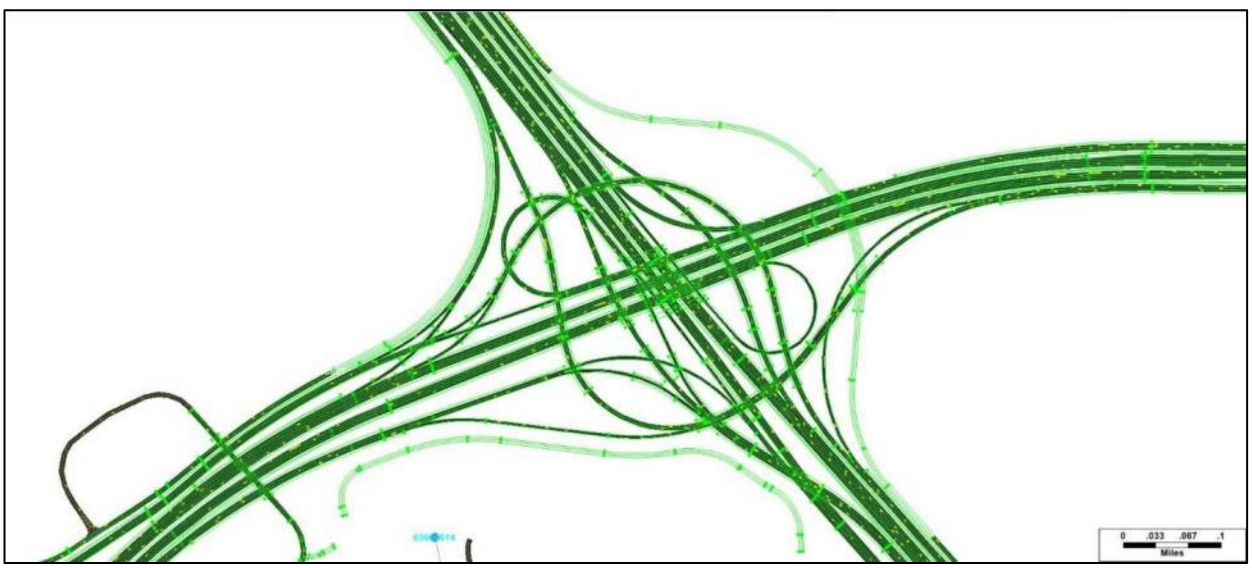


Figure 12 - Exit 107/Exit 64 (AO21) Simulation - PM Peak Hour



Exit 108 (I-126)

- AM Peak Hour – See **Figure 13** – I-126 eastbound operates under capacity.
- PM Peak Hour – See **Figure 14** – I-126 westbound operates at capacity. I-126 WB experiences heavy queuing as it narrows down from four lanes to two lane prior to meeting with I-26 westbound.   I-26 EB off-ramp to Bush River Road operates at capacity with stop-control at ramp-termini. The installation of a signal and/or additional capacity may alleviate queuing on ramp.

Figure 13 - Exit 108 (I-126) Simulation - AM Peak Hour

Figure 14 - Exit 108 (I-126) Simulation - PM Peak Hour

- Exit 110 (AO46)
  - AM Peak Hour – See **Figure 15** – Interchange operates over capacity at the I-26 eastbound off-ramp termini. The westbound off-ramp operates at capacity.
  - PM Peak Hour – See **Figure 16** – Interchange operates at capacity at the I-26 eastbound and westbound off-ramps due to the arterial queuing along US 378.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

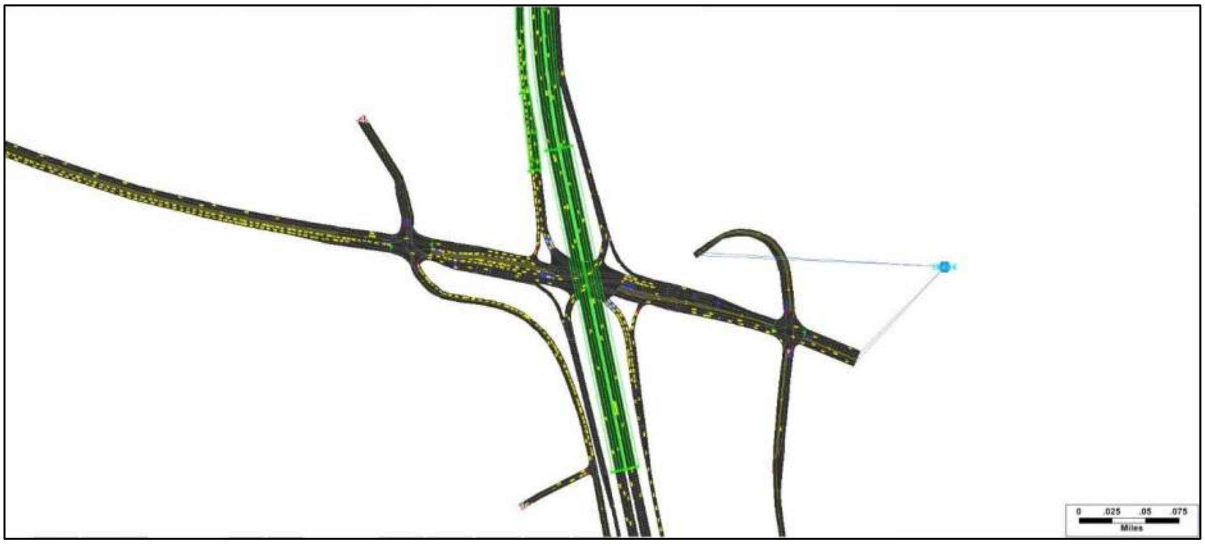
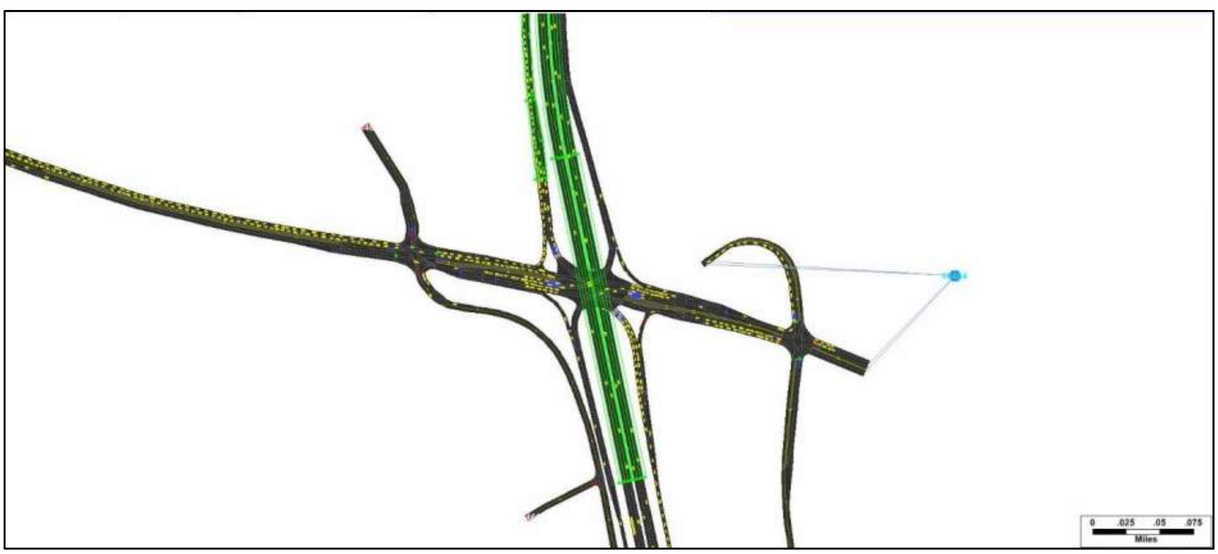


Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity.
    - PM Peak Hour – See **Figure 18** – Interchanges operates under capacity. Heavy volume along I-126 WB prior to I-26 merge during the PM peak hour. Four lanes drop to two lanes prior to merge with I-26 WB.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

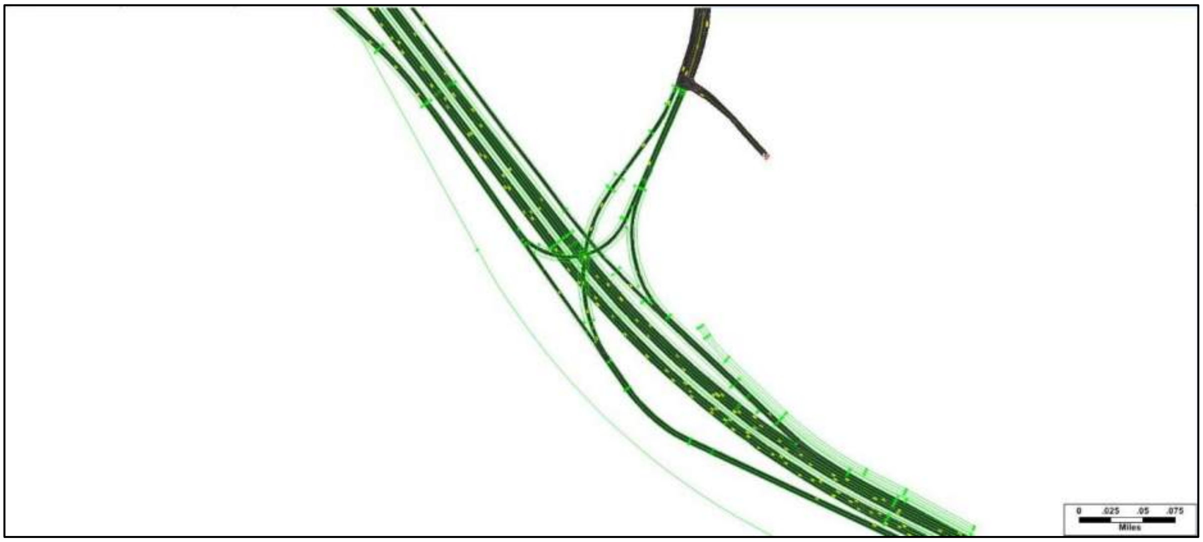
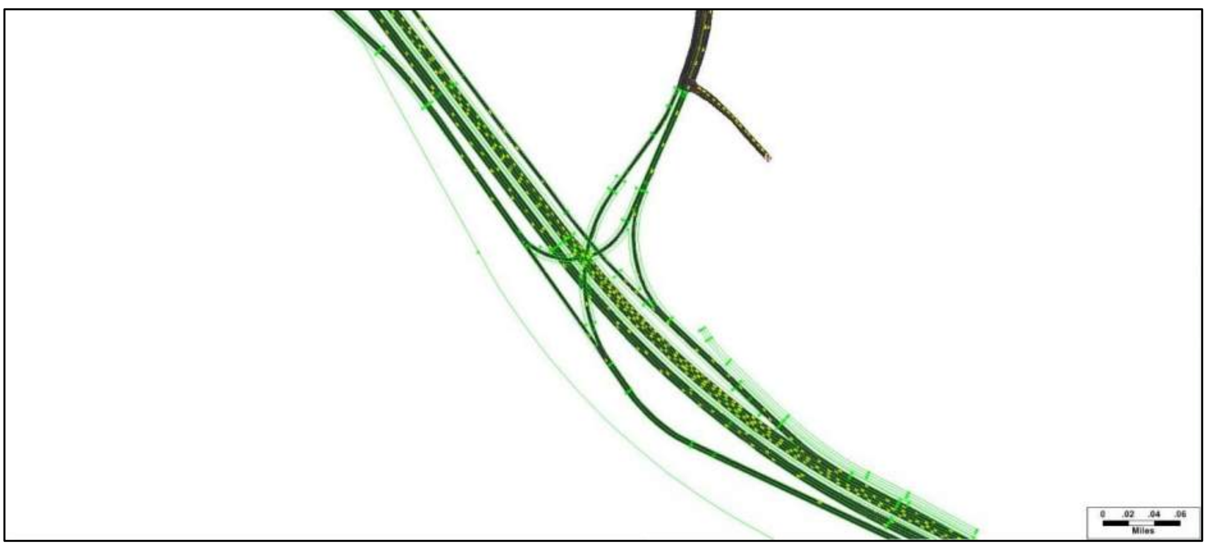


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO7) – The new connection from Executive Center Drive to Rockland Road to access Bush River Road, alleviates the congestion from the closely spaced intersections of Berryhill Drive and the westbound ramps along Bush River Road.
    - AM Peak Hour – See **Figure 19** – interchange operates under capacity.
    - PM Peak Hour – See **Figure 20** – interchange operates under capacity.

Figure 19 - Exit 63 (AO5) Simulation - AM Peak Hour

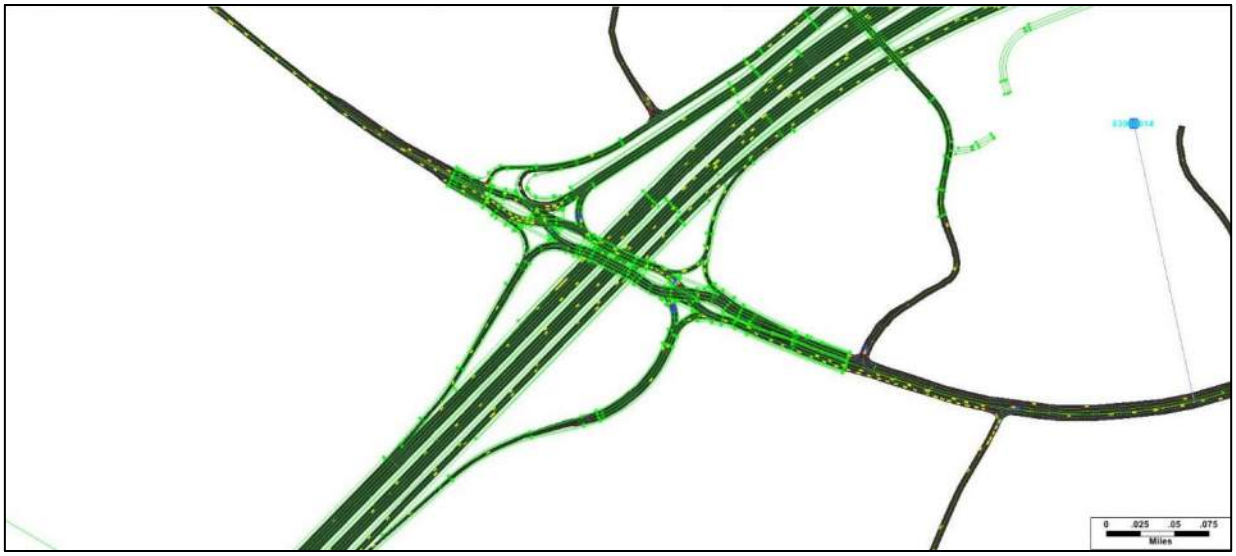
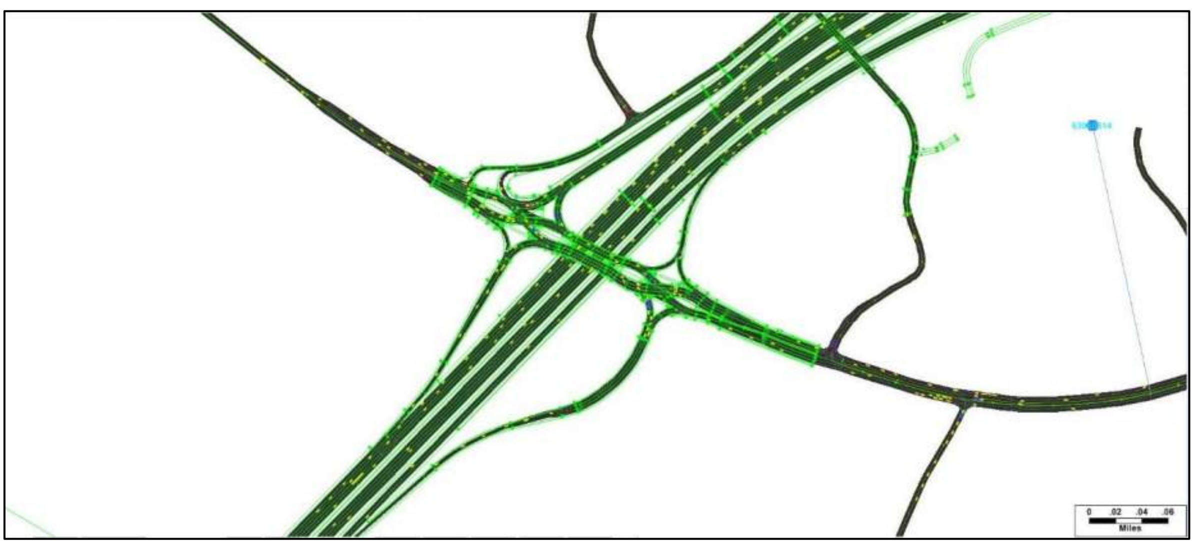


Figure 20 - Exit 63 (AO5) Simulation - PM Peak Hour



- Exit 65 (AO3)
  - AM Peak Hour – See **Figure 21** – interchange operates under capacity.
  - PM Peak Hour – See **Figure 22** – interchange operates over capacity. The westbound off-ramp is over capacity during the PM peak hour, which results in queue spillback into the I-20 westbound mainline.

Figure 21 - Exit 65 (AO6) Simulation - AM Peak Hour

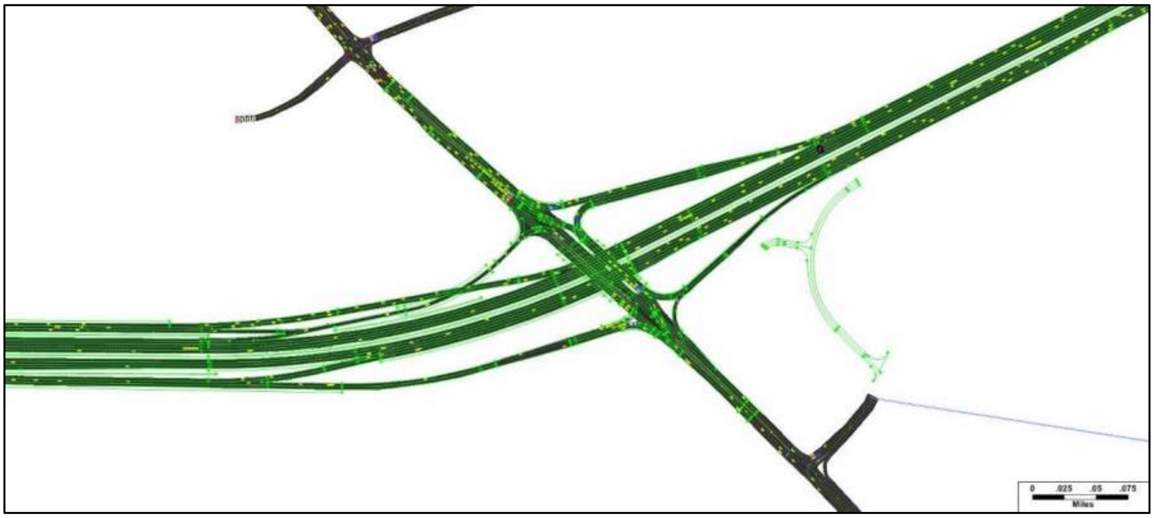
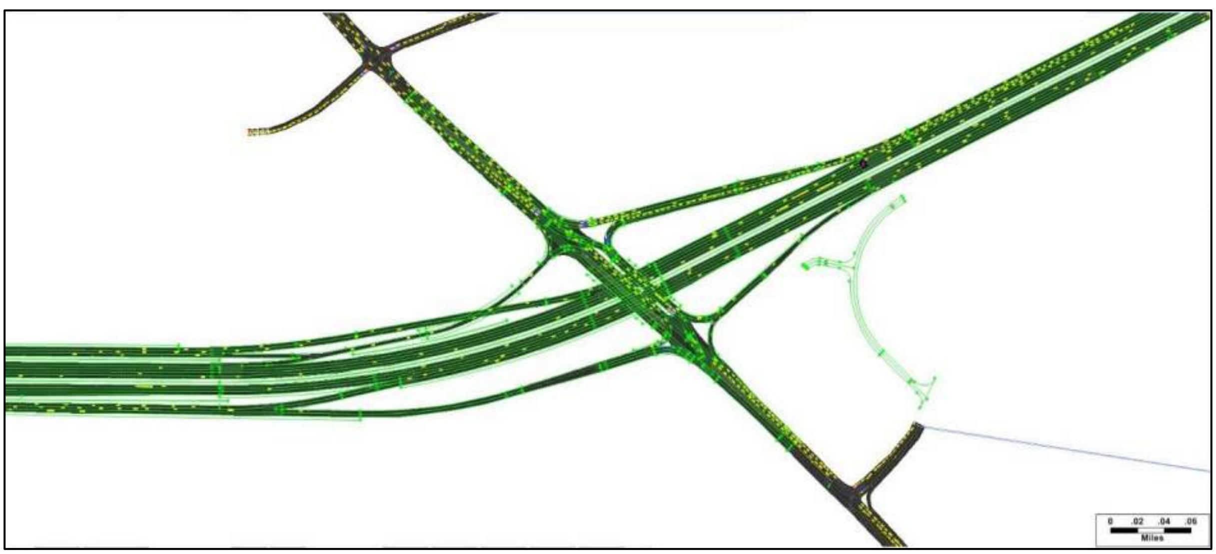
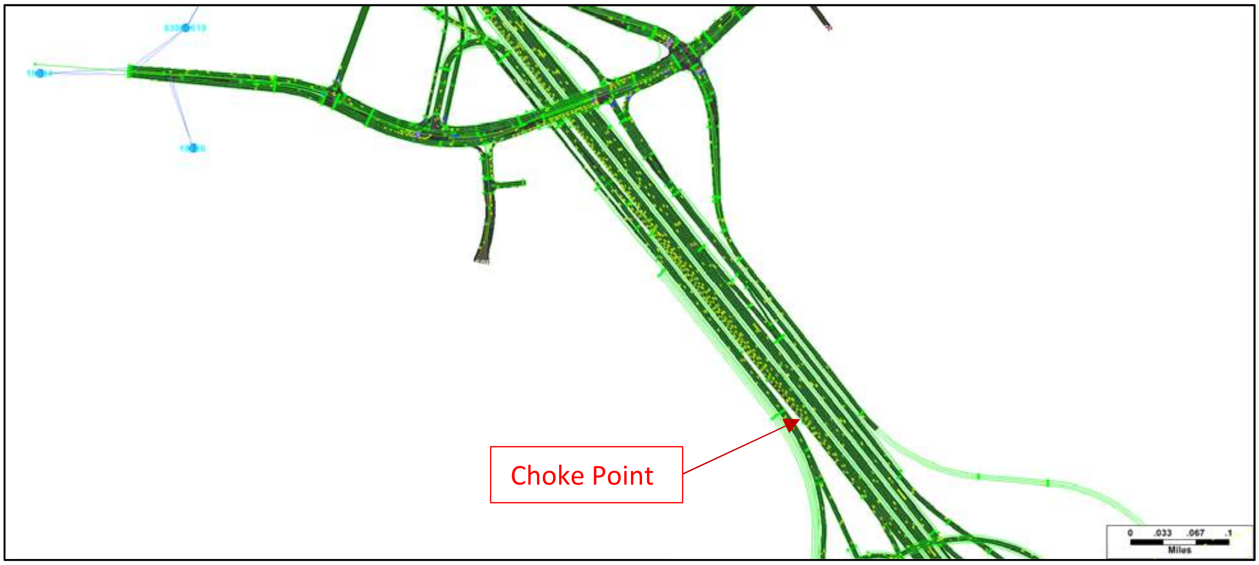


Figure 22 - Exit 65 (AO6) Simulation - PM Peak Hour

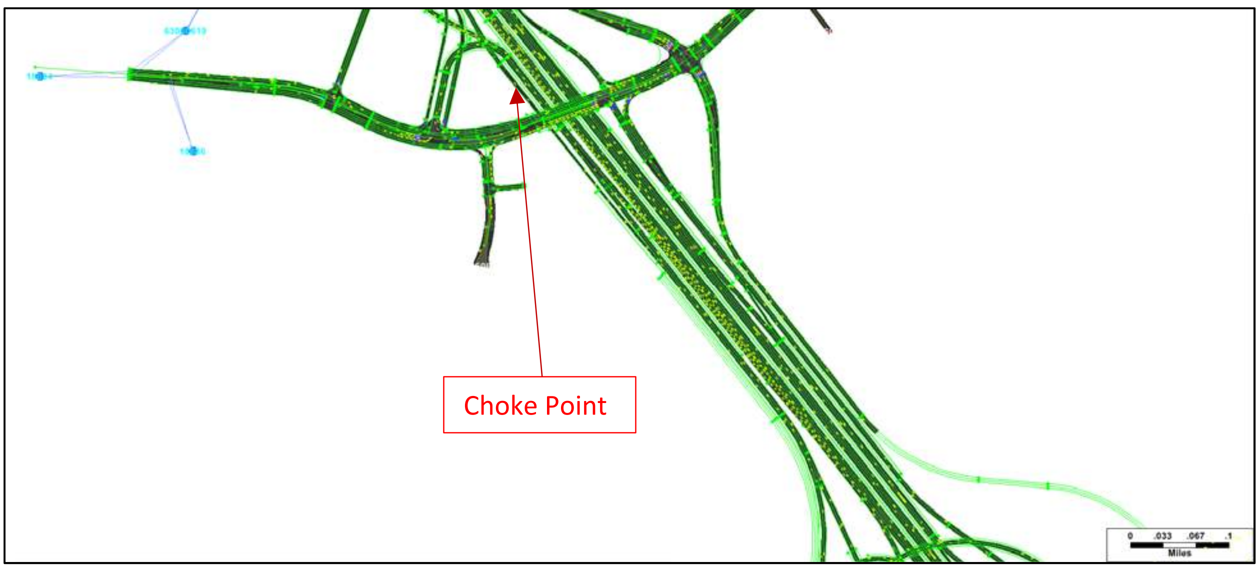


RA3 Specific Choke Points:

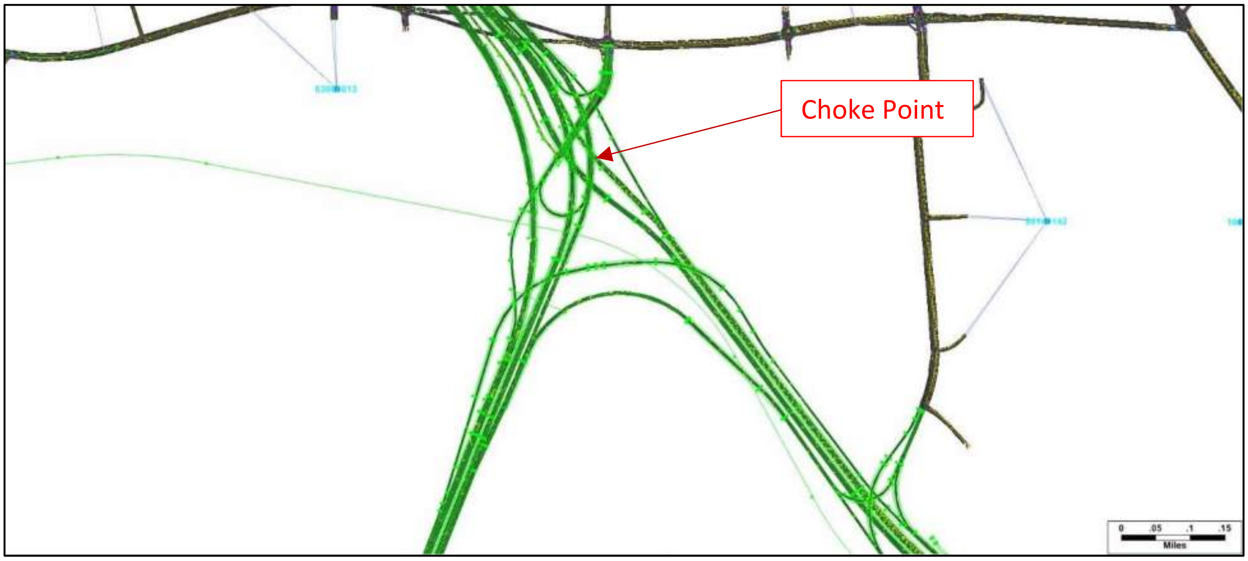
1. I-26 EB Exit 106 on-ramp onto I-26 EB mainline, lane drop within a heavy weaving area. (Only two lanes to I-126)



2. I-26 EB C-D lane drop down to one lane, vehicles exiting at Exit 106 and looping onto I-26 EB.



3. I-126 WB lane drop down prior to merge with I-26 WB.



Reasonable Alternative 4 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM EB	AM WB	PM EB	PM WB	Comment
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	Under	
Exit 103-104	Under	Under	Under	Under	
Exit 104-106	Over	Under	Under	Over	Overcapacity on the EB C-D road that exits to the I-20 WB/EB ramps during the AM peak hour. Heavy PM queuing at WB on-ramp merge from Exit 106.
Exit 106-107	Under	Under	Under	Under	Heavy volume on the westbound C-D road during the PM peak hour. This stems from the westbound off-ramp queuing at Exit 106. However, flow is steady on the mainline.
Exit 107-108	Under	Under	Under	Under	
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	At	Under	Under	At	Heavy volume along I-126 EB after the traffic from the on-ramp from I-20. Merge causes slower traffic flow. Heavy volume along I-126 WB prior to I-26 split. However, flow is steady.
Exit 63-64	Under	Under	Under	Under	Overcapacity on the WB C-D road that merges onto I-20 during the PM peak hour. Additional capacity to merge onto I-20 may improve traffic flow on ramps.
Exit 64-65	Under	Under	Under	Under	Overcapacity on the WB C-D road that exits to the I-26 WB/EB ramps during the PM peak hour. This stems from the westbound off-ramp queuing at Exit 106.

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	Par.Clo.	Under	Under	Under	Under	
Exit 102	Par.Clo.	Under	Under	Under	Under	
Exit 103	AO35	Under	Under	Under	Under	
Exit 104	AO32	Under	At	Under	Under	During the AM peak hour, the westbound off-ramp queuing results from heavy queuing along the arterial.
Exit 106	AO15	Under	Under	Under	Over	
Exit 107/Exit 64	AO22	At	Under	Under	Over	Moderate queuing on the I-26 EB C-D road during the AM peak hour. During the PM peak hour, the I-20 WB on-ramp experiences heavy queuing as a result of one lane (narrowing from three) entering I-20. Additional capacity may be required to improve traffic flow.
Exit 108 – I-126	AO25	At	Under	Under	At	Heavy volume along I-126 EB after the traffic from the I-20 EB on-ramp merges . Merge causes slower traffic flow. Heavy volume along I-126 WB prior to merge with I-26 WB during the PM Peak hour.
Exit 110	AO46	Over	Under	Under	Over	Arterial experiences heavy traffic and turning queues causing backups on the eastbound off-ramps during the AM peak hour and the westbound off-ramps during the PM peak hour. Further adjustments may be made to signals on US 378 to improve arterial operations.
Colonial Life	AO22	Under	Under	Under	Under	

Interchanges - continued

Exit		AM		PM		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
Exit 63	AO7	Over	Under	At	At	The eastbound left turns onto I-20 experiences heavy queuing during the AM peak hour. Extending the dual left turn lanes may improve intersection operations. During the PM peak hour, the overall intersection experiences moderate queuing.
Exit 65	AO3	At	Under	At	Under	The southbound left turn on-ramp to I-20 experiences heavy queuing during the AM peak hour. Dual left turn lanes may be necessary to improve intersection operations. The signalized EB off-ramp experiences moderate queues during the PM peak hour. Traffic signal timing modifications may improve operations.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations.

- Exit 101 (Par.Clo)
  - AM Peak Hour – See **Figure 1** – interchange operates under capacity
  - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

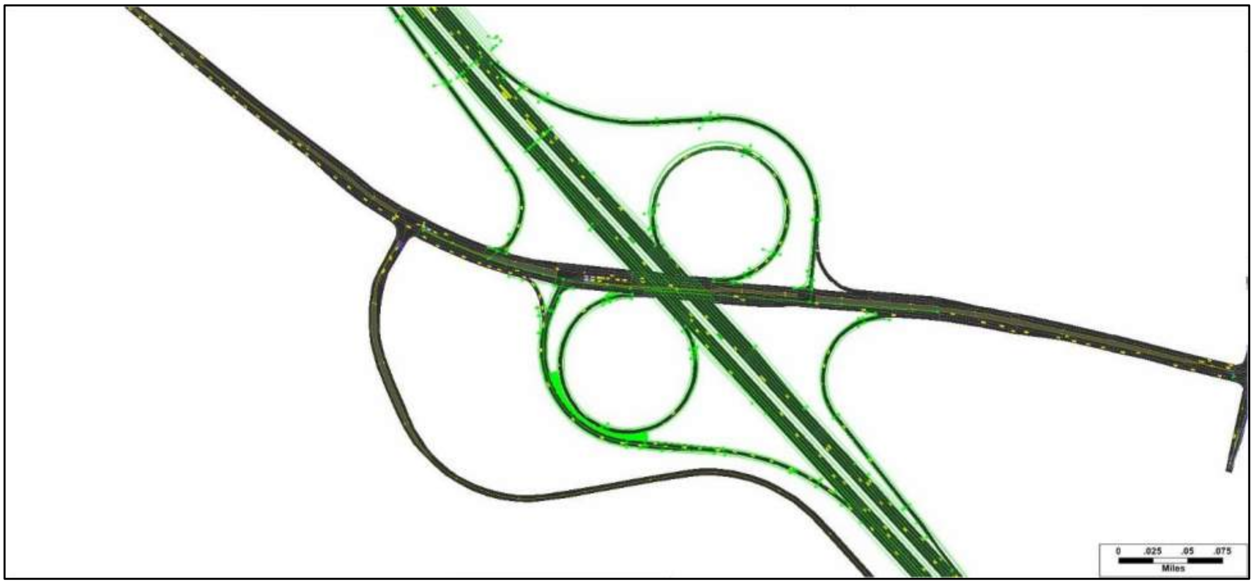
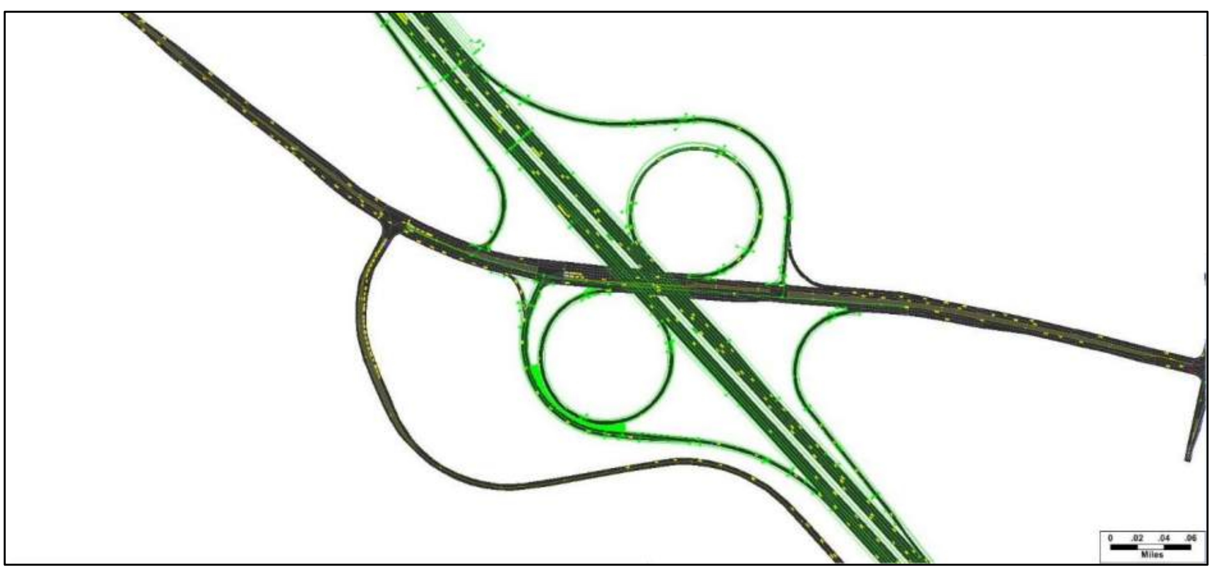


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo)
    - AM Peak Hour – See **Figure 3** – interchange operates under capacity
    - PM Peak Hour – See **Figure 4** – interchange operates under capacity

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

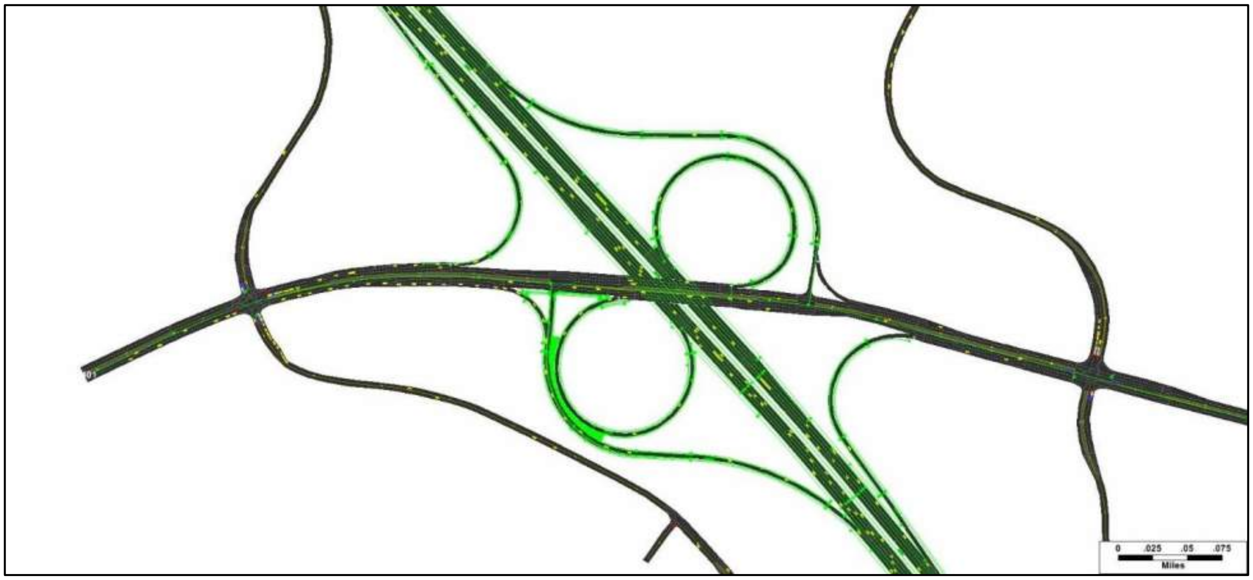
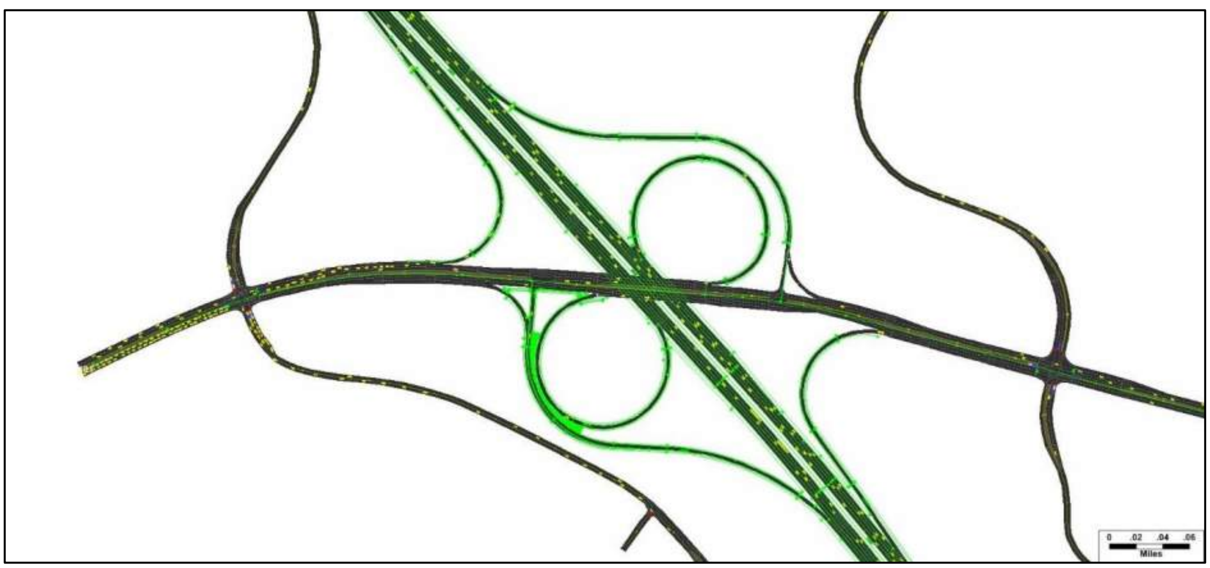


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO35)
  - AM Peak Hour – See **Figure 5** – interchange operates under capacity
  - PM Peak Hour – See **Figure 6** – interchange operates under capacity.

Figure 5 - Exit 103 (AO35) Simulation - AM Peak Hour

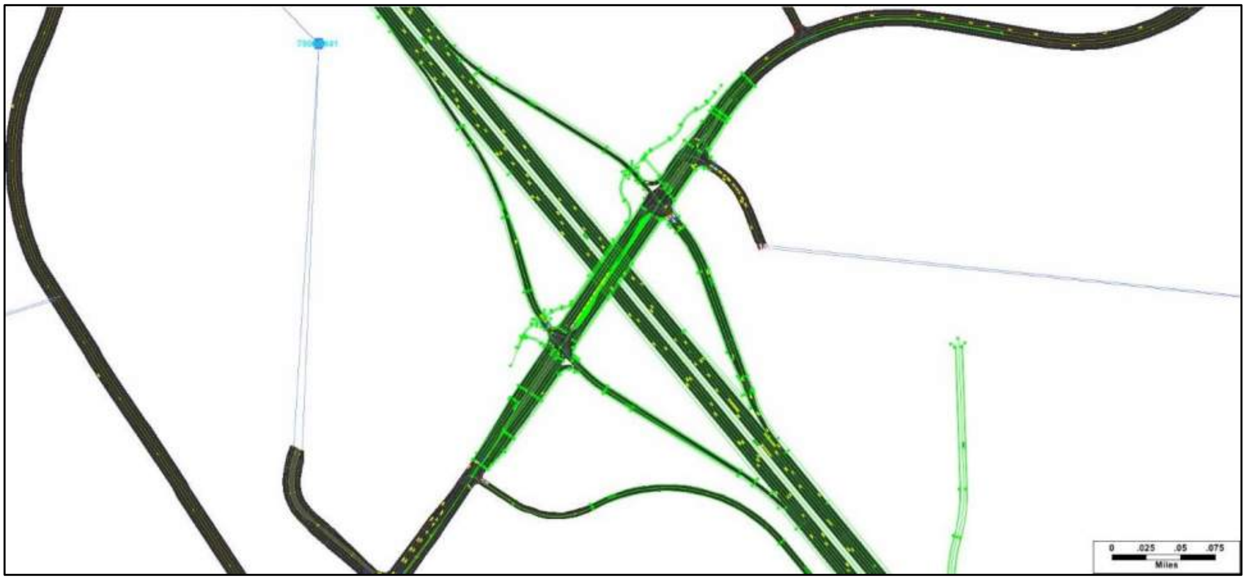
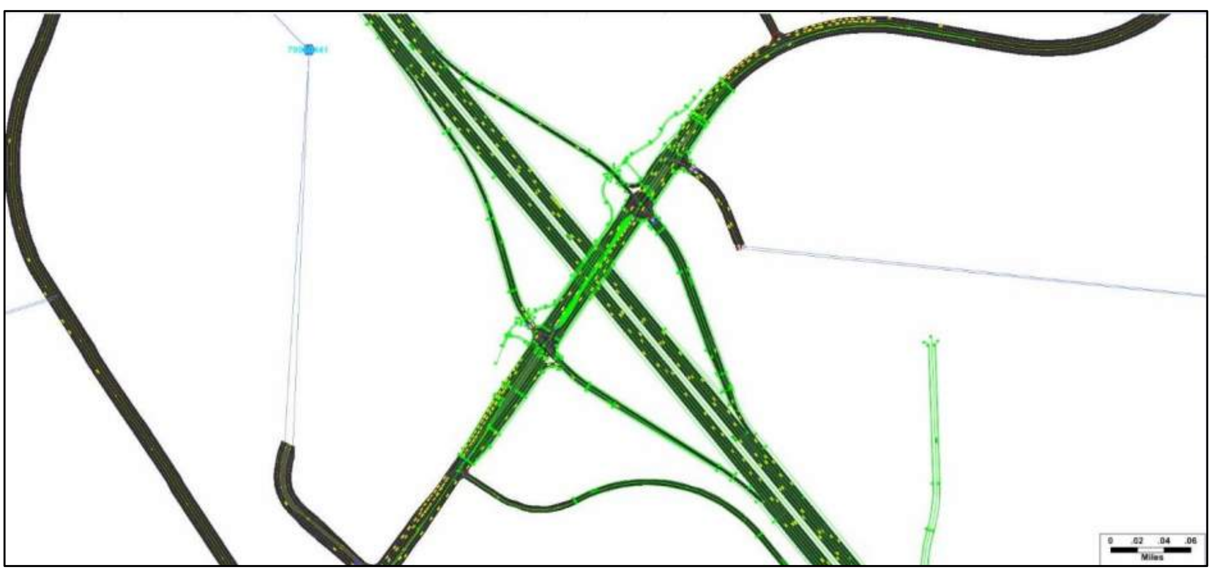


Figure 6 - Exit 103 (AO35) Simulation - PM Peak Hour



- Exit 104 (AO32)
    - AM Peak Hour – See **Figure 7** – interchange operates at capacity at the westbound ramps intersection. The westbound off-ramp right turn experiences queuing due to heavy queuing along the arterial.
    - PM Peak Hour – See **Figure 8** – interchange operates under capacity. Heavy northbound left turn volume at the intersection of Piney Grove Road at Fernandina Road will require geometric and signal timing modifications to improve queuing and overall traffic operations.

Figure 7 - Exit 104 (AO32) Simulation - AM Peak Hour

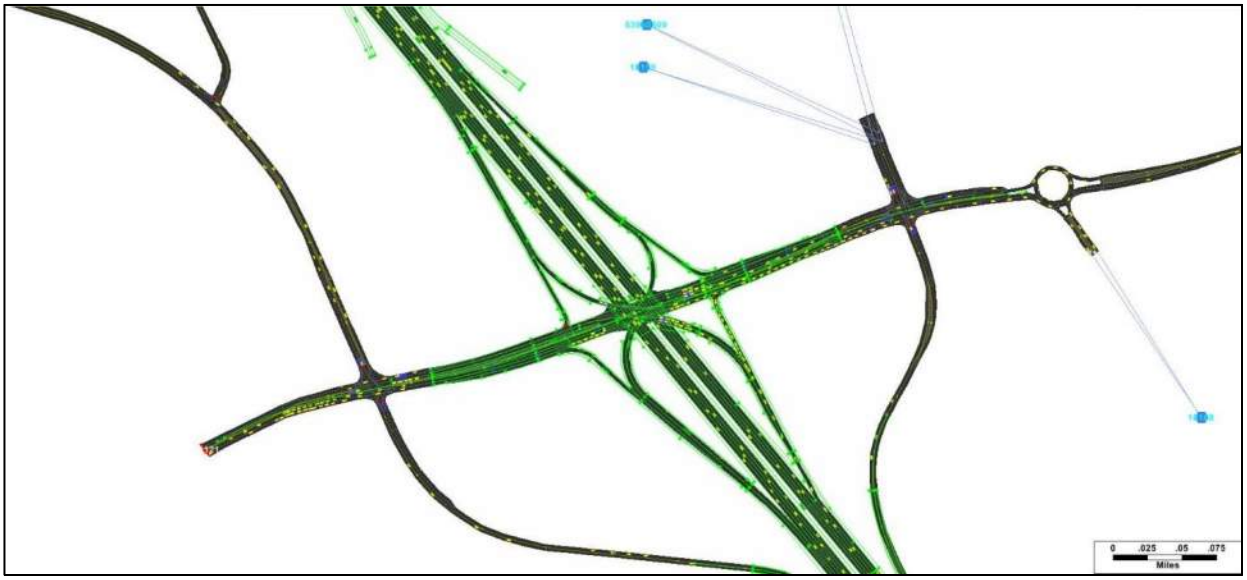
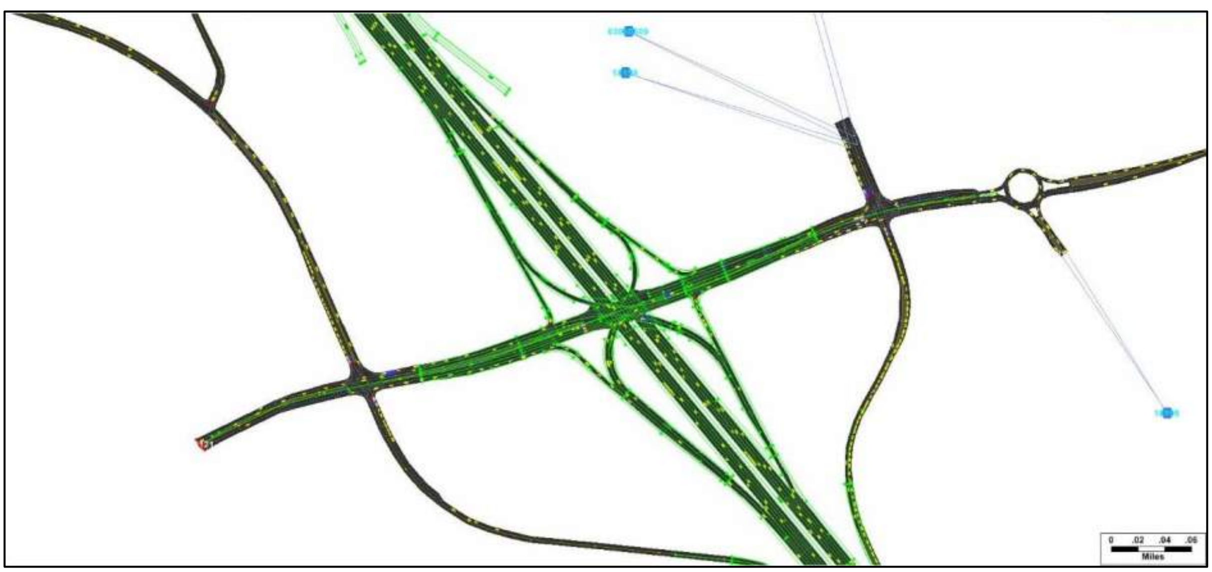


Figure 8 - Exit 104 (AO32) Simulation - PM Peak Hour



- Exit 106 (AO15)
    - AM Peak Hour – See **Figure 9** – interchange operates at capacity at the WB off-ramps intersection. The dual right turns experience major queuing while maneuvering to the far left lane on St. Andrews Road to access Fernandina Road. This closely spaced intersection of St. Andrews Road at Fernandina Road adds additional delay to the operation of both the DDI and the intersection. Traffic signal timing modifications may improve queuing along the arterial and ramp.
    - PM Peak Hour – See **Figure 10** – interchange operates over capacity at the WB off ramps intersection. Similar to AM conditions, the dual right turns experience major queuing while maneuvering to the far left lane on St. Andrews Road to access Fernandina Road. This queue spills onto the C-D ramp. In addition, demand volume from Burning Tree Road requires traffic signal timing modifications.

Figure 9 - Exit 106 (AO15) Simulation - AM Peak Hour

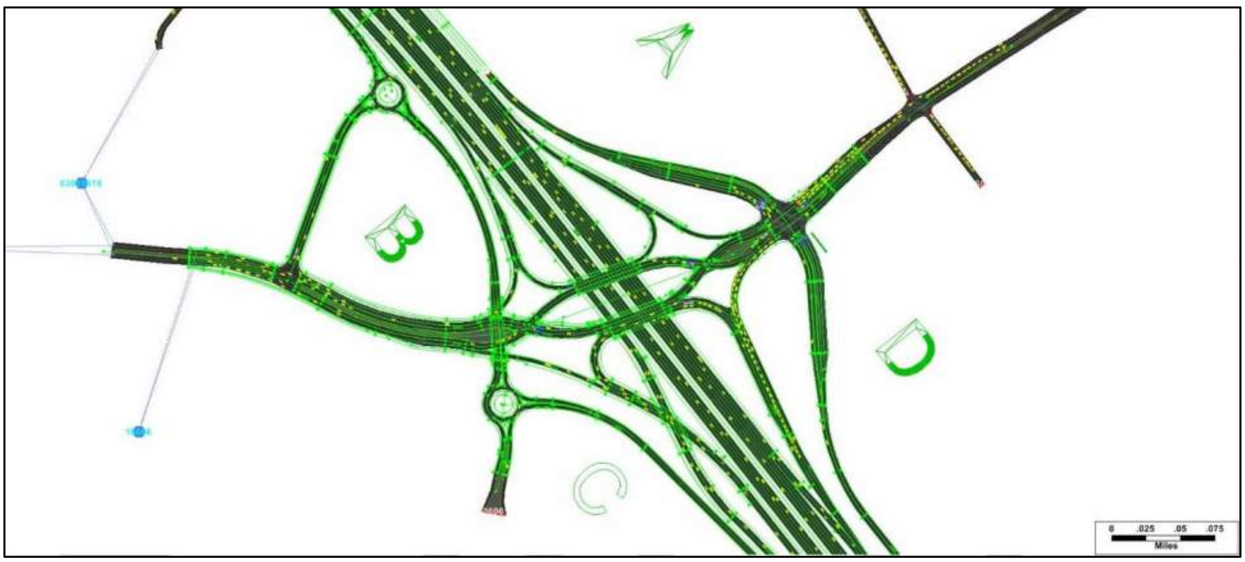
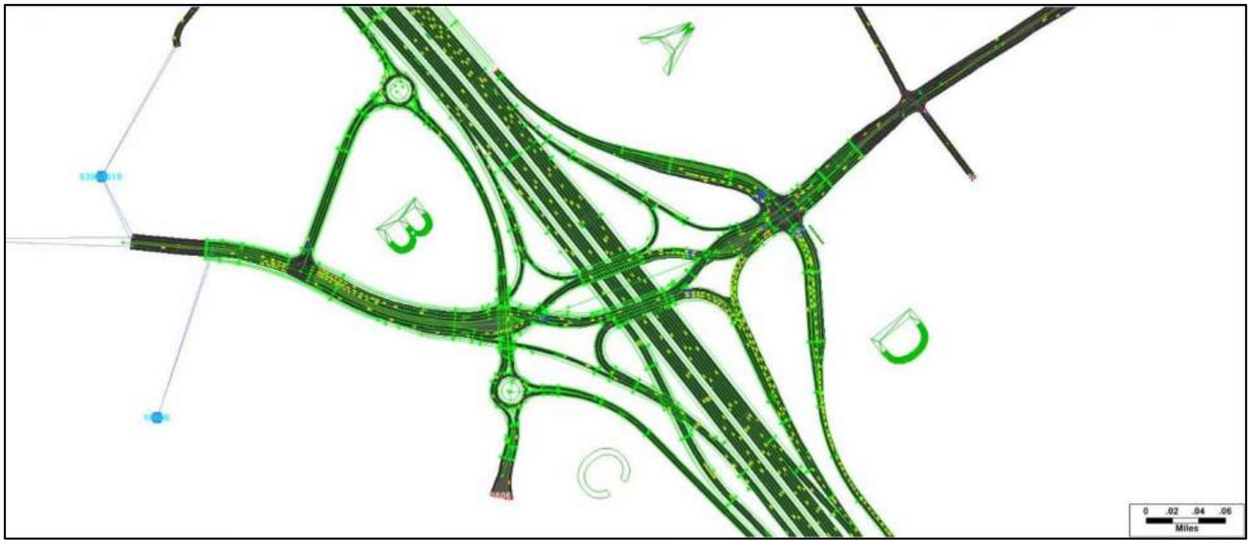


Figure 10 - Exit 106 (AO15) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO22)
    - AM Peak Hour – See **Figure 11** – interchange operates under capacity. The I-26 eastbound C-D ramp to I-20 experiences moderate queuing however, flow is steady.
    - PM Peak Hour – See **Figure 12** – interchange operates over capacity. The I-26 westbound off-ramp to I-20 WB experiences heavy queuing. The ramp volume to I-20 westbound from I-26 in both the eastbound and westbound directions merges from three lanes to one lane causing major queuing. Additional lanes may be needed to merge into I-20 to improve traffic flow on these ramps. In addition, the westbound on ramp from I-20 WB experiences heavy queuing which stems from the Exit 106 interchange. The westbound off-ramp volume at that exit backs up onto the C-D road which causes a major queue backup onto I-20 westbound to Exit 65.

Figure 11 - Exit 107/Exit 64 (AO22) Simulation - AM Peak Hour

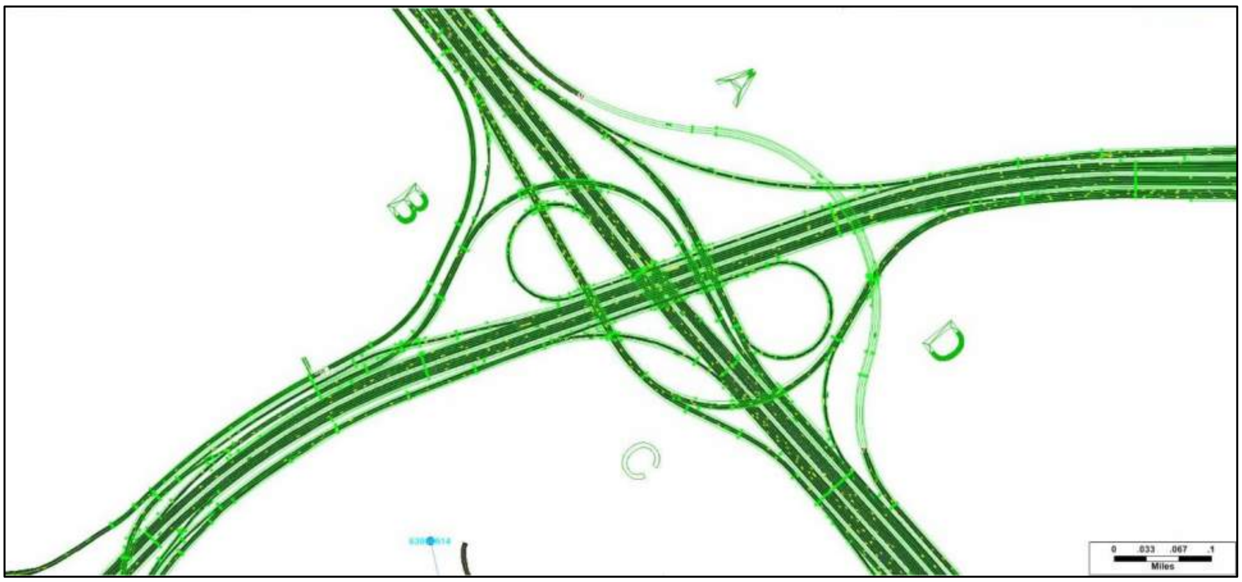
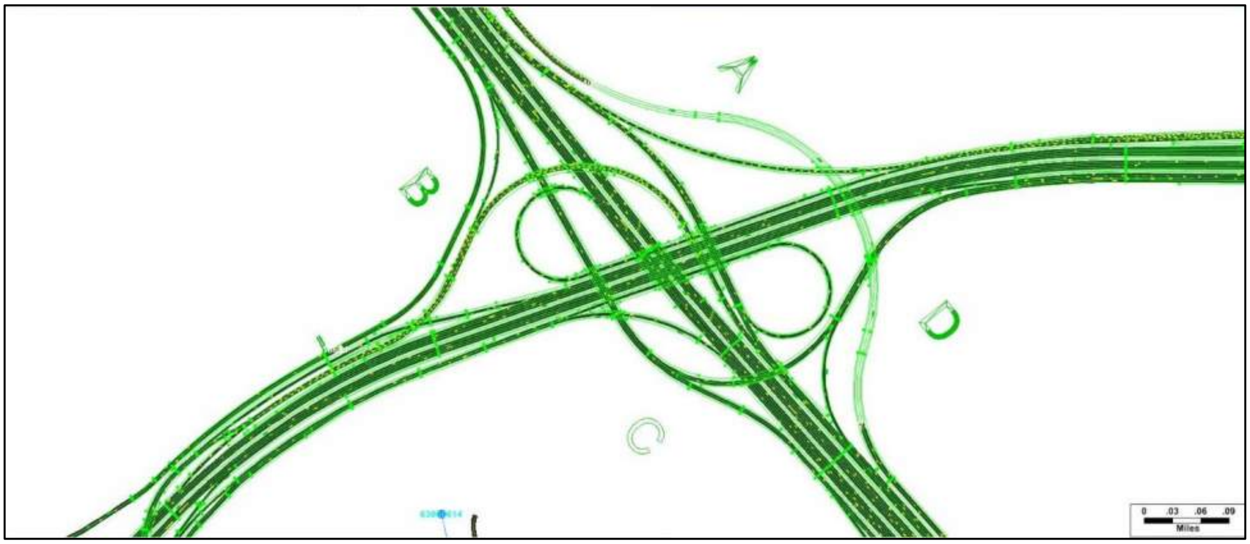


Figure 12 - Exit 107/Exit 64 (AO22) Simulation - PM Peak Hour



Exit 108 (I-126)

- AM Peak Hour – See **Figure 13** – I-126 eastbound operates at capacity towards I-126 eastbound. However, flow is steady.
- PM Peak Hour – See **Figure 14** – I-126 westbound operates at capacity. The I-126 WB expressway to I-20 experiences moderate queuing as it narrows down from two lanes to one lane prior to meeting with Bush River Road on ramp.

Figure 13 - Exit 108 (I-126) Simulation - AM Peak Hour

Figure 14 - Exit 108 (I-126) Simulation - PM Peak Hour

- Exit 110 (AO46)
    - AM Peak Hour – See **Figure 15** – Interchange operates over capacity at the eastbound off-ramp termini.
    - PM Peak Hour – See **Figure 16** – Interchange operates over capacity at the I-26 westbound off-ramp due to the arterial queuing along US 378.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

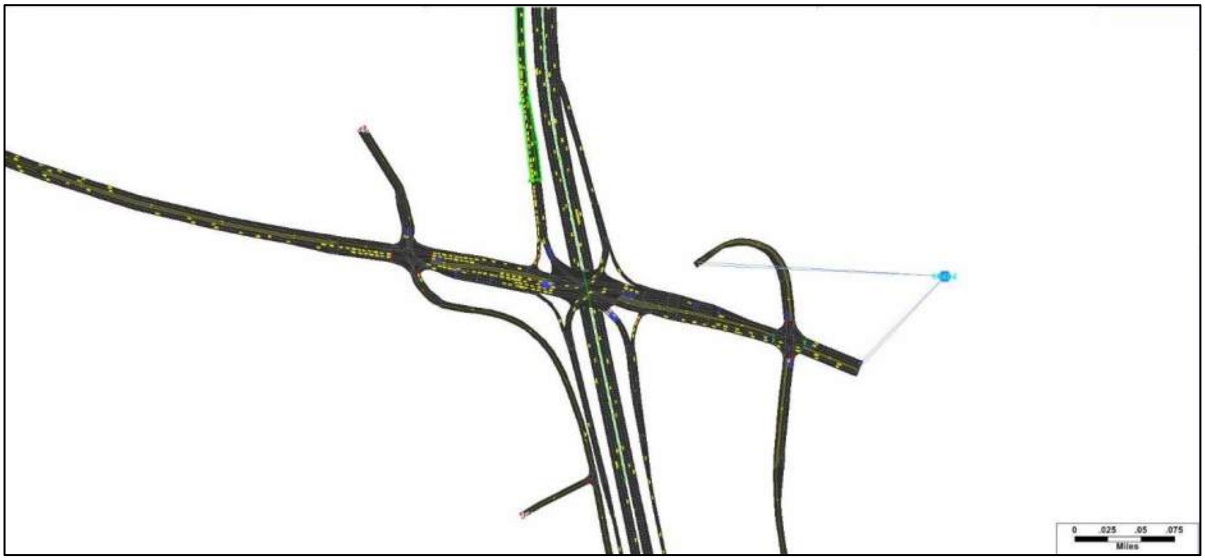
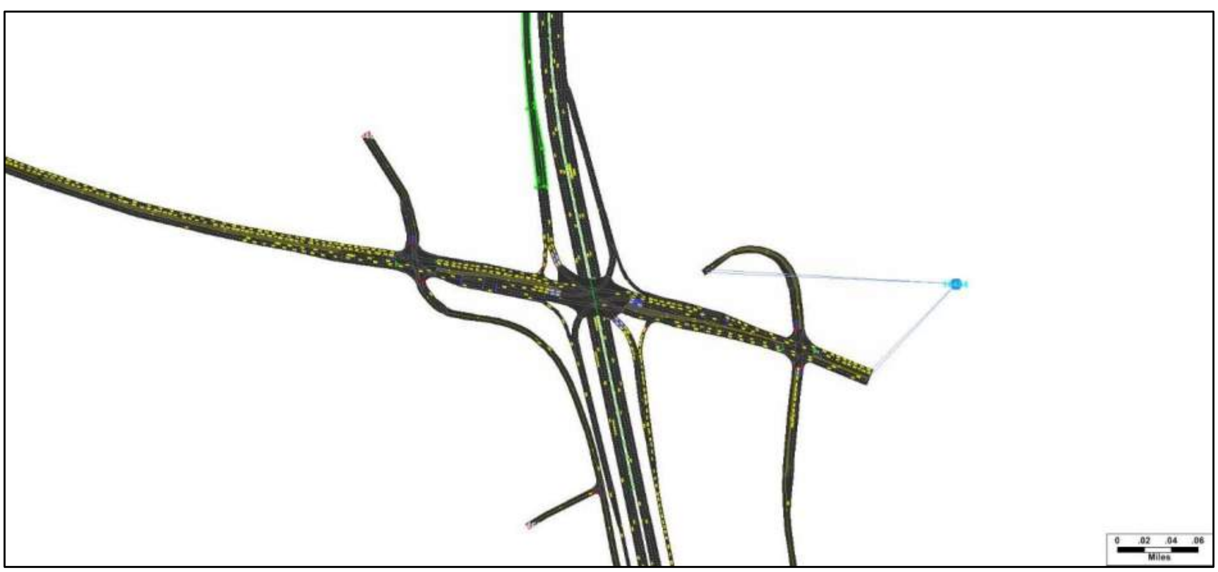


Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity. Mainline volume slightly queues in the eastbound direction. However, flow is steady.
    - PM Peak Hour – See **Figure 18** – Interchanges operates under capacity.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

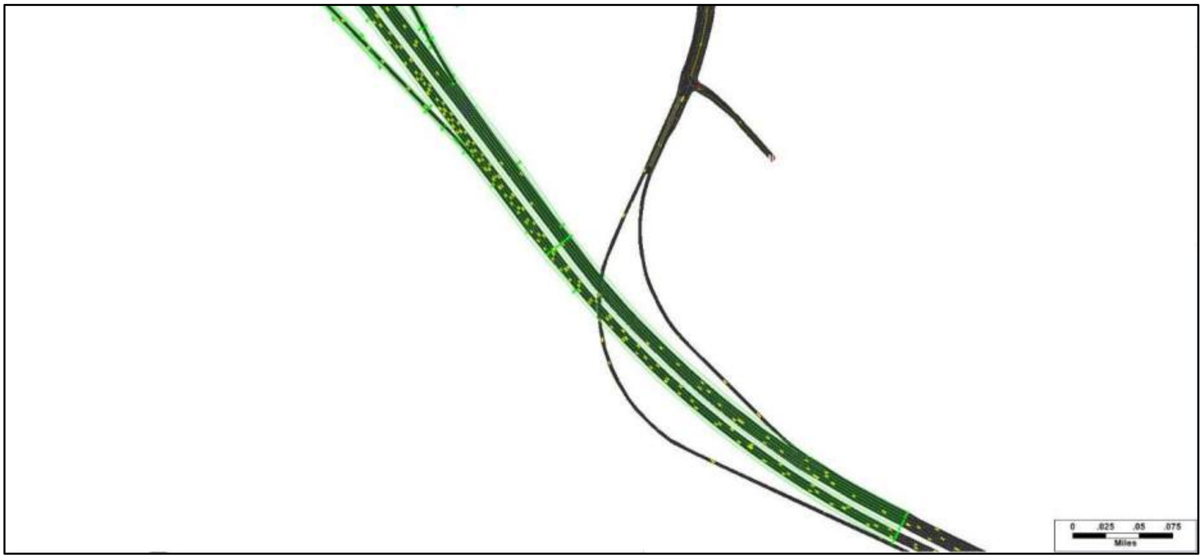
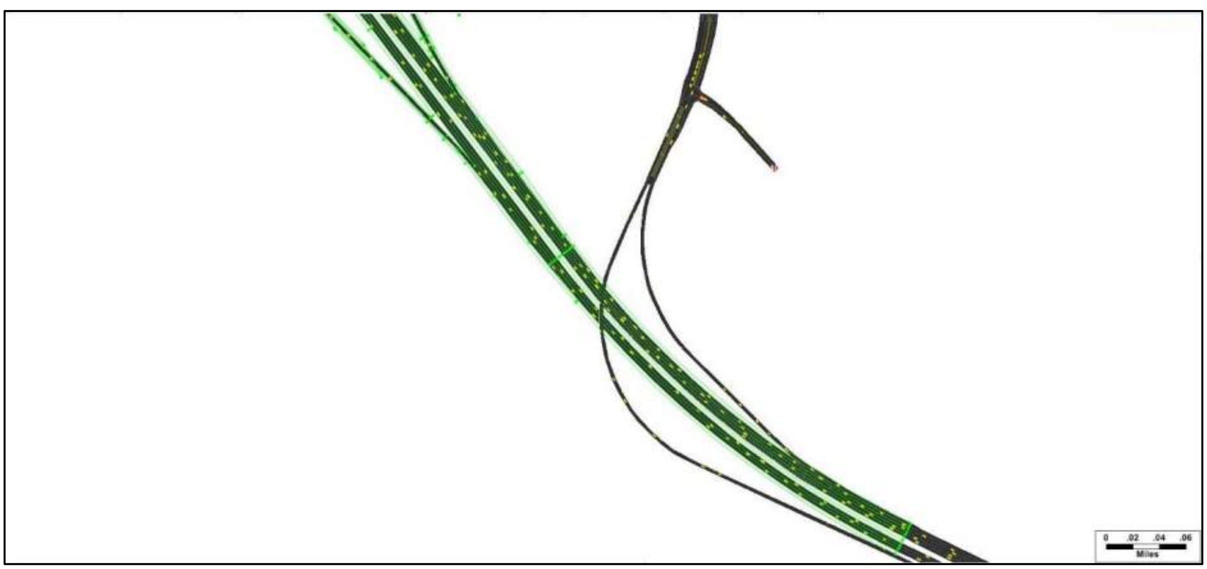


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO7) – Bush River Road is widened to provide dual left turn lanes and a single right turn lane in both the eastbound and westbound direction. Also, channelized right turn lanes were provided for the I-20 off-ramps.
    - AM Peak Hour – See **Figure 19** – interchange operates over capacity for the eastbound dual left turn lanes. Geometric changes such as extending the dual left turn lanes and modifying traffic signal timing may improve intersection operations.
    - PM Peak Hour – See **Figure 20** – interchange operates at capacity. The intersection experiences moderate delay.

Figure 19 - Exit 63 (AO7) Simulation - AM Peak Hour

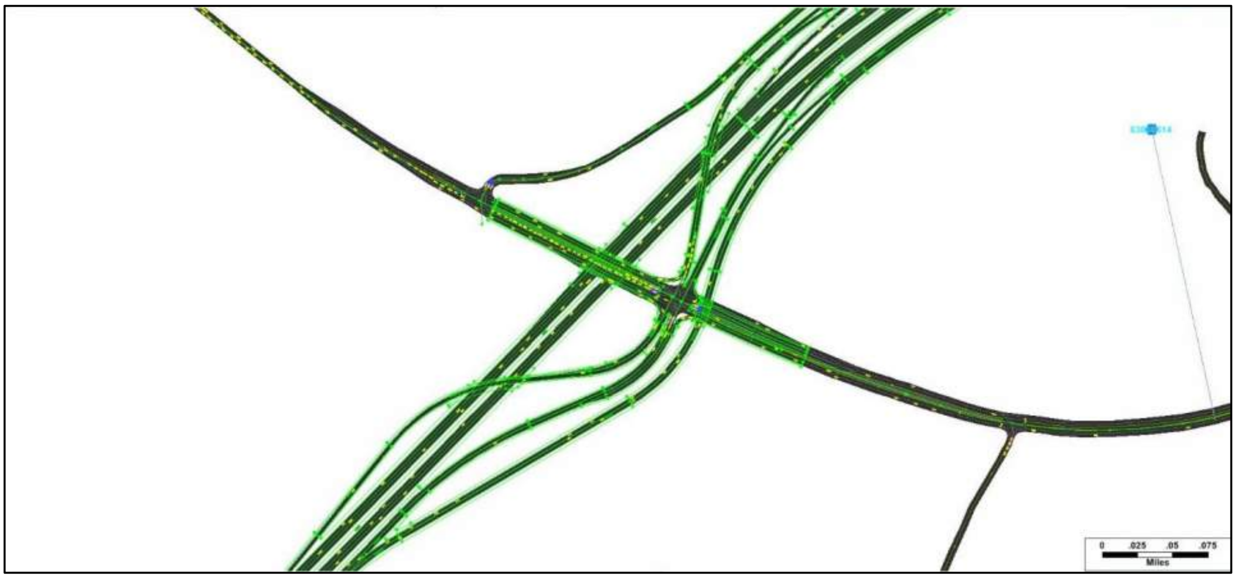
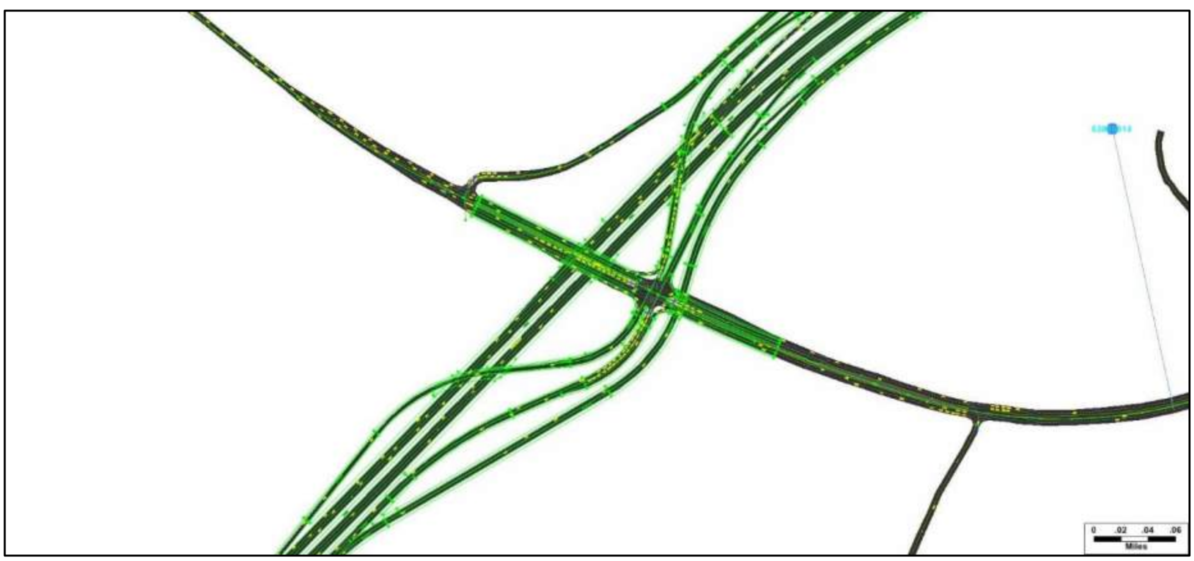


Figure 20 - Exit 63 (AO7) Simulation - PM Peak Hour



- Exit 65 (AO3) – Simulation file differs slightly from .KMZ file. The original design narrowed the eastbound C-D ramp volume down to one lane as the ramp was merging with I-20 mainline, causing major bottleneck issues. Two lanes merging onto I-20 eastbound were modeled, and a lane drop was added shortly after merge to improve traffic flow.
    - AM Peak Hour – See **Figure 21** – interchange operates at capacity. The southbound left turn onto I-20 eastbound experiences heavy queuing. The southbound left turn volume may require dual turn lanes to improve intersection operations. Although not shown in Figure 21, the eastbound off-ramp experiences moderate queuing at the ramp termini.
    - PM Peak Hour – See **Figure 22** – interchange operates at capacity. The eastbound off-ramp experiences heavy queuing at the ramp termini. The westbound C-D road from I-20 westbound to I-26 westbound is overcapacity during the PM peak hour, which results in queue spillback into the I-20 westbound mainline. This stems from the I-26 westbound off-ramp queuing at Exit 106.

Figure 21 - Exit 65 (AO3) Simulation - AM Peak Hour

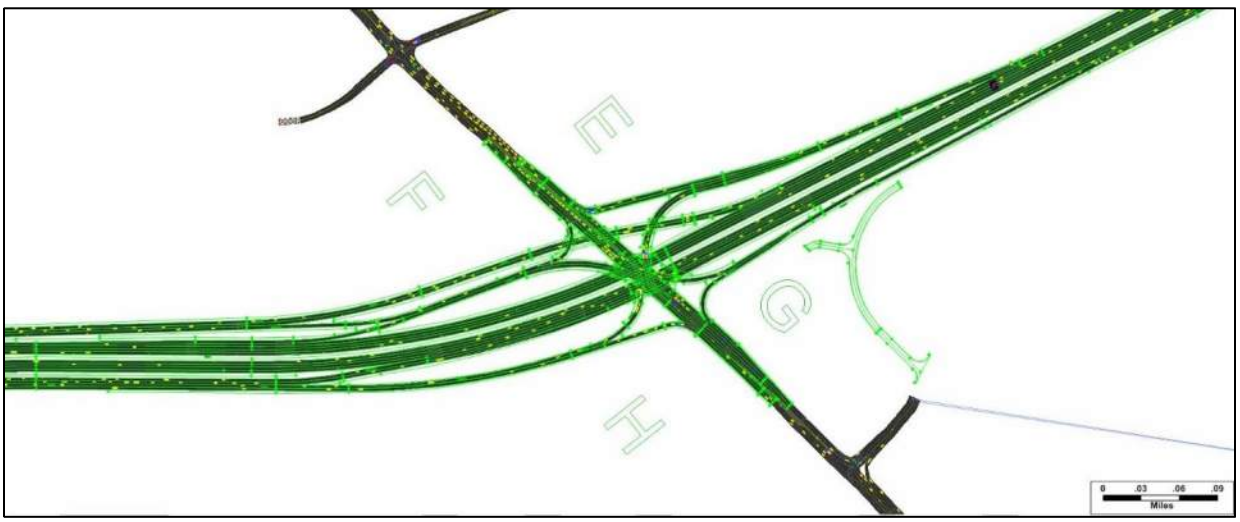
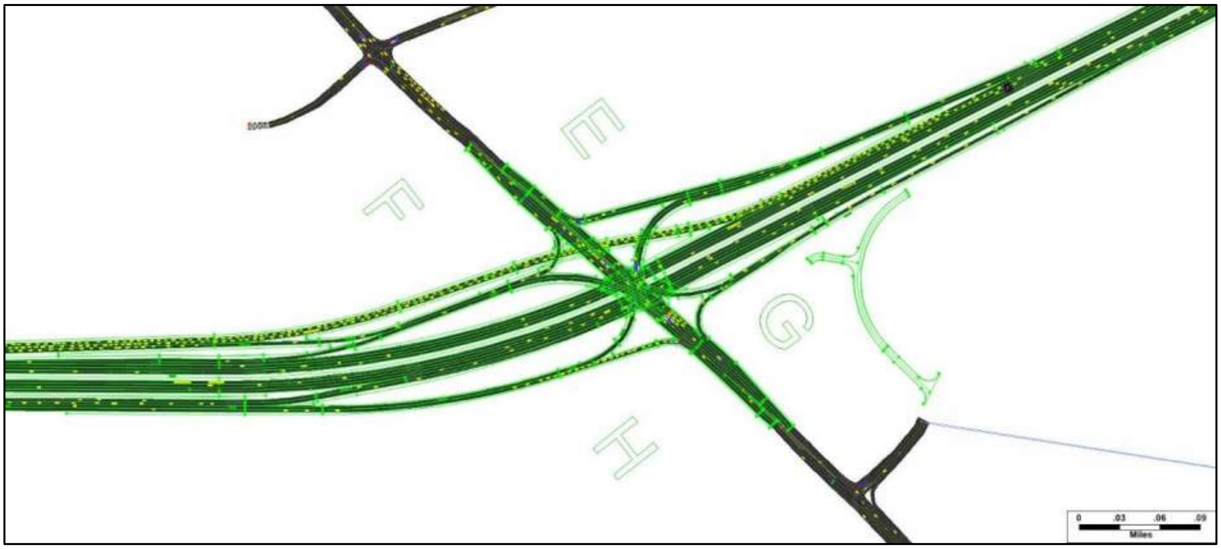


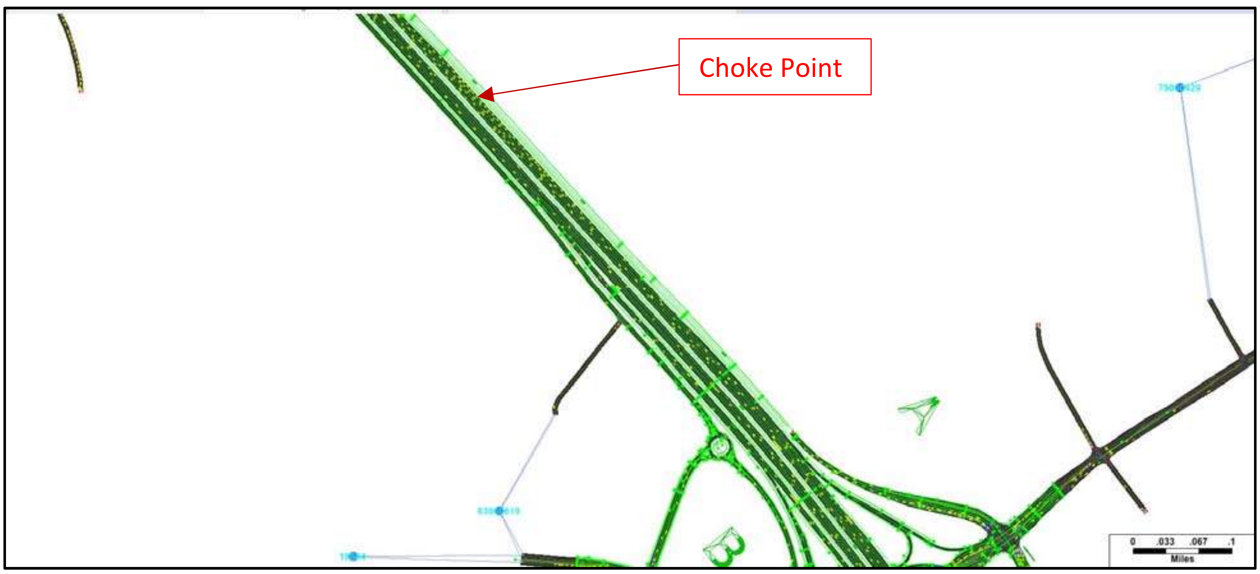
Figure 22 - Exit 65 (AO3) Simulation - PM Peak Hour



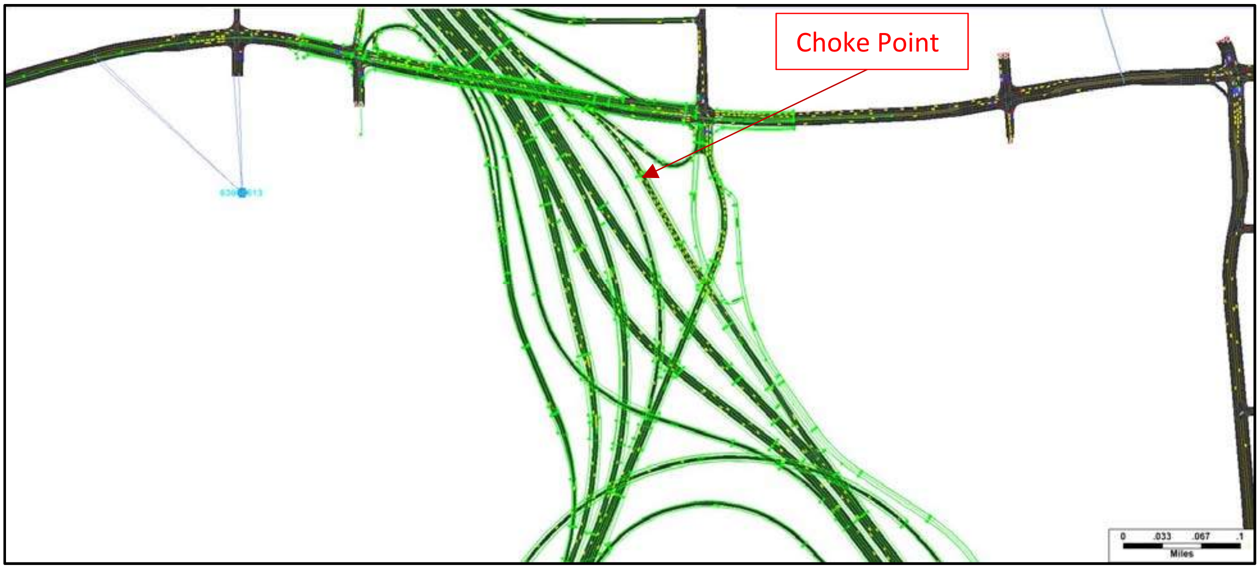
RA4 Specific Choke Points:

1. I-20 on-ramp from I-26 EB/WB lane drop prior to merge onto the mainline

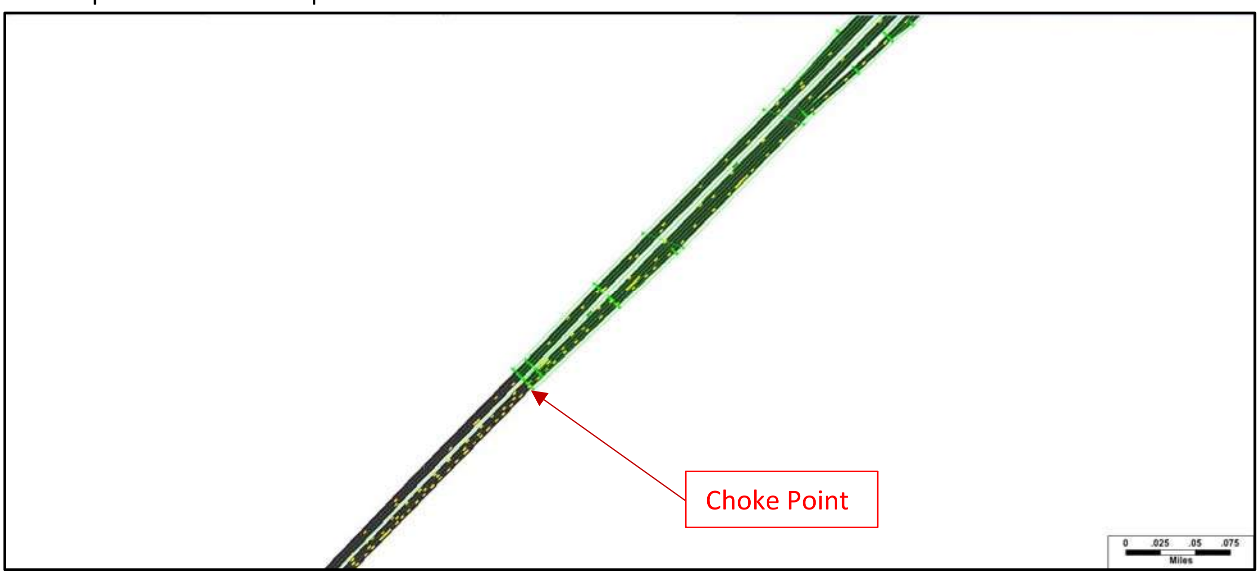
2. I-26 WB lane drop between Exit 106 and Exit 104



3. Merge Point for off-ramp from I-126 WB to I-26 C-D Road

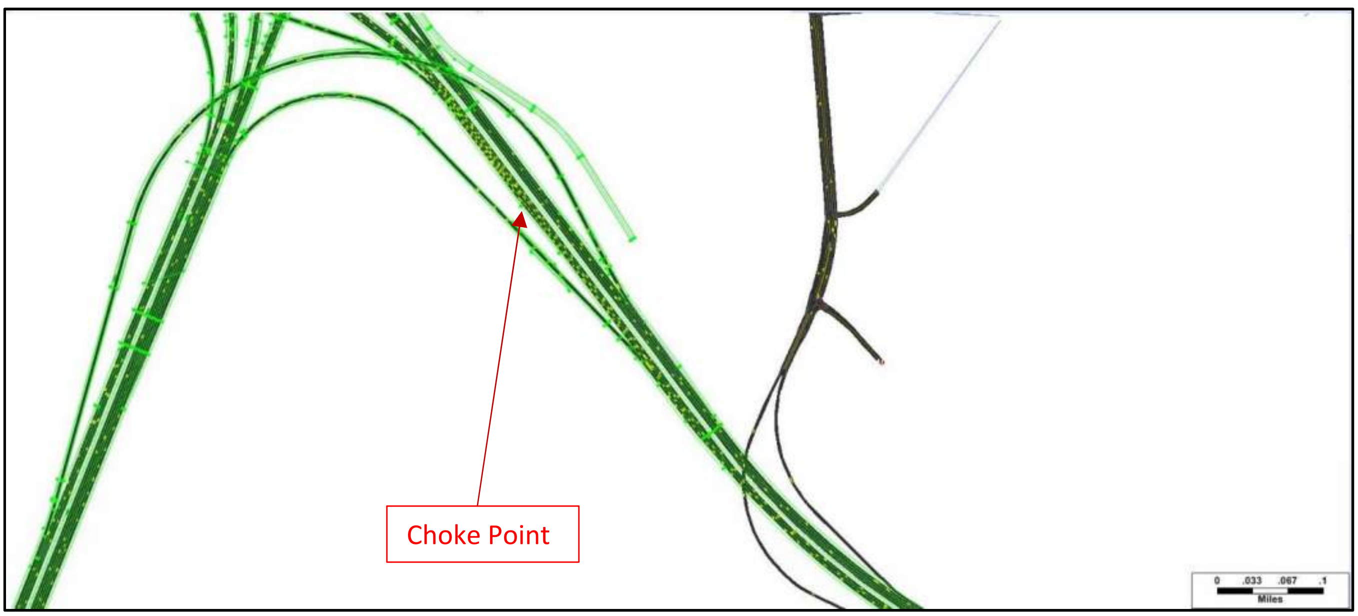


4. I-20 EB prior to C-D road split

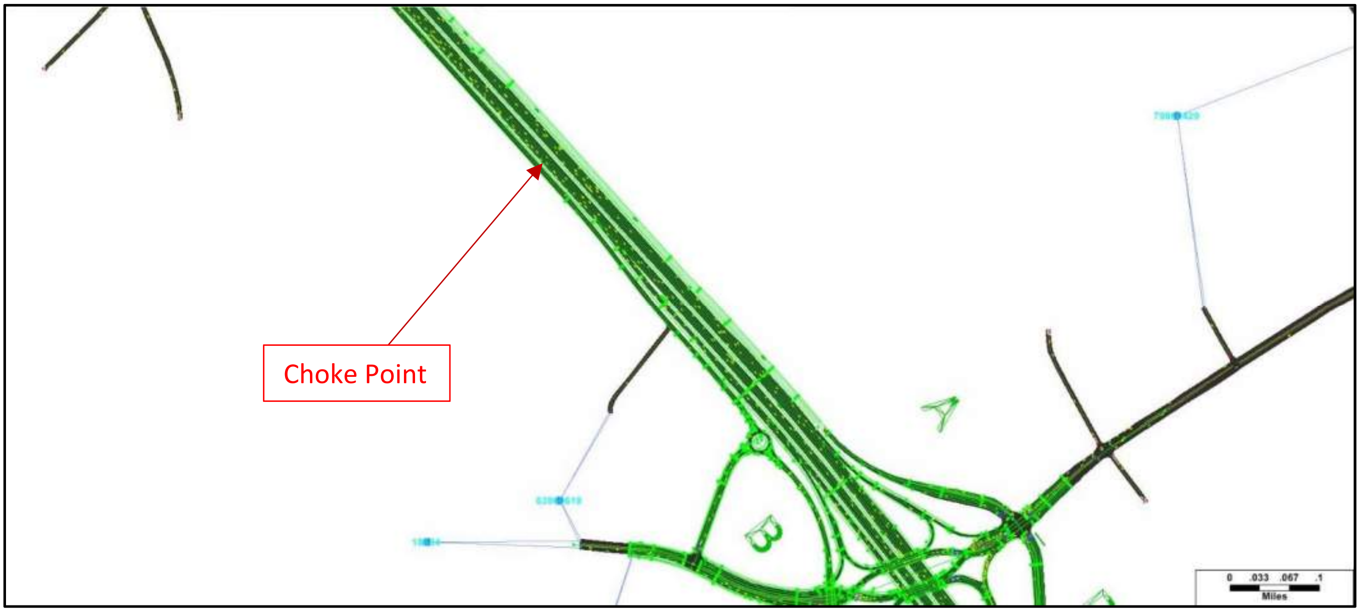


5. Weaving area at merge point between Exit 106 WB off-ramp and the I-26 WB C-D road and Choke point at lane drop on I-20 WB C-D road

6. I-126 EB bottleneck at on-ramps from I-26



7. I-26 EB prior to I-26 EB C-D off-ramp east of Exit 106



Reasonable Alternative 5 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM EB	AM WB	PM EB	PM WB	Comment
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	Under	As shown in the new .KMZ file, the westbound on-ramp acceleration lane from Exit 103 will be extended to the westbound off-ramp at Exit 102 which will increase capacity.
Exit 103-104	Over	Under	Under	Over	There is congestion on the mainline between the on-ramp at Exit 103 and downstream off-ramp at Exit 104. In new .KMZ file, the eastbound on-ramp acceleration lane from Exit 103 will be extended to the eastbound off-ramp at Exit 104 which will create a weaving section and should increase capacity. Similar issues between the westbound on-ramp from from Exit 104 to the off-ramp at Exit 103; In the new KMZ file, the ramps connect, creating a westbound weaving section that should increase capacity.
Exit 104-106	Over	Under	Over	Over	Overcapacity on the EB C-D road that goes to I-20 WB/EB ramps at Exit 107 in both the AM and PM peak hours. (In the new .KMZ file, the EB C-D Road has four lanes instead of two, which should alleviate most of the capacity issues. Heavy PM queuing at WB on-ramp merge from Exit 106. In the new KMZ file, the WB on-ramp from Exit 106 extends to the off-ramp at Exit 104, creating a weaving section that should increase capacity.
Exit 106-107	At	Under	Under	At	Heavy volume on the eastbound mainline during the AM peak hour and on the westbound mainline during the PM peak hour. However, flow is steady
Exit 107-108	Under	Under	Under	At	Heavy volume in the westbound direction during the PM peak hour. However, flow is steady
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	Under	Under	At	Over	Heavy volume along I-126 EB after the traffic from the on-ramp from I-20 EB

					merges just to the west of the Bush River Road bridge. Merge causes slower traffic flow. The New .KMZ file maintains four lanes and incorporates a new design – this should improve flow as the currently modeled section goes from four to three lanes west of the location where the I-26 WB ramp to I-126 EB merges.
Exit 63-64	Under	Under	Under	Under	The current network is missing a connection from I-26 WB to Exit 63 via I-20 WB. This and other elements of the Exit 107 interchange will be addressed in a new .KMZ file)
Exit 64-65	Under	Under	Under	Under	Ramp connections from I-20 and Exit 65 to I-26 and the Exit 107 interchange will be updated in the new .KMZ file

<u>Interchanges</u>

Exit		**AM**		**PM**		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
Exit 101	Par.Clo.	Under	Under	Under	Under	During the AM peak hour, the eastbound on-ramp queues at the merge point; however the new .KMZ file shows an acceleration lane/weaving section that should reduce or eliminate this queuing.
Exit 102	Par.Clo.	Under	Under	Under	Under	
Exit 103	AO35	Under	Under	Under	Under	
Exit 104	AO30	Under	Under	Under	Under	
Exit 106	AO13	Over	Under	Under	Over	EB right turn to the EB on-ramp experiences heavy queuing on the arterial during AM peak hour due to the heavy WB left turn to the EB on-ramp. WB left turn to the EB on-ramp experiences heavy queuing on the arterial during the PM peak hour. The westbound off-ramp also experiences heavy queuing during the PM peak hour.
Exit 107/Exit 64	AO20	At	Under	Under	Under	Heavy weaving/merging from I-26 eastbound on-ramp from I-20. This may be addressed by

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
						changes in the concept as shown in the new KMZ
Exit 108 – I-126	AO24	At	Under	Under	At	Heavy volume along I-126 EB after the traffic from the on-ramp from I-20 EB merges just to the west of the Bush River Road bridge. Merge causes slower traffic flow. The New .KMZ file maintains four lanes and incorporates a new design – this should improve flow as the currently modeled section goes from four to three lanes west of the location where the I-26 WB ramp to I-126 EB merges. Heavy volume along I-126 WB prior to merge with I-26. New .KMZ file maintains three lanes but is reduced to two lanes prior to merge with I-26. This is also reflected in the existing KMZ where two lanes from I-126 WB merge to I-26. This may have to be adjusted further to improve flow and keep traffic from backing up on I-126 WB to the Colonial Life interchange.
Exit 110	AO46	Under	Under	Over	At	Arterial experiences heavy traffic and turning queues causing backups on both the eastbound and westbound off-ramps. Further adjustments may be able to be made to signals on US 378.
Colonial Life	AO20	Under	Under	Under	Under	Will update (as shown in new .KMZ file)

Interchanges - continued

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 63	AO8	Over	Under	Over	Over	During the AM peak hour, the eastbound off-ramp experiences

Exit		AM		PM		Comment
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	
						heavy delay. Traffic control modifications may be necessary to alleviate off-ramp queuing. It should be noted in the current and new KMZ, there is no access from I-26 WB/I-126 WB to this exit. This will need to be addressed. In addition to the removal of the ramps to Bush River Road at Exit 108, vehicle paths were either exiting at Exit 106 then returning back to I-26 eastbound or taking I-20 westbound, exiting at Exit 61, then getting off at the eastbound exit ramps. Both the westbound and eastbound ramp termini experience heavy queuing because of the detoured traffic.
Exit 65	AO3	Under	Under	Under	Over	Broad River Road experiences heavy northbound queuing causing backup on the westbound off-ramps. Traffic control modifications may be necessary to alleviate off-ramp queuing.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations. The gray linework is the revised design which will be incorporated into the simulation model.

- Exit 101 (Par.Clo) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
    - AM Peak Hour – See **Figure 1** – interchange operates under capacity
    - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

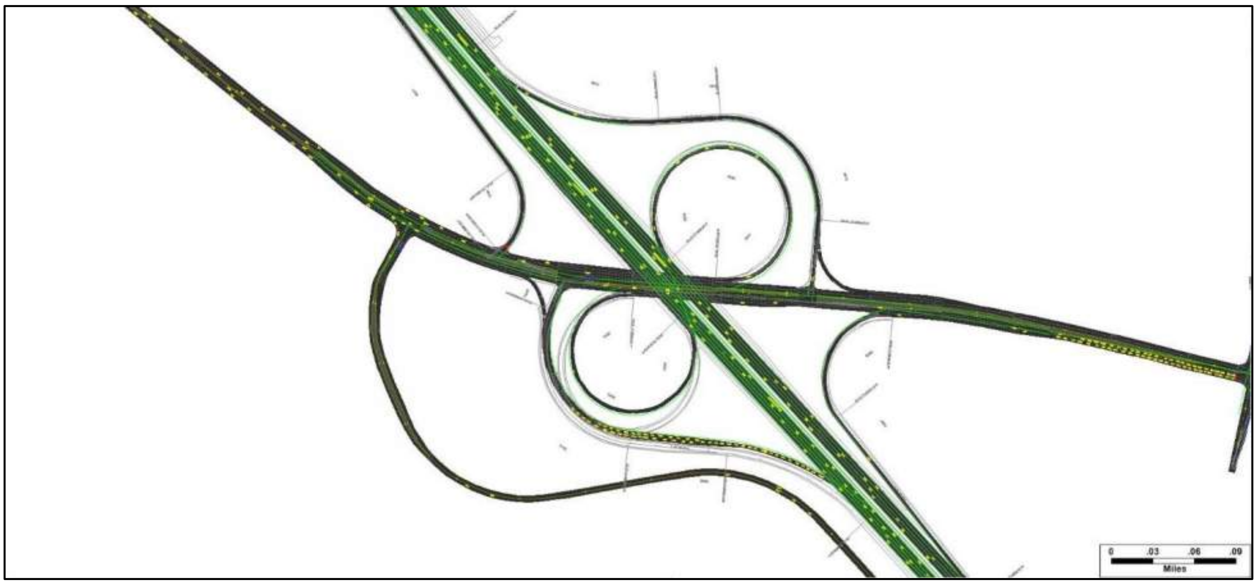
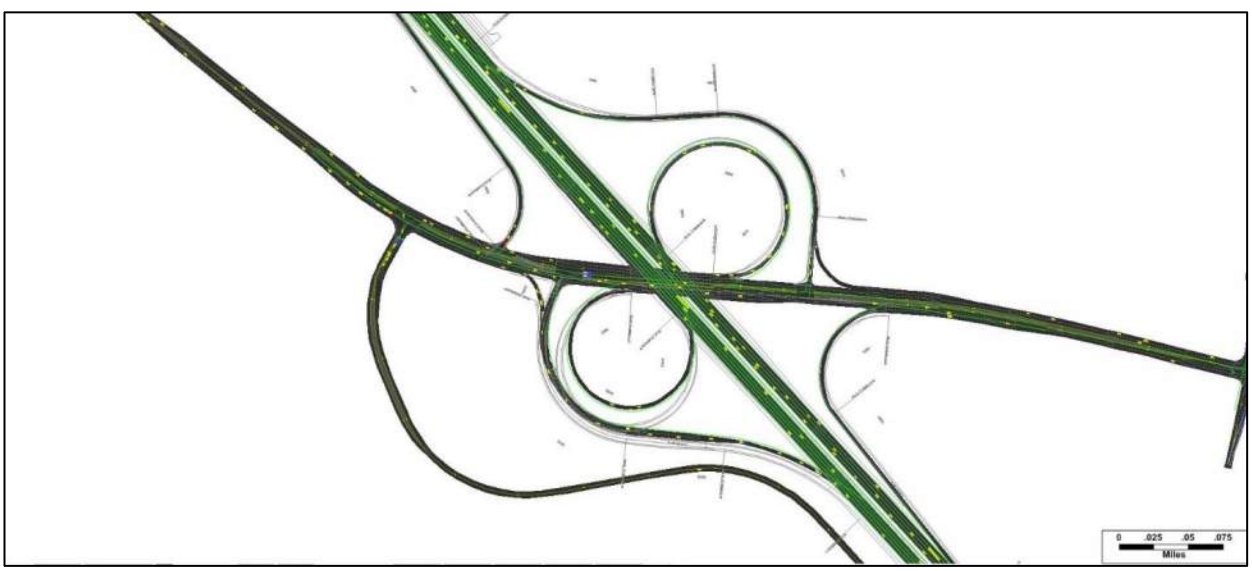


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
    - AM Peak Hour – See **Figure 3** – interchange operates under capacity
    - PM Peak Hour – See **Figure 4** – interchange operates under capacity

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

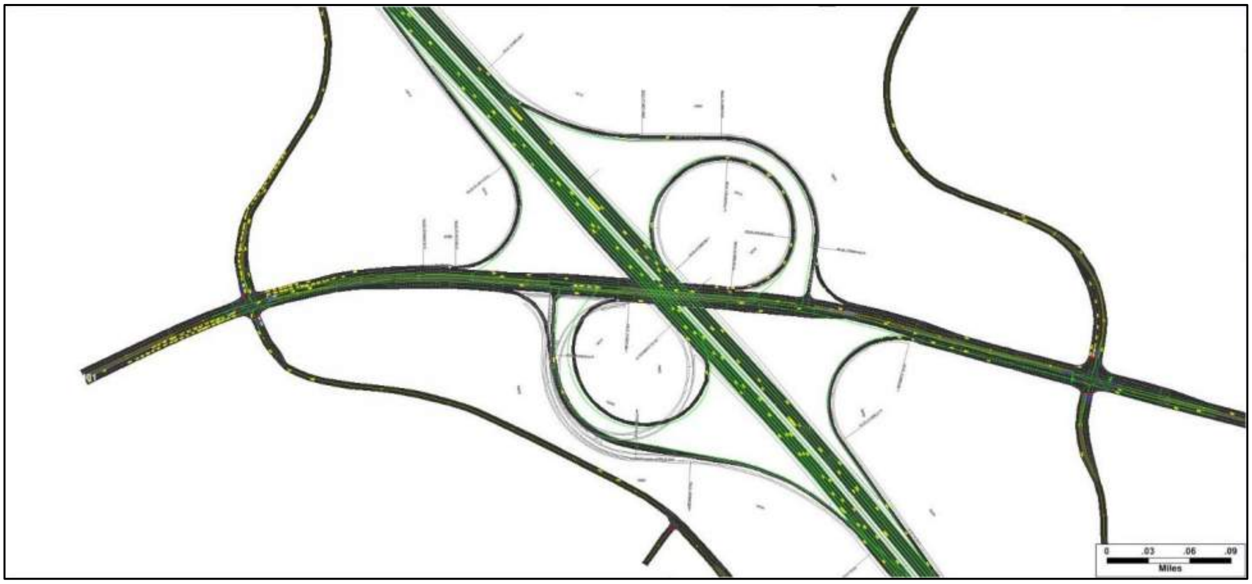
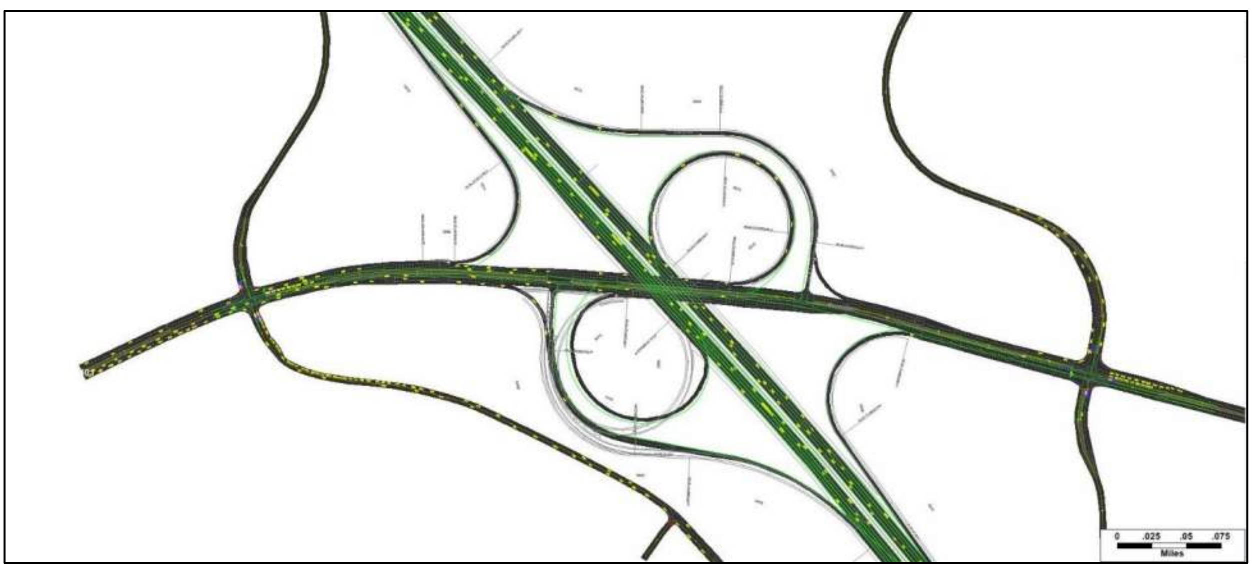


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO35) – Interchange design differs in new .KMZ file, but there should be no significant impact to operations with these changes as capacity remains the same.
    - AM Peak Hour – See **Figure 5** – interchange operates under capacity
    - PM Peak Hour – See **Figure 6** – interchange operates under capacity.

Figure 5 - Exit 103 (AO35) Simulation - AM Peak Hour

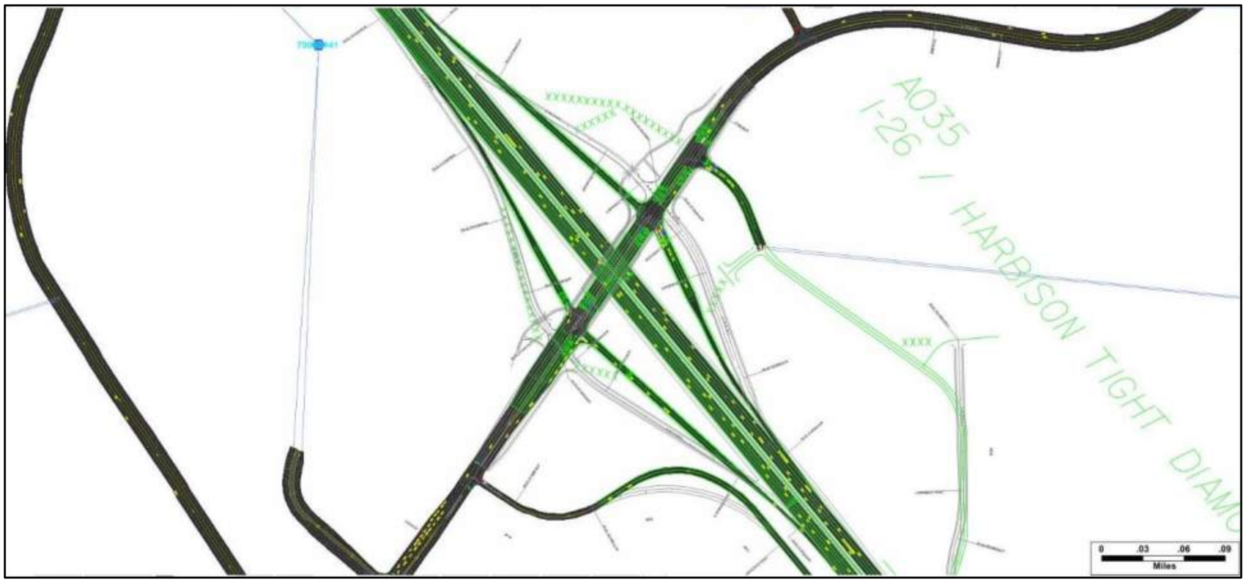


Figure 6 - Exit 103 (AO35) Simulation - PM Peak Hour

- Exit 104 (AO30) – Interchange design slightly differs in new .KMZ file, but there should be no significant impact to operations with these changes.
    - AM Peak Hour – See **Figure 7** – interchange operates under capacity at the eastbound ramps intersection. I-26 eastbound is over capacity due to off-ramp queuing from the C-D Road to Exit 106 and I-20. The new KMZ incorporates additional lane for collector-distributor off-ramp (currently modeled as two lanes).
    - PM Peak Hour – See **Figure 8** – interchange operates under capacity

Figure 7 - Exit 104 (AO30) Simulation - AM Peak Hour

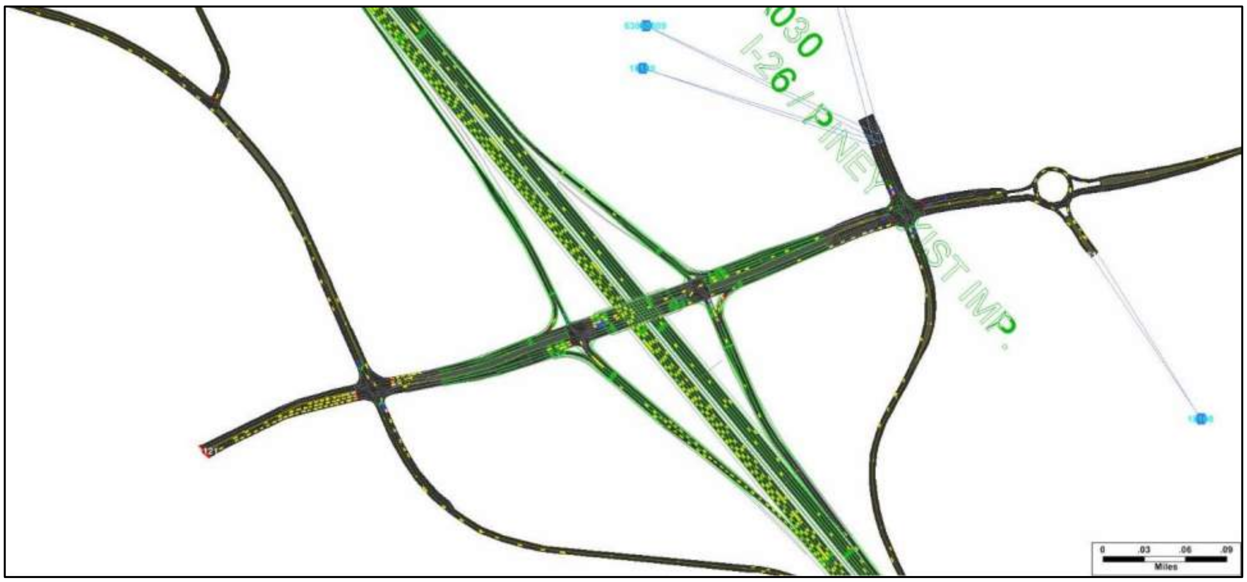
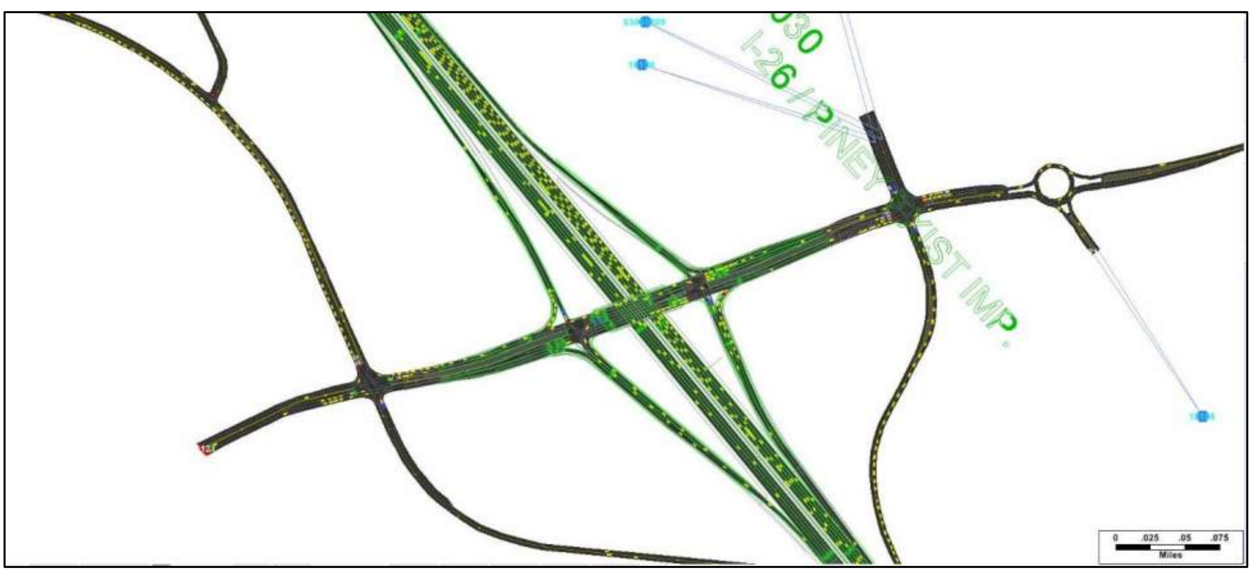


Figure 8 - Exit 104 (AO30) Simulation - PM Peak Hour



- Exit 106 (AO13) – Interchange design differs in new .KMZ file. The SPUI ramps are pushed out towards the existing ramps in new KMZ. Also, the new KMZ shows a wider arterial footprint within the interchange. Revised runs will need to be completed to see how these changes improve capacity. Fernandina/Burning Tree existing configuration maintained both KMZ.
    - AM Peak Hour – See **Figure 9** – interchange operates over capacity at the eastbound ramps intersection. An additional EB right turn lane onto EB I-26 was added for capacity. Interchange operates at capacity at the westbound ramps intersection. Dual WB left turn movement from St Andrews to the EB on-ramp was included in the simulation network.
    - PM Peak Hour – See **Figure 10** – interchange operates over capacity at the WB dual left turns onto I-26 eastbound.

Figure 9 - Exit 106 (AO13) Simulation - AM Peak Hour

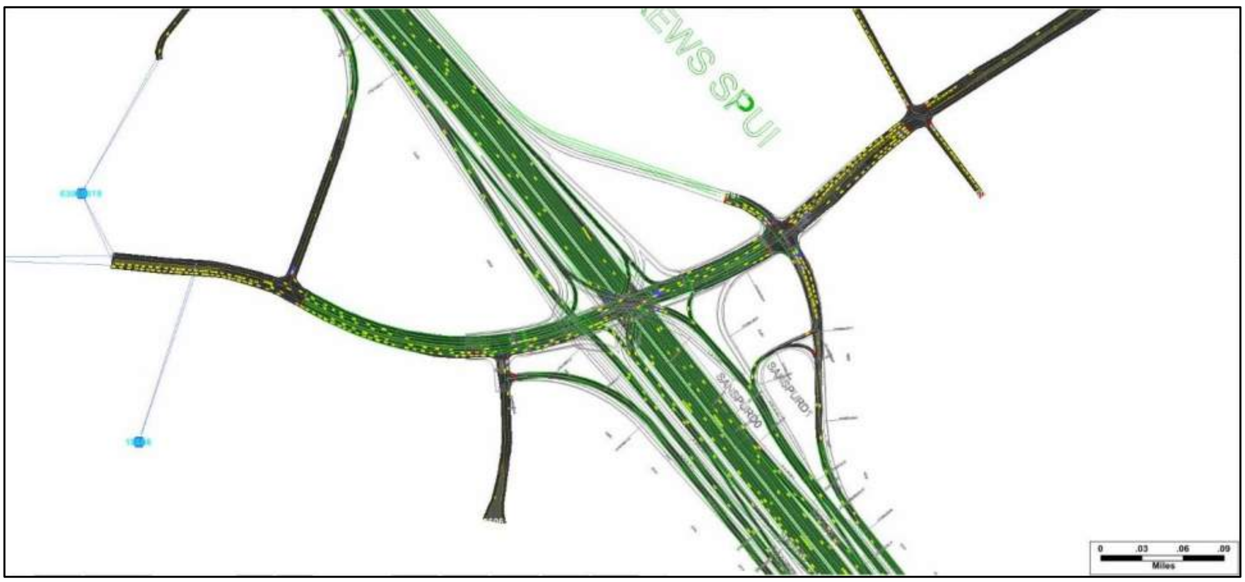
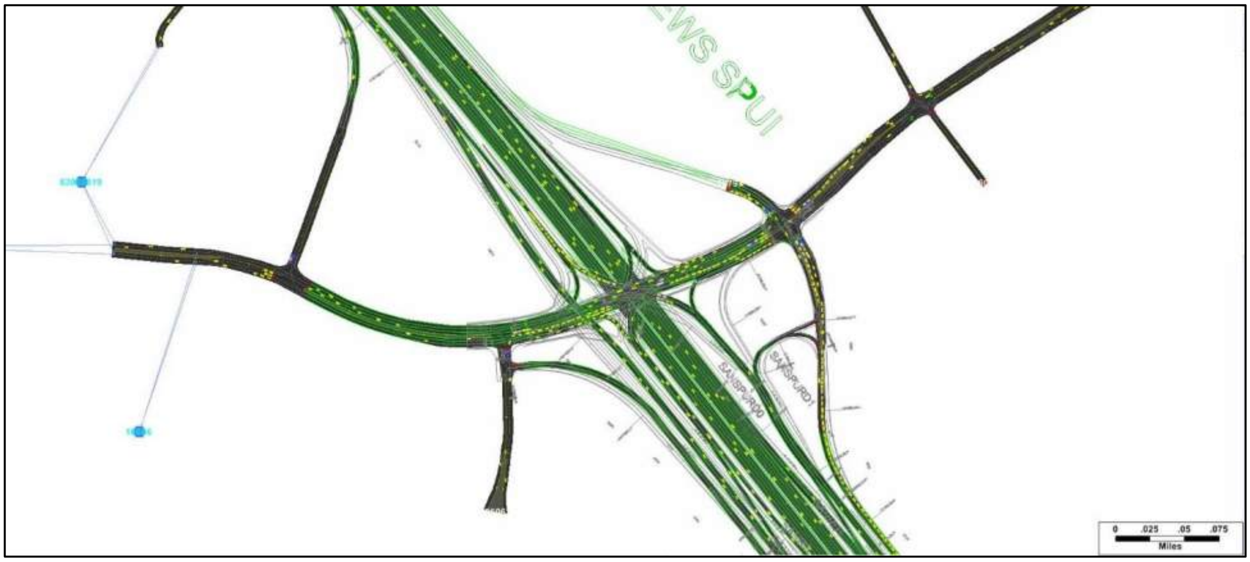


Figure 10 - Exit 106 (AO13) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO20) – Interchange design slightly differs in new .KMZ file. Revised runs will need to be completed to see if there are any additional capacity issues. Also need to address providing access to Exit 63 from WB I-26.
    - AM Peak Hour – See **Figure 11** – The I-26 eastbound on-ramp from I-20 WB is at capacity but experiences weaving issues where the I-20 EB to I-26 EB ramp and the C-D Road to EB I-126 meet.
    - PM Peak Hour – See **Figure 12** – interchange operates under capacity.

Figure 11 - Exit 107/Exit 64 (AO20) Simulation - AM Peak Hour

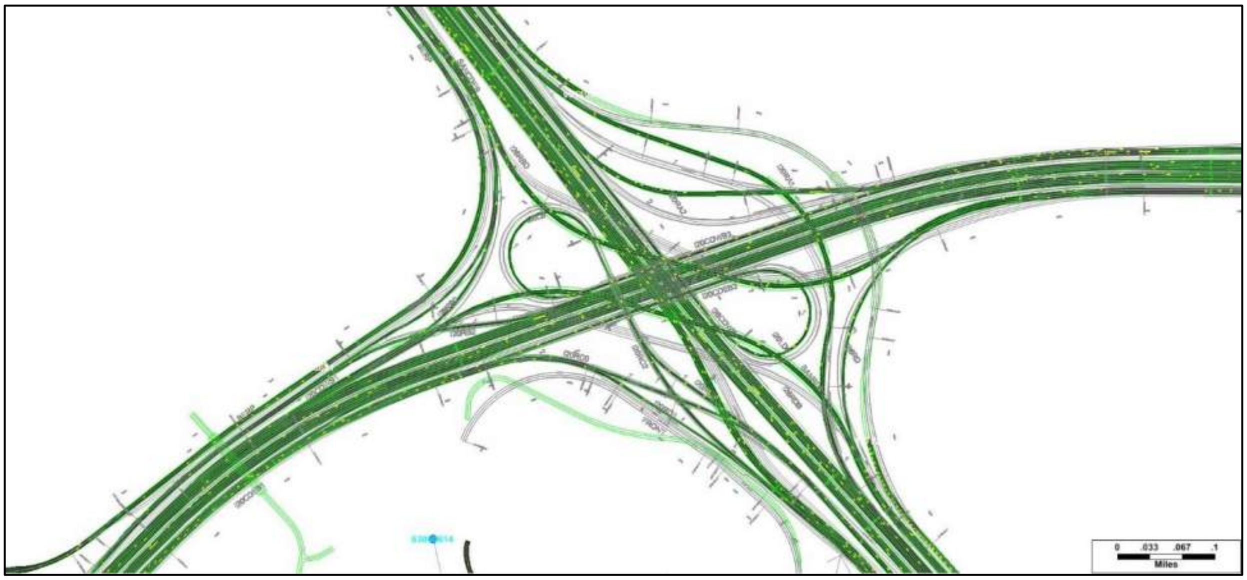
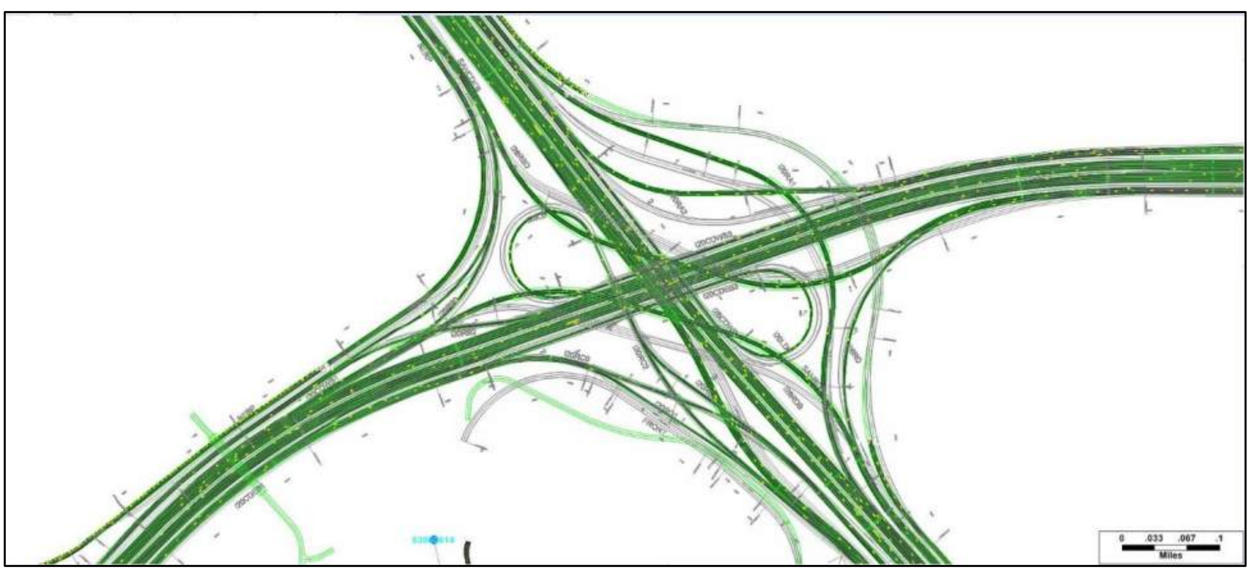


Figure 12 - Exit 107/Exit 64 (AO20) Simulation - PM Peak Hour



Exit 108 (I-126) – The revised KMZ file shows significant modifications to the ramp alignments and split locations. Revised runs will need to be completed to see if there are any additional capacity issues.

- AM Peak Hour – See **Figure 13** – I-126 eastbound operates at capacity. An additional lane to EB I-126 is added in new .kmz file and should improve flow.
- PM Peak Hour – See **Figure 14** – I-126 westbound operates at capacity. Additional lane added in new .kmz file which should improve flow, but I-126 WB still merges into I-26 WB with two lanes (narrowing from three) similar to the existing KMZ. It may be necessary to add another lane to improve flow and keep WB traffic on I-126 from backing up to the Colonial Life interchange, .

Figure 13 - Exit 108 (I-126) Simulation - AM Peak Hour

Figure 14 - Exit 108 (I-126) Simulation - PM Peak Hour

- Exit 110 (AO46) – no geometric changes
  - AM Peak Hour – See **Figure 15** – Interchange operates at capacity at the eastbound ramp termini. The westbound off-ramp termini queues.
  - PM Peak Hour – See **Figure 16** – Interchange operates over capacity at the I-26 westbound off-ramp due to the arterial queuing along US 378.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

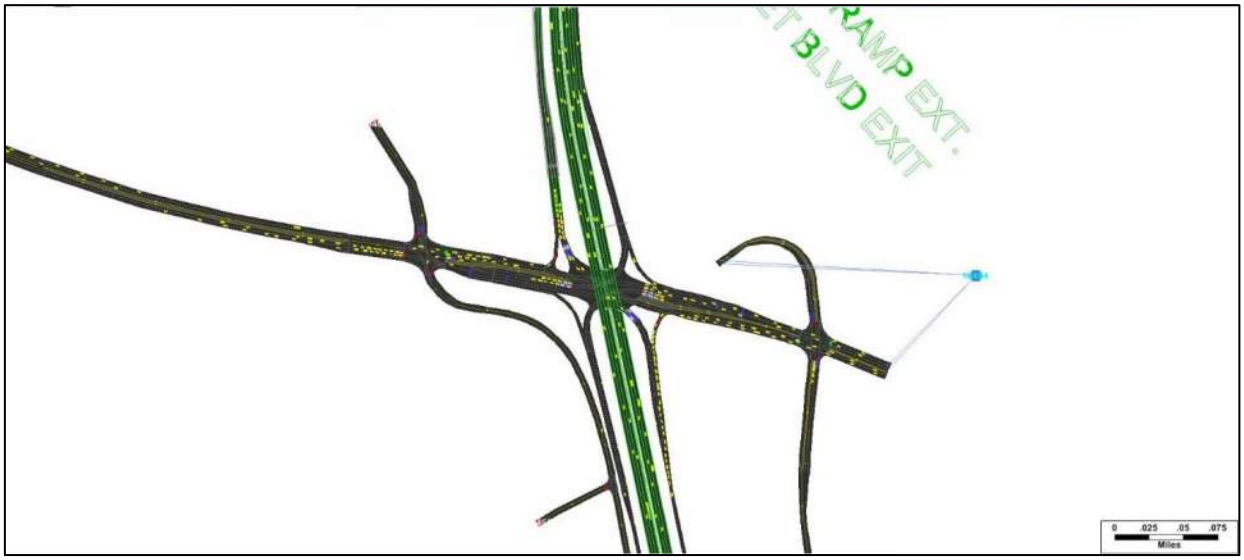
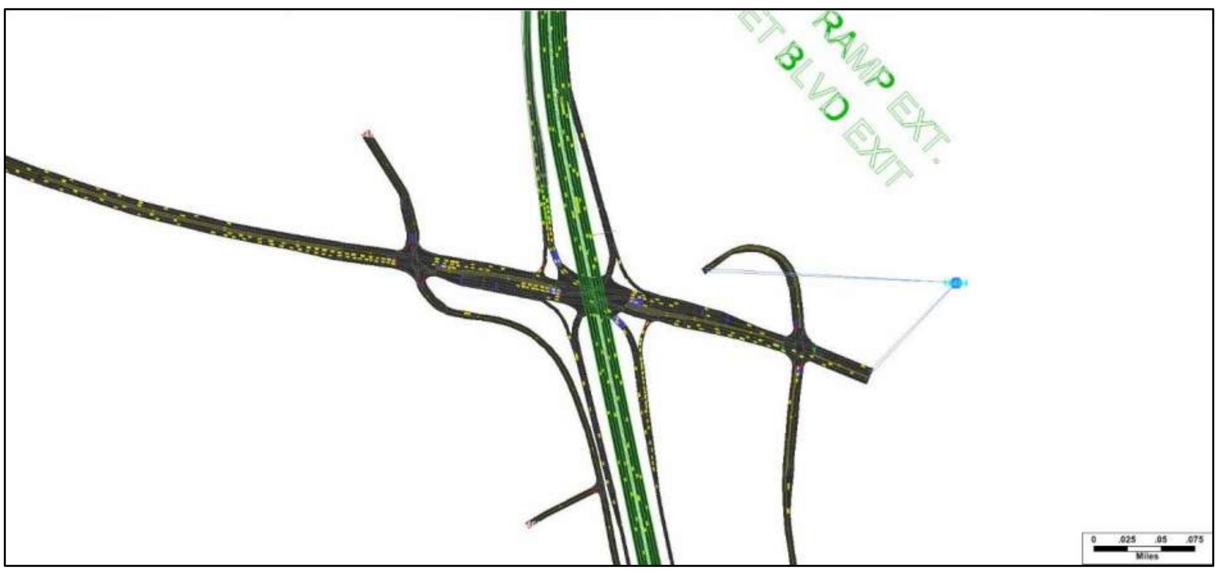


Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard – The revised KMZ file shows significant interchange modifications at Colonial Life Boulevard. Revised runs will need to be completed to see if there are any additional capacity issues.
  - AM Peak Hour – See **Figure 17** – Interchange operates under capacity with installation of signal.
  - PM Peak Hour – See **Figure 18** – Interchanges operates at capacity with installation of signal. Without a signal, the Colonial Life Boulevard arterial in the southbound direction will queue to Bush River Road.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

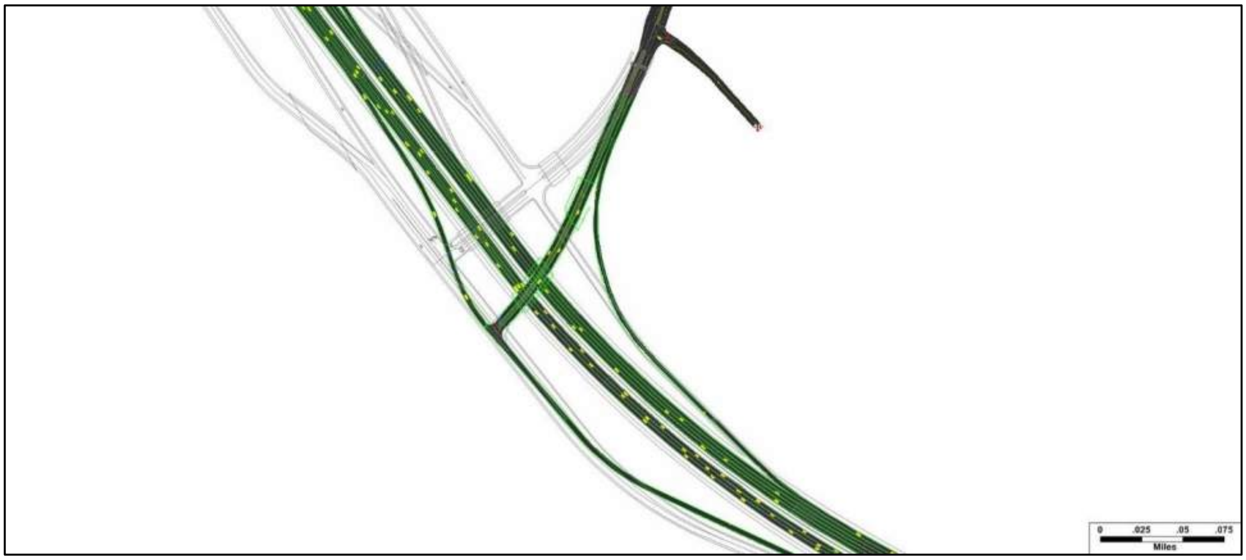
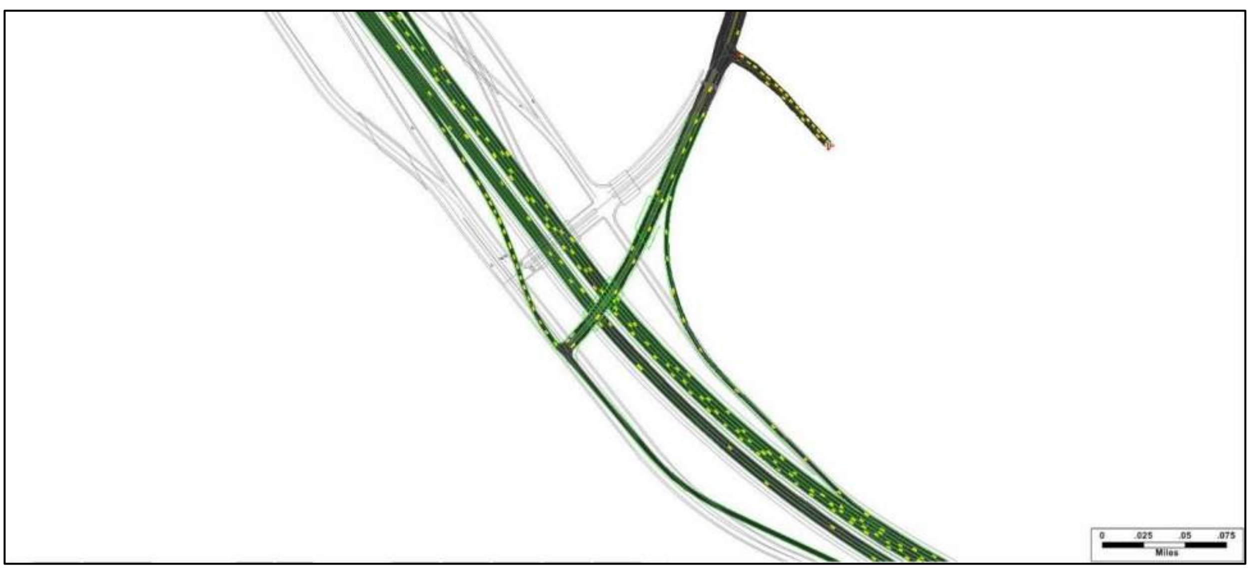


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO8) – Interchange design similar to new .KMZ file.
  - AM Peak Hour – See **Figure 19** – interchange operates over capacity at the eastbound off-ramp termini. Currently, the northbound right turn operates under signal control with no right turn on red. Traffic signal timing modifications may help the intersection operation.
  - PM Peak Hour – See **Figure 20** – interchange operates over capacity.
  - It should be noted, based on this alternative design, there is no access from I-26 WB/I-126 WB to this exit. In addition to the closure of the Bush River Road exits, it was observed that most vehicle paths on I-26 westbound with a destination to Bush River Road at Exit 63 were using I-20 westbound, making a u-turn at Exit 61, then exiting at the eastbound off-ramps. Both the westbound and eastbound ramp termini experience heavy queuing because of this detoured traffic.

Figure 19 - Exit 63 (AO6) Simulation - AM Peak Hour

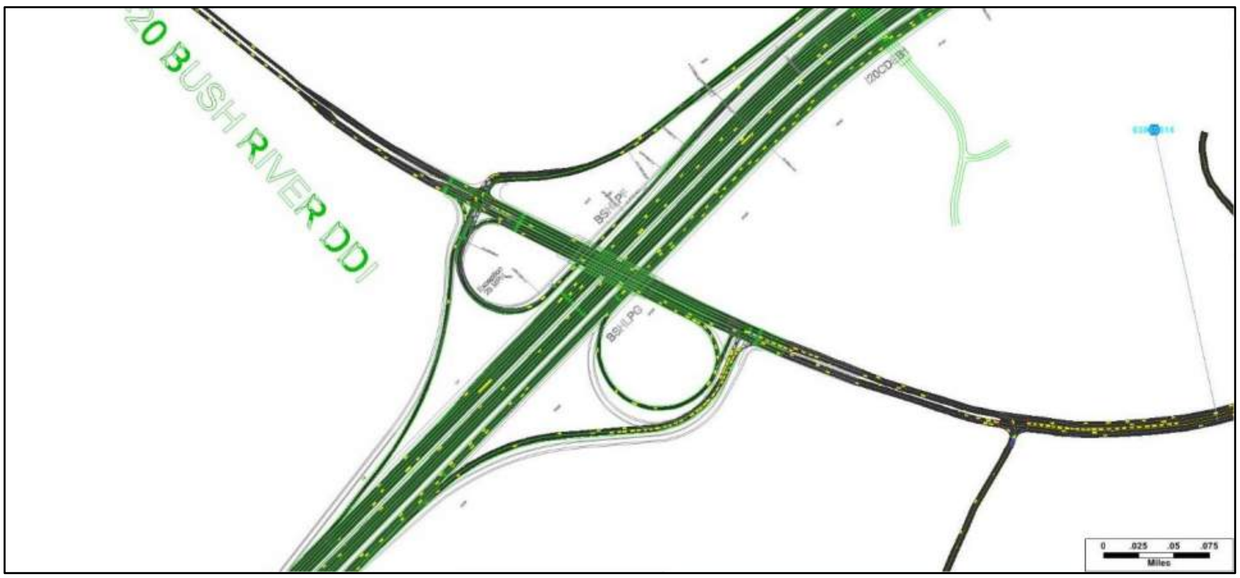
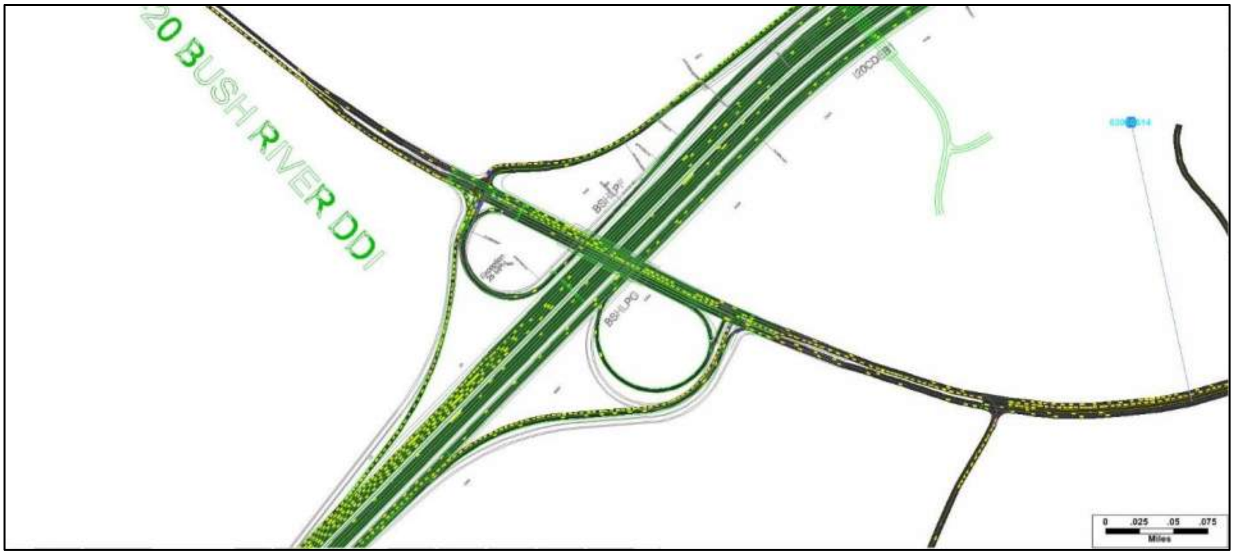
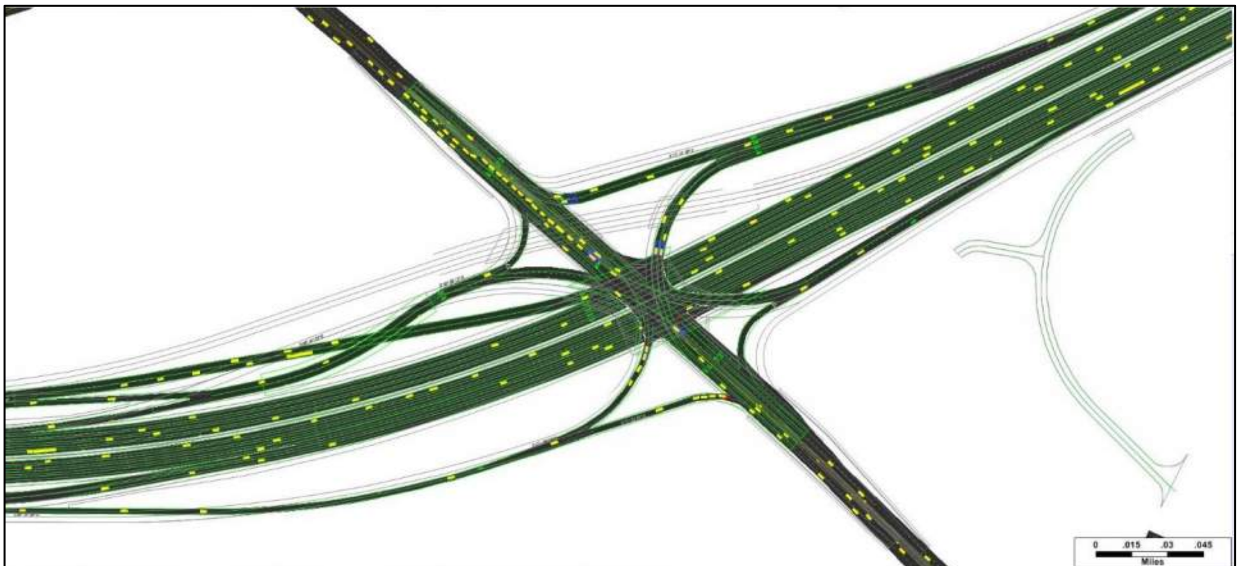


Figure 20 - Exit 63 (AO6) Simulation - PM Peak Hour



- Exit 65 (AO3) – The revised KMZ file shows significant interchange modifications to the ramps from Exit 65 and from I-20 WB towards the system interchange at Exit 107. Revised runs will need to be completed to see if these difference result in any capacity issues.
  - AM Peak Hour – See **Figure 21** – interchange operates at capacity. The southbound left turn onto I-20 eastbound experiences moderate queuing on dual left turn lanes.
  - PM Peak Hour – See **Figure 22** – interchange operates over capacity. Major queuing on the I-20 eastbound off-ramp due to stop sign control on the right turn movement. Adapting this to signal control may improve operations.

Figure 21 - Exit 65 (AO6) Simulation - AM Peak Hour



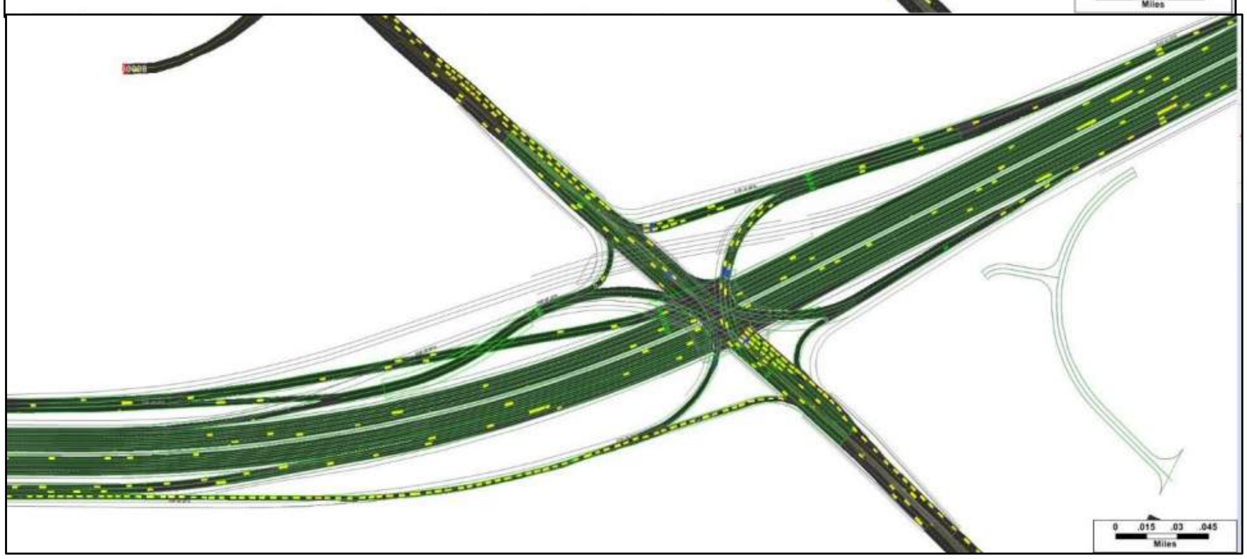
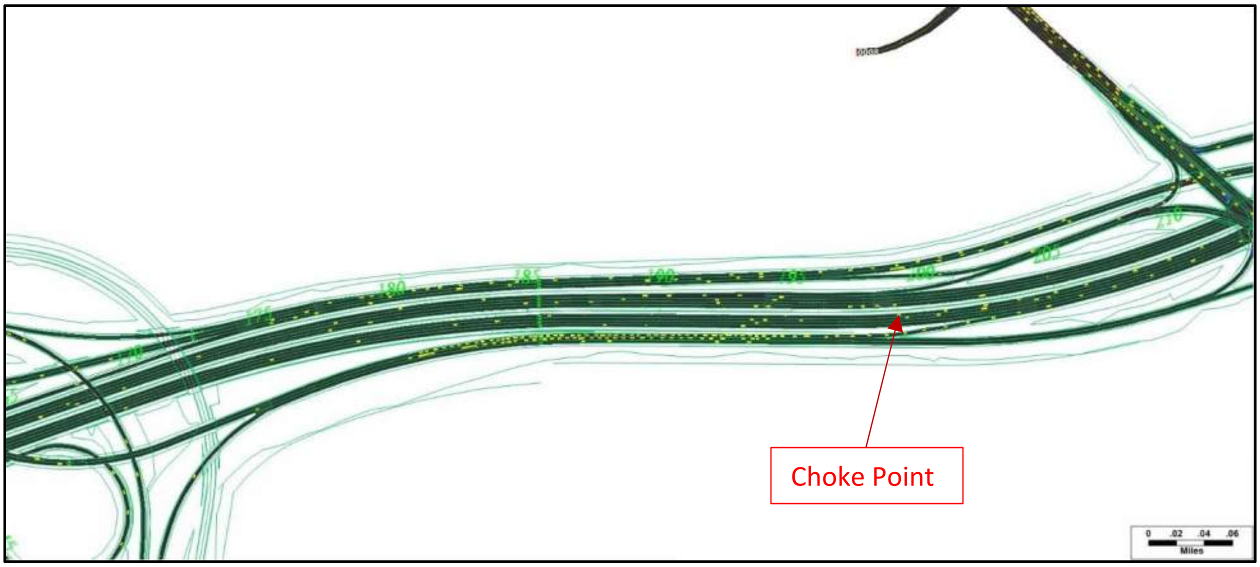


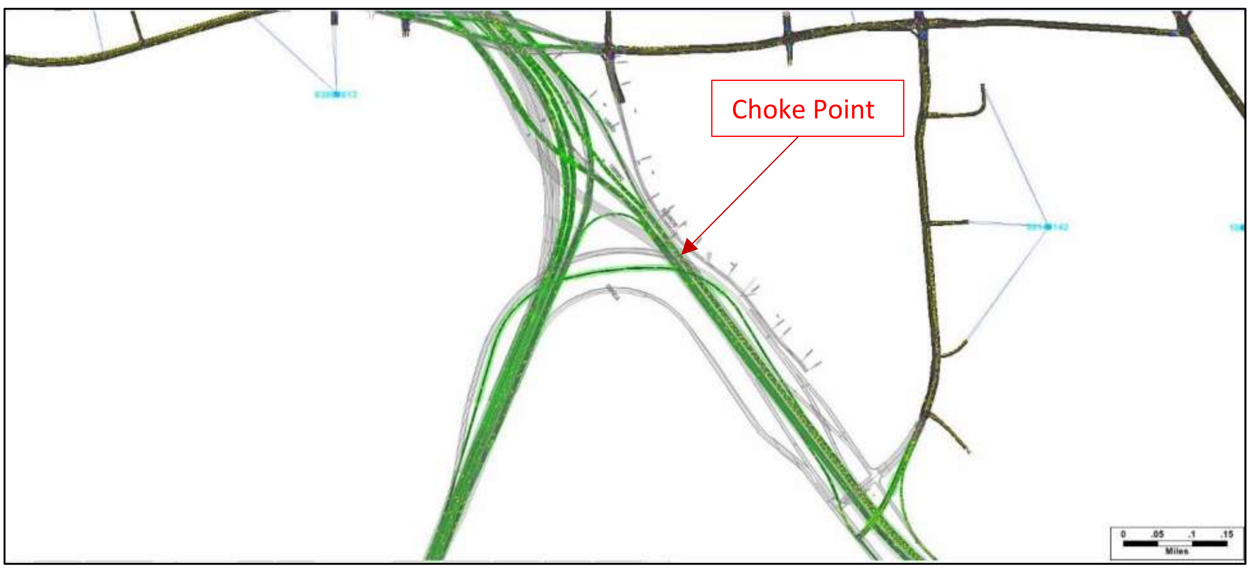
Figure 22 - Exit 65 (AO3) Simulation - PM Peak Hour

RA5 Specific Choke Points:

1. I-20 EB C-D on-ramp to I-20 WB, only one lane onto I-20 EB mainline



2. I-126 WB prior to merge with I-26 WB mainline



Reasonable Alternative 6 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	Under	
Exit 103-104	Over	Under	Under	Under	Severe congestion is observed on the mainline in the eastbound direction during the AM peak hour. In the new .KMZ file, the connection between I-26 and I-20 is provided via an eastbound C-D Road. Traffic is diverted to this C-D Road west of Exit 106 and merged back to I-20 east of Exit 65 (There is no direct connection to the mainline in between). The C-D Road doesn't have the capacity to carry this high traffic volume and also has multiple lane drops at close proximity. These cause severe queuing that propagates all the way back to Exit 103.
Exit 104-106	Over	Under	Over	Over	Severe congestion is observed on the mainline in the eastbound direction during the AM peak hour. In the new .KMZ file, the connection between I-26 and I-20 is provided via an eastbound C-D Road. Traffic is diverted to this C-D Road west of Exit 106 and merged back to I-20 east of Exit 65 (There is no direct connection to the mainline in between). The C-D Road doesn't have the capacity to carry this high traffic volume and also has multiple lane drops at close proximity. These cause severe queuing that propagates all the way back to Exit 103. During the PM peak hour, the EB C-D Road carries volume towards I-20 and I-126 which causes major queuing on the EB I-26 mainline.
Exit 106-107	Under	Under	Under	At	Over capacity on the EB C-D road that goes to I-20 WB/EB ramps at Exit 107 in the AM peak hour. Mainline operates well.

					During the PM peak hour. WB traffic weaving on the short segment from where the ramps from I-20 EB and I-20 WB meet prior to Exit 106 and then separate to exit to the mainline WB I-26 or to Exit 106, weaving slows traffic and causes moderate congestion.
Exit 107-108	Under	Under	Under	At	
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	Under	Under	At	Over	In the PM peak, heavy volume along I-126 WB and I-26 WB where the two roadways meet under Bush River Road experiences congestion due to the weaving movement of WB I-26 traffic shifting to the right to the ramp that leads to Exit 106 and the WB I-126 traffic shifting to the left to continue on mainline WB I-26.
Exit 63-64	Under	Under	Under	Under	Mainline sections operate under capacity in both peak hours. The westbound C-D Road, which carries traffic from the ramp from I-26 EB to I-20 WB, traffic from the WB on-ramp from Exit 65, and traffic from I-20 WB that enters the C-D road east of Exit 65 is operating over capacity. Additionally, the WB C-D Road design includes closely spaced merge areas that reduce three lanes to the one lane entering I-20 WB. As a result, severe queuing was observed on both the C-D Road and the System Ramp from WB I-26 to WB I-20. Increased capacity and the elimination of the bottlenecks may reduce congestion and improve traffic operation.
Exit 64-65	Under	Under	Under	Under	Mainline sections operate under capacity in both peak hours. Traffic on the two lane I-26 eastbound System Ramp splits to provide a single lane to EB I-20 and to Exit 65. The portion of the ramp entering EB I-20 merges from two lanes to one lane west of Exit 65. This bottleneck causes

					congestion and results in upstream back-ups. Increased capacity and the elimination of the bottlenecks may reduce congestion and improve traffic operation.

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	AO43	Under	Under	Under	Under	
Exit 102	AO42	Under	Under	Under	Under	
Exit 103	AO37	Under	Under	Under	Under	Moderate queuing is observed on the WB Off-ramp during the AM peak hour.
Exit 104	AO31	Under	Under	Under	Under	During the AM peak hour, congestion on the EB mainline causes queues to be observed backing up onto the EB on-ramp from Exit 104
Exit 106	AO14	Over	Over	Under	Under	During the AM peak hour, queue backups on the EB C-D Road causes eastbound on-ramp traffic from Exit 106 to back up all the way to the interchange and block access to the ramp for both the EB right and WB left turns on St Andrews Road. The WB left turn queue on St Andrews Road propagates beyond the DDI interchange and blocks access for the WB Off-ramp left turn traffic to St Andrews Road. Increased capacity and the elimination of bottleneck on the C-D Road may reduce congestion and improve traffic operation.
Exit 107/Exit 64	AO19	Over	Under	Under	Over	During the AM peak hour, heavy weaving and merging was observed on the C-D Road from the EB I-26 System Ramp to EB I-20. This causes severe congestion along the C-D Road with queues backing up to Exit 103 on the EB I-26 mainline. Congestion on the Eastbound C-D Road was also observed during the PM peak hour. However, the queue backup does not extend beyond the merge point between the I-26

Exit		AM		PM		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
						EB System Ramp and the EB C-D Road to EB I-20.. Lack of capacity, merging and weaving problems on the westbound C-D Road from the I-26 system ramps to the merge into I-20 WB west of Exit 63 is congested during the PM peak hour. Increased capacity and the elimination of bottlenecks may reduce congestion and improve traffic operation.
Exit 108 – I-126	AO24	Under	Under	Under	Under	During the PM peak hour, heavy volume along I-126 WB merges with the traffic from the on-ramp from I-26 WB just to the west of the Bush River Road bridge. The merge causes slower traffic flow. This also cause moderate queuing on WB I-126 which extends beyond Colonial Life Boulevard.
Exit 110	AO47	Under	Under	Over	Over	Arterial experiences heavy traffic and turning queues are causing backups on both the eastbound and westbound off-ramps. Further adjustments may be able to be made to the signals on US 378.
Colonial Life	AO19	Under	Under	Under	Under	Queuing issues were observed during the AM peak hour on both the EB C-D Road and SB Colonial Life Boulevard. A left turn lane on the C-D Road at the intersection may improve traffic operation further.

Interchanges - continued

Exit		AM		PM		
Location	**AO**	**EB Ramp**	**WB Ramp**	**EB Ramp**	**WB Ramp**	**Comment**
Exit 63	AO7	Under	Under	Over	Over	Severe queuing was observed on the westbound Off-and On-Ramp during the PM peak hour. The WB On-ramp congestion is caused by merging at the ramp terminus on the mainline.
Exit 65	AO5	Over	Over	Under	Over	During the PM peak hour, the merging of the EB on-ramp traffic on to EB I-20 creates a major backup on the EB On-ramp and blocks southbound left turn traffic from Broad River Road from entering the EB On-ramp.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations.

- Exit 101 (AO43)
    - AM Peak Hour – See **Figure 1** – interchange operates under capacity
    - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (AO43) Simulation - AM Peak Hour

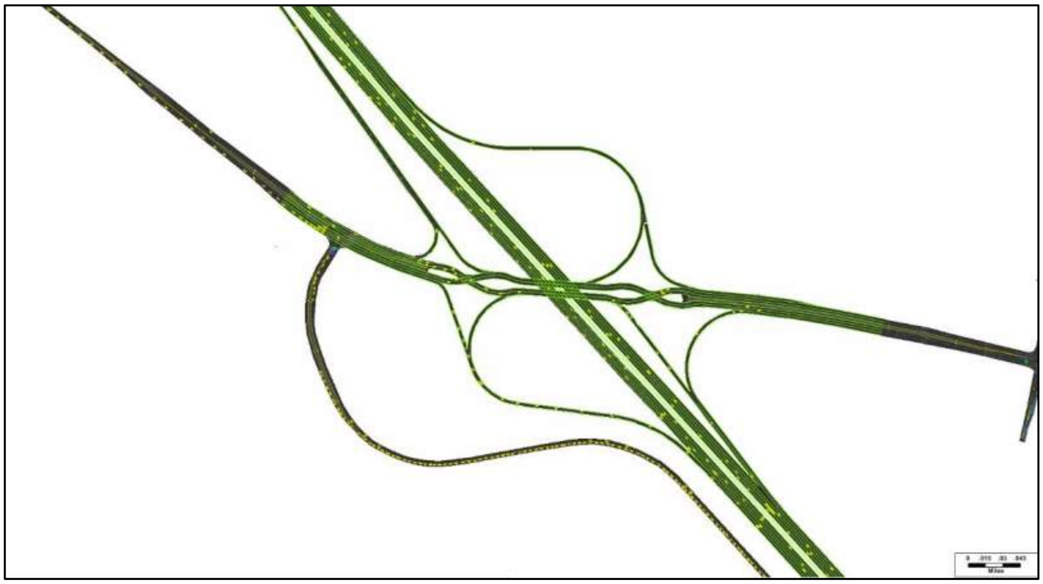
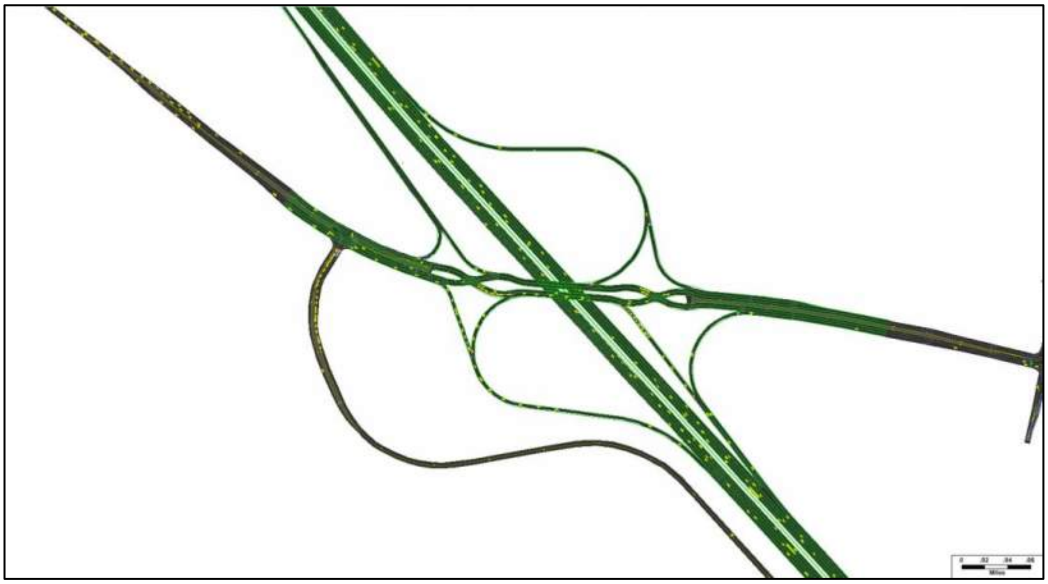


Figure 2 - Exit 101 (AO43) Simulation - PM Peak Hour



- Exit 102 (AO42)
  - AM Peak Hour – See **Figure 3** – interchange operates under capacity
  - PM Peak Hour – See **Figure 4** – interchange operates under capacity

Figure 3 - Exit 102 (AO42) Simulation - AM Peak Hour

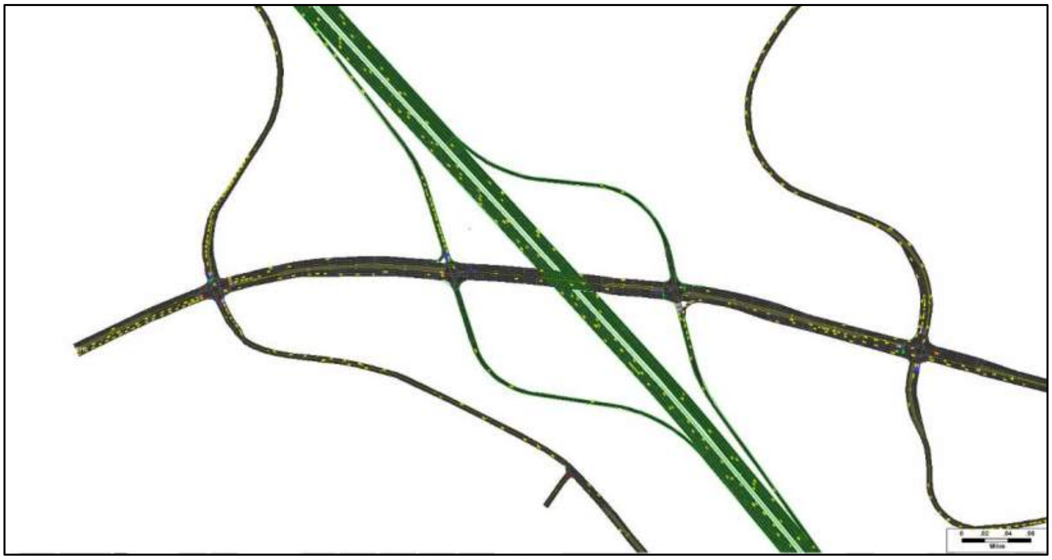
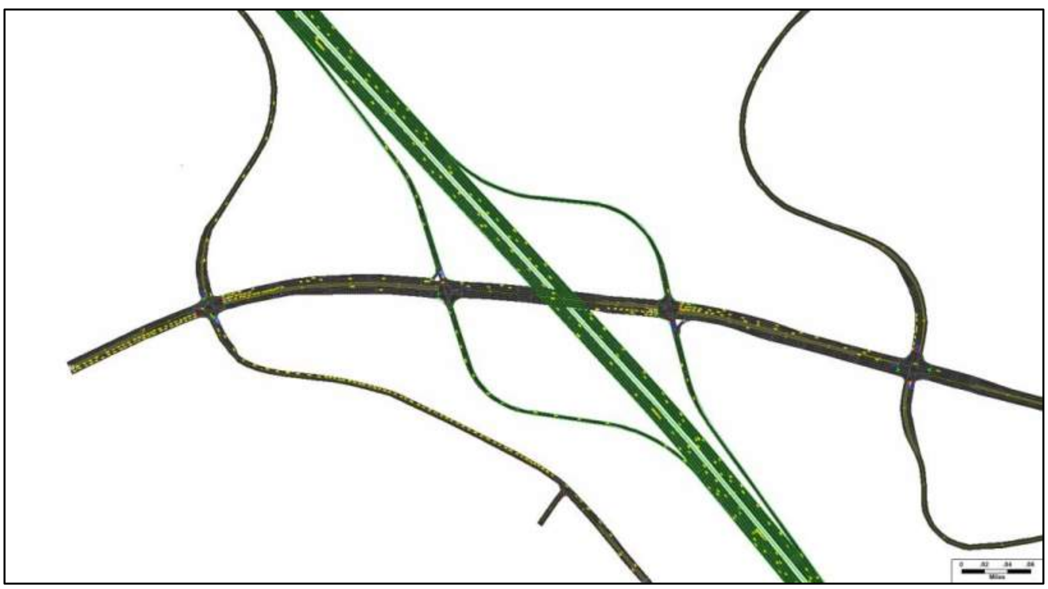


Figure 4 - Exit 102 (AO42) Simulation - PM Peak Hour



- Exit 103 (AO37)
    - AM Peak Hour – See **Figure 5** – interchange operates under capacity. I-26 eastbound is operating over capacity due to off-ramp queuing from the C-D Road to Exit 106 and I-20. Queuing is also observed at the EB On-ramp merge area
    - PM Peak Hour – See **Figure 6** – interchange operates under capacity. Moderate queuing occurs on the WB Off-ramp due to the signal operation. Traffic signal modifications may address this issue.

Figure 5 - Exit 103 (AO37) Simulation - AM Peak Hour

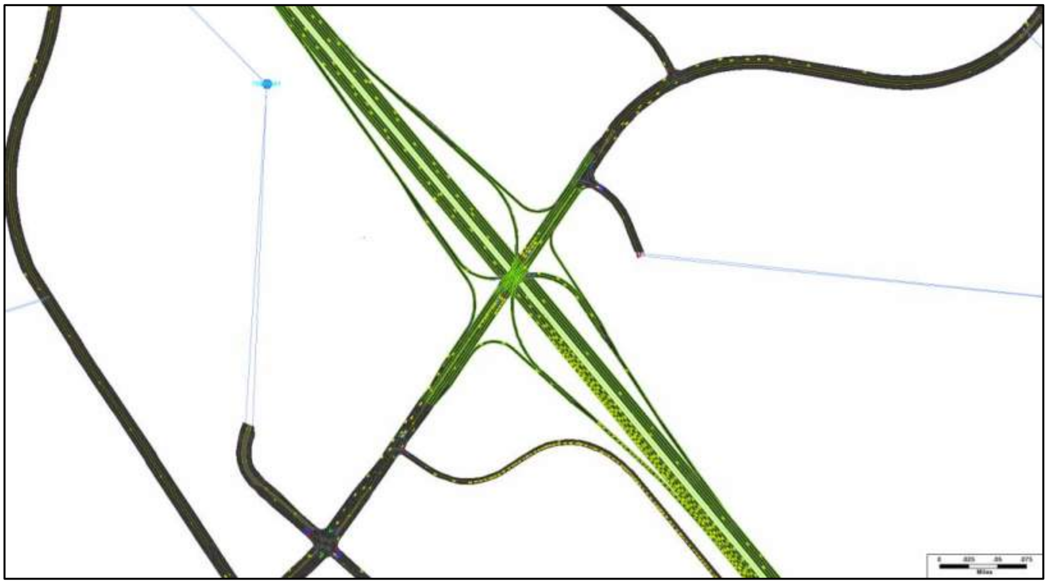
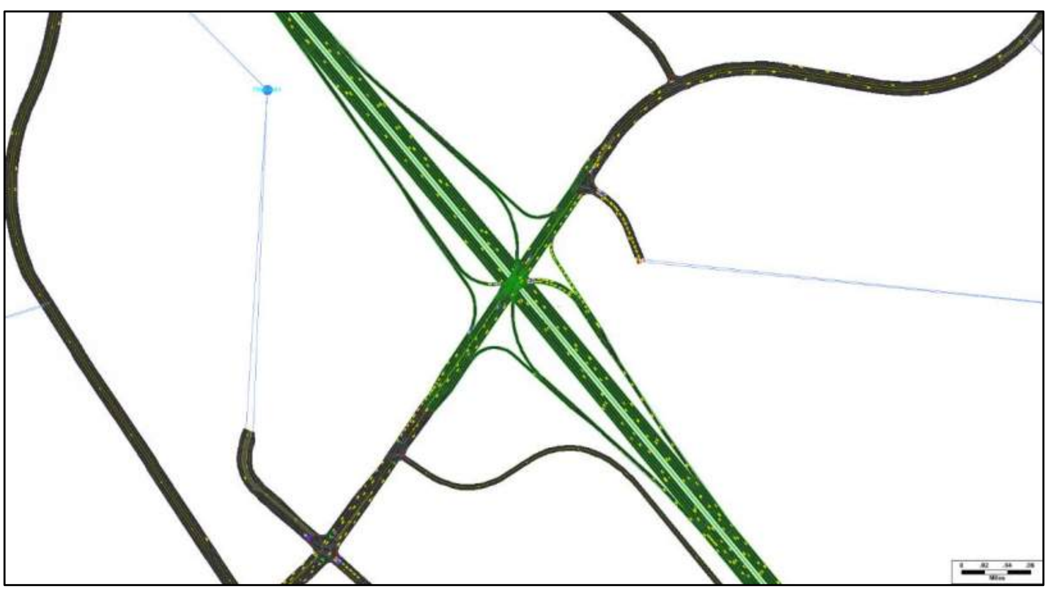


Figure 6 - Exit 103 (AO37) Simulation - PM Peak Hour



- Exit 104 (AO31)
    - AM Peak Hour – See **Figure 7** – interchange operates under capacity at the eastbound ramps intersection. I-26 eastbound is over capacity due to off-ramp queuing from the C-D Road to Exit 106 and I-20. Because of this, the eastbound On-Ramp also backs up all the way to Piney Grove Road, resulting in queuing on the DDI in the westbound direction between the eastbound on-ramp and westbound off-ramp
    - PM Peak Hour – See **Figure 8** – interchange operates under capacity

Figure 7 - Exit 104 (AO31) Simulation - AM Peak Hour

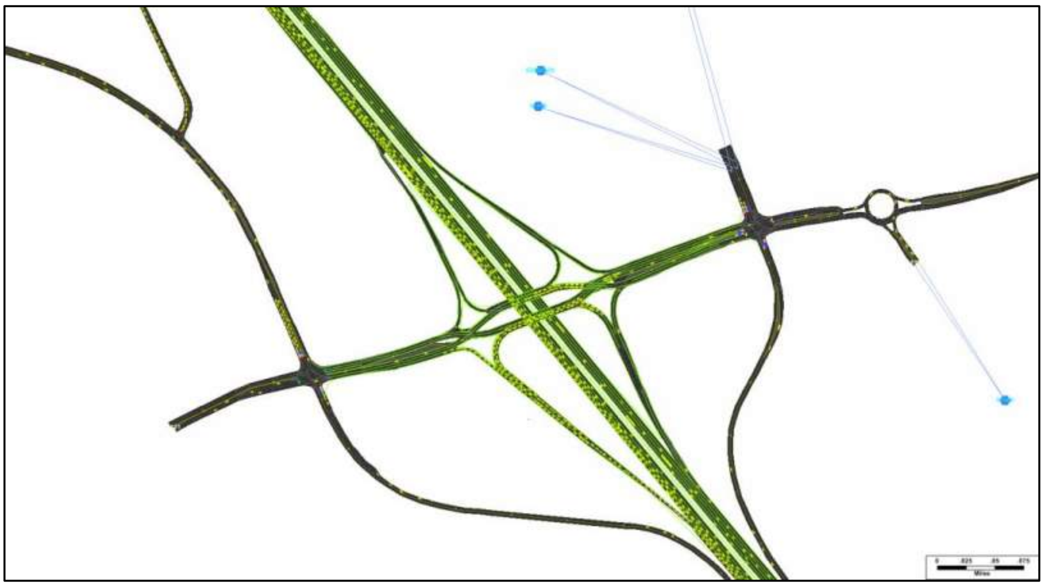
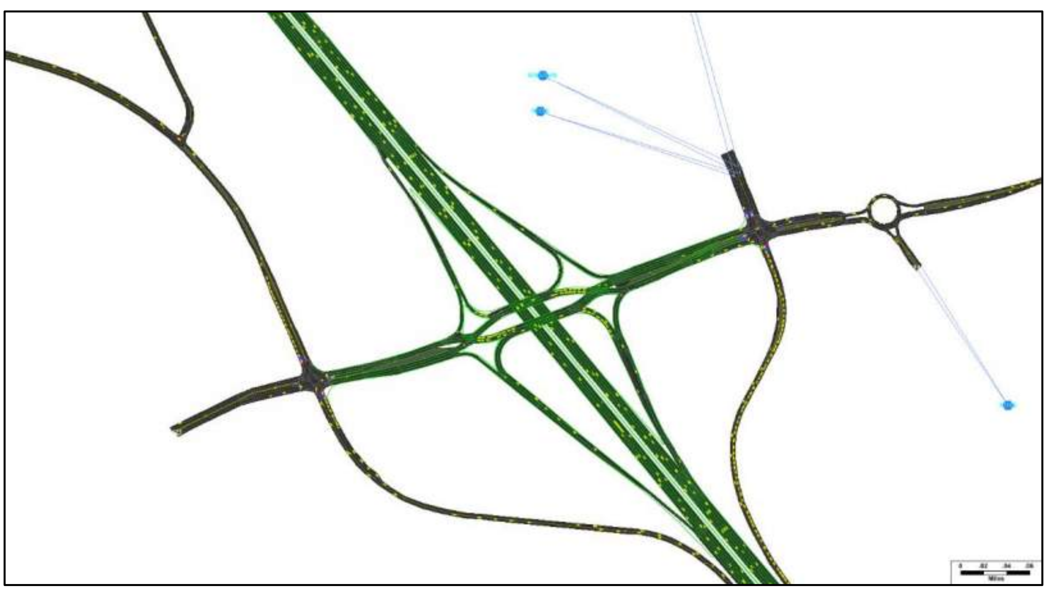


Figure 8 - Exit 104 (AO31) Simulation - PM Peak Hour



- Exit 106 (AO14)
  - AM Peak Hour – See **Figure 9** – The I-26 eastbound on-and off-ramps are completely blocked due to the severe queuing on the C-D Road, which in turn causes severe queuing in both directions along the arterial. Queue backup propagates beyond the westbound ramp intersection and blocks access to the interchange for the left turning traffic on the westbound off-ramp. Increased capacity and the elimination of bottlenecks on the eastbound C-D Road may reduce congestion and improve traffic operation.
  - PM Peak Hour – See **Figure 10** – interchange operates under capacity at the WB dual left turns onto I-26 eastbound.
  - The proposed closure of Fernandina Road and rerouting traffic via Kay Street will adversely impact traffic operations at the intersections of Kay Street and St. Andrews Road and Kay Street and Beatty Road.
    - The diverted left turn traffic on the eastbound approach of St. Andrews Road at the Kay Street intersection results in major queuing in the eastbound direction***.*** Geometric improvements, such as providing a second eastbound left turn lane for traffic turning on to Kay Street and traffic control modification at this intersection may improve traffic operation and reduce queuing
    - The intersection of Kay Street and Beatty Road will also experience severe queuing if the Kay Street approach continues to be stop sign controlled. Queues were observed extending all the way to St. Andrews Road. Installation of a traffic signal at this intersection may need to be considered to improve traffic operation and reduce queuing.
  - Adjustments are likely needed to turn lanes and signal operation at the intersection of Jamil Road and relocated Woodland Hills Road to reduce observed queuing in the peak hours.

Figure 9 - Exit 106 (AO14) Simulation - AM Peak Hour

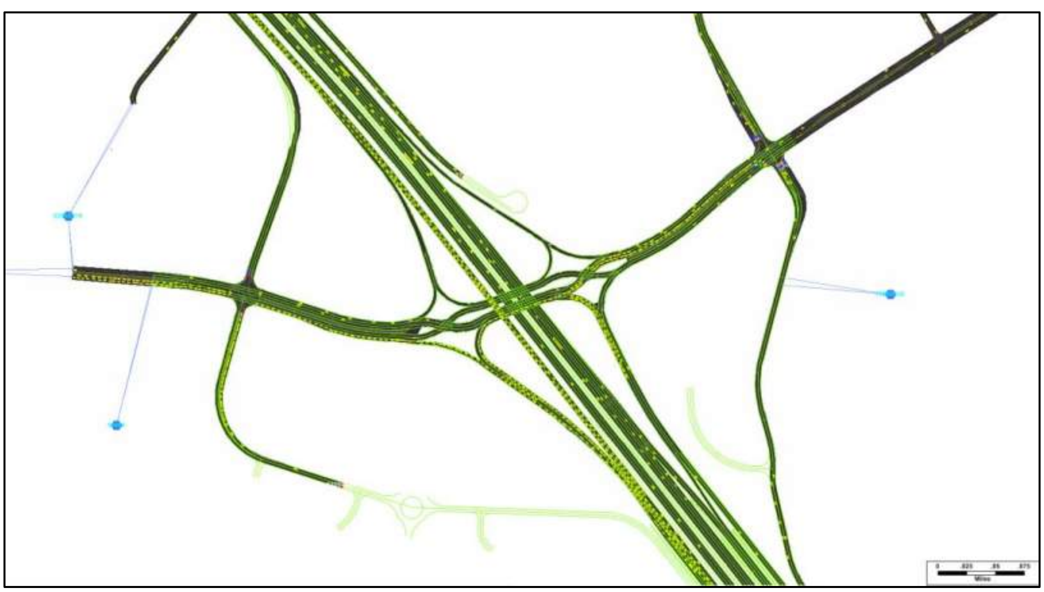
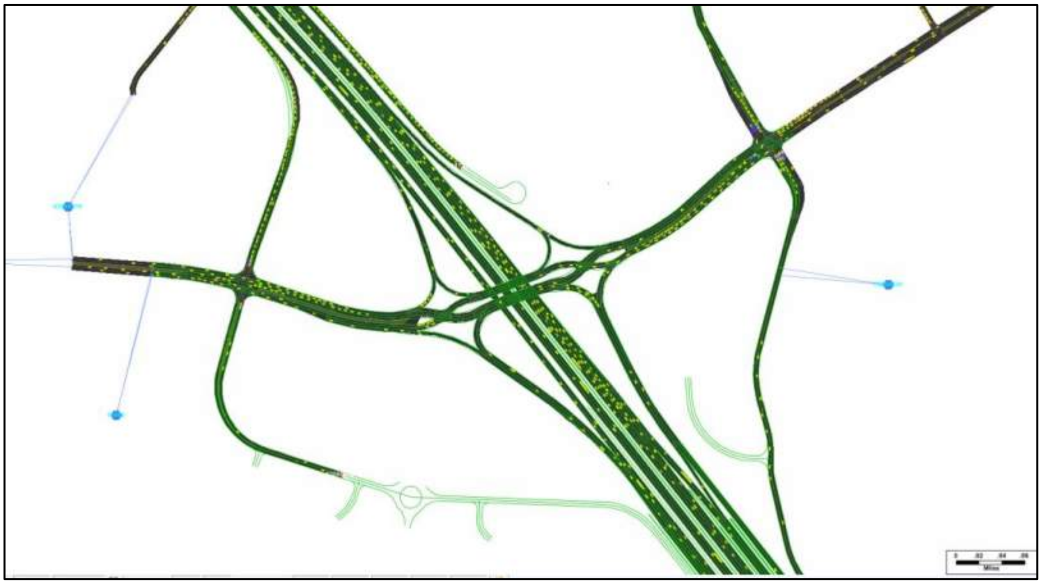


Figure 10 - Exit 106 (AO14) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO19)
    - AM Peak Hour – See **Figure 11** – the eastbound I-20 C-D Road operates over capacity and has several lane drops in close proximity, creating localized bottlenecks. Additionally, weaving issues were observed where the I-26 EB system ramp merges with the EB I-20 C-D Road. This causes a severe backup on the I-26 eastbound System Ramp onto I-26 EB upstream of Exit 106. Increases in capacity and the elimination of bottlenecks may reduce congestion and improve traffic operation.
    - PM Peak Hour – See **Figure 12** –.Congestion issues similar to the AM peak hour were observed on the EB I-20 C-D Road to the west of Exit 65, although the queue backup is less severe and doesn't propagate all the way back to I-26 EB System Ramp. The westbound I-20 C-D Road also experiences congestion due to lack of capacity and closely spaced weaving and merging areas. The resulting congestion creates severe queueing on the WB I-26 System Ramp to I-20 WB. Capacity increases and the elimination of bottlenecks may reduce congestion and improve traffic operation.

Figure 11 - Exit 107/Exit 64 (AO19) Simulation - AM Peak Hour

Figure 12 - Exit 107/Exit 64 (AO19) Simulation - PM Peak Hour

Exit 108 (I-126)

- AM Peak Hour – See **Figure 13** –eastbound and westbound I-126 operate under capacity.
- PM Peak Hour – See **Figure 14** – I-126 westbound operates over capacity with queues extending beyond the Colonial Life interchange. This is the result of the congestion introduced by weaving traffic at the location where I-26 WB and I-126 WB meet at the Bush River Road bridge.

Figure 13 - Exit 108 (I-126) Simulation - AM Peak Hour

Figure 14 - Exit 108 (I-126) Simulation - PM Peak Hour

- Exit 110 (AO47) – no geometric changes
  - AM Peak Hour – See **Figure 15** – Interchange operates at capacity at the eastbound ramp terminus. Both the eastbound and westbound off-ramp experiences queuing, however these queuing do not impact I-26 mainline operation.
  - PM Peak Hour – See **Figure 16** – Interchange operates over capacity at the I-26 westbound off-ramp due to the arterial queuing along US 378.

Figure 15 - Exit 110 (AO47) Simulation - AM Peak Hour

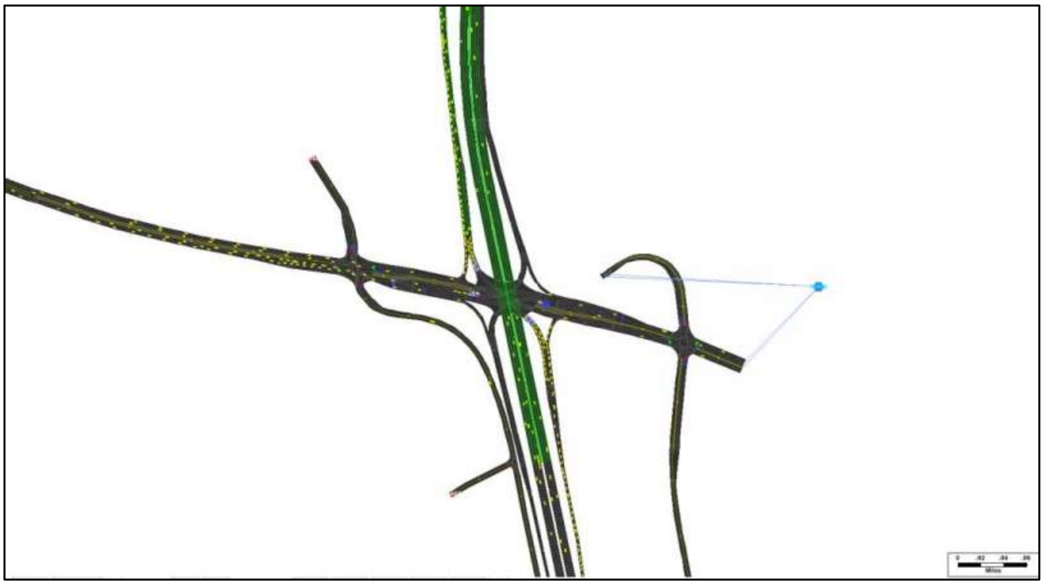
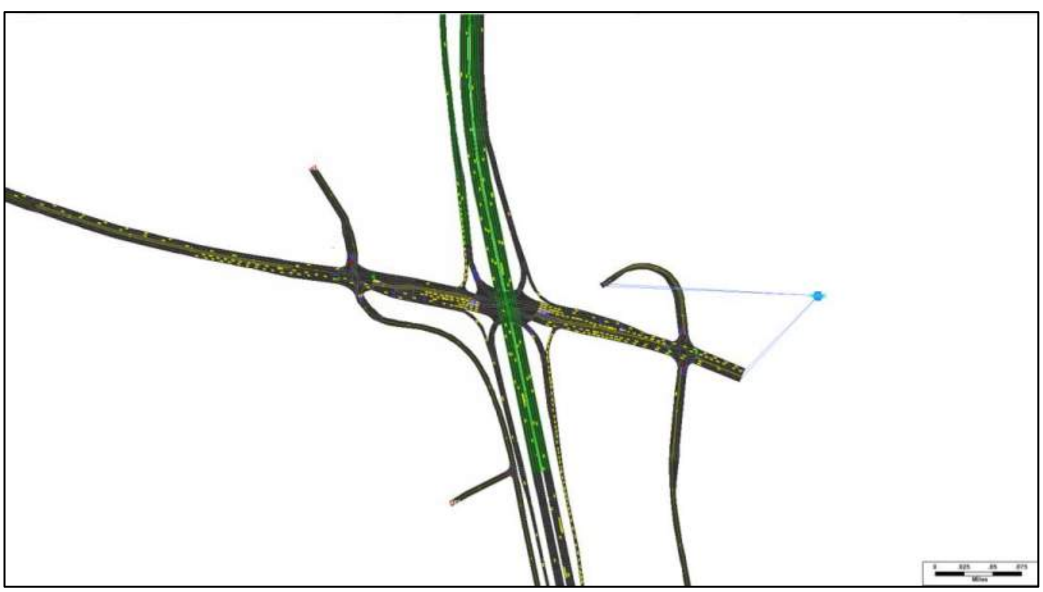


Figure 16 - Exit 110 (AO47) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity with the eastbound ramp intersection operating under signal control. Queuing is observed at the eastbound ramp intersection both on southbound Colonial Life Boulevard and the eastbound C-D Road/off-ramp.
    - PM Peak Hour – See **Figure 18** – Interchange operates under capacity with installation of signal.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

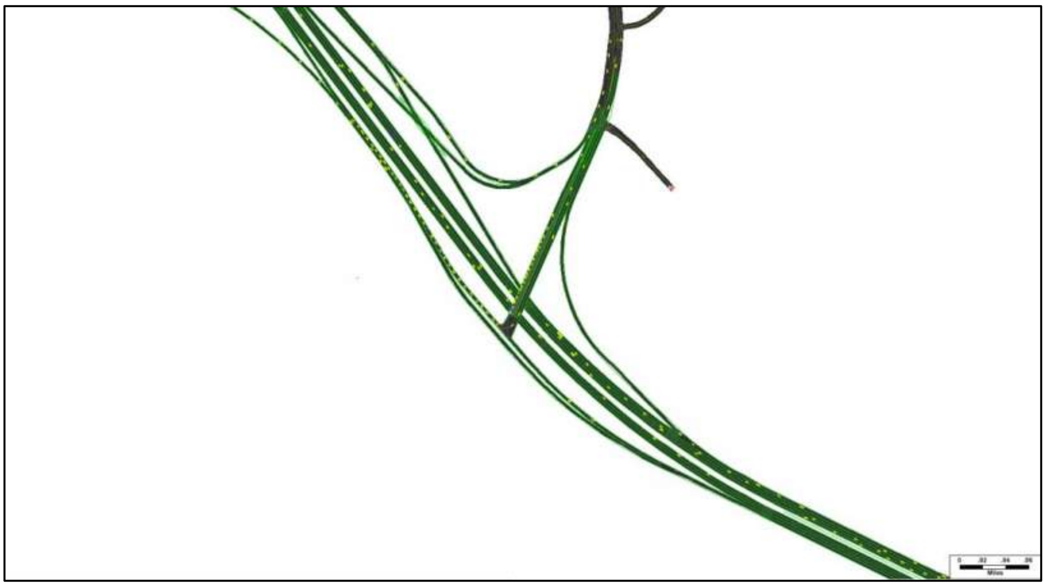
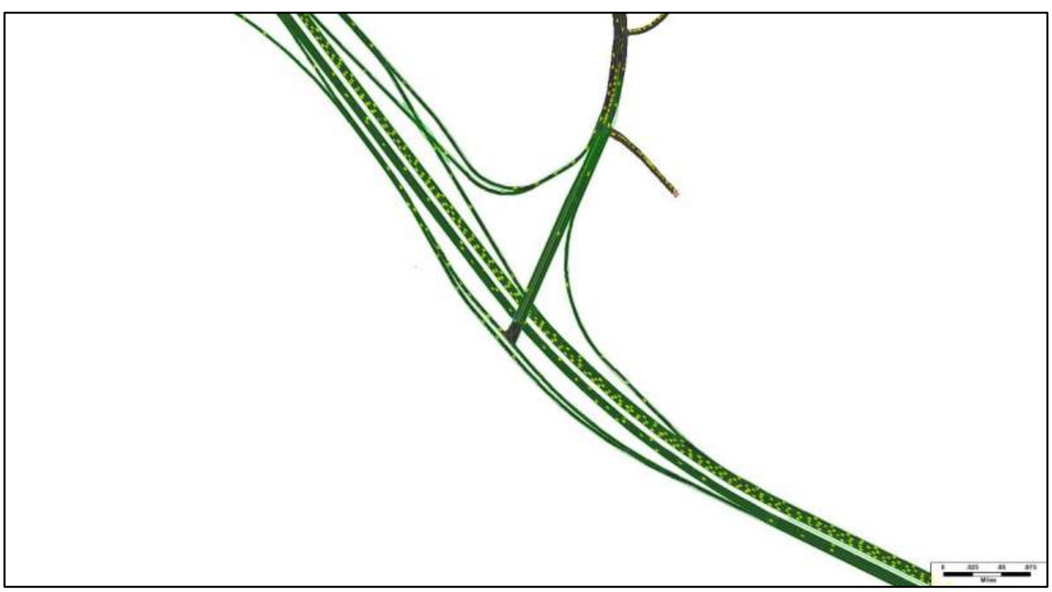


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO7) – Interchange design differs from the .KMZ file. In the simulation network, Bush River Road is widened to provide dual eastbound left turn lanes and a single westbound right turn lane to facilitate traffic entering the eastbound on-ramp. Also, a channelized right turn was provided on the westbound off-ramp.
  - AM Peak Hour – See **Figure 19** – interchange operates under capacity
  - PM Peak Hour – See **Figure 20** – interchange operates over capacity. Severe queuing is observed on the westbound On-and Off-ramps.

Figure 19 - Exit 63 (AO7) Simulation - AM Peak Hour

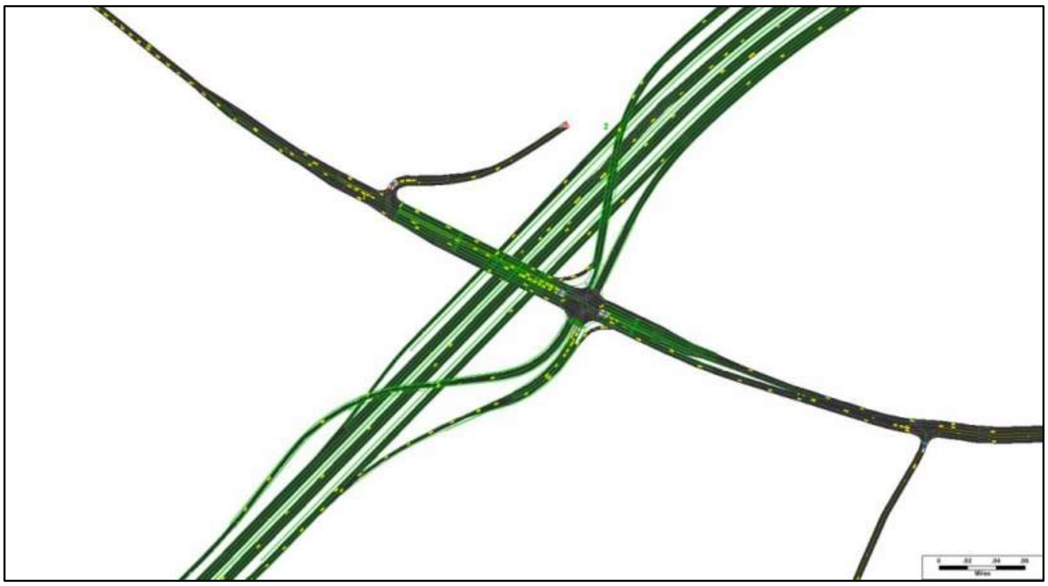
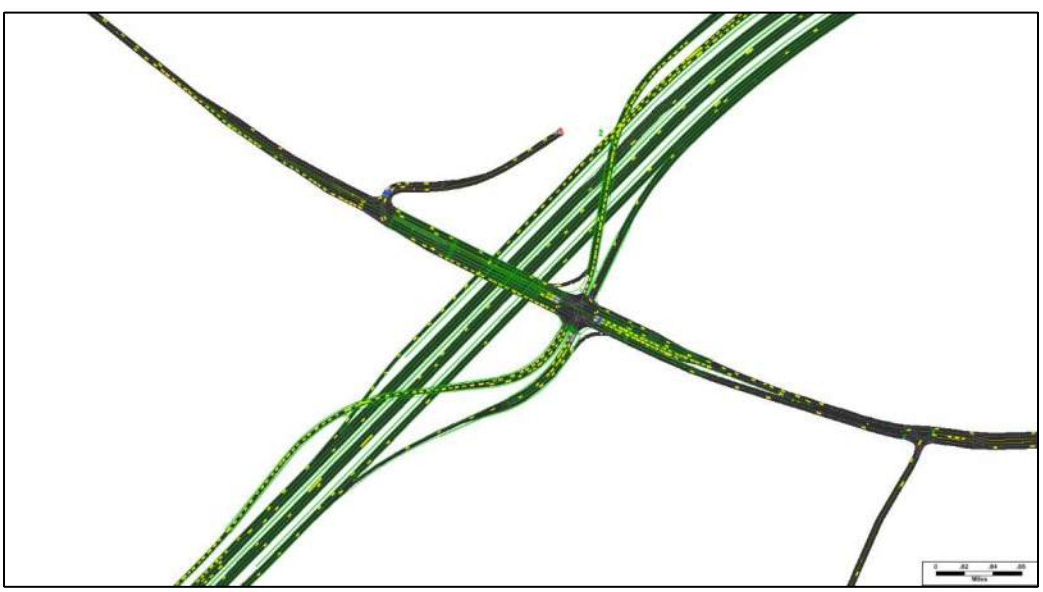


Figure 20 - Exit 63 (AO7) Simulation - PM Peak Hour



- Exit 65 (AO5)
    - AM Peak Hour – See **Figure 21** – interchange operates at capacity. The southbound traffic at the crossover heading to the left turn to the EB on-ramp experiences queuing back towards Marley Drive.
    - PM Peak Hour – See **Figure 22** – interchange operates over capacity. Severe queuing is present on the eastbound On-ramp extending back from the merge area into EB I-20, which in turn creates significant backup on the displaced left turn lanes on the Broad River Road overpass. There is also queuing along northbound Broad River Road between Marley Drive to the south of Longcreek Drive.

Figure 21 - Exit 65 (AO5) Simulation - AM Peak Hour

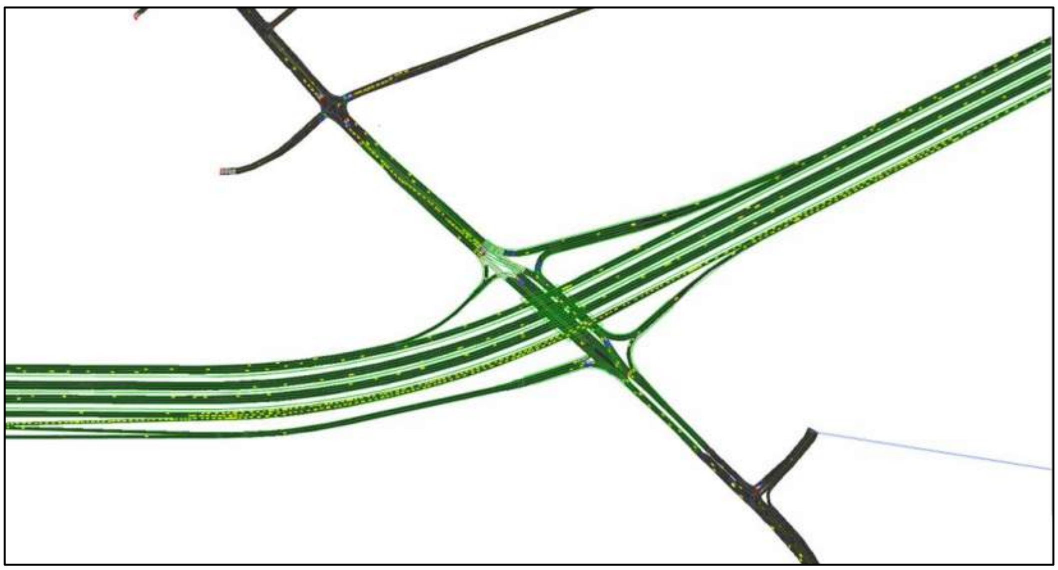
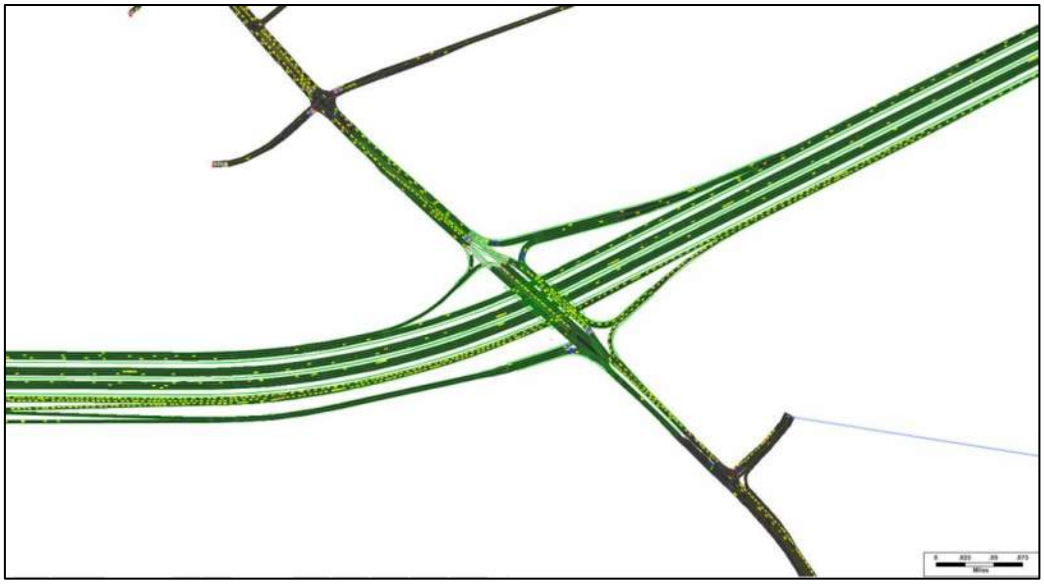
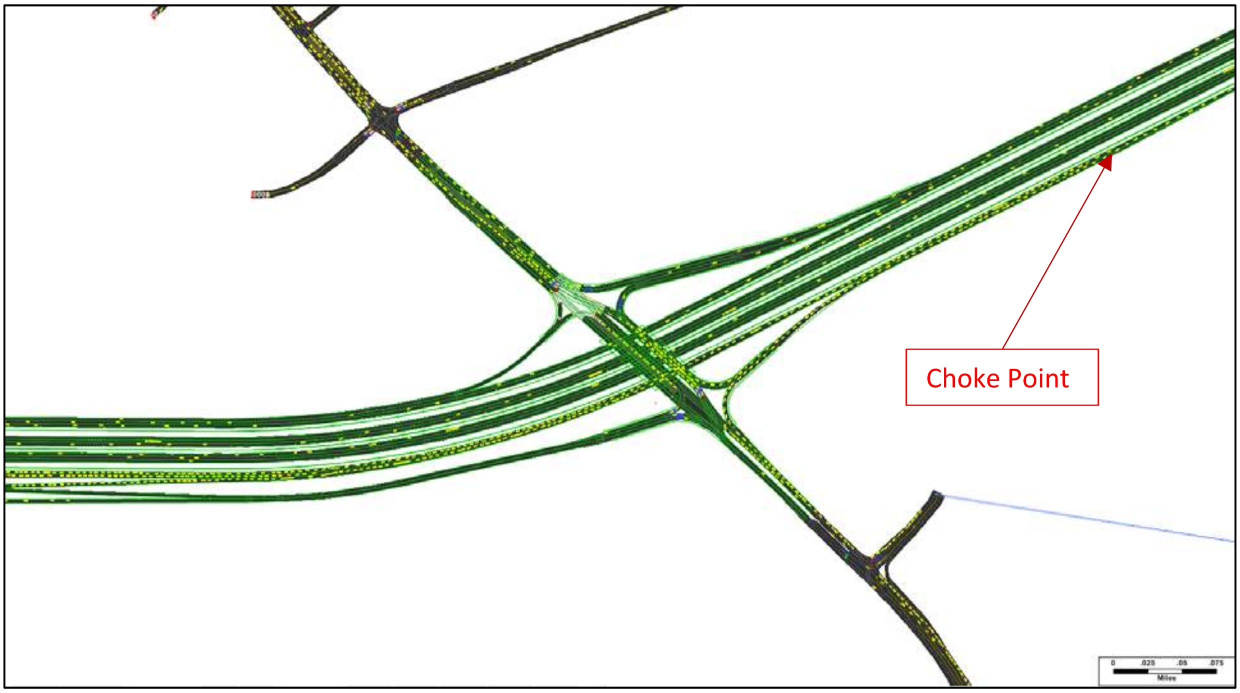


Figure 22 - Exit 65 (AO5) Simulation - PM Peak Hour

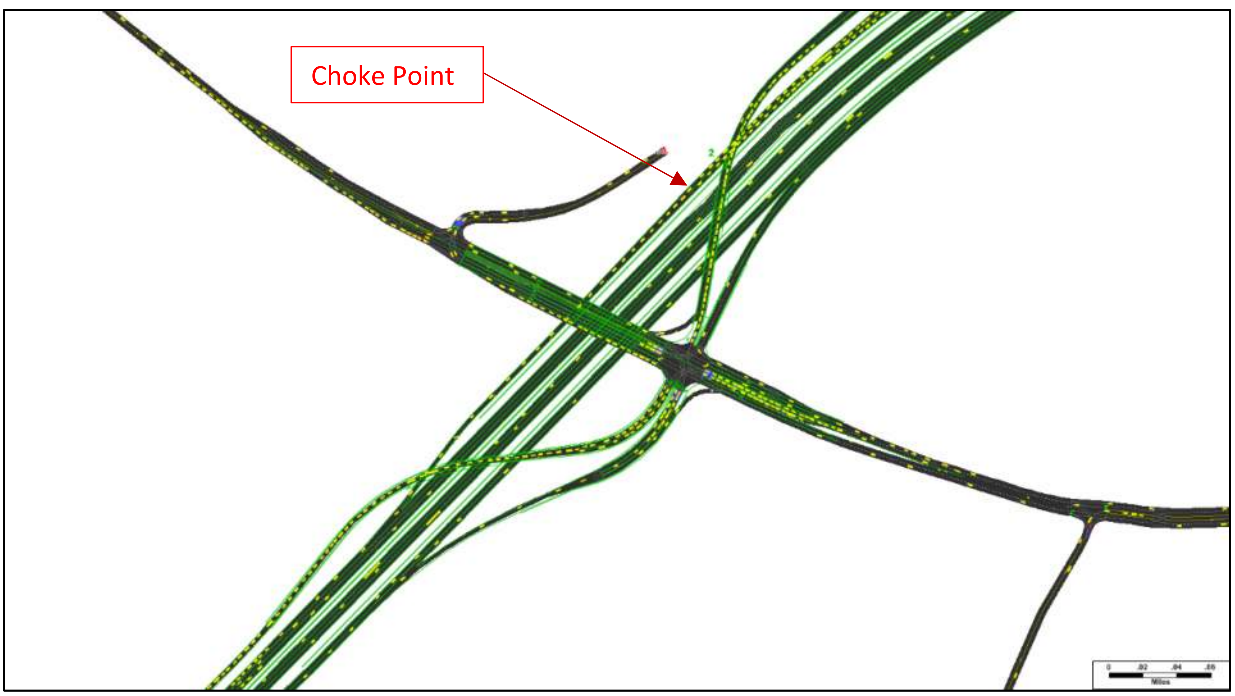


RA6 Specific Choke Points:

1. I-20 EB on-ramp from C-D road, lane drop prior to merge onto the mainline



2. I-20 WB on-ramp from C-D road, lane drop prior to merge onto the mainline



Reasonable Alternative 7 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	Under	Under	Under	
Exit 103-104	Under	Under	Under	At	Simulation did not show any significant issues in this section, however some volume may be getting held up due to Exit 106 queuing.
Exit 104-106	Under	Under	Under	At	Simulation did not show any significant issues in this section, however some volume may be getting held up due to Exit 106 queuing.
Exit 106-107	At	Under	Under	At	Congestion from the lane drop on EB I-26 in the AM peak hour. Simulation did not show any significant issues in this section, however some volume may be getting held up due to Exit 106 queuing in the PM peak hour.
Exit 107-108	Over	Under	Under	Under	Congestion at the lane drop on EB I-26 combined with the on-ramp volume from WB I-20 to EB I-26 causes over capacity conditions in the AM peak hour.
Exit 108-110	Under	Under	At	Under	Simulation did not show any significant issues in this section.
Exit 108 – Colonial Life	Under	Under	Under	At	Queuing from Exit 106 causing WB congestion issues in this section during the PM peak.
Exit 63-64	Under	Under	Under	Under	
Exit 64-65	Under	Under	Under	Under	

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	Par. Clo.	Under	Under	Under	Under	
Exit 102	Par. Clo.	Under	Under	Under	Under	
Exit 103	AO49	Under	Under	Under	Under	
Exit 104	AO30	Under	Under	Over	Under	Additional signal improvements may get this to be at/under capacity
Exit 106	AO13	Under	Under	Under	Over	Excessive queuing stemming from the interaction with the Burning Tree Dr/Fernandina Rd intersection. Minor geometric /timing changes have not been able to alleviate the issue. A detailed comparison of the microsimulation volumes and the existing turning movement volumes may be required to verify traffic is not being over-assigned to this intersection.
Exit 107/Exit 64	AO27	Under	Under	Under	Over	Spillback queuing from the Exit 106 issues is causing congestion on the ramps at this interchange.
Exit 108 – I-126	AO27	Under	Under	Under	Under	
Exit 110	AO46	Under	Under	Under	Over	Issues with the adjacent intersection volumes are causing spillback queuing. An excessive number of vehicles are trying to make a left turn onto McSwain Drive due to the split centroid. This may be able to be corrected by adjusting the routes to the centroid.
Colonial Life	AO24	Under	Under	Under	Under	
Exit 63	AO8	Under	At	Over	Over	Heavy off ramp volumes causing queuing, however, additional signal timing changes may be able to improve the conditions.
Exit 65	AO5	Under	Under	Under	Under	

Simulation Observations and Alternative Modifications

The green line work is the KMZ file used for the simulation observations.

- Exit 101 (Par.Clo) – .KMZ file did not contain WB I-26 off-ramp to southbound Broad River Road, however, it was maintained for the simulation.
  - AM Peak Hour – See **Figure 1** – interchange operates under capacity
  - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

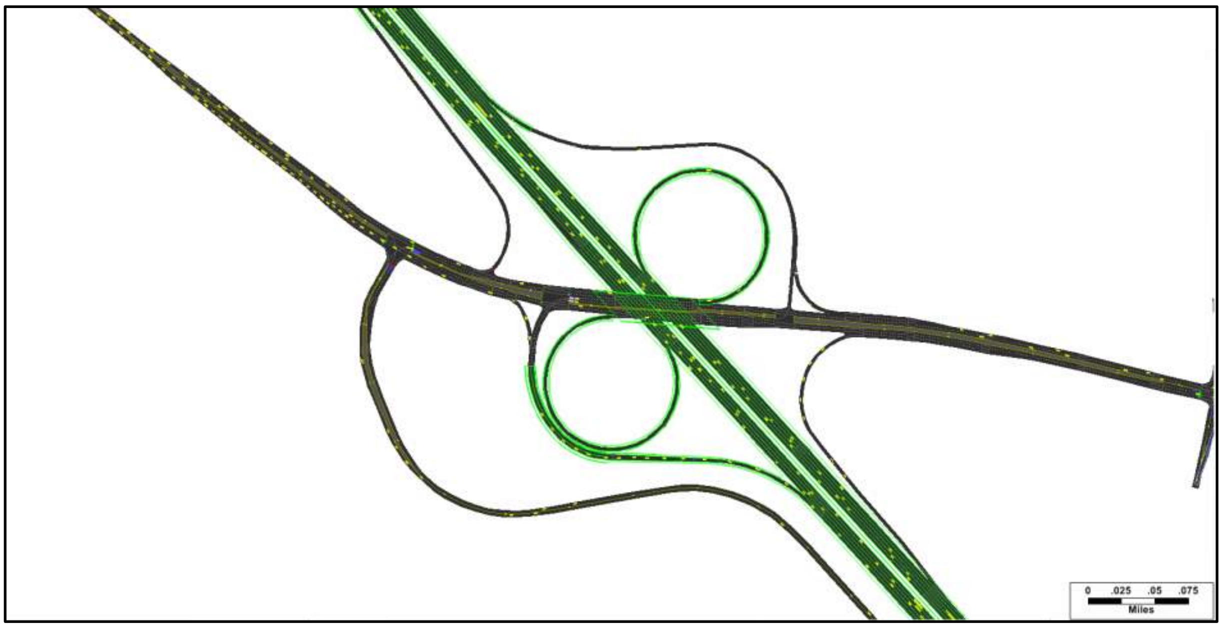
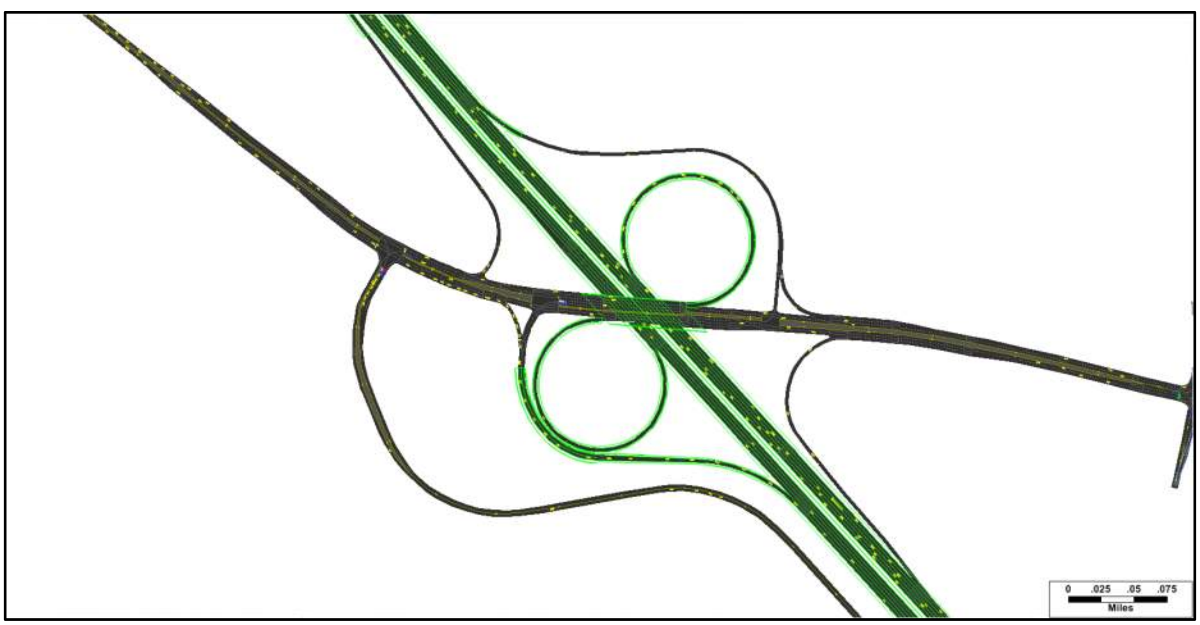


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 3** – interchange operates under capacity
    - PM Peak Hour – See **Figure 4** – interchange operates under capacity. Queuing on Columbiana Dr. may be able to be corrected with further signal timing improvements.

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

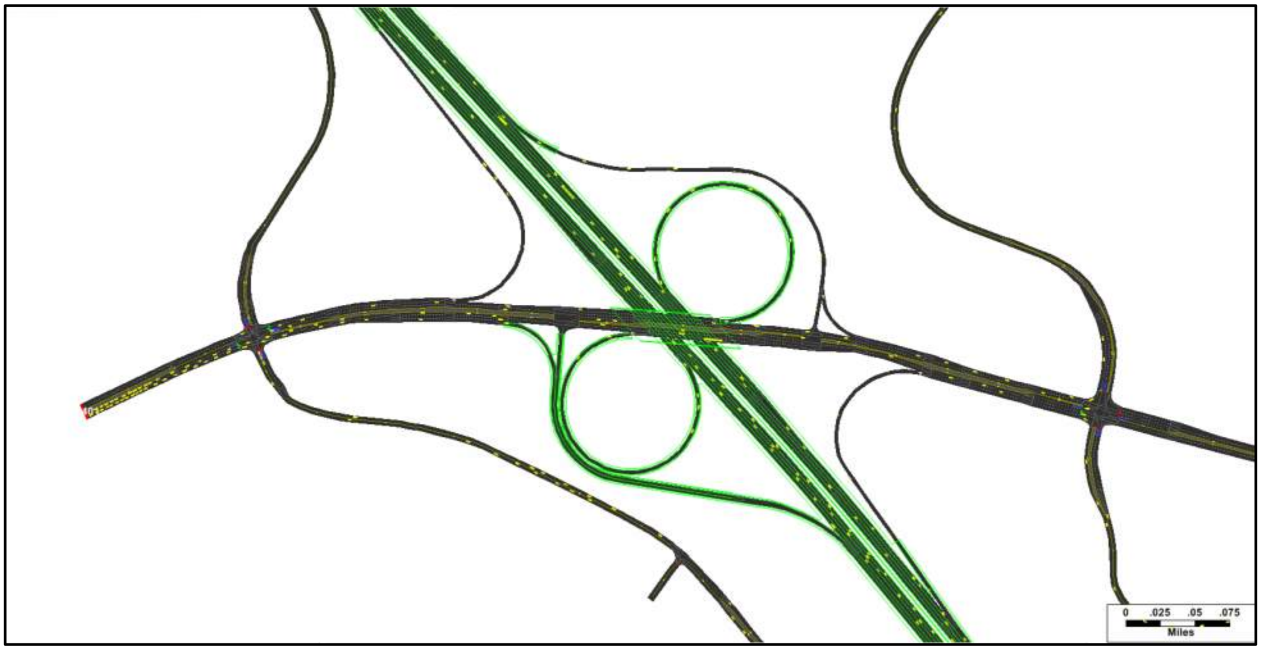
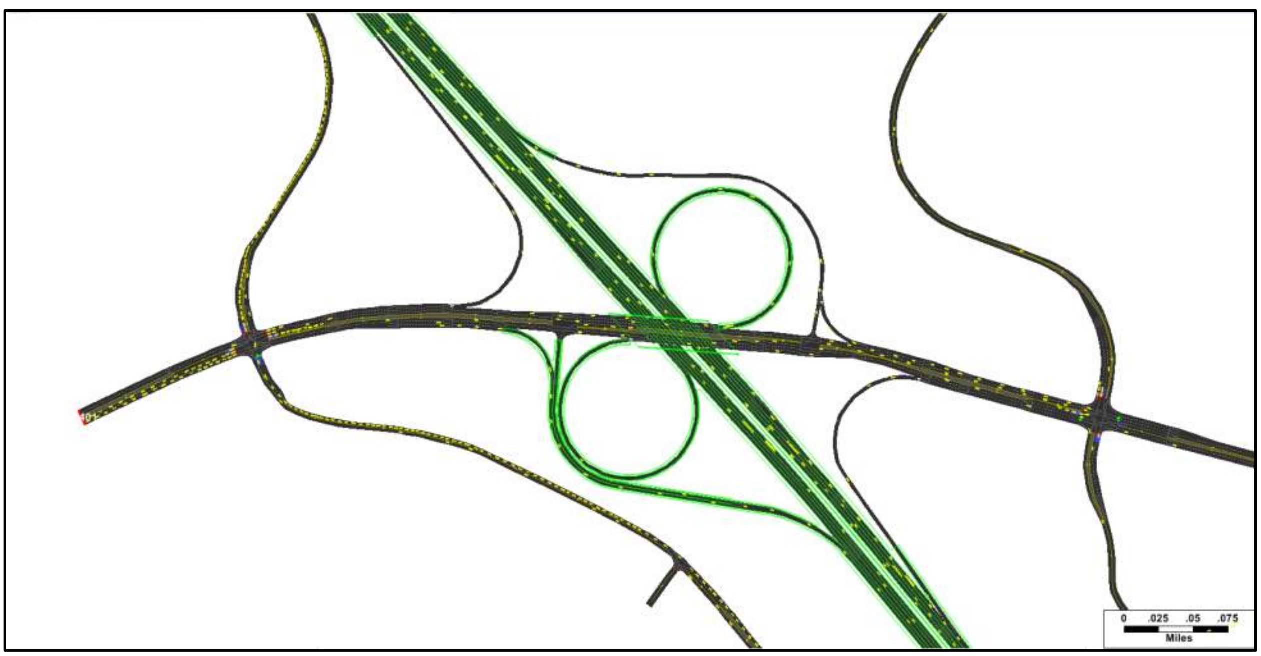


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO49) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 5** – interchange operates under capacity
    - PM Peak Hour – See **Figure 6** – interchange operates under capacity. Queueing on Woodcross Drive may be able to be relieved with further signal timing adjustments.

Figure 5 - Exit 103 (AO49) Simulation - AM Peak Hour

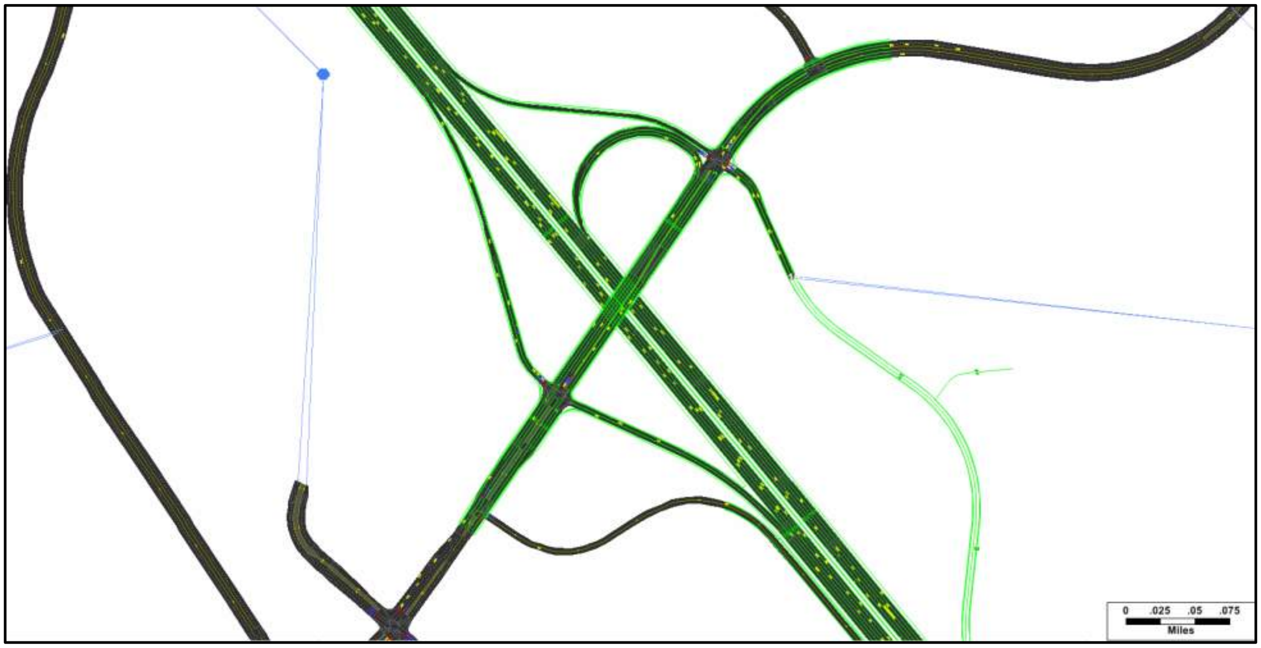
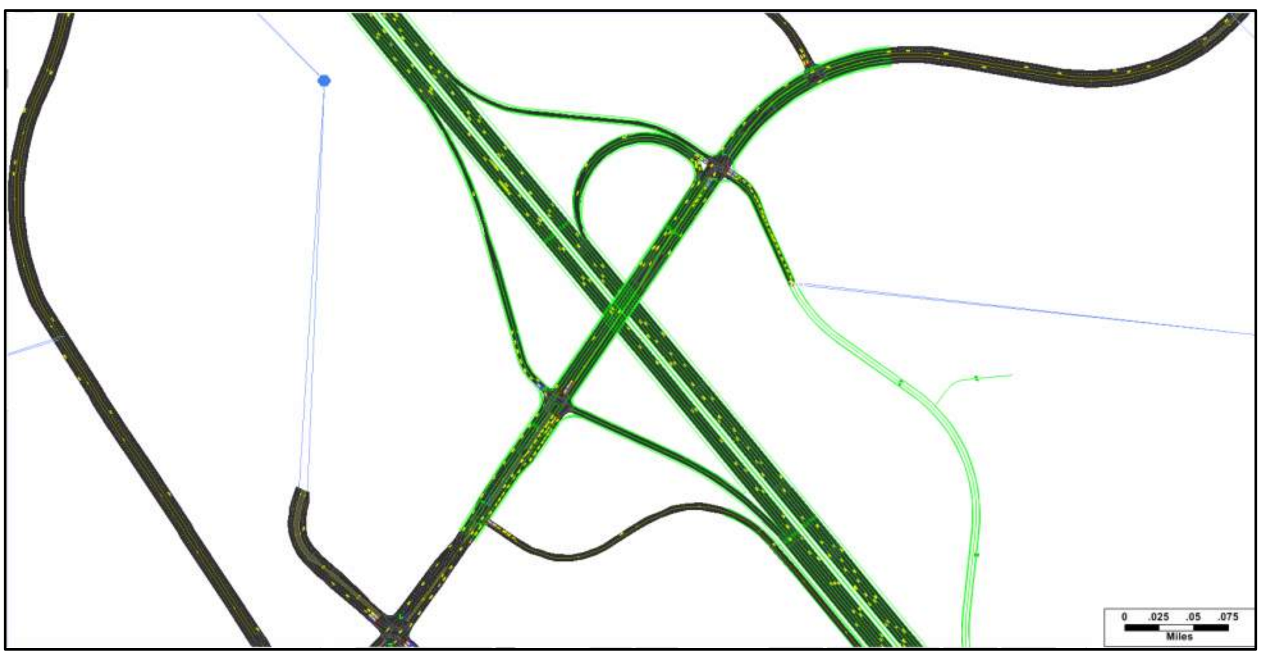


Figure 6 - Exit 103 (AO49) Simulation - PM Peak Hour



- Exit 104 (AO30) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 7** – interchange operates under capacity.
    - PM Peak Hour – See **Figure 8** – Eastbound I-26 off-ramp operates at capacity, otherwise interchange operates under capacity.

Figure 7 - Exit 104 (AO30) Simulation - AM Peak Hour

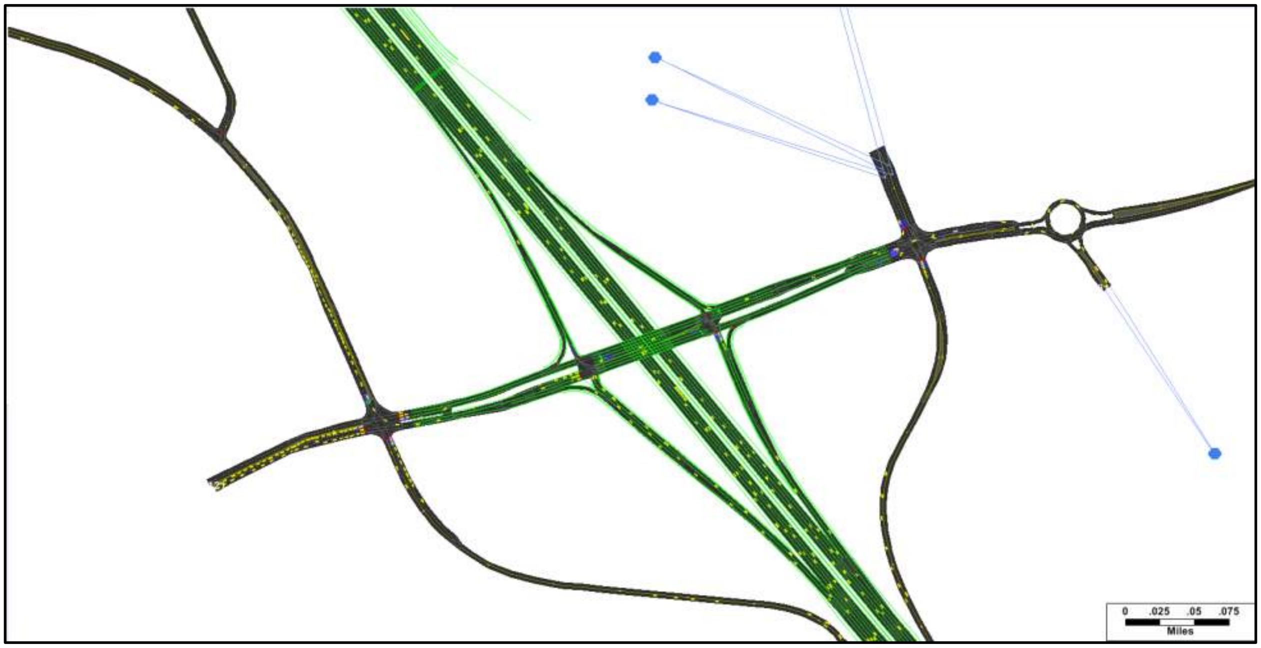
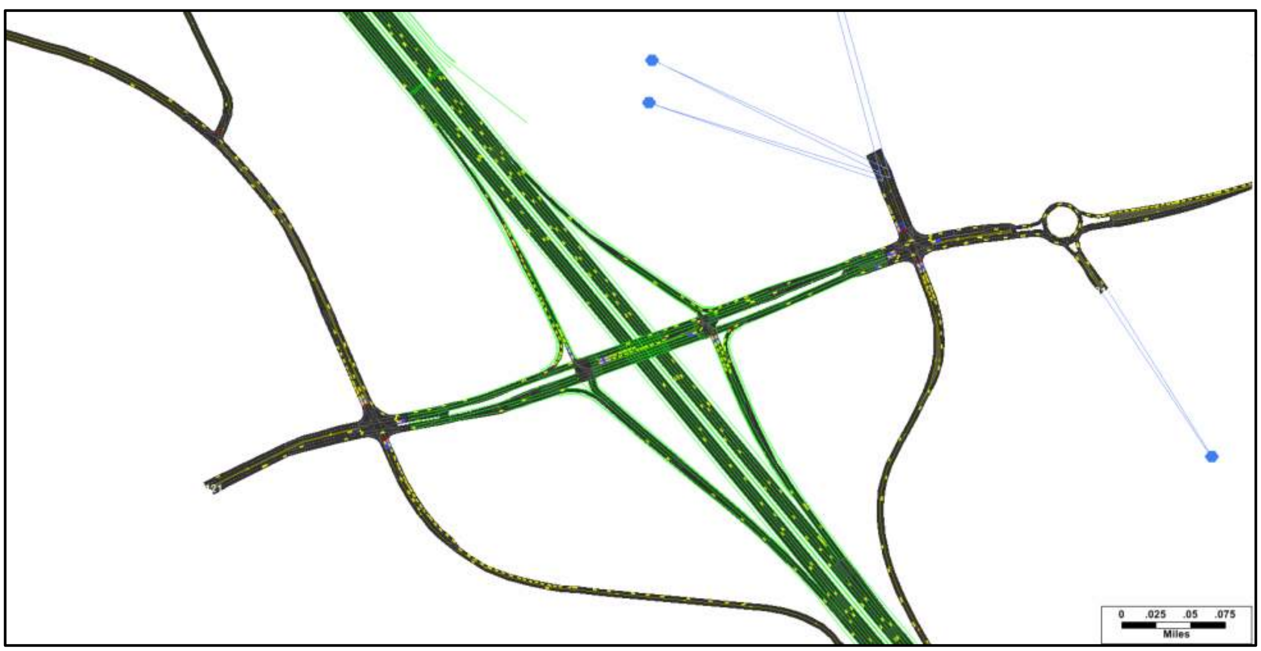


Figure 8 - Exit 104 (AO30) Simulation - PM Peak Hour



- Exit 106 (AO13) – Northbound approach of Burning Tree Dr modified from the .KMZ to ease the movement of vehicles from the westbound off-ramp as well as help with PM queuing issues.
    - AM Peak Hour – See **Figure 9** – interchange operates under capacity except for the heavy movement from eastbound right turn movement from St. Andrews Road to the on-ramp to eastbound I-26.
    - PM Peak Hour – See **Figure 10** – interchange operates over capacity at the Fernandina Rd/Burning Tree Dr. intersection which causes spillback queuing onto I-26 and I-20. The Burning Tree Dr. approach combined with the westbound off-ramp traffic making a left-turn onto St. Andrews Road is a very heavy movement and conflicts with the westbound off-ramp right turn onto St. Andrews Road. As more time is given to the Burning Tree Dr approach. This impacts the eastbound off ramp left-turn movement as well as the westbound ramp right-turn movement, causing spillback on those ramps. A detailed comparison of the microsimulation volumes and the existing turning movement volumes may be required to verify traffic is not being over-assigned to this intersection, however, many lane configurations and timing changes were explored with little improvement.

Figure 9 - Exit 106 (AO13) Simulation - AM Peak Hour

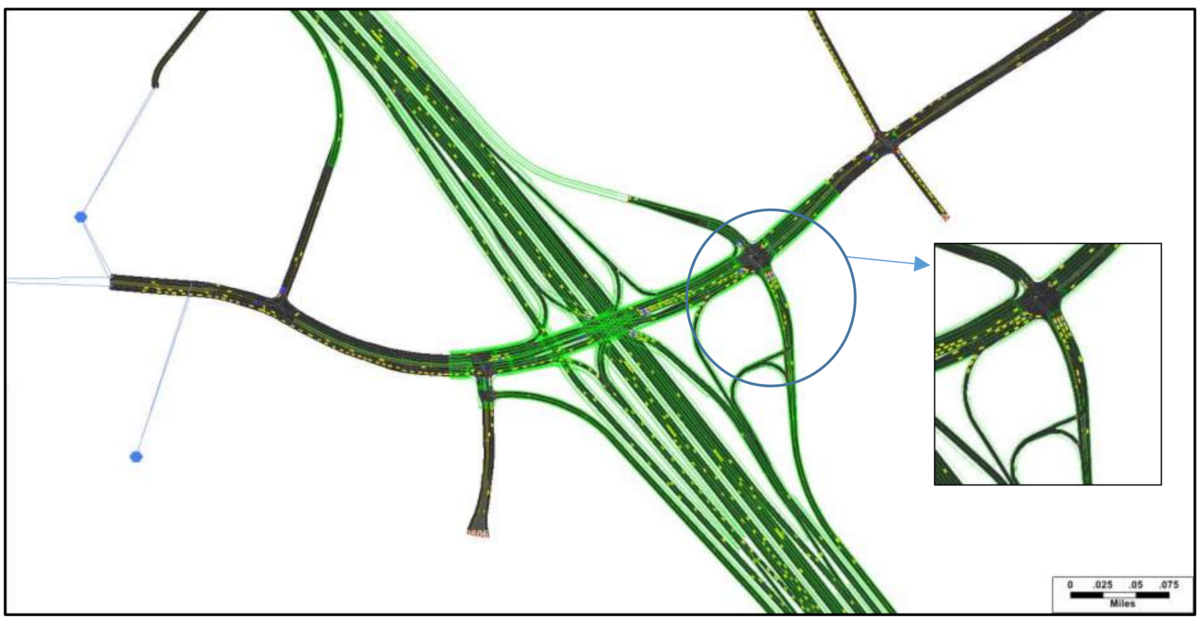
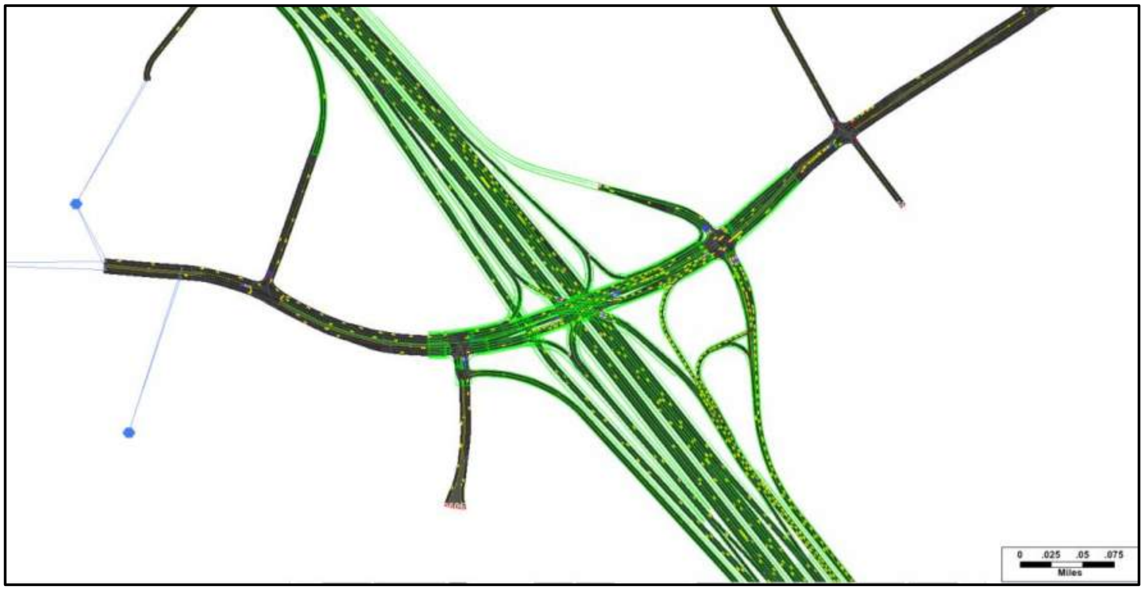


Figure 10 - Exit 106 (AO13) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO27) – Due to queueing in the AM and PM Peak hours on the ramp from westbound I-126 and I-26 where it merged down to 1 lane, 1 lane was dropped on mainline I-26 and a 2nd lane was merged on from the overcapacity ramp (See Figure 12 for details). Review of the microsimulation assignments may be necessary to ensure a majority of vehicles coming from I-126 are staying on the main through lanes through the interchange, however, the single lane ramp may still be an issue at the merge point.
    - AM Peak Hour – See **Figure 11** – The I-26 eastbound mainline is over capacity due to the lane drop west of the on-ramp from I-20 westbound. Additional design changes needed to address this issue. Queuing does not extend back into the Exit 106 interchange during the peak hour. Otherwise the interchange operates under capacity.
    - PM Peak Hour – See **Figure 12** – interchange operates under capacity with the exception of the spillback queuing from Exit 106.

Figure 11 - Exit 107/Exit 64 (AO27) Simulation - AM Peak Hour

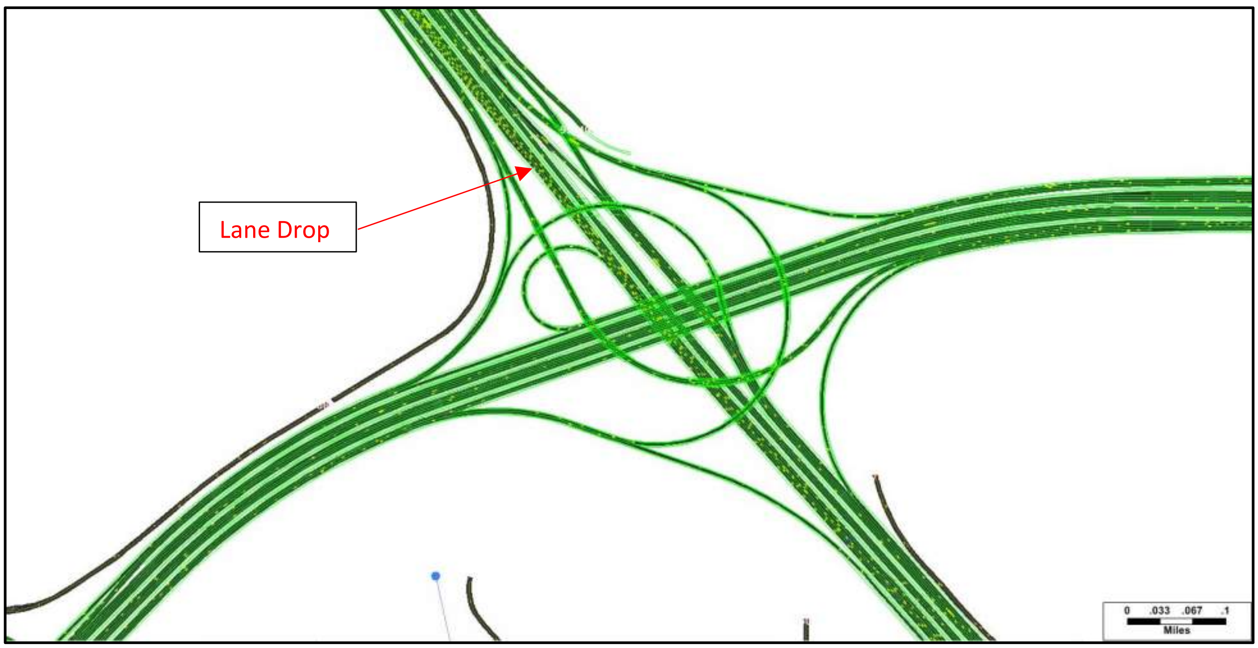
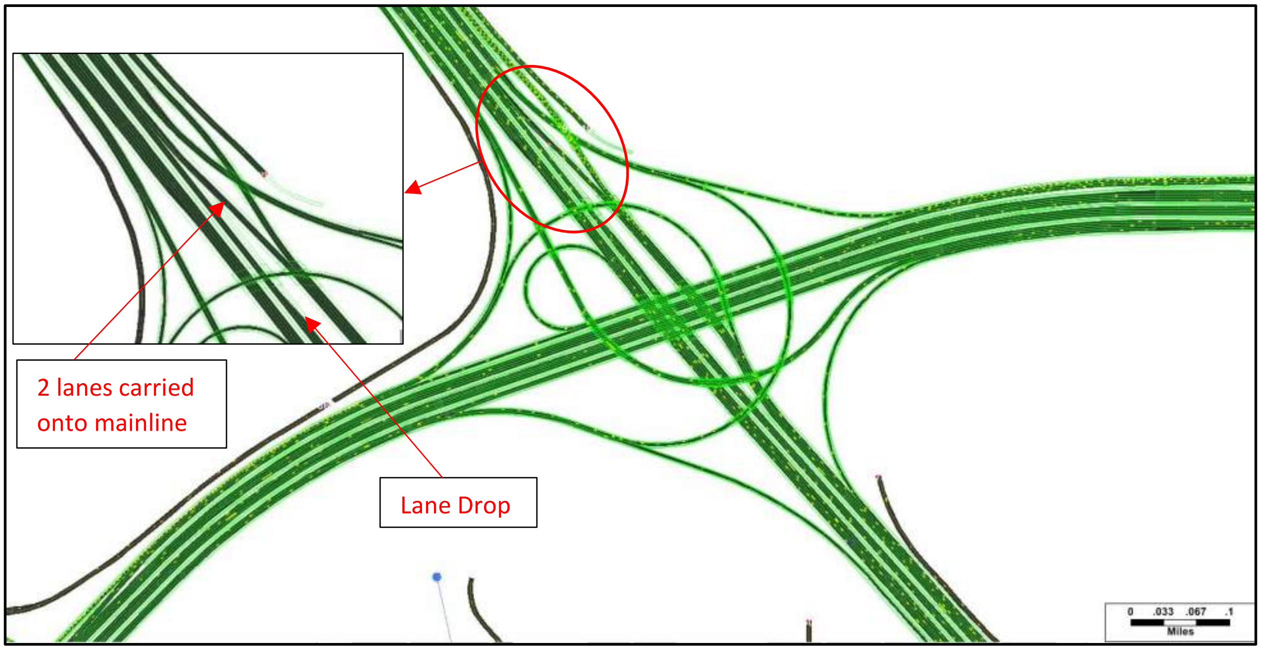


Figure 12 - Exit 107/Exit 64 (AO27) Simulation - PM Peak Hour



Exit 108 (AO27) – No geometric changes made from the .KMZ file.

- AM Peak Hour – See **Figure 13** – The interchange operates under capacity.
- PM Peak Hour – See **Figure 14** Interchange operates under capacity with the exception of the spillback queuing from Exit 106.

Figure 13 - Exit 108 (AO27) Simulation - AM Peak Hour

Figure 14 - Exit 108 (AO27) Simulation - PM Peak Hour

- Exit 110 (AO46) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 15** – Interchange operates under capacity.
    - PM Peak Hour – See **Figure 16** – Interchange operates over capacity at the I-26 westbound off-ramp due to the arterial queuing along US 378. This appears due to an excessive number of vehicles trying to turn left onto McSwain Drive due to the split centroid. Routing changes may alleviate this queuing.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

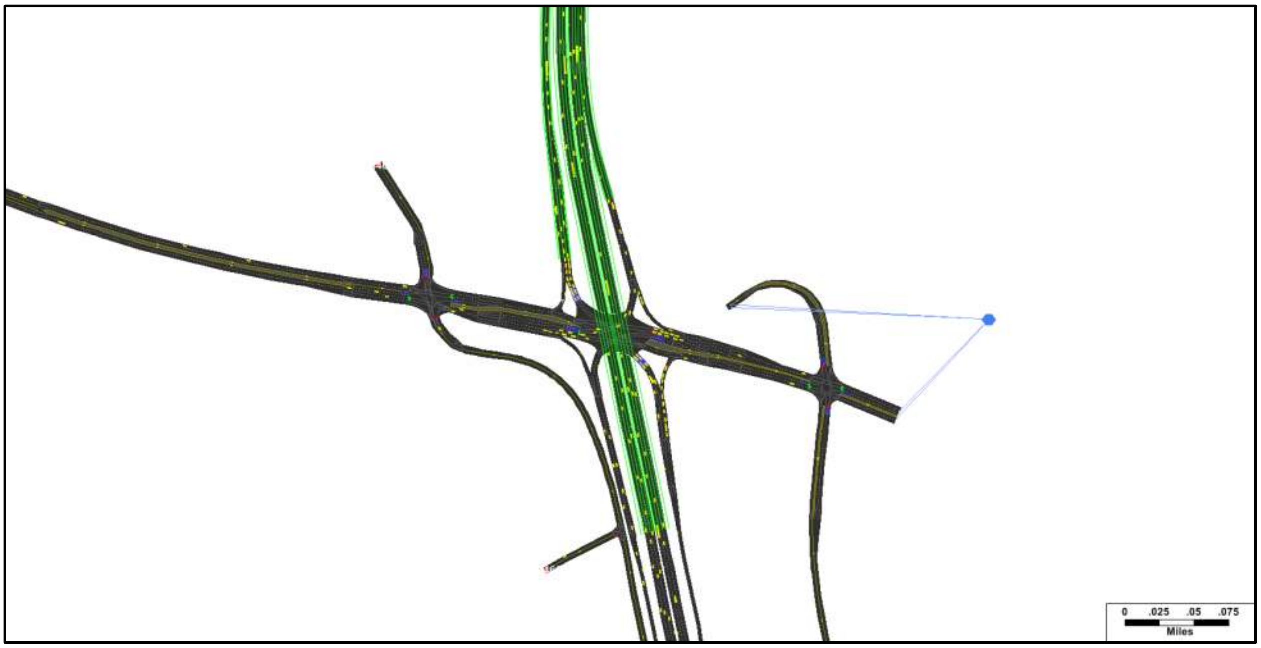
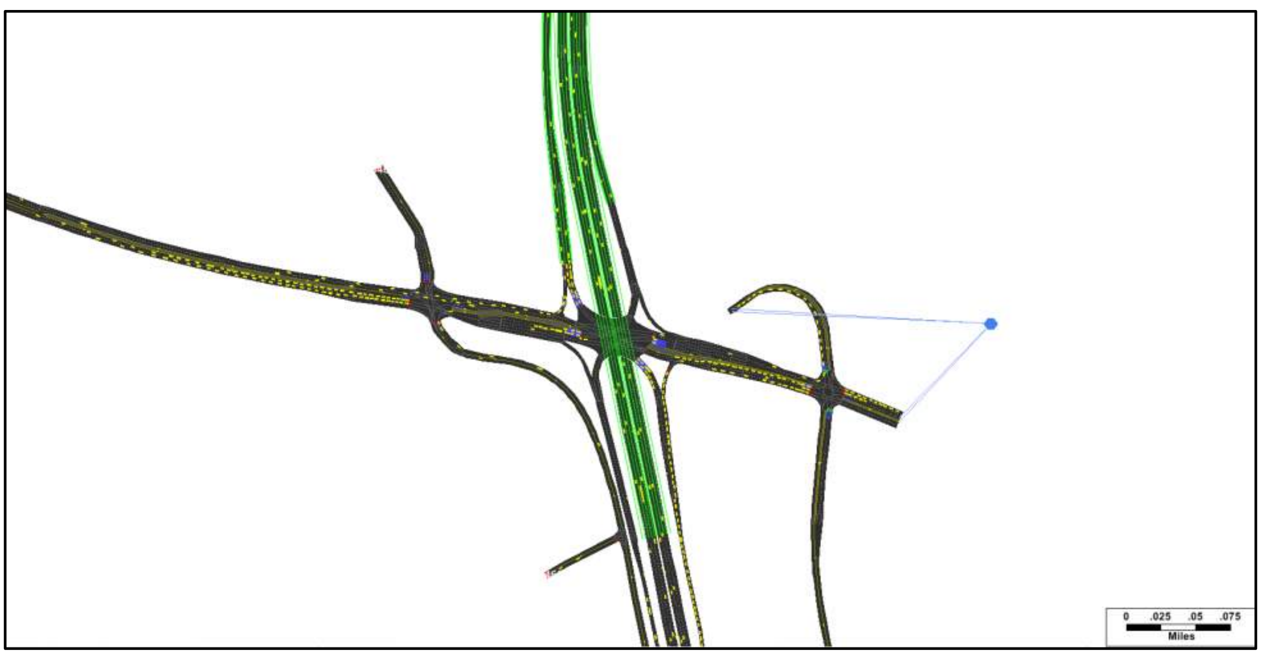


Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity with installation of signal.
    - PM Peak Hour – See **Figure 18** – Interchange operates under capacity with installation of signals.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

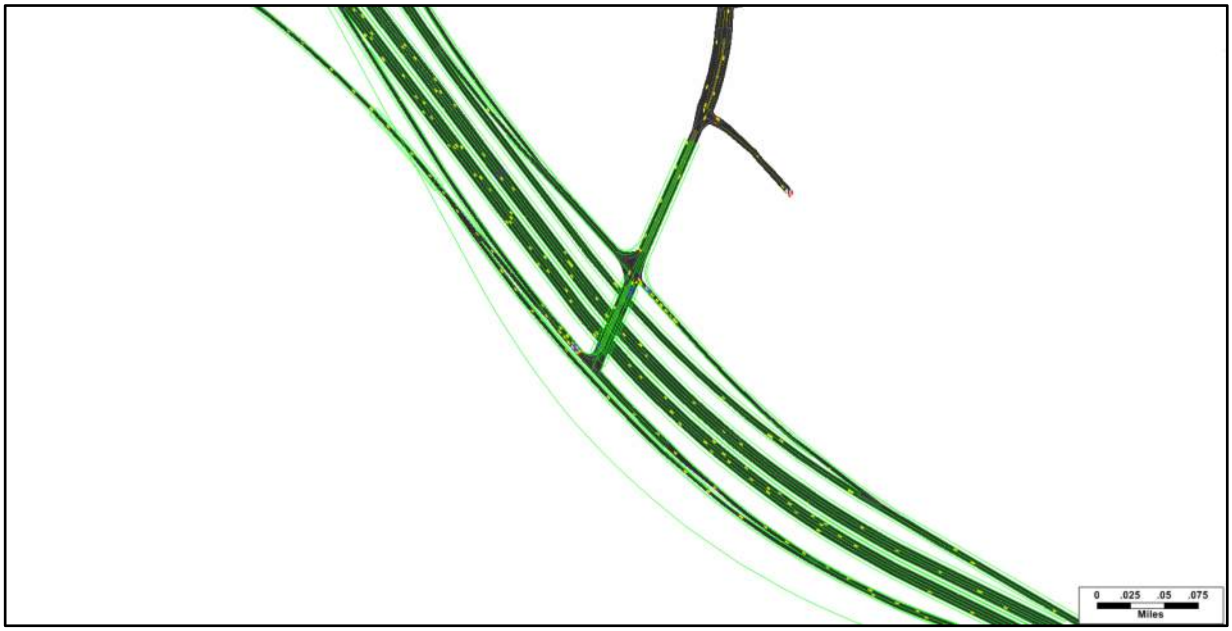
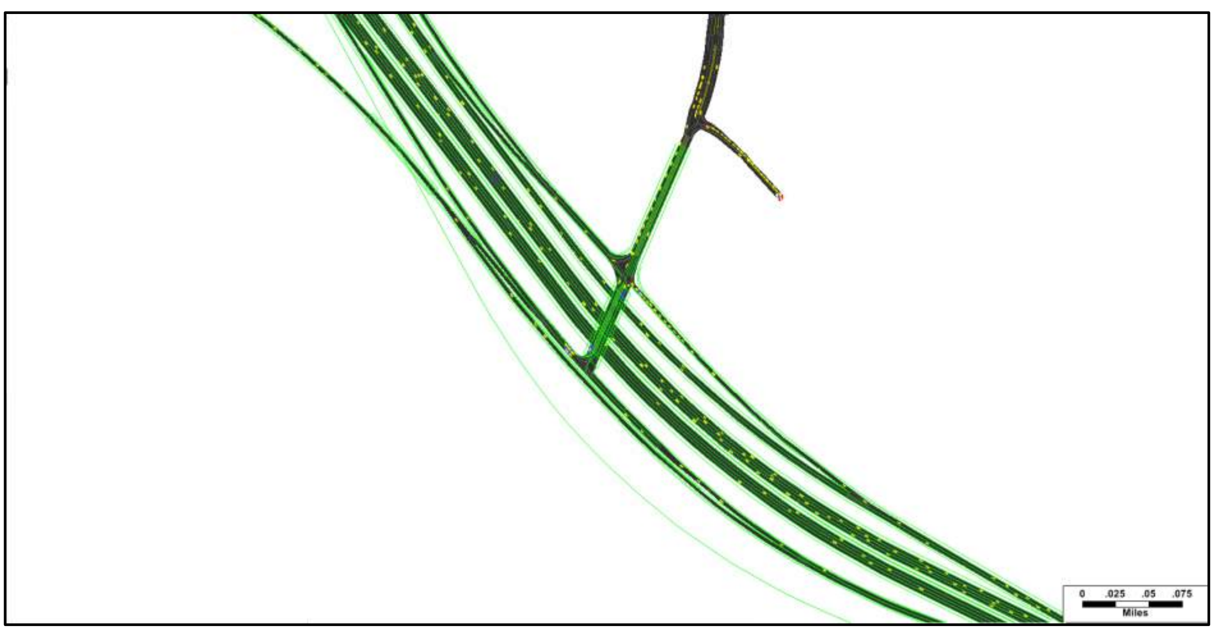


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO8) – Interchange design similar to new .KMZ file except for the addition of a left-turn bay at the eastbound I-20 off-ramp termini.
    - AM Peak Hour – See **Figure 19** – interchange operates over capacity along eastbound Bush River Road at the intersection with the westbound I-20 ramps. Traffic signal timing modifications may help the intersection operation. Most vehicles appear to be stacking in the right lane in anticipation of the eastbound I-20 on-ramp.
    - PM Peak Hour – See **Figure 20** – interchange operates over capacity. However, further signal timing changes may alleviate some of the queuing improving the interchange operations.

Figure 19 - Exit 63 (AO8) Simulation - AM Peak Hour

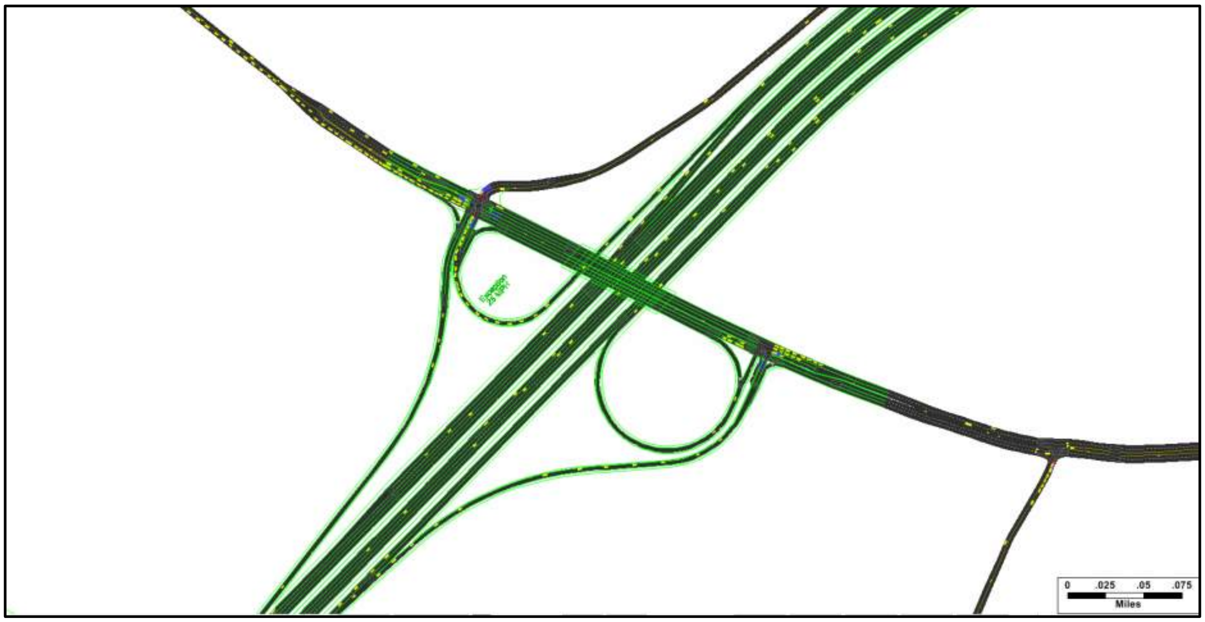
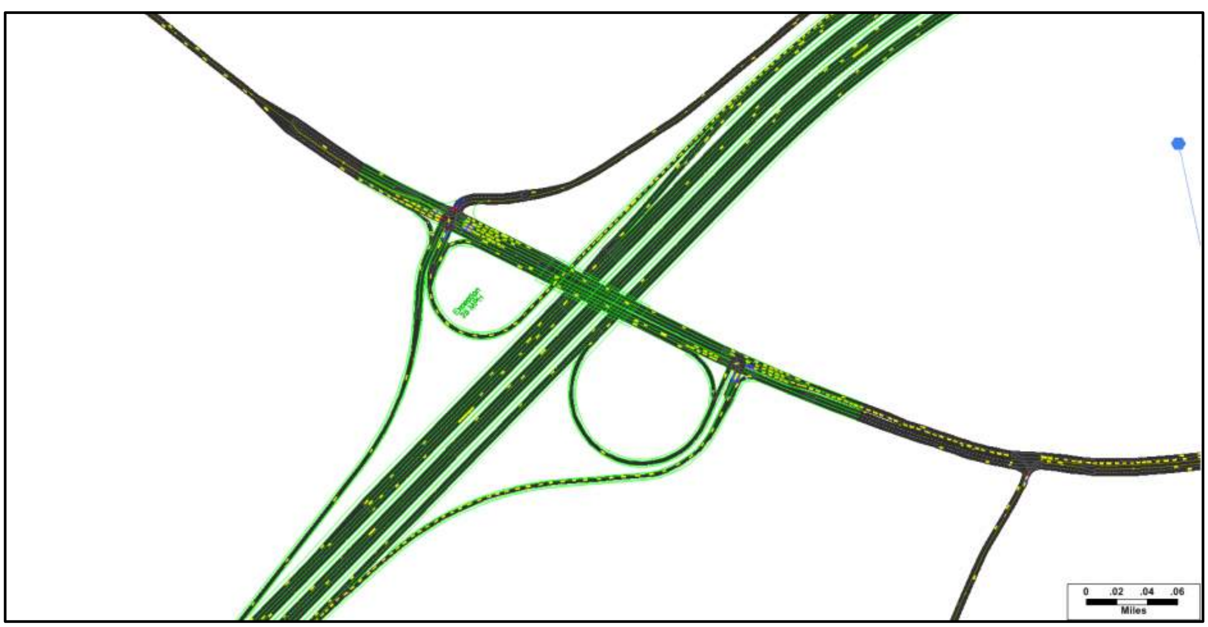


Figure 20 - Exit 63 (AO8) Simulation - PM Peak Hour



- Exit 65 (AO5) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 21** – interchange operates under capacity. Eastbound I-20 experiences congestion east of the interchange at the lane drop
    - PM Peak Hour – See **Figure 22** – interchange operates under capacity.

Figure 21 - Exit 65 (AO5) Simulation - AM Peak Hour

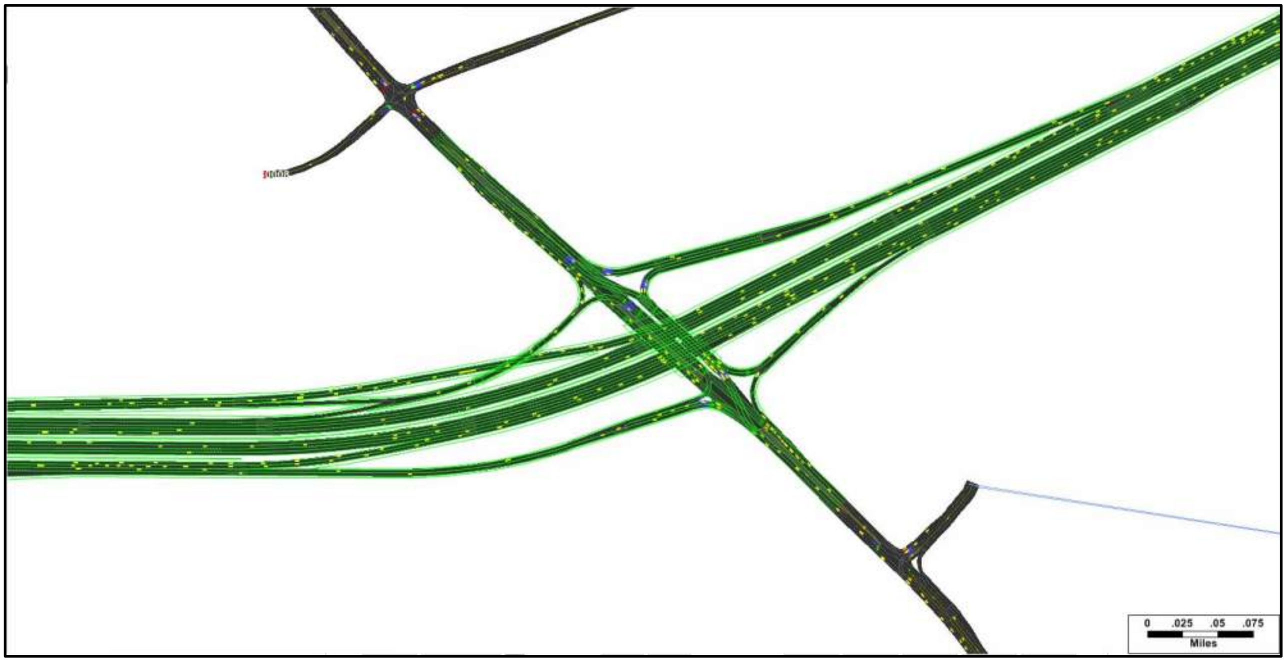
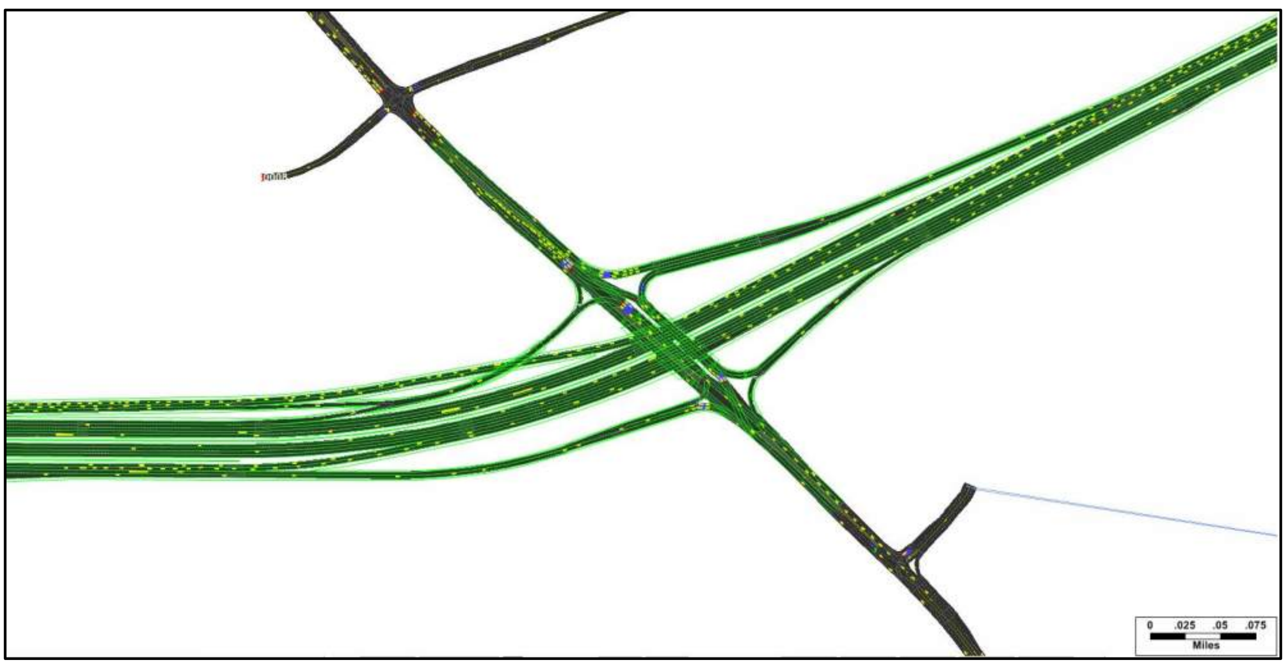
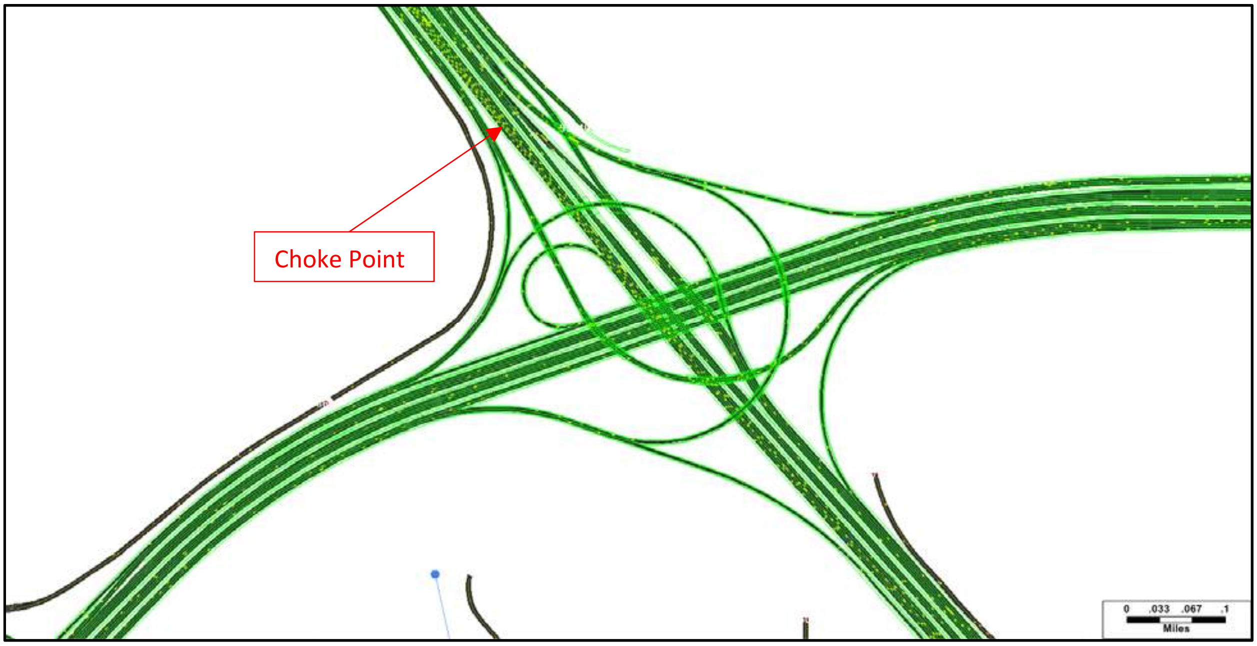


Figure 22 - Exit 65 (AO5) Simulation - PM Peak Hour

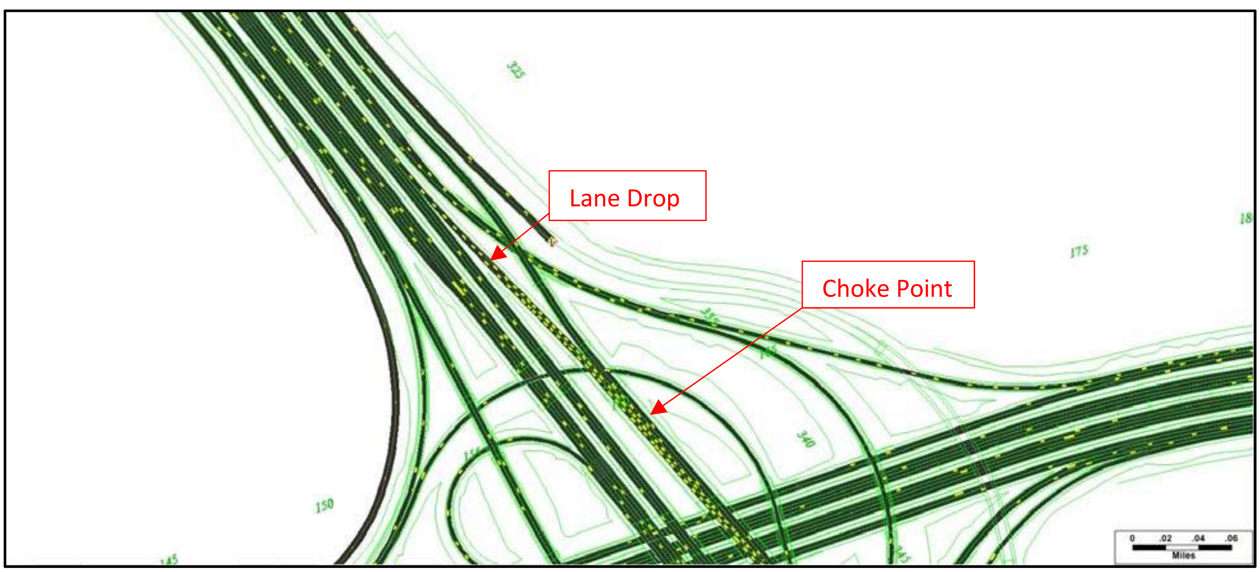


RA7 Specific Choke Points:

1. I-26 EB mainline lane drop prior to on-ramp from I-20 westbound C-D road



2. I-126 WB/I-26 WB merge



Reasonable Alternative 8 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Under	Under	Under	Under	
Exit 102-103	Under	At	Under	Under	Simulation did not show any operational issues
Exit 103-104	At	Under	Under	Under	
Exit 104-106	At	Under	At	At	Eastbound queuing issues are a result of the merge from I-26 to eastbound I-20. Westbound capacity issues due to the lane reduction. If additional lane is carried through to Exit 104, this may reduce the capacity issue.
Exit 106-107	Under	Under	Under	Under	
Exit 107-108	Under	Under	Under	At	Some minor congestion was observed in the simulation in the westbound direction between Exits 108 and 107 due to weaving.
Exit 108-110	Under	Under	Under	Under	
Exit 108 – Colonial Life	Under	Under	Under	Under	
Exit 63-64	Under	Under	Under	Under	
Exit 64-65	Under	Under	Under	Under	
E-W Connector	Under	Under	Under	Under	

Interchanges

Exit		AM		PM		Comment
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	
Exit 101	Par. Clo.	At	Under	Under	Under	Eastbound on ramp operates at capacity due to heavy traffic from the west of the interchange
Exit 102	Par. Clo.	Under	Under	Under	Under	
Exit 103	AO35	Under	Under	Under	At	Westbound off-ramp operates at capacity, further signal timing changes may alleviate the queuing.
Exit 104	AO31	Under	Under	Under	Under	
Exit 106	AO13	Over	Under	Under	Over	Heavy right turn volume from St. Andrews Road to the eastbound on-ramp queues onto St. Andrews Road.

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
						Additional on-ramp capacity needed to ease congestion in the AM. In the PM, heavy westbound off-ramp traffic necessitates additional geometric changes. Some of the westbound off-ramp congestion is due to its interaction with and proximity to Fernandina/Burning Tree Road.
Exit 107/Exit 64	AO28	Over	Under	Over	Under	Ramp from I-26 to eastbound to both I-20 ramps operates over capacity due to the capacity reduction right at the merge point of the CD road onto the mainline of eastbound I-20. This creates extensive queuing back along the I-20 eastbound C-D road onto eastbound I-26. The new .KMZ file shows revised ramp alignments which will need to be evaluated.
Exit 108 – I-126	AO28	Under	Under	Under	Under	
Exit 110	AO46	At	At	At	At	Signal timing changes have made some improvement to the operation of the off-ramps, however, further geometric and/or signal timing changes may be necessary to improve the operations of the interchange.
Colonial Life		At	Under	Under	Under	The lane drop in the eastbound direction causes minor congestion.
Exit 63	AO28	Under	Under	Under	Under	
Exit 65	AO3	Under	Under	Under	Under	
E-W Connector at Bush River Road	AO28	Under	Under	Under	Under	

Simulation Observations and Alternative Modifications

The green line work is the KMZ file used for the simulation observations. The gray line work represents the latest provided KMZ file.

- Exit 101 (Par. Clo) – .KMZ file did not contain WB I-26 off-ramp to southbound Broad River Road, however, it was maintained for the simulation. There are some slight alignment changes for the new .KMZ file which should not cause any operation changes.
  - AM Peak Hour – See **Figure 1** – interchange operates under capacity except the EB on-ramp which operates at capacity.
  - PM Peak Hour – See **Figure 2** – interchange operates under capacity.

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

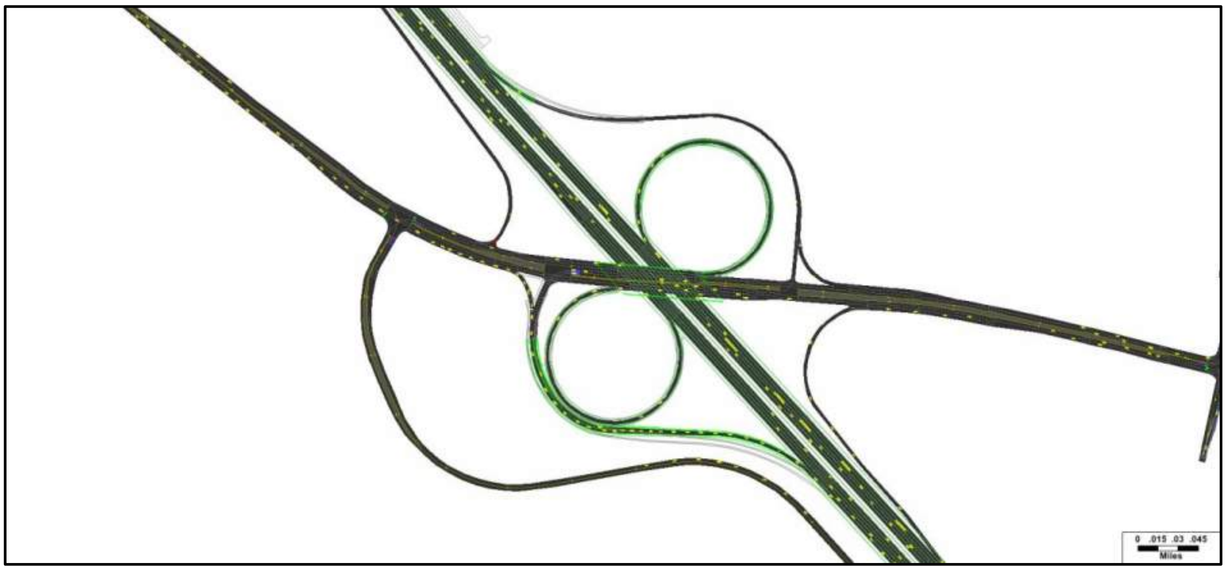
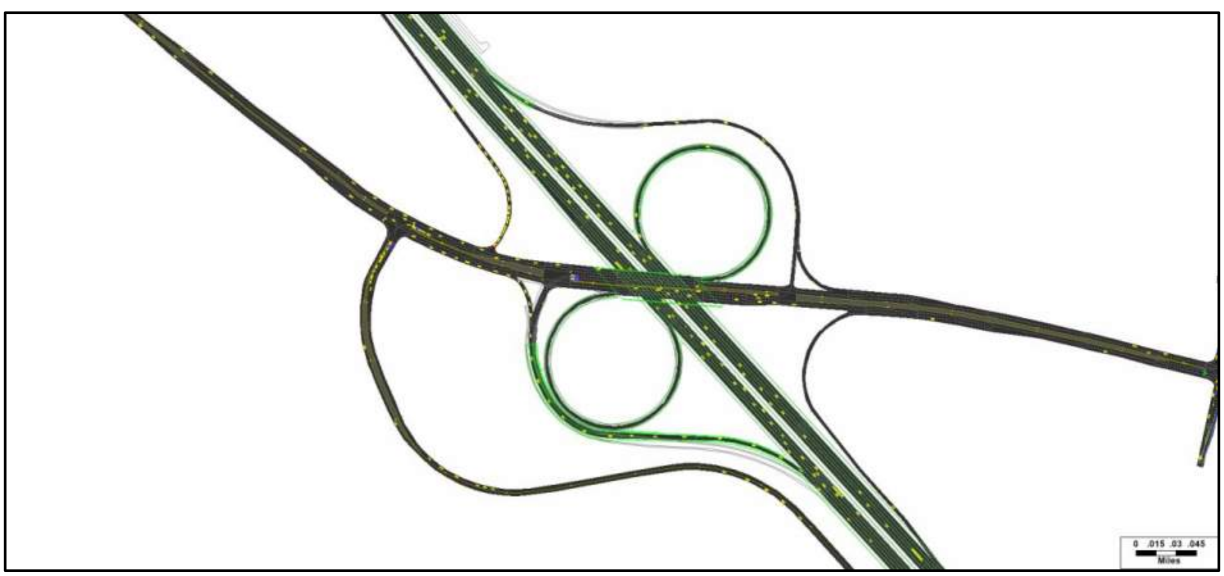


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 102 (Par.Clo) – No geometric changes made from the .KMZ file. There are some slight alignment changes for the new .KMZ file which should not result in any operation changes.
  - AM Peak Hour – See **Figure 3** – interchange operates under capacity
  - PM Peak Hour – See **Figure 4** – interchange operates under capacity. Queuing on Columbiana Dr. may be able to be corrected with further signal timing and geometric improvements.

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

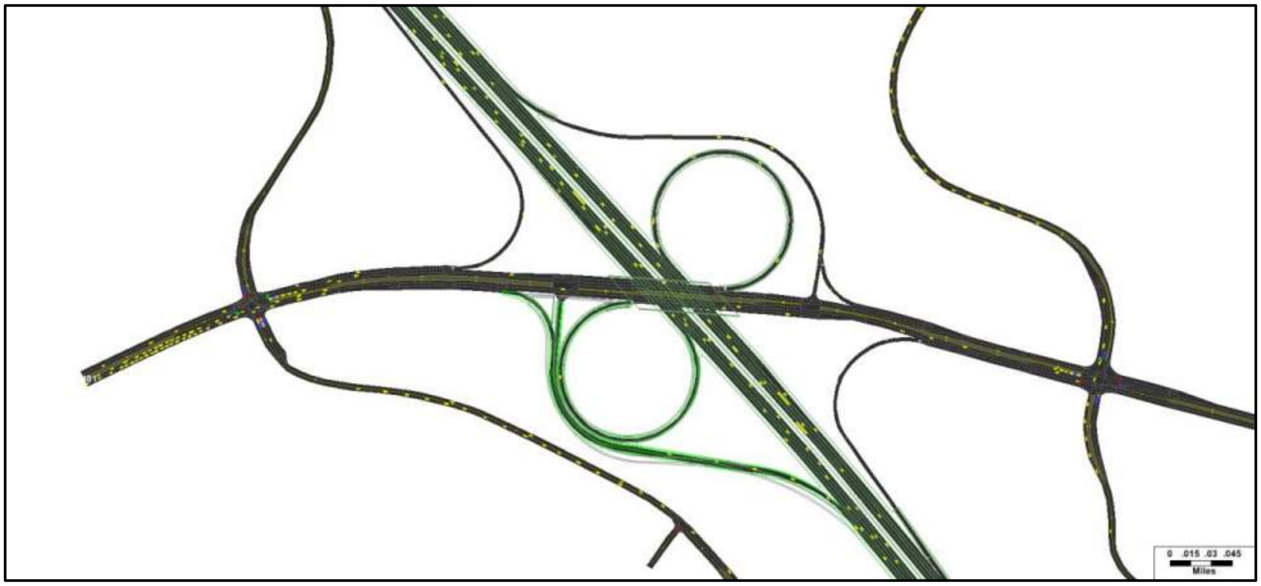
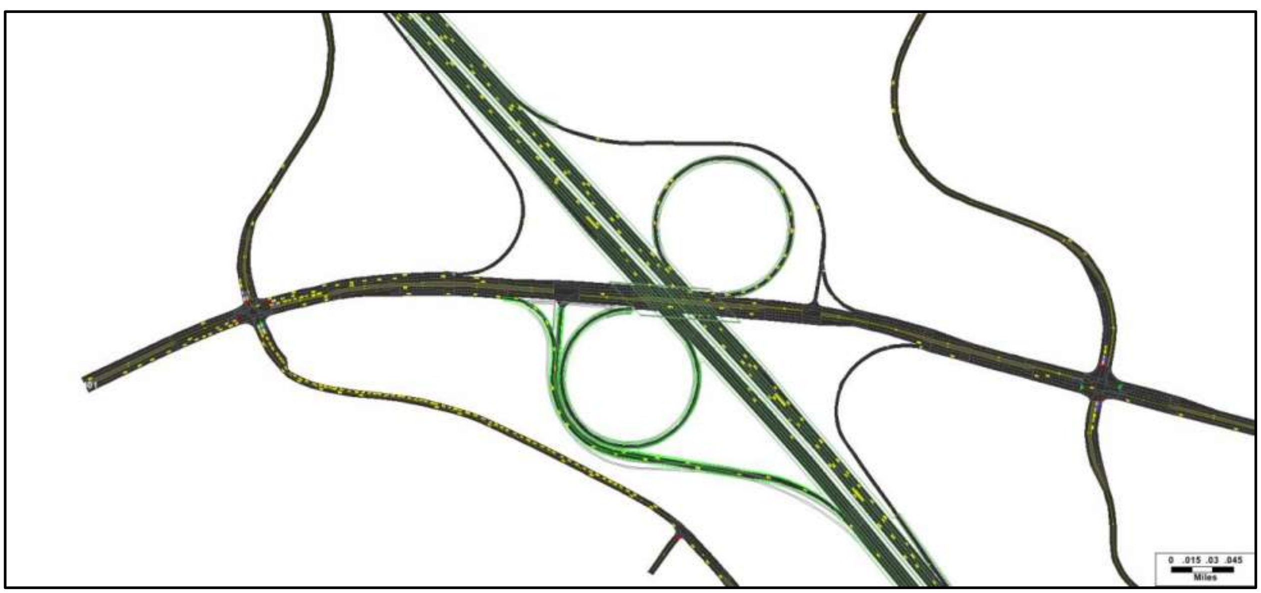


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO35) – No geometric changes made from the .KMZ file. Revised .KMZ file changes the locations of the intersections as well as impacts some of the storage lengths. For example, moving the westbound ramp intersection closer to Woodcross Road may negatively impact operation along Harbison Boulevard. Further signal timing changes may be necessary to accommodate the geometric changes.
    - AM Peak Hour – See **Figure 5** – interchange operates under capacity
    - PM Peak Hour – See **Figure 6** – interchange operates under capacity except the westbound off-ramp. Further signal timing changes may improve the operations.

Figure 5 - Exit 103 (AO35) Simulation - AM Peak Hour

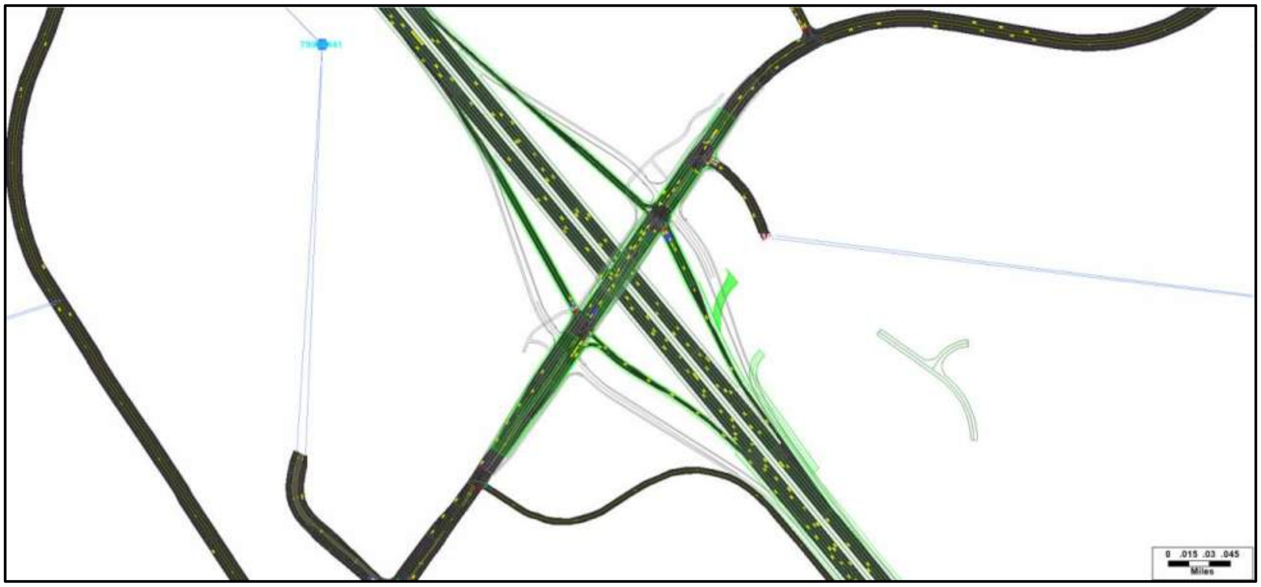
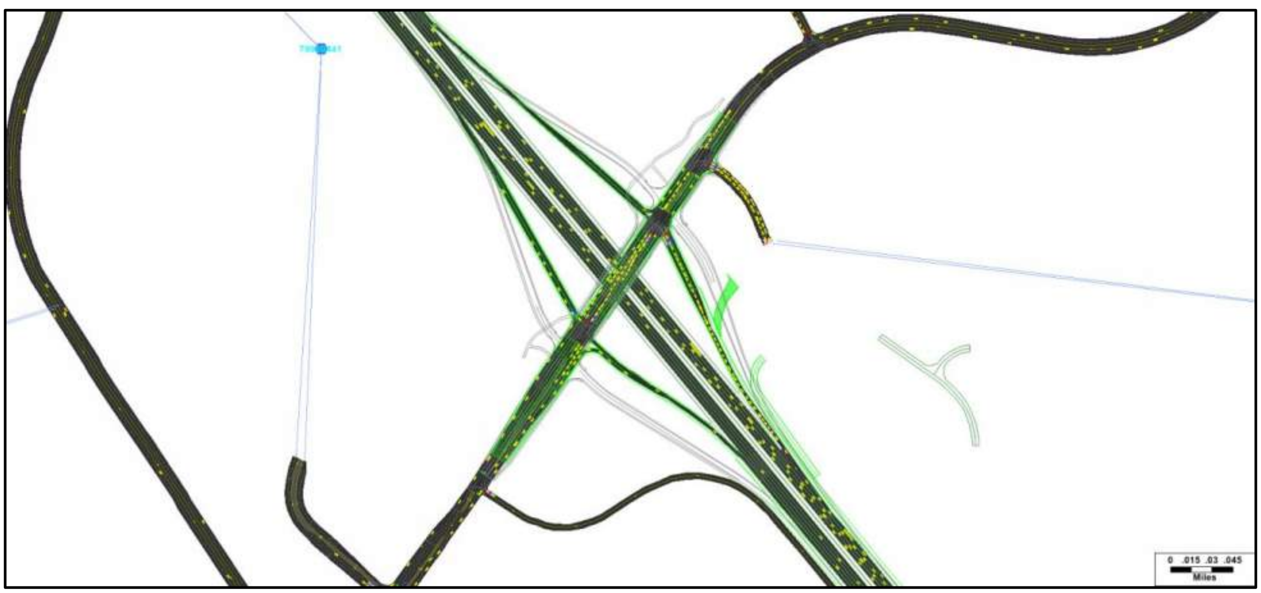


Figure 6 - Exit 103 (AO35) Simulation - PM Peak Hour



- Exit 104 (AO31) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 7** – interchange operates under capacity.
    - PM Peak Hour – See **Figure 8** – interchange operates under capacity. Heavy queuing on NB Jamil Rd and NB Fernandina Rd may be corrected with additional signal timing and geometric changes.

Figure 7 - Exit 104 (AO31) Simulation - AM Peak Hour

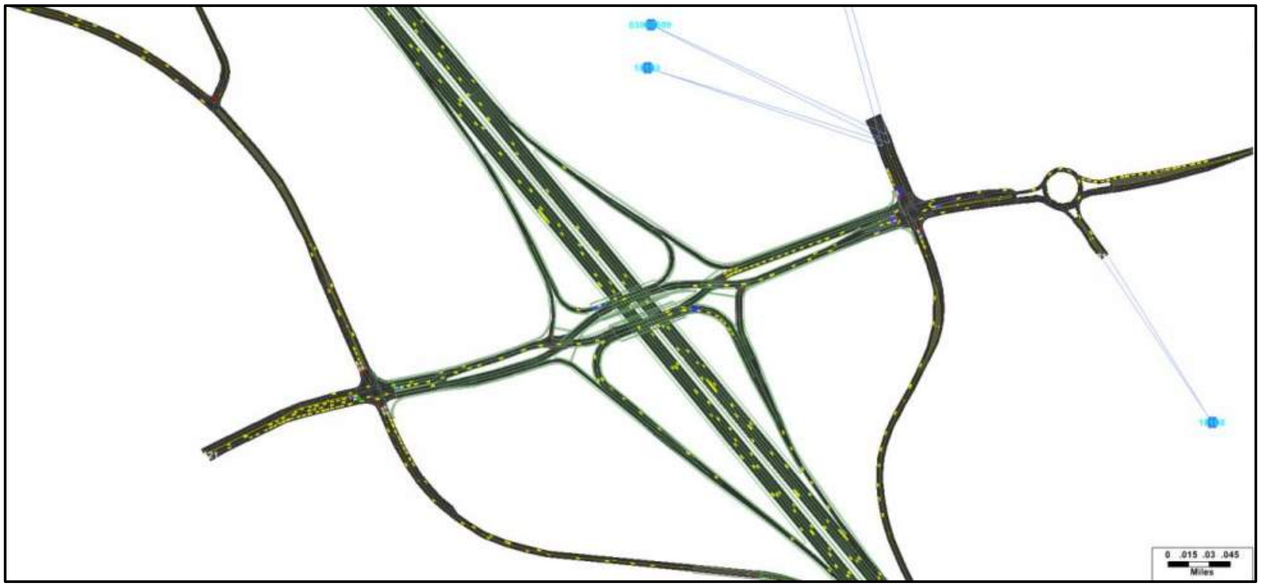
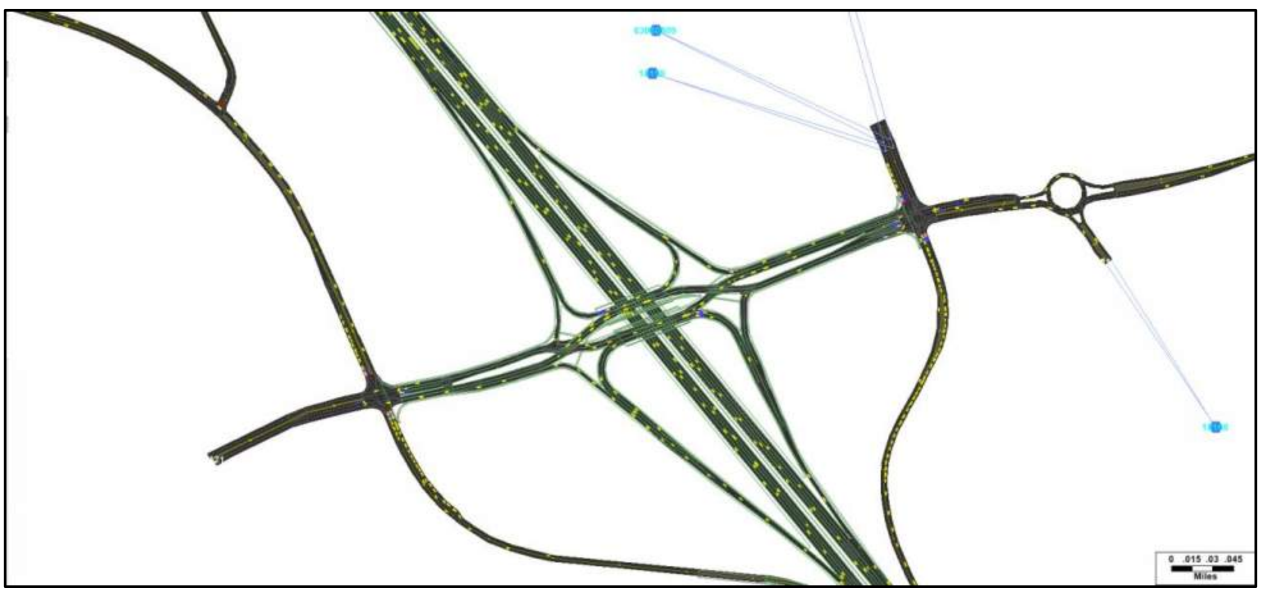


Figure 8 - Exit 104 (AO31) Simulation - PM Peak Hour



- Exit 106 (AO13) – Northbound approach of Burning Tree Dr. modified from the .KMZ to ease the movement of vehicles from the westbound off-ramp as well as help with PM queuing issues. Modifications included widening the approach to St. Andrews Road to 4 lanes (double left, through, right). Queuing is evident on the eastbound C-D road leading to the system interchange in AM/PM.
    - AM Peak Hour – See **Figure 9** – interchange operates under capacity except for the heavy movement from eastbound right turn movement from St. Andrews Road to the on-ramp to eastbound I-26.
    - PM Peak Hour – See **Figure 10** – interchange operates at capacity except at the Fernandina Rd/Burning Tree Dr. intersection. Additional signal timing changes may improve arterial operations which currently shows heavy queuing along St. Andrews Road approaching the interchange from the east and west.

Figure 9 - Exit 106 (AO13) Simulation - AM Peak Hour

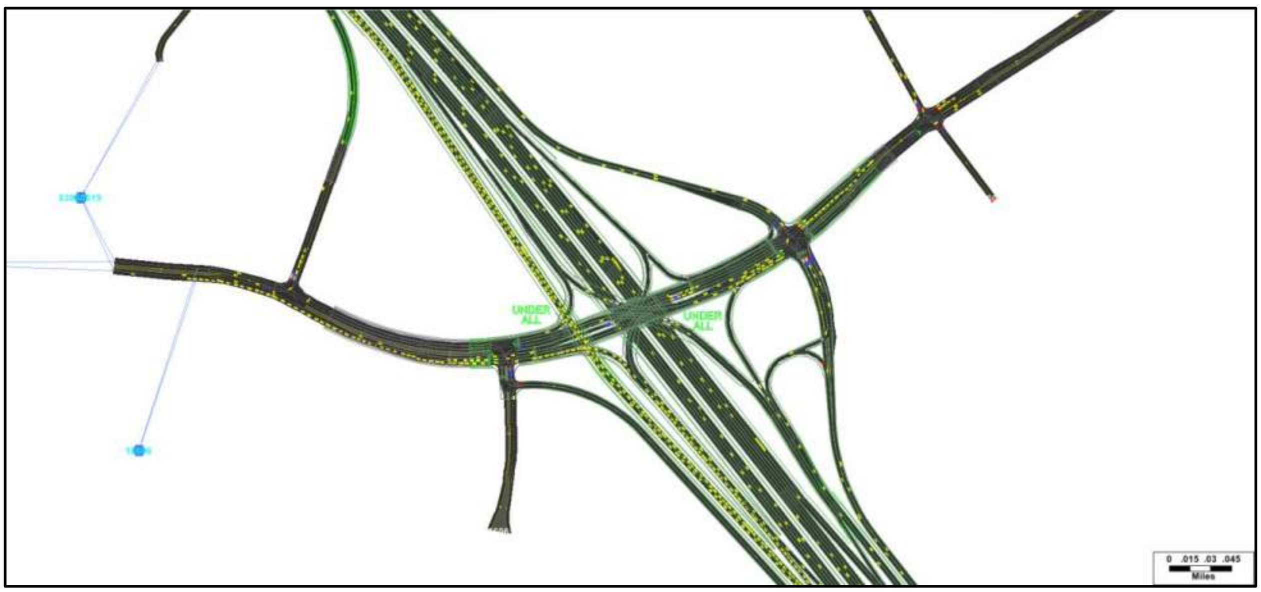
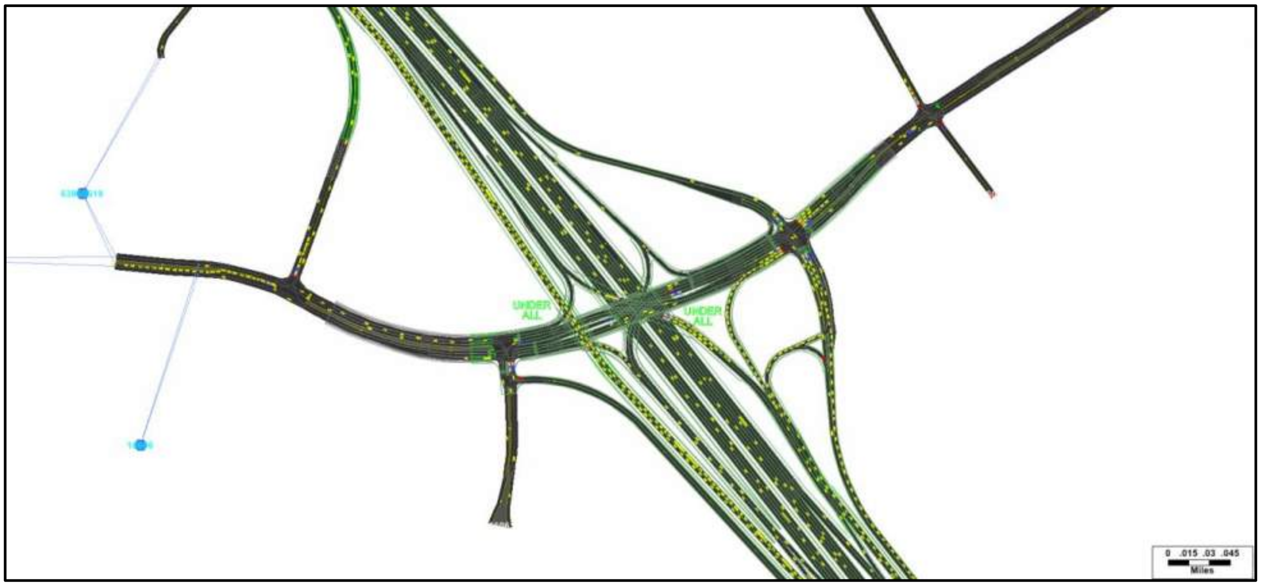


Figure 10 - Exit 106 (AO13) Simulation - PM Peak Hour



- Exit 107/Exit 64 (AO28) –The I-20 eastbound on-ramp from the I-26 EB CD road operates over capacity and creates heavy queuing conditions on the ramp from I-26 eastbound as constructed in the .KMZ file where it merges to a single lane at the merge point with I-20. The revised .KMZ file shows significant changes to the ramp arrangement of the interchange and will need to be further evaluated.
    - AM Peak Hour – See **Figure 11** – interchange operates over capacity due to the merge of the CD road onto eastbound I-20.
    - PM Peak Hour – See **Figure 12** – interchange operates over capacity due to the merge of the CD road onto eastbound I-20. The I-20 westbound off-ramp to I-26 westbound is at capacity and causes minor congestion at the diverge point.

Figure 11 - Exit 107/Exit 64 (AO28) Simulation - AM Peak Hour

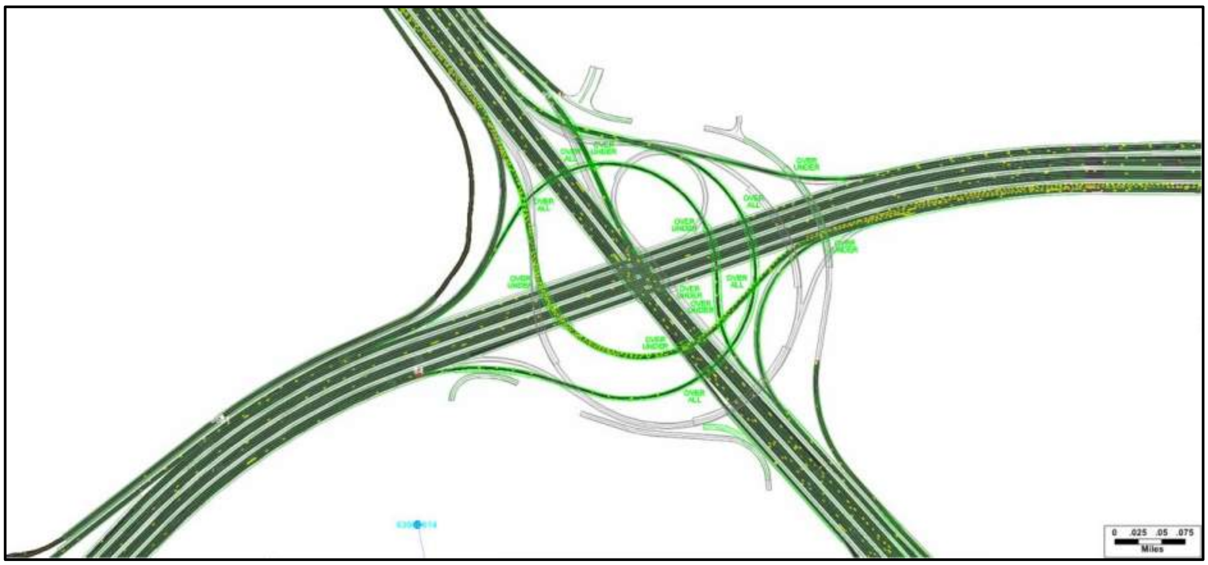
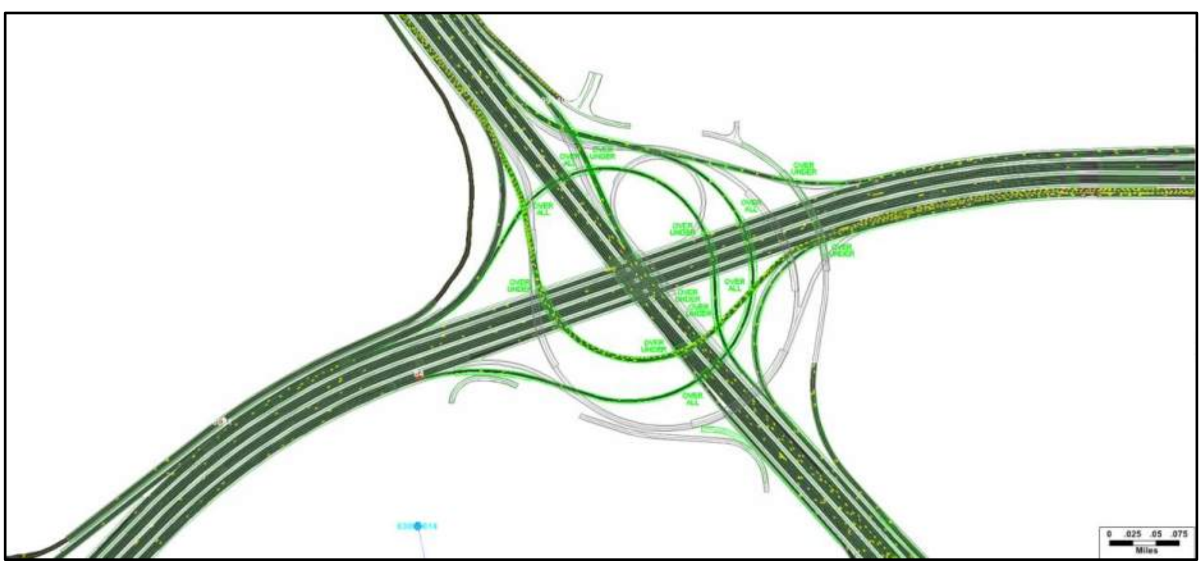


Figure 12 - Exit 107/Exit 64 (AO28) Simulation - PM Peak Hour



- Exit 108 (AO28) – No geometric changes made from the .KMZ file. Revised .KMZ shows a channelized right turn at the intersection of Bush River Road and Morninghill Dr./Ramps to/from I-26 which should help operations. Other changes in the revised .KMZ file include realignment of multiple ramps but they should not have a significant impact on the operations.
  - AM Peak Hour – See **Figure 13** – The interchange operates under capacity.
  - PM Peak Hour – See **Figure 14** - Interchange operates under capacity with the exception of the intersection of Bush River Road and Morninghill Dr./Ramps to/from I-26. The off-ramp experienced spillback queuing. An overlap right turn was added which improved operations so that it operates under capacity. Some minor congestion was observed in the simulation in the westbound direction between Exits 108 and 107 due to weaving.

Figure 13 - Exit 108 (AO28) Simulation - AM Peak Hour

Figure 14 - Exit 108 (AO28) Simulation - PM Peak Hour

- Exit 110 (AO46) – No geometric changes made from the .KMZ file.
  - AM Peak Hour – See **Figure 15** – Congested conditions along the arterial. Both the northbound and southbound ramps operate at capacity. Additional signal timing and geometric changes may help alleviate this congestion.
  - PM Peak Hour – See **Figure 16** – Both the northbound and southbound ramps operate at capacity. Additional signal timing and geometric changes may help alleviate this congestion.

Figure 15 - Exit 110 (AO46) Simulation - AM Peak Hour

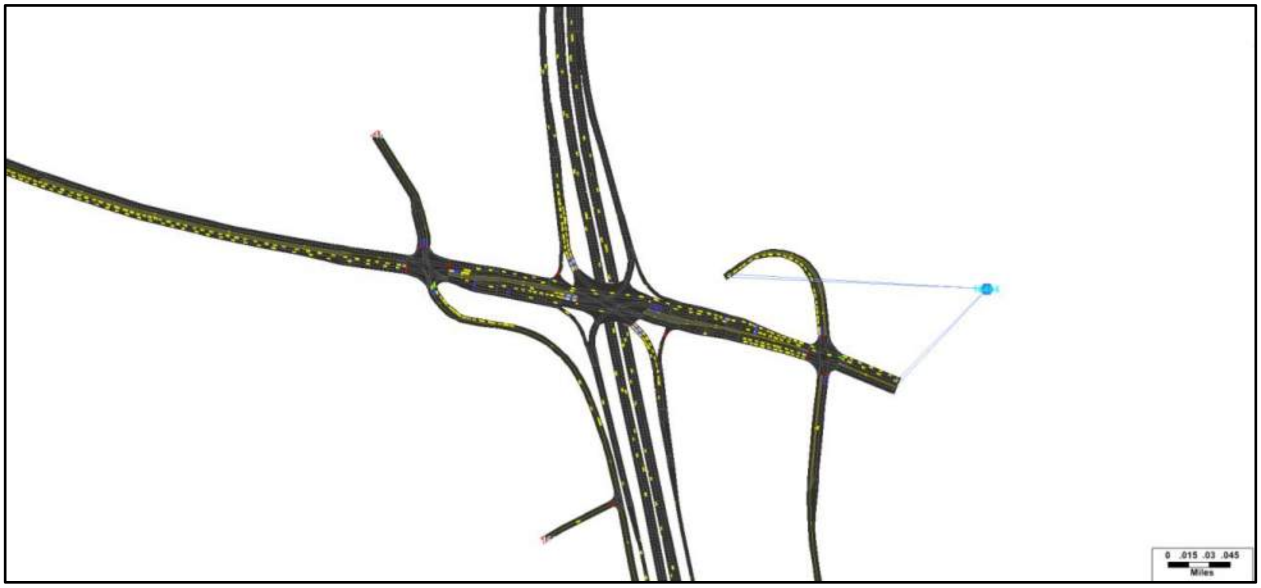
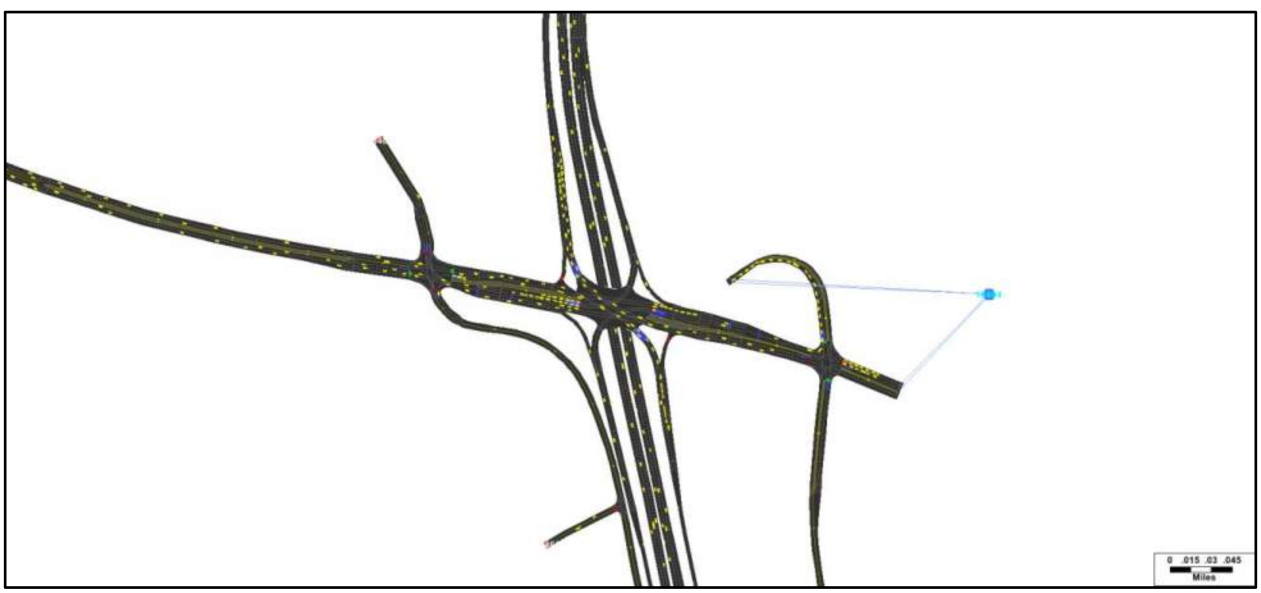


Figure 16 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 17** – Interchange operates under capacity with the exception of at the lane drop on the eastbound ramp approaching Colonial Life Boulevard, which causes minor congestion.
    - PM Peak Hour – See **Figure 18** – Interchange operates under capacity.

Figure 17 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

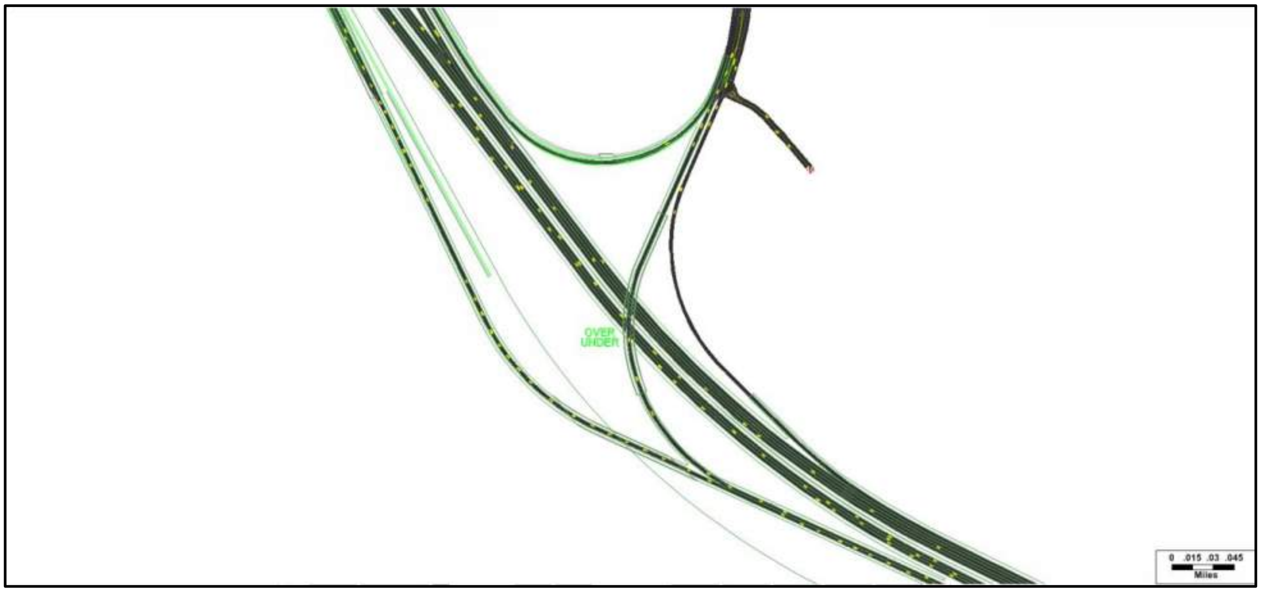
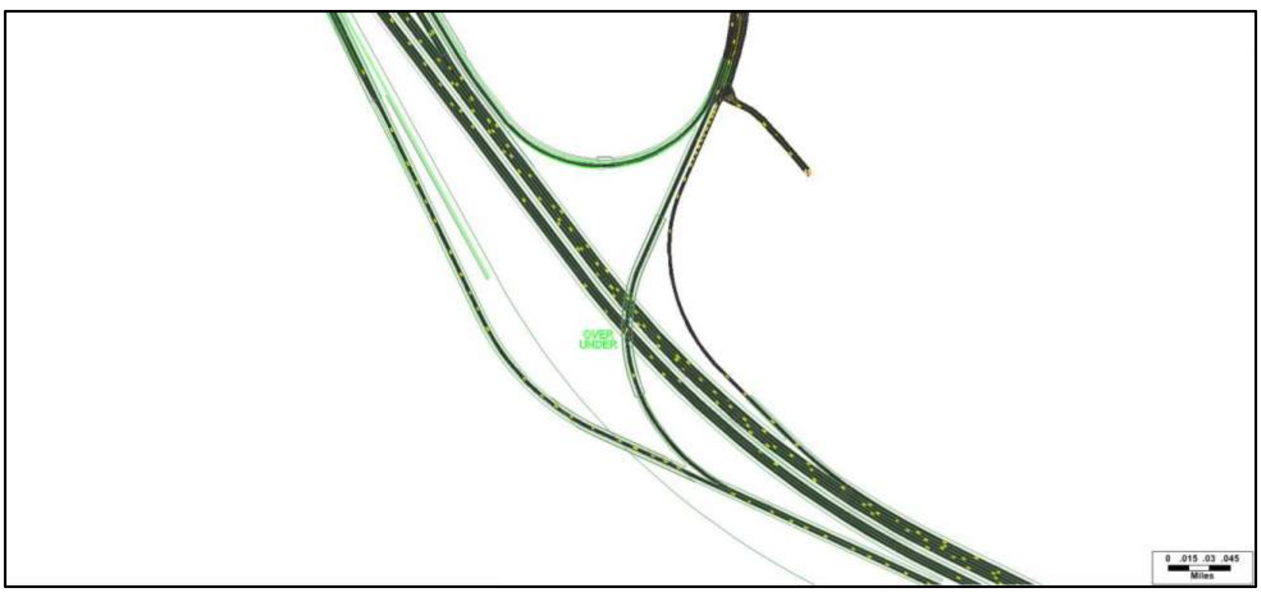


Figure 18 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO28) – No geometric changes made from the .KMZ file. New .KMZ file has realigned ramps and merge points but significant changes to the operations are not expected.
    - AM Peak Hour – See **Figure 19** – interchange operates over capacity. However, further signal timing changes may alleviate some of the queuing along the arterial.
    - PM Peak Hour – See **Figure 20** – interchange operates over capacity.

Figure 19 - Exit 63 (AO28) Simulation - AM Peak Hour

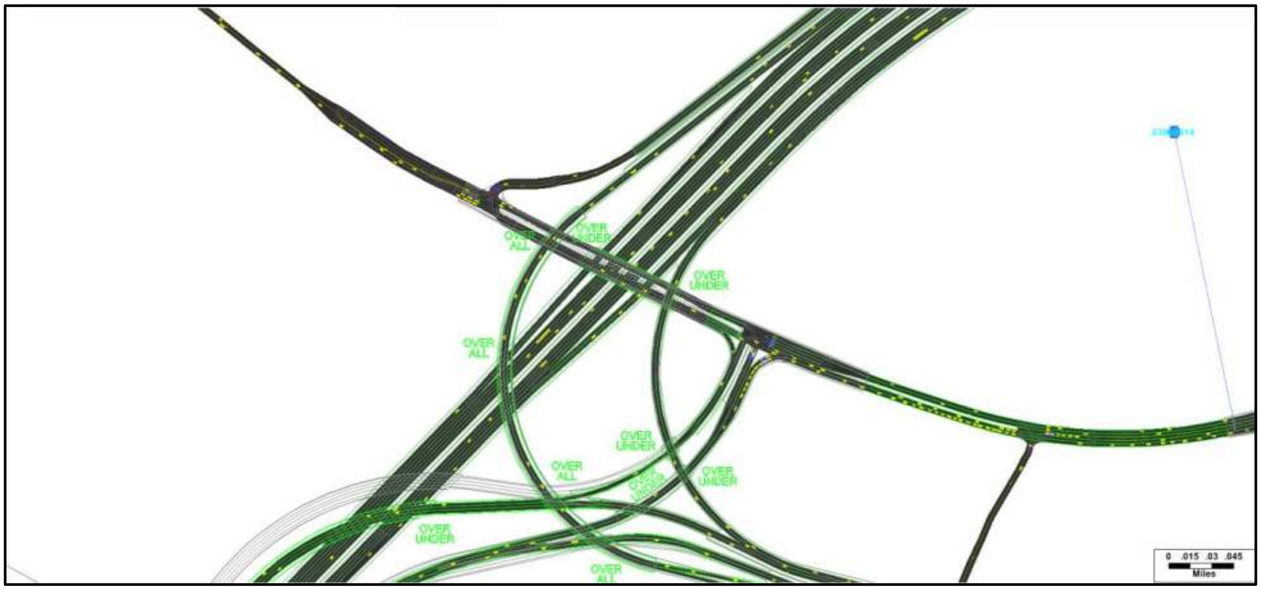
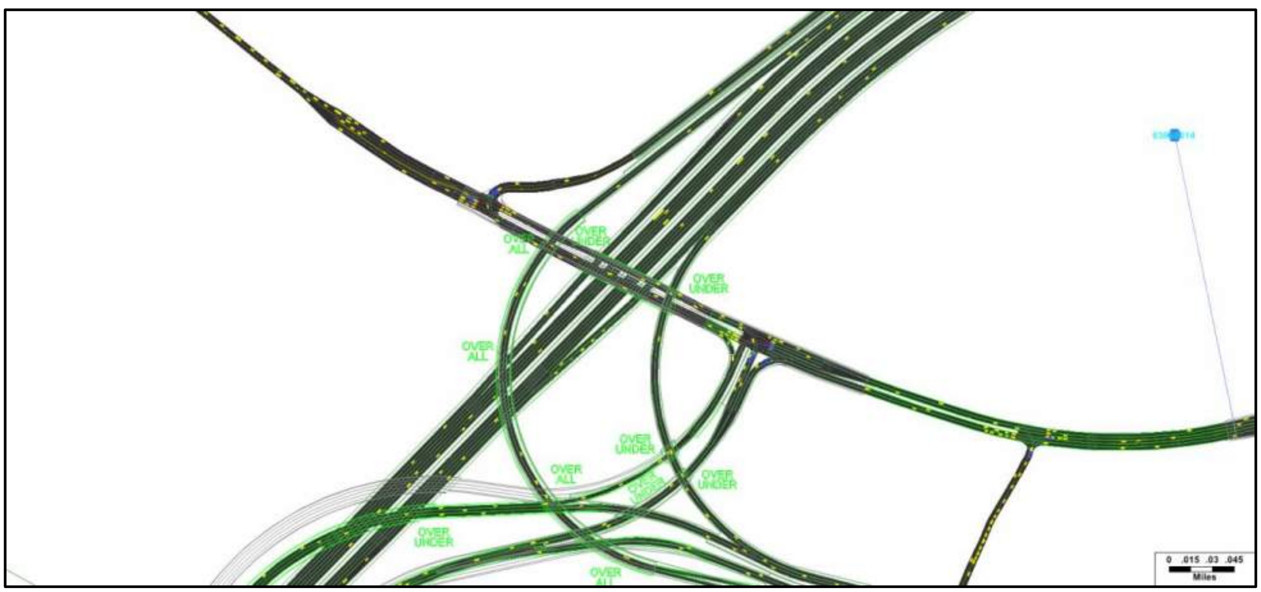


Figure 20 - Exit 63 (AO28) Simulation - PM Peak Hour



- Exit 65 (AO3) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 21** – interchange operates under capacity with the exception of the left turn from Broad River Road onto eastbound I-20.
    - PM Peak Hour – See **Figure 22** – interchange operates under capacity.

Figure 21 - Exit 65 (AO3) Simulation - AM Peak Hour

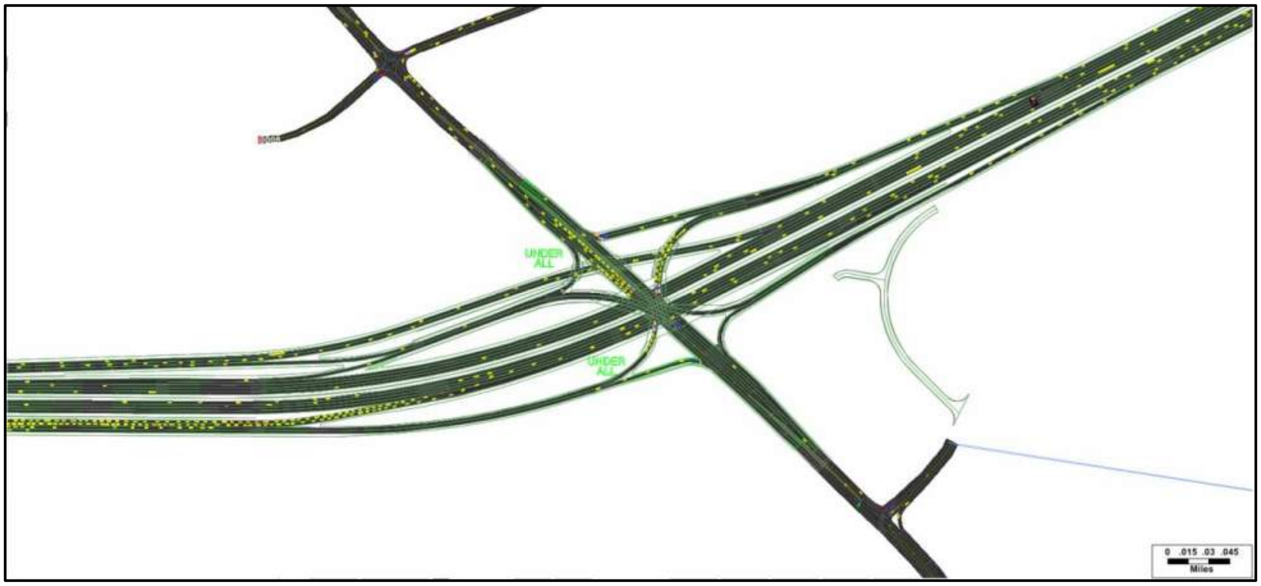
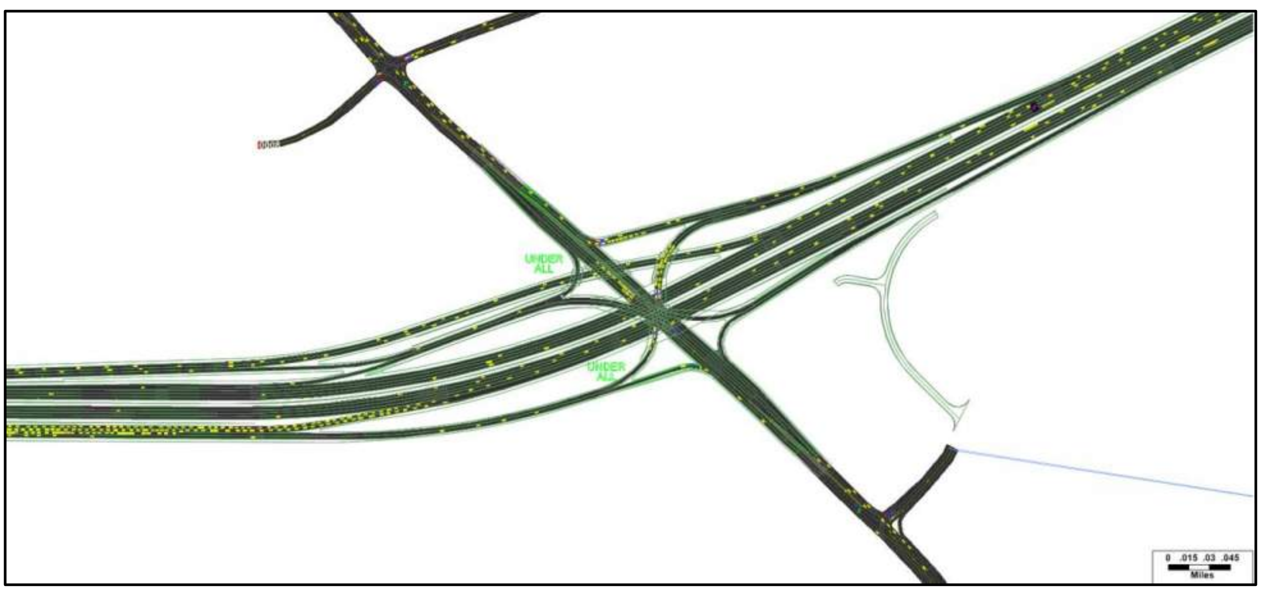


Figure 22 - Exit 65 (AO3) Simulation - PM Peak Hour



- E-W Connector (AO28) – No geometric changes made from the .KMZ file.
    - AM Peak Hour – See **Figure 23** – connector operates under capacity.
    - PM Peak Hour – See **Figure 24** – connector operates under capacity.

Figure 23 - E-W Connector (AO28) Simulation - AM Peak Hour

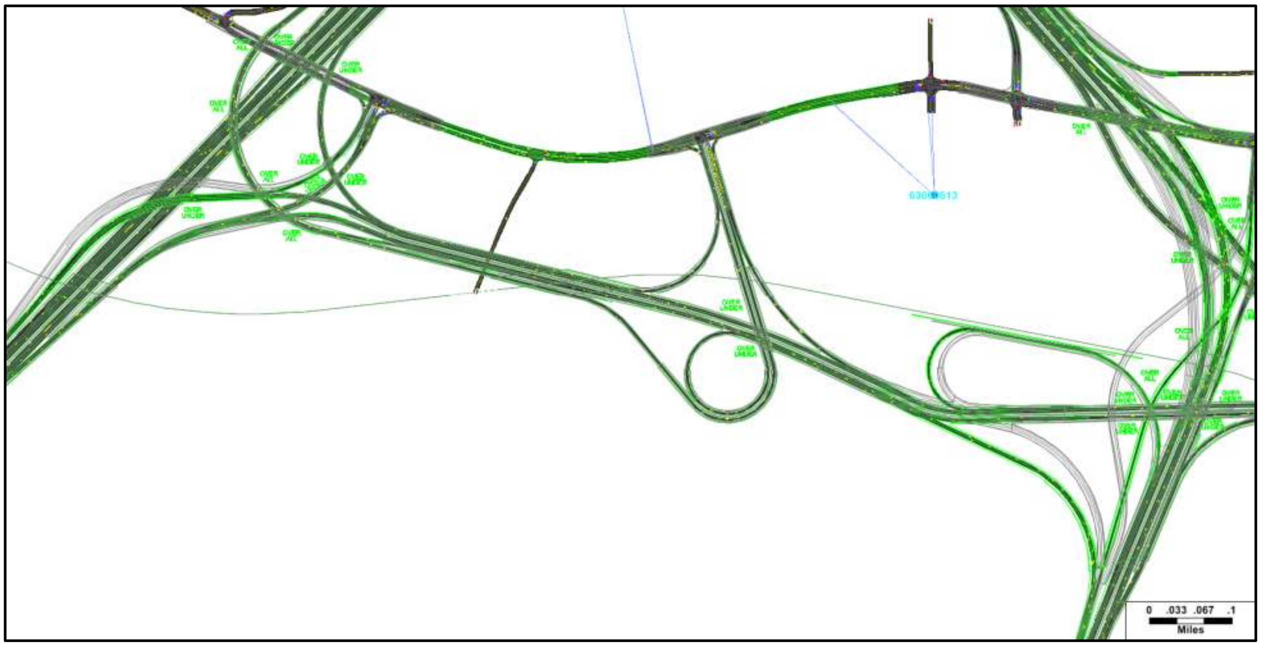
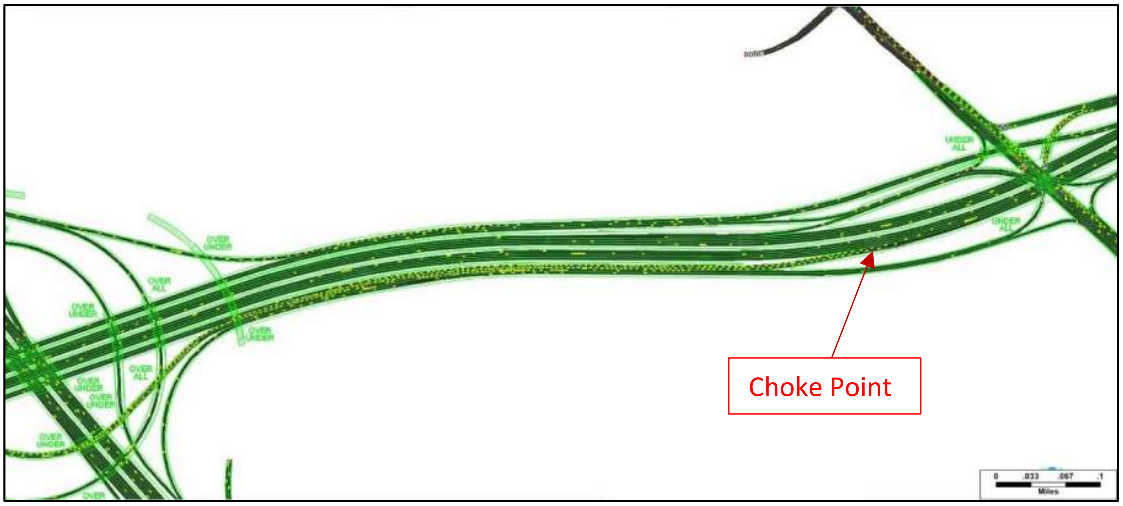


Figure 24 - E-W Connector (AO28) Simulation - PM Peak Hour

RA8 Specific Issues/Choke Points:

1. I-20 EB C-D road lane drop at same location of on-ramp merge into the I-20 EB mainline.

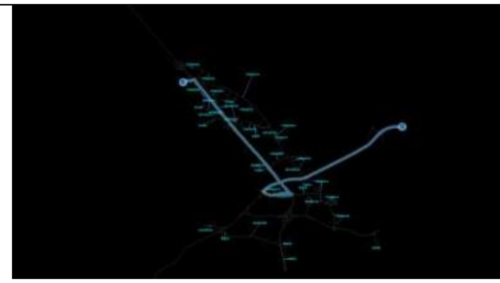
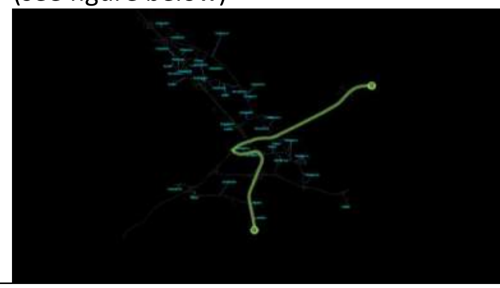


Reasonable Alternative 9 – Microsimulation Summary (2040 Volumes)

Freeway Segments

Segment	AM		PM		Comment
	EB	WB	EB	WB	
Exit 101-102	Over	Under	Under	Under	During the AM peak hour, heavy queueing is observed on EB I-26. This queueing is the result of the traffic back up that originated at I-26 EB Off-Ramp onto Bush River Road and propagated back beyond exit 102. The path of the assignment from the west end of the project to EB I-20 indicates traffic will likely not use the proposed the East-West connector. The assignment path shows EB traffic exiting at Exit 108, traveling west along Bush River Road, and entering I-20 EB at Exit 63 (see the figure below). 
Exit 102-103	Over	Under	Under	Under	During the AM peak hour, heavy queuing was observed on the EB I-26. This queueing is the result of the traffic back up that originated at I-26 EB Off-Ramp at Exit 108 and propagated back beyond exit 102.
Exit 103-104	Over	Under	Under	Under	During the AM peak hour, heavy queuing was observed on the EB I-26. This queueing is the result of the traffic back up that originated at I-26 EB Off-Ramp at Exit 108 and propagated back beyond exit 102.
Exit 104-106	Over	Under	Over	Under	During the AM peak hour, heavy queuing was observed on the EB I-26. This queueing is the result of the traffic back up that originated at I-26 EB Off-Ramp at Exit 108 and propagated back beyond exit 102. Similar queues on EB I-26 extend between Exits 106 and 104 in the PM peak hour on EB I-26 . As in the AM peak

					hour, this queuing originates at the -26 EB Off-Ramp at Exit 108 by traffic destined towards EB I-20.
Exit 106-108	Over	Over	Over	Over	Heavy queuing was observed on EB I-26 during both peak hours. This results from traffic going to I-20 EB getting off the I-26 EB Off-Ramp at Exit 108. Heavy queuing was also observed along WB I-26 during the AM peak hour. This results from WB Off-Ramp left turn queues at Exit 106 being gridlocked by traffic on WB St Andrews unable to enter the Exit 106 EB On-Ramp. During the PM peak hour, a combination of diverging traffic at Exit 106 and merging traffic from WB On-ramp at exit 108 is slowing traffic down on WB I-26.
Exit 108-110	Under	Over	Under	Under	During the AM peak hour, queuing was observed on WB I-26 between Exit 108 and proposed E-W Connector system interchange. This results from the westbound Off-Ramp queuing at Exit 106. Queuing was also observed on I-26 WB east of the proposed E-W Connector interchange. This results from queuing on the I-26 WB Off-Ramp at Exit 108. During the PM peak hour, the area where traffic from WB I-126 and WB I-26 merge is congested.
Exit 108 – Colonial Life	Under	Under	Under	Under	The WB I-126 traffic traveling to the E-W Connector to the ramp to WB I-26 results in congestion extending past the Colonial Life interchange during the PM peak hour.
Exit 63-64	Under	Over	Under	Over	During both peak hours, heavy WB off-ramp traffic causes upstream queuing on WB I-20. The model assignment path shows that majority of the trips on WB I-20 do not use the proposed East-West Connector to reach WB I-26., Instead traffic is routed from WB I-20 to Exit 63, travel east on Bush River Road and then get onto WB I-26 I-26 WB On-Ramp at Exit 108(See the Figure below).

					 Similarly, majority of the trips between WB I-20 to EB I-26 exit on at Exit 63, travel east on Bush River Road and enter EB I-26 using the on-ramp at Exit 108 (see figure below) 
Exit 64-65	Under	Over	Under	Under	During the AM peak hour, heavy queuing was observed on WB I-20. This results from queuing on WB Off-Ramp at Exit 63 by traffic using Bush River Road as a bypass to either WB I-26 or EB I-26.

Interchanges

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
Exit 101	Par.Clo.	Under	Under	Under	Under	
Exit 102	Par.Clo.	Over	Under	Under	Under	During the AM Peak hour, queuing was observed on EB Lake Murray Blvd as a result of traffic backup on the EB I-26 On-Ramp. This backup is caused by severe queuing on EB I-26 mainline.
Exit 103	AO49	Over	Under	Under	Under	During the AM peak hour, the traffic backup on the EB On-Ramp caused by the congestion on EB I-26 results in queuing along Harbison Blvd in both the eastbound and westbound directions. The resulting arterial queuing extends in each direction beyond the interchange area.
Exit 104	AO32	Over	Under	Under	Under	During the AM peak hour, the traffic backup on the EB On-Ramp causes heavy queuing along the arterial in both the eastbound and westbound directions.
Exit 106	AO15	Over	Over	Over	Under	During the AM peak hour, traffic backup on the EB On-Ramp causes heavy queuing along the arterial in both the eastbound and westbound directions. These queuing extends beyond the interchange in both directions. The resulting westbound queue also impacts traffic operation at the westbound Off-Ramp termini intersection, blocking access for the westbound left turn traffic. This in turn causes heavy congestion on the westbound Off-Ramp which extends beyond the ramp and spills back on to WB I-26 mainline.

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
						Heavy queuing was also observed on the EB on-ramp during the PM peak hour. This queuing blocks eastbound right turn traffic from entering the on-ramp, resulting in congestion along the arterial in the eastbound direction.
Exit 107/Exit 64	Removed					
Exit 108	AO29	Over	Over	Over	Over	Arterial experiences heavy congestion that in turn causes significant backup on both the EB and WB Off-Ramps from I-26. These traffic backup extends beyond the ramp and spills back on the mainline.
Exit 110	AO46	Under	Over	Over	Over	During the AM peak hour, the traffic backup on the westbound on-ramp, caused by congestion on WB I-26, results in congestion on the arterial in both the eastbound and westbound directions. During the PM peak hour, due to heavy traffic volume along the arterial, both the EB and WB off-ramps experiences queuing. Mainline traffic flow is not impacted by these queuing.
Colonial Life		Under	Under	Under	Under	
Exit 63	A010	Over	Over	Over	Over	Lack of ramp capacity and heavy traffic along Bush River Road creates traffic backup on both the eastbound and westbound off-ramps from I-20, which propagates beyond the ramps and onto the mainline.
Exit 65	AO3	Over	Over	Under	Over	During the AM peak hour, I-20 WB on-ramp experience backup due to heavy queuing on the mainline. This traffic backup also blocks northbound left turners from entering the ramp,

Exit		AM		PM		
Location	AO	EB Ramp	WB Ramp	EB Ramp	WB Ramp	Comment
						resulting queuing on the arterial in the northbound direction. Moderate queuing is also observed on the eastbound off-ramp, however traffic flows steadily on EB I-20. During the PM peak hour queuing on the westbound off-ramp was observed due to congestion on the arterial.

Simulation Observations and Alternative Modifications

The greenline work is the KMZ file used for the simulation observations.

- Exit 101 (Par.Clo)
    - AM Peak Hour – See **Figure 1** – interchange operates under capacity
    - PM Peak Hour – See **Figure 2** – interchange operates under capacity

Figure 1 - Exit 101 (Partial Cloverleaf) Simulation - AM Peak Hour

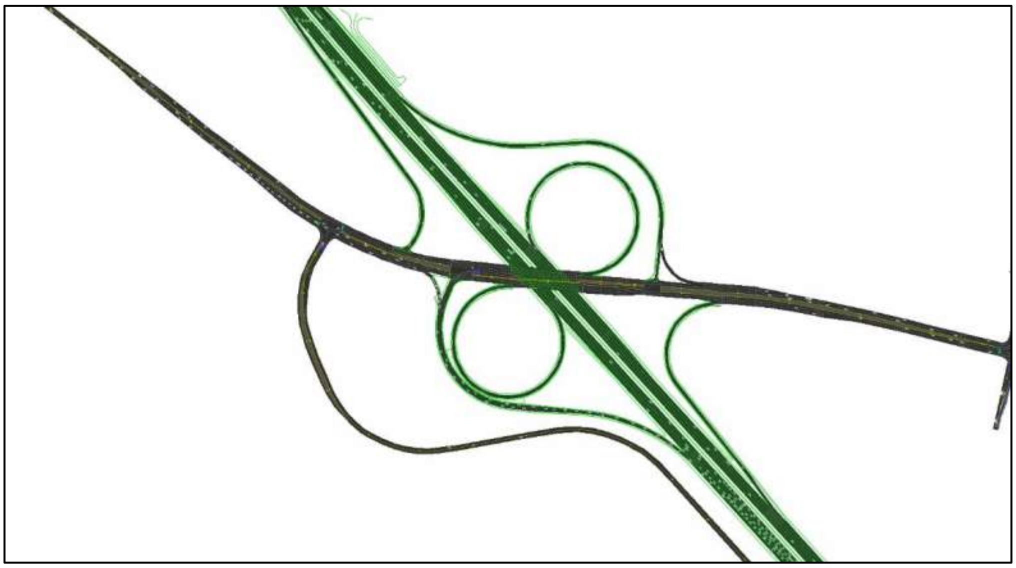
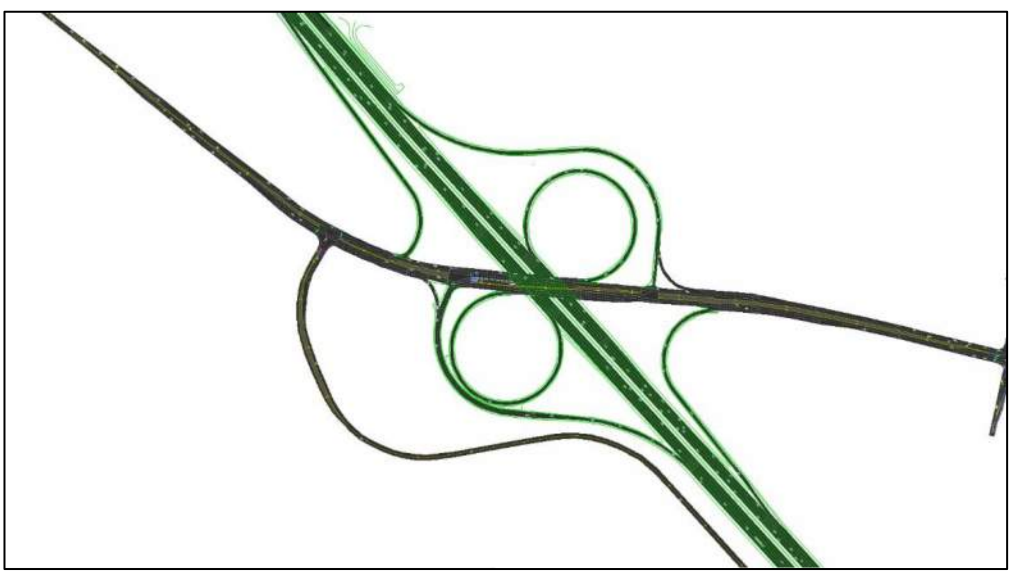


Figure 2 - Exit 101 (Partial Cloverleaf) Simulation - PM Peak Hour



-

- Exit 102 (Par.Clo)
    - AM Peak Hour – See **Figure 3** – interchange operates under capacity. However, queuing was observed on EB Lake Murray Blvd as a result of the traffic backup on the I-26 EB On-Ramp. This backup is caused by severe queuing on EB I-26 mainline.
    - PM Peak Hour – See **Figure 4** – interchange operates under capacity

Figure 3 - Exit 102 (Partial Cloverleaf) Simulation - AM Peak Hour

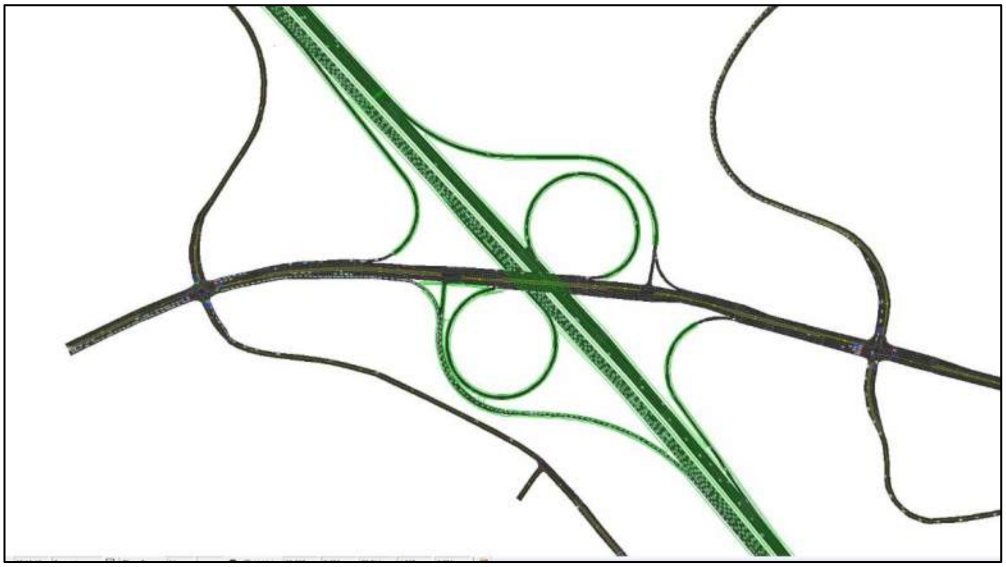
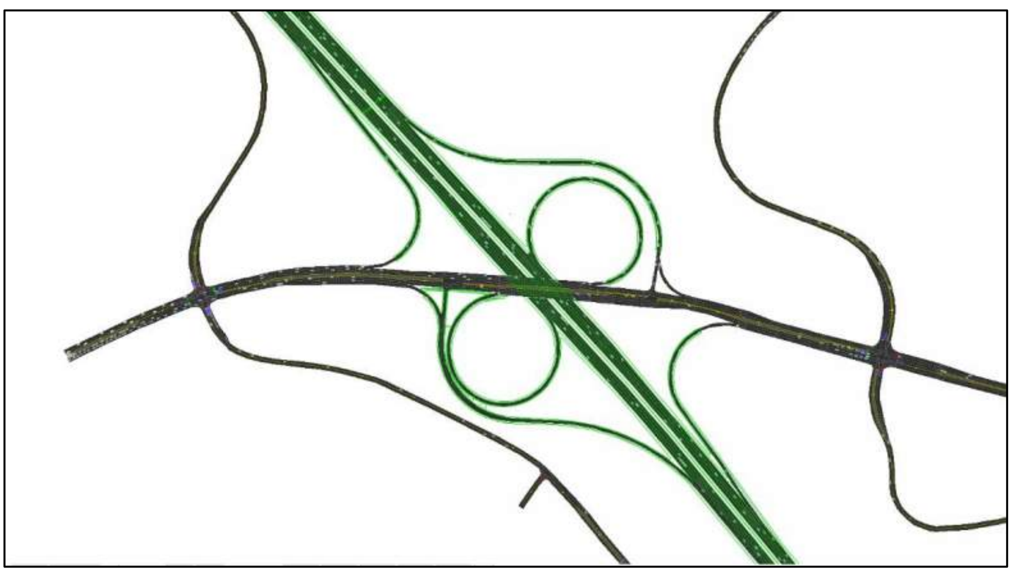


Figure 4 - Exit 102 (Partial Cloverleaf) Simulation - PM Peak Hour



- Exit 103 (AO49)-Simulation file differs slightly from .KMZ file. The original design showed dual right turns and a shared through/left turn lane on the westbound off-ramp approach at ramp termini intersection. Separate left turn and through lanes were modeled instead.
    - AM Peak Hour – See **Figure 5** – interchange operates over capacity. The traffic backup on the EB On-Ramp caused by the congestion on EB I-26 results in queuing along Harbison Blvd in both the eastbound and westbound directions. The resulting arterial queuing extends in each direction beyond the interchange area.
    - PM Peak Hour – See **Figure 6** – interchange operates under capacity.

Figure 5 - Exit 103 (AO49) Simulation - AM Peak Hour

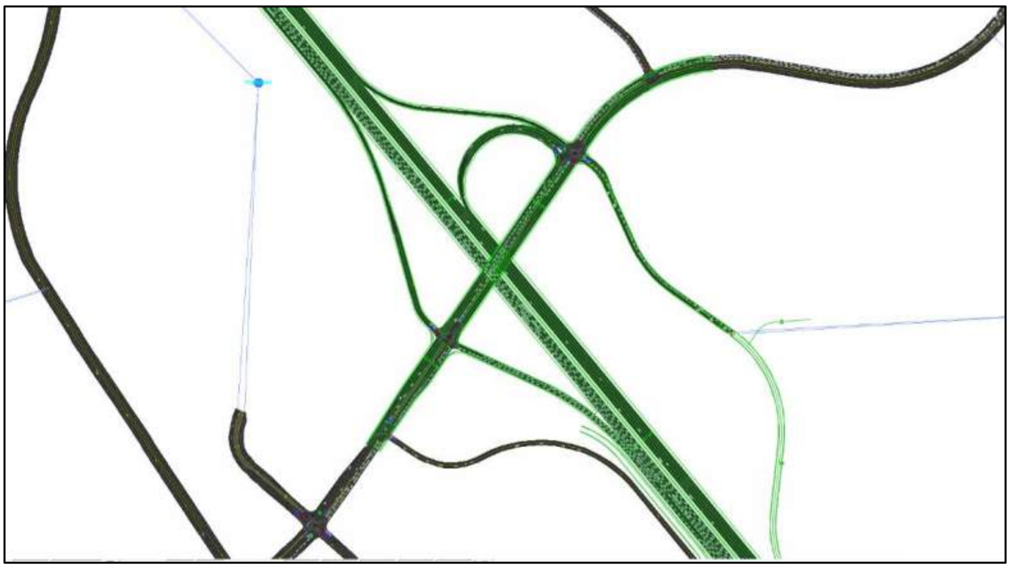
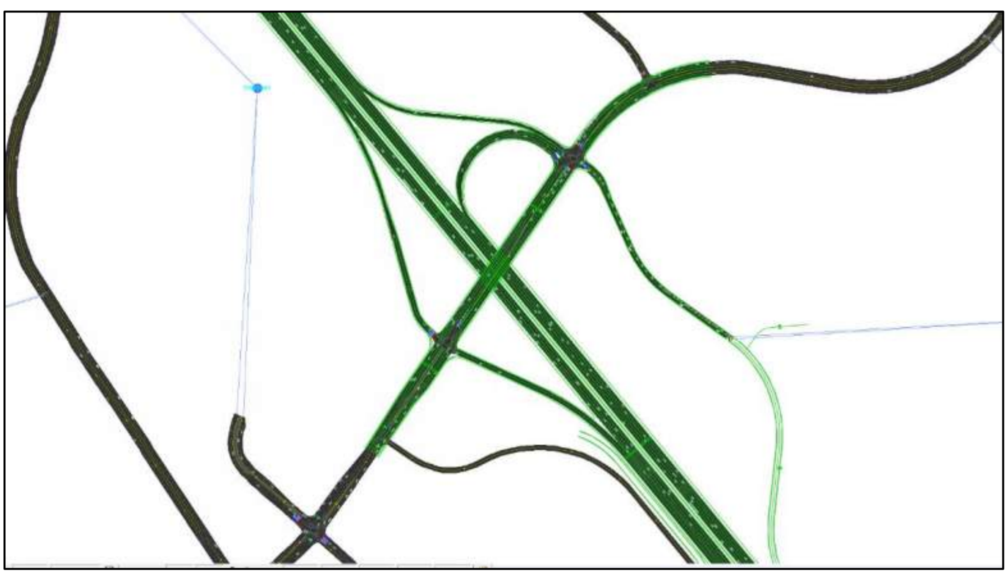


Figure 6 - Exit 103 (AO49) Simulation - PM Peak Hour



- Exit 104 (AO32)
    - AM Peak Hour – See **Figure 7** – interchange operates over capacity. The traffic backup on the EB On-Ramp caused by congestion on EB I-26 results in heavy queuing along the arterial in both the eastbound and westbound directions.
    - PM Peak Hour – See **Figure 8** – interchange operates under capacity. Heavy northbound left turn volume at the intersection of Piney Grove Road at Fernandina Road will require geometric and signal timing modifications to improve queuing and overall traffic operations.

Figure 7 - Exit 104 (AO32) Simulation - AM Peak Hour

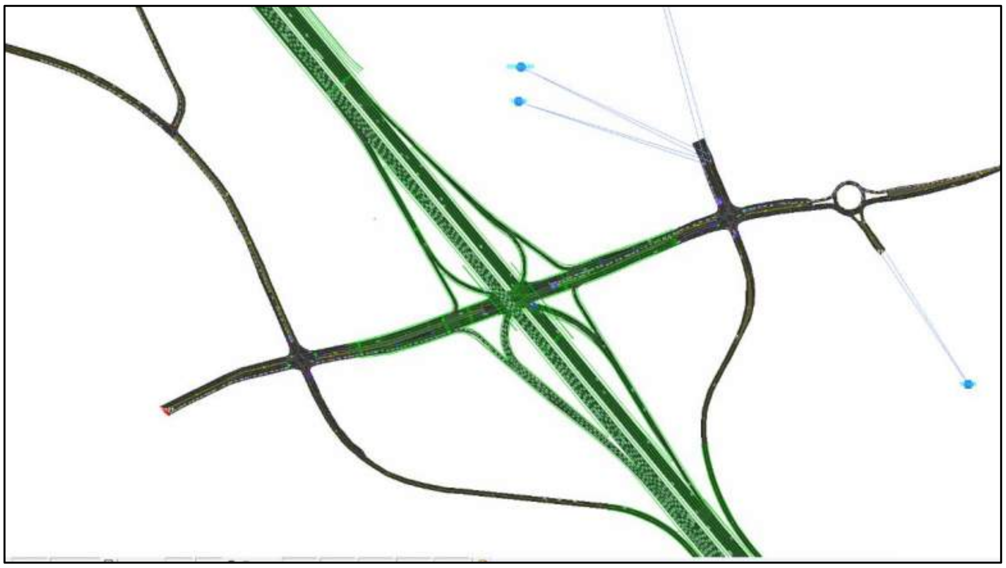
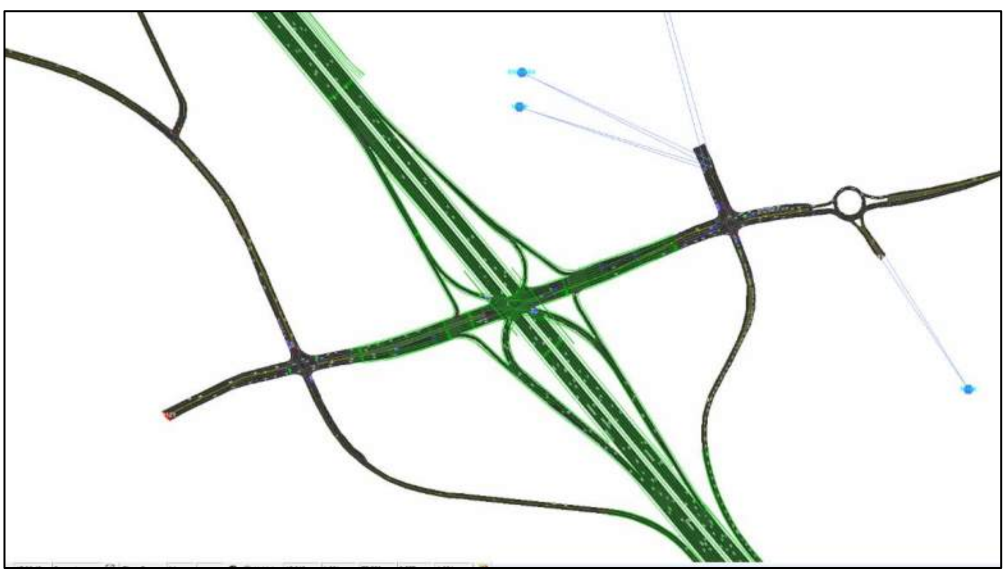


Figure 8 - Exit 104 (AO32) Simulation - PM Peak Hour



- Exit 106 (AO15)
    - AM Peak Hour – See **Figure 9** – Interchange operates at capacity at the EB Off-Ramp intersection while WB Off-Ramp operates over capacity. The traffic backup on the EB On-Ramp causes heavy queuing along the arterial in both the eastbound and westbound directions. These queuing extends beyond the interchange in both directions. The resulting westbound queue on St Andrews Road also impacts the operation at the westbound Off-Ramp intersection, blocking access for the westbound off-ramp left turn traffic. This in turn causes heavy congestion on the westbound off-ramp that spills back on to the WB I-26 mainline.
    - PM Peak Hour – See **Figure 10** – interchange operates under capacity. However, the EB on-ramp experiences heavy queuing which blocks eastbound right turn traffic from entering the on-ramp, resulting in congestion along the arterial in the eastbound direction.

Figure 9 - Exit 106 (AO15) Simulation - AM Peak Hour

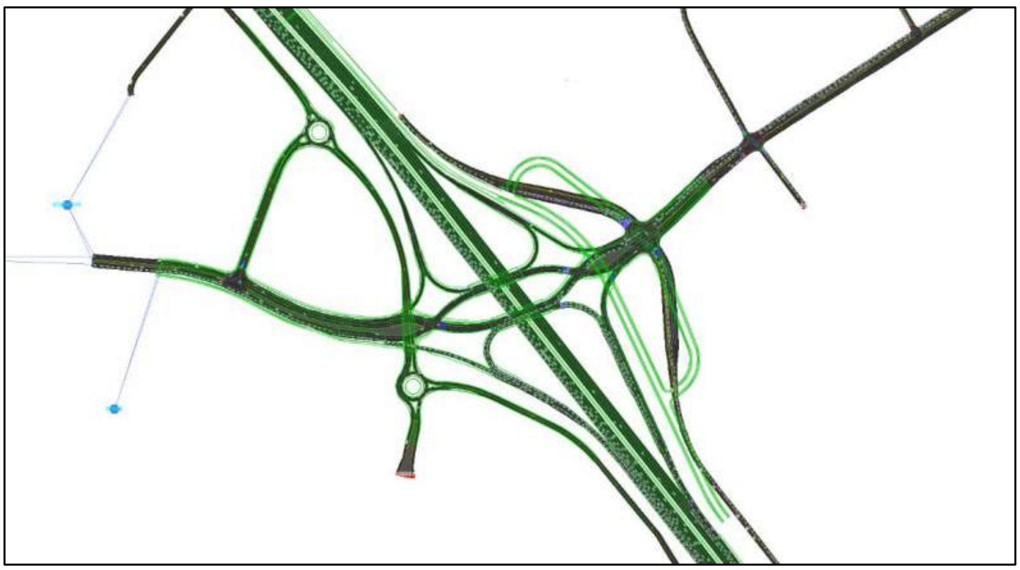
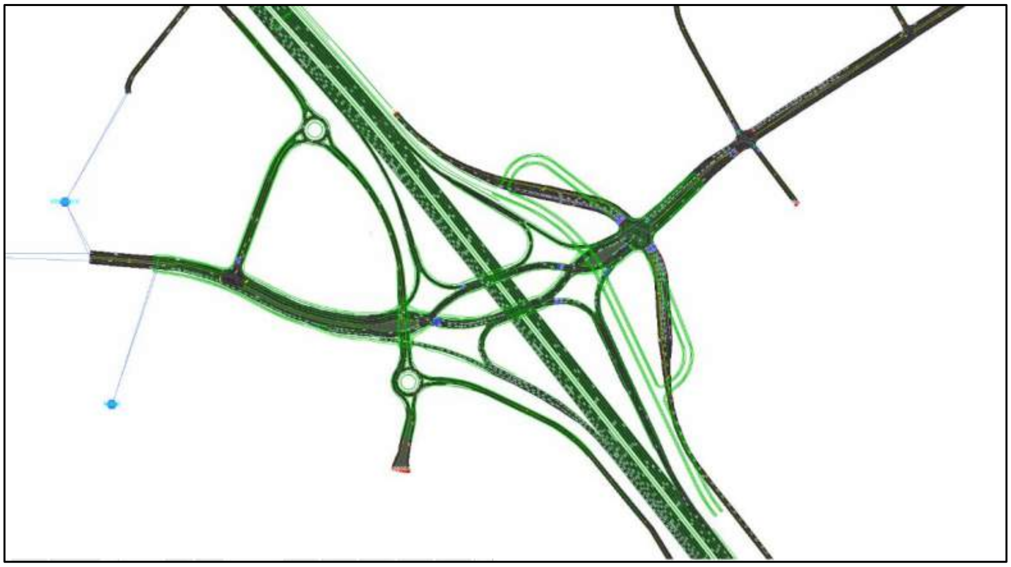


Figure 10 - Exit 106 (AO15) Simulation - PM Peak Hour



Exit 108 (AO29)

- AM Peak Hour – See **Figure 11** – Interchange operates over capacity. Due to traffic congestion along Bush River Road, both the eastbound and westbound off-ramps from I-26 experiences queuing that extends beyond the ramps onto the mainline.
- PM Peak Hour – See **Figure 12** – Interchange operates over capacity. Due to traffic congestion along Bush River Road, both the eastbound and westbound off-ramps from I-26 experiences queuing that extends beyond the ramps onto the mainline.

Figure 11 - Exit 108 (AO29) Simulation - AM Peak Hour

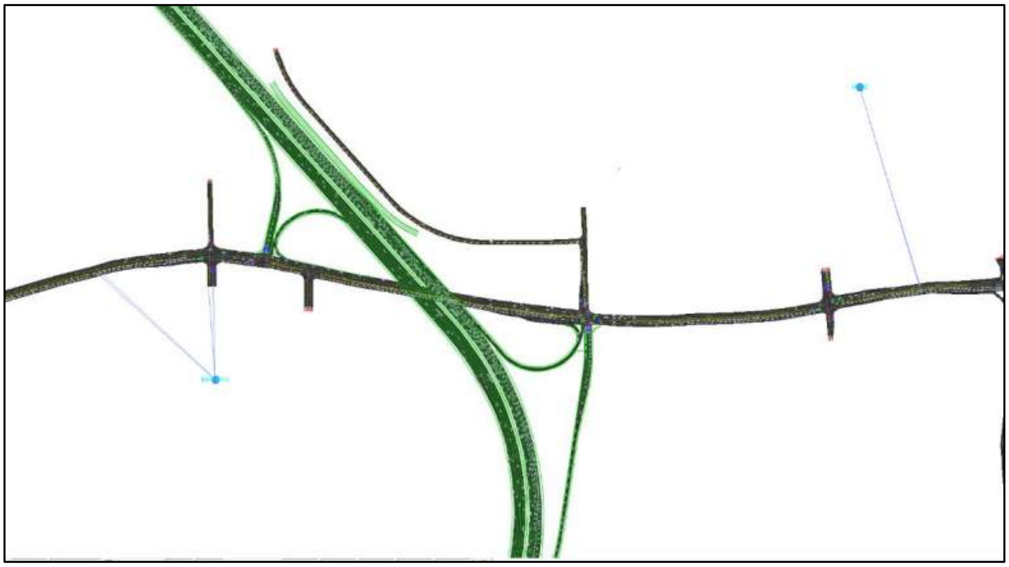
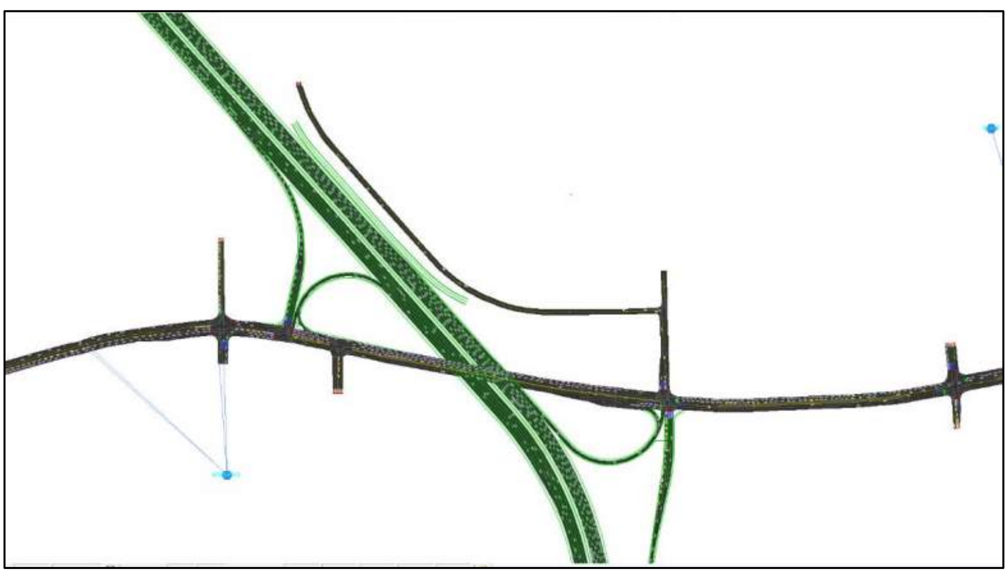


Figure 12 - Exit 108 (AO29) Simulation - PM Peak Hour



- Exit 110 (AO46)
    - AM Peak Hour – See **Figure 13** – Interchange operates over capacity. The traffic backup on the westbound on-ramp, resulting from congestion on WB I-26, causes in congestion along the arterial in both the eastbound and westbound directions. The resulting congestions extends beyond the adjacent signalized intersections and impacts traffic operation.
    - PM Peak Hour – See **Figure 14** – Interchange operates over capacity. Due to heavy traffic volume along the arterial, both the EB and WB off-ramps experiences queuing. Mainline traffic flow is not impacted by these queuing.

Figure 13 - Exit 110 (AO46) Simulation - AM Peak Hour

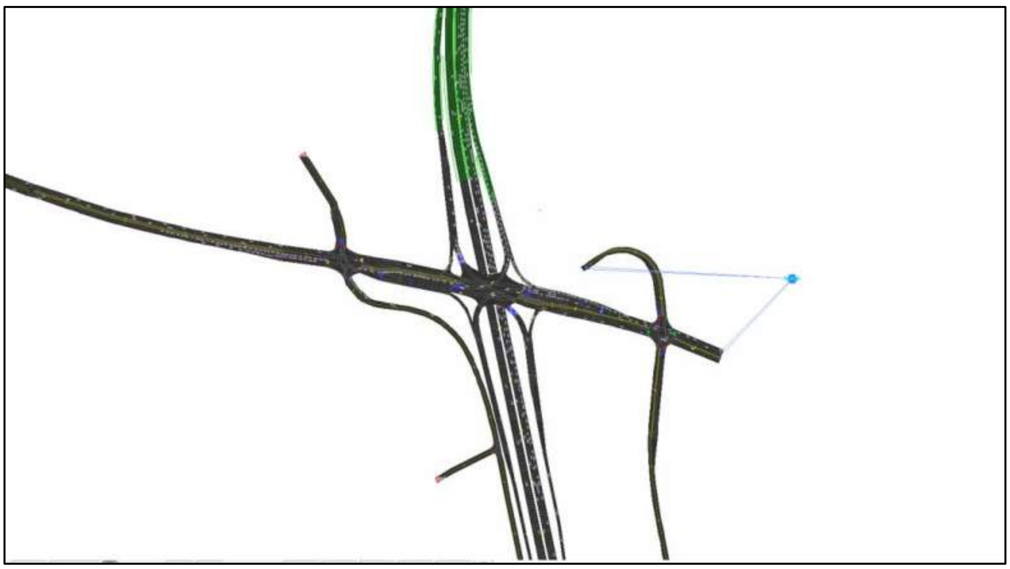
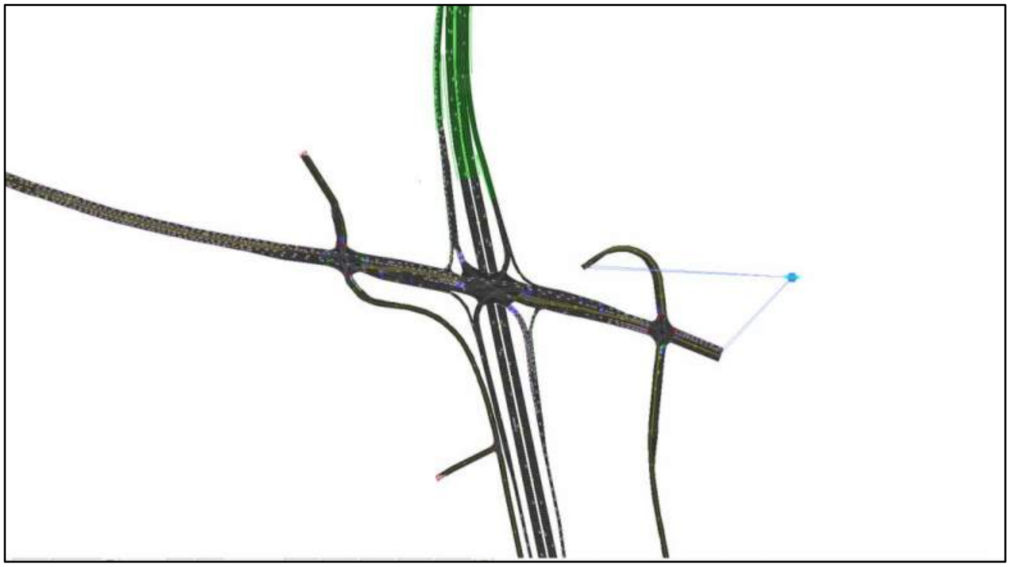


Figure 14 - Exit 110 (AO46) Simulation - PM Peak Hour



- I-126 at Colonial Life Boulevard
    - AM Peak Hour – See **Figure 15** – Interchange operates under capacity.
    - PM Peak Hour – See **Figure 16** – Interchanges operates under capacity.

Figure 15 – I-126 at Colonial Life Boulevard Simulation - AM Peak Hour

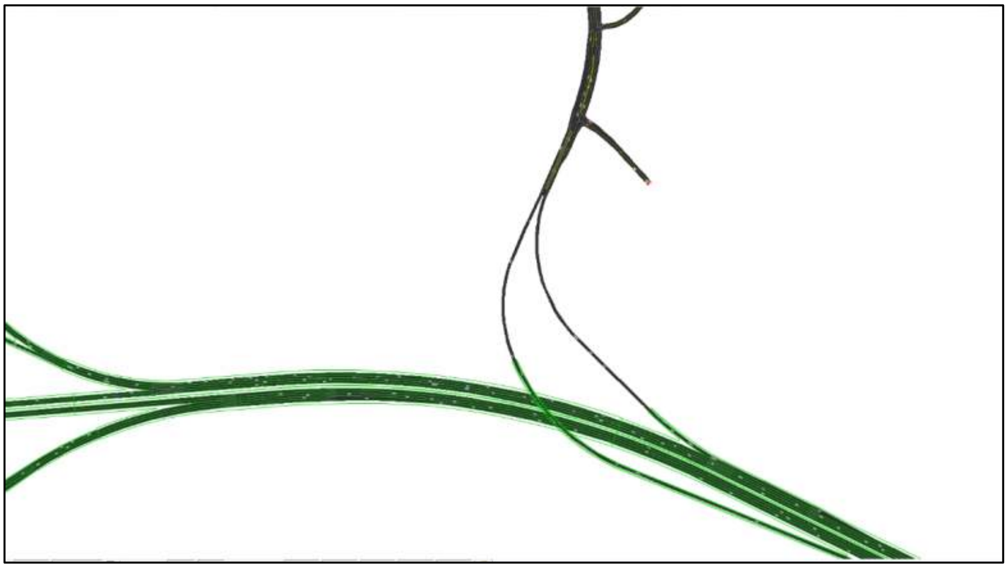
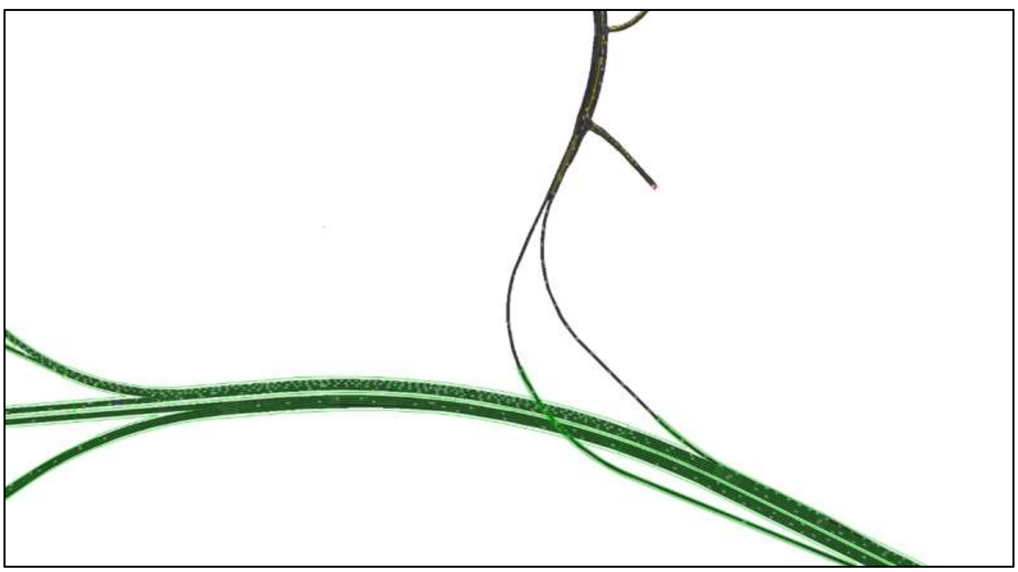


Figure 16 – I-126 at Colonial Life Boulevard Simulation - PM Peak Hour



- Exit 63 (AO10)
    - AM Peak Hour – See **Figure 17** – interchange operates over capacity. Severe congestion along Bush River Road creates backups on both the eastbound and westbound off-ramps from I-20; these backups extend onto I-20.
    - PM Peak Hour – See **Figure 18** – interchange operates over capacity. Congestion on both the EB and WB off-ramps from I-20 was observed, these backups extend onto I-20.

Figure 17 - Exit 63 (AO10) Simulation - AM Peak Hour

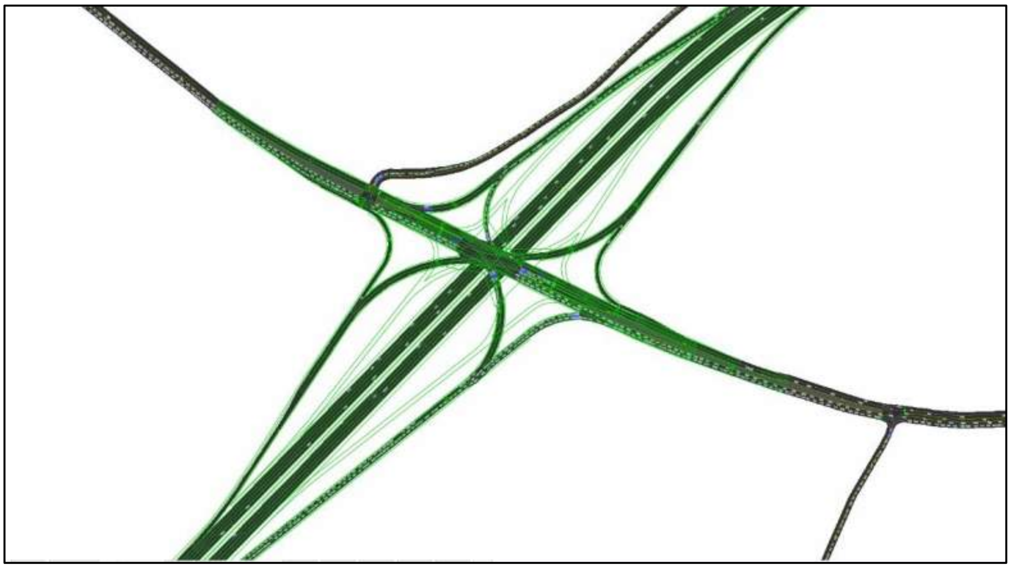
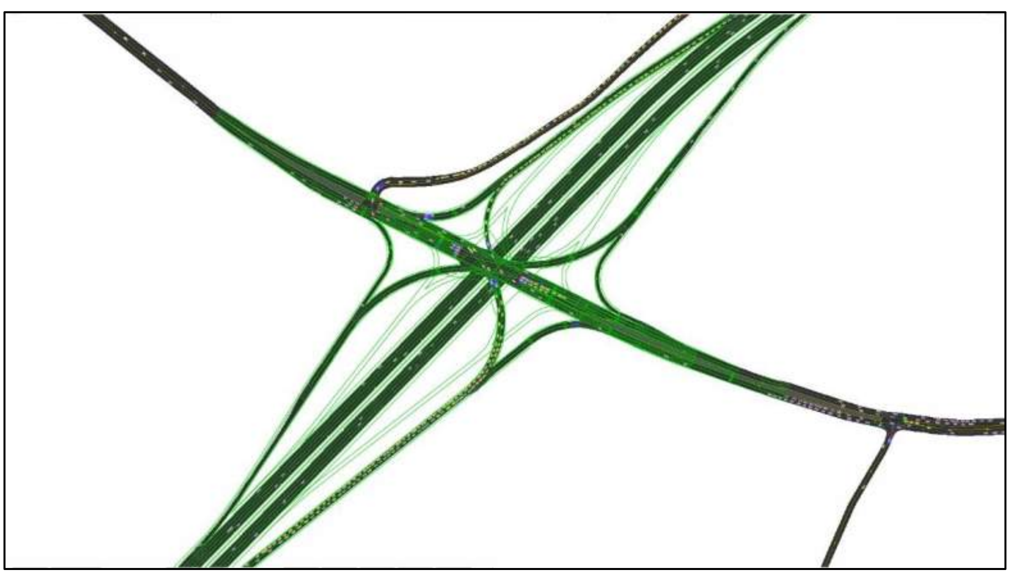


Figure 18 - Exit 63 (AO10) Simulation - PM Peak Hour



- Exit 65 (AO3)
    - AM Peak Hour – See **Figure 19** – interchange operates over capacity. The southbound left turn onto EB I-20 experiences heavy queuing – dual left turn lanes may improve the operation of this movement. The I-20 WB on-ramp experiences congestion back onto Broad River Road due to congestion on the mainline. This on-ramp congestion also blocks northbound left turners from entering the ramp, resulting queuing on the NB arterial. Moderate queuing is also observed on the eastbound off-ramp, however traffic flows steadily on EB I-20.
    - PM Peak Hour – See **Figure 20** – interchange operates over capacity. Due to heavy traffic volume along the arterial, queuing observed on the WB Off-Ramp extends back towards the mainline.

Figure *19* - Exit 65 (AO3) Simulation - AM Peak Hour

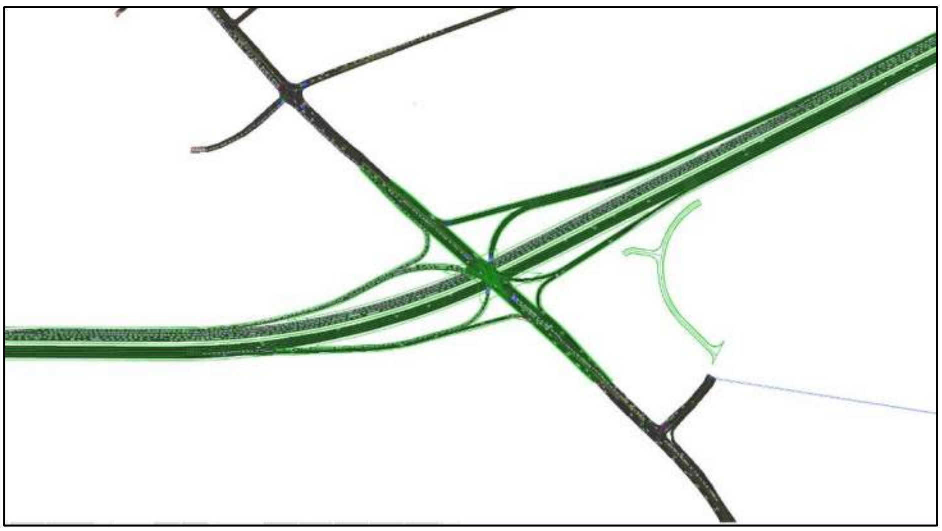
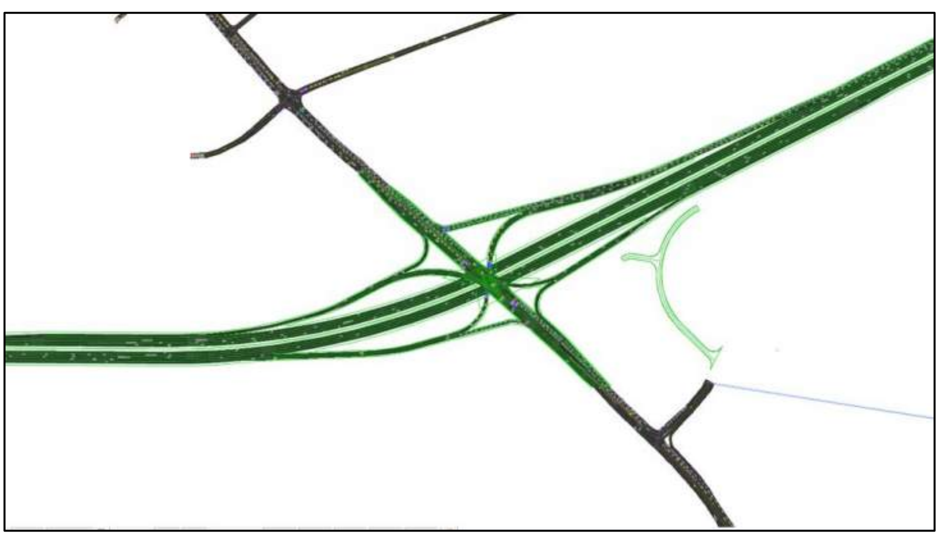


Figure 18 - Exit 65 (AO3) Simulation - PM Peak Hour



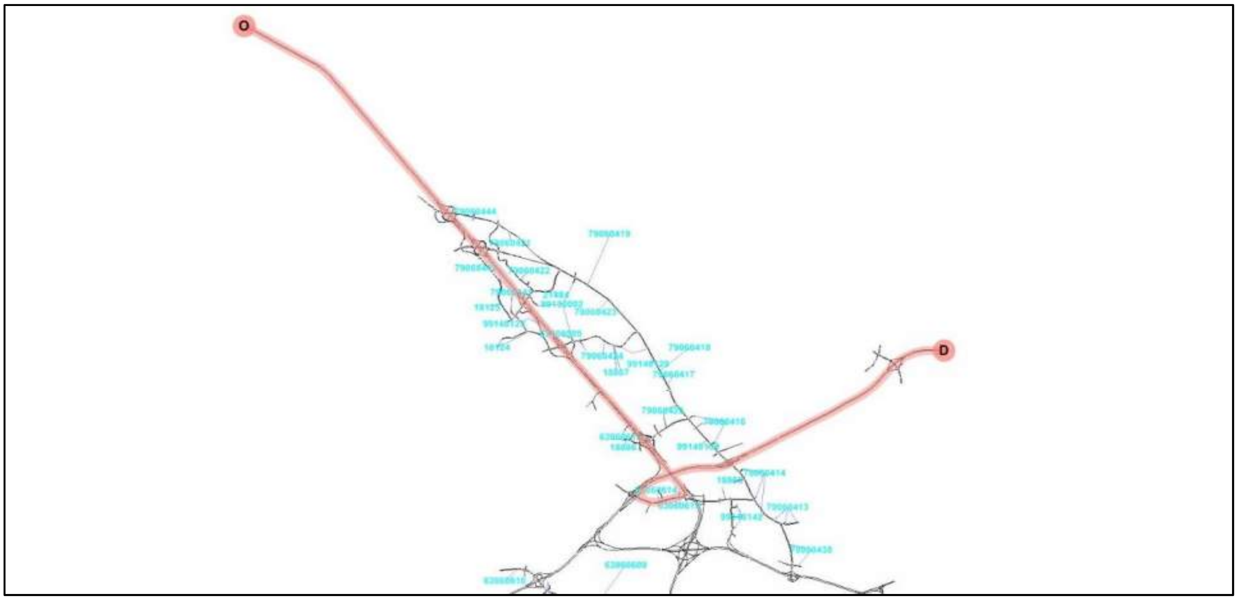
- E-W Connector (AO29)
  - AM Peak Hour – See **Figure 21** –the WB connector operates over capacity due to queuing on the EB I-20 mainline. The resulting traffic backup was along the WB connector, and extended back onto WB I-126.
  - PM Peak Hour – See **Figure 22** – connector operates under capacity.

Figure *21* – E-W Connector (AO3) Simulation - AM Peak Hour

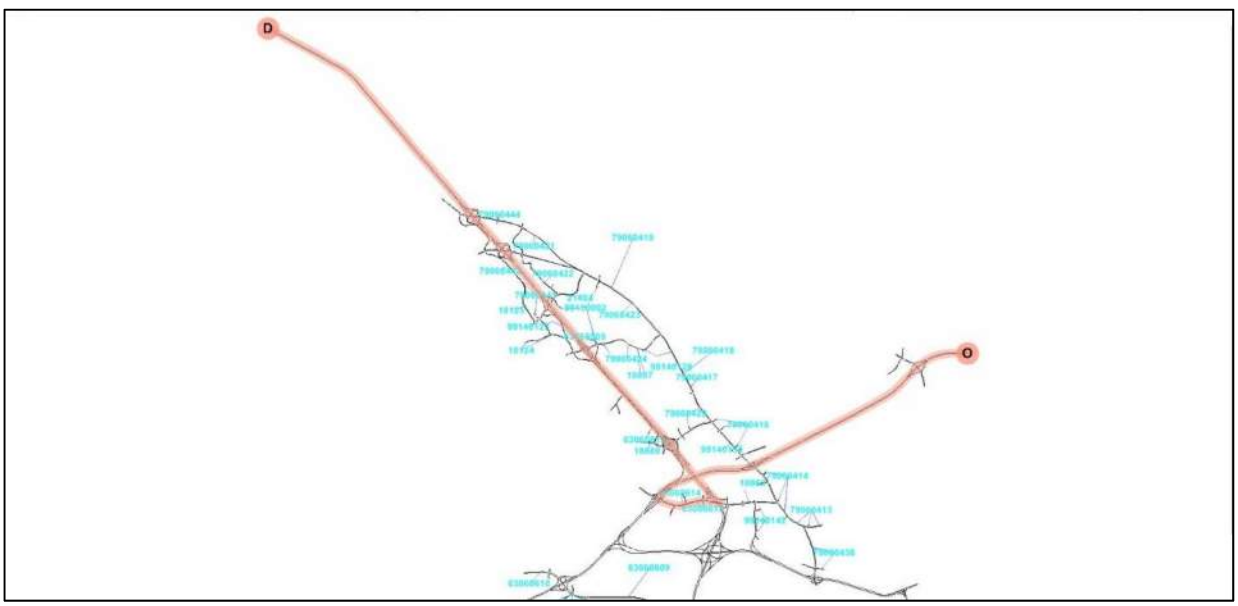
Figure *22* – E-W Connector (AO3) Simulation - PM Peak Hour

RA9 Specific Issues/Choke Points:

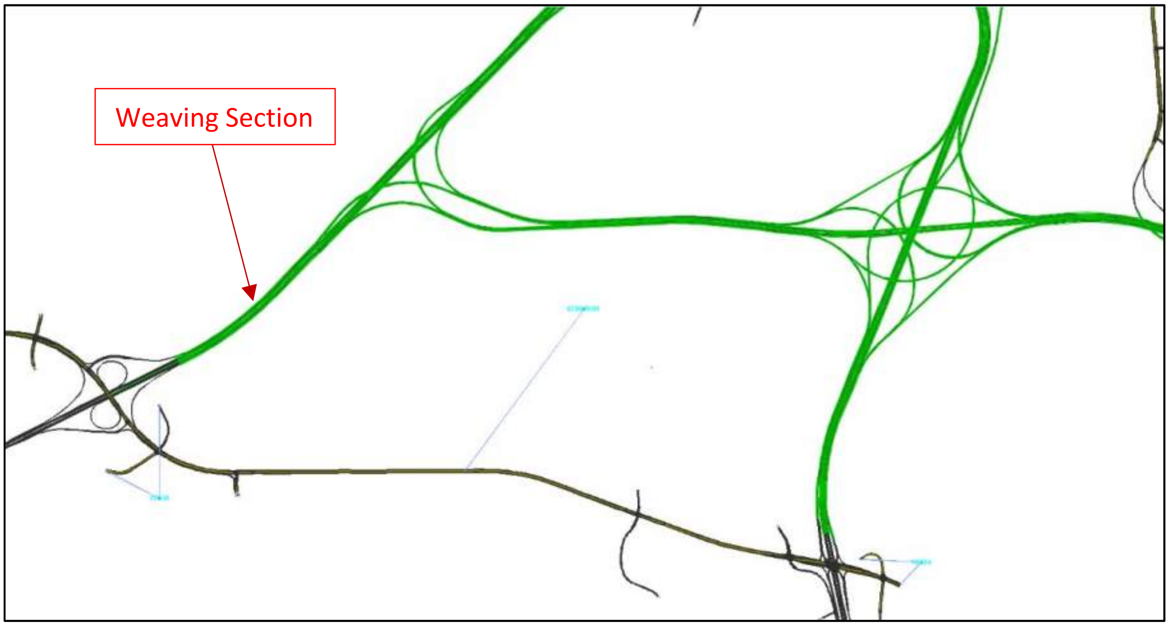
1. I-26 EB to I-20 EB uses Exit 108 Bush River Road and enters I-20 at Exit 63, EB on ramp.



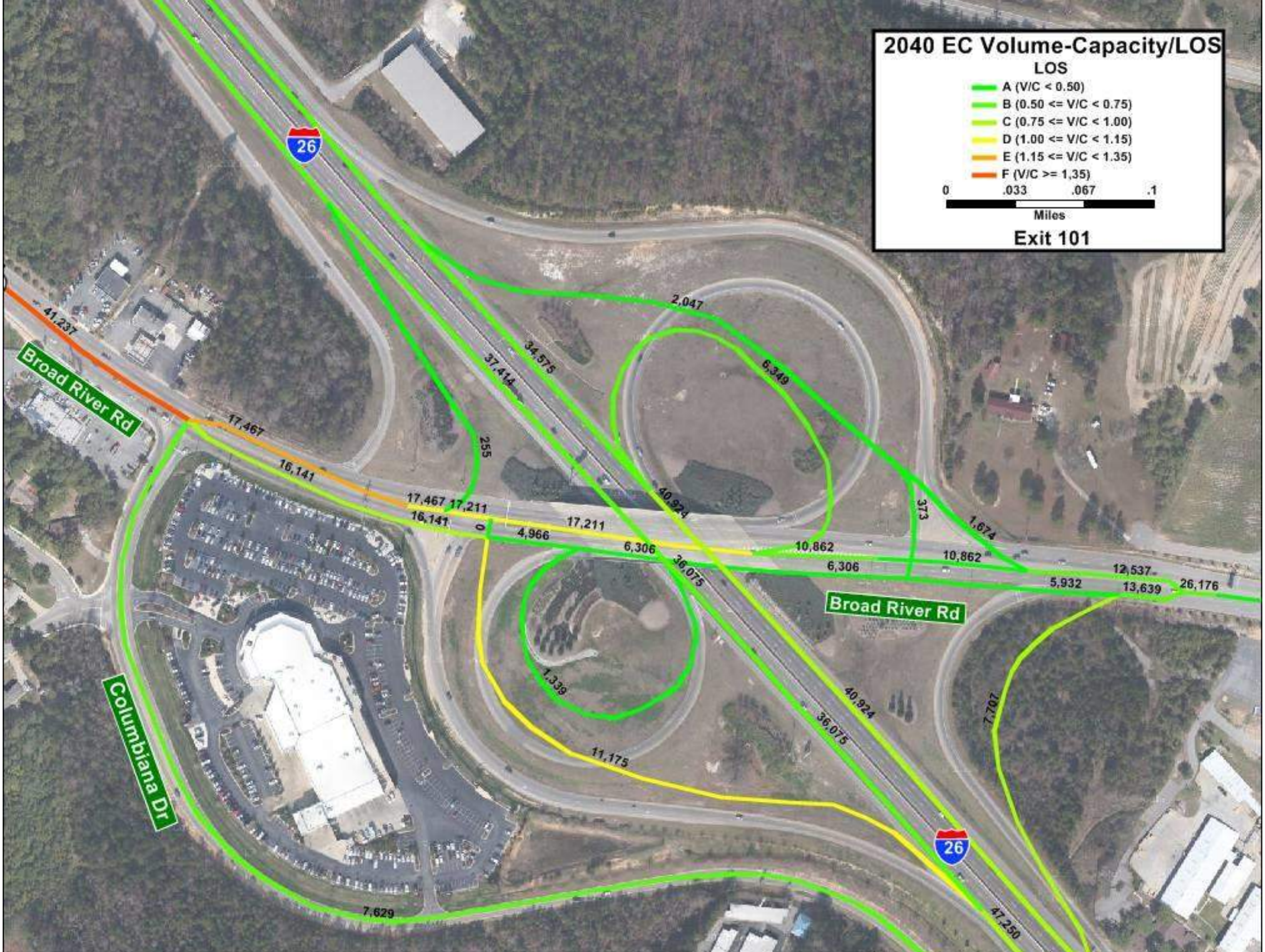
2. I-20 WB to I-26 WB uses Exit 63 Bush River Road and enters I-26 at Exit 108, WB on ramp.



3. I-20 WB weaving between Exit 61 and Exit 63, short distance between E-W connector on-ramp and Exit 61 off-ramp

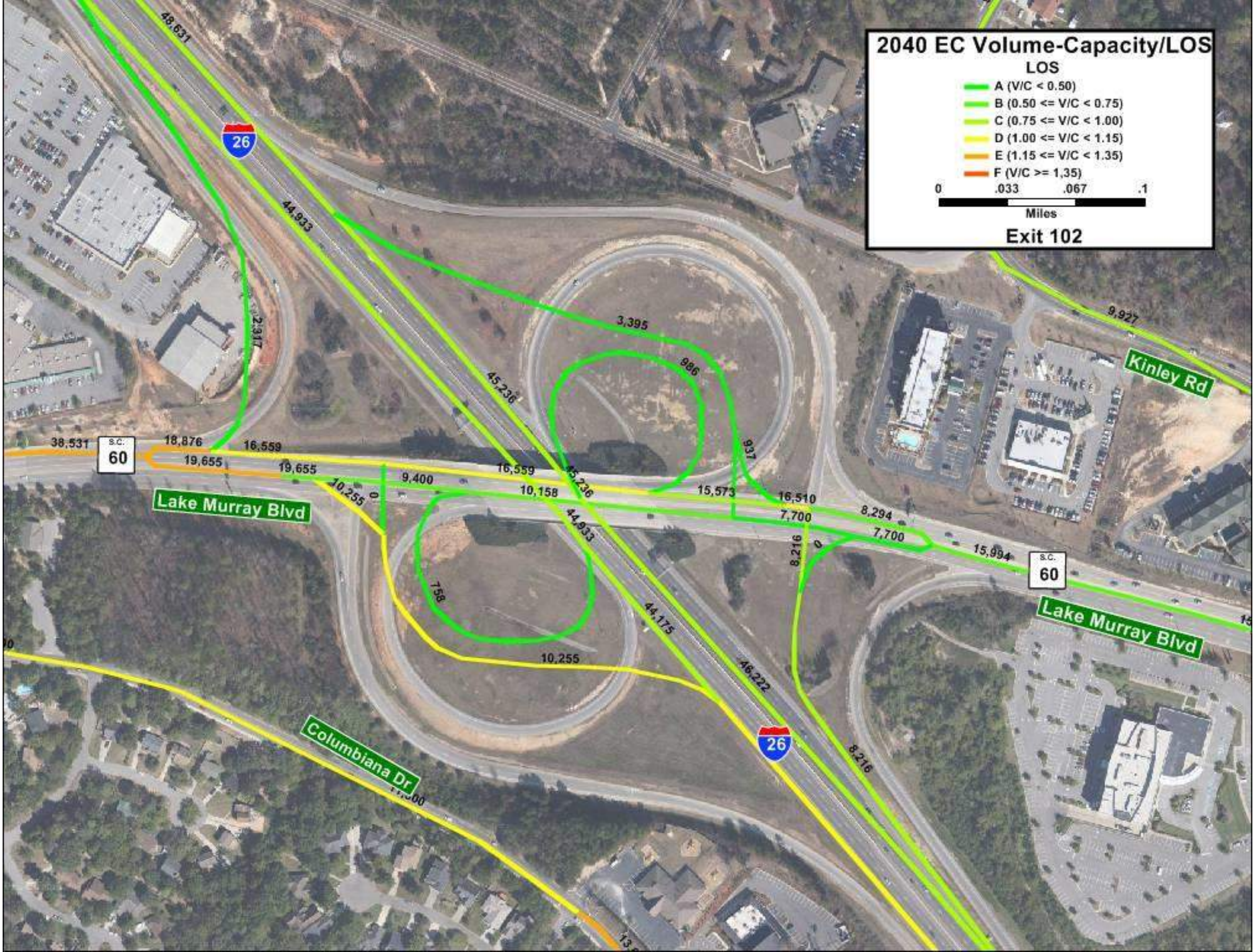


Appendix H—SCSWM EC (RA10) Volume/LOS



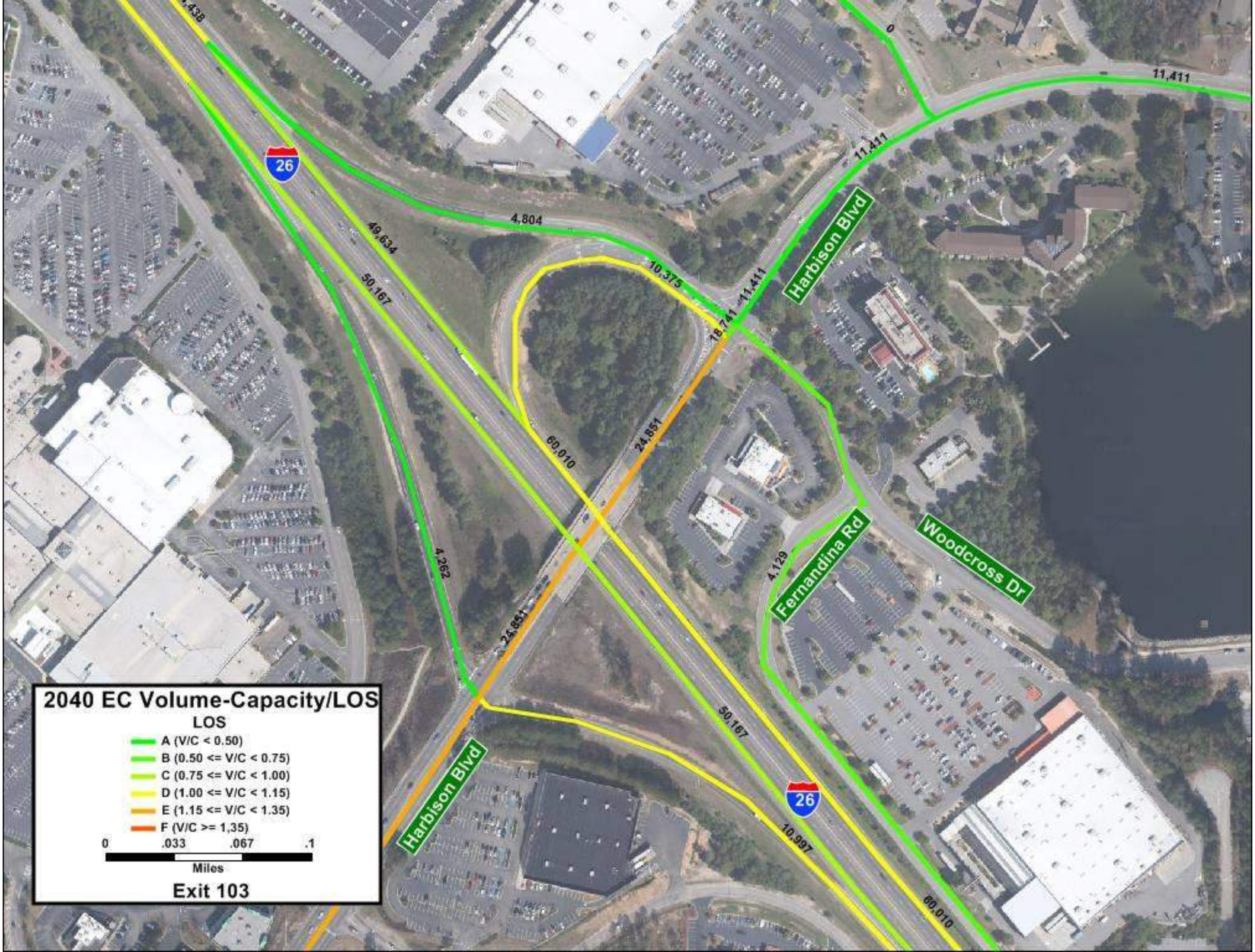
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 101
26
Broad River Rd
Broad River Rd
Columbiana Dr
41,237
17,467
16,141
17,467
17,211
16,141
0
4,966
17,211
255
37,414
34,575
2,047
6,349
40,924
6,306
36,075
10,862
10,862
6,306
373
1,674
12,537
5,932
13,639
26,176
1,339
11,175
40,924
36,075
7,707
7,629
47,250


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0 .033 .067 .1
Miles
Exit 101-102
Columbiana Dr
40,924
47,250
48,631
26
26
7,629
44,933

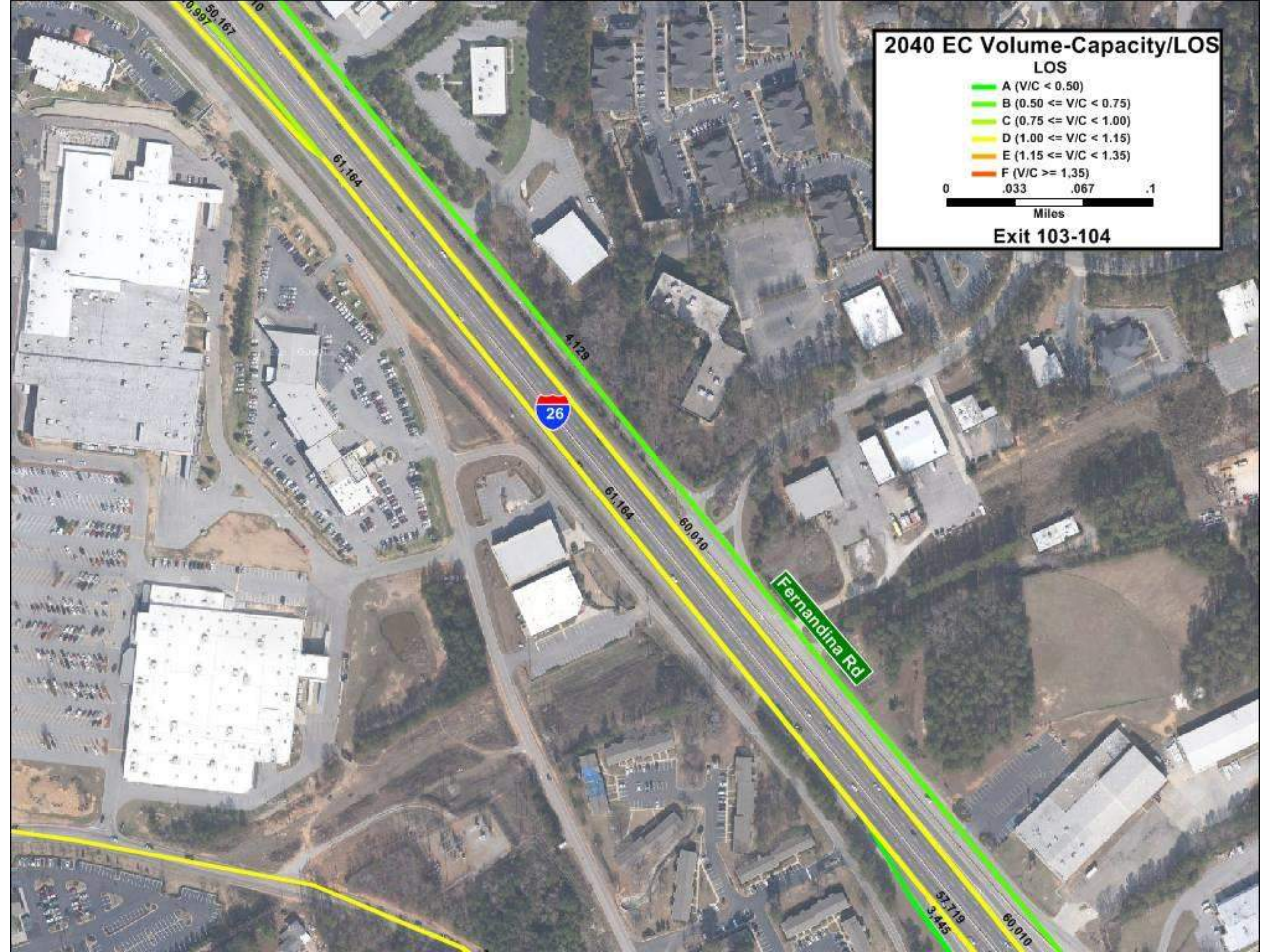


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 102
26
26
S.C. 60
S.C. 60
Lake Murray Blvd
Lake Murray Blvd
Kinley Rd
Columbiana Dr
48,631
44,933
2,317
3,395
986
45,236
937
9,927
38,531
18,876
16,559
19,655
19,655
16,559
9,400
10,255
0
10,158
45,236
15,573
16,510
7,700
8,294
7,700
8,216
0
15,994
44,933
758
44,175
10,255
46,222
8,216

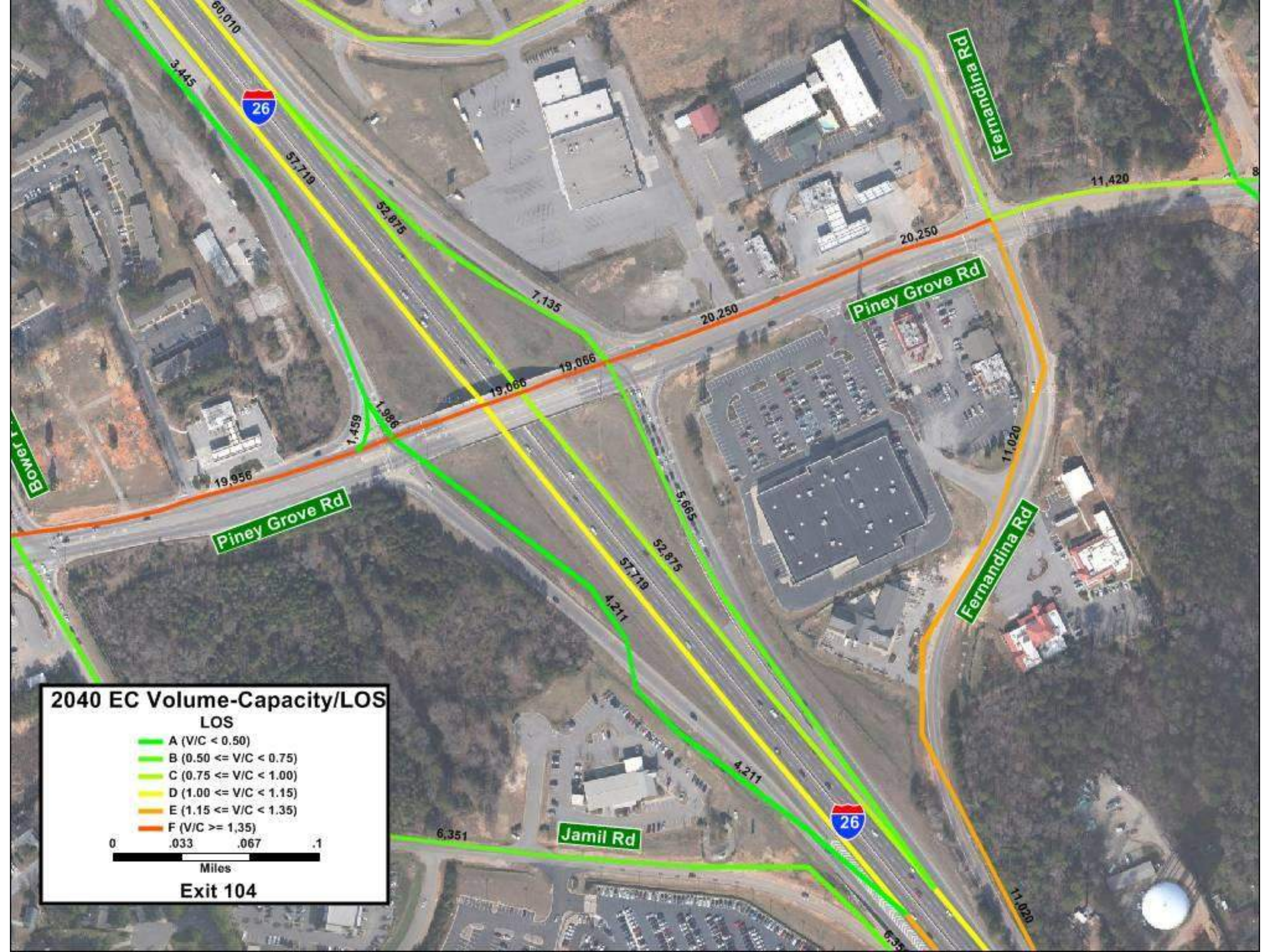
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.03
.06
.09
Miles
Exit 102-103
26
54,438
Columbiana Dr
14,824



11,438
0
11,411
11,411
4,804
49,634
50,167
10,375
11,411
18,741
Harbison Blvd
24,851
60,010
4,262
24,851
4,129
Fernandina Rd
Woodcross Dr
50,167
Harbison Blvd
10,997
60,010
26
26
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Exit 103

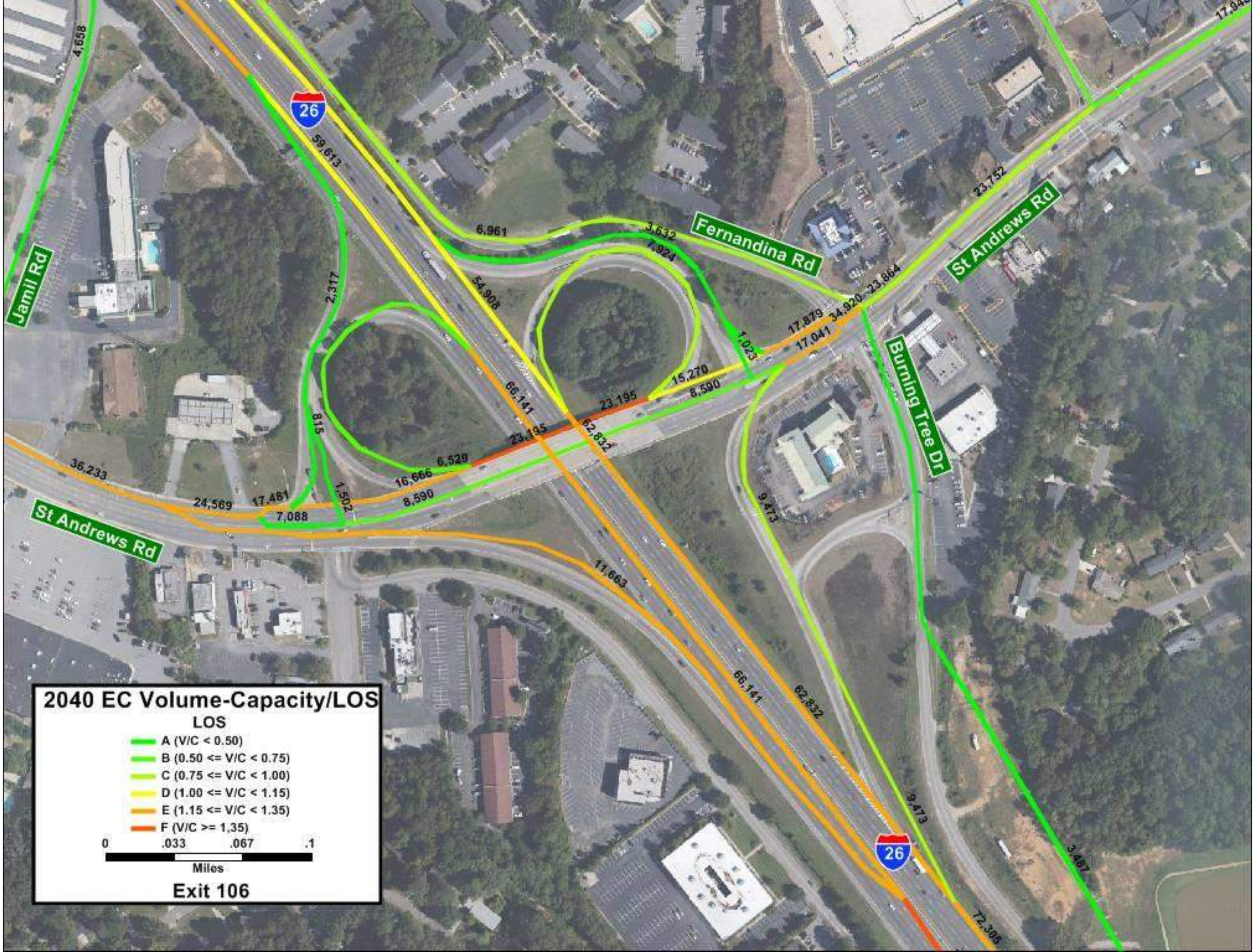


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 103-104
26
Fernandina Rd
50,167
61,164
4,129
61,164
60,010
57,719
3,445
60,010

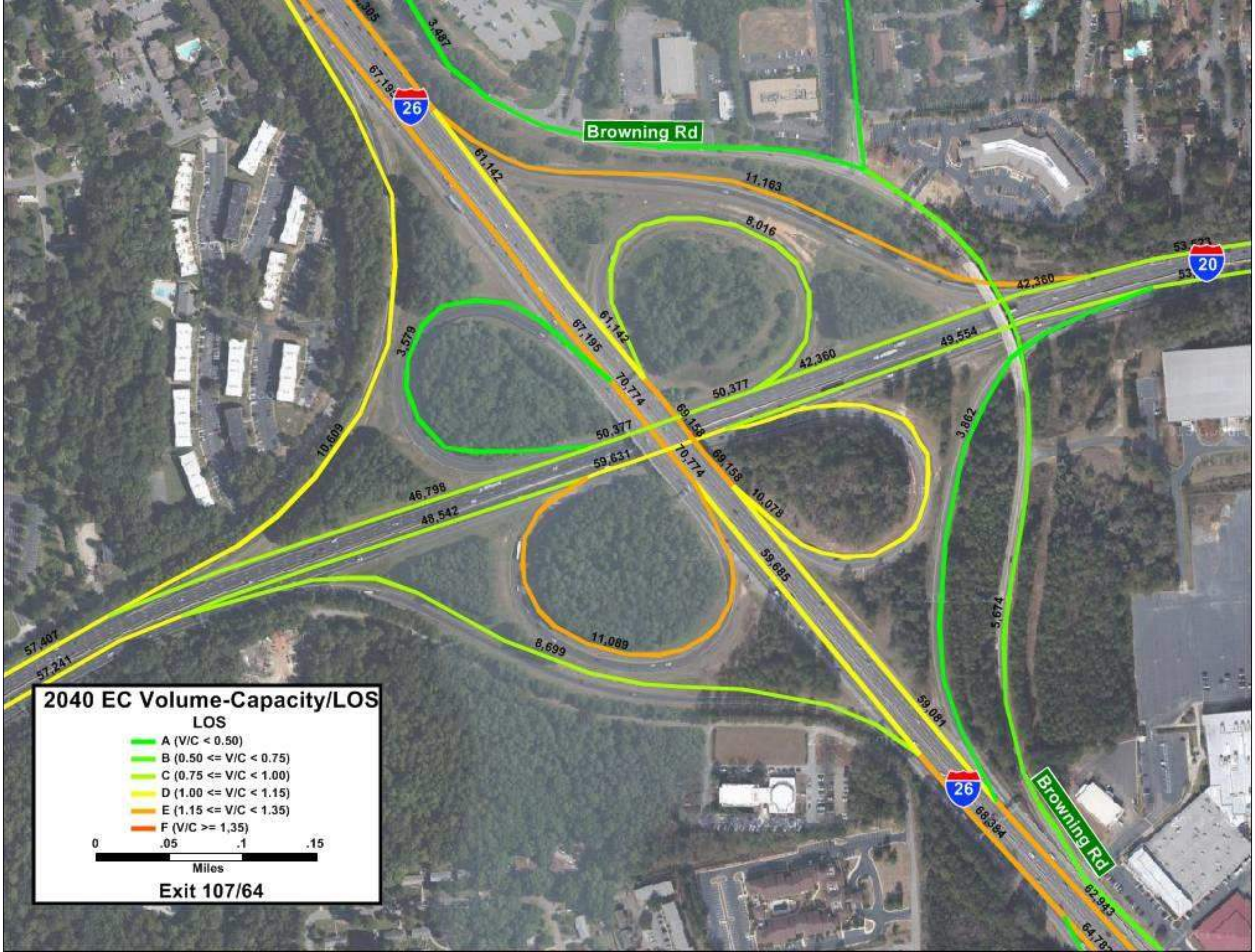


60,010
3,445
26
57,719
52,875
7,135
Fernandina Rd
11,420
20,250
20,250
Piney Grove Rd
19,066
19,066
1,986
1,459
19,956
Bower
Piney Grove Rd
5,665
52,875
57,719
4,211
11,020
Fernandina Rd
4,211
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 104
6,351
Jamil Rd
26
11,020


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Exit 104-106
26
Fernandina Rd
Jamil Rd
Tram Rd
Beatty Rd
Fernandina Rd
Jamil Rd
26
6,163
6,351
61,930
1,569
1,569
2,656
6,303
58,539


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Exit 106
Jamil Rd
Fernandina Rd
St Andrews Rd
St Andrews Rd
Burning Tree Dr
26
26
4,658
59,613
6,961
3,632
7,924
23,752
23,864
34,920
17,879
17,041
1,023
15,270
8,590
23,195
23,195
54,908
66,141
62,832
2,317
815
6,529
16,666
36,233
24,569
17,481
7,088
1,502
8,590
9,473
11,663
66,141
62,832
9,473
3,487
72,305

2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 106-107
66,141
62,832
26
9,473
77,804
Burning Tree Dr
72,306
3,487
67,195
26
Browning Rd
61,142
11,163
8,016
10,609



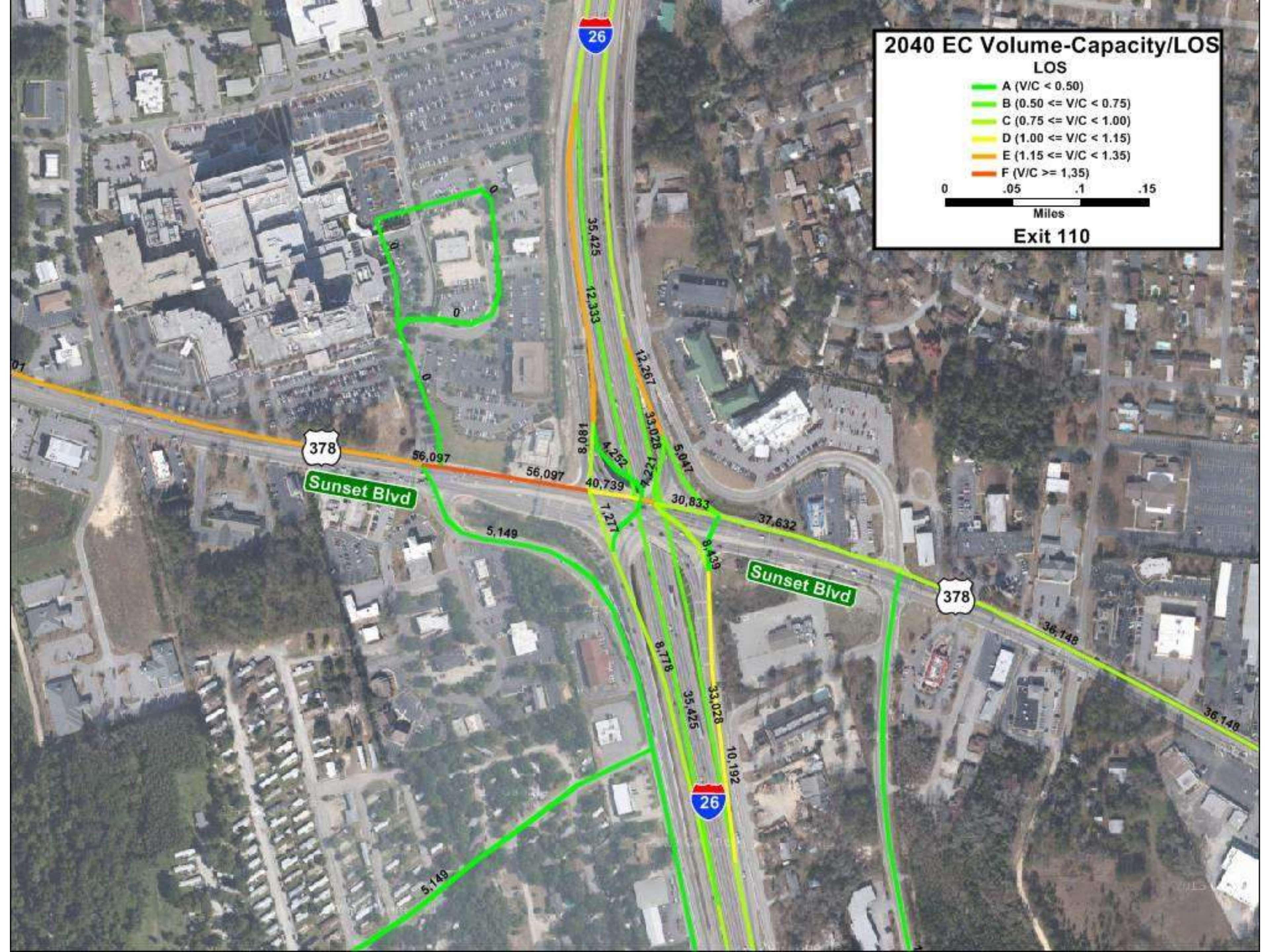
26
Browning Rd
20
26
Browning Rd
3,487
67,195
61,142
11,163
8,016
53,523
42,360
3,579
67,195
61,142
49,554
42,360
50,377
3,862
70,774
69,158
50,377
10,609
59,631
70,774
69,158
46,798
10,078
48,542
59,685
5,674
57,407
57,241
8,699
11,089
59,081
68,384
62,943
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.05
.1
.15
Miles
Exit 107/64

59,081
5,674
26
Browning Rd
68,384
62,943
64,782
26
1,316
3,602
10,337
23,943
23,943
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Exit 107-108

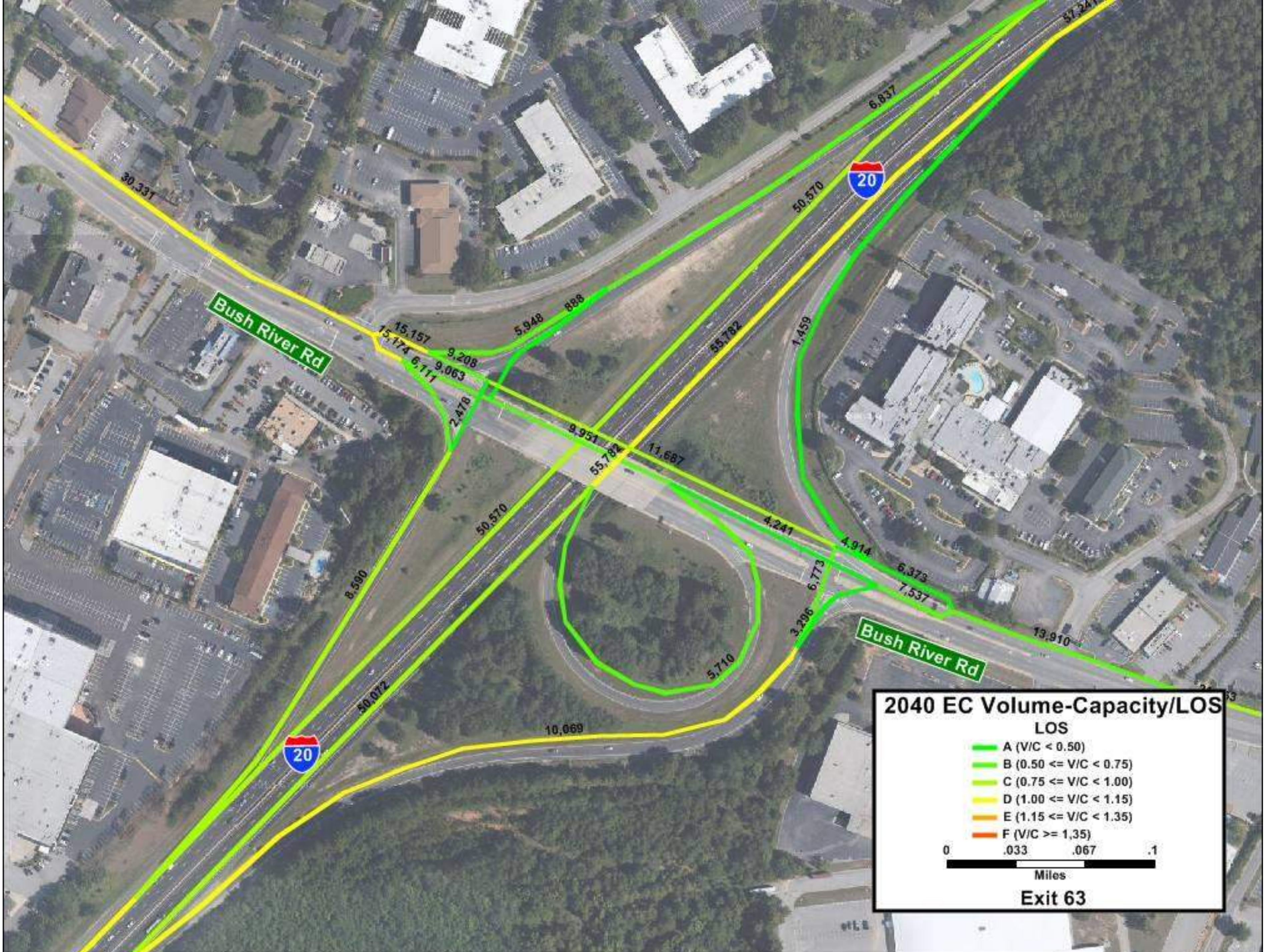
Burnette Dr
Bush River Rd
Morninghill Dr
Bush River Rd
26
26
64,782
1,316
3,602
9,837
23,943
23,943
24,266
3,922
61,627
6,414
23,110
29,524
64,782
29,524
10,337
61,627
29,524
64,782
29,524
29,152
29,15
1,316
1,316
64,782
61,627
0
61,627
64,782
30,228
34,554
10,847
30,683
30,943
40,565
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 108A

2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Exit 108B
30,228
34,554
0
10,047
26
30,943
30,683
4,305
40,565
126
30,683
7,193
38,859
45,295
26

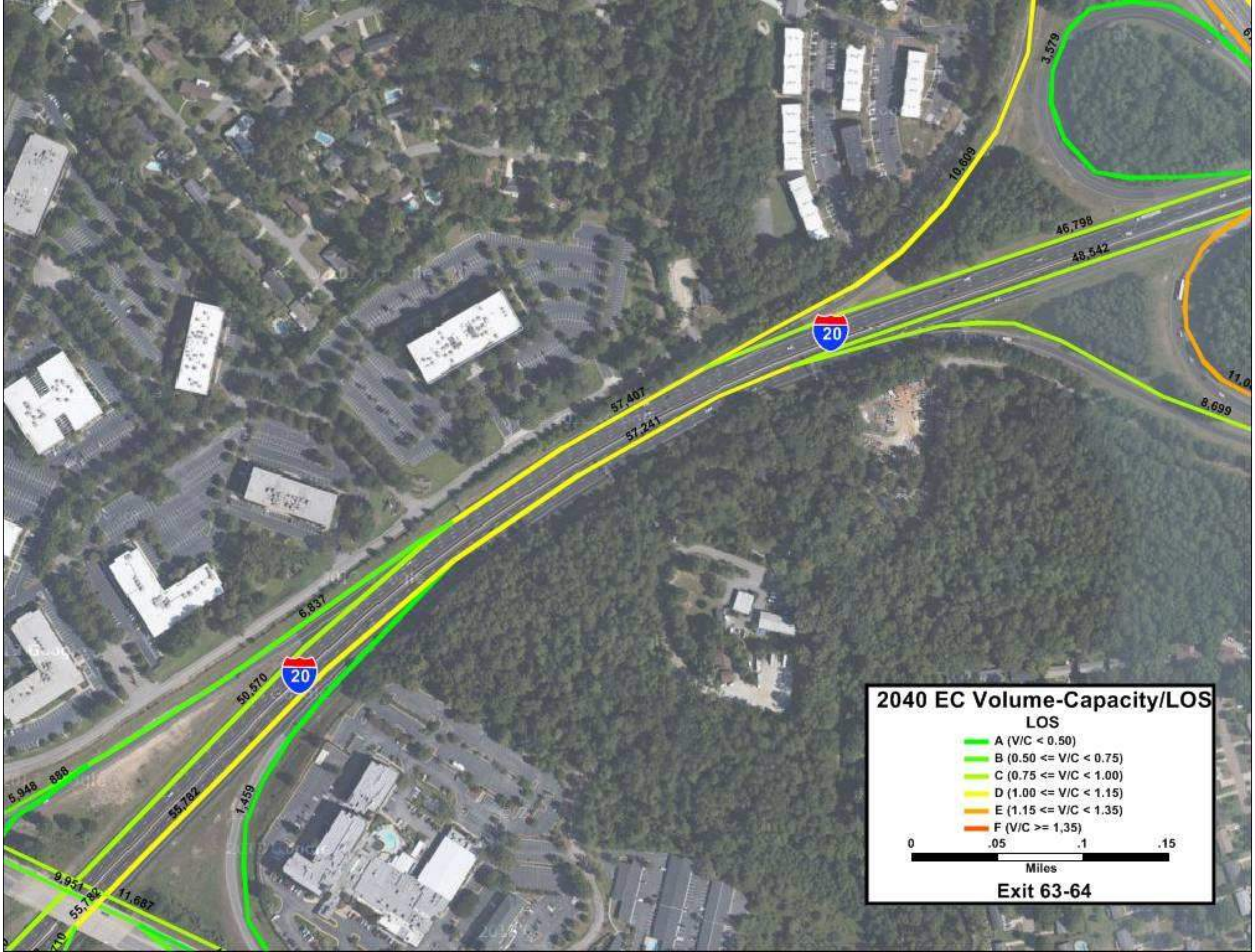

26
47,758
45,295
26
12,333
35,425
0
0
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.05
.1
.15
Miles
Exit 108-110



2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.05
.1
.15
Miles
Exit 110
26
378
Sunset Blvd
35,425
12,333
12,267
33,028
8,081
4,252
4,221
5,047
56,097
56,097
40,739
30,833
37,632
7,277
8,439
5,149
36,148
36,148
8,778
35,425
33,028
10,192
5,149
0
0
0
0

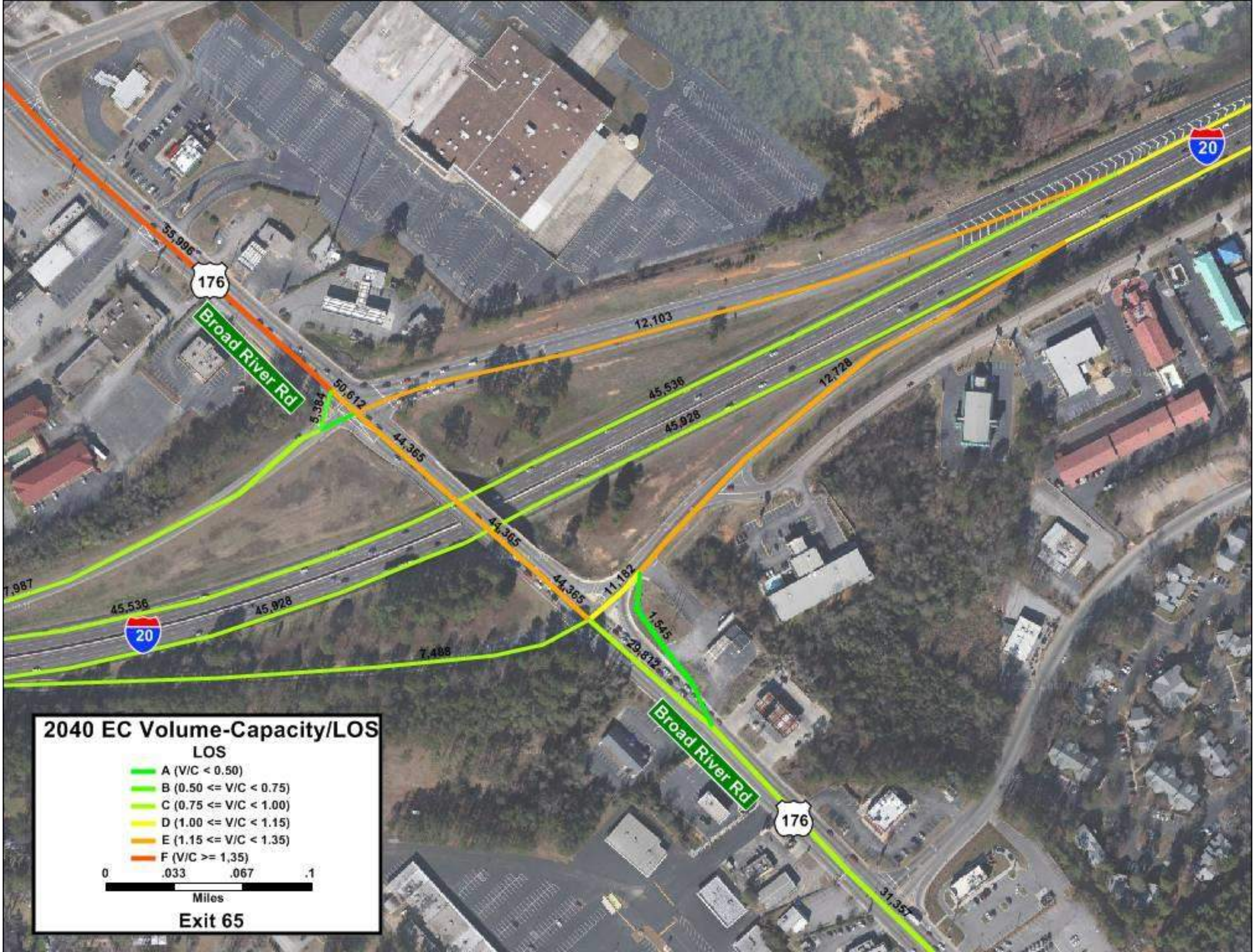


30,331
6,837
57,241
20
50,570
1,459
55,782
888
5,948
Bush River Rd
15,157
15,174
9,208
6,711
9,063
2,478
9,951
55,782
11,687
50,570
4,241
4,914
6,373
6,773
7,537
8,590
3,296
13,910
Bush River Rd
5,710
50,072
10,069
20
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 63

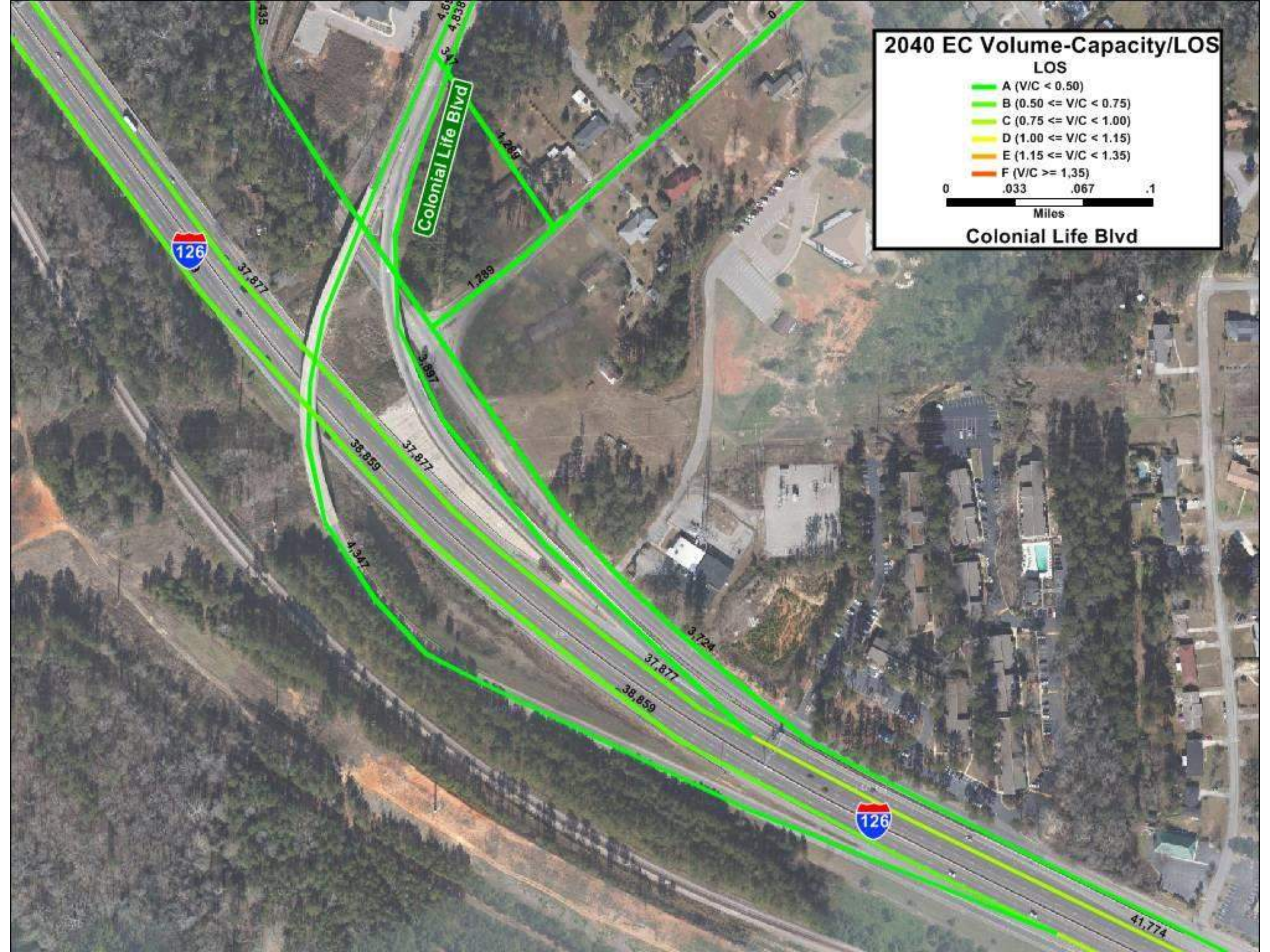


20
20
3,579
10,609
46,798
48,542
57,407
57,241
8,699
6,837
50,570
5,948
888
55,782
1,459
9,951
55,782
11,687
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.05
.1
.15
Miles
Exit 63-64

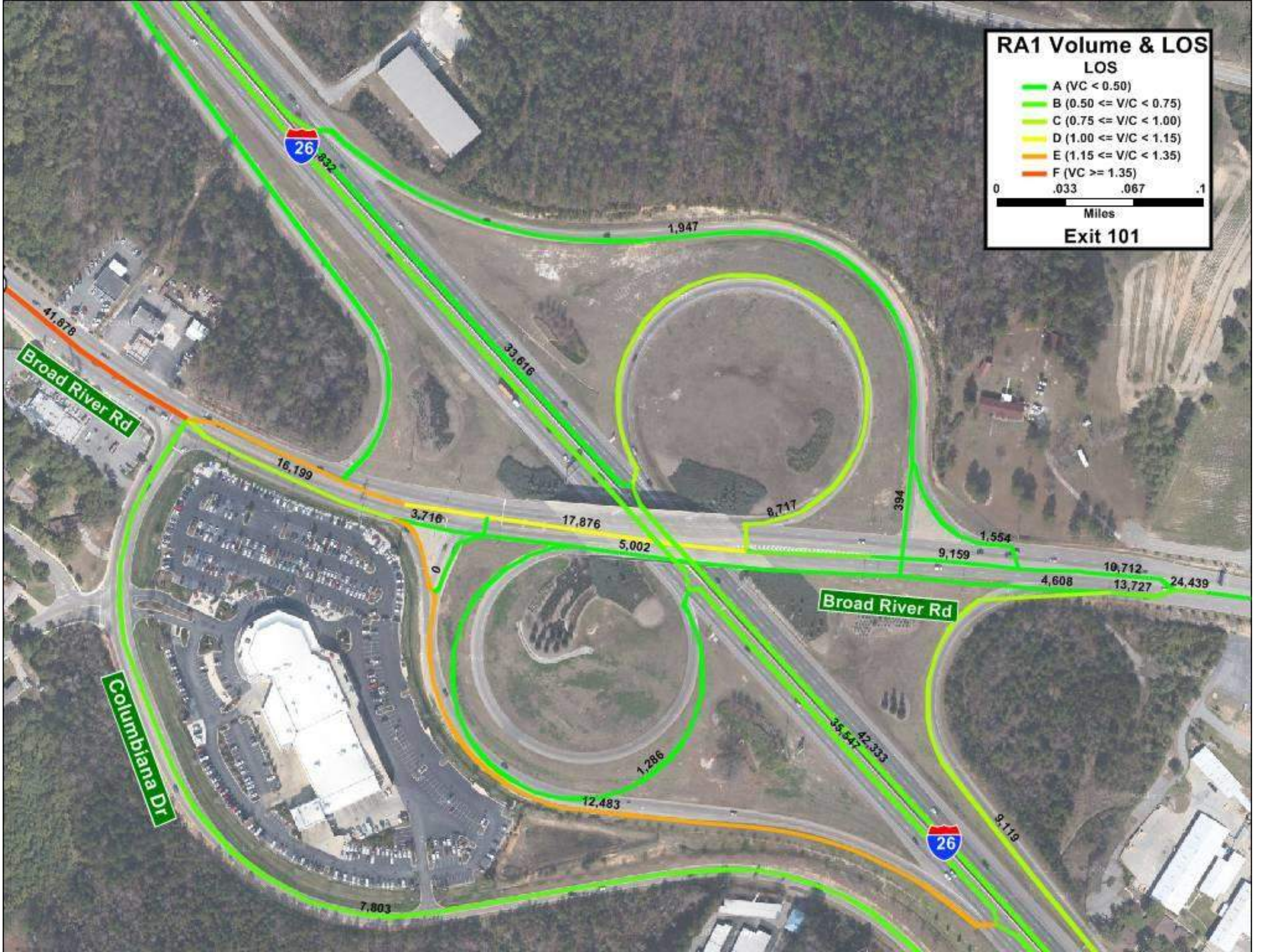

7,987
45,536
53,623
20
7,488
53,416
20
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0 .033 .067 .1
Miles
Exit 64-65



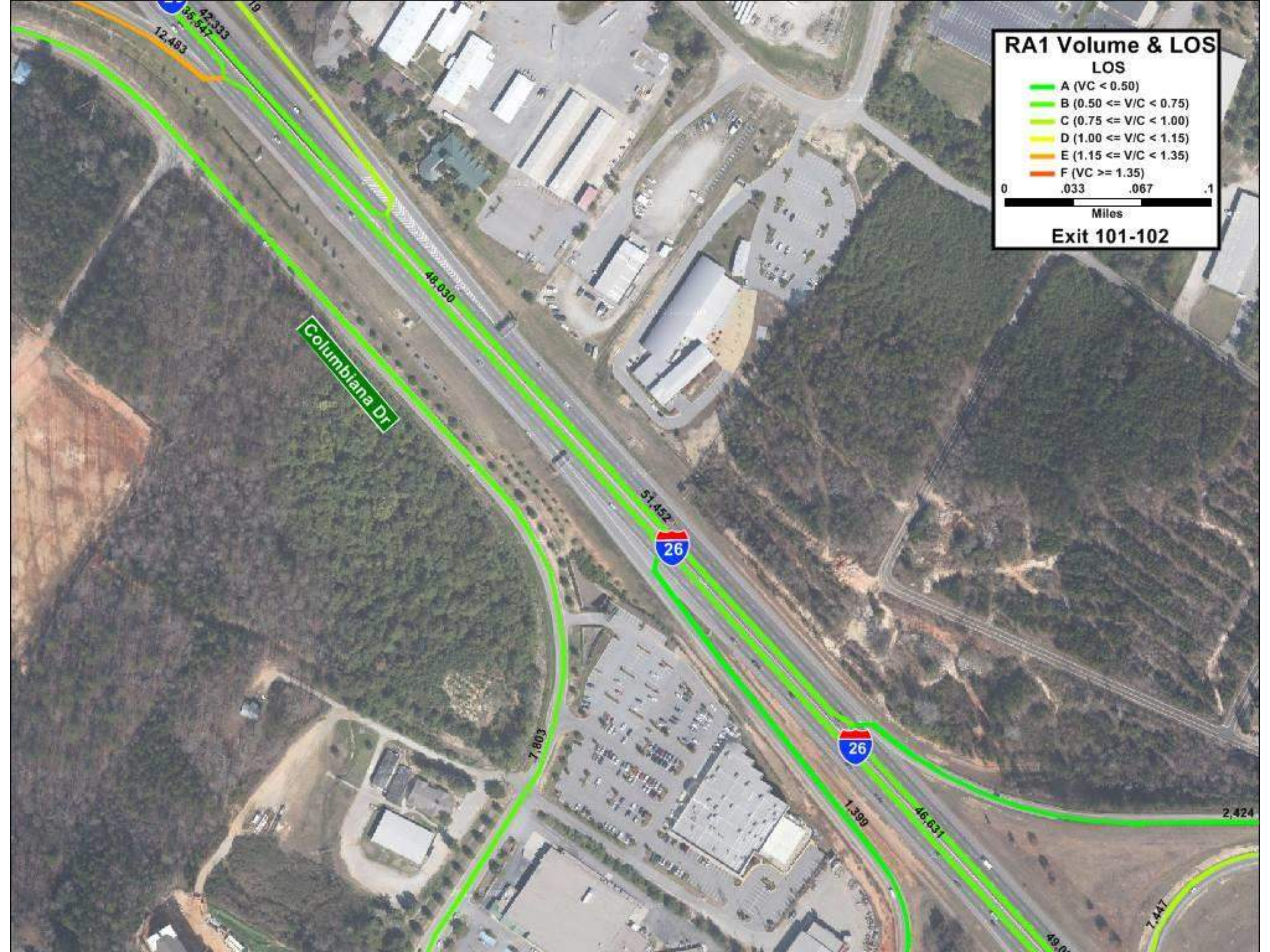
55,996
176
Broad River Rd
50,612
5,384
12,103
45,536
45,928
12,728
44,365
44,365
44,365
11,182
1,545
29,812
7,987
45,536
45,928
7,488
20
20
Broad River Rd
176
31,357
2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0 .033 .067 .1
Miles
Exit 65


2040 EC Volume-Capacity/LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1,35)
0
.033
.067
.1
Miles
Colonial Life Blvd
Colonial Life Blvd
126
37,877
1,289
1,289
3,897
38,859
37,877
4,347
3,724
37,877
38,859
126
41,774

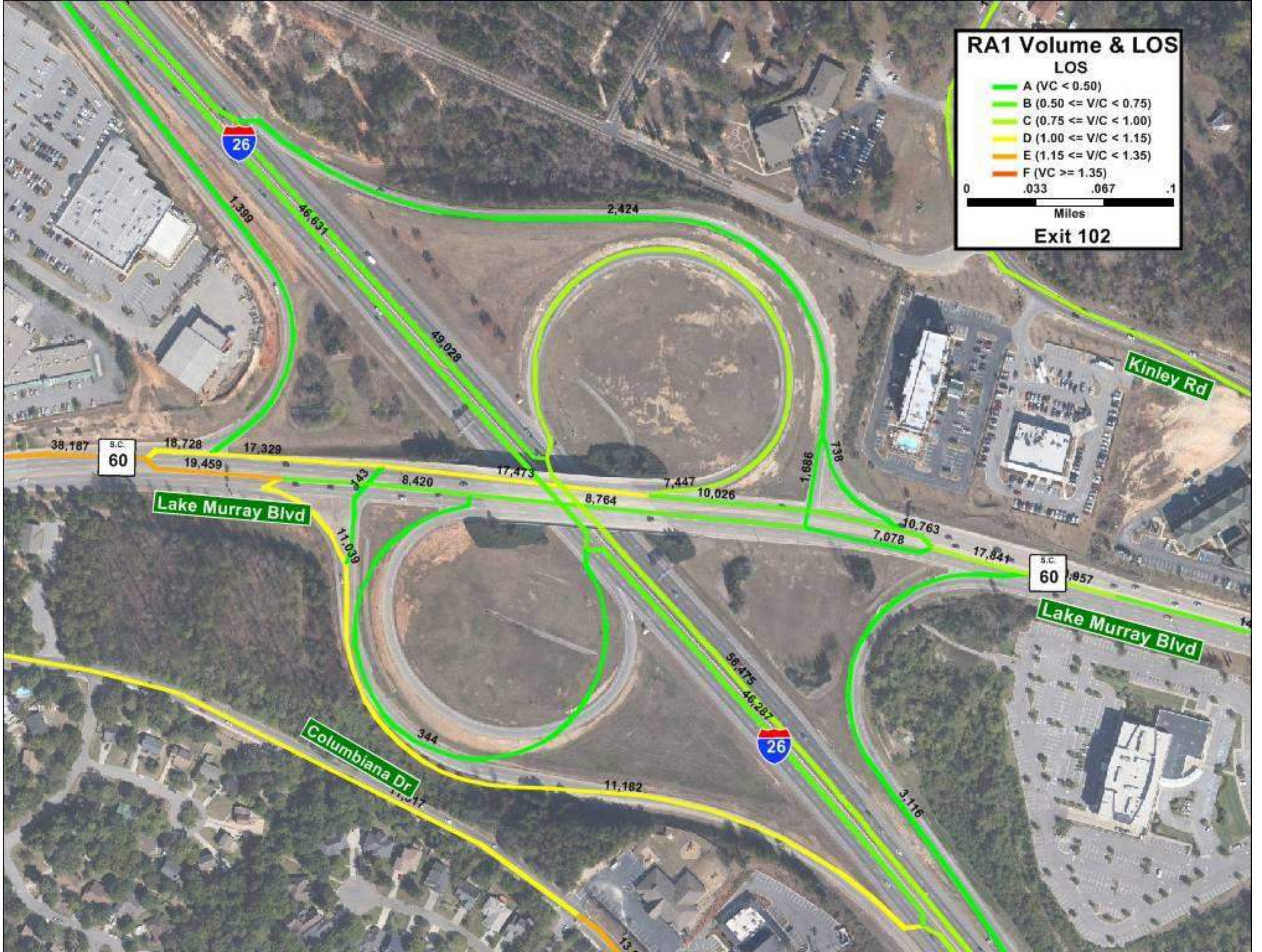
Appendix I—SCSWM RA1 Volume/LOS



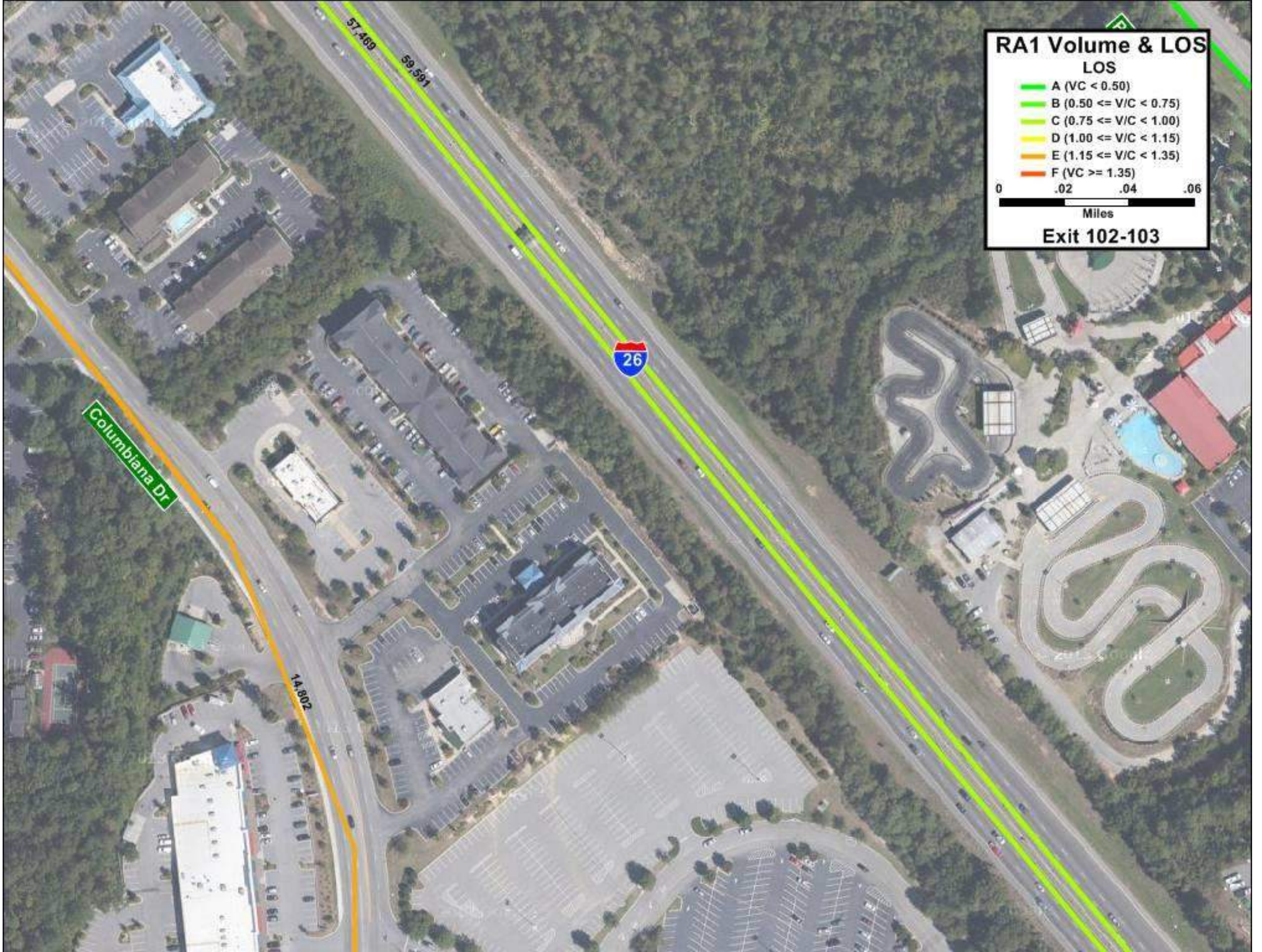
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 101
26
832
1,947
41,878
Broad River Rd
33,616
16,199
3,716
17,876
8,717
394
1,554
5,002
9,159
10,712
0
4,608
13,727
24,439
Broad River Rd
Columbiana Dr
35,547
42,333
1,286
12,483
9,119
26
7,803

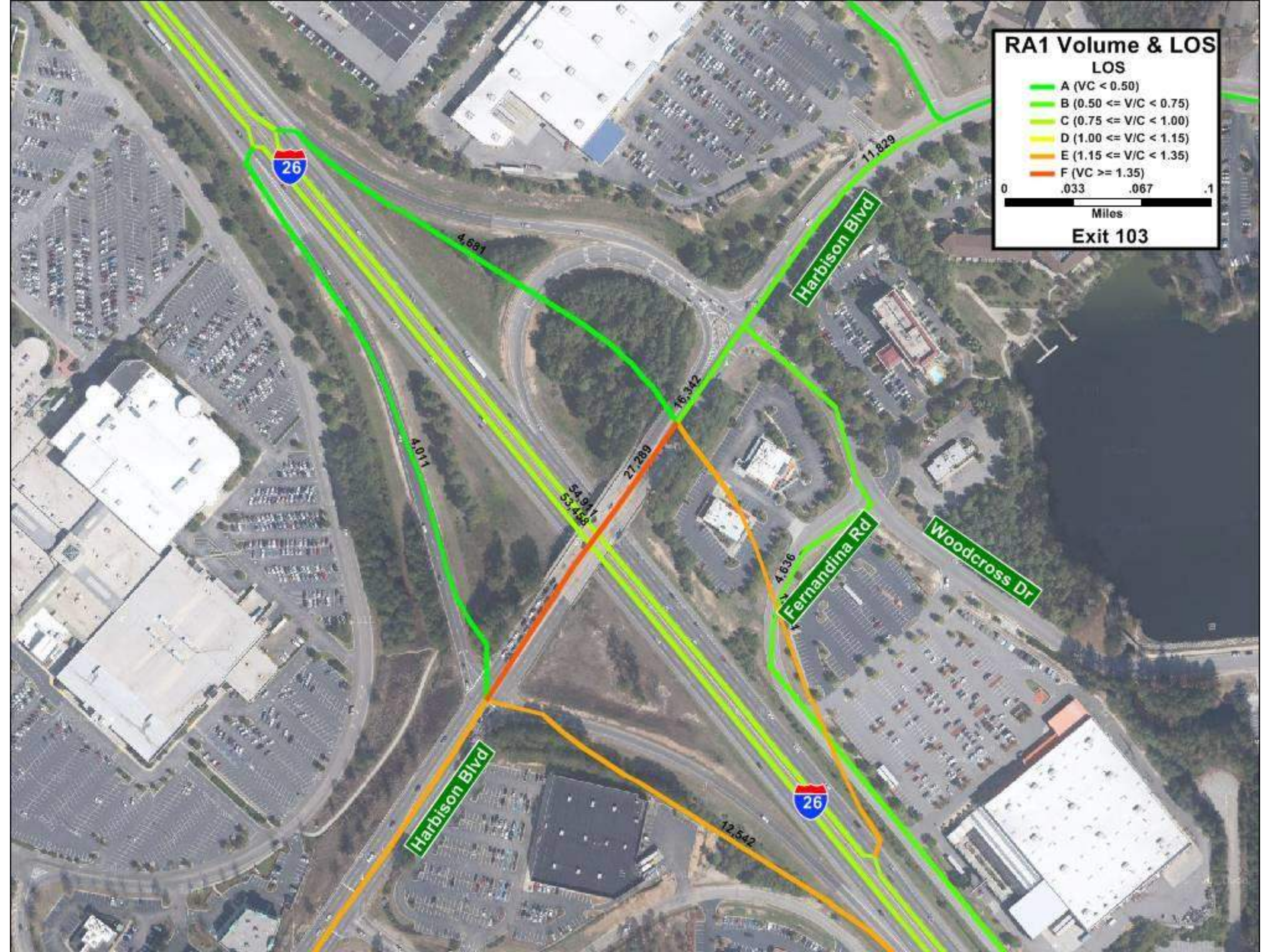


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 101-102
Columbiana Dr
42,333
35,547
12,483
48,030
51,452
26
26
7,803
1,399
46,631
2,424
7,447



RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 102
26
1,399
46,631
2,424
49,028
Kinley Rd
38,187
S.C.
60
18,728
17,329
19,459
17,473
7,447
10,026
1,686
738
143
8,420
8,764
Lake Murray Blvd
11,039
10,763
7,078
17,841
S.C.
60
Lake Murray Blvd
56,475
46,287
26
344
Columbiana Dr
11,182
3,116


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.02
.04
.06
Miles
Exit 102-103
57,469
59,591
26
Columbiana Dr
14,802



RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 103
26
11,829
4,681
Harbison Blvd
16,342
27,289
4,011
54,911
53,458
Woodcross Dr
Fernandina Rd
4,636
Harbison Blvd
26
12,542

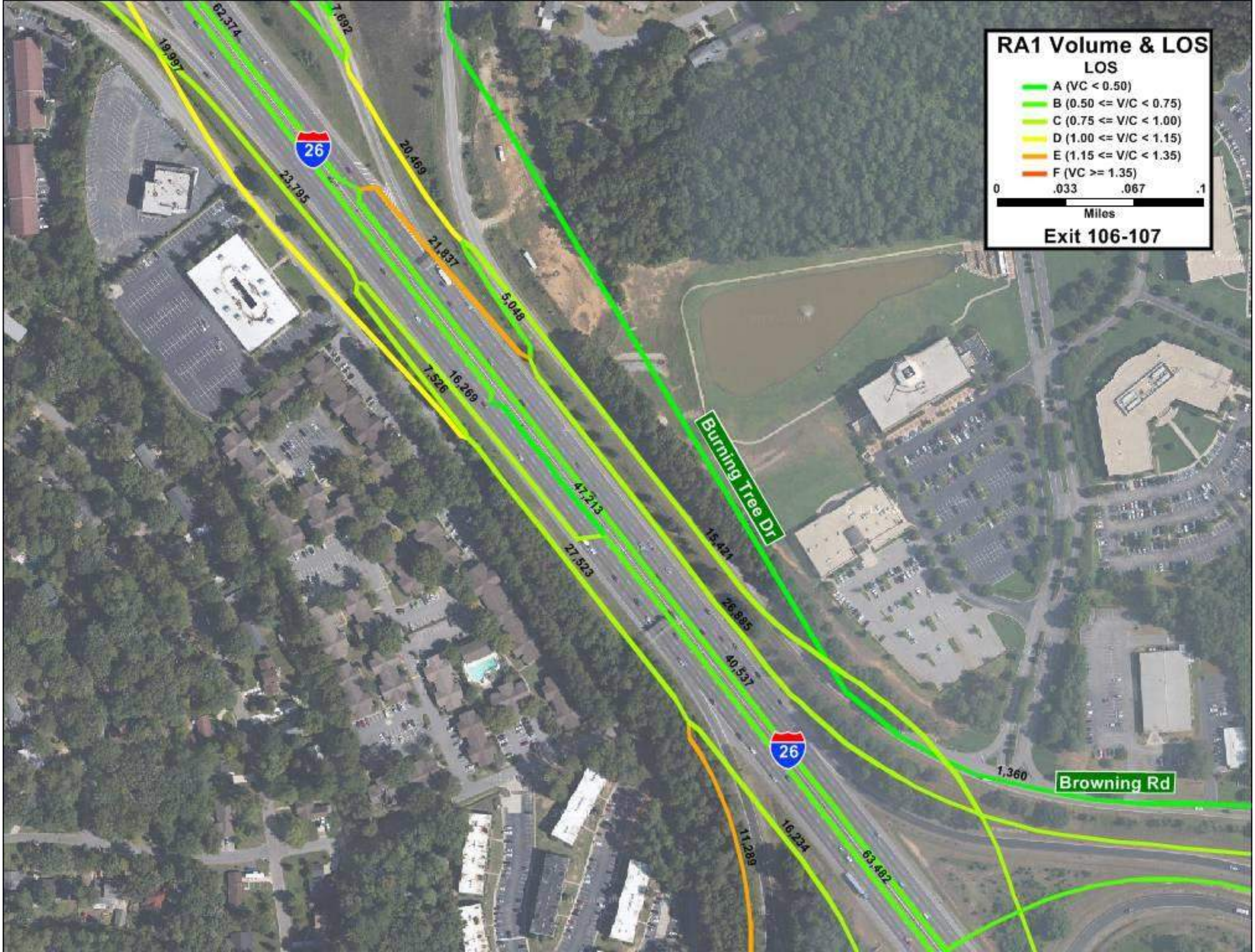
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 103-104
4,636
26
67,265
66,000
Fernandina Rd

26
1,678
5,754
Fernandina Rd
12,205
Piney Grove Rd
20,770
1,025
654
18,926
17,910
64,322
61,511
10,485
Bower
19,950
Piney Grove Rd
Fernandina Rd
7,412
8,537
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 104
5,120
Jamil Rd
26

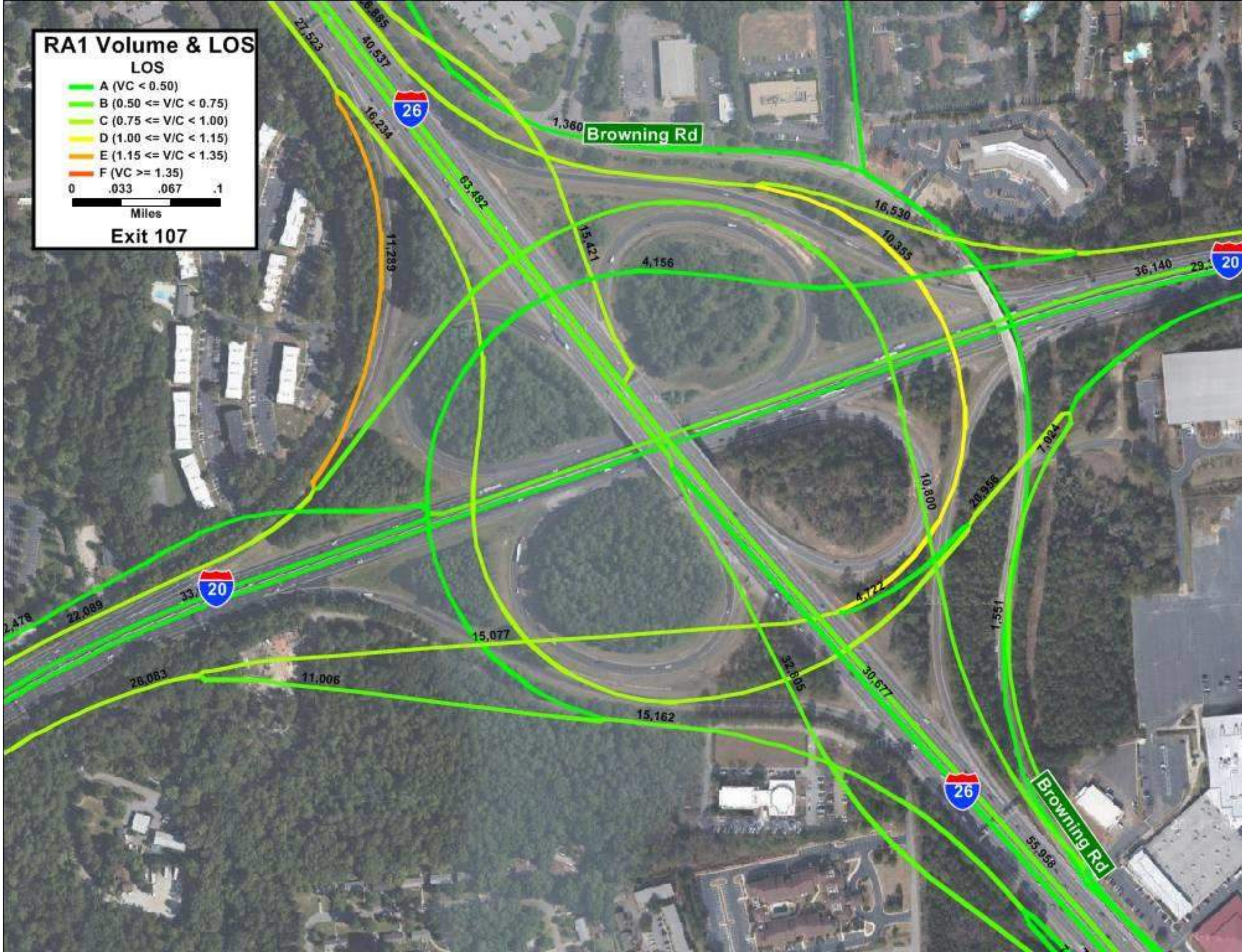

RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 104-106
Fernandina Rd
Jamil Rd
Beatty Rd
Tram Rd
26
5,628
71,734
5,120
1,539
70,048
2,325
5,562
7,355


7,355
7,389
Evelyn Dr
26
67,211
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 104-106

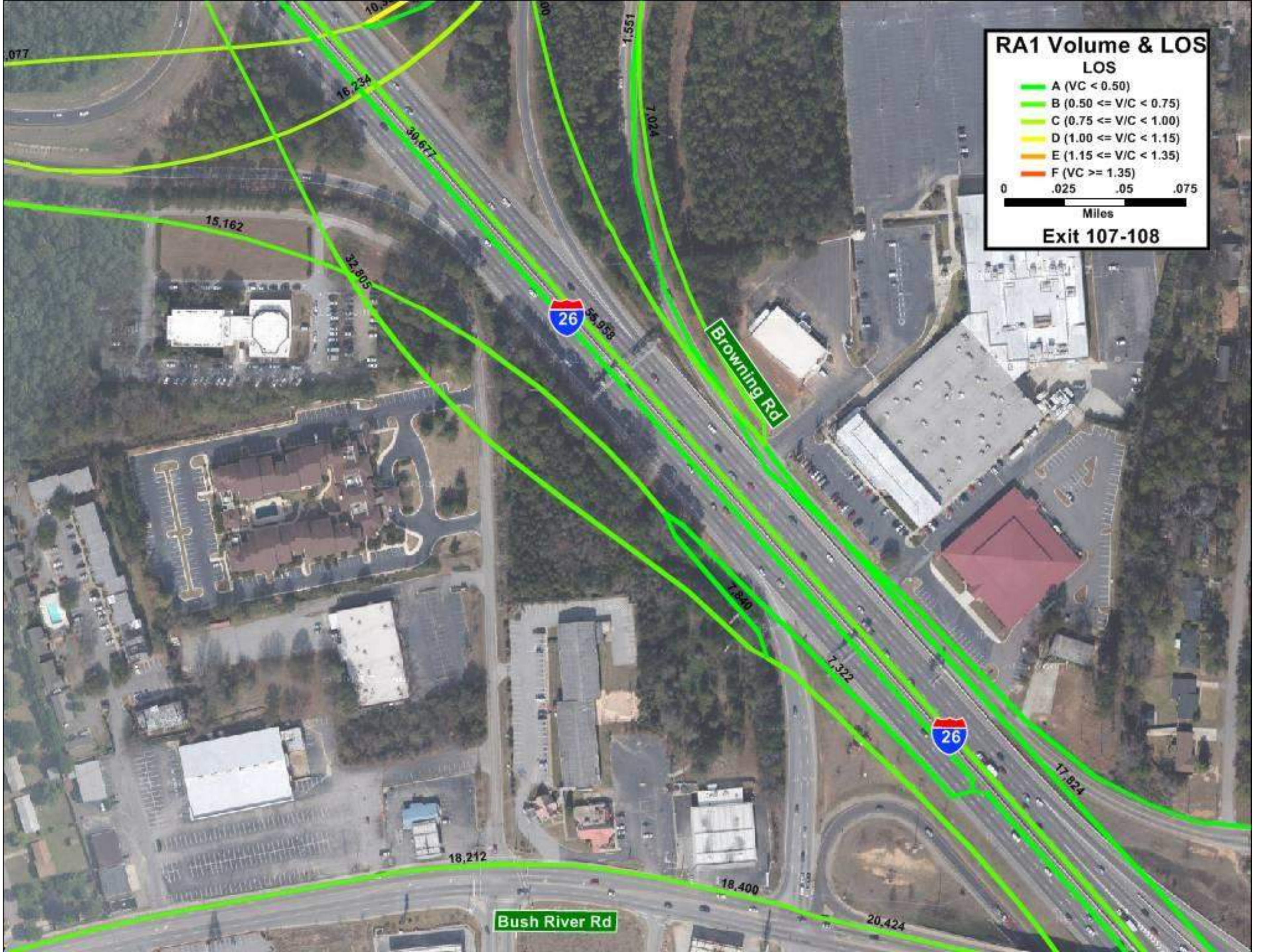
Jamil Rd
Fernandina Rd
St Andrews Rd
St Andrews Rd
Burning Tree Dr
26
26
6,283
7,674
4,523
7,477
26,225
26,386
26,272
62,374
47,213
5,209
2,465
21,063
3,395
27,570
26,618
38,742
37,613
12,799
10,996
12,777
6,069
1,623
7,692
1,360
0
19,997
20,469
23,795
21,837
5,048
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 106



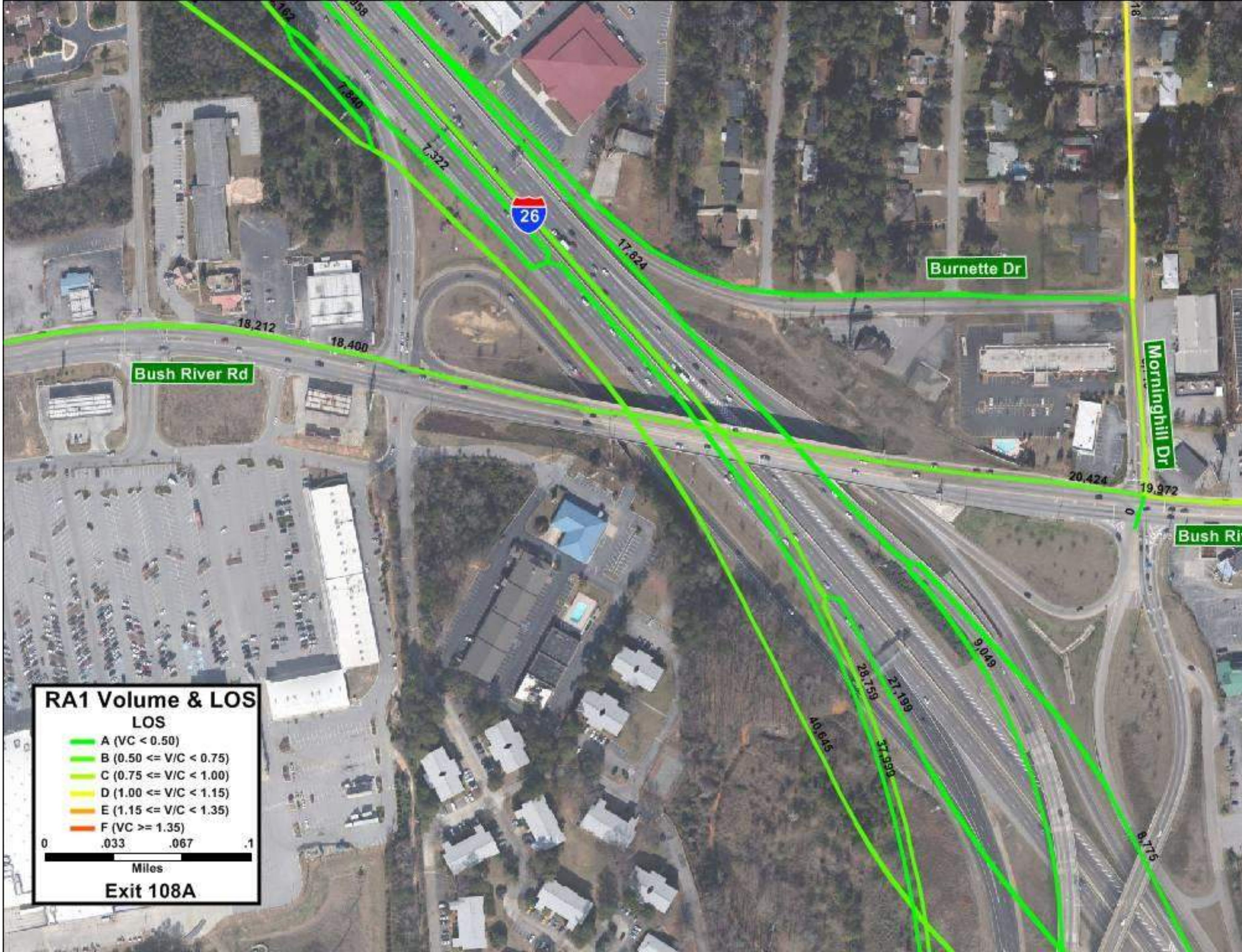
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 106-107
26
Burning Tree Dr
Browning Rd
62,374
7,692
19,997
20,469
23,795
21,837
5,048
7,526
16,269
47,213
15,421
27,523
26,885
40,537
1,360
11,289
16,234
63,482



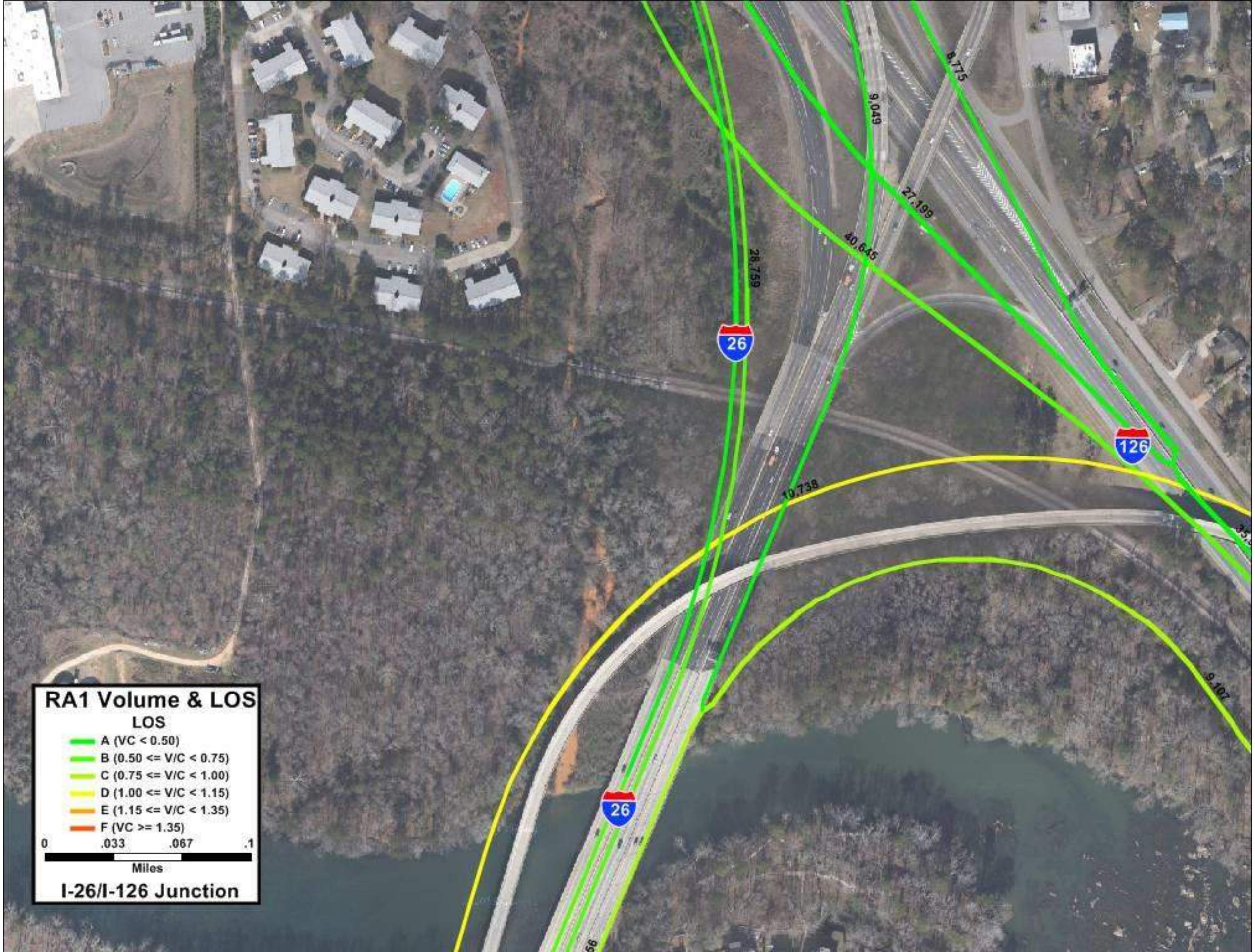
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .033 .067 .1
Miles
Exit 107
26
20
Browning Rd
27,523
40,537
16,234
63,482
11,289
15,421
1,360
16,530
10,355
4,156
36,140
10,800
28,956
7,024
4,722
1,551
22,089
15,077
28,083
11,006
15,162
32,805
30,677
55,958



RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.025
.05
.075
Miles
Exit 107-108
Browning Rd
Bush River Rd
26
26
16,234
30,677
15,162
32,805
55,958
7,024
1,551
7,840
7,322
17,824
18,212
18,400
20,424

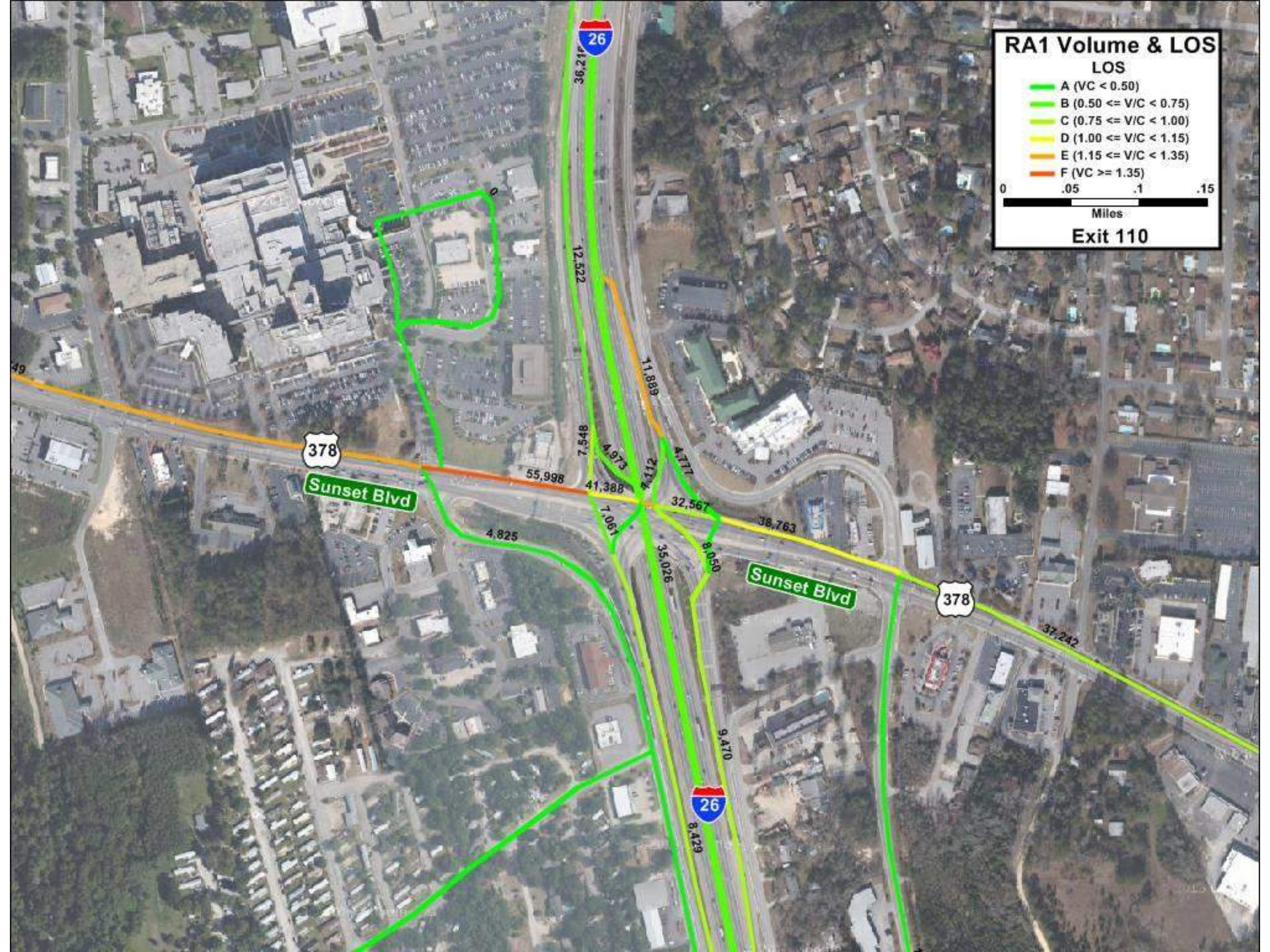


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 108A
26
Burnette Dr
Bush River Rd
Morninghill Dr
Bush Riv
7,840
7,322
17,624
18,212
18,400
20,424
19,972
0
9,049
28,759
27,199
40,645
37,999
8,775

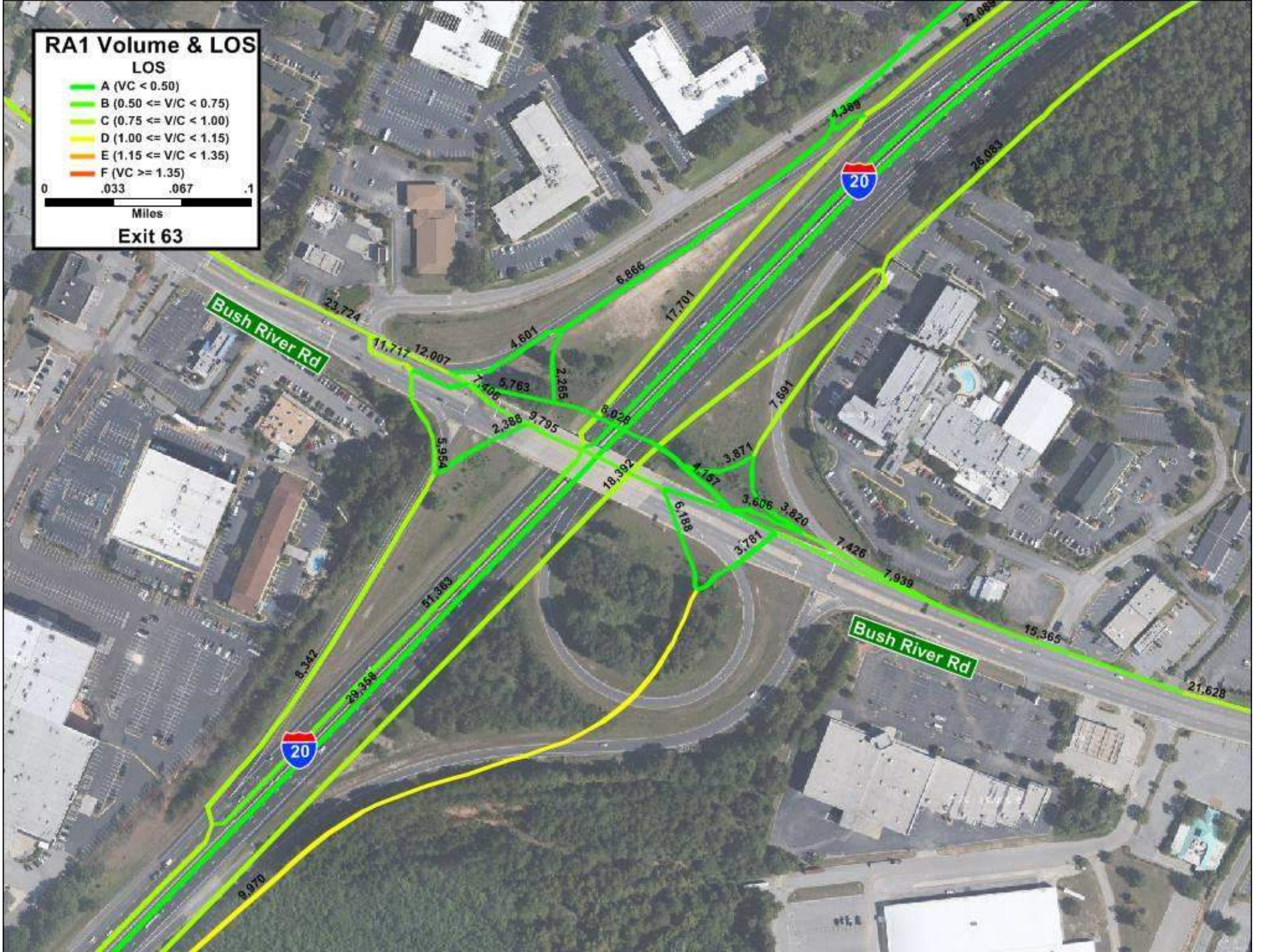


8,775
9,049
27,199
40,645
26,759
26
126
10,738
9,107
26
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
I-26/I-126 Junction

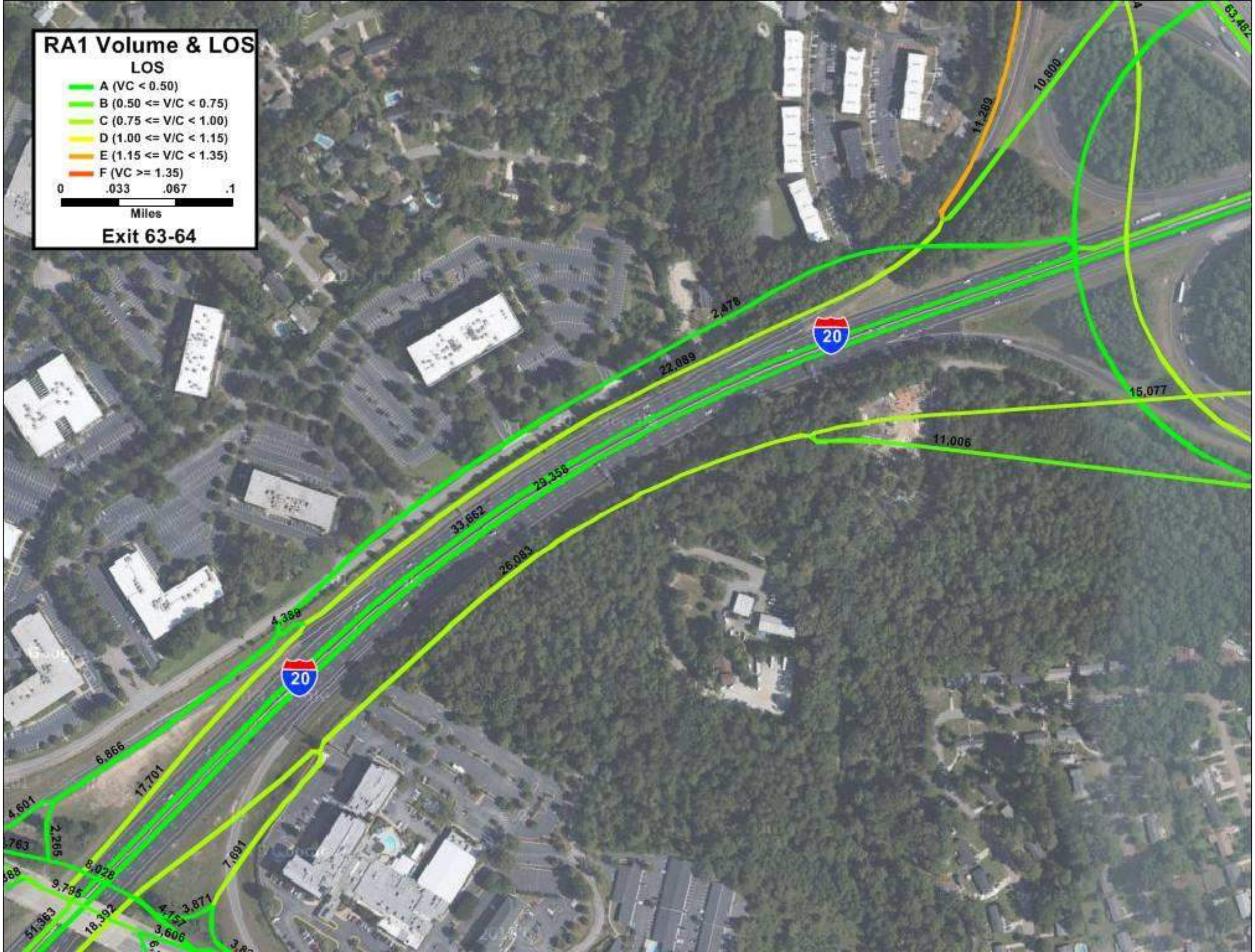

12,522
26
46,915
26
36,21
0
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .05 .1 .15
Miles
Exit 108-110

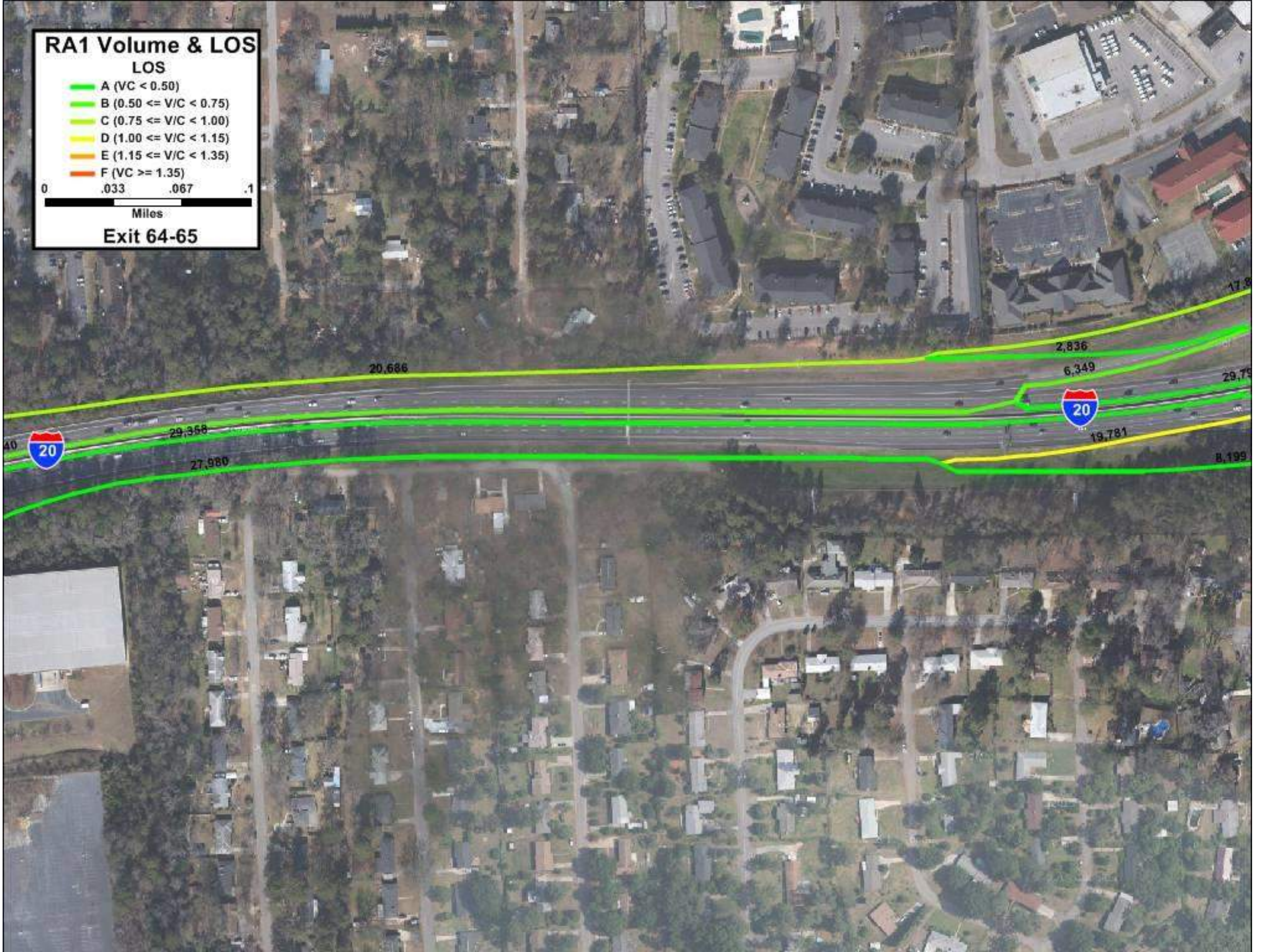


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.05
.1
.15
Miles
Exit 110
26
378
Sunset Blvd
55,998
41,388
32,567
38,763
37,242
12,522
11,889
7,548
4,973
4,112
4,777
7,061
4,825
35,026
8,050
9,470
8,429
0

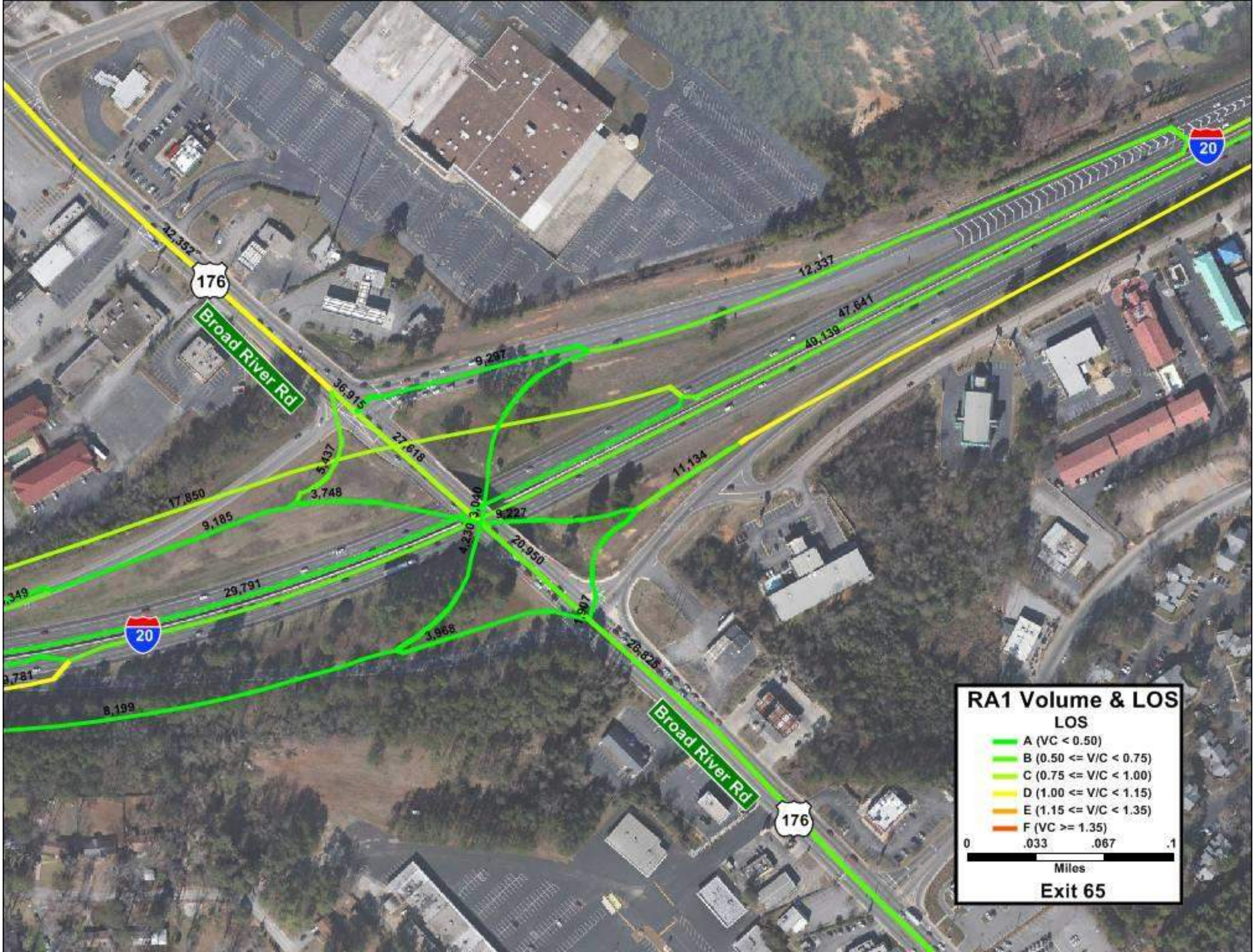


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .033 .067 .1
Miles
Exit 63
Bush River Rd
Bush River Rd
20
20
22,089
4,389
26,083
6,866
17,701
23,724
11,717
12,007
4,601
2,265
7,406
5,763
8,028
7,691
2,388
9,795
5,954
3,871
4,157
18,392
3,606
3,820
6,188
3,781
7,426
7,939
15,365
21,628
51,363
29,358
8,342
9,970


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .033 .067 .1
Miles
Exit 63-64
20
20
63,482
10,800
11,289
2,478
22,089
15,077
11,006
29,358
33,662
26,083
4,388
6,866
17,701
4,601
2,265
8,028
9,795
7,691
3,871
4,157
3,606
51,363
18,392

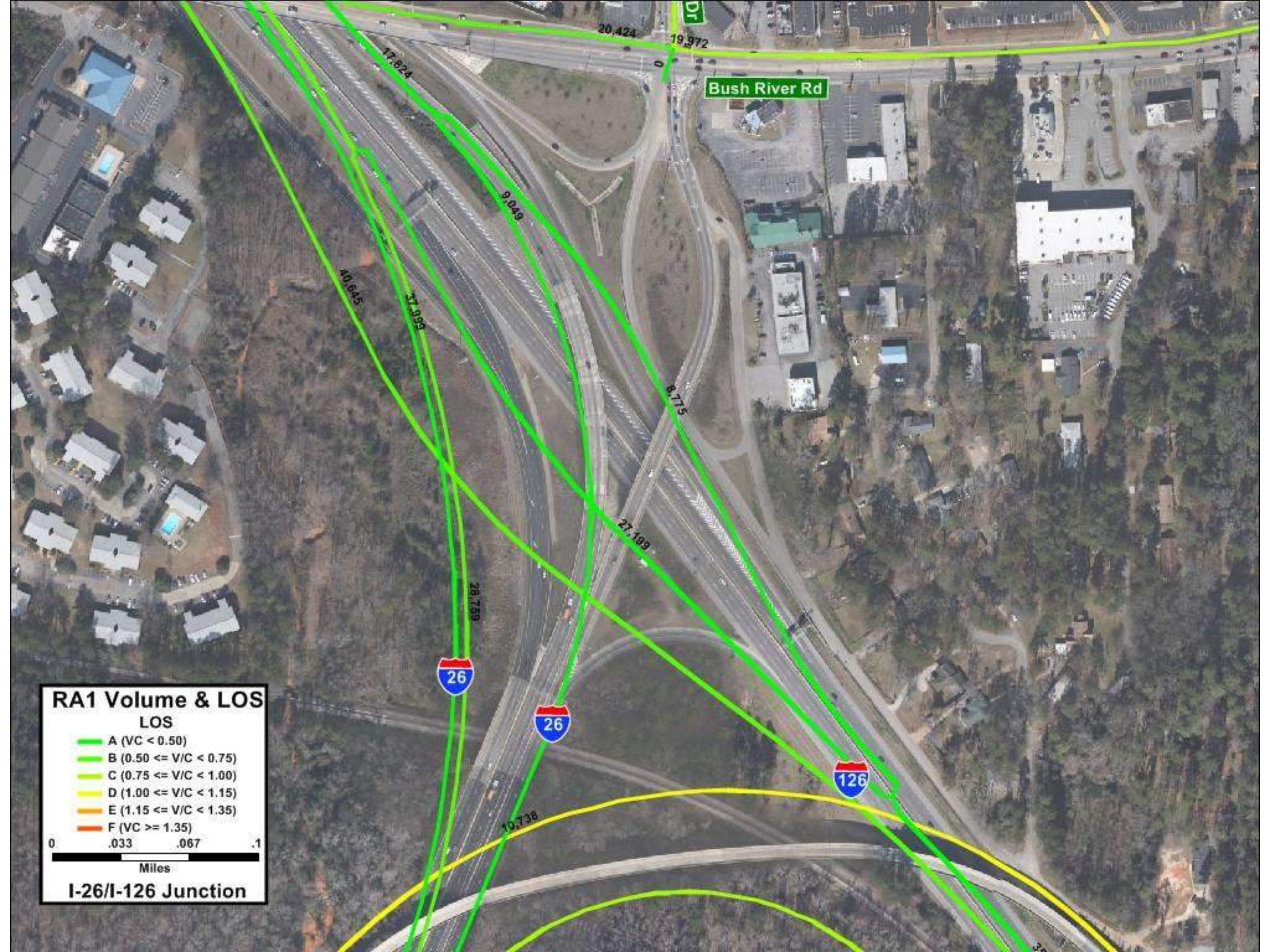


RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 64-65
20,686
2,836
6,349
29,358
27,980
19,781
8,199
20
20

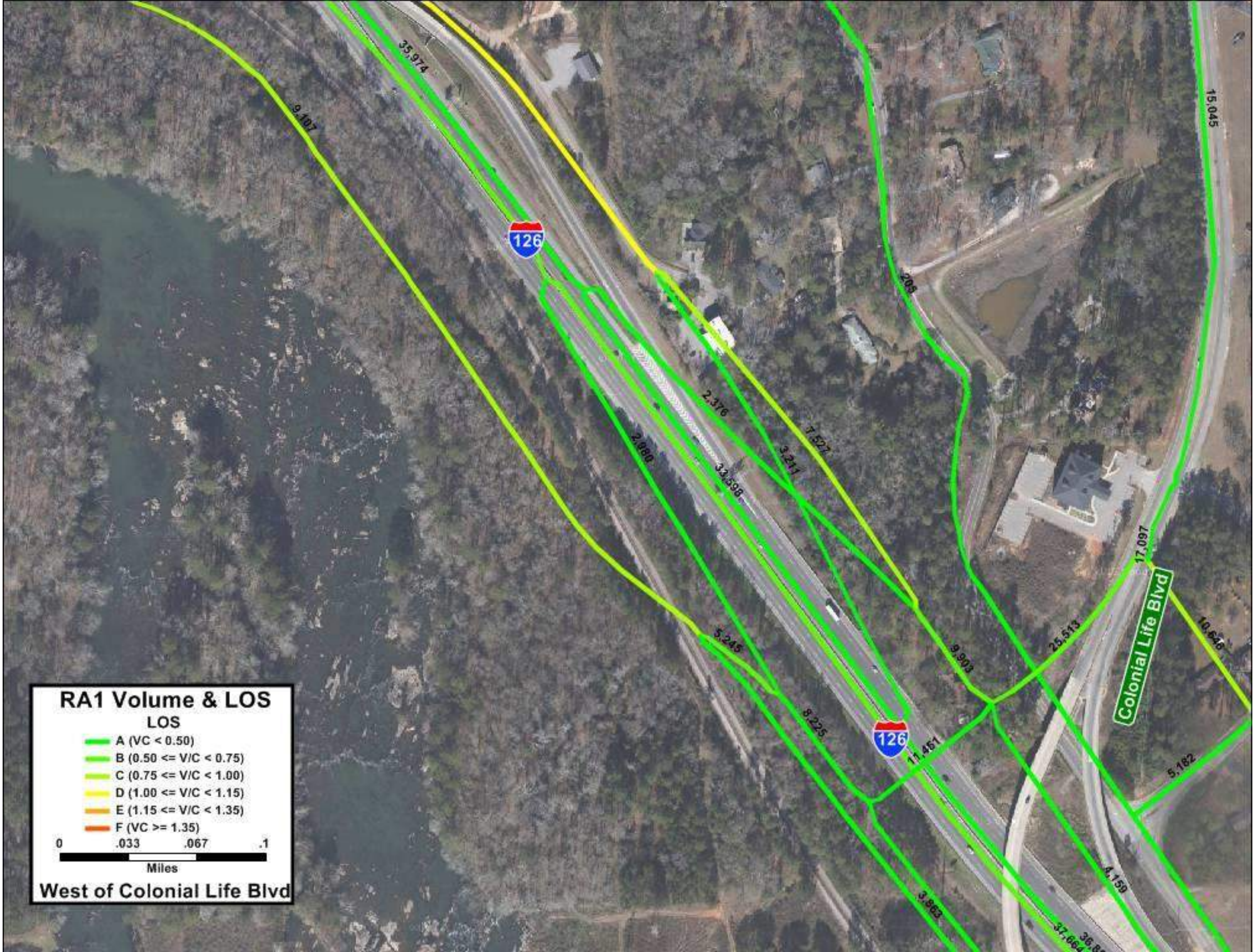


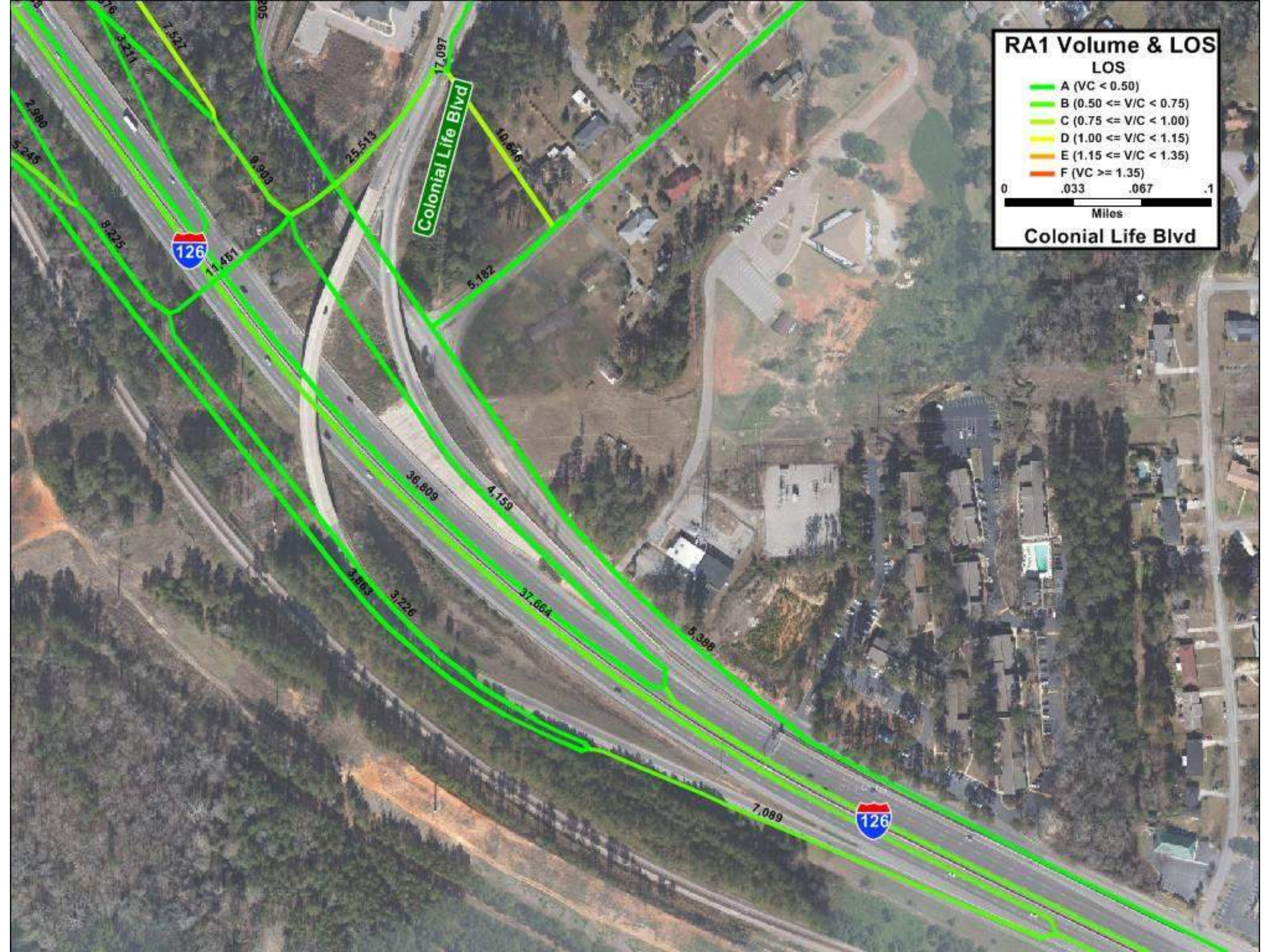
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Exit 65
Broad River Rd
Broad River Rd
176
176
20
20
42,352
36,915
27,618
20,950
26,826
12,337
47,641
49,139
9,297
5,437
3,748
17,850
9,185
3,040
9,227
4,230
11,134
29,791
1,907
3,968
8,199


59,978
20
60,273
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .033 .067 .1
Miles
East of Exit 65



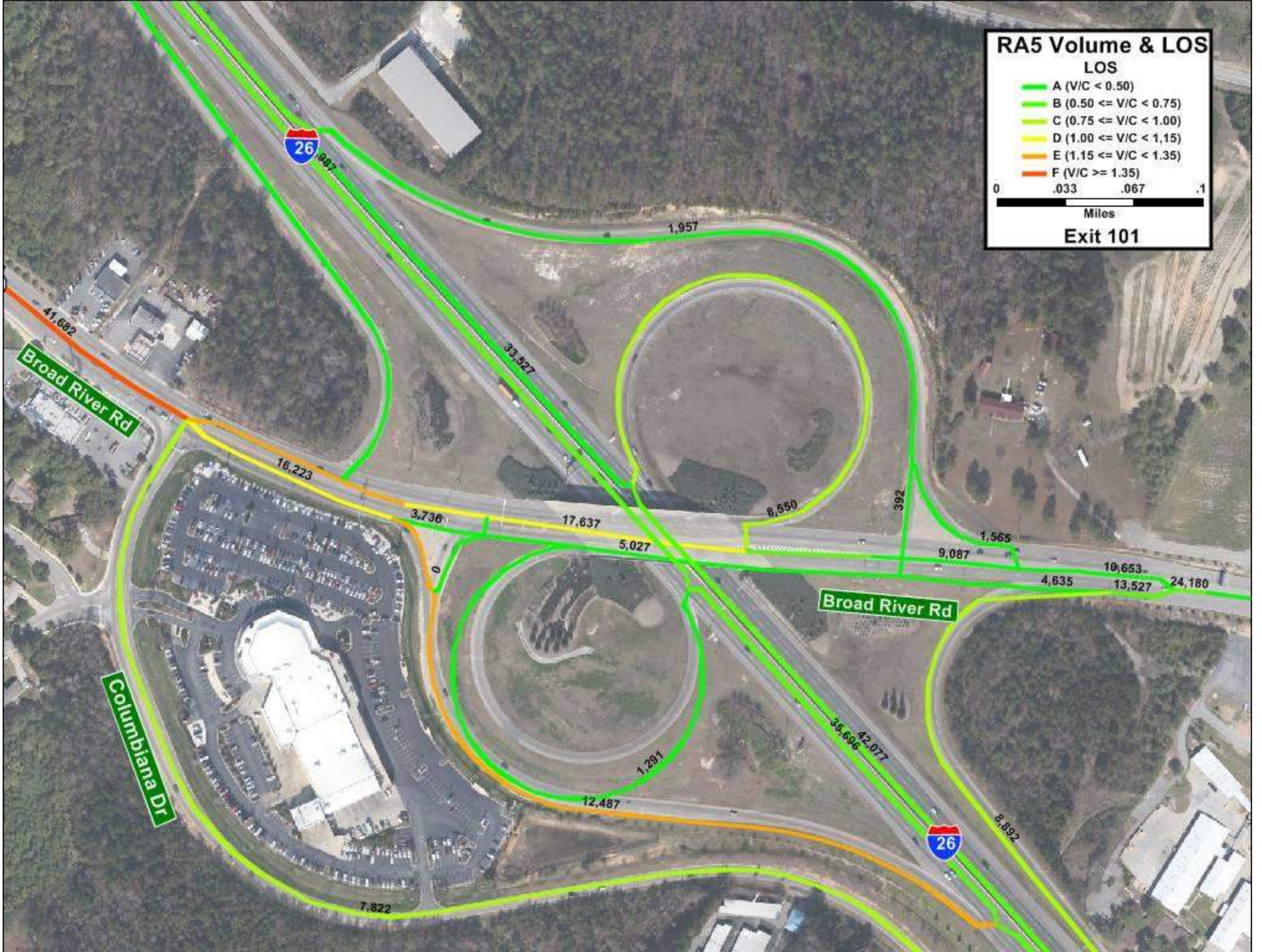
Dr
20,424
19,972
0
Bush River Rd
17,624
9,049
40,645
37,999
8,775
27,199
28,759
26
26
126
10,738
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
I-26/I-126 Junction

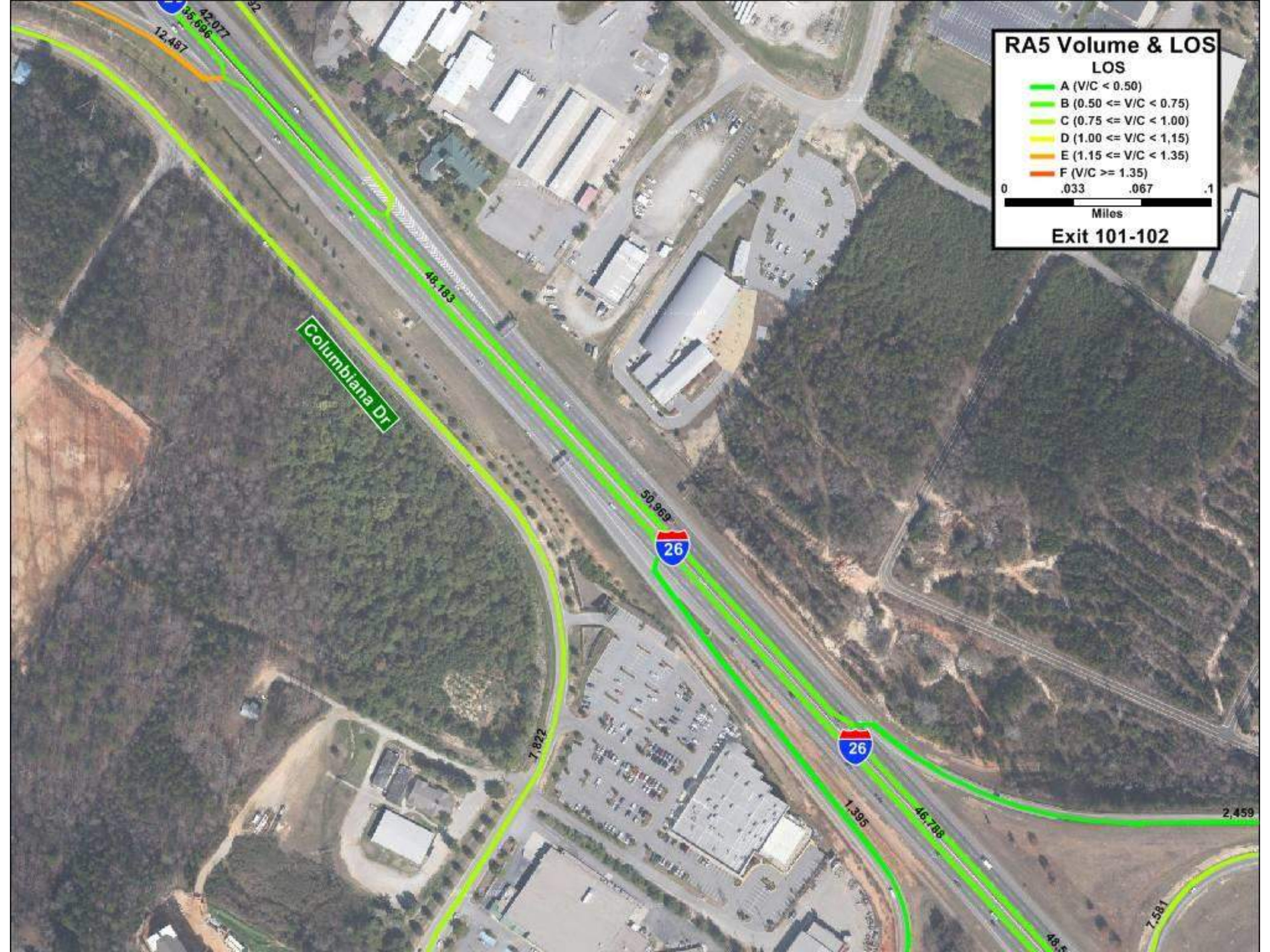

35,974
9,107
15,045
209
2,376
7,527
3,211
2,980
34,398
17,097
Colonial Life Blvd
10,646
25,513
9,903
5,245
8,225
11,451
5,182
3,863
4,159
37,664
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0 .033 .067 .1
Miles
West of Colonial Life Blvd

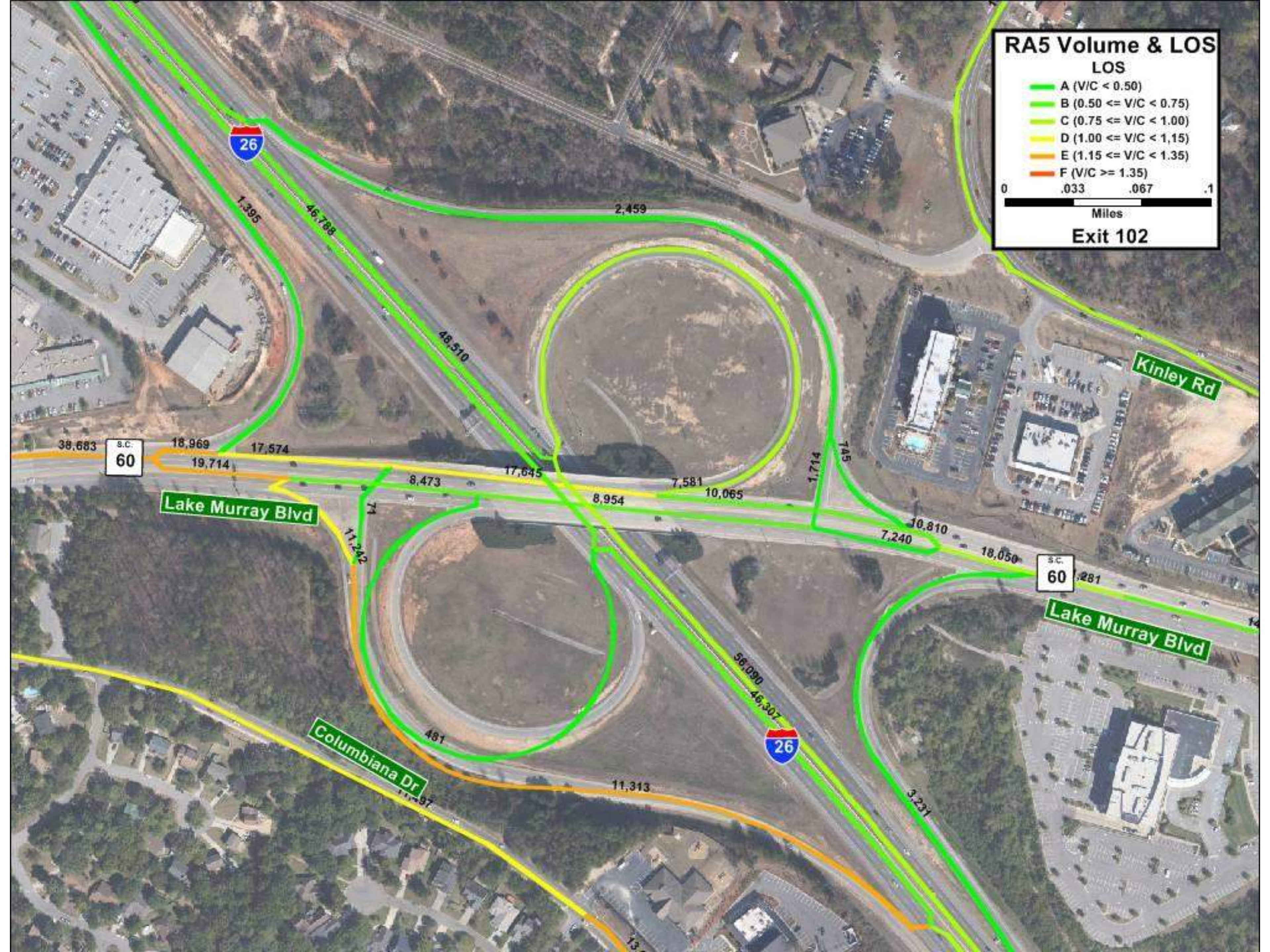


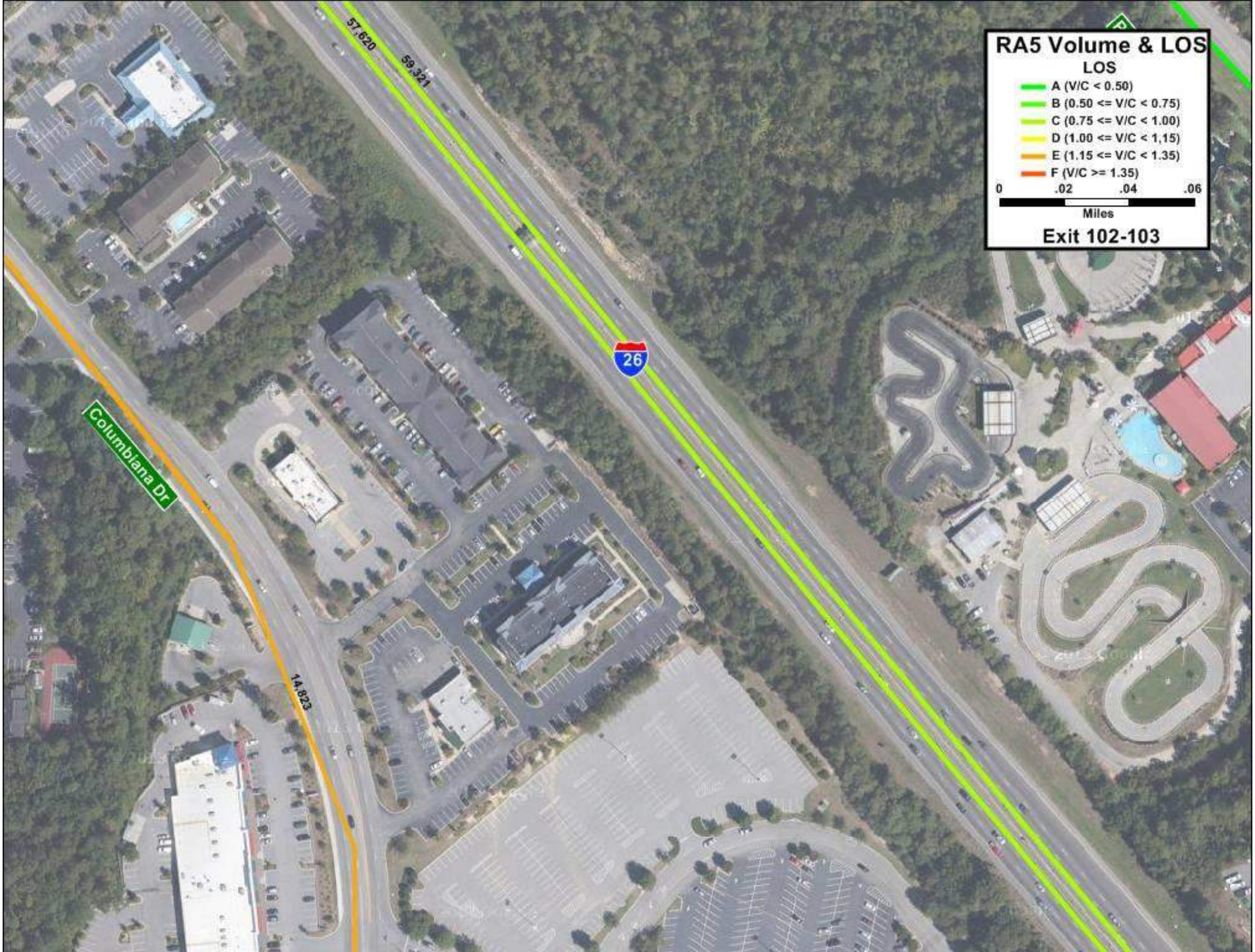
RA1 Volume & LOS
LOS
A (VC < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (VC >= 1.35)
0
.033
.067
.1
Miles
Colonial Life Blvd
Colonial Life Blvd
126
126
17,097
7,527
3,211
2,980
5,245
25,513
9,903
10,646
8,225
11,451
5,182
36,809
4,159
3,863
3,226
37,664
5,388
7,089

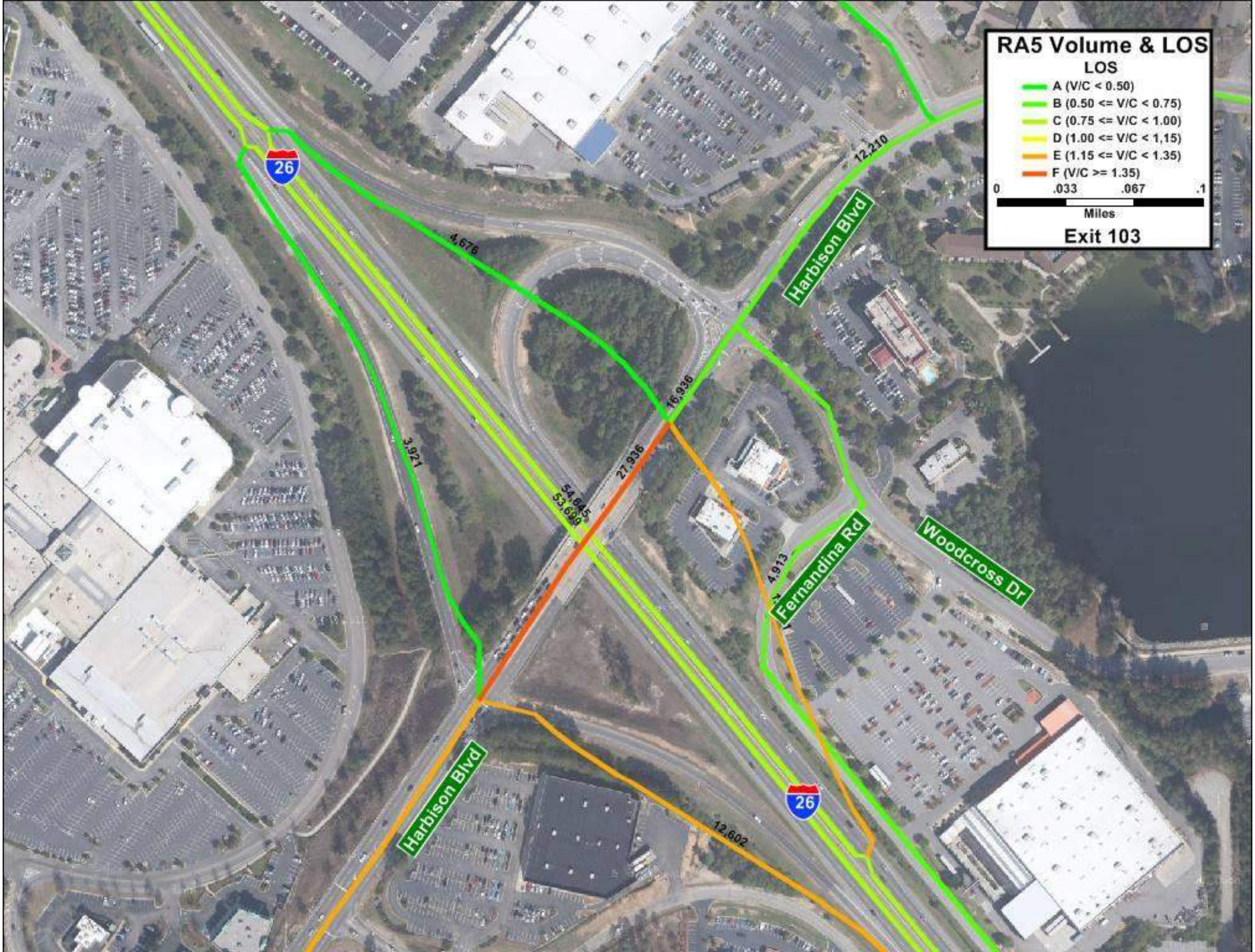
Appendix J— SCSWM RA5 Volume/LOS


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 101
26
987
1,957
41,682
Broad River Rd
33,527
16,223
8,550
392
3,736
17,637
1,565
5,027
9,087
10,653
0
4,635
13,527
24,180
Broad River Rd
Columbiana Dr
35,696
42,077
1,291
12,487
8,892
26
7,822


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 101-102
Columbiana Dr
42.077
35.696
12.487
48.183
50.969
26
26
7.822
1.395
46.788
2,459
7.581


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 102
26
26
S.C. 60
S.C. 60
Lake Murray Blvd
Lake Murray Blvd
Kinley Rd
Columbiana Dr
1,395
46,788
2,459
48,510
38,683
18,969
17,574
19,714
17,645
8,473
7,581
10,065
8,954
1,714
745
10,810
7,240
18,050
71
11,242
56,090
46,307
481
11,313
3,231


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.02
.04
.06
Miles
Exit 102-103
57,620
59,321
26
Columbiana Dr
14,823



RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 103
26
26
Harbison Blvd
Harbison Blvd
Fernandina Rd
Woodcross Dr
12,210
4,676
3,921
16,936
27,936
54,645
53,699
4,913
12,602

RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 103-104
4,913
26
67,016
66,300
Fernandina Rd

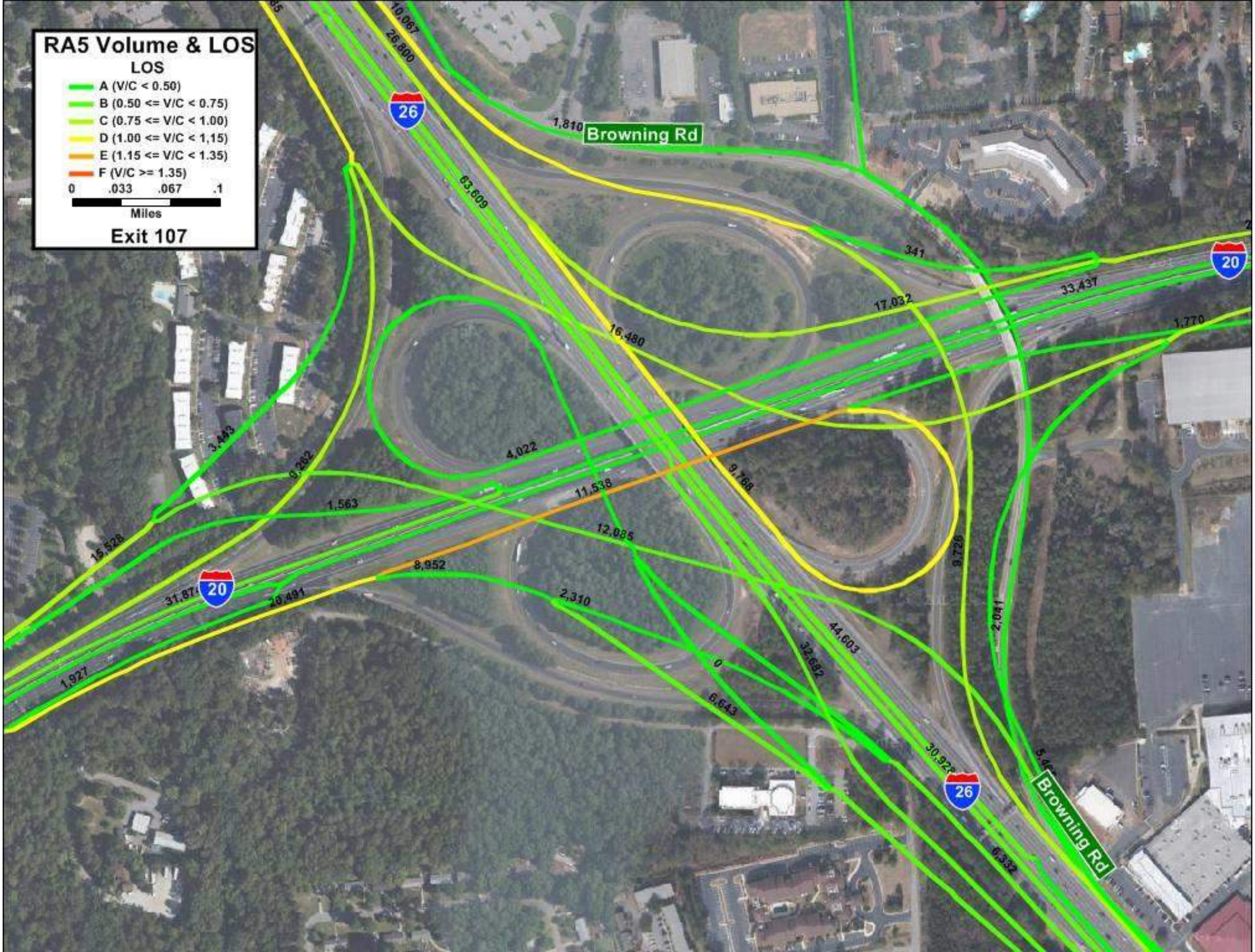
26
1,324
5,708
Fernandina Rd
12,876
Piney Grove Rd
20,893
819
505
19,539
18,053
20,358
64,976
61,308
10,202
Bower
Piney Grove Rd
Fernandina Rd
8,180
9,890
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1.15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 104
5,001
Jamil Rd
26

RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 104-106
26
Fernandina Rd
Jamil Rd
Tram Rd
Beatty Rd
Fernandina Rd
Jamil Rd
26
5,137
73,156
5,001
1,208
71,198
2,316
5,435
7,246

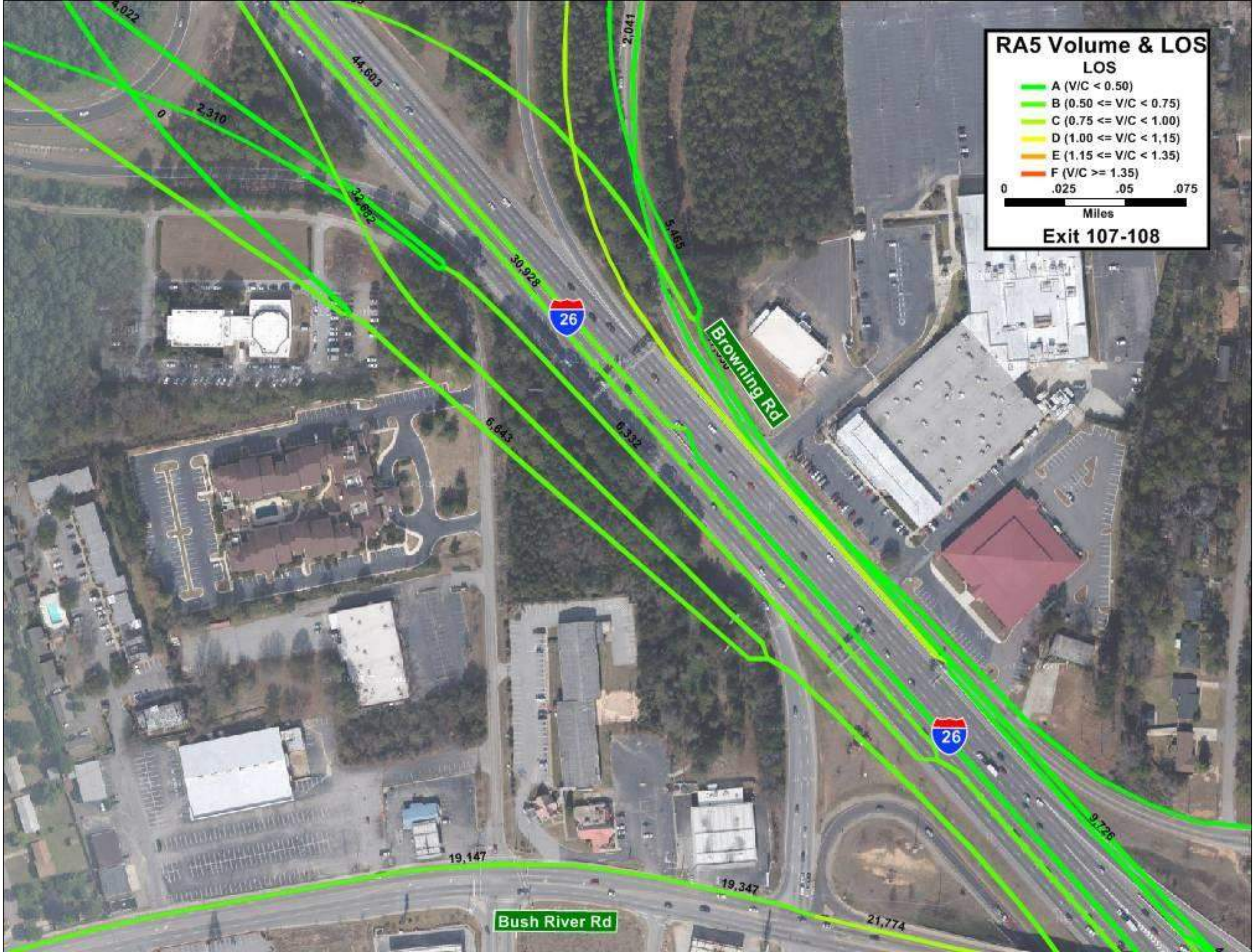
3,929
7,246
7,269
Evelyn Dr
26
54,969
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 104-106

RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 106
26
Jamil Rd
Fernandina Rd
St Andrews Rd
St Andrews Rd
Burning Tree Dr
6,422
6,260
8,321
18,167
7,338
26,103
26,261
27,610
64,938
46,647
2,173
4,087
1,440
6,881
23,522
17,391
26,461
38,469
10,568
10,423
4,882
0
1,810
1,227
6,109
27,960
16,532
20,335
6,465

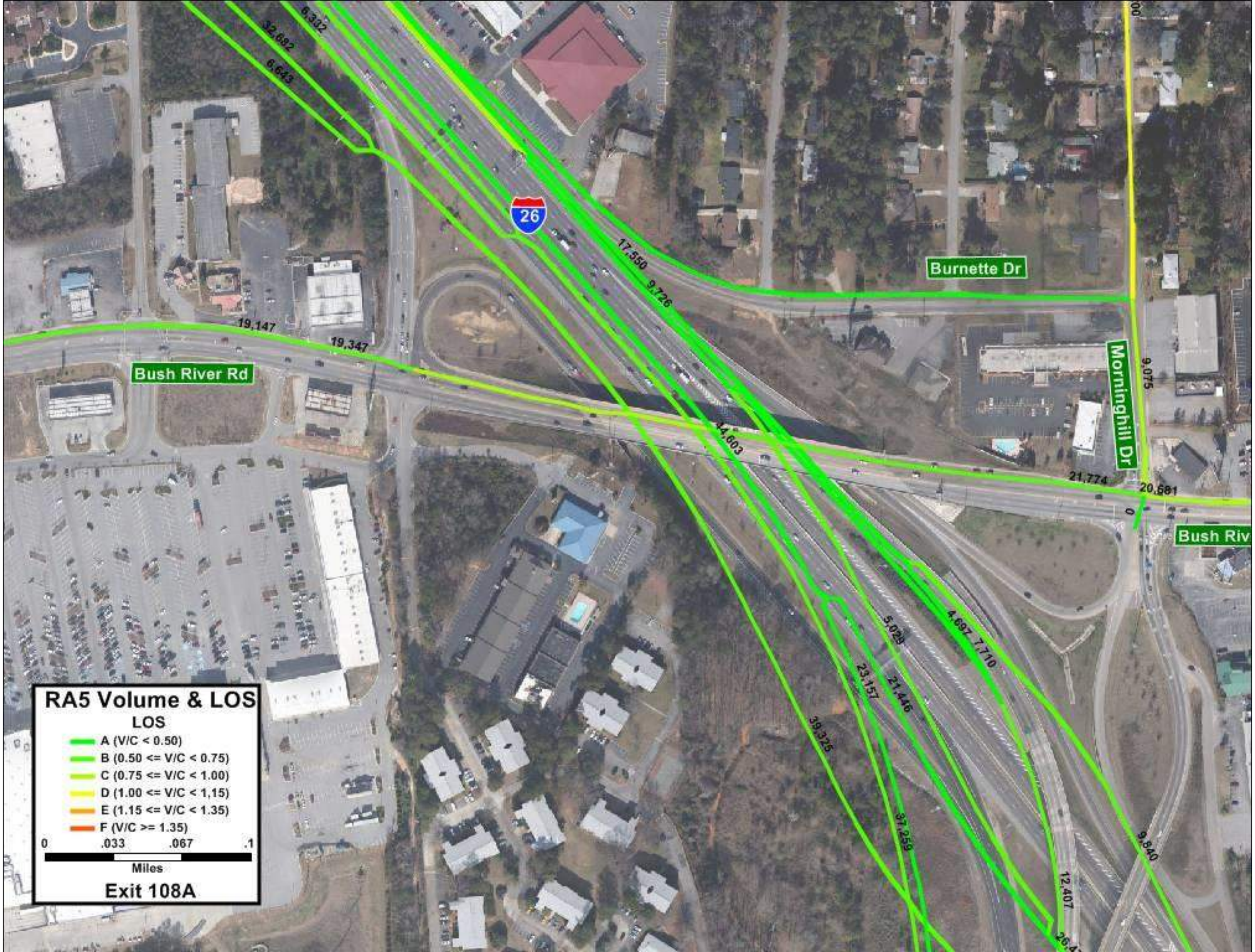
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 106-107
Burning Tree Dr
Browning Rd
26
26
64,938
46,647
6,109
10,423
27,960
16,532
20,335
6,465
10,998
16,962
63,609
26,800
29,185
44,603
10,067
1,810



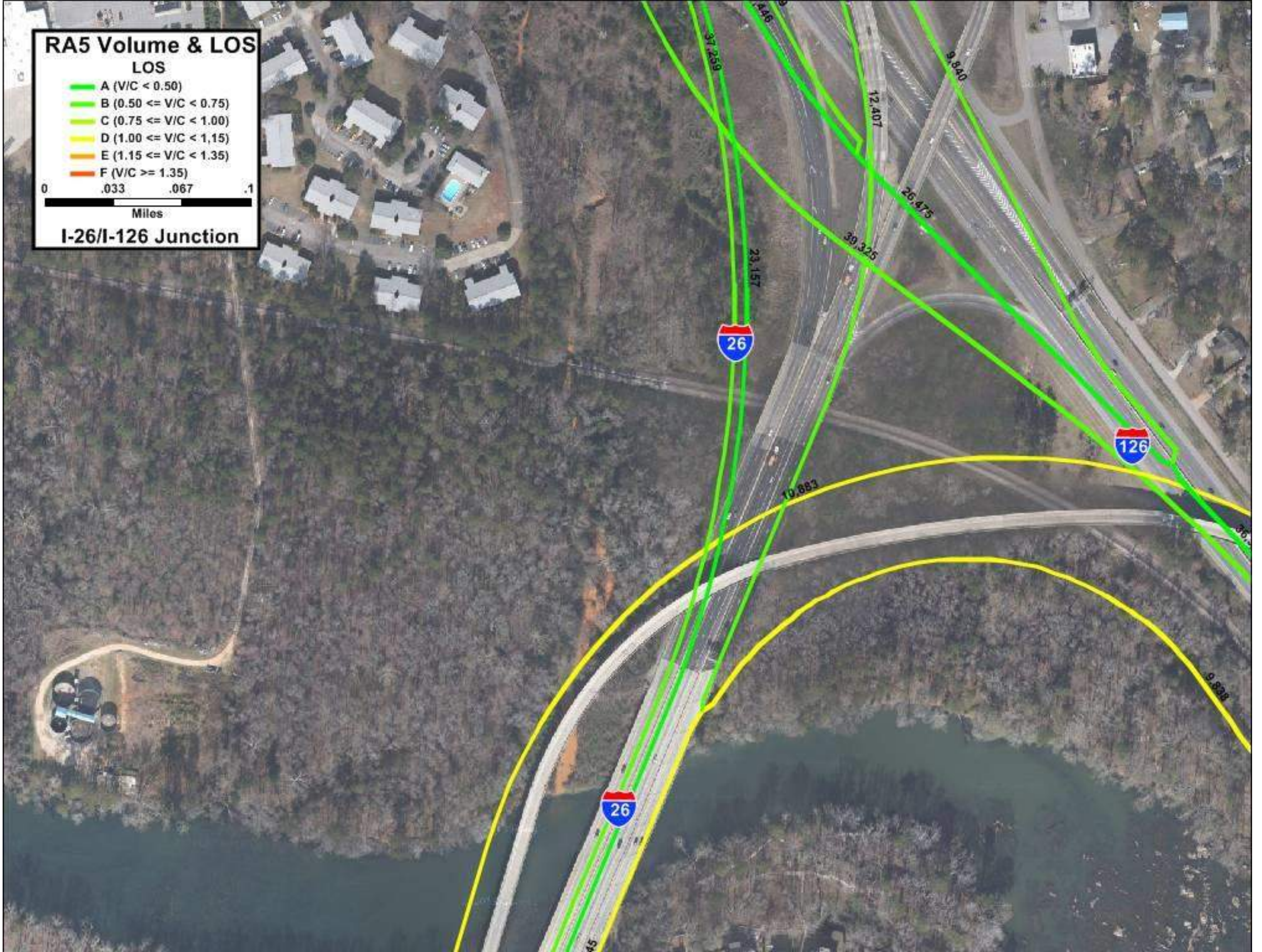
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 107
26
Browning Rd
20
10,067
26,800
1,810
63,609
341
33,437
17,032
16,480
1,770
3,443
9,262
4,022
11,538
9,768
1,563
12,085
15,528
9,726
8,952
31,874
20,491
2,310
2,041
44,603
32,682
0
1,927
6,643
30,928
6,332



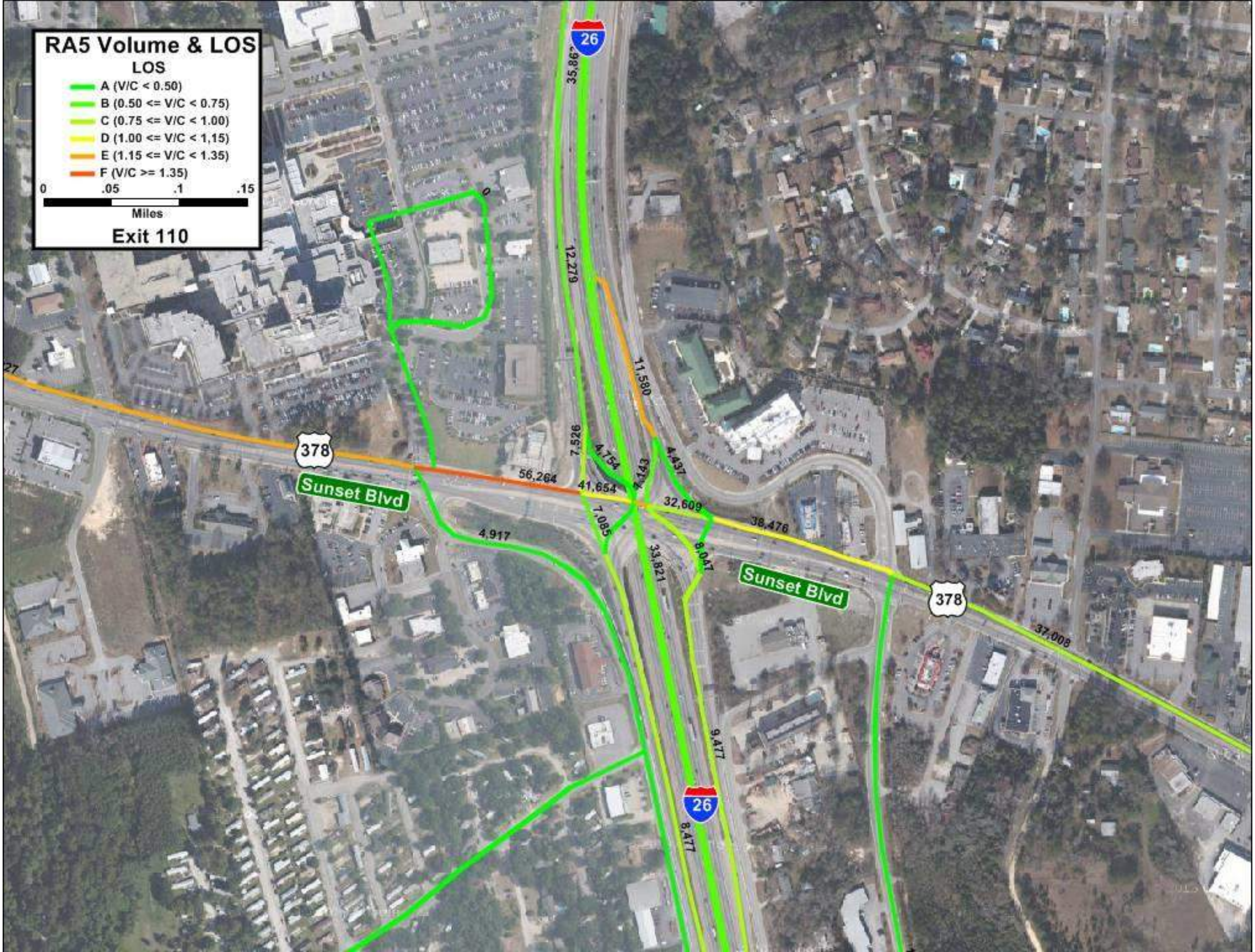
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.025
.05
.075
Miles
Exit 107-108
4,022
44,603
2,041
0
2,310
32,682
5,465
30,928
26
Browning Rd
6,643
6,332
26
9,726
19,147
19,347
21,774
Bush River Rd



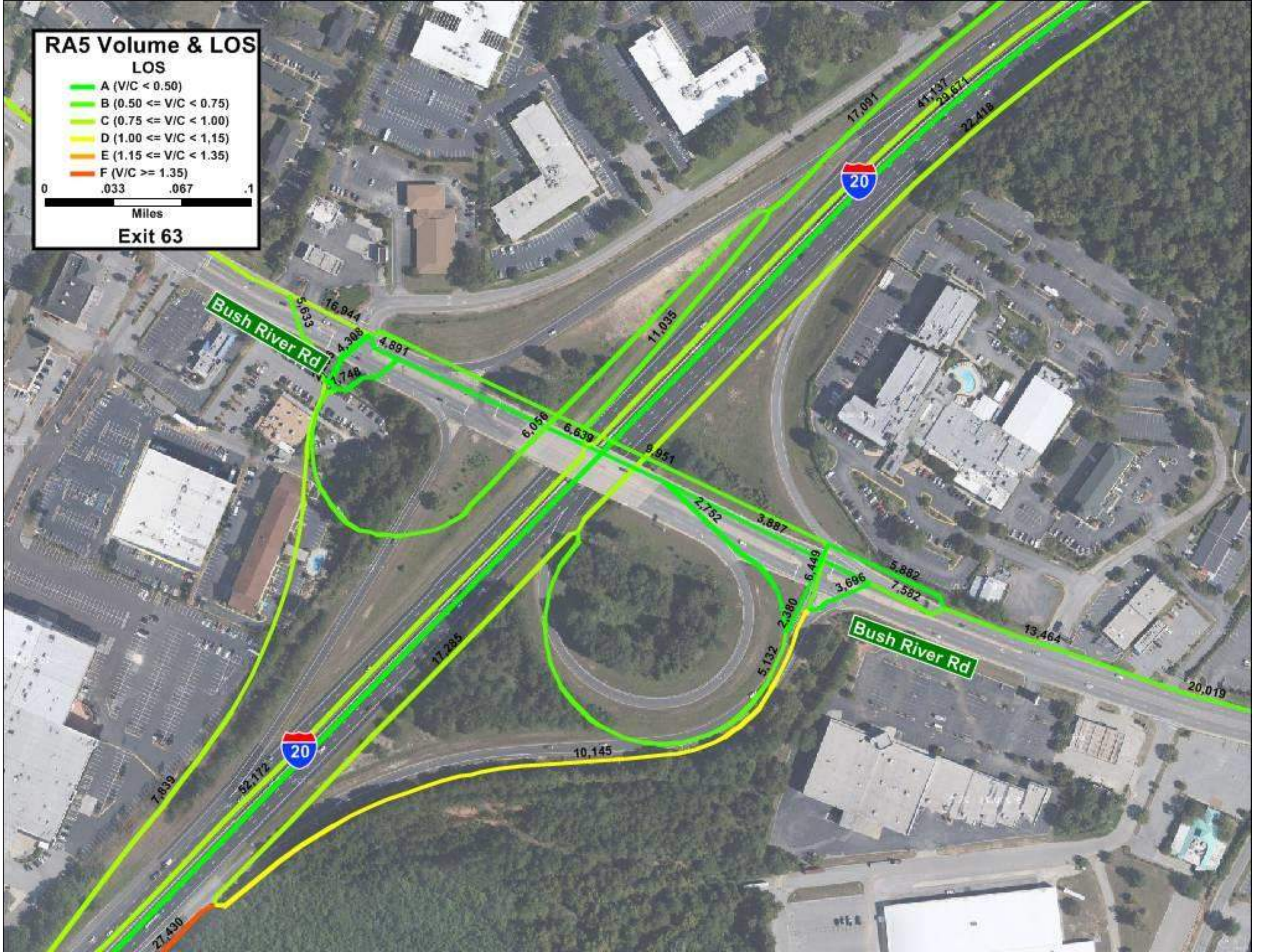
32,682
6,332
6,643
26
17,550
9,726
Burnette Dr
19,147
19,347
Bush River Rd
Morninghill Dr
9,075
14,603
21,774
20,581
0
Bush Riv
5,029
4,697
7,710
23,157
21,446
39,325
37,259
12,407
9,840
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 108A

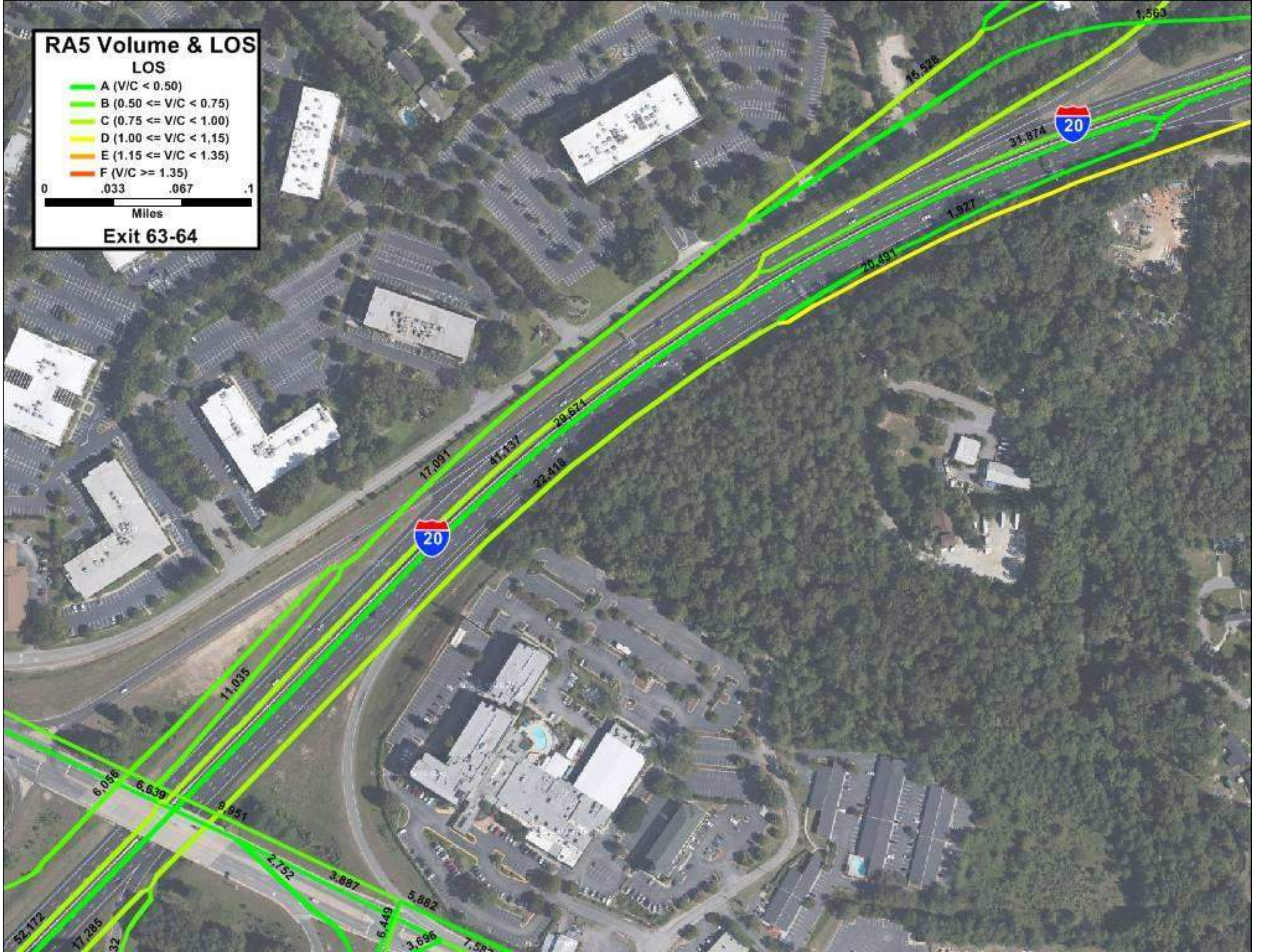

RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
I-26/I-126 Junction
37,259
12,407
9,840
26,475
39,325
23,157
19,883
9,838
26
126

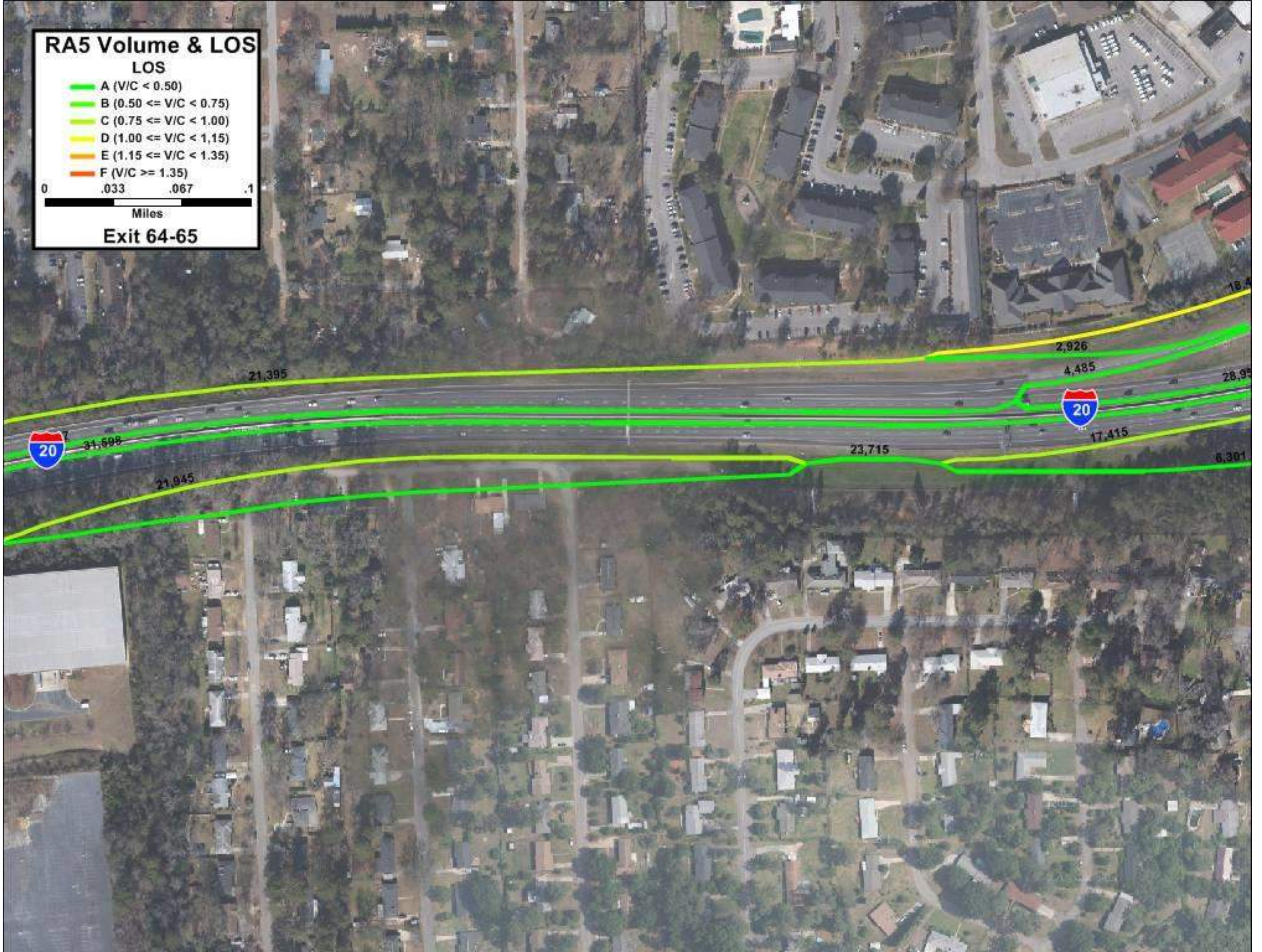
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .05 .1 .15
Miles
Exit 108-110
12,279
26
45,401
26
35,86
0

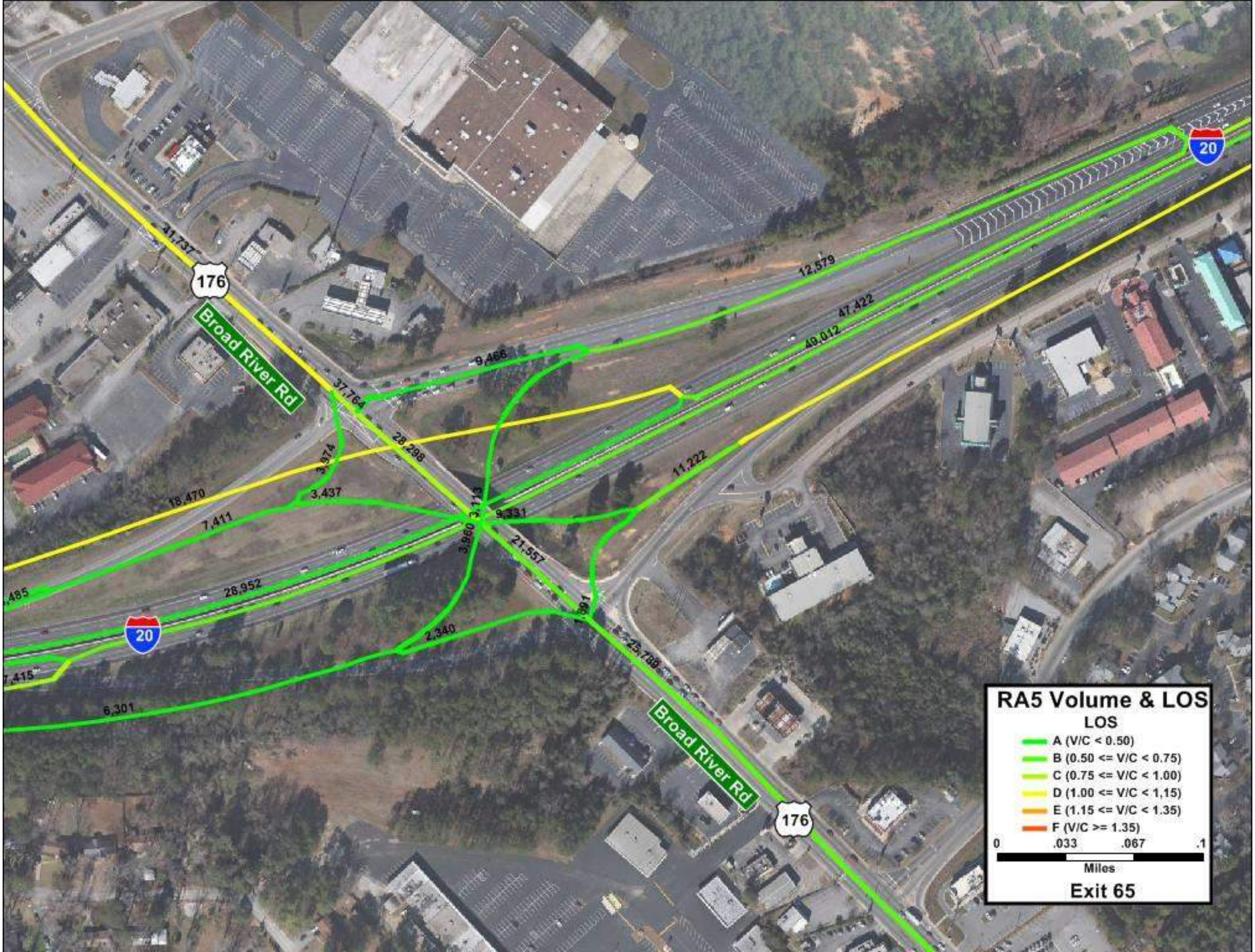


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .05 .1 .15
Miles
Exit 110
26
378
Sunset Blvd
56,264
41,654
32,609
38,476
37,008
12,279
11,580
7,526
4,754
7,143
4,437
7,085
4,917
33,821
8,047
9,477
8,477
0


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 63
Bush River Rd
Bush River Rd
20
20
17,091
41,137
29,671
22,418
5,633
16,944
4,308
4,891
1,748
11,035
6,056
6,639
9,951
2,752
3,887
6,449
3,696
5,882
7,582
2,380
13,464
20,019
5,132
17,285
10,145
52,172
7,639
27,430

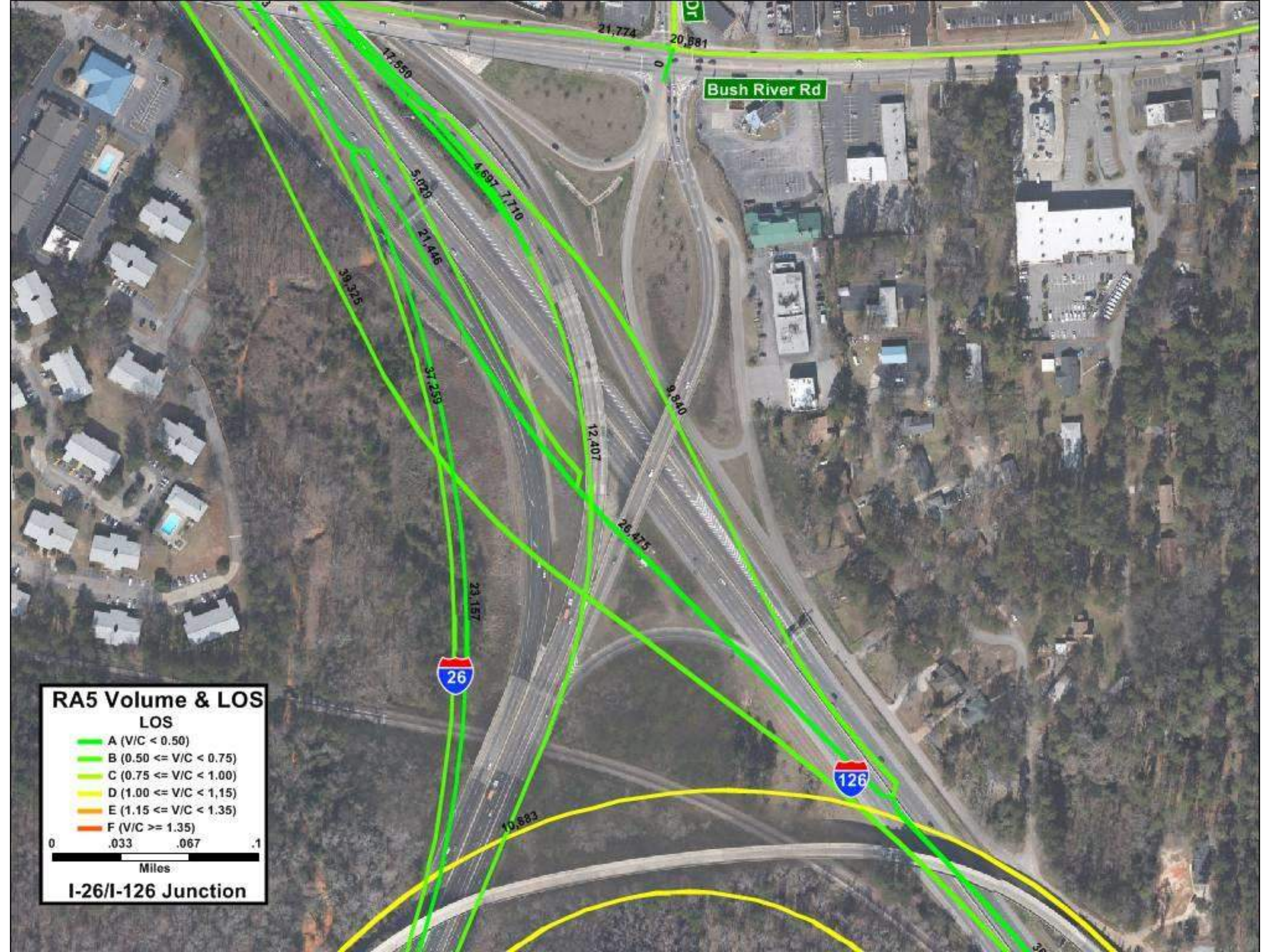

RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0 .033 .067 .1
Miles
Exit 63-64
20
20
20
1,563
15,526
31,874
1,927
20,491
29,674
41,137
17,091
22,418
11,035
6,056
6,639
9,951
2,752
3,887
5,882
6,449
3,696
52,172
17,285


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 64-65
21,395
2,926
4,485
20
31,598
20
17,415
23,715
6,301
21,945

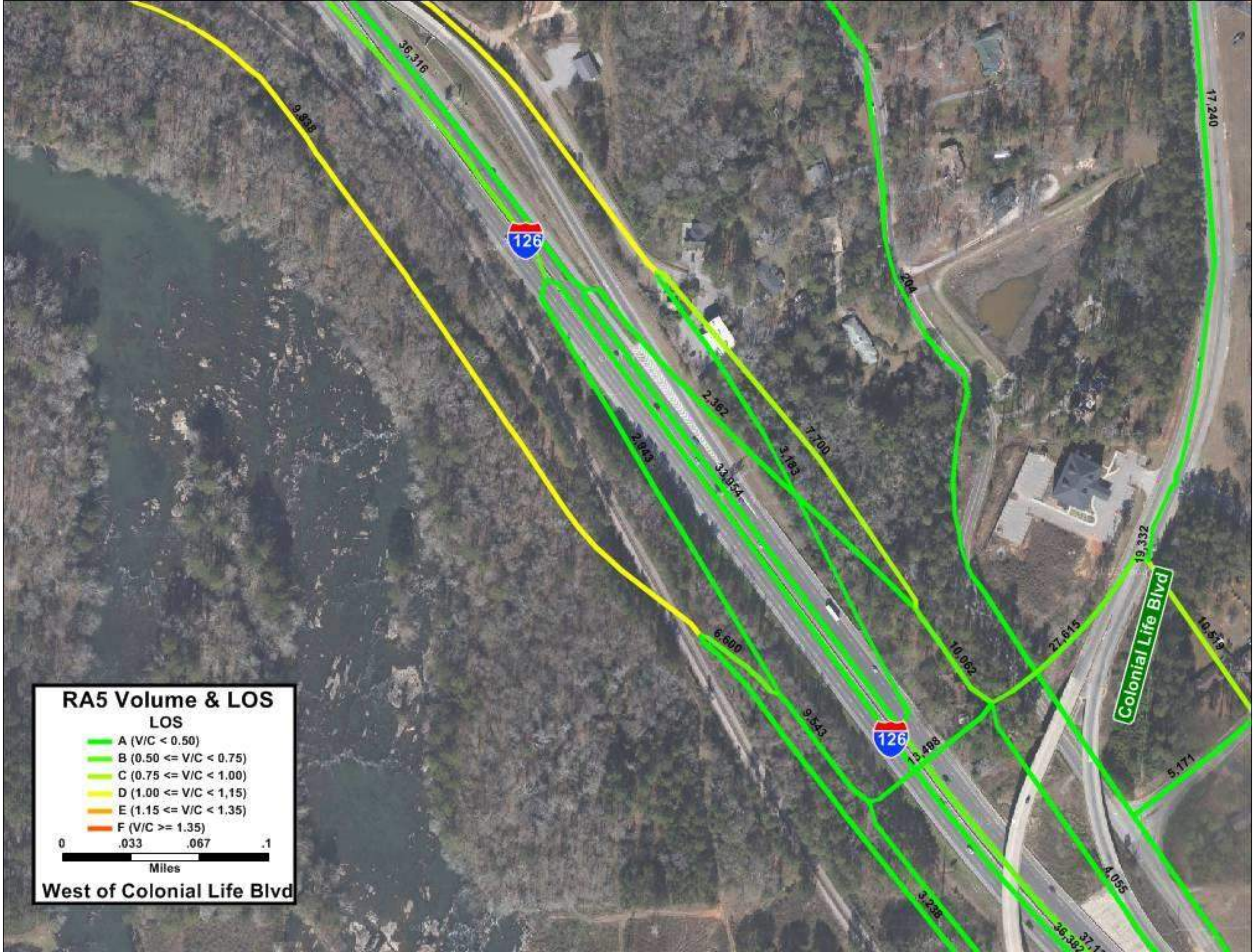


41,737
176
Broad River Rd
12,579
47,422
49,012
9,466
37,764
28,298
3,874
11,222
18,470
3,437
3,113
9,331
7,411
3,960
21,557
,485
28,952
20
1,891
2,340
25,780
7,415
6,301
Broad River Rd
176
20
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Exit 65

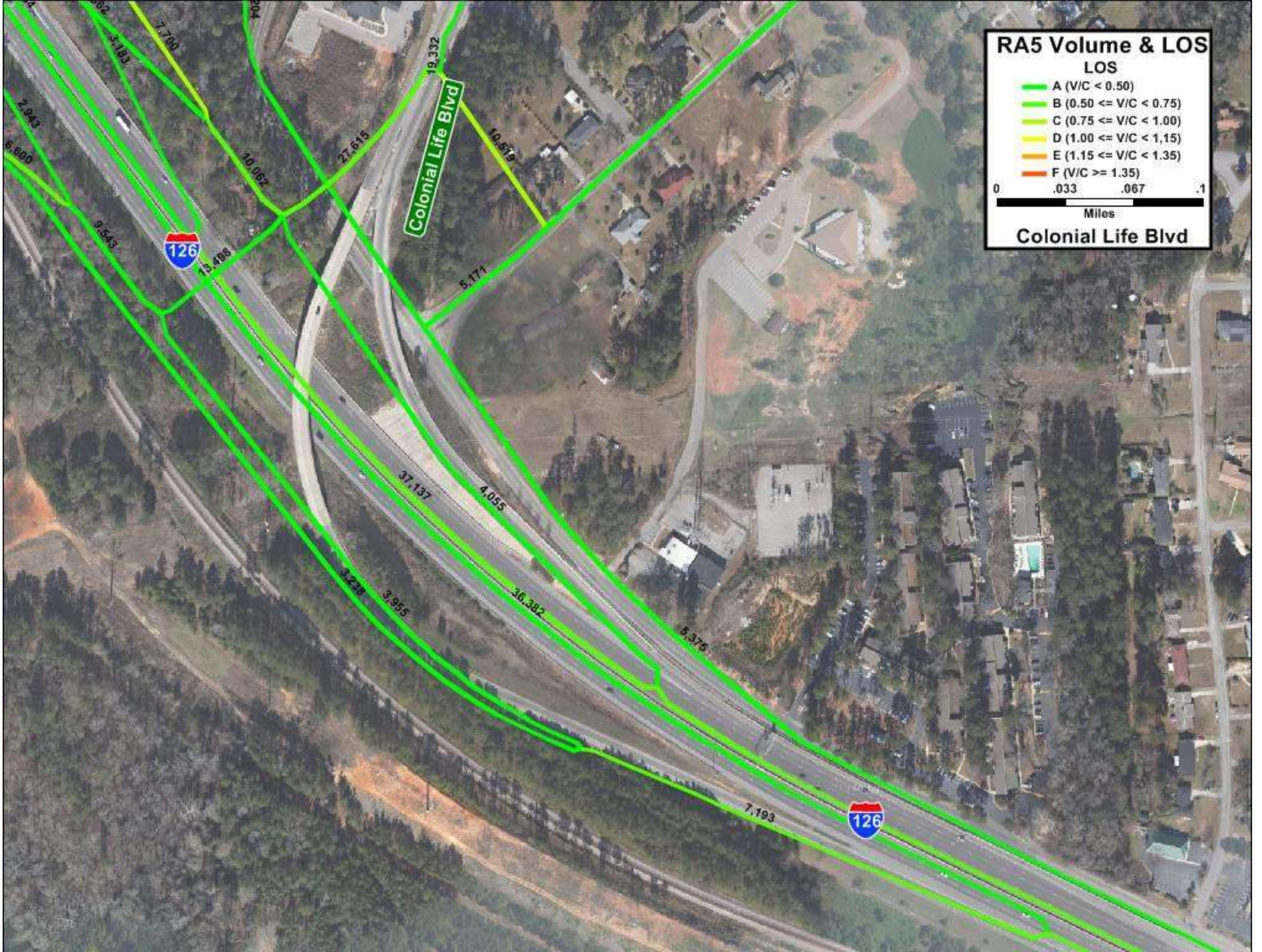

60,001
20
60,234
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
East of Exit 65



21,774
20,881
0
Bush River Rd
17,550
5,020
4,697
7,710
21,446
39,325
37,259
9,840
12,407
26,475
23,157
26
126
10,883
RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
I-26/I-126 Junction



RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
West of Colonial Life Blvd
Colonial Life Blvd
126
126
36,316
9,838
17,240
204
2,362
7,700
3,183
2,943
33,954
19,332
10,519
27,615
10,062
6,600
9,543
13,498
5,171
4,055
3,238
36,382


RA5 Volume & LOS
LOS
A (V/C < 0.50)
B (0.50 <= V/C < 0.75)
C (0.75 <= V/C < 1.00)
D (1.00 <= V/C < 1,15)
E (1.15 <= V/C < 1.35)
F (V/C >= 1.35)
0
.033
.067
.1
Miles
Colonial Life Blvd
Colonial Life Blvd
126
126
19,332
27,615
10,062
10,519
5,171
15,498
9,543
2,943
3,183
7,700
6,600
37,137
4,055
36,382
5,375
3,238
3,955
7,193

Appendix K— Draft I-20/I-26/I-77 Traffic Microsimulation Model Calibration Report

DRAFT Traffic Microsimulation Model Calibration Report

I-20/I-26/I-77 Corridor Management Plan Study

Draft - June 16, 2016

Table of Contents

EXECUTIVE SUMMARY I

1.0 INTRODUCTION 1

2.0 DATA DEVELOPMENT 2
2.1 NETWORK COMPONENTS 2
2.2 TRAFFIC SIGNAL TIMING PLANS 5
2.3 TRAFFIC COUNTS 6
2.4 TRIP TABLES 7
2.4.1 SCSWM Subarea Network and Trip Matrices 8
2.4.2 Origin Destination Matrix Estimation 8
2.5 MODEL PARAMETERS 10

3.0 MODEL CALIBRATION 12
3.1 TESTING AND CALIBRATION 12
3.1.1 Initial Model Runs and Error Checking 13
3.1.2 General Calibration Issues 13
3.1.3 Location Specific Concerns 16
3.2 CALIBRATION STATISTICS 21
3.3 CALIBRATION CRITERIA .... **ERROR! BOOKMARK NOT DEFINED.**
3.4 CORRIDOR ANALYSIS 23

LIST OF TABLES

Table 1. Trip Table Totals 10
Table 2. Vehicle Fleet Mix per Trip Table 11
Table 3. Traffic Flow Calibration Statistics 23
Table 4. Interstate and Freeway Segments within 15% of Observed Travel Speeds 23
Table 5. I-26 Eastbound Volume Comparison 24
Table 6. I-26 Westbound Volume Comparison 26
Table 7. I-26 Ramp Volume Comparison 28
Table 8. I-26 Segment Speed Comparison 33
Table 9. I-20 Eastbound Volume Comparison 36
Table 10. I-20 Westbound Volume Comparison 38
Table 11. I-20 Ramp Volume Comparison 40
Table 12. I-20 Segment Speed Comparison 45
Table 13. I-77 Northbound Volume Comparison 47
Table 14. I-77 Southbound Volume Comparison 49
Table 15. I-77 Ramp Volume Comparison 51
Table 16. I-77 Segment Speed Comparison 56
Table 17. I-126 / SC-277 Eastbound Volume Comparison 59
Table 18. I-126 / SC-277 Westbound Volume Comparison 61
Table 19. I-126 / SC-277 Ramp Volume Comparison 63
Table 20. I-126 / SC-277 Segment Speed Comparison 68

LIST OF FIGURES

Figure 1. Network Components 3
Figure 2. Signal Timing Plan 5
Figure 3. Count Locations 6
Figure 4. Broad River Road at I-20 18
Figure 5. I-26/I-126 Merge Approaching the I-20 Interchange 20
Figure 6. I-26 Eastbound Volume Comparison: AM Peak Hour 25
Figure 7. I-26 Eastbound Volume Comparison: PM Peak Hour 25
Figure 8. I-26 Westbound Volume Comparison: AM Peak Hour 26
Figure 9. I-26 Westbound Volume Comparison: PM Peak Hour 27
Figure 10. I-26 Eastbound Ramp Volumes: AM Peak Hour 29
Figure 11. I-26 Eastbound Ramp Volumes: PM Peak Hour 30
Figure 12. I-26 Westbound Ramp Volumes: AM Peak Hour 31
Figure 13. I-26 Westbound Ramp Volumes: PM Peak Hour 32
Figure 14. I-26 Eastbound Speeds: AM Peak Hour 34
Figure 15. I-26 Eastbound Speeds: PM Peak Hour 34
Figure 16. I-26 Westbound Speeds: AM Peak Hour 35
Figure 17. I-26 Westbound Speeds: PM Peak Hour 35
Figure 18. I-20 Eastbound Volume Comparison: AM Peak Hour 37
Figure 19. I-20 Eastbound Volume Comparison: PM Peak Hour 37
Figure 20. I-20 Westbound Volume Comparison: AM Peak Hour 39
Figure 21. I-20 Westbound Volume Comparison: PM Peak Hour 39
Figure 22. I-20 Eastbound Ramp Volumes: AM Peak Hour 41
Figure 23. I-20 Eastbound Ramp Volumes: PM Peak Hour 42
Figure 24. I-20 Westbound Ramp Volumes: AM Peak Hour 43
Figure 25. I-20 Westbound Ramp Volumes: PM Peak Hour 44
Figure 26. I-20 Eastbound Speeds: AM Peak Hour 45
Figure 27. I-20 Eastbound Speeds: PM Peak Hour 46
Figure 28. I-20 Westbound Speeds: AM Peak Hour 46
Figure 29. I-20 Westbound Speeds: PM Peak Hour 47
Figure 30. I-77 Northbound Volume Comparison: AM Peak Hour 48
Figure 31. I-77 Northbound Volume Comparison: PM Peak Hour 48
Figure 32. I-77 Southbound Volume Comparison: AM Peak Hour 50
Figure 33. I-77 Southbound Volume Comparison: PM Peak Hour 50
Figure 34. I-77 Northbound Ramp Volumes: AM Peak Hour 52
Figure 35. I-77 Northbound Ramp Volumes: PM Peak Hour 53
Figure 36. Southbound Ramp Volumes: AM Peak Hour 54
Figure 37. Southbound Ramp Volumes: PM Peak Hour 55
Figure 38. I-77 Northbound Speeds: AM Peak Hour 57
Figure 39. I-77 Northbound Speeds: PM Peak Hour 57
Figure 40. I-77 Southbound Speeds: AM Peak Hour 58
Figure 41. I-77 Southbound Speeds: PM Peak Hour 58
Figure 42. I-126 / SC-277 Eastbound Volume Comparison: AM Peak Hour 60
Figure 43. I-126 / SC-277 Eastbound Volume Comparison: PM Peak Hour 60

Figure 44. I-126 / SC-277 Westbound Volume Comparison: AM Peak Hour 62
Figure 45. I-126 / SC-277 Westbound Volume Comparison: PM Peak Hour 62
Figure 46. I-126 / SC-277 Eastbound Ramp Volumes: AM Peak Hour 64
Figure 47. I-126 / SC-277 Eastbound Ramp Volumes: PM Peak Hour 65
Figure 48. I-126 / SC-277 Westbound Ramp Volumes: AM Peak Hour 66
Figure 49. I-126 / SC-277 Westbound Ramp Volumes: PM Peak Hour 67
Figure 50. I-126 / SC-277 Eastbound Speeds: AM Peak Hour 68
Figure 51. I-126 / SC-277 Eastbound Speeds: PM Peak Hour 69
Figure 52. I-126 / SC-277 Westbound Speeds: AM Peak Hour 69
Figure 53. I-126 / SC-277 Westbound Speeds: PM Peak Hour 70

LIST OF APPENDICES

APPENDIX A EXISTING CONGESTION OBSERVATIONS ....ERROR! BOOKMARK NOT DEFINED.

Executive Summary

A traffic microsimulation model has been developed for use in the I-20/26/77 Corridor Management Plan study to help identify and evaluate congestion management and capacity improvement strategies for the interstate and freeway system in Columbia, South Carolina region. General facts regarding the model include:

- The model is developed and runs in version 4 of the TransModeler simulation software, developed by the Caliper Corporation, which provided the initial network.

- The model includes approximately 110 miles of interstate and freeway, including six system interchanges and 43 service interchanges with the surface street network. The model includes approximately 70 miles of highway, arterial, and local streets.

- The existing 2015 base year model and 2040 future year model includes separate AM peak hour (7:15 AM to 8:15 AM) and PM peak hour (4:45 PM to 5:45 PM) analysis periods. Thirty minute "preload" periods are simulated before the analysis periods.

- The model incorporates approximately130 traffic signals, with signal timing plans provided by SCDOT.

- Almost 300 traffic counts, including directional and turning movement counts, were used to estimate, calibrate, and validate the model in both the AM and PM peak periods.

- The initial AM and PM seed tables used to develop the existing and future year trip tables for autos and trucks were provided from a subarea analysis of the South Carolina Statewide Model (SCSWM). The subarea's network and matrices correspond directly with the simulation model network and trip tables.

- The trip tables include 170 external nodes and 65 centroids for a total of 235 unique entry and exits points in the matrix. The final existing year peak hour AM matrices include over 112,000 auto and 5,200 truck trips. The final existing year peak hour PM matrices include over 123,000 auto and 4,200 truck trips.

The calibration process of the model entailed identifying issues, making the appropriate adjustments and corrections, and ultimately validating the model's traffic flows and travel speeds, along with other traffic conditions such as bottlenecks and queues, to observed count and speed data. Many of the issues identified during calibration were resolved through a process of trial and error of various techniques and adjustments. Some of the issues identified and adjustments made included:

- Corrections and redevelopment of the seed matrices from the SCSWM planning model which originally contained higher than actual peak period trip levels.

- Network adjustments to reflect how lane queues are informally formed and operated at exit ramps during peak period congestion, and changes to driver behavior regarding stopped gaps and stop times.

- Adjustments to TransModeler's critical distance parameters affecting lane changing behavior.

- The representation of local streets and driveways serving as traffic entry and exits points with stubs and centroid connectors.

- The incorporation of a defined 30-minute preload period to ensure that sufficient levels of traffic congestion existed on the network at the start of the model's analysis periods.

Several areas of the model required additional focus to resolve identified calibration issues related to travel speed and congestion.

- The Elmwood Avenue Corridor through the Columbia Central Business District (CBD) experienced gridlock conditions due to high volumes of local downtown cross traffic, which was blocking traffic from and to the interstate and freeway system from the larger network. A portion of these local trips, with both trip ends within the corridor, were removed from the trip tables so that operations along the corridor resembled field observations and interstate traffic flowed to and from the CBD appropriately.

- Left-turning traffic on Broad River Road in the vicinity of I-20 was creating significant queues at the two intersections north of the interstate ramps, resulting in gridlock backups on the interstate. An additional centroid was added to this area to help better distribute local traffic from Broad River Road, which has many commercial driveways and local streets in this section.

- Travel speeds and bottleneck conditions on the segment between the interchanges of I-26 and I-126 and I-26 and I-20, particularly in the westbound direction during the PM peak hour, were not reflecting speed data and field observations. A lack of the significant weaving was not generating the disruption to traffic flow that occurs in this section. Among other adjustments, separate matrices were created for trips arriving from I-126, with half of the trips exiting to I-20 required to use the right auxiliary ramp as directed by traffic control signs, while the other half or trips could continue in the left lanes and weave across incoming I-26 lanes to the I-20 extra ramps. This additional weaving, along with other adjustments, resulted in the traffic conditions observed in this section.

Traffic flows and travel speeds for the AM and PM peak hour models were compared to the criteria presented in Table 4 of the FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for*

Applying Traffic Microsimulation Modeling Software¸ July 2004. The models generally met those criteria. The criteria general required traffic flows and travel speeds being within fifteen percent (15%) of observed counts and speeds for at least 85% of cases. The traffic flow criteria differed slightly according to the volume of the roadway. With the exception of one volume class in the PM peak hour missing the 85% target by a single link, both model met criteria targets. Additional criteria for speed-flow conditions and bottlenecks, as determined by a visual audit of the model in operation, were met by a consensus of the model's developers and reviewers.

1.0 INTRODUCTION

This report describes the development process of a TransModeler traffic microsimulation model ("the model") for use in the I-20/26/77 Corridor Management Plan study ("the study"). The study's primary goal is to identify effective strategies for congestion relief and improved capacity on I-20, I-26, I-77, I-126, and SC-277 in metropolitan Columbia, South Carolina. The model is intended to establish baseline traffic conditions, in the form of quantifiable performance measures for both the present existing condition and the future no-build condition, in order to help identify and evaluate such strategies. The two primary phases of the model's development process are data development and model calibration. Data development encompasses the assembly and coordination of the component parts of the model itself. These components include the network and its attributes and associated files; trip tables for both autos and trucks; traffic control and signal plans; traffic counts for use in calibration; and operational parameters affecting vehicular behavior under various conditions. Model calibration is the process of refining the model's operation, primarily through the adjustment of network attributes, trip tables, and parameters to accurately match observed traffic conditions such as travel speeds and link flows using predefined criteria.

The process of model development and calibration for this project generally followed the resource guidance of FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Software*, published in July 2004, although many of calibration parameters discussed in the guidebook are estimated and incorporated by default in the TransModeler software and are adjusted as warranted during the calibration. Wisconsin DOT's calibration criteria for observable metrics, as described in the guidebook, are the source of the primary calibration criteria used to validate the model.

The report begins with a description of the development of model components and their subsequent calibration and concludes with the presentation of calibration statistics.

2.0 DATA DEVELOPMENT

A TransModeler microsimulation model is a large collection of component database and executable files that are linked through a common directory structure which can be archived to a zip file, transferred, and then reinstalled on a new computer running TransModeler software. Once installed, the model is initiated within TransModeler through a single project file, which for this model is ***Columbia.smp***. The major components of the model are the network files, traffic signal timing plans, trip tables, traffic counts, and parameter files. This section describes the development of these major components for the purposes of creating a base year model of existing conditions.

2.1 NETWORK COMPONENTS

The Caliper Corporation, developer of the TransModeler software, provided SCDOT with an initial model network for this project. This network was based on roadway network attributes previously stored in a geocoded link layer database similar to those used in traditional TransCAD travel demand model networks. The simulation network differs from a conventional link layer from a travel demand model in that the proportions of the roadway network and its lane, median and intersection configurations are shown in precise detail as to reflect the actual roadway geometry as designed. In addition to providing an accurate illustration of the network, this presentation allows for the visual observation of traffic traversing the network itself. In addition, unlike the traditional demand model networks which consist solely of database files for links and nodes, the simulation model network includes separate database files for the following:

- Links: the primary roadway between intersections (nodes) which consist of segments and lanes;
- Nodes: the intersections of links or the external endpoint of a link, in which case it serves as a source point for traffic entering and exiting the network;
- Segments: the component parts of links that distinguish unique attributes of the link at that segment, such as the number of lanes, direction, and presence of a median;
- Lanes: the individual lanes included in a segment;
- Lane Connectors: the acceptable connecting paths between corresponding lanes entering and exiting intersections and between lanes of connected segments;
- Centroids: the theoretical sources for some of the traffic entering or exiting the network if such traffic is not entering or exiting from an external node;
- Centroid Connectors: the theoretical connection points where traffic from a centroid appears and disappears on a link segment; (There may be multiple centroid connectors for a single centroid.)
- Sensors: the location and dimension of vehicle sensors on the network, typically occurring at intersections and related to signal operation, but also capable of recording vehicle data as needed.

Figure 1 provides an illustration of the simulation network's various components. In addition to the depictions of links, lanes and intersections (nodes), the illustration shows the gray lane connectors traversing the intersections and connecting lanes in link segments. The light blue boxes indicate the location of vehicle sensors tied to the traffic signal. Centroids and centroid connectors are depicted in red and the ID number represents the corresponding record in the trip tables. Trip table records also correspond to external nodes, which are also identified by an ID number.

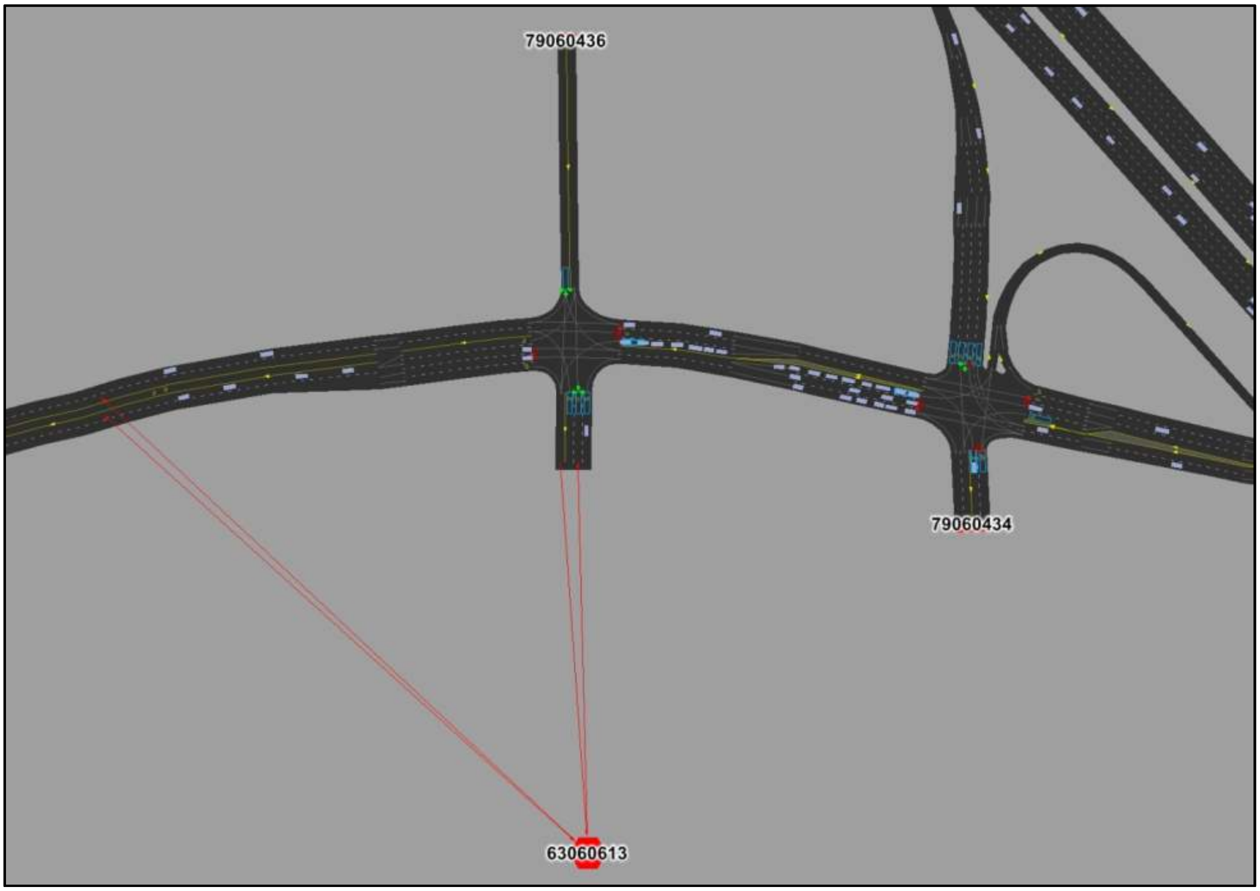


Figure 1. Network Components

The initial network from Caliper originally included more than 110 miles of interstate and expressway surrounding and bisecting the Columbia metropolitan area, including six system interchanges and 43 service interchanges. In addition to I-20, I-26, I-77, I-126, and SC-277, the network also included approximately 70 miles of surface streets, including connecting portions of five major arterial routes:

1. Broad River Road (US 176),from exit 97 of I-26 to I-126 via its intersection with Greystone Boulevard;
2. Bush River Road from exit 63 of I-20 to its intersection with Broad River Road;
3. Sunset Boulevard (US 378), from exit 61 of I-20 to exit 110 of I-26;
4. Elmwood Avenue and Bull Street, from I-126 to SC-277; and,

data development

5. Two Notch Road (US 1) from exit 74 of I-20 to exit 17 of I-77.

Segments of the surface arterials connected with interstate and freeway service interchanges, as well as the local legs of the most adjacent surface intersections were also included.

With a goal of keeping the emphasis of the model on the freeway system, SCDOT staff identified approximately 40 miles of surface network as superfluous to this project and eligible for deletion. The network links identified for removal include local road stubs attached to surface arterials, frontage roads, and some downtown streets. Other stub links were shortened or disconnected from one another, effectively becoming stubs. The stub links that remain in the network serve as the entry points for traffic entering and exiting the system, along with supplemental centroids and centroid connectors that load traffic from multiple local surface streets not adjacent to interstate and freeway ramps.

Caliper produced the initial network from a transformation of a conventional line and node layer network with limited editing. While most of the network attributes such as geographic location, lane configuration and connectivity were correct, given the size and complexity of the network, many details of the network required refinement and correction. Using underlying aerial imagery as a guide, the network was edited and refined to reflect the actual geometries and attributes of the network as accurately as possible. Network editing was continuous through the model development and calibration process. Initial editing began upon receipt of the model files and in conjunction with network revisions incorporating SCDOT's red-line edits of the extended surface network.

The network was further refined to ensure compatibility with the SCSWM's subarea network, particularly the location of external nodes and centroid connectors. The geometry and lane configuration of intersections were again reviewed and refined during the installation of traffic signal timing plans and again as directional and turn movement counts were appended to the network. As trip tables were introduced and the model simulations started, unusual traffic congestion patterns, particularly at individual intersections, revealed additional network errors and areas needing refinement. Reviews of the completed model by the larger model team identified additional corrections, including the incorporation of additional centroids or external nodes to properly accommodate traffic at local legs of ancillary intersections.

The bulk of network edits, corrections and revisions involved the position and length of lanes and the application of lane connectors at intersections and between link segments. Common corrections and edits included:

- The creation or revision of turn lane pockets at intersections, particularly in regard to free right turn islands and the length and starting point of turn lanes;
- The actual length of individual lane queue storage, particularly on exit ramps where vehicle queues extend into the median or beyond the designated lane stripes;
- The correct configuration of lane connectors through an intersection, both at the upstream and downstream locations, particularly for left turns and shared through and turn lanes;
- The configuration and location of lane connectors on lane origins and lane drops on interstates and freeways;
- The exact curvature and shape of irregularly shaped intersections and their individual approaches.

- The placement of stop bars, yield signs and sensors at intersections;
- The placement of centroid and centroid connectors to correspond with the South Carolina Statewide Travel Demand Model (planning model).

2.2 TRAFFIC SIGNAL TIMING PLANS

SCDOT provided timing plans for approximately 130 traffic signals located within the model network. These plans were input into the model using TransModeler's Intersection Toolbox, and are maintained within an intersection control plan file. In locations where timing plans vary between the AM and PM peak hours, both plans are included and used, respectively. While most signals operate independently, coordinated timing plans were included for the Elmwood Avenue, Bush River Road, and Two Notch Road corridors. While a few signals are pre-timed, most signal feature some degree of traffic actuation, in connection with the vehicle sensors embed in each lane connected to the intersection. Figure 3 presents an example of a timing plan as presented in TransModeler's Intersection Toolbox.

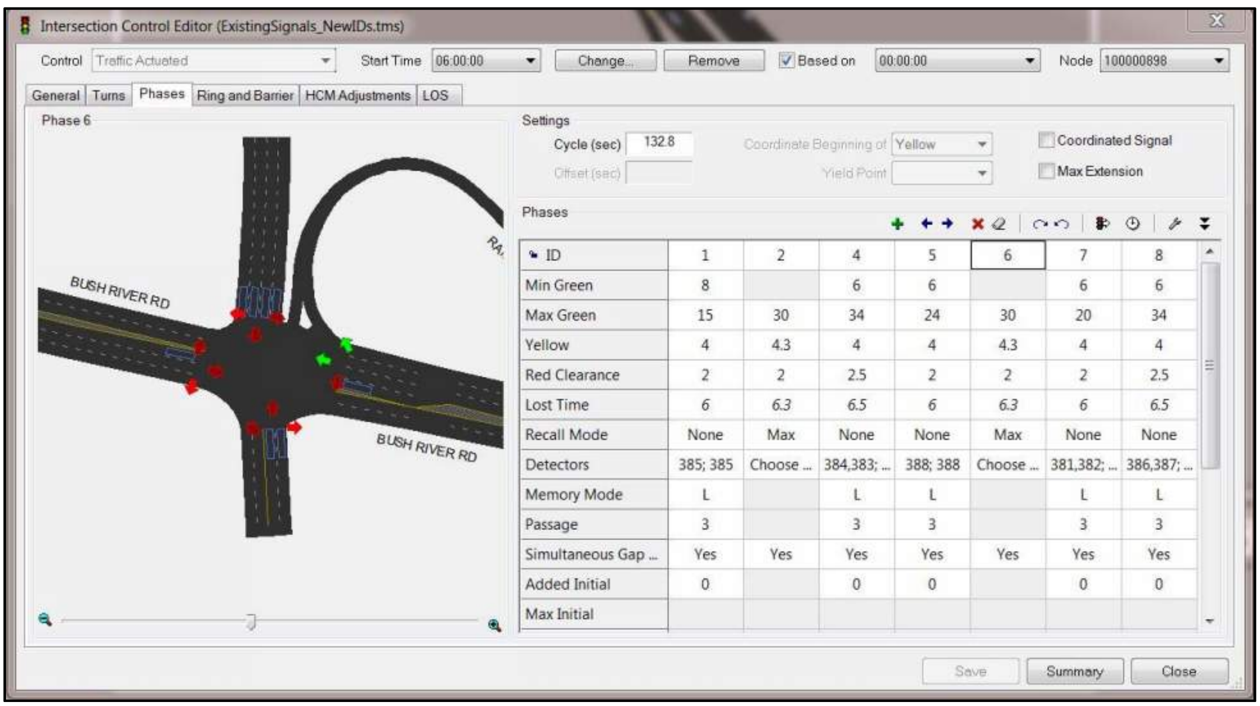


Figure 2. Signal Timing Plan

As previously stated the processing and testing of signal timing plans offered an additional opportunity to review the geometry of the intersection and its approaches against underlying aerial imagery. This included verification of the placement of lane connectors, signal detectors, stop bars, and yield signs. Unsignalized intersections are also included in the intersection control file and these intersections were also reviewed to ensure all traffic controls such as stop bars and yield signs are correctly entered.

2.3 TRAFFIC COUNTS

For the purposes of model calibration and validation, traffic counts were collected from several sources:

- Peak Period Turn Movement Counts (TMCS):
  - o 168 locations collected for this project in May, 2015;
  - o 32 locations provided by SCDOT, collected in April, 2015;
- 48-Hour Ramp Tube Counts:
  - o 63 location collected for this project in May, 2015;
  - o 12 locations collected for the Carolina Crossroads project in April 2015;
- 48-Hour Mainline Interstate and Freeway Counts:
  - o 8 locations collected for this project in May, 2015;
  - o 9 locations collected by SCDOT from Automatic Traffic Recorders (ATR), recorded in May, 2015.

Figure 3 provides the location of the counts recorded in the model's link database and in the turn movement files.

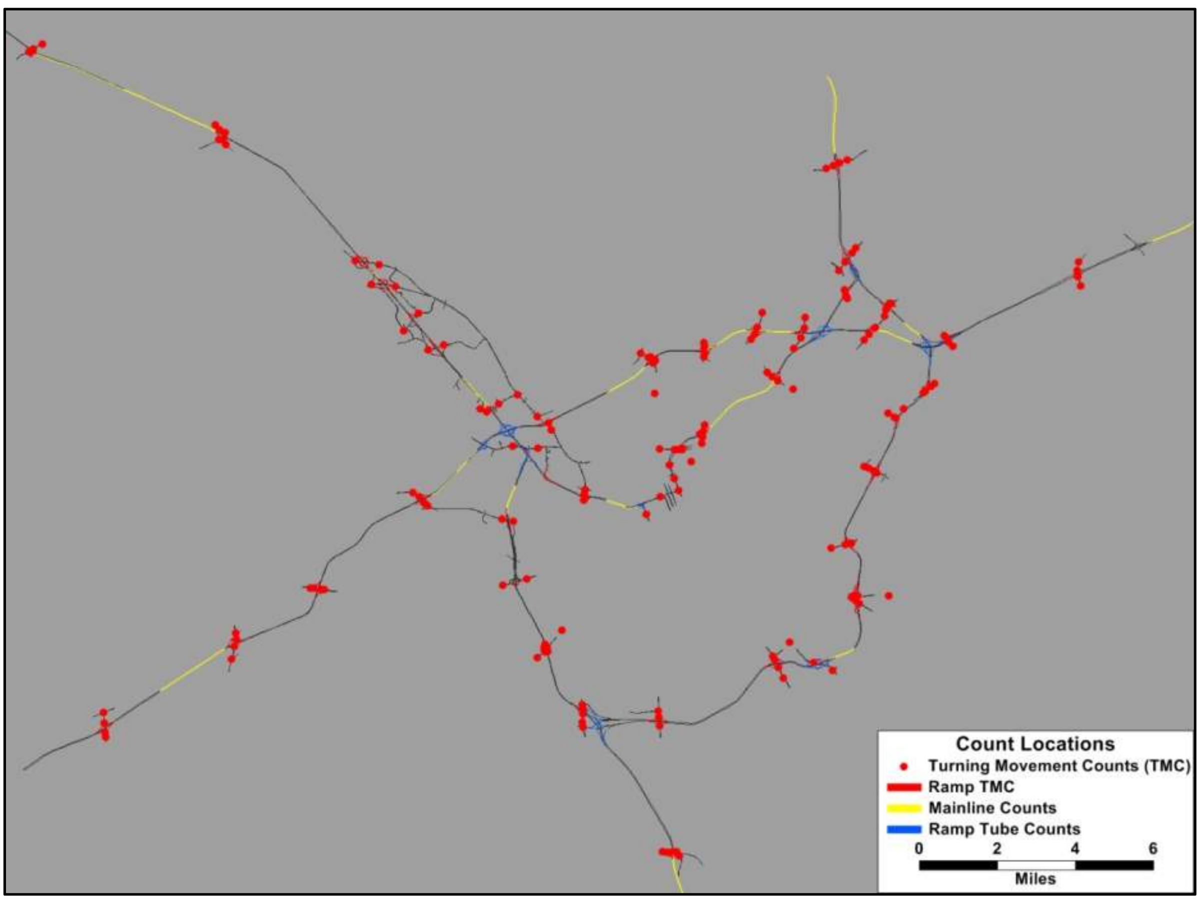


Figure 3. Count Locations

With the exception of the mainline ATR counts, all counts were recorded in 15 minute increments and covered the complete AM (6:00 AM to 9:00 AM) and PM (3:00 PM to 7:00 PM) peak periods established in the SCSWM. Fifteen minute increments from the mainline counts were analyzed to determine four time parameters used in the development of the model:

1. The consecutive 60 minute increment with the highest trips per peak hour:
    a. AM peak hour: 7:15 AM to 8:15 AM;
    b. PM peak hour: 4:45 PM to 5:45 PM;

2. The percentage of peak period trips occurring within the peak hour:
    a. AM peak hour: 43% out of the 3 hour AM peak period (6:00 AM to 9:00 AM);
    b. PM peak hour: 30% out of the 4 hour PM peak period (3:00 PM to 7:00 PM);

3. The distribution of the traffic peak within the peak hour, per four consecutive 15 minute increments:
    a. AM peak hour: 24%, 25%, 26%, 23%;
    b. PM peak hour: 25%, 27%, 26%, 22%;

4. The percentage of trips occurring in the 30 minute preload period, as compared to the peak hour total, per two consecutive15 minute increments:
    a. AM preload period: 17%, 20%;
    b. PM preload period: 21%, 26%.

AM and PM peak hour TMC's are stored in AM and PM turn movement files which can be queried using TransModeler's intersection toolbox. Mainline and ramp tube counts are appended to the model network's link database on a directional basis. Separate counts are included for all traffic and for trucks, where truck counts were available. Using a procedure in TransModeler, the total counts of all turn movements were aggregated to their respective approach link. For interstate and freeway ramps without tube counts, these aggregated counts were also appended to the model network's link database.

As previously stated, as turning movement counts were entered at each intersection, the geometry of the intersection as well as the intersection's approaches were reviewed again against underlying aerial imagery. Similarly, the geometry of ramps was also reviewed as counts are entered.

2.4 TRIP TABLES

The simulation model contains several trip tables, also referred to as trip matrices. Trip tables exist for each AM and PM scenario, with a row and column for each external node and centroid in the network. Each cell in the trip tables contains the total number of vehicles traveling along the network between that particular pair of external nodes or centroids. The trip tables all share the same dimensions, with 235 rows and columns, represented in the network by 170 external nodes and 65 centroids. Trucks and autos each have separate trip tables with their own fleet characteristics and separate trip tables exist for the 30 minute preload periods and the 60 minute peak hour analysis periods.

2.4.1 SCSWM Subarea Network and Trip Matrices

The simulation model trip tables were developed from subarea trip matrices output from the SCSWM planning model. The row and column ID's from the subarea trip matrices correlate exactly with the row and column ID's in the simulation model trip tables. The subarea trip matrices represent the select geographic area of the larger SCSWM network that corresponds to the simulation model network, with the similar location of external nodes and centroids in both networks.

The process of coordinating the simulation network with the subarea network from the planning network involved several steps. The first step was development of the simulation network sub area within the larger SCSWM network. The subarea network must encompass enough area and link connectivity for the SCSWM to properly distribute and assign trips while also reflecting the desired limits of the simulation model network. Further, the subarea network must reflect the greater detail and granularity of the simulation model network while preserving the larger flexibility of the SCSWM to distribute traffic effectively over the larger region.

The coordination of the two networks was achieved by overlaying the simulation model network over the planning network and zone structure and identifying the specific links in the planning network that corresponded with the external nodes of the simulation model. This process was relatively straightforward because both model networks contained the same corresponding links. Identifying centroid connectors within the SCSWM was more complex. It was important to ensure that all trips generated from one of the SCSWM's centroids were distributed entirely within the subarea network area. This was important to ensure that any intrazonal shifts in traffic over time are reflected in the current and future year subarea matrices. Therefore, in cases where some centroid connectors connected within the network and other connectors extended outside the network area, the latter connectors were either moved within the model area or the zone was split to more accurately correspond with the model area limits. The coordination of the two networks and trip tables and matrices was an iterative process. As the trip tables for the simulation model was tested and reviewed, new subarea networks and trip matrices were required to reflect individual areas where further network definition was needed. The final dimensions of the trip matrices are 235 x 235, with 170 external nodes and 65 centroids.

2.4.2 Origin Destination Matrix Estimation

Originally developed as a daily model, the SCSWM was adapted for this project to provide AM and PM peak period subarea trip matrices to reflect the peak directionality for both the AM and PM peak periods. These trip matrices serve as the seed tables used in the development of AM and PM peak hour trip tables for the simulation model. The seed tables are inputs along with traffic counts in TransModeler's Origin Destination Matrix Estimation (ODME) procedure. The ODME procedure is an iterative assignment process that uses algorithms to estimate the trip matrices which, when assigned to the network, most closely match the observed traffic counts recorded in the network layer.

In regard to inputs into the ODME process, traffic counts are the most influential element of the ODME process, as assignment iterations will continue until the best fit between an assigned trip matrix and observed counts is established. However, seed matrices that accurately reflect the true distribution of trips within the study area increase the likelihood of the ODME process estimating a good fit more quickly in fewer iterations.

The assignment produced from the ODME process is analogous to the assignment produced in a conventional travel demand model. It uses general assumptions regarding capacity constraints on the network to establish travel speeds and trip times, and ultimately trip paths. The ODME assignment effectively illustrates the best theoretical simulation outcome available using the trip tables estimated, assuming basic and predictable operating conditions. In fact, the implementation of more detailed traffic operational rules and behaviors during the simulation runs substantially affect traffic flows and operations, revealing which aspects of the model network and operational assumptions need to be corrected or refined.

Because the AM and PM subarea trip matrices reflect larger peak periods, the subarea matrices were factored to reflect the smaller portion of trips occurring in the peak hour before applying the ODME procedure. This adjustment helped more accurately define the magnitude of trips estimated. The factors used were calculated from comparing peak period and peak hour counts from the mainline count data. For the three hour AM peak period, the peak hour factor was 43% of total trips. For the four hour PM peak period, the factor was 30% of total trips.

Given their distinct trip patterns, truck matrices were estimated separately from autos. While the planning subarea matrices included trip matrices for both medium and heavy trucks the majority of turning movement counts did not distinguish between truck classes. Therefore the two truck classes could not be estimated separately. However, the difference between the subarea trip matrix totals for medium and heavy trucks were compared to the available classification data collected from the mainline counts and it was determined that the proportion of medium to heavy trucks was reasonable and could be preserved. Therefore, while the ODME process for medium and heavy trucks used the same count data and produced a single truck trip table, the proportion of medium trucks to heavy trucks within each cell was preserved by factoring the cells of the estimated trip table by the respective proportion of medium to heavy trucks from the subarea trip matrices to create separate trip tables for medium and heavy trucks.

The first ODME process for total traffic incorporated all available counts in the estimation, including the individual turn movements at intersections. However, the output trip tables and the associated assignments of these trips to the network fit very poorly with the mainline and ramp tube counts, which were primary and critical metrics. It appeared that the high number of turn movement counts on the surface street network effectively diluted the estimation process's ability to prioritize interstate and ramp flows. As a result, the ODME process converged at a lower threshold of accuracy as it attempted to equally incorporate all counts regardless of location or type.

In response to this result, only mainline and ramp tube counts and turn movement volumes aggregated to ramp links were used during the next iteration of the ODME process. Individual turn movements were not included in the process. With fewer constraints and a priority given to matching interstate and ramp counts, the resulting ODME assignment significantly improved the fit on the mainline interstate and freeway system, closely matching their respective counts. However with few counts included on the surface network, the fit of the ODME assignment on the surface street network needed improvement in many location. Therefore an iterative process was used in which a small number of surface links with the worst fit between counts and ODME assignment were identified. At these locations, turn movement counts were aggregated to the link, and the ODME process run again, with counts at these locations included in the process.

With each iteration of this process, the overall fit between counts and ODME assignment improved. The process continued for multiple iterations of additional links until the fit between the ODME assignment and all mainline and ramp counts (including aggregated turn movement counts) met the criteria for the overall GEH statistic presented in the FHWA's *Traffic Analysis Toolbox Volume III: Guidelines*. Specifically, the percentage of links with a GEH statistic under 5 must be greater than 85 percent, and the GEH statistic for the sum of all link flows must be under 5. The GEH statistic is described in further detail in Section 3.2. Setting this threshold was intended to include enough counts in the ODME process to produce trip tables that reflect the interstate and freeway flows without overwhelming it with too many counts that could have the effect of deprioritizing the interstates and freeways. Further, it was understood that additional ODME iterations were likely to occur once the testing and calibration phase of the simulation model.

Table 1 presents the trip totals from the subarea matrices before and after factoring to peak hour, and the original and final ODME estimated trip tables used in the simulation model.

Table 1. Trip Table Totals

AM Peak Hour			
	Auto	Medium Truck	Heavy Truck
SCSWM Subarea (3-hour Period)	242,393	9,677	2,489
43% of Subarea (Peak Hour)	104,229	4,161	1,070
ODME	112,068	3,953	1,229
Final (adjusted)	112,884	3,953	1,229
PM Peak Hour			
	Auto	Medium Truck	Heavy Truck
SCSWM Subarea (4-hour Period)	381,057	12,050	3,097
30% of Subarea (Peak Hour)	114,317	3,615	929
ODME	123,539	2,993	1,250
Final (adjusted)	123,838	2,993	1,250

2.5 MODEL PARAMETERS

TransModeler includes parameters for various components and procedures occurring in the model, including aspects of the vehicle fleet, roadway characteristics, route choice, and driver behavior. TransModeler initially sets these parameters to default values that can be adjusted according to available local information. While most parameter adjustments occur during the testing and calibration and phase, the following parameter adjustments made during initial develop include:

- Vehicle fleet: TransModeler includes several vehicle classes to represent the trips simulated in the model. The distinct classes look and operate differently based on their class attributes. The model uses separate trip tables for autos, medium and heavy trucks.

Stantec

The fleet mix for the auto trip tables was therefore adjusted to reflect the absence of medium and heavy trucks in those particular tables. The default distribution of high, mid and low performance passenger cars; pickups and vans; and motorcycles was maintained, as the registration data provided by SCDOT did not distinguish between the model type or performance class of passenger vehicles. Table 2 presents the vehicle fleet mix for the trip tables.

Table 2. Vehicle Fleet Mix per Trip Table

	Trip Table		
Vehicle Class	Autos	Truck 1	Truck 2
High Performance Passenger Cars	32%		
Medium Performance Passenger Cars	36%		
Low Performance Passenger Cars	21%		
Pickups, Vans, and SUVs	10%		
Motorcycles	1%		
Single-unit Trucks		100%	
Trailer Trucks			100%

- Heavy truck appearance: TransModeler's default configuration for tractor trailers has a much longer cab section than is typical, resulting in the joint of the truck being articulated in the middle. The initial settings for the appearance heavy trailer trucks were adjusted to reflect a more standard truck configuration with the articulation in the front.
- Road Classes: As this model focuses primarily on the interstate and freeway system, an additional freeway class was added to help distinguish between segments of rural interstates, suburban interstates, and complex urban freeway segments. These classes represent not only distinct posted speeds but also distinct free flow speed parameters.

Other parameter adjustments made during the testing and calibration phase are discussed in the next section.

3.0 MODEL CALIBRATION

For the purposes of this simulation model exercise, the term model calibration is used in its most expansive sense to mean all of the adjustments and refinements that occur after all of the model components have been initially developed and assembled. It also refers to the validation of the model's calibration, as compared to specific metrics and conditions. Section 3.1 addresses the adjustments that were made to achieve a calibrated model. Sections 3.2 and 3.3 present the calibration criteria and statistics for the model.

3.1 TESTING AND CALIBRATION

Once all model data components were prepared and organized within the simulation project file, the testing and calibration process began. The calibration process is an iterative process of running the model and making adjustments and refinements to the various model components until the model meets the specified criteria for reflecting observed conditions, as measured via visual audit and quantifiable metrics. A visual audit involves watching simulations as they run in real time to verify realistic traffic operations in general and specific observed conditions, such as identified bottlenecks and queues at specific locations. Visual audits initially precede the comparison of quantifiable metrics, since it is literally the "eye test" that must be passed before quantifiable metrics are of value. However visual audits are also a formal aspect of the calibration criteria and therefore occur as part of the final model validation as well.

The process of visually inspecting the simulations as they ran initially began by determining whether the traffic loading and volume in general met reasonable expectations based on field observation notes and common sense. Upon initiation, the model begins by establishing a preload condition. During this period, traffic is loaded onto the empty network until TransModeler has determined that sufficient traffic exists to reflect the conditions at the start of the analysis period. This determination is based on an algorithm involving the duration of the model period the total traffic in the trip tables, and the size of the network. Once TransModeler determines that the preload condition has been met, the analysis period begins, with vehicles from the trip table loaded onto the network at the proportional rate established in the scenario settings. Trips for the AM and PM models were loaded at varying rates over four 15 minute increments according to the distribution determined from the analysis of traffic counts:

- AM peak hour: 24%, 25%, 26%, 23%;
- PM peak hour: 25%, 27%, 26%, 22%;

In this manner, the peak traffic demand within the peak hour could be captured in the model as traffic was loaded onto the network. However, as the distributions within the peak hours indicate, the peaking characteristics for both AM and PM peak hours were relatively flat, which should be reflected in relatively even levels of traffic conditions throughout the analysis period.

3.1.1 Initial Model Runs and Error Checking

One of the first issues to arise when initially running the model was how quickly the surface network intersections became overwhelmed during the early period of the model. Conversely, traffic on the interstates and freeways was light, primarily due to bottlenecks at intersections preventing traffic to access the interstates and freeways in significant volumes. While it was eventually determined that a post-processing issue in the SCSWM's subarea extraction process had resulted in excessive traffic volumes, a strategy was initially devised to investigate the bottlenecks that were occurring at intersections in the order that they arose, as soon as they began to appear in the simulation period. This strategy had the immediate benefit of revealing previously undetected errors in network coding and signal plans, as the excessive trip volumes quickly exacerbated and identified these problems first. As errors were detected and corrected, subsequent simulation runs would identify new hot spots as upstream bottlenecks were resolved and downstream bottlenecks resulted. Ultimately the processing issues from the SCSWM's subarea extraction were identified and corrected, and traffic volumes from subsequent trip tables decreased to the generally reasonable levels. However, the initially high traffic did prove valuable in quickly identifying network and traffic control errors.

Another source for checking errors is the warning files that are produced by TransModeler before and after model runs. These files often include warnings that are ultimately irrelevant, such as a warning for a non-standard signal plan or trip path errors for trips that do not exist in the trip table. However, the warning files also include relevant problems such as missing lane connectors or diverted trips. While most of the relevant problems are resolved early in the development process, as new edits are made, review of the warning files helps identify new problems.

3.1.2 General Calibration Issues

Once the issue with the subarea trip tables from the SCSWM had been resolved and specific network and signal errors were identified and corrected, the total traffic loadings decreased and traffic operations began to resemble reasonable expectations. Identifying and addressing issues with less readily apparent resolutions then became the focus the calibration process. During this phase, comparisons of model outputs for speeds and traffic volumes observed data became an integral aspect of the review process, in combination with visual inspection of the model simulations. Below are a summary of the general issues that were identified addressed during the calibration phase.

1. <u>Exit ramp queues</u>: At many intersection exit ramps, traffic queues extended beyond their observed or reasonable limits despite matching the traffic counts on the ramps. In many cases, this was the result of distinct differences between the official pavement markings and the actual queuing patterns at these exits. For example, at Exit 9B on southbound I-77 at Leesburg Road, the dual lane queue, identifiable by two distinct elongated pavement stains, extends at least 200 feet beyond the last lane stripe delimiter. In addition to increased storage capacity, this longer queue separation results in the more efficient sorting of left versus right-turning vehicles. A similar issue is the presence of a separate, informal right-turn queue at the end of a ramp, despite the lack of an official lane stripe delimiter. (for example, Exit 51 on westbound I-20). These distinctions between official and informal lanes may only occur during peak congestion periods, but their impact on the ultimate flow and operation of the ramp and intersection is significant. Therefore at ramp locations where traffic queues in the model exceeded observed limits,

and where indications suggested that lane queues differed from official markings, the network was edited to reflect how the queues were realistically forming.

2. Stopped gaps and times: Related to establishing proper queue lengths on ramps and surface intersections in general, two driver behavior parameters were adjusted to reflect the more compressed nature of peak hour queues and increased volume through stop controlled intersections. First, the mean distance between stopped light vehicles was reduced from 8 feet to 6 feet. The 4 foot standard deviation and the 12 foot mean stopped gap behind trucks was not adjusted. Second, the distribution of stopped time at stop controlled intersections where there is no competing traffic was adjusted on average of 0.2 seconds. These two adjustments decreased the follow up time between vehicles at intersections, thereby increasing the volume through the intersections and decreasing queue backups.

3. Critical Distance: As part of the methodology directing driver behavior, the "critical distance" parameter sets the general distribution of distance from a downstream intersection or path diversion at which point a vehicle must seek to be in the correct lane in order to maintain the correct path through that intersection or diversion. A short critical distance could cause vehicles to delay changing into the correct lane until the last moment, while a longer critical distance could find vehicles prematurely queuing in a slower lane in anticipation of turn far ahead. TransModeler maintains separate critical distance distributions for streets and freeways. In the case of this model, visual inspections of the simulation found multiple incidents of interstate and freeway traffic queuing early in order to make future ramp movements. The consequences were significant imbalances in volume and lane speed despite significant distance from exit ramps. At one location on westbound I-20, mainline traffic queuing too early for the downstream SC-277 ramp prevented vehicles entering from Two Notch Road from merging correctly. To resolve this issue, the distribution of the critical distance was decreased by roughly 750 feet, to between 500 and 2,750 feet.

   Conversely, at one location on northbound Broad River Road, the critical distance distribution was increased through the use of a local parameter so that the queue to turn left onto Bush River Road would form properly without excess conflict at the intersection from late lane changers.

4. Multiple local streets and driveways: A specific challenge of coordinating of the simulation model with the SCSWM is reflecting the distinct difference in how trips are loaded onto the two respective networks. Many of the entry and exit points in both the simulation model and the subarea network of the SCSWM are external nodes that represent endpoints of actual roads. However, other entry points are represented by centroids via centroid connectors located within internal areas of the network. Unlike external nodes, centroid connectors are theoretical entry points without physical attributes. Cars simply appear on the network at these locations. The reason for this is that as a large scale planning model, the SCSWM must aggregate the individual driveways and local roads connecting to major streets and highways. In the simulation model, centroid connectors were generally located where they occur in the SCSWM. In many cases, centroid connecters were attached to physical stubs of local roads so that they entered the network through controlled intersections. However, if the volume of traffic for the centroid in question significantly exceeded the capacity of such a local

intersection, centroid connectors were attached directly to the network but away from intersections so as not to disrupt their operation. Also, centroids often have multiple connectors. In some at intersections where commercial driveways or a low volume local street is included in the traffic signal with a higher volume street included in the network, centroid connectors were employed to distribute some traffic to those legs of the intersections. However, in a few cases where this approach proved unworkable, the networks of both the SCSWM and the simulation models had to be edited and the trip tables expanded to create new distinct external nodes. This step would require the rerunning of the SCSWM subarea extraction process and the development of new ODME trip tables.

5. Preload Period: As a part of its standard operation, TransModeler begins each simulation by "preloading" the network with trips based on volumes and trip patterns from the model's trip tables. This is done so that vehicles enter a network that reflects the real conditions occurring when the official analysis period begins. The preload period is supposed to continue until a "preload condition" has been met, signifying that the network is sufficiently congested. However, over the course of the calibration process, it was generally observed that at the start of the analysis period, traffic conditions were relatively light and that expected congested conditions did not occur until late into the analysis period. It was therefore decided to add a static 30-minute preload periods with trip tables reflecting the traffic occurring before the AM and PM peak hours. TransModeler's preload procedure still begins the simulation, but now begins before the static 30 minute preload period. The 60 minute peak hour analysis periods remain the same. The preload trip tables were proportioned from the peak hour trip tables to match the observed volumes of the two 15 minute increments occurring before each of the AM and PM peak hours.

   The introduction of the static preload periods had the desired effect of creating congestion build up similar to observed conditions. The peak of congestion now occurs towards the middle of the peak hour and is tapering towards the end of the simulation period.

6. Manual Matrix Adjustments: The intention of using the SCSWM subarea seed tables and the ODME process to develop the trip tables is to have a transparent and repeatable methodology. In comparison, manual alternations to the cells in the table, in order to supplement or reduce traffic volumes between particular points, are independent and arbitrarily estimated outside of any formal methodology governing trip generation and distribution. They should be limited because such alterations must be consistently accounted for and reflected in the future year trip tables. However, the SCSWM and the ODME process are not exact in their ability to create trip tables that produce accurate traffic flows in a microsimulation. Particularly in such a large and complex model network with so many counts and point of entry, some manual adjustments were ultimately required to achieve the critical mainline volumes on the interstates and freeways necessary to match and reflect the level of congestion recorded in counts and in field observations.

   Given the comparatively lower volume of trucks compared to passenger vehicles, no trips in the ODME truck matrices were adjusted. For the AM auto trip table a total of 25 trip pairs representing 16 entry points and 16 exit points were adjusted from the final

ODME matrix. For the PM auto trip table, 34 trip pairs representing 11 entry points and 19 exit points were adjusted. Trip adjustments were both positive and negative. Most trip reductions occurred among trip pairs located along the Elmwood Avenue corridor in the Central Business District (CBD) downtown, while most additions represented trips from the CBD onto the larger interstate network via I-126 and SC-277. A further explanation of these adjustments occurs in the next section.

3.1.3 Location Specific Concerns

As the overall simulation output data began to fit relatively well with recorded traffic counts travel speeds, and the simulation generally appeared reasonable upon visual inspection, three geographic areas in the model remained problematic and required particular intervention. The issues and resolutions regarding these areas are presented below.

1. Central Business District: The CBD is incorporated in the model through Elmwood Avenue and Bull Street, which connect to I-126 and SC-277 respectively. Stubs from side streets, some carrying significant volumes of traffic, are connected to Elmwood, along with their associated traffic signals. Given that the corridor is in the CBD, a large amount of local trip paths initially crossed and traversed the relatively short and dense Elmwood corridor. These local CBD trips were only on the model's network for a few blocks but effectively overloaded Elmwood Avenue between Assembly Street and Bull Street, creating a gridlock situation in both the AM and PM peak periods. Despite the inclusion of a coordinated traffic signal plan for Elmwood Avenue, vehicle queues and vehicles waiting to queue in their target lanes effectively blocked traffic from both entering and traversing the corridor. This resulted in through traffic and CBD traffic destined for the interstate system via I-126 or SC-277 being severely restricted and delayed, and backups on inbound traffic extending far along both I-126 and SC-277.

   A possible explanation for this situation was the sheer volume of the CBD traffic and how it was assigned to the subarea matrices via the SCSWM's subarea extraction process. Perhaps a larger CBD grid network, with more directionality and interconnectivity to distribute CBD traffic was required. However it was determined that as the operation of the CBD was not the focus of the model, the best solution given the network and count data available was to manually remove enough of the purely local CBD trips from the trip tables so that the Elmwood Avenue corridor would appear to function as depicted in field observations. With sufficient local trips removed from the trip tables, traffic congestion in the corridor remains heavy but does not ultimately degrade into a paralyzed gridlock state. However, given persistently low volumes on I-126 and SC-277 away from the CBD even after the gridlock conditions in the corridor were resolved, some supplement traffic was added to peripheral CBD links to destinations along the I-26 and I-20 corridors. These trips helped ensure that enough traffic flowed on I-126 and SC-277 to create conditions identified in field observations and recorded in counts and link travel speeds.

2. Broad River Road at I-20: Broad River Road is one of the parallel arterial corridors included in the model. It parallels I-26 from Exit 97 on the northwest to I-20, continuing to a point east of Greystone Boulevard, which connects it to I-126. As a major urban arterial, Broad River Road serves dense commercial and residential development particular around its interchange with I-20, where traffic conditions are very congested. A particular

problem in the PM model was left-tuning westbound traffic on Broad River Road directly north of I-20, backing up and creating gridlock that extended onto the westbound I-20 exit ramps. Initially traffic destined for the west side of Broad River was queuing at a single intersection, Briargate Circle. However, in reality this left-turning traffic is distributed between multiple driveways and local streets between I-20 and Zimalcrest Drive. To resolve the issues associated with the channeling of left turns, Seminole Road and an additional centroid between Seminole Road and Zimalcrest Drive (see **Figure 4**, red oval) was added to the SCSWM subarea network and the subarea analysis rerun, producing new trip matrices. These additional links distributed the left turns among multiple locations, reducing left turn queues at Briargate Circle to reasonable levels. On the south side of I-20, Bakersfield Road, which had previously been represented by a centroid connecter, was converted to a road stub and the traffic signal plans at this intersection were installed (see **Figure 4**, purple oval). The addition of this signal helped complete a more accurate representation of traffic operations at the critical corridor.

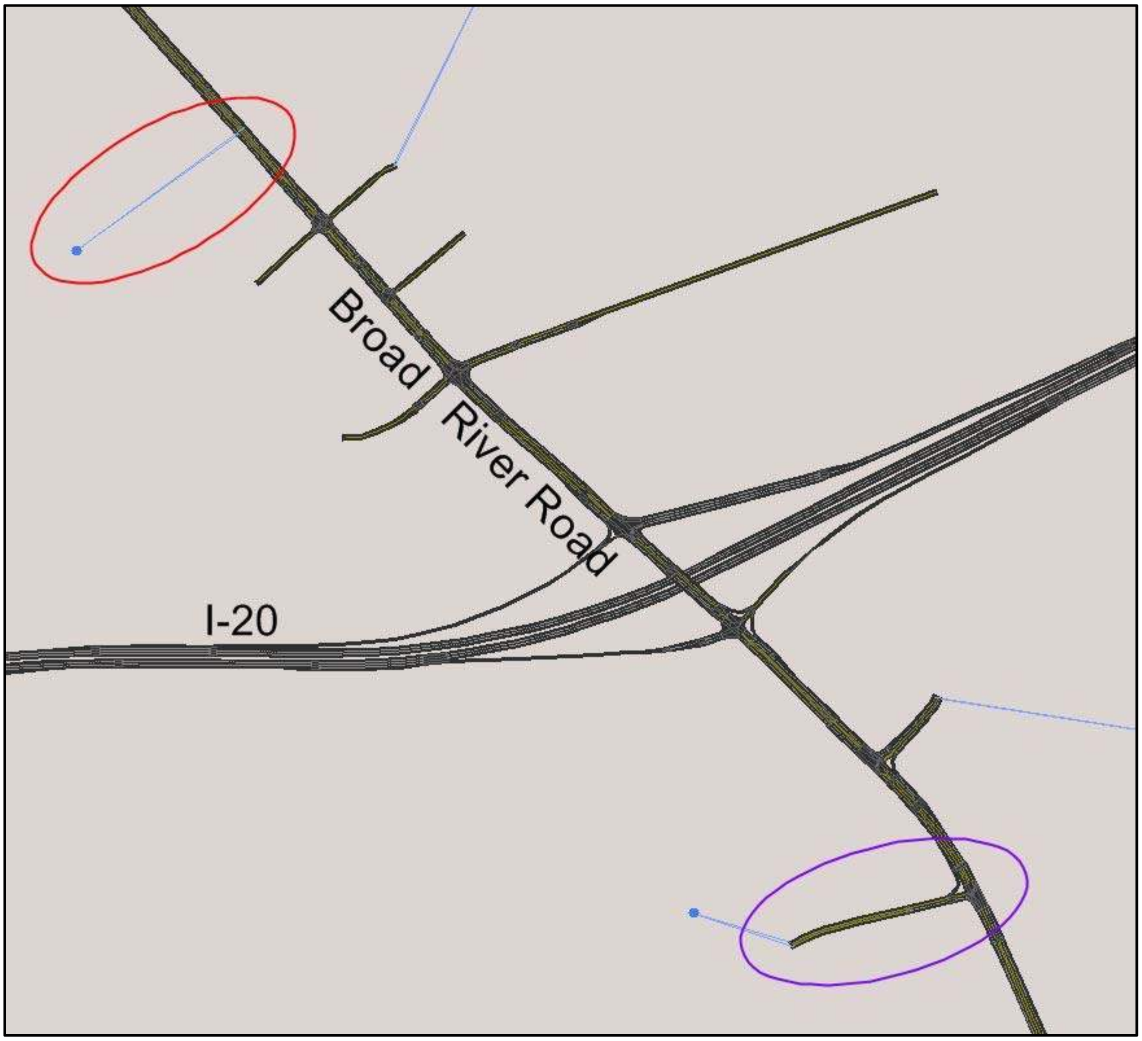


Figure 4. Broad River Road at I-20

3. <u>Westbound Interchanges of I-26, I-126 and I-20</u>: During the PM peak hour simulation, traffic volumes generally reflected counts along the corridor from westbound I-126 and its merge with westbound I-26, to the I-26 interchange with I-20. However, travel speeds in this corridor remained stubbornly high and did not reflect travel time data that indicated a severe slowdown as traffic merged and weaved within a 1-mile 5-lane section. An analysis of trip paths in both the SCSWM and the simulation model's path file demonstrated that larger trip patterns through this area were generally appropriate. Traffic from westbound I-26 through the I-20 interchange generally continued westbound on I-26 or exited to eastbound I-20, while traffic from I-126 continued on I-26 or exited to westbound I-20. Further, ramp volumes at the I-20/I-26 interchange were high but within reasonable range with counts. The incongruity in observed versus model travel speeds did not appear to be due to a lack of traffic volume or incorrect trip paths, but rather the

absence of significant weaving as vehicles positioned themselves across the five lanes in this section.

A review of the network settings and traffic patterns in this area determined factors possible factors contributing to the relative lack of weaving and higher than observed travel speeds. First, and most significant was the path choices of vehicles approaching the section from I-126. Second was a lower than expected volume of traffic entering from the Bush River Road westbound entrance ramp. The third factor was the project settings for lane speed variability.

The first factor related to trips from I-126 bound for I-20. Traffic signs direct drivers on I-126 that are exiting to eastbound and westbound I-20 to use a an auxiliary exit ramp positioned on the right side of the flyover that conveys the traffic merging from I-26. By using this side ramp, the exiting traffic from I-126 is positioned to the right of the I-26 traffic as it merges with I-126. (See **Figure 4**, ramp in red.) After diverging from mainline I-126, this auxiliary ramp first merges with traffic from a Bush River Road entrance ramp before realigning with the other lanes of I-26 briefly before becoming an exit-only lane for the I-20 eastbound ramp. In contrast, the left lanes on I-126 are intended for through traffic continuing on I-26 westbound, with the lanes from the I-26 flyover landing to their right. In practice, many I-126 drivers bound for the I-20 ramps stay in the left lanes through the merge with the flyover and then cross over the I-26 traffic lanes to get to the I-20 exit ramps. In fact, initial model runs demonstrated that the preferred path for I-126 traffic exiting to I-20 was via the left lanes because of their higher speeds. In order to force I-126 exiting traffic to use the right auxiliary ramp as directed, a full turn movement prohibition was set in the model's project settings which prevented the movement of vehicles from the left lanes of I-126 to the I-20 exit ramps. When this path prohibition was implemented, all I-126 traffic destined for I-20 used the auxiliary ramp. As a result, disruption caused from lane weaving significantly decreased and speeds for all lanes except the right lane actually increased.

Figure 5. I-26/I-126 Merge Approaching the I-20 Interchange

As field observation and observed travel speeds make clear, a full path prohibition preventing I-126 traffic from approaching I-20 exit ramps from the left is not reflective of what occurs at this location. Therefore a method to direct some I-126 exiting traffic to use the right auxiliary ramp while others continue to weave over from the left lanes was devised. This method involved extracting trips originating from I-126 to I-20 from the larger trip tables and transferring them into two new exclusive trip tables named User A or User B. User B trips are prohibited from using the left lanes and crossing over, while User A trips use the left lanes, as it is the preferred faster free-flow path. User A trips therefore weave across the incoming I-26 traffic lanes to get to the exit ramps for I-20, consequently creating the disruption and slowdown in this section observed in the travel time data. The number trips in the User A and User B matrices were adjusted to determine what proportion of total I-126 trips should be in each matrix to effectively reflect the ramp counts on the auxiliary ramp and the level of disruption required to lower speeds and create backup queues as observed in the field notes. The number of User A trips and User B trips was ultimately set evenly, with the same number trips in both matrices.

The second factor affecting the weaving in this section relates to the traffic entering from the Bush River Road entrance ramp. This traffic merges first with the I-126 traffic on the right side ramp and then, unless bound for the immediate I-20 eastbound ramp, must weave quickly into the center and left lanes to continue on I-26 westbound. However, based a comparison of ramp counts, not enough traffic was using this ramp and making this movement. In the model network, Bush River Road connects to both I-26 and I-20, and it appeared that too much of the traffic generated between the two interstates was directed toward I-20. With less traffic merging and weaving onto I-26 from the right, the disruption that was observed in the field was not being captured in the model. To encourage more local traffic on Bush River Road to use the ramp at I-26 as opposed to the I-20 ramp to the west, a lower free-flow speed was set for Bush River Road between the two interstates. A lower free flow speed may in fact be justified given the presence of local streets and driveways that are not in the model. This adjustment effectively increased the ramp traffic at I-26. As expected, this additional ramp traffic increased the overall disruption observed in this section as it merged and weaved into this section of I-26.

The third and final factor regards lane speeds in this section in general. TransModeler includes variable speed adjustments per lane position on multi-lane highways, with left lane traffic traveling fastest. As the number of lanes in a segment increases, the variance between the speeds from the left lanes to the right lanes increases. Being one of the few 5-lane sections in the network, the speed bias for the left lanes in this section was significant, with the speed of the far left lane set six percent higher than the average link speed set at 55 mph for this section. However, given that the presence of five lanes in this location is due to the merging of the I-126 and I-26 lanes and a right auxiliary lane, the disparity between lane speeds here should not be so pronounced. Further, a portion of the traffic in the left lanes is in fact trying to weave through the center lanes to the right lanes, which reduces the potential for higher speeds.

Having made the described adjustments for these three factors, link speeds dropped to the levels observed in the speed data and backup queues began to form on both the I-26 flyover and I-126 towards Colonial Life Boulevard.

3.2 CALIBRATION CRITERIA

The criteria used to confirm that the simulation models have been sufficiently calibrated were taken from the FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software¸ July 2004 (FHWA Publication No. FHWA-HRT-04-040)*. The specific criteria, which were originally developed by The Wisconsin Department of Transportation, are found in Table 4 on page 64 of that document. The criteria consist of three general metrics: 1) traffic flow, 2) travel times, and 3) visual audits. The first two metrics are quantifiable based on observed data and model output while the third metric is based on a visual audit to the "analyst's satisfaction."

As each microsimulation run incorporates random seeds to reflect the daily variance in traffic conditions, multiple simulations runs of each model scenario are performed, with their output statistics averaged to provide mean statistics for comparison to observed values. For comparing traffic flow and travel speeds, the *FHWA Toolbox Guidelines, Appendix B: Confidence Intervals*, was consulted to establish the proper number of simulations required to ensure that the mean statistics taken from the model are within an acceptable confidence level of the true mean. Based on the standard deviation of a sample of link speeds and link flows from model output, it was determined that an average of ten (10) model runs would be sufficient to ensure that the mean model speeds and traffic flows are within a single standard deviation of the true mean at the 95% confidence level. This has a practical implication in that the minimum computer processing time for each 90 minute simulation (including the 30-minute preload period), is approximately 10-12 minutes. Therefore developing output statistics for a single model scenario based on 10 runs requires approximately two hours of processing time, in addition to any input adjustments and output processing.

3.2.1 Traffic Flows

To compare traffic flows, traffic counts from every mainline, ramp tube, and aggregate ramp TMC were compared to average traffic flows at the same locations for both AM and PM peak hour models. In addition to an overall comparison of total model flow to total count volume, the *FHWA Guidelines* criteria divides flows into three volume groups, with separate criteria for each. The criteria also includes the GEH statistic, which is computed as follows:

$$GEH = \sqrt{\frac{(E-V)^2}{(E+V)/2}}$$

Where:

E = model estimated volume
V = field count

A total of 277 count locations were compared. Table 3 presents the calibration targets and flow statistics from the AM and PM peak hour models. As Table 3 shows, the flow statistics were within the range of criteria targets for each volume category, with one exception. In the PM peak hour, the only 83% of links with counts over 2,700 vehicles per hour were within 400 of the count, one link short of the 85% target. However, all but one link in this volume class was within 15% of its respective count volume. The total flow to count ratio is slightly higher than counts in both the AM and PM peak periods, but within the target five percent (5%) threshold. The target threshold of total links meeting a maximum GEH statistic less than five (5) was also met for both the AM and PM models. A second criteria for cumulative GEH under four (4) could not be met, but was considered not relevant since the total flow to count thresholds were within the 5% thresholds.

Table 3. Traffic Flow Calibration Statistics

	Target	AM Peak Hr		PM Peak Hr	
Hourly Flows, Model Versus Observed		Total Links	% of cases	Total Links	% of cases
Individual Link Flows					
Within 15%, for 700 for veh/h <Flow < 2700 veh/h	> 85% of cases	171	92%	169	89%
Within 100 veh/h, for Flow < 700 veh/h	> 85% of cases	84	95%	82	85%
Within 400 veh/h, for Flow > 2700 veh/h	> 85% of cases	22	91%	24	83%
Sum of All Links	Within 5% of sum of all link counts	277		277	
Sum of Link Flow			254,644		269,572
Sum of Counts			250,214		257,562
(Flow-Counts)/Counts			1.77%		4.66%
Links with GEH Statistic < 5	> 85% of cases	250	90%	239	86%

3.2.2 Travel Speeds

The criteria for travel times in the *FHWA Guidelines* are a comparison of journey travel times. Given the size of the network and the multitude of available paths within it, travel times for specific paths were not measured in the model output. Instead, travel speeds were compared for each segment of the interstate and freeway corridors. Each segment between both system and service interchanges, for both directions were included. Table 4 presents a comparison of the total number of segments and the number of segments that were within the *FHWA Guidelines* criteria of fifteen percent (15%) of the observed travel speed. Both the AM and PM models meet the target threshold of 85% of segments within 15% of the observed speed.

Table 4. Interstate and Freeway Segments within 15% of Observed Travel Speeds

	AM Peak Hour		PM Peak Hour	
	Segments	Within 15%	Segments	Within 15%
I-26	30	25	30	27
I-20	32	30	32	32
I-77	26	26	26	23
I-126/SC 277	14	11	14	9
Total	102	92	102	91
85% Target		90%		89%

3.2.3 Visual Audits

Visual audits were conducted by watching the model simulations live while referring to field notes of traffic conditions, including the location and length of bottlenecks and intersection queues. Given the size of the network, subjective interpretation of the field notes,(such as "very congested" and "traffic moves between 40-50 mph"), and the *FHWA Guidelines* criteria being "to analyst's satisfaction," the visual audit process was primarily based a consensus among the model developers and reviewers that conditions were generally within the expectations of a congested peak hour, as informed by the field notes and input from project leaders and the client. A memorandum of the field notes is included as Appendix A.

3.3 CORRIDOR STATISTICS

In addition to the calibration criteria, graphical representations of the link flow and travel speed comparisons between observed data and model output were developed to show the fit of the model for each corridor. Where mainline counts exist, the model flow is compared to the counts. Otherwise segment volumes are calculated by adding and subtracting ramp counts at each interchange. This section is organized by interstate system with tables and corresponding graphs for mainline segment volumes, ramp volumes, and segment travel speeds.

3.3.1 I-26 Corridor Statistics

Table 5. I-26 Eastbound Volume Comparison

I-26 Mainline Volume Calibration Summary		Eastbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	west of Exit 91 (Columbia Ave)	3384		1,326	1,507			1,354	1,590	
2	Exit 91 to Exit 97 (Broad River Rd)	3376	1,984		2,170	4	1,821		2,103	6
3	Exit 97 to Exit 101 (Broad River Rd)	3365		3,126	3,333			2,314	2,677	
4	Exit 101 to Exit 102 (Lake Murray Blvd)	3353		3,782	4,103		3,435		3,296	2
5	Exit 102 to Exit 103 (Harbison Blvd)	3333		3,902	4,221			3,834	3,635	
6	Exit 103 to Exit 104 (Piney Grove Rd)	3324		4,436	4,673			4,205	4,052	
7	Exit I 104 to Exit 106 (St. Andrews Rd)	6369	5,597		5,432	2	4,690		4,633	1
8	Exit 106 to Exit 107 (I-20)	3284		7,377	7,141			5,662	5,575	
9	I-26 to I-26	3254	2,954		3,111	3	2,505		3,124	12
10	Exit 108 to Exit 110 (Sunset Blvd)	6370	3,628		3,414	4	4,029		3,919	2
11	Exit 110 to Exit 111 (Augusta Rd)	4281		3,512	3,287			4,072	3,887	
12	Exit 111 to Exit 113 (Edmund Hwy)	4267		4,262	3,938			4,423	4,331	
13	Exit 113 to Exit 115 (Charleston Hwy)	4255		4,189	3,823			4,144	3,991	
14	Exit 116 (I-77) to Exit 119 (Charleston Hwy)	1269		1,552	1,974			2,063	2,729	
15	southeast of Exit 119	1280	1,323		1,701	10	1,895		2,518	13

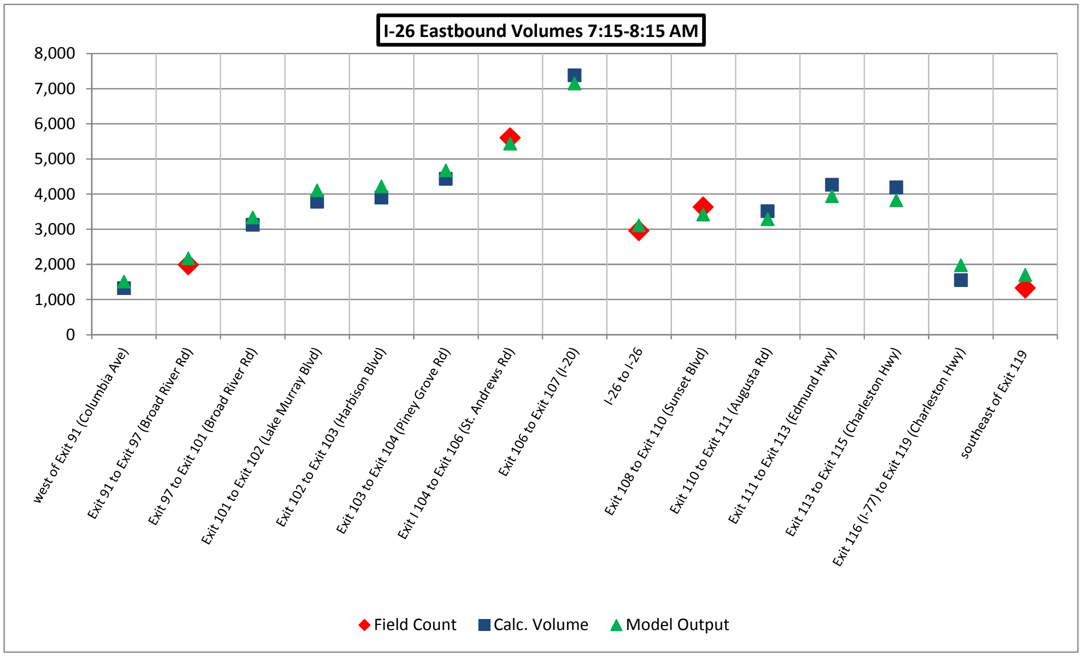


Figure 6. I-26 Eastbound Volume Comparison: AM Peak Hour

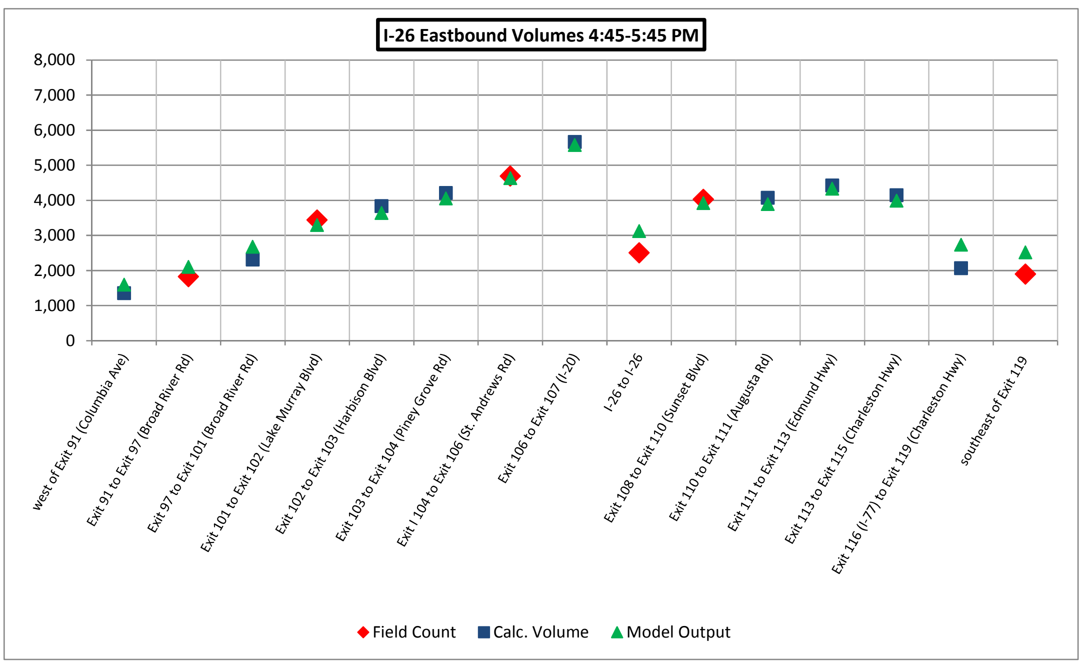


Figure 7. I-26 Eastbound Volume Comparison: PM Peak Hour

Table 6. I-26 Westbound Volume Comparison

I-26 Mainline Volume Calibration Summary		Westbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	west of Exit 91 (Columbia Ave)	3382		851	1,190			1,543	1,953	
2	Exit 91 to Exit 97 (Broad River Rd)	3369	1,389		1,574	5	2,114		2,499	8
3	Exit 97 to Exit 101 (Broad River Rd)	3363		1,381	1,892			2,292	3,702	
4	Exit 101 to Exit 102 (Lake Murray Blvd)	3346	2,700		2,405	6	4,679		4,679	0
5	Exit 102 to Exit 103 (Harbison Blvd)	3337		3,152	2,929			5,367	5,421	
6	Exit 103 to Exit 104 (Piney Grove Rd)	3322		2,849	3,405			5,097	5,961	
7	Exit I 104 to Exit 106 (St. Andrews Rd)	3304	3,514		3,722	3	5,623		6,186	7
8	Exit 106 to Exit 107 (I-20)	3285		3,788	4,642			5,380	7,286	
9	I-26 to I-26	3249	2,102		2,503	8	2,437		2,754	6
10	Exit 108 to Exit 110 (Sunset Blvd)	4294	3,700		3,593	2	3,578		3,977	6
11	Exit 110 to Exit 111 (Augusta Rd)	4283		3,700	3,574			3,578	3,883	
12	Exit 111 to Exit 113 (Edmund Hwy)	4265		3,700	4,095			3,578	4,514	
13	Exit 113 to Exit 115 (Charleston Hwy)	4253		3,700	3,950			3,578	4,502	
14	Exit 116 (I-77) to Exit 119 (Charleston Hwy)	1267		1,525	2,446			1,833	2,835	
15	southeast of Exit 119	1277	1,525		2,027	12	1,833		2,407	12

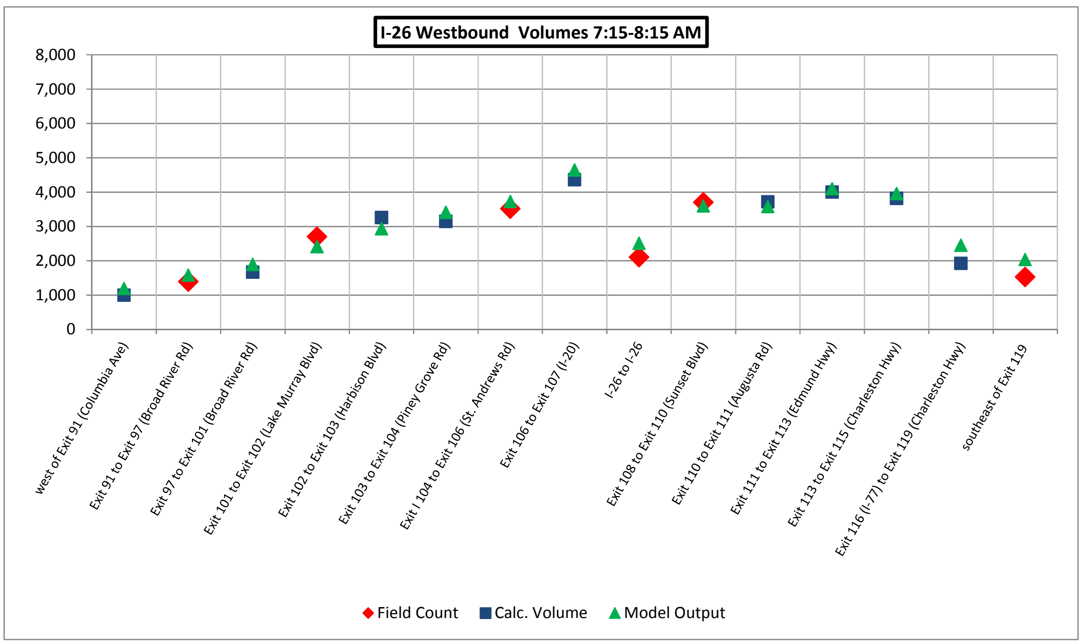


Figure 8. I-26 Westbound Volume Comparison: AM Peak Hour

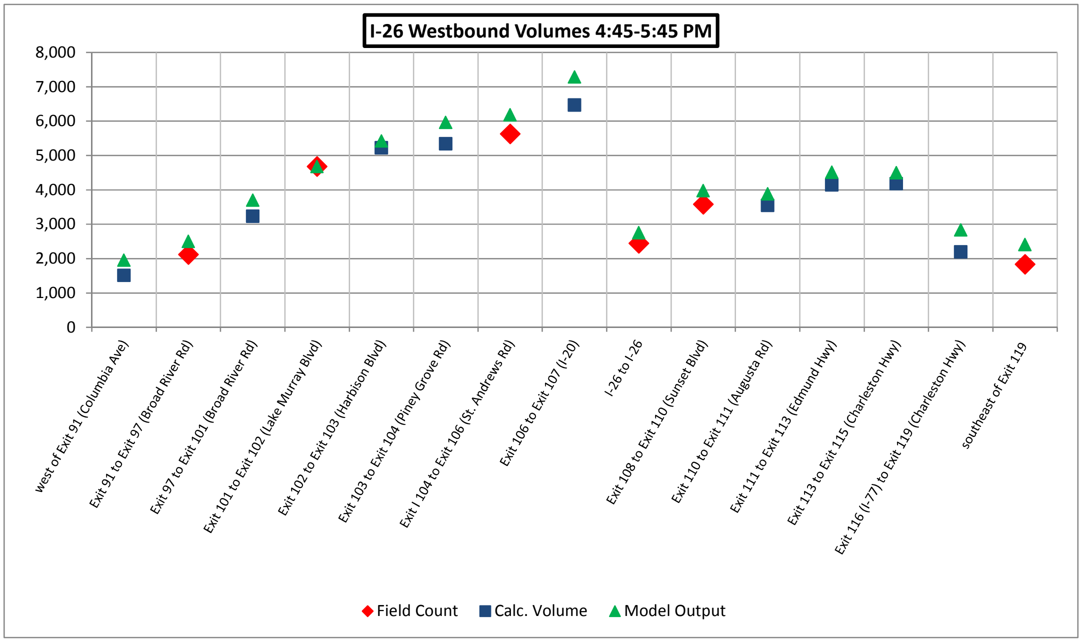


Figure 9. I-26 Westbound Volume Comparison: PM Peak Hour

Table 7. I-26 Ramp Volume Comparison

	I-26 Ramp Volume Calibration Summary		Eastbound								Westbound									
			7:15-8:15 AM				4:45-5:45 PM					7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.
1	Exit 91 (Columbia Ave) off ramp	3383	113	116	0	3	82	83	0	1	3377	503	476	1	-27	721	683	1	-38
2	Exit 91 (Columbia Ave) on ramp	6299	771	794	1	23	549	582	1	33	3381	112	128	1	16	118	126	1	8
3	Exit 97 (Broad River Rd) off ramp	3375	119	111	1	-8	216	226	1	10	3366	457	470	1	13	1,240	1,272	1	32
4	Exit 97 (Broad River Rd) on ramp	5064	1,261	1,300	1	39	709	761	2	52	5046	178	172	0	-6	119	136	1	17
5	Exit 101 (Broad River Rd) off ramp (wb)	3361	127	114	1	-13	88	92	0	4	3357	362	386	1	24	661	707	2	46
6	Exit 101 (Broad River Rd) off ramp (eb)	3358	256	247	1	-9	117	119	0	2	3347	287	239	3	-48	401	426	1	25
7	Exit 101 (Broad River Rd) on ramp	3352	1,039	1,159	4	120	837	811	1	-26	3362	132	132	0	0	229	221	1	-8
8	Exit 102 (Lake Murray Blvd) off ramp (wb)	3354	288	295	0	7	193	199	0	6	3339	484	434	2	-50	606	622	1	16
9	Exit 102 (Lake Murray Blvd) off ramp (eb)	3343	312	338	1	26	193	204	1	11	3342	348	318	2	-30	351	403	3	52
10	Exit 102 (Lake Murray Blvd) on ramp	3336	720	786	2	66	757	753	0	-4	3349	276	244	2	-32	409	301	6	-108
11	Exit 103 (Harbison Blvd) off ramp	3211	105	164	5	59	372	316	3	-56	3326	472	597	5	125	800	875	3	75
12	Exit 103 (Harbison Blvd) on ramp	3328	639	640	0	1	857	741	4	-116	3242	158	122	3	-36	468	309	8	-159
13	Exit 104 (Piney Grove Rd) off ramp	3233	134	170	3	36	272	204	4	-68	3307	617	671	2	54	693	750	2	57
14	Exit 104 (Piney Grove Rd) on ramp	3311	906	950	1	44	780	745	1	-35	3321	251	391	8	140	413	571	7	158
15	Exit 106 (St. Andrews Rd) off ramp	3300	117	172	5	55	287	372	5	85	3286	697	725	1	28	470	583	5	113
16	Exit 106 (St. Andrews Rd) eb on / wb off ramp	3296	829	859	1	30	890	769	4	-121	3290	342	369	1	27	632	673	2	41
17	Exit 106 (St. Andrews Rd) on ramp	3282	1,120	1,093	1	-27	696	575	5	-121	3303	188	173	1	-15	256	175	6	-81
18	Exit 107 to wb I-20	3288	518	645	5	127	793	918	4	125	3279	419	500	4	81	1,016	1,424	12	408
19	Exit 107 to eb I-20	3278	1,410	1,472	2	62	1,366	1,229	4	-137	4316	619	545	3	-74	579	551	1	-28
20	Exit 107 from wb I-20	3274	790	706	3	-84	594	618	1	24	3281	1,122	1,059	2	-63	1,145	1,112	1	-33
21	Exit 107 from eb I-20	4322	1,203	1,244	1	41	677	980	11	303	4332	584	572	0	-12	574	674	4	100
22	Exit 108 (Bush River Rd) off ramp	51	324	450	6	126	340	506	8	166	6399	324	392	4	68	1,006	868	5	-138
23	Exit 108 (Bush River Rd) on ramp	3261	472	598	5	126	638	746	4	108	6402	332	392	3	60	828	576	10	-252
24	Exit 108 to/from I-126	6400	316	351	2	35	763	792	1	29	6398	589	631	2	42	280	309	2	29
25	Exit 110 (Sunset Blvd) off ramp	4297	818	818	0	0	783	883	3	100	4285	851	859	0	8	787	824	1	37
26	Exit 110 (Sunset Blvd) on ramp	4288	702	690	0	-12	826	839	0	13	4293	832	898	2	66	820	927	4	107
27	Exit 111 (Augusta Rd) off ramp (wb)	4280	185	254	5	69	342	400	3	58	4278	623	818	7	195	829	1,014	6	185
28	Exit 111 (Augusta Rd) on ramp (wb)	4268	425	413	1	-12	527	482	2	-45	6404	264	271	0	7	280	314	2	34
29	Exit 111 (Augusta Rd) off ramp (eb)	6406	247	312	4	65	351	372	1	21	4275	435	465	1	30	421	392	1	-29
30	Exit 111 (Augusta Rd) on ramp (eb)	4272	757	827	2	70	517	719	8	202	6405	511	513	0	2	375	439	3	64
31	Exit 113 (Edmund Hwy) off ramp	4266	782	770	0	-12	936	991	2	55	4262	675	657	1	-18	676	703	1	27
32	Exit 113 (Edmund Hwy) on ramp	5991	709	685	1	-24	657	645	0	-12	5996	858	821	1	-37	639	699	2	60
33	Exit 115 (Charleston Hwy) off ramp	1253	758	816	2	58	1,096	1,154	2	58	6420	193	221	2	28	113	183	6	70
34	Exit 115 (Charleston Hwy) on ramp (sb)	4823	76	70	1	-6	178	188	1	10	1251	235	252	1	17	299	368	4	69
35	Exit 115 (Charleston Hwy) on ramp (nb)	6412	85	73	1	-12	82	78	1	-5	4821	1,161	1,185	1	24	616	613	0	-3
36	Exit 116 to I-77	1258	2,161	2,170	0	9	1,556	1,523	1	-33	4230	1,122	1,203	2	81	1,158	1,228	2	70
37	Exit 116 from I-77	6416	994	1,037	1	43	1,005	1,156	5	151	6415	1,574	1,512	2	-62	2,132	2,056	2	-76
38	Exit 119 (Charleston Hwy) off ramp	1273	285	333	3	48	249	302	3	53	1276	90	116	3	26	39	44	1	5
39	Exit 119 (Charleston Hwy) on ramp	1279	56	72	2	16	81	94	1	13	6017	494	553	3	59	401	469	3	68

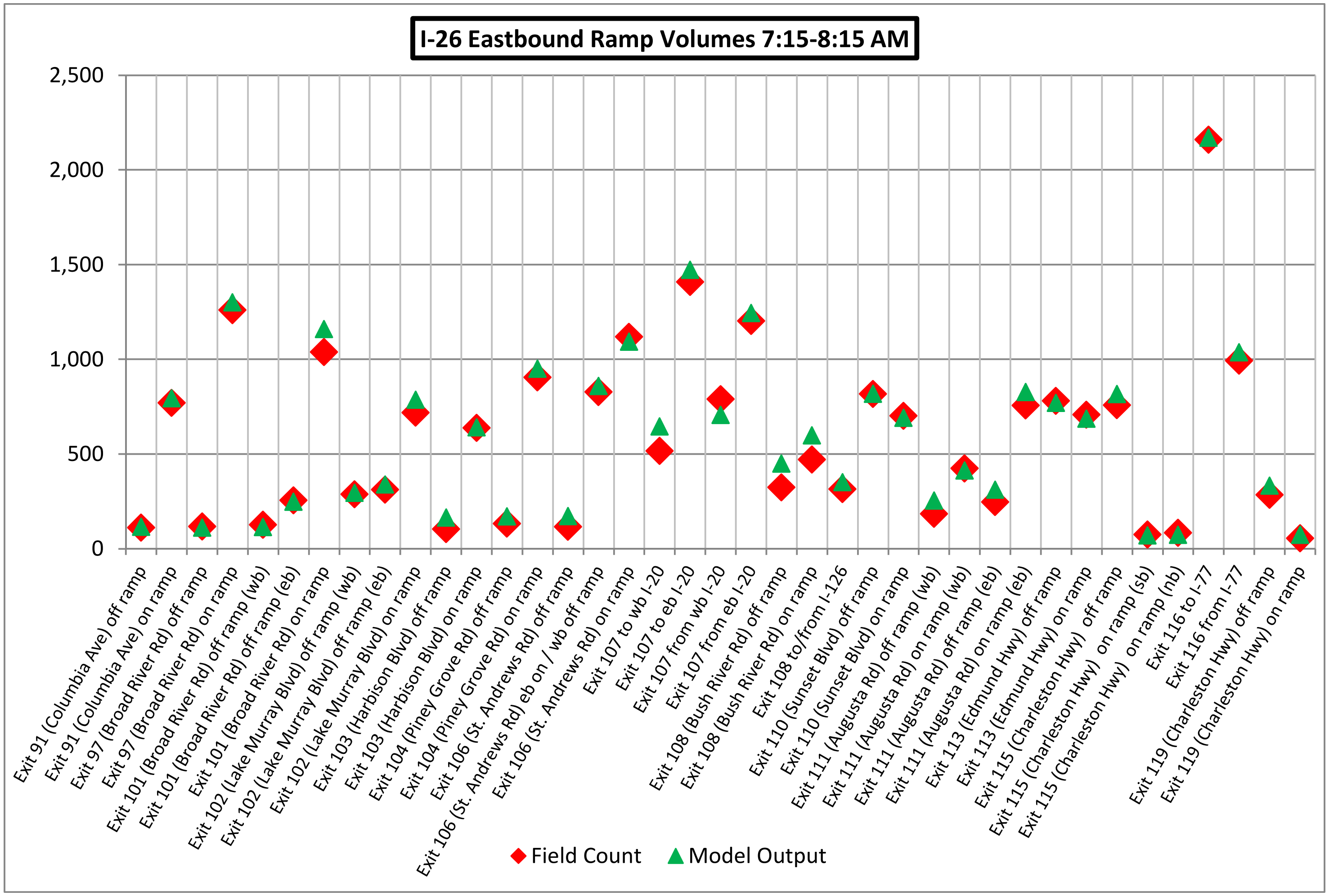


Figure 10. I-26 Eastbound Ramp Volumes: AM Peak Hour

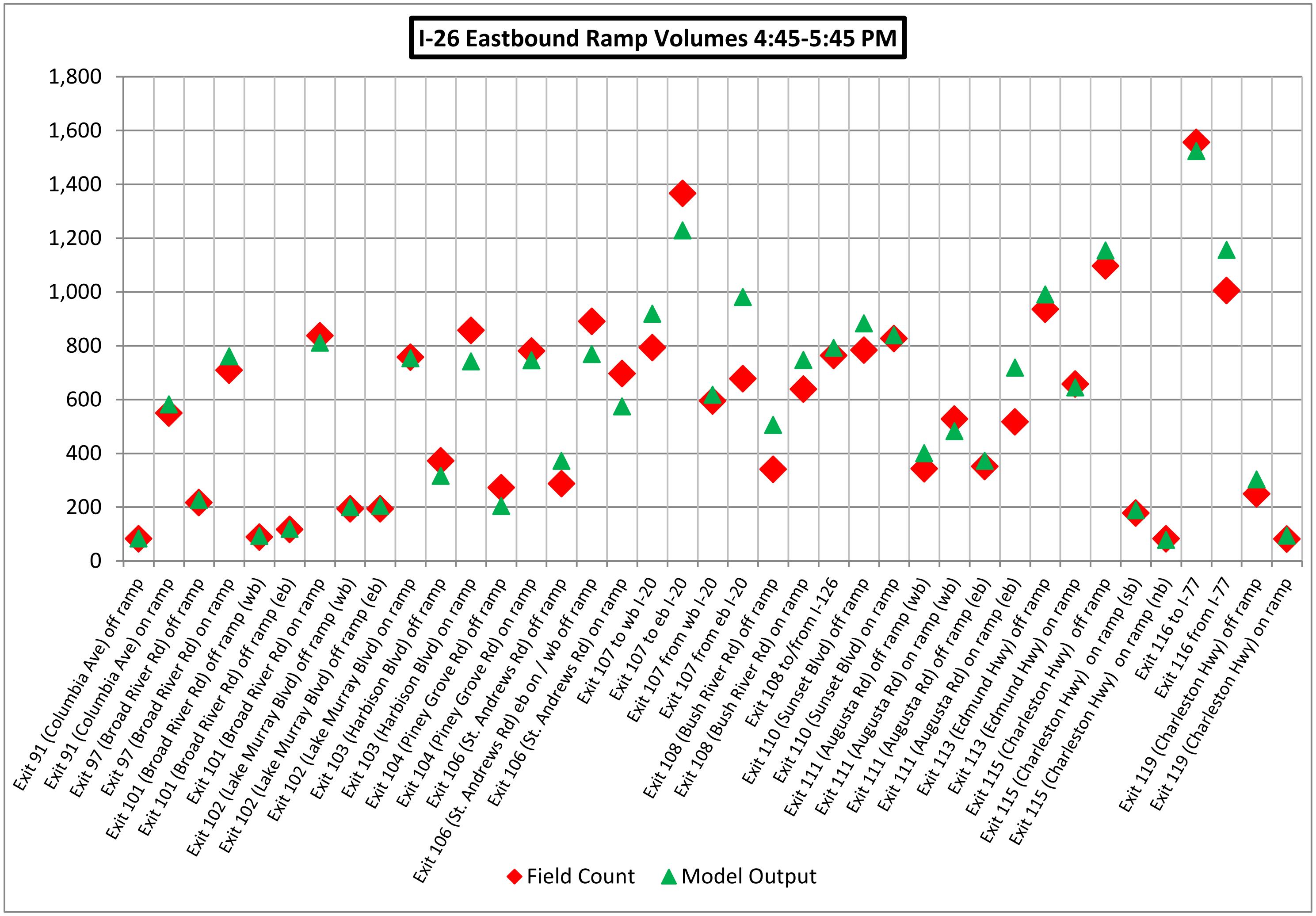


Figure 11. I-26 Eastbound Ramp Volumes: PM Peak Hour

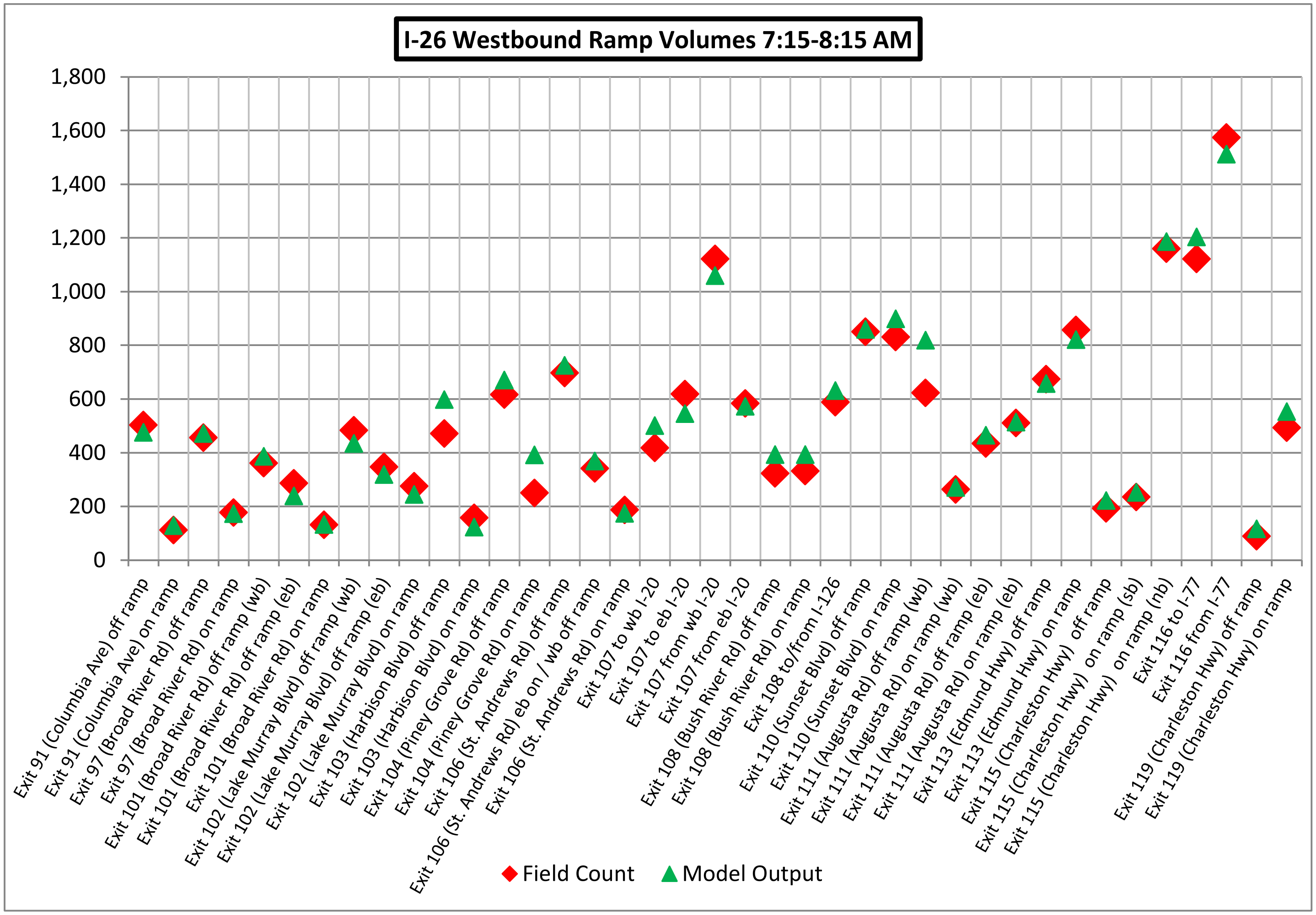


Figure 12. I-26 Westbound Ramp Volumes: AM Peak Hour

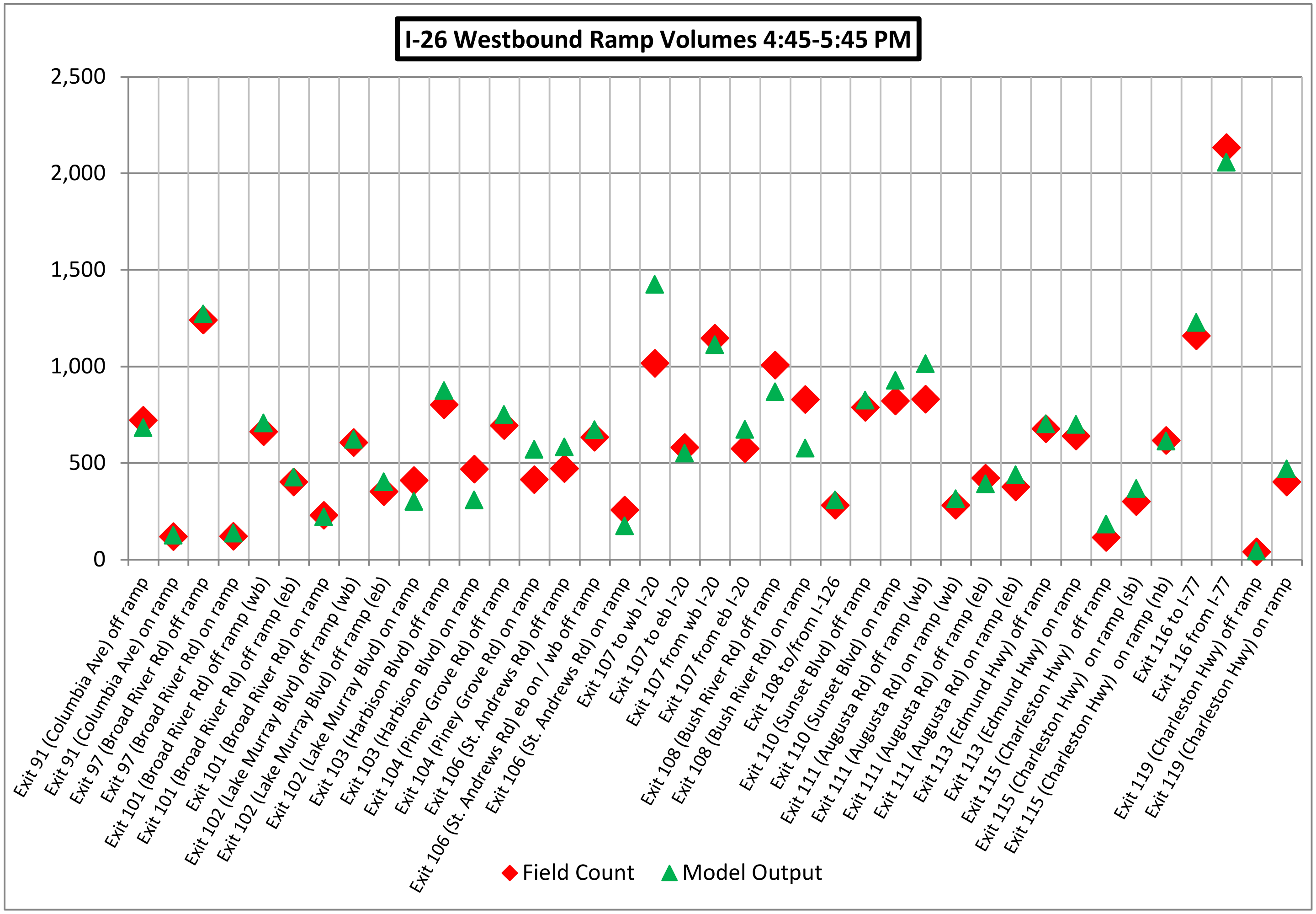


Figure 13. I-26 Westbound Ramp Volumes: PM Peak Hour

Table 8. I-26 Segment Speed Comparison

Segment	Location	Eastbound						Westbound				
		Segment	AM		PM			Segment	AM		PM	
		ID	INRIX	Model	INRIX	Model		ID	INRIX	Model	INRIX	Model
1	west of Exit 91 (Columbia Ave)	4801	71	70	70	70		4796	68	71	70	69
2	Exit 91 to Exit 97 (Broad River Rd)	4787	70	67	71	67		4774	69	70	70	69
3	Exit 97 to Exit 101 (Broad River Rd)	4768	68	64	69	66		4762	68	69	68	54
4	Exit 101 to Exit 102 (Lake Murray Blvd)	4748	54	59	65	62		4741	64	66	64	63
5	Exit 102 to Exit 103 (Harbison Blvd)	4720	44	60	63	62		4726	63	65	62	58
6	Exit 103 to Exit 104 (Piney Grove Rd)	4707	49	60	63	62		4701	63	64	59	49
7	Exit I 104 to Exit 106 (St. Andrews Rd)	4669	53	57	60	61		8551	62	62	52	49
8	Exit 106 to Exit 107 (I-20)	4649	52	42	56	48		4651	58	48	32	29
9	I-26 to I-26	6186	59	57	58	56		4604	57	48	31	31
10	Exit 108 to Exit 110 (Sunset Blvd)	6177	60	63	59	62		8554	61	58	45	57
11	Exit 110 to Exit 111 (Augusta Rd)	6152	60	65	62	63		6158	61	65	61	64
12	Exit 111 to Exit 113 (Edmund Hwy)	6134	61	63	64	62		6127	60	62	60	61
13	Exit 113 to Exit 115 (Charleston Hwy)	6114	61	63	62	62		6108	61	60	62	60
14	Exit 116 to Exit 119 (Charleston Hwy)	1548	64	63	63	62		1544	64	60	64	58
15	southeast of Exit 119	1565	64	69	64	67		1560	67	70	66	69

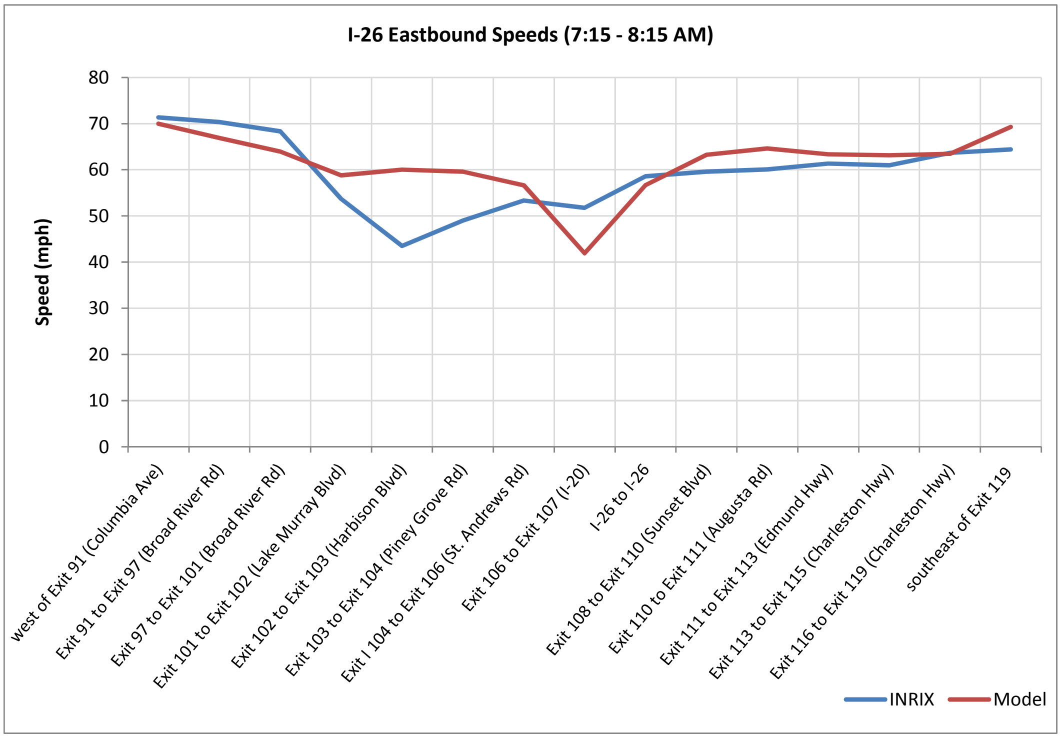


Figure 14. I-26 Eastbound Speeds: AM Peak Hour

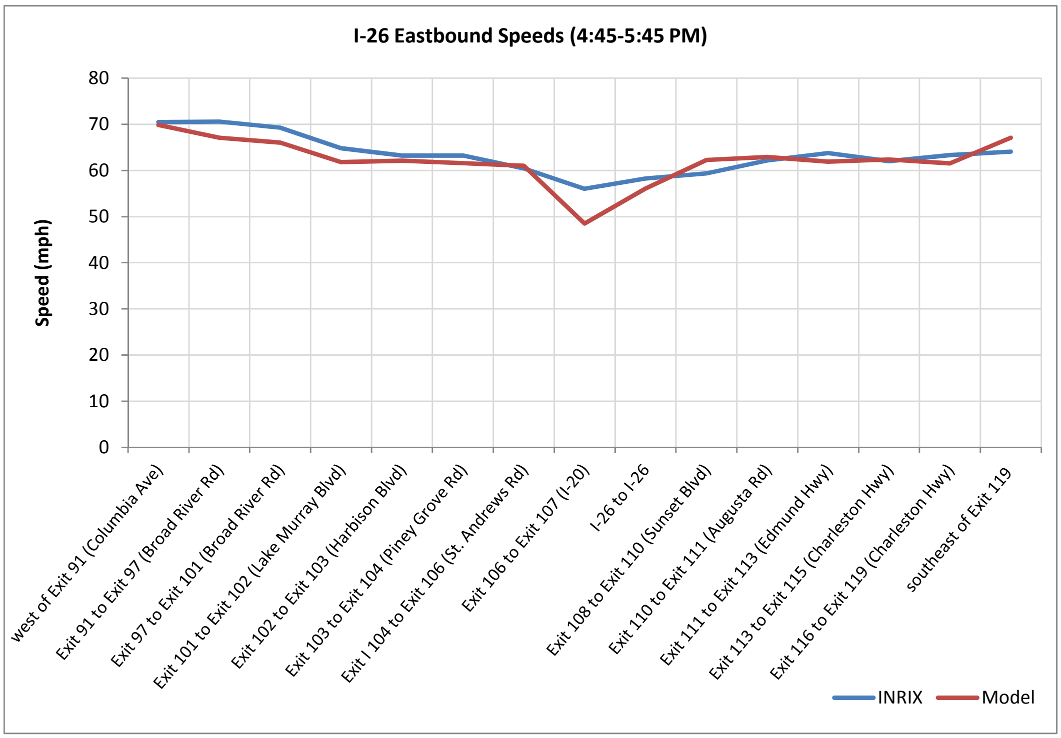


Figure 15. I-26 Eastbound Speeds: PM Peak Hour

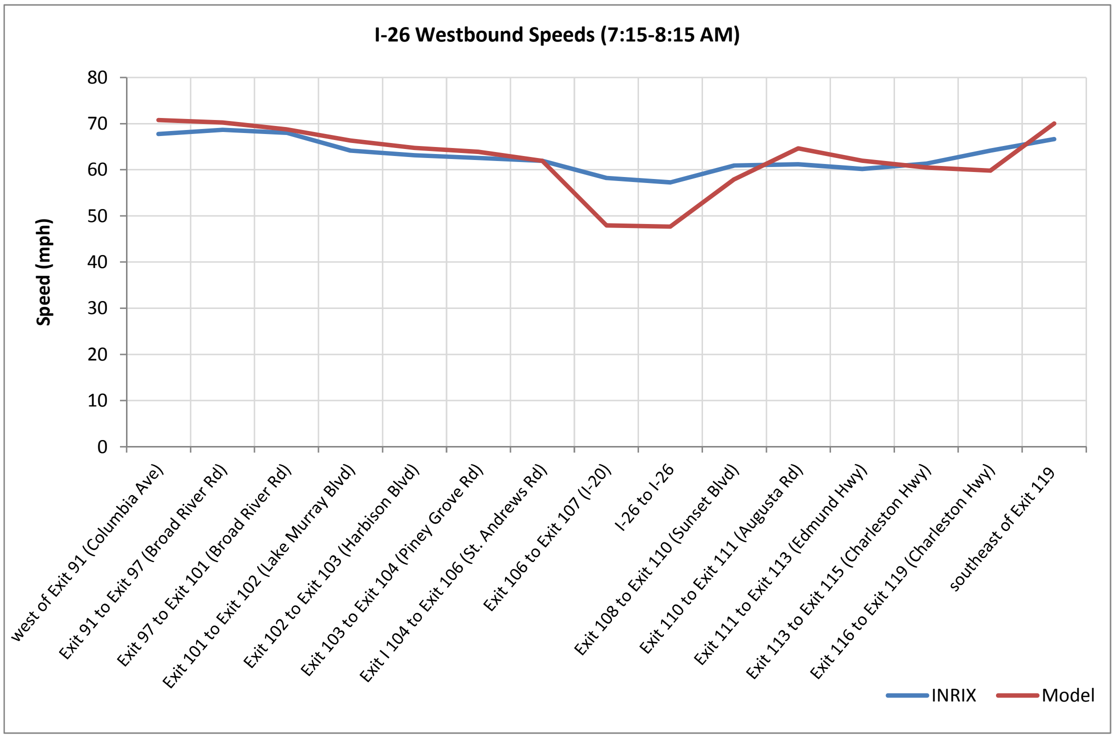


Figure 16. I-26 Westbound Speeds: AM Peak Hour

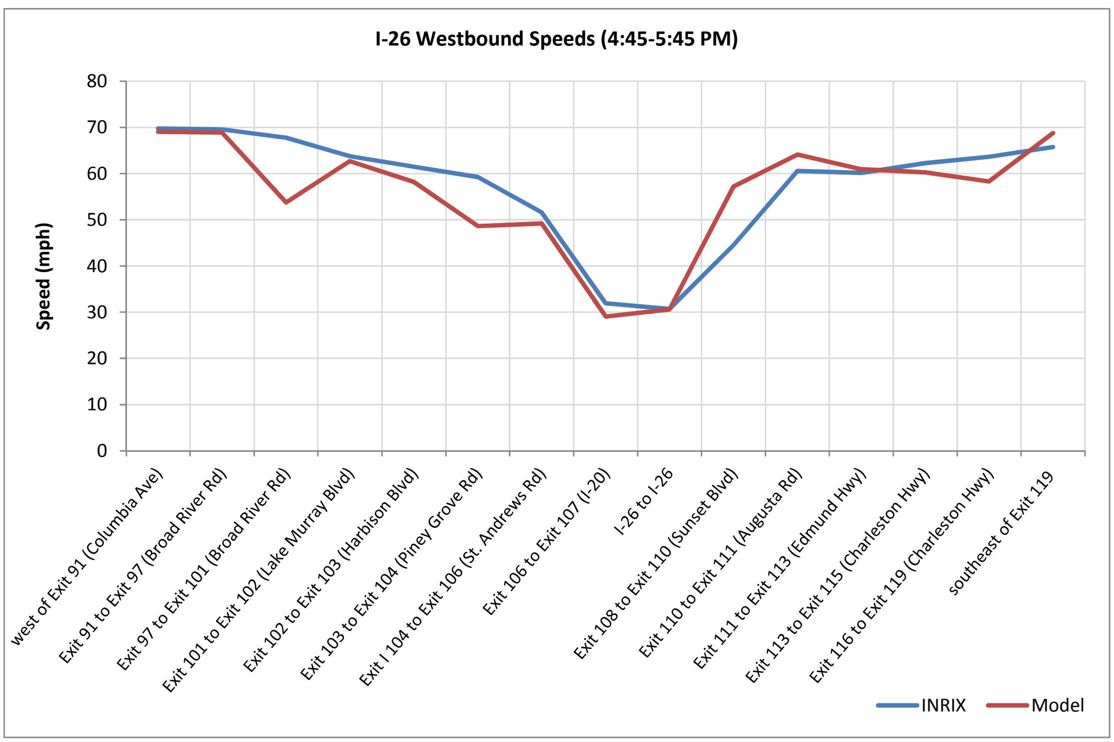


Figure 17. I-26 Westbound Speeds: PM Peak Hour

3.3.2 I-20 Corridor Statistics

Table 9. I-20 Eastbound Volume Comparison

I-20 Mainline Volume Calibration Summary		Eastbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	west of Exit 51 (Long Pond Rd)	6443		1,450	1,551			1,367	1,425	
2	Exit 51 to Exit 55 (S Lake Dr)	6461	2,620		2,516	2	1,678		1,853	4
3	Exit 55 to Exit 58 (Augusta Rd)	2018		3,668	3,443			2,347	2,567	
4	Exit 58 to Exit 61 (Sunset Blvd)	2028		4,158	4,049			2,257	2,570	
5	Exit 61 to Exit 63 (Bush River Rd)	2051	5,131		4,927	3	3,144		3,390	4
6	Exit 63 to Exit 64 (I-26)	2068		4,734	4,405			3,228	3,875	
7	Exit 64 to Exit 65 (Broad River Rd)	4319		4,523	4,580			3,639	4,004	
8	Exit 65 to Exit 68 (Monticello Rd)	6463	5,174		5,094	1	4,391		4,466	1
9	Exit 68 to Exit 70 (Fairfield Rd)	4355		4,968	4,817			4,522	4,558	
10	Exit 70 to Exit 71 (N Main St)	4372	4,561		4,620	1	4,106		4,418	5
11	Exit 71 to Exit 72 (Farrow Rd)	4389	4,340		4,274	1	4,132		4,210	1
12	Exit 72 to Exit 73 (SC 277)	4404		3,643	3,651			3,900	3,960	
13	Exit 73 to Exit 74 (Two Notch Rd)	4422		2,959	2,870			4,042	4,273	
14	Exit 74 to Exit 76 (I-77)	4435	2,241		2,171	1	3,242		3,402	3
15	Exit 76 to Exit 80 (Clemson Rd)	947		2,325	2,483			3,990	4,317	
16	Exit 80 to Exit 82 (Spear Creek Church Rd)	36		1,524	1,713			2,840	3,203	
17	east of Exit 82	981	1,114		1,203	3	2,390		2,469	2

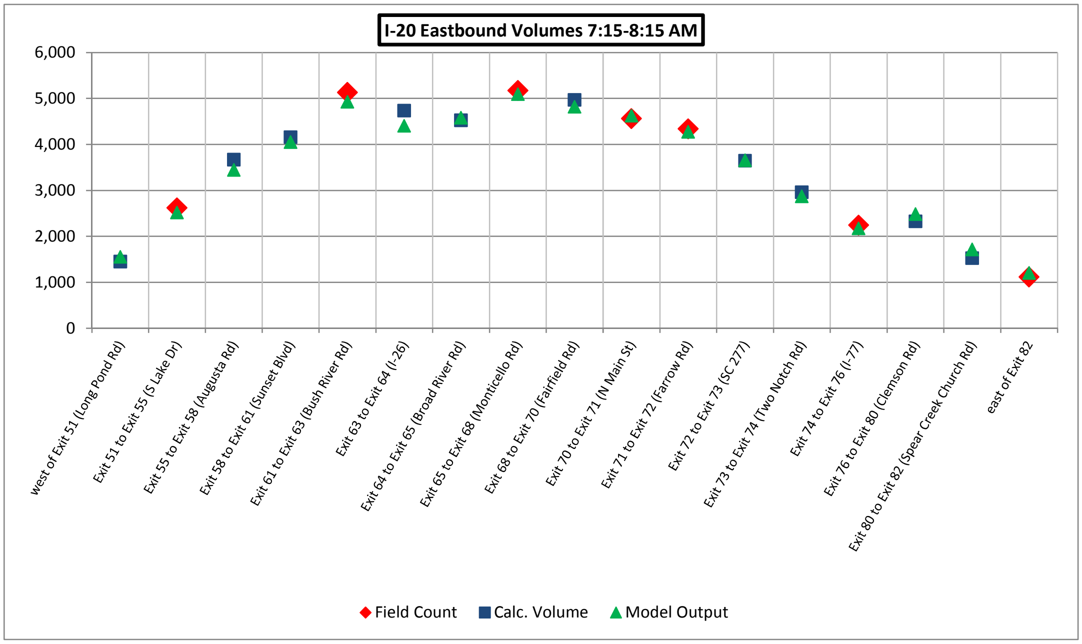


Figure 18. I-20 Eastbound Volume Comparison: AM Peak Hour

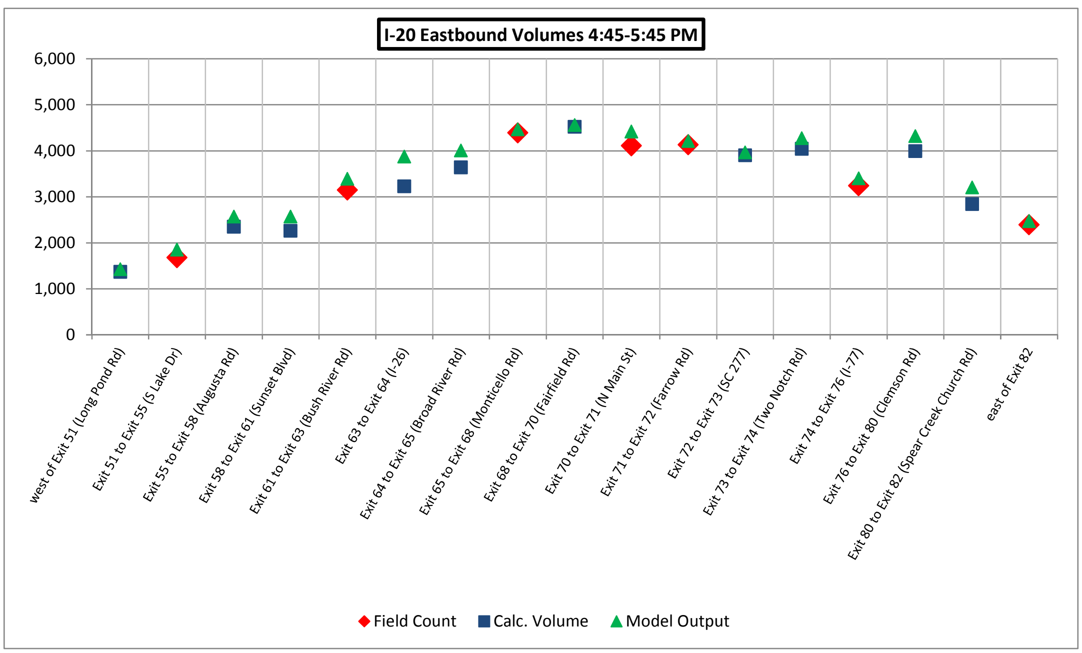


Figure 19. I-20 Eastbound Volume Comparison: PM Peak Hour

Table 10. I-20 Westbound Volume Comparison

I-20 Mainline Volume Calibration Summary		Westbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	west of Exit 51 (Long Pond Rd)	1987		1,008	1,108			2,024	1,647	
2	Exit 51 to Exit 55 (S Lake Dr)	2000	1,219		1,348	4	2,167		2,335	4
3	Exit 55 to Exit 58 (Augusta Rd)	2016		2,153	1,827			2,815	3,308	
4	Exit 58 to Exit 61 (Sunset Blvd)	2033		1,237	1,983			3,422	3,568	
5	Exit 61 to Exit 63 (Bush River Rd)	2049	2,618		2,857	5	4,558		4,718	2
6	Exit 63 to Exit 64 (I-26)	2064		1,919	3,061			3,924	4,878	
7	Exit 64 to Exit 65 (Broad River Rd)	4337		4,151	3,695			4,637	4,246	
8	Exit 65 to Exit 68 (Monticello Rd)	4347	4,580		4,629	1	4,884		5,427	8
9	Exit 68 to Exit 70 (Fairfield Rd)	4357		5,838	4,576			5,749	5,071	
10	Exit 70 to Exit 71 (N Main St)	4362	4,318		4,395	1	4,731		5,005	4
11	Exit 71 to Exit 72 (Farrow Rd)	4383	4,246		4,215	0	4,197		4,680	7
12	Exit 72 to Exit 73 (SC 277)	4399		4,246	4,049			4,197	4,170	
13	Exit 73 to Exit 74 (Two Notch Rd)	4409		3,738	4,375			2,795	3,416	
14	Exit 74 to Exit 76 (I-77)	4429	3,738		3,684	1	2,795		2,888	2
15	Exit 76 to Exit 80 (Clemson Rd)	943		3,738	4,561			2,795	2,917	
16	Exit 80 to Exit 82 (Spear Creek Church Rd)	968		3,738	3,679			2,795	2,247	
17	east of Exit 82	971	2,763		2,850	2	1,580		1,763	4

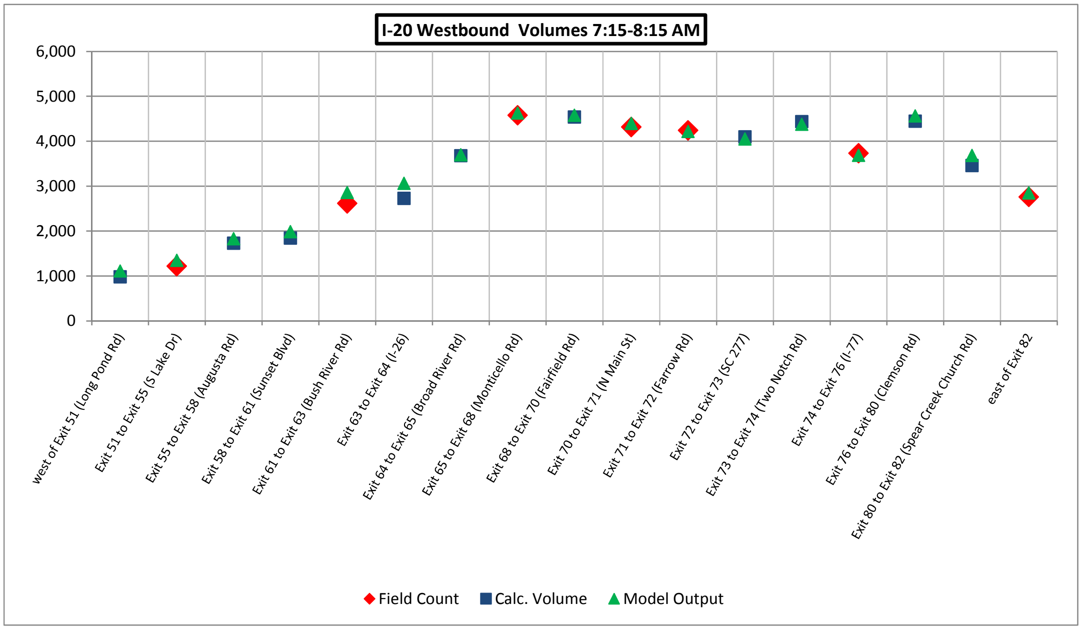


Figure 20. I-20 Westbound Volume Comparison: AM Peak Hour

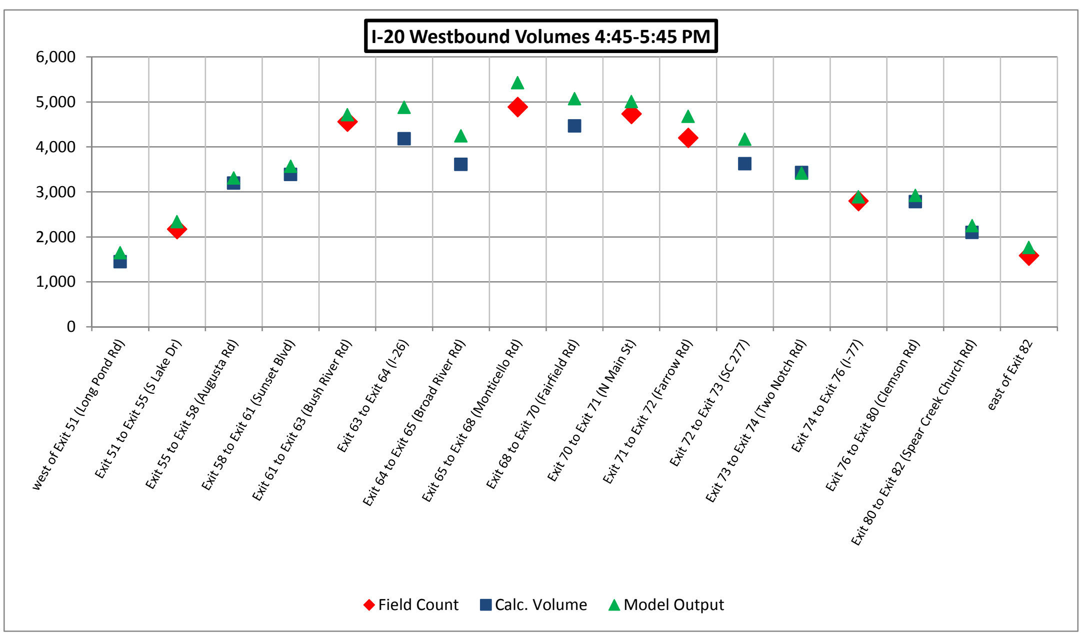


Figure 21. I-20 Westbound Volume Comparison: PM Peak Hour

Table 11. I-20 Ramp Volume Comparison

	I-20 Ramp Volume Calibration Summary		Eastbound									Westbound								
			7:15-8:15 AM				4:45-5:45 PM					7:15-8:15 AM				4:45-5:45 PM				
#	Location	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.
1	Exit 51 (Long Pond Rd) off ramp	1996	134	169	3	35	156	173	1	17	2003	379	375	0	-4	897	826	2	-71
2	Exit 51 (Long Pond Rd) on ramp	1998	1,304	1,134	5	-170	467	542	3	75	1991	138	158	2	20	173	201	2	28
3	Exit 55 off ramp (S Lake Dr) (nb)	2012	251	239	1	-12	199	209	1	10	2015	309	300	0	-9	452	430	1	-22
4	Exit 55 on ramp (S Lake Dr) (sb)										6380	370	364	0	-6	774	803	1	29
5	Exit 55 (S Lake Dr) on ramp	5004	1,299	1,251	1	-48	868	909	1	41	2008	170	180	1	10	196	204	1	8
6	Exit 58 (Augusta Rd) off ramp	2023	458	467	0	9	516	558	2	42	2034	487	455	1	-32	762	793	1	31
7	Exit 58 (Augusta Rd) on ramp	2027	1,318	1,233	2	-85	478	540	3	62	2019	308	353	2	45	605	623	1	18
8	Exit 61 (Sunset Blvd) off ramp	2041	864	812	2	-52	315	400	5	85	2050	1,104	1,169	2	65	1,737	1,646	2	-91
9	Exit 61 (Sunset Blvd) on ramp (wb)	2045	674	650	1	-24	493	478	1	-15	2038	191	194	0	3	355	361	0	6
10	Exit 61 (Sunset Blvd) on ramp (eb)	2036	1,163	1,053	3	-110	709	722	0	13	2035	138	139	0	1	209	219	1	10
11	Exit 63 (Bush River Rd) off ramp	2055	863	790	3	-73	684	563	5	-121	2066	449	588	6	139	460	835	15	375
12	Exit 63 (Bush River Rd) on ramp	2067	99	80	2	-19	176	177	0	1	2056	342	383	2	41	840	666	6	-174
13	Exit 63 (Bush River Rd) on ramp (eb)	2058	367	237	7	-130	592	860	10	268									
14	Exit 64 from eb I-26	3278	1,410	1,472	2	62	1,366	1,229	4	-137	3288	518	645	5	127	793	918	4	125
15	Exit 64 from wb I-26	4316	619	545	3	-74	579	551	1	-28	3279	419	500	4	81	1,016	1,424	12	408
16	Exit 64 to eb I-26	4322	1,203	1,244	1	41	677	980	11	303	3274	790	706	3	-84	594	618	1	24
17	Exit 64 to wb I-26	4332	584	572	0	-12	574	674	4	100	3281	1,122	1,059	2	-63	1,145	1,112	1	-33
18	Exit 65 (Broad River Rd) off ramp	4341	363	381	1	18	266	464	10	198	4346	1,210	1,131	2	-79	1,556	1,574	0	18
19	Exit 65 (Broad River Rd) on ramp	4344	1,014	1,078	2	64	1,018	1,008	0	-10	4339	307	272	2	-35	284	430	8	146
20	Exit 68 (Monticello Rd) off ramp	4350	736	781	2	45	478	554	3	76	4356	441	458	1	17	358	409	3	51
21	Exit 68 (Monticello Rd) on ramp	5159	530	450	4	-80	609	568	2	-41	4348	484	506	1	22	776	740	1	-36
22	Exit 70 (Fairfield Rd) off ramp	4366	639	629	0	-10	426	465	2	39	4360	475	497	1	22	373	378	0	5
23	Exit 70 (Fairfield Rd) on ramp	4371	451	461	0	10	302	325	1	23	4363	264	270	0	6	230	298	4	68
24	Exit 71 (N Main St) off ramp	4380	513	556	2	43	494	505	1	11	4384	464	463	0	-1	232	247	1	15
25	Exit 71 (N Main St) on ramp	4388	240	247	0	7	270	294	1	24	4376	647	669	1	22	516	559	2	43
26	Exit 72 (Farrow Rd) off ramp	4393	824	822	0	-2	415	455	2	40	4400	177	180	0	3	100	129	3	29
27	Exit 72 (Farrow Rd)on ramp	4403	127	230	8	103	183	212	2	29	4394	327	364	2	37	673	640	1	-33
28	Exit 73 to sb SC 277	4408	170	1	18	-169	132	103	3	-30	4410	1,829	1,749	2	-80	579	590	0	11
29	Exit 73 from sb SC 277										4412	1,477	1,369	3	-108	1,270	1,330	2	60
30	Exit 73 to nb SC 277	4417	1,256	1,227	1	-29	1,244	1,261	0	17									
31	Exit 73 from nb SC 277	4421	498	448	2	-50	1,839	1,642	5	-197	4416	96	77	2	-19	134	0	16	-134
32	Exit 74 (Two Notch Rd) off ramp	4424	859	836	1	-24	1,093	1,121	1	28	4430	272	259	1	-13	201	259	4	58
33	Exit 74 (Two Notch Rd) on ramp	4434	141	156	1	15	293	274	1	-19	4426	971	985	0	14	835	783	2	-52
34	Exit 76 to sb I-77	6387	631	407	10	-224	629	519	5	-110	6388	1,720	1,615	3	-105	938	998	2	60
35	Exit 76 from sb I-77	4102	433	400	2	-33	467	478	0	11	6389	34	1	8	-33	56	1	10	-55
36	Exit 76 to nb I-77										938	1,778	1,749	1	-29	964	1,010	1	46
37	Exit 76 from nb I-77	4108	863	877	0	14	1,656	1,730	2	74	4107	557	488	3	-69	603	591	0	-12
	Exit 76A (Alpine Rd) off ramp	5264	733	698	1	-35	931	911	1	-20	944	220	217	0	-3	110	115	0	5
	Exit76A (Alpine Rd) on ramp	956	152	177	2	25	185	190	0	5	6396	699	567	5	-132	431	413	1	-18
38	Exit 80 (Clemson Rd) off ramp	945	958	916	1	-42	1,408	1,359	1	-49	969	270	281	1	11	184	189	0	5
39	Exit 80 (Clemson Rd) on ramp	39	157	160	0	3	258	258	0	0	960	1,258	1,272	0	14	865	898	1	33

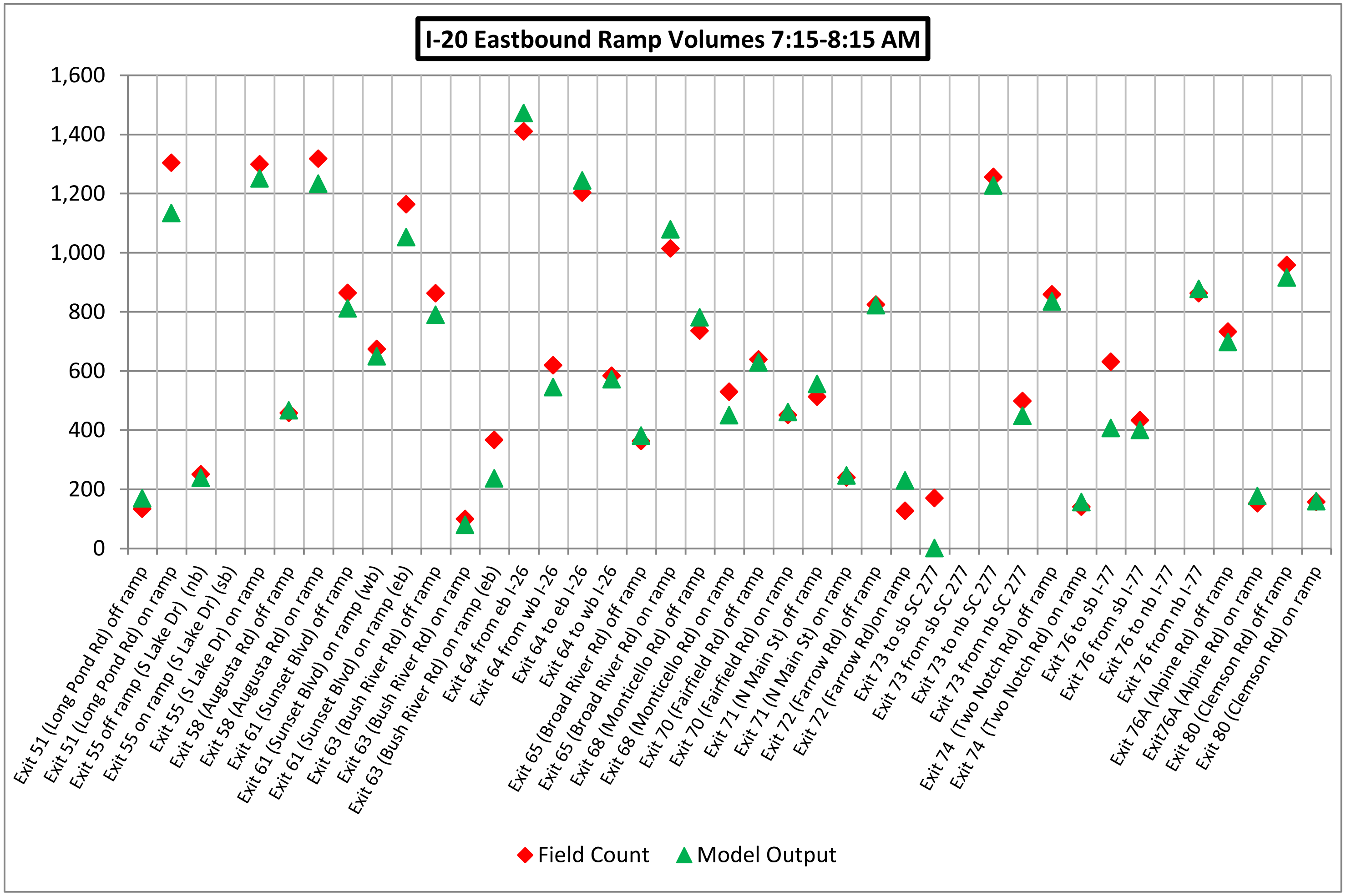


Figure 22. I-20 Eastbound Ramp Volumes: AM Peak Hour

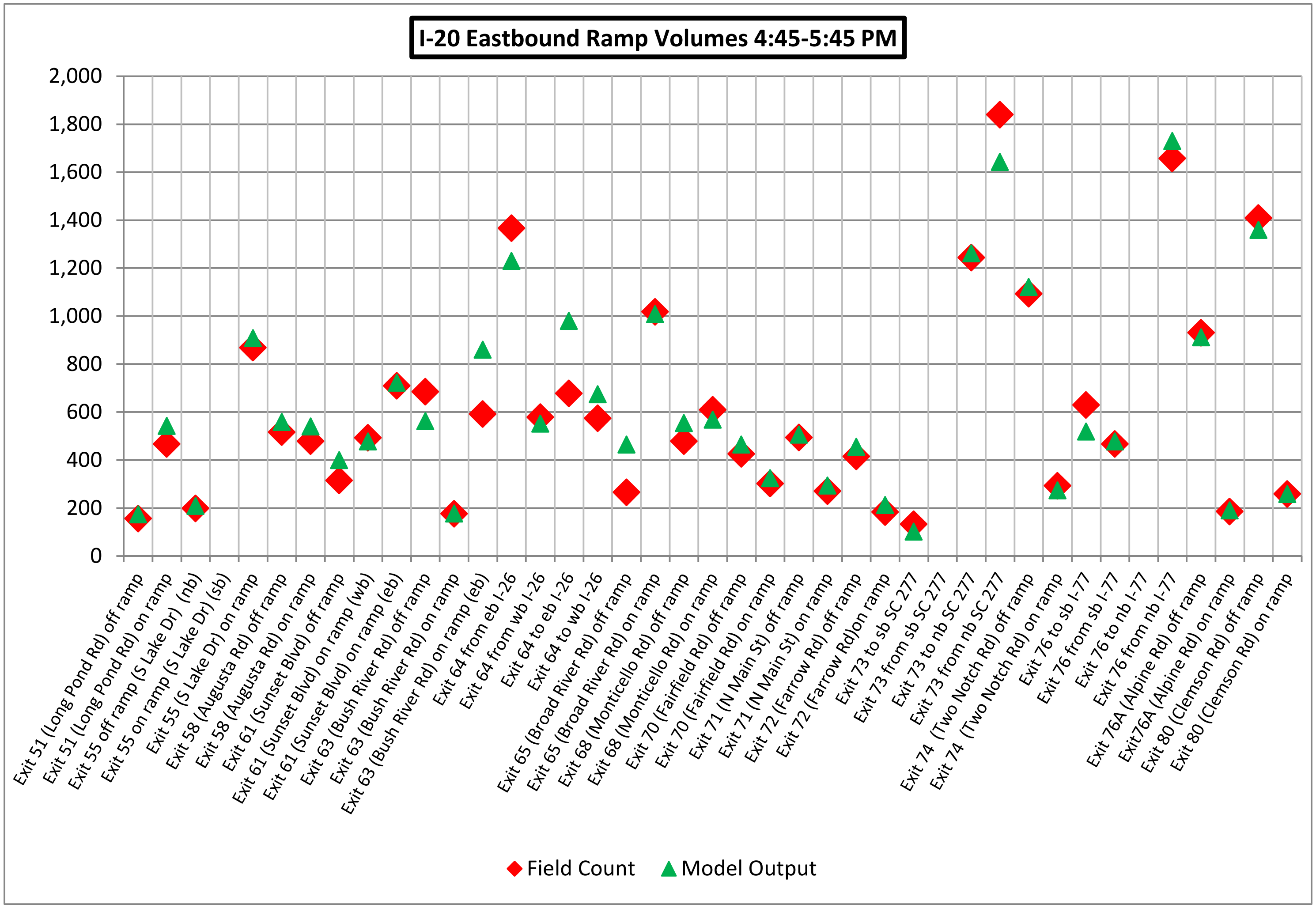


Figure 23. I-20 Eastbound Ramp Volumes: PM Peak Hour

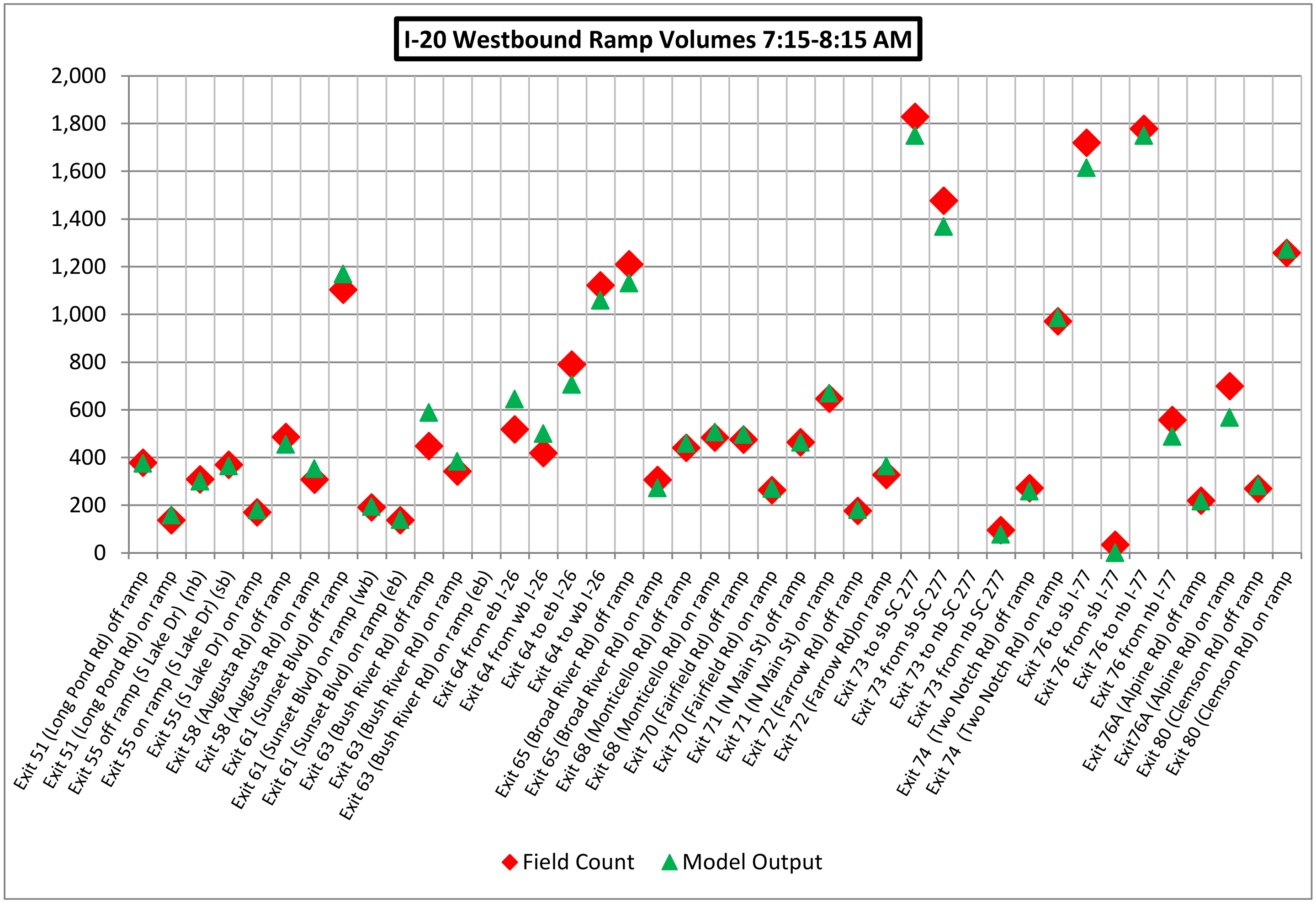


Figure 24. I-20 Westbound Ramp Volumes: AM Peak Hour

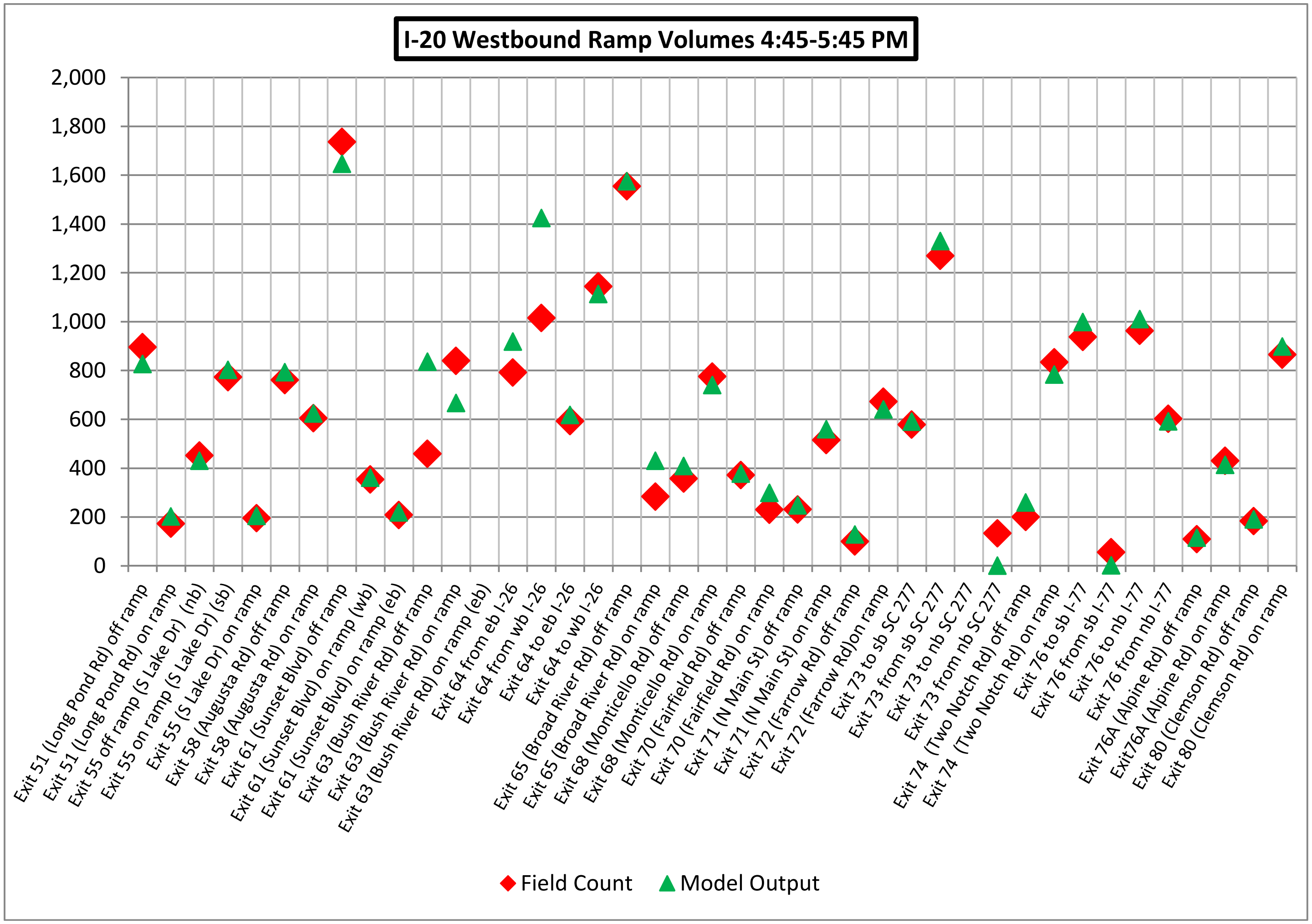


Figure 25. I-20 Westbound Ramp Volumes: PM Peak Hour

Table 12. I-20 Segment Speed Comparison

		Eastbound						Westbound				
Segment	Location	Segment	AM		PM			Segment	AM		PM	
		ID	INRIX	Model	INRIX	Model		ID	INRIX	Model	INRIX	Model
1	west of Exit 51 (Long Pond Rd)	8626		71	70	72		8627		71	70	72
2	Exit 51 to Exit 55 (S Lake Dr)	8657		62	70	64		2767		62	70	64
3	Exit 55 to Exit 58 (Augusta Rd)	2793	53	49	67	61		2790	53	49	67	61
4	Exit 58 to Exit 61 (Sunset Blvd)	2805	61	55	67	62		2816	61	55	67	62
5	Exit 61 to Exit 63 (Bush River Rd)	8542	62	61	65	64		2838	62	61	65	64
6	Exit 63 to Exit 64 (I-26)	2863	58	63	61	62		2859	58	63	61	62
7	Exit 64 to Exit 65 (Broad River Rd)	6207	60	61	60	62		6230	60	61	60	62
8	Exit 65 to Exit 68 (Monticello Rd)	6243	63	59	64	61		8658	63	59	64	61
9	Exit 68 to Exit 70 (Fairfield Rd)	6259	62	61	63	61		6265	62	61	63	61
10	Exit 70 to Exit 71 (N Main St)	6285	62	61	64	62		6273	62	61	64	62
11	Exit 71 to Exit 72 (Farrow Rd)	8548	60	61	62	63		8547	60	61	62	63
12	Exit 73 (SC 277) to Exit 74 (Two Notch Rd)	6351	63	65	63	59		6334	63	65	63	59
13	Exit 74 to Exit 76 (I-77)	6374	63	65	63	64		6365	63	65	63	64
14	Exit 76 to Exit 80 (Clemson Rd)	8643	62	65	59	61		1059	62	65	59	61
15	Exit 80 to Exit 82 (Spear Creek Church Rd)	1112	63	66	63	63		1098	63	66	63	63
16	east of Exit 82	8645	67	72	69	67		1106	67	72	69	67

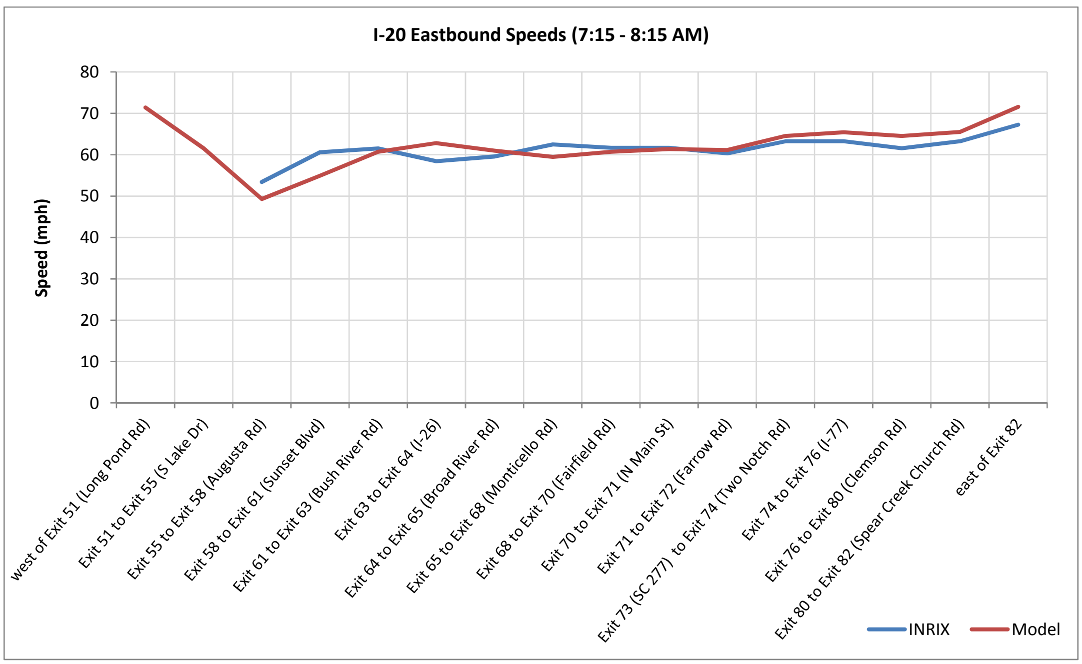


Figure 26. I-20 Eastbound Speeds: AM Peak Hour

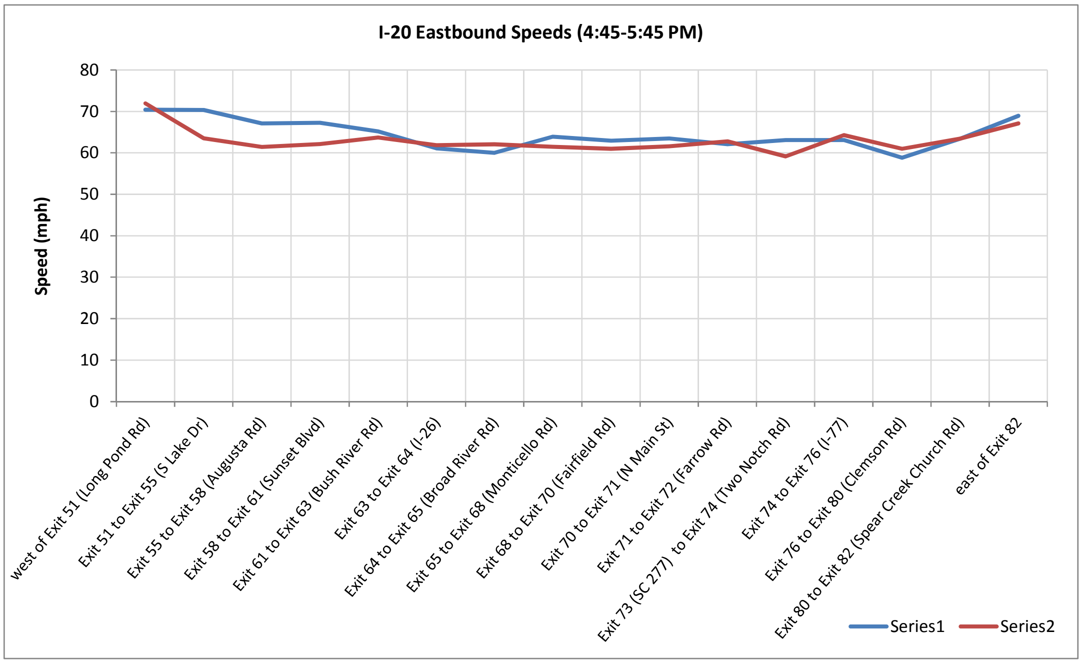


Figure 27. I-20 Eastbound Speeds: PM Peak Hour

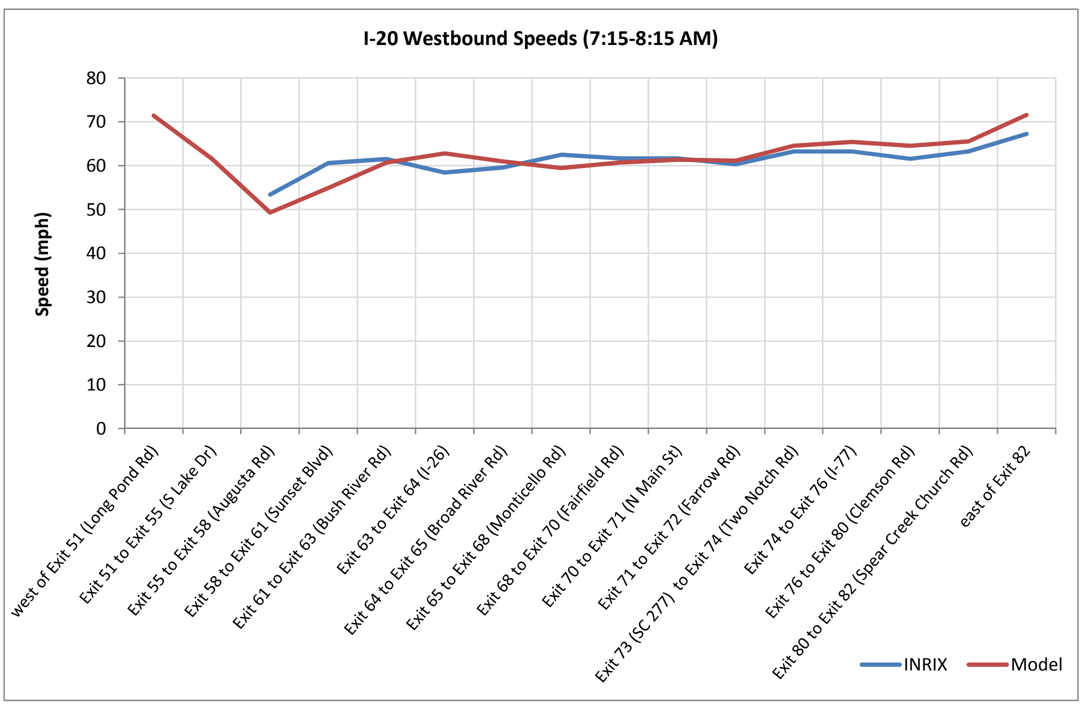


Figure 28. I-20 Westbound Speeds: AM Peak Hour

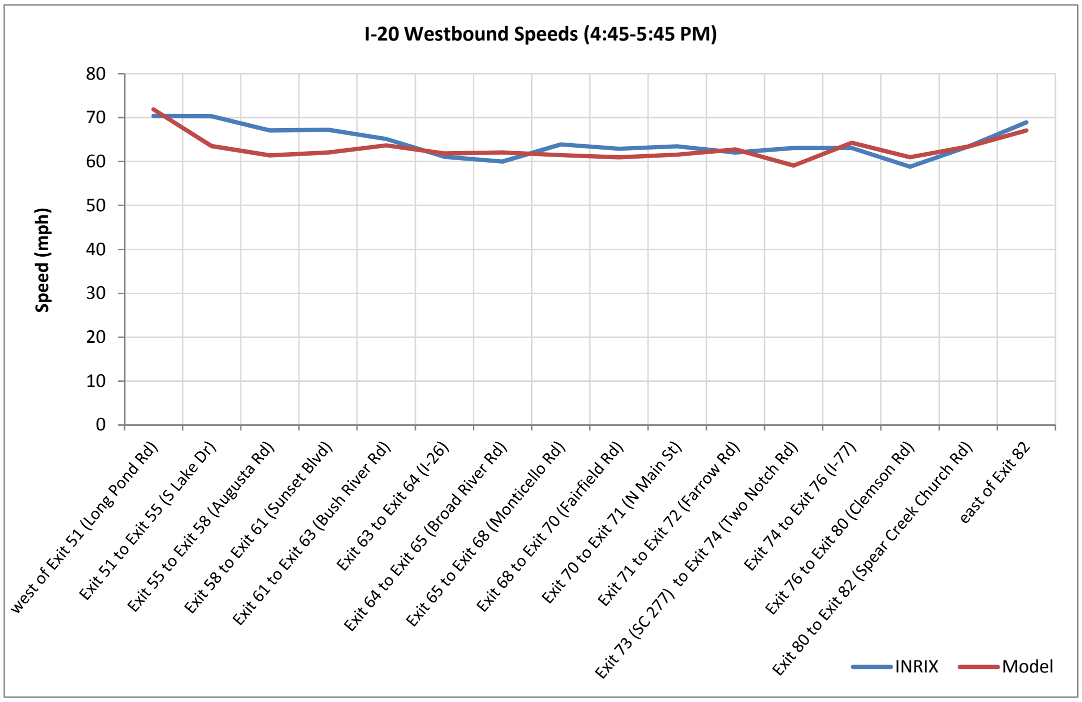


Figure 29. I-20 Westbound Speeds: PM Peak Hour

3.3.3 I-77 Corridor Statistics

Table 13. I-77 Northbound Volume Comparison

I-77 Mainline Volume Calibration Summary		Northbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	north of Exit 22 (Killian Rd)	3879	1,874		1,945	2	2,742		3,092	6
2	Exit 22 to Exit 19 (Farrow Rd)	3971		2,495	2,641			4,351	4,824	
4	Exit 18 (SC 277) to Exit 17 (Two Notch Road)	4049		2,106	2,156			2,775	2,881	
5	Exit 17 to Exit 16 (I-20)	4083	2,202		2,304	2	2,889		3,052	3
6	Exit 16 to Exit 15 (Percival Rd)	4105		3,016	3,099			4,770	5,011	
7	Exit 15 to Exit 13 (Decker Blvd)	4126		3,041	3,079			4,774	4,918	
8	Exit 15 to Exit 12 (Forest Dr)	4128		3,630	3,695			5,471	5,645	
9	Exit 12 to Exit 10 (Fort Jackson)	4139		3,543	3,932			4,830	5,033	
10	Exit 10 to Exit 9 (Garners Ferry Rd / Leesburg Rd)	4155		3,657	3,818			4,040	4,455	
11	Exit 9 to Exit 6 (Shop Rd)	4173	2,453		2,723	5	3,203		3,595	7
12	Exit 6 to Exit 5 (Bluff Rd)	4190		3,248	3,427			3,815	3,874	
13	Exit 5 to Exit 2 (12 St. Extension)	4205		3,895	4,217			3,771	3,853	
14	Exit 2 to Exit 1 (I-26)	4217		4,094	4,520			3,395	3,416	

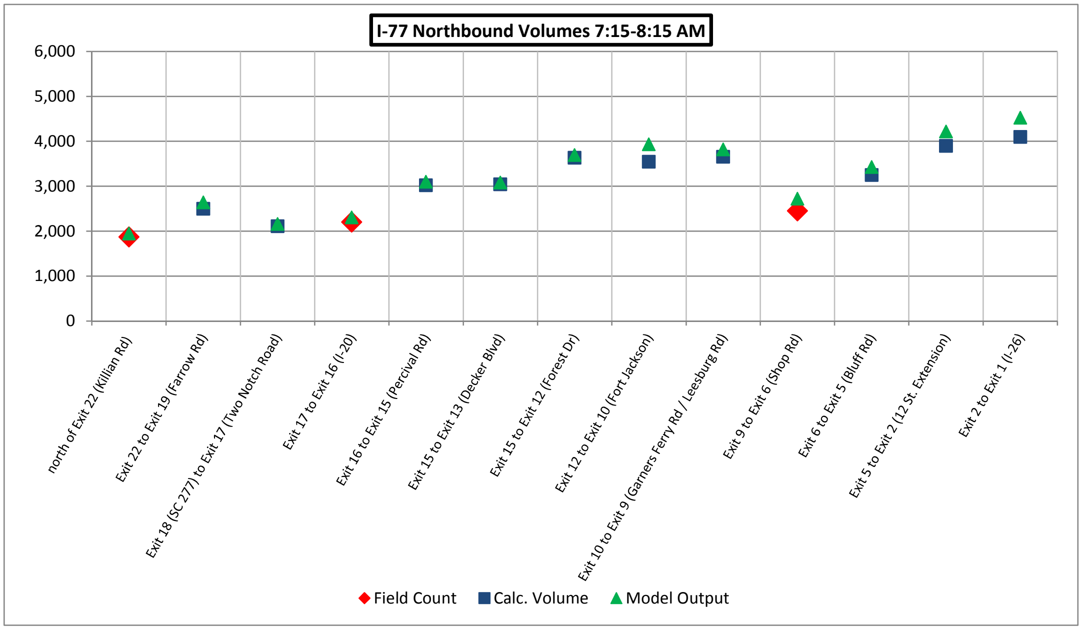


Figure 30. I-77 Northbound Volume Comparison: AM Peak Hour

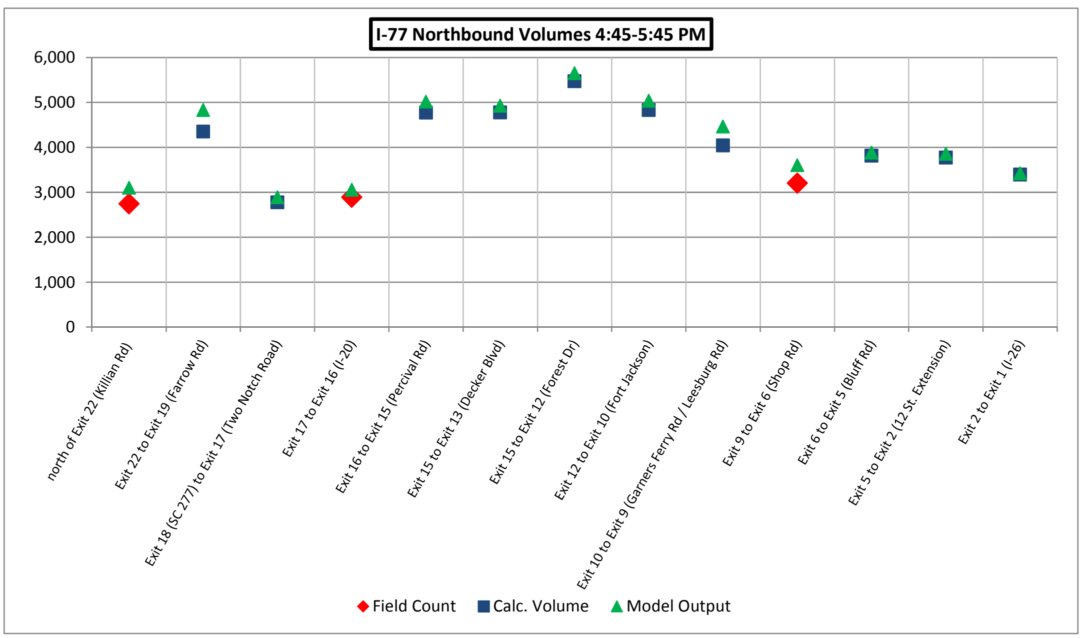


Figure 31. I-77 Northbound Volume Comparison: PM Peak Hour

Table 14. I-77 Southbound Volume Comparison

I-77 Mainline Volume Calibration Summary			Southbound							
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	north of Exit 22 (Killian Rd)	3864	3,208		3,490	5	2,254		2,650	8
2	Exit 22 to Exit 19 (Farrow Rd)	3968		3,688	5,220			3,036	3,550	
4	Exit 18 (SC 277) to Exit 17 (Two Notch Road)	4053		2,797	2,531			1,834	2,465	
5	Exit 17 to Exit 16 (I-20)	6375	3,010		2,899	2	2,367		2,609	5
6	Exit 16 to Exit 15 (Percival Rd)	4110		2,776	4,499			3,026	3,648	
7	Exit 15 to Exit 13 (Decker Blvd)	3861		4,982	4,092			3,092	3,586	
8	Exit 15 to Exit 12 (Forest Dr)	4124		6,556	4,697			5,224	4,246	
9	Exit 12 to Exit 10 (Fort Jackson)	4143		6,556	4,574			5,224	4,399	
10	Exit 10 to Exit 9 (Garners Ferry Rd / Leesburg Rd)	4158		3,323	4,070			2,771	3,909	
11	Exit 9 to Exit 6 (Shop Rd)	6372	3,323		3,500	3	2,771		3,139	7
12	Exit 6 to Exit 5 (Bluff Rd)	4192		3,323	3,855			2,771	3,757	
13	Exit 5 to Exit 2 (12 St. Extension)	4204		3,323	3,875			2,771	4,716	
14	Exit 2 to Exit 1 (I-26)	4222		3,323	3,272			2,771	4,533	

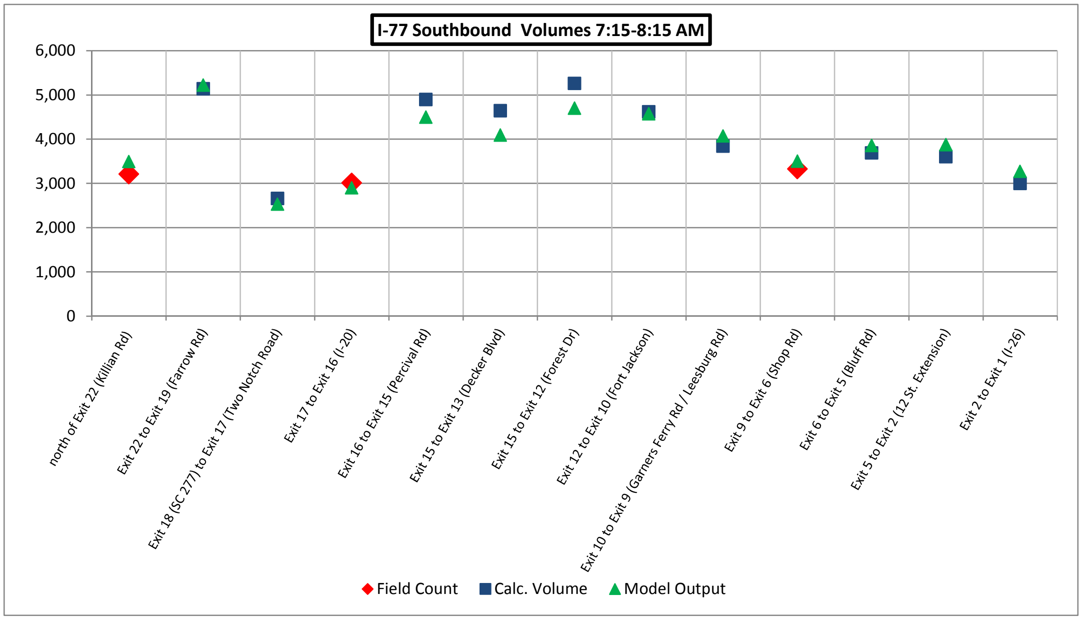


Figure 32. I-77 Southbound Volume Comparison: AM Peak Hour

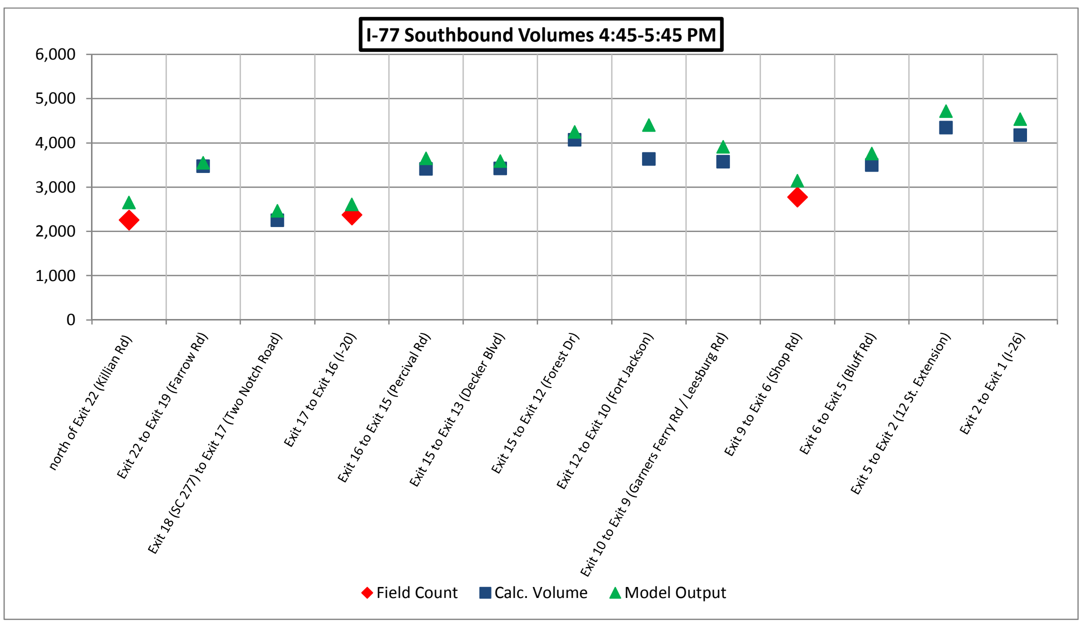


Figure 33. I-77 Southbound Volume Comparison: PM Peak Hour

Table 15. I-77 Ramp Volume Comparison

	I-77 Ramp Volume Calibration Summary		Northbound								Southbound									
			7:15-8:15 AM				4:45-5:45 PM					7:15-8:15 AM				4:45-5:45 PM				
#	Location	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.	
1	Exit 22 (Killian Rd) off ramp	3972	784	781	0	-3	1,877	1,808	2	-69	3918	204	217	1	13	581	588	0	7	
2	Exit 22 (Killian Rd) on ramp	3956	163	143	2	-20	268	226	3	-42	3967	2,136	2,031	2	-105	1,801	1,467	8	-334	
3	Exit 19 (Farrow Rd) off ramp	4044	759	732	1	-27	512	513	0	1	4021	292	286	0	-6	166	168	0	2	
4	Exit 19 (Farrow) on ramp	4006	79	81	0	2	163	151	1	-12	4515	445	564	5	119	651	632	1	-19	
5	Exit 18 from nb SC 277 /to sb SC 277	4031	1,162	1,179	1	17	2,348	2,475	3	127	6436	2,723	2,837	2	114	1,286	1,362	2	76	
6	Exit 17 (Two Notch Road) off ramp	4084	360	378	1	18	408	452	2	44	4068	290	259	2	-31	252	261	1	9	
7	Exit 17 (Two Notch Road) on ramp	4074	264	254	1	-10	294	295	0	1	4078	642	638	0	-4	373	397	1	24	
8	Exit 16 to wb I-20	4107	557	488	3	-69	603	591	0	-12	6389	34	1	8	-33	56	1	10	-55	
9	Exit 16 to eb I-20	4108	863	877	0	14	1,656	1,730	2	74	4102	433	400	2	-33	467	478	0	11	
10	Exit 16 from wb I-20	4092	606	583	1	-23	378	370	0	-8	6388	1,720	1,615	3	-105	938	998	2	60	
11	Exit 16 from eb I-20										6387	631	407	10	-224	629	519	5	-110	
12	Exit 15 (Percival Rd) off ramp	4125	301	318	1	17	370	378	0	8	4114	668	658	0	-11	355	366	1	11	
13	Exit 15 (Percival Rd) off ramp (eb)	4121	70	48	3	-22	96	82	1	-14										
14	Exit 15 (Percival Rd) on ramp	4111	346	354	0	8	462	488	1	26	3860	287	285	0	-2	307	317	1	10	
15	Exit 13 (Decker Blvd) nb off / sb on ramp	4127	589	594	0	5	697	709	0	12	4123	621	625	0	4	650	647	0	-3	
16	Exit 12 (Forest Dr) off ramp	4140	568	530	2	-38	793	793	0	0	4142	977	948	1	-29	774	811	1	37	
17	Exit 12 (Forest Dr) on ramp	4130	317	326	1	9	1,372	1,409	1	37	3303	188	173	1	-15	256	175	6	-81	
18	Exit 10 (Fort Jackson) off ramp	4156	495	459	2	-36	260	297	2	37	4151	965	839	4	-126	781	810	1	29	
19	Exit 10 (Fort Jackson) on ramp	4145	582	628	2	46	901	929	1	28	4157	320	353	2	33	348	372	1	24	
20	Exit 9 (Leesburg Rd) off ramp	6429	154	185	2	31	315	341	1	26	4163	800	837	1	37	1,130	1,015	4	-115	
21	Exit 9 (Leesburg Rd) on ramp	4161	1,684	1,626	1	-58	1,154	1,161	0	7	4171	290	224	4	-66	150	133	1	-17	
22	Exit 9 (Garners Ferry Rd) off ramp	6426	659	672	1	13	430	454	1	24	4169	540	484	2	-56	452	447	0	-5	
23	Exit 9 (Garners Ferry Rd) on ramp	6427	333	356	1	23	428	481	2	53	4175	529	575	2	46	628	611	1	-17	
24	Exit 6 (Shop Rd) off ramp	4189	803	862	2	59	768	832	2	64	4181	481	443	2	-38	264	287	1	23	
25	Exit 6 (Shop Rd) wb off ramp/on ramp	4185	132	109	2	-23	89	2	13	-87	4183	694	750	2	56	797	771	1	-26	
26	Exit 6 (Shop Rd) on ramp	4178	140	141	0	1	245	208	2	-37	6421	151	72	7	-79	190	136	4	-54	
27	Exit 5 (Bluff Rd) off ramp	4206	961	1,051	3	90	421	484	3	63	4193	575	557	1	-18	196	225	2	29	
28	Exit 5 (Bluff Rd) on ramp (nb)	4197	79	81	0	2	131	126	0	-5	4199	205	242	2	37	402	460	3	58	
29	Exit 5 (Bluff Rd) on ramp (sb)	4202	235	214	1	-21	334	378	2	44	4201	287	363	4	76	643	719	3	76	
30	Exit 2 (12 St. Extension) off ramp	4218	527	605	3	78	199	195	0	-4	4210	751	728	1	-23	547	543	0	-4	
31	Exit 2 (12 St. Extension) on ramp	4213	328	355	1	27	575	599	1	24	4221	144	184	3	40	379	398	1	19	
32	Exit 1 from/to wb I-26	4230	1,122	1,203	2	81	1,158	1,228	2	70	6416	994	1,037	1	43	1,005	1,156	5	151	
33	Exit 1 from/to eb I-26	1258	2,161	2,170	0	9	1,556	1,523	1	-33	6415	1,574	1,512	2	-62	2,132	2,056	2	-76	
34	Exit 1 from/to Fish Hatchery Rd	4246	1,171	1,199	1	28	644	650	0	6	6414	652	712	2	60	1,155	1,308	4	153	

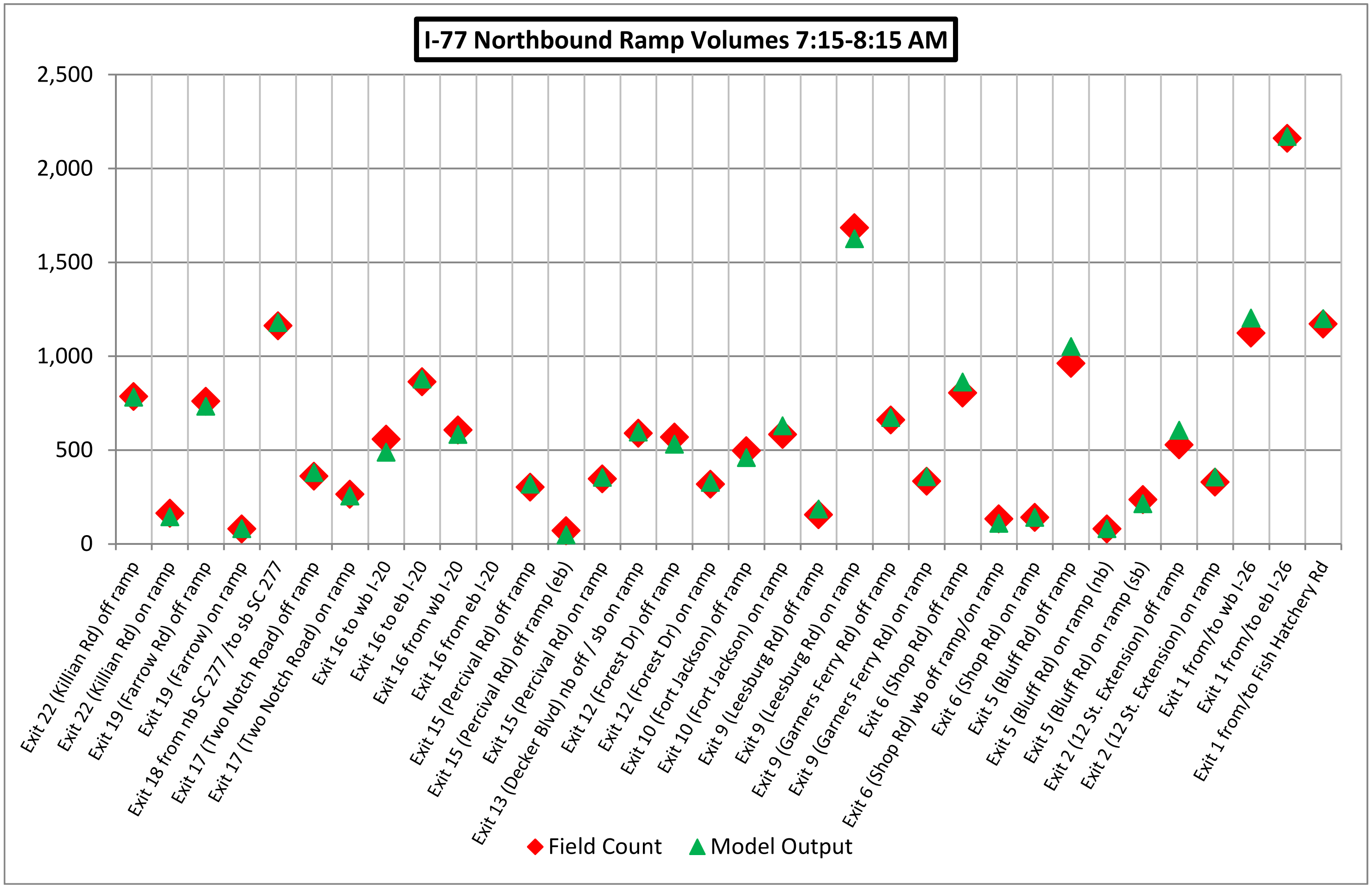


Figure 34. I-77 Northbound Ramp Volumes: AM Peak Hour

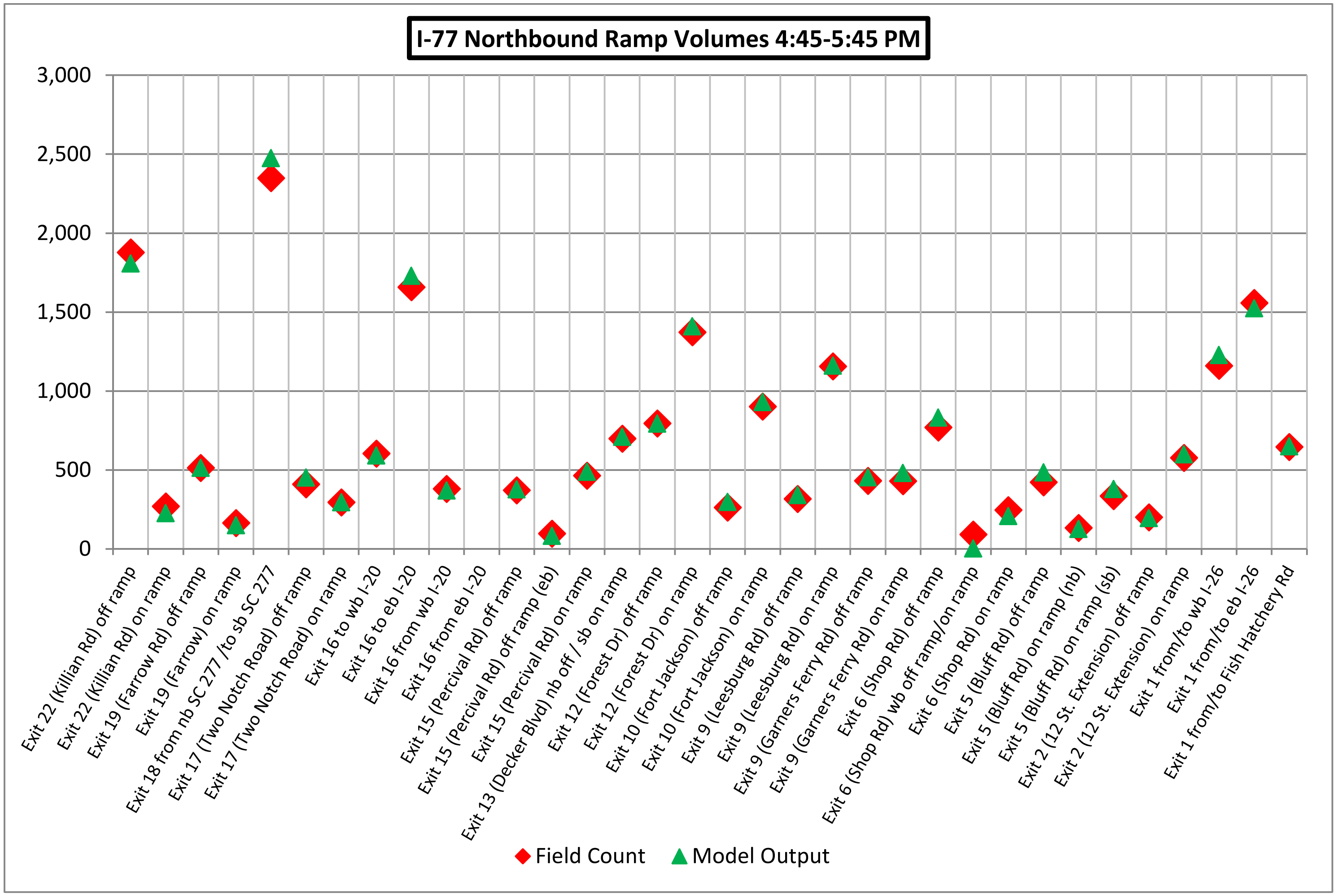


Figure 35. I-77 Northbound Ramp Volumes: PM Peak Hour

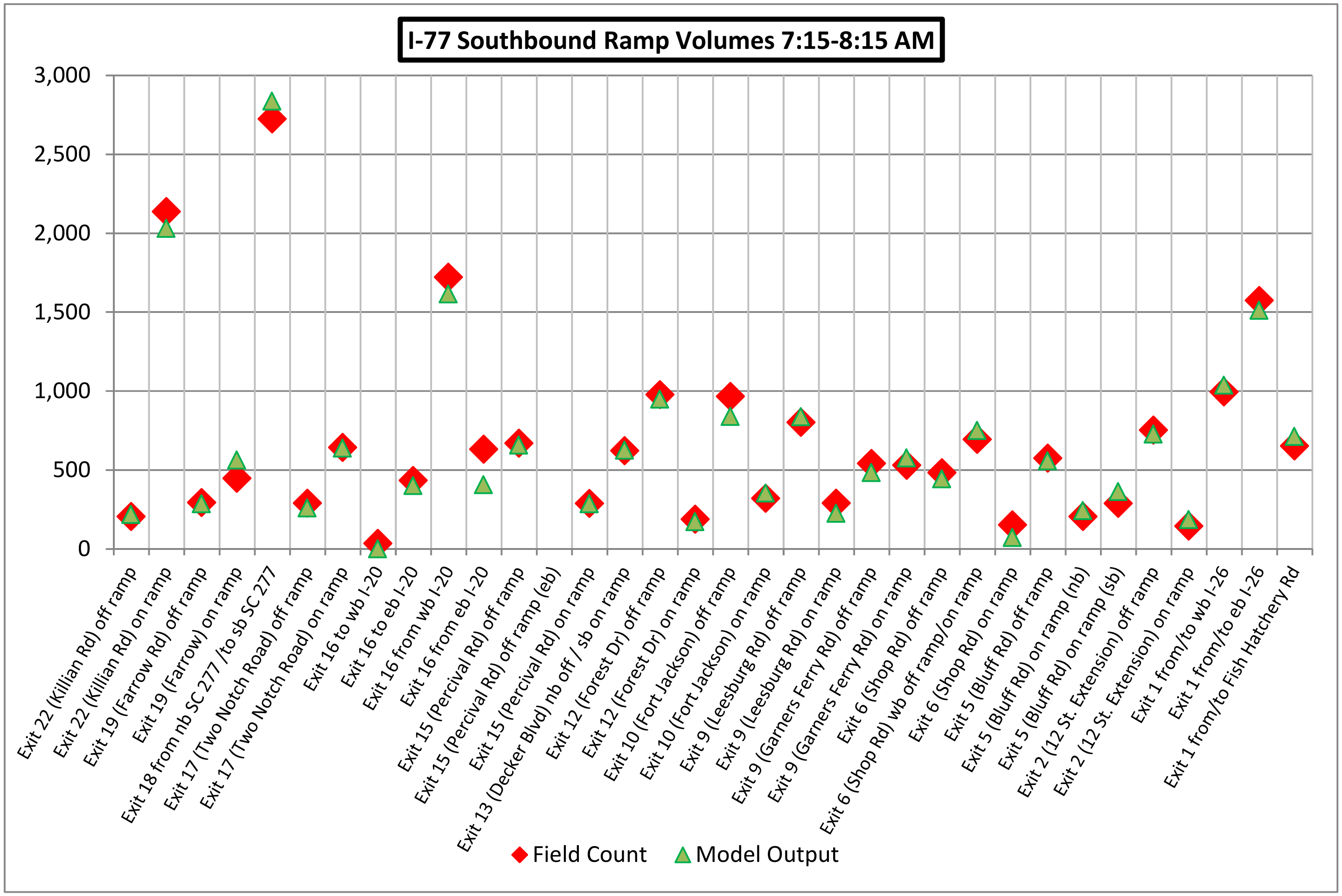


Figure 36. Southbound Ramp Volumes: AM Peak Hour

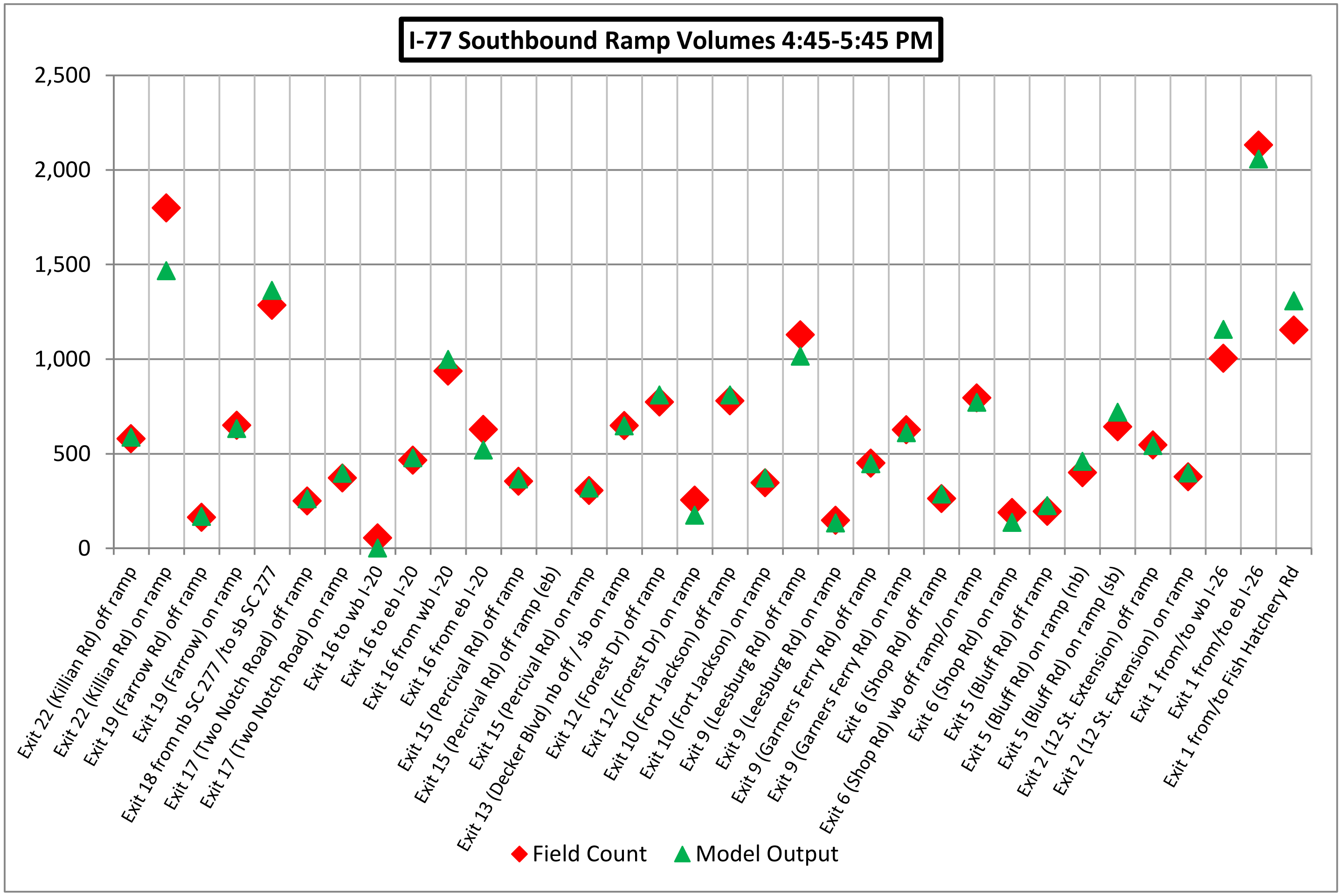


Figure 37. Southbound Ramp Volumes: PM Peak Hour

Table 16. I-77 Segment Speed Comparison

Segment	Location	Northbound						Southbound				
		Segment	AM		PM			Segment	AM		PM	
		ID	INRIX	Model	INRIX	Model		ID	INRIX	Model	INRIX	Model
1	north of Exit 22 (Killian Rd)	5586	67	71	68	70		5561	70	70	70	71
2	Exit 22 to Exit 19 (Farrow Rd)	5712	67	71	63	62		5707	68	61	68	68
3	Exit 18 (SC 277) to Exit 17 (Two Notch Rd)	5762	64	66	65	54		5829	66	64	65	63
5	Exit 17 to Exit 16 (I-20)	5869	64	63	65	61		8558	63	63	63	63
6	Exit 16 to Exit 15 (Percival Rd)	5899	61	63	62	52		5904	63	57	63	62
7	Exit 15 to Exit 13 (Decker Blvd)	5925	62	65	64	61		5557	64	63	64	63
8	Exit 13 to Exit 12 (Forest Dr)	5931	62	62	63	54		5922	62	56	63	59
9	Exit 12 to Exit 10 (Fort Jackson)	5946	63	63	64	59		5952	63	61	63	60
10	Exit 10 to Exit 9 (Garners Ferry Rd / Leesburg Rd)	5976	63	62	62	45		5969	63	63	65	61
11	Exit 9 to Exit 6 (Shop Rd)	8556	62	64	64	63		6002	65	64	64	65
12	Exit 6 to Exit 5 (Bluff Rd)	6020	60	64	63	63		6022	61	64	61	63
13	Exit 5 to Exit 2 (12 St. Extension)	6042	64	66	67	68		6038	65	67	63	65
14	Exit 2 to Exit 1 (I-26)	6060	64	57	66	68		6065	63	68	62	64

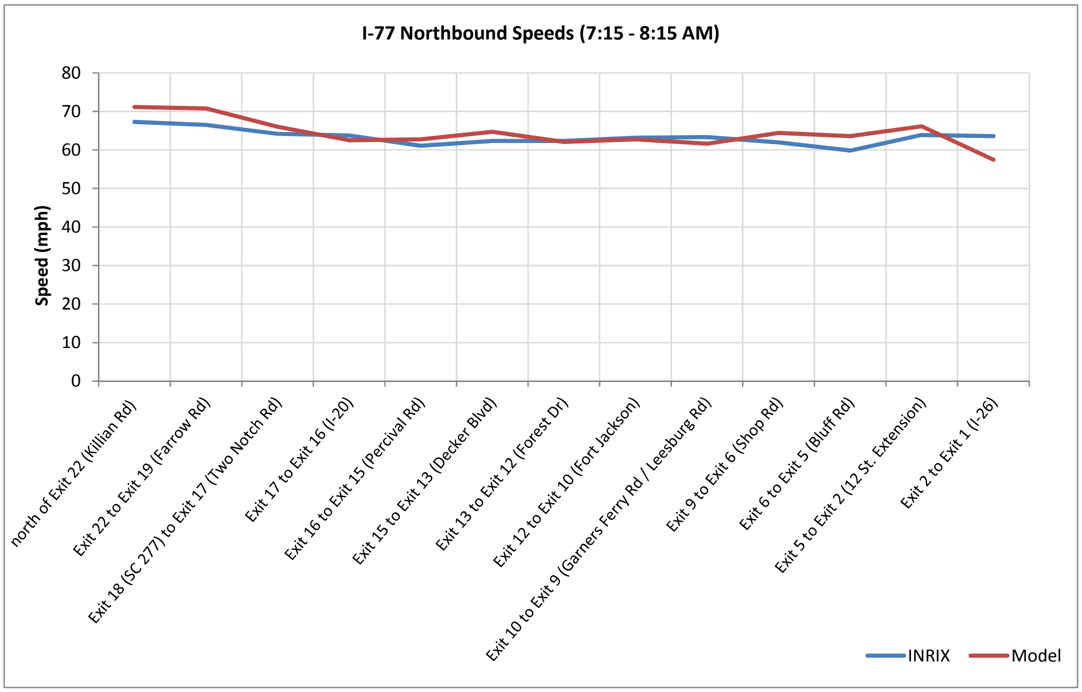


Figure 38. I-77 Northbound Speeds: AM Peak Hour

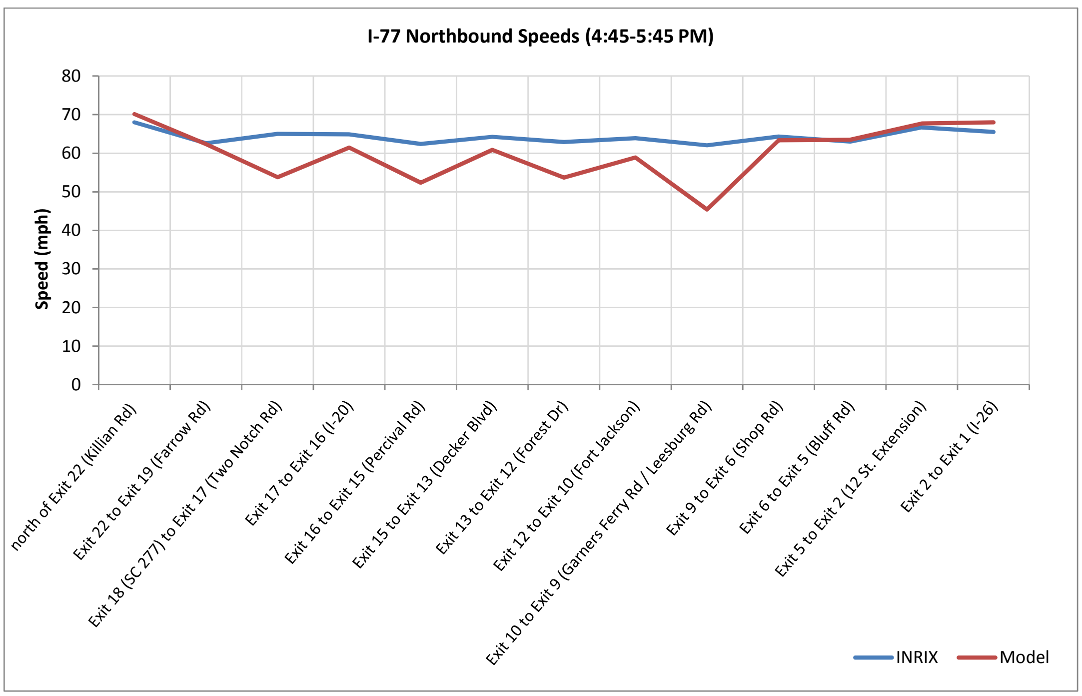


Figure 39. I-77 Northbound Speeds: PM Peak Hour

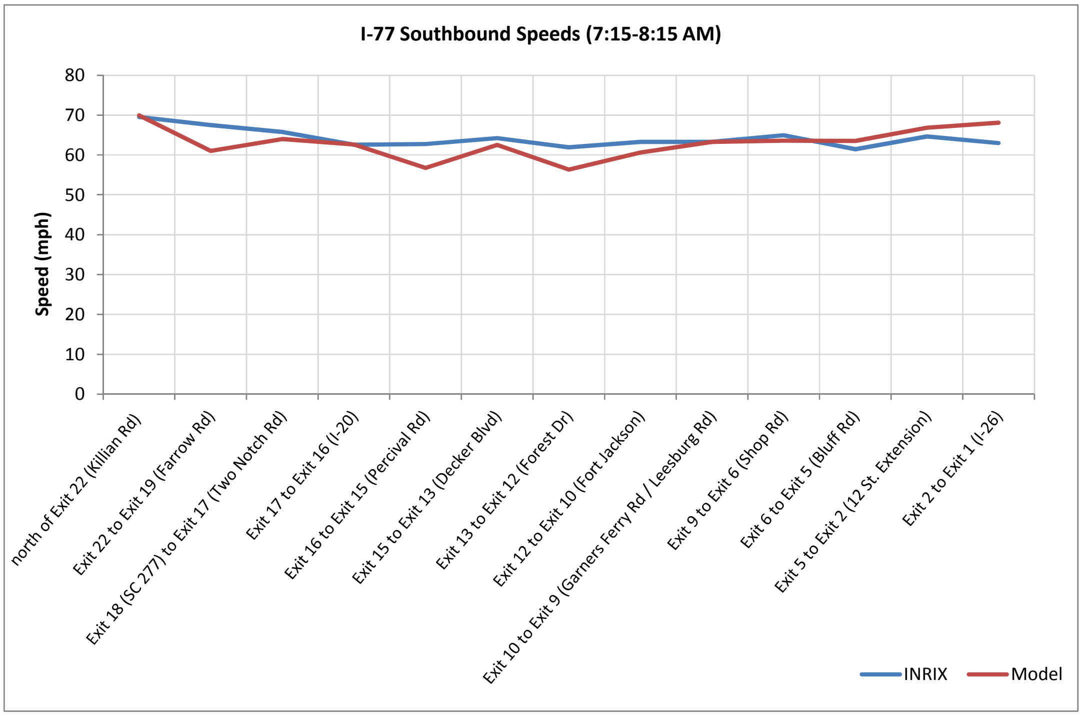


Figure 40. I-77 Southbound Speeds: AM Peak Hour

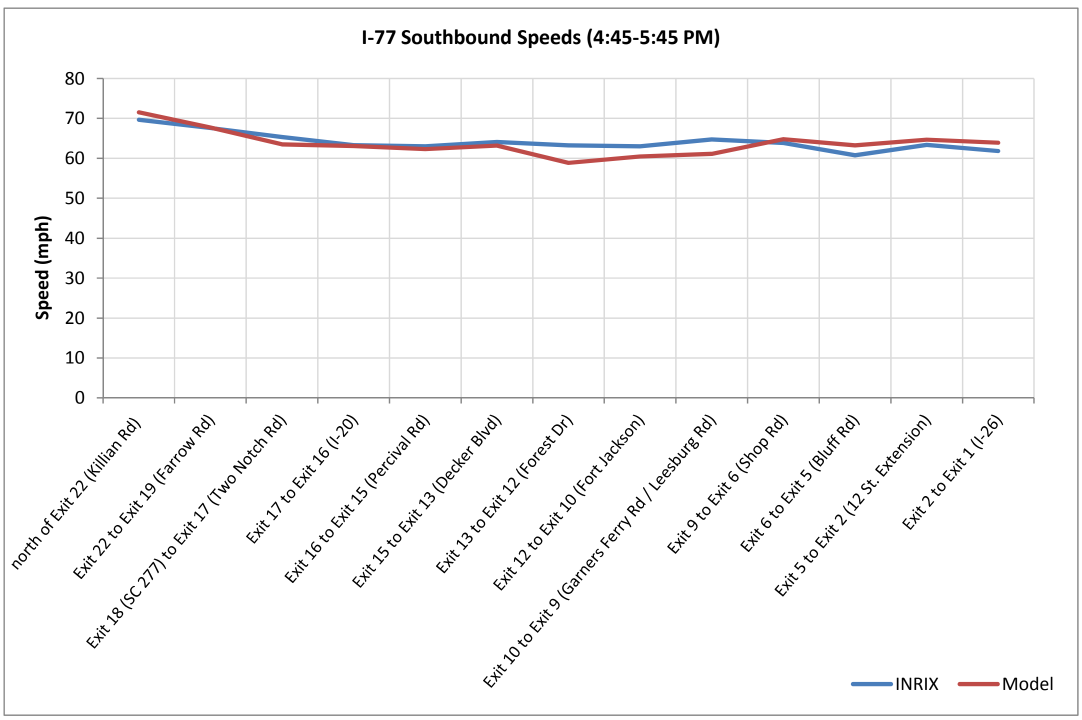


Figure 41. I-77 Southbound Speeds: PM Peak Hour

3.3.4 I-126 / SC-277 Corridor Statistics

Table 17. I-126 / SC-277 Eastbound Volume Comparison

I-126 / SC 277 Volume Summary		Eastbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	I-126 from I-26 to Colonial Life Blvd	3253	3,970		3,959	0	1,981		2,174	4
2	I-126 from Colonial Life Blvd to Greystone Blvd	3231		5,032	5,028			2,569	2,750	
3	I-126 from Greystone Blvd to Huger St	6377	5,295		4,960	5	2,747		2,579	3
1	SC 277 from Sunset Dr to Farrow Rd	4482		890	874			3,256	3,015	
2	SC 277 from Farrow Rd to Fontaine Rd	4472	1,040		968	2	3,753		3,525	4
3	SC 277 from Fontaine Rd to I-20	4423		1,208	1,124			4,149	3,918	
4	SC 277 from I-20 to Parklane Rd	4415		1,870	1,800			3,420	3,498	

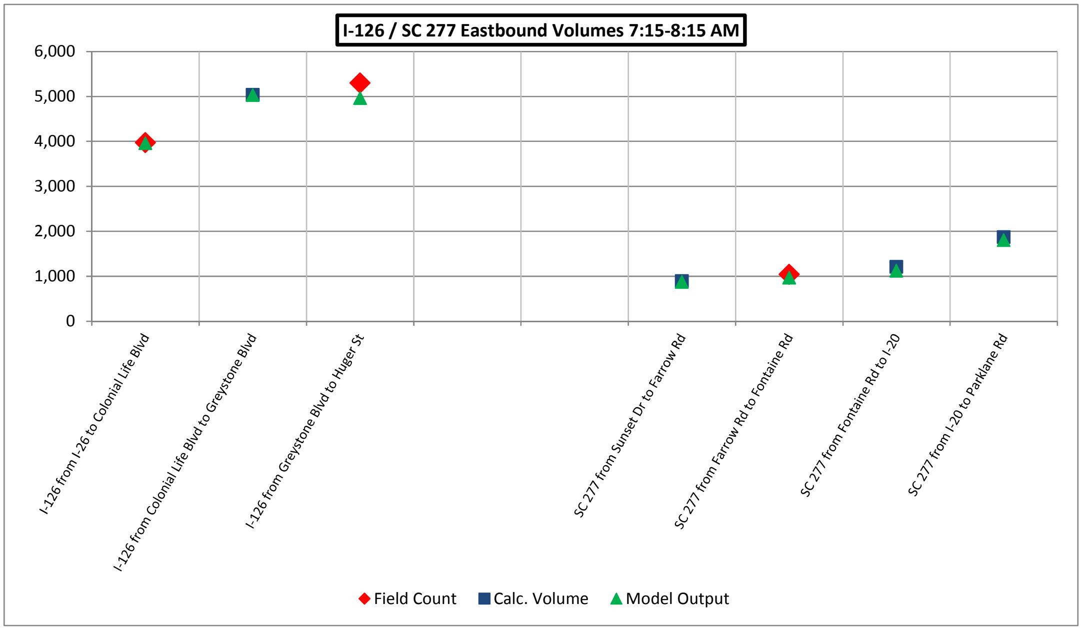


Figure 42. I-126 / SC-277 Eastbound Volume Comparison: AM Peak Hour

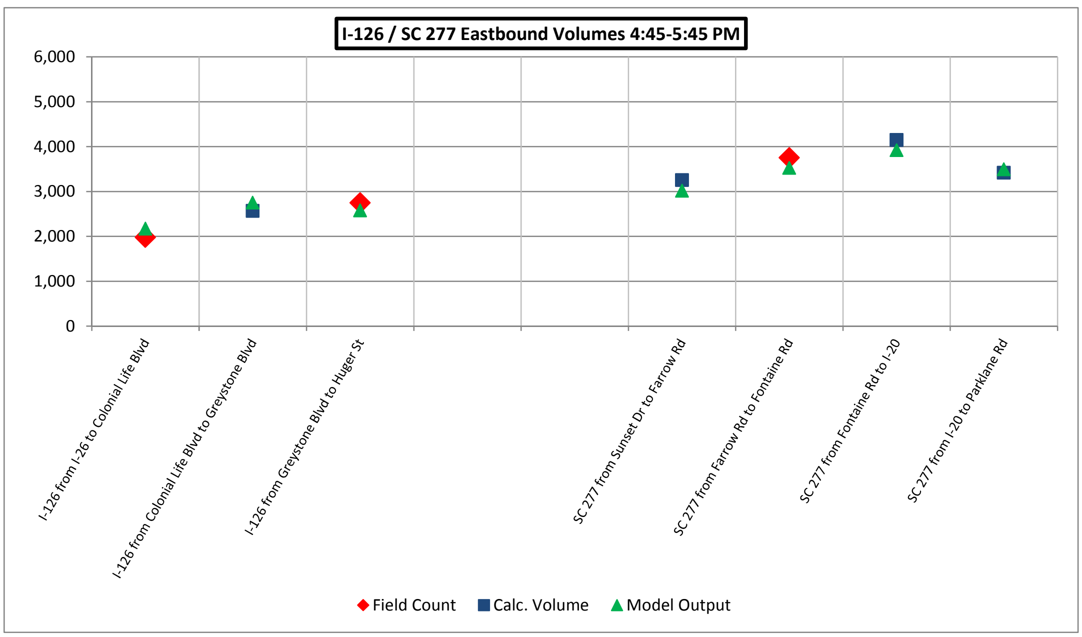


Figure 43. I-126 / SC-277 Eastbound Volume Comparison: PM Peak Hour

Table 18. I-126 / SC-277 Westbound Volume Comparison

I-126 / SC 277 Volume Calibration Summary		Westbound								
			7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Calc. Volume	Model Output	GEH	Field Count	Calc. Volume	Model Output	GEH
1	I-126 from I-26 to Colonial Life Blvd	3248	876		970	3	2,702		3,228	10
2	I-126 from Colonial Life Blvd to Greystone Blvd	3236		-270	1,914			4,326	5,441	
3	I-126 from Greystone Blvd to Huger St	3220	2,008		2,001	0	4,961		5,171	3
1	SC 277 from Sunset Dr to Farrow Rd	4486		3,886	3,354			1,351	1,366	
2	SC 277 from Farrow Rd to Fontaine Rd	4470	3,886		3,634	4	1,351		1,418	2
3	SC 277 from Fontaine Rd to I-20	4458		3,886	3,977			1,351	1,701	
4	SC 277 from I-20 to Parklane Rd	4453		3,886	3,681			1,351	2,325	

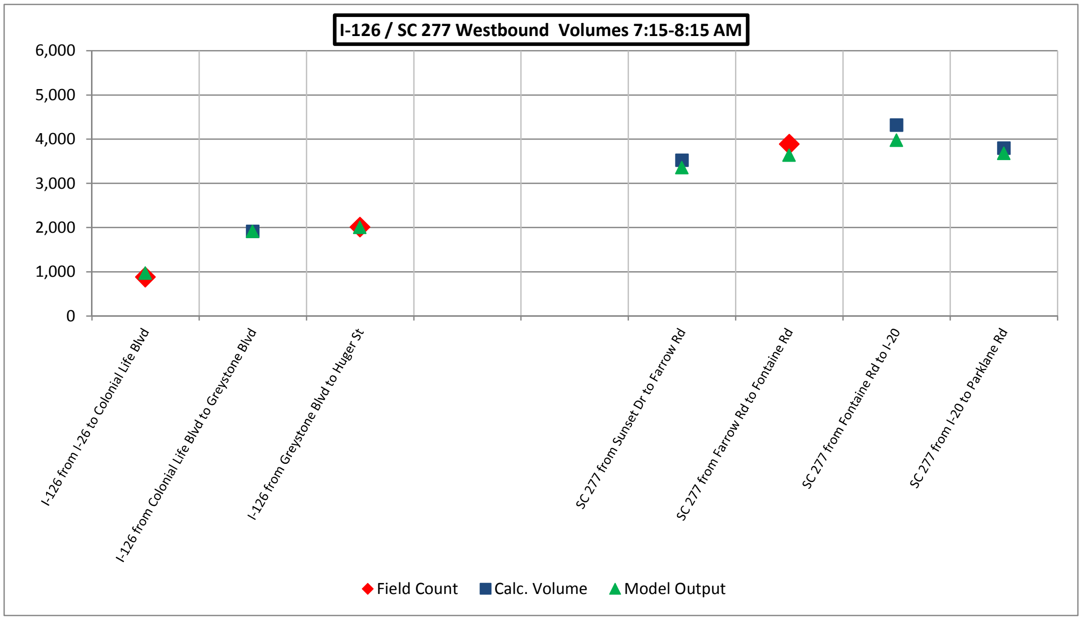


Figure 44. I-126 / SC-277 Westbound Volume Comparison: AM Peak Hour

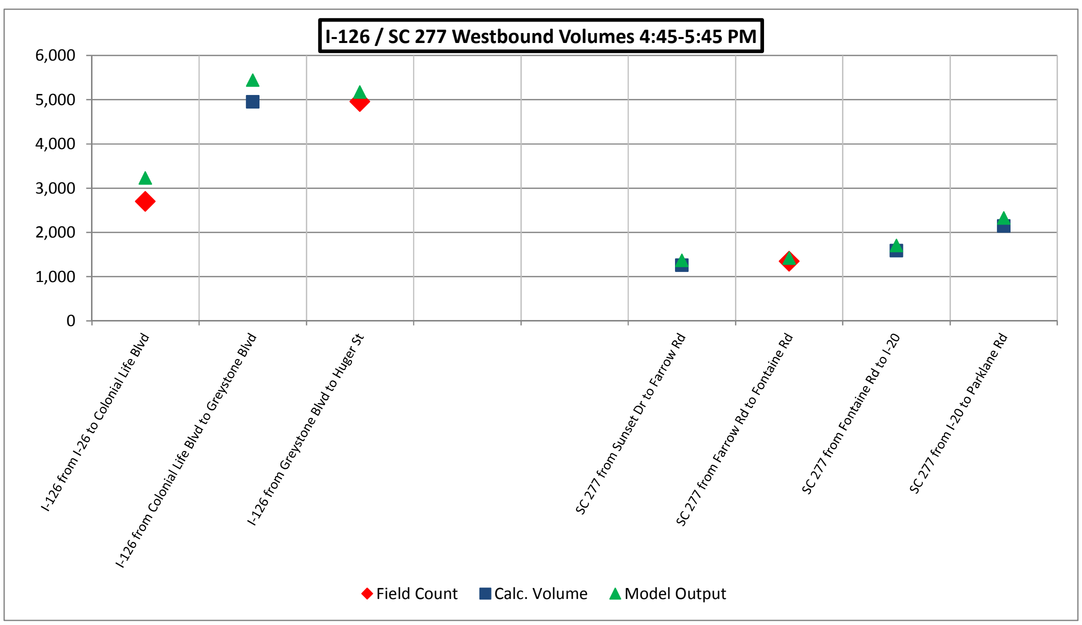


Figure 45. I-126 / SC-277 Westbound Volume Comparison: PM Peak Hour

Table 19. I-126 / SC-277 Ramp Volume Comparison

	I-126 / SC 277 Ramp Volume Calibration Summary		Eastbound									Westbound								
			7:15-8:15 AM				4:45-5:45 PM					7:15-8:15 AM				4:45-5:45 PM			
#	Location	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.	Link ID	Field Count	Model Output	GEH	Diff.	Field Count	Model Output	GEH	Diff.
1	from nb I-26 / to nb I-26 (side)	6398	589	631	2	42	280	309	2	29	6402	332	349	1	17	828	576	10	-252
2	to sb I-26	6400	316	351	2	35	763	792	1	29									
3	from / to Colonial Life Blvd	3239	473	502	1	29	308	282	2	-27	3243	200	224	2	24	812	870	2	58
4	Greystone Blvd off ramps	3232	588	550	2	-39	503	497	0	-6	3222	415	456	2	41	645	582	3	-63
5	Greystone Blvd on ramps	3224	530	531	0	1	535	471	3	-64	3235	321	360	2	39	634	708	3	74
1	Farrow Rd off ramps	4483	59	110	6	51	158	182	2	24	4477	546	475	3	-71	213	216	0	3
2	Farrow Rd on ramps	4479	209	203	0	-6	655	676	1	21	4485	183	239	4	56	121	170	4	49
3	Fontaine Rd off ramps	4473	183	177	0	-6	253	147	7	-106	4464	634	535	4	-100	399	439	2	40
4	Fontaine Rd on ramps	4459	351	342	0	-9	649	582	3	-68	4469	206	216	1	10	167	151	1	-16
5	to I-20 eb	4421	498	448	2	-50	1,839	1,642	5	-197									
6	to I-20 wb	4416	96	77	2	-19	134	0	16	-134	4412	1,477	1,369	3	-108	1,270	1,330	2	60
7	from I-20 eb	4417	1,256	1,227	1	-29	1,244	1,261	0	17	4408	170	1	18	-169	132	103	3	-30
8	from I-20 wb										4410	1,829	1,749	2	-80	579	590	0	11
9	Parklane Rd off ramps	4450	400	381	1	-19	428	469	2	41	4442	147	118	3	-29	151	162	1	11
10	Parklane Rd on ramps	4445	153	153	0	0	327	290	2	-38	4452	478	504	1	26	514	490	1	-24
11	to / from I-77 nb	4031	1,162	1,179	1	17	2,348	2,475	3	127	6436	2,723	2,837	2	114	1,286	1,362	2	76
12	Farrow Rd off / on ramps	4512	432	398	2	-34	914	867	2	-47	4515	445	564	5	119	651	632	1	-19

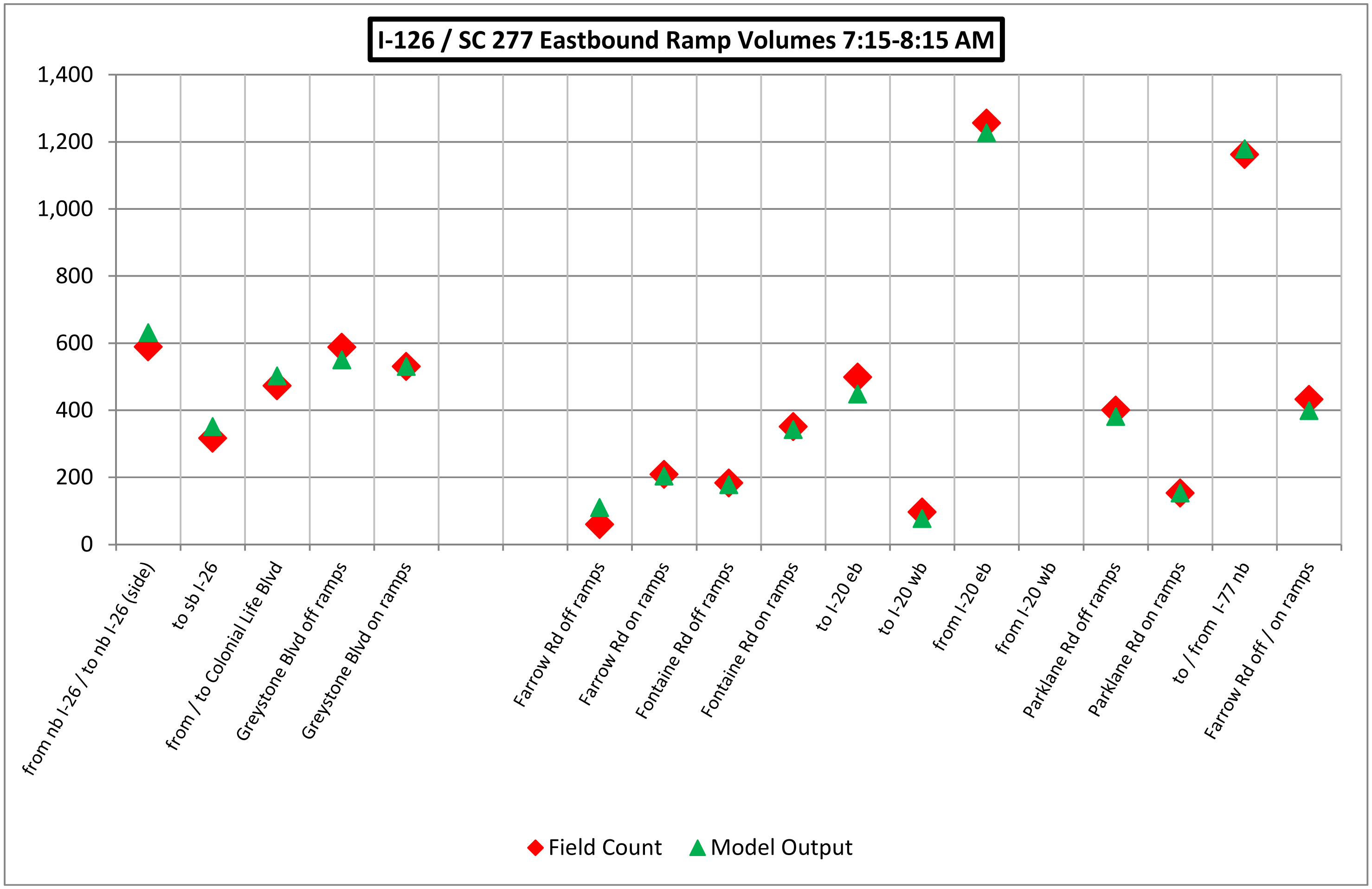


Figure 46. I-126 / SC-277 Eastbound Ramp Volumes: AM Peak Hour

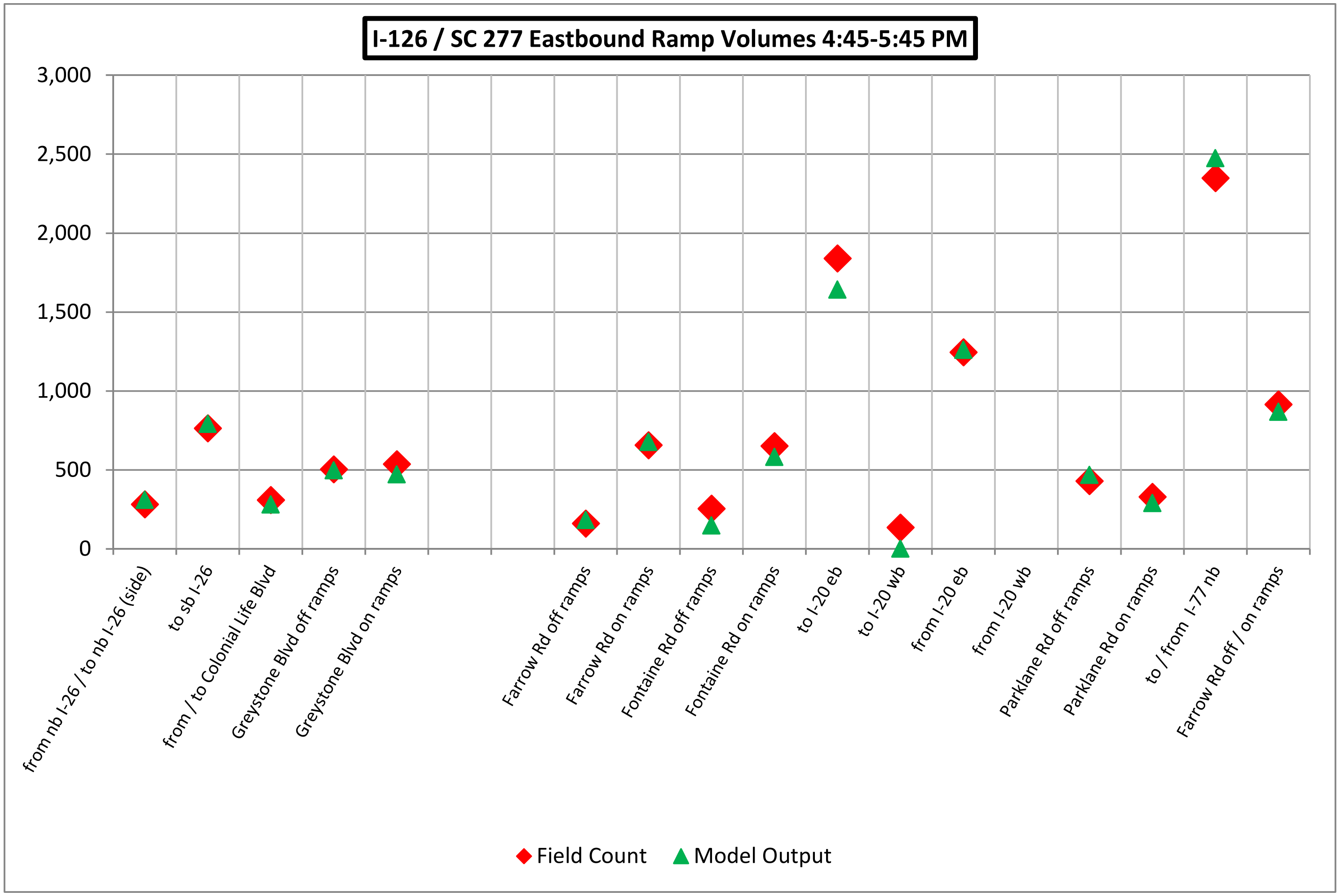


Figure 47. I-126 / SC-277 Eastbound Ramp Volumes: PM Peak Hour

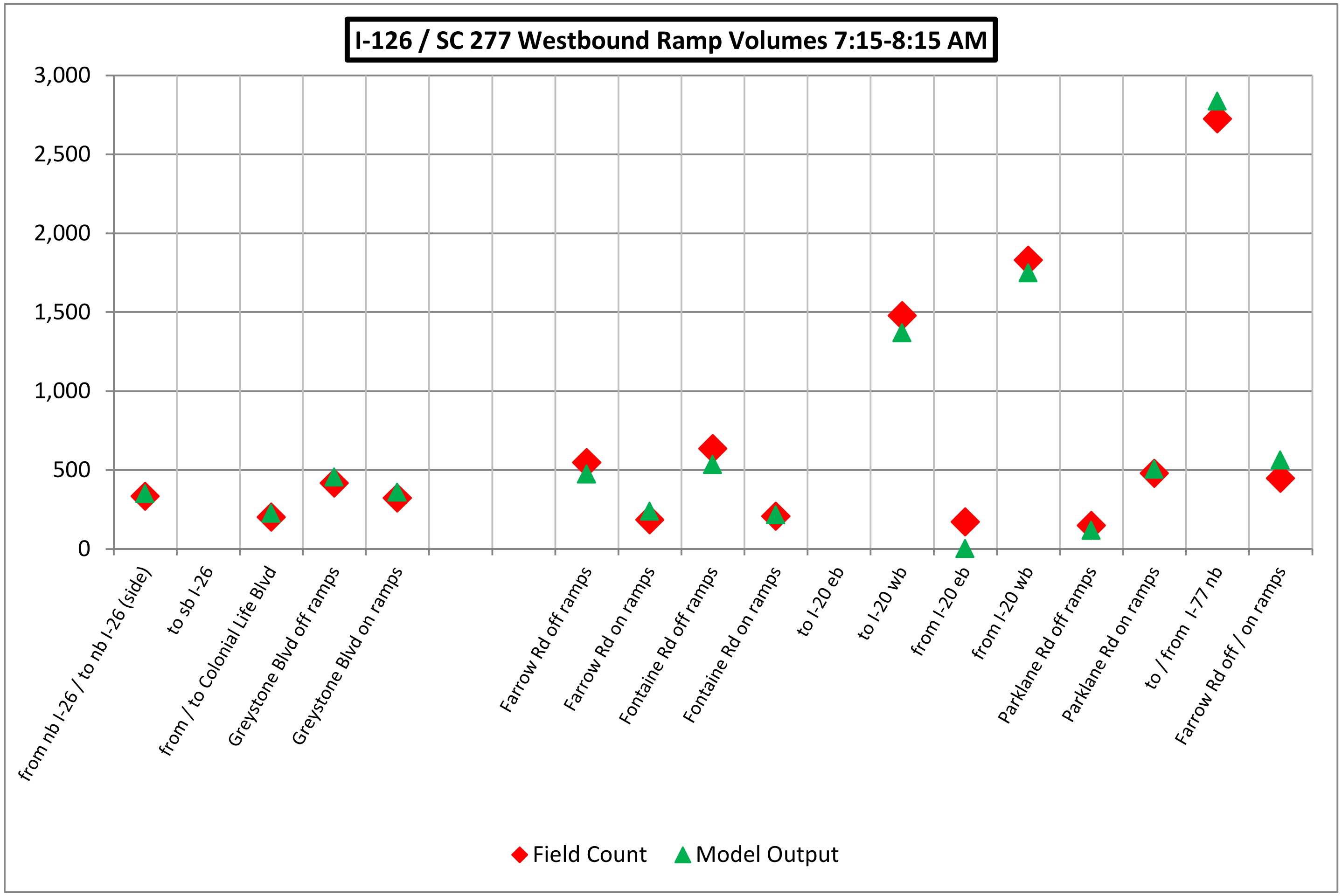


Figure 48. I-126 / SC-277 Westbound Ramp Volumes: AM Peak Hour

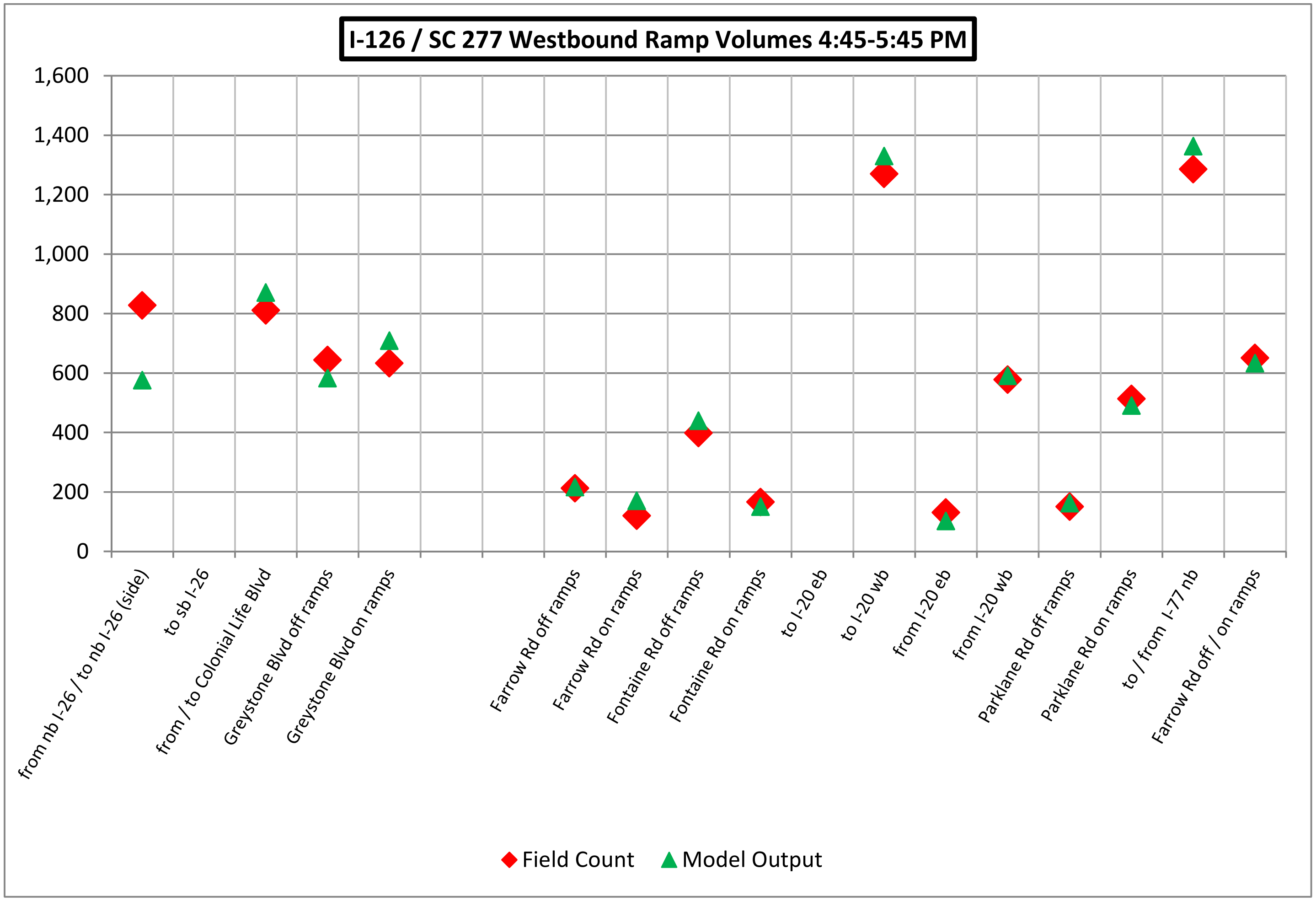


Figure 49. I-126 / SC-277 Westbound Ramp Volumes: PM Peak Hour

Table 20. I-126 / SC-277 Segment Speed Comparison

		Eastbound						Westbound				
Segment	Location	Segment	AM		PM			Segment	AM		PM	
		ID	INRIX	Model	INRIX	Model		ID	INRIX	Model	INRIX	Model
1	I-126 from I-26 to Colonial Life Blvd	4594	62	63	65	67		4599	61	66	41	60
2	I-126 from Colonial Life Blvd to Greystone Blvd	4578	62	62	62	65		4587	61	67	48	61
3	I-126 from Greystone Blvd to Huger St	4563	51	62	55	66		4566	57	65	56	62
1	SC 277 from Sunset Dr to Farrow Rd	6434		64	50	56		6439		59	56	62
2	SC 277 from Farrow Rd to Fontaine Rd	8561		61	58	40		8562		54	63	61
3	SC 277 from Fontaine Rd to I-20	6355		59	60	46		6403		45	62	60
4	SC 277 from I-20 to Parklane Rd	6342		59	60	55		6396		32	61	53

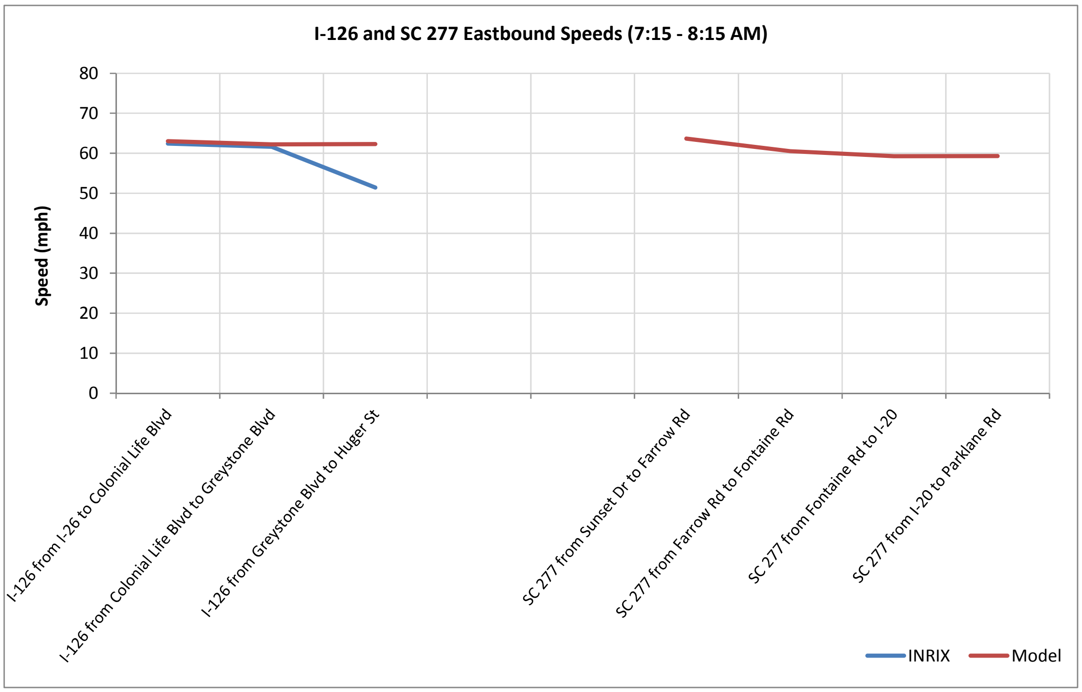


Figure 50. I-126 / SC-277 Eastbound Speeds: AM Peak Hour

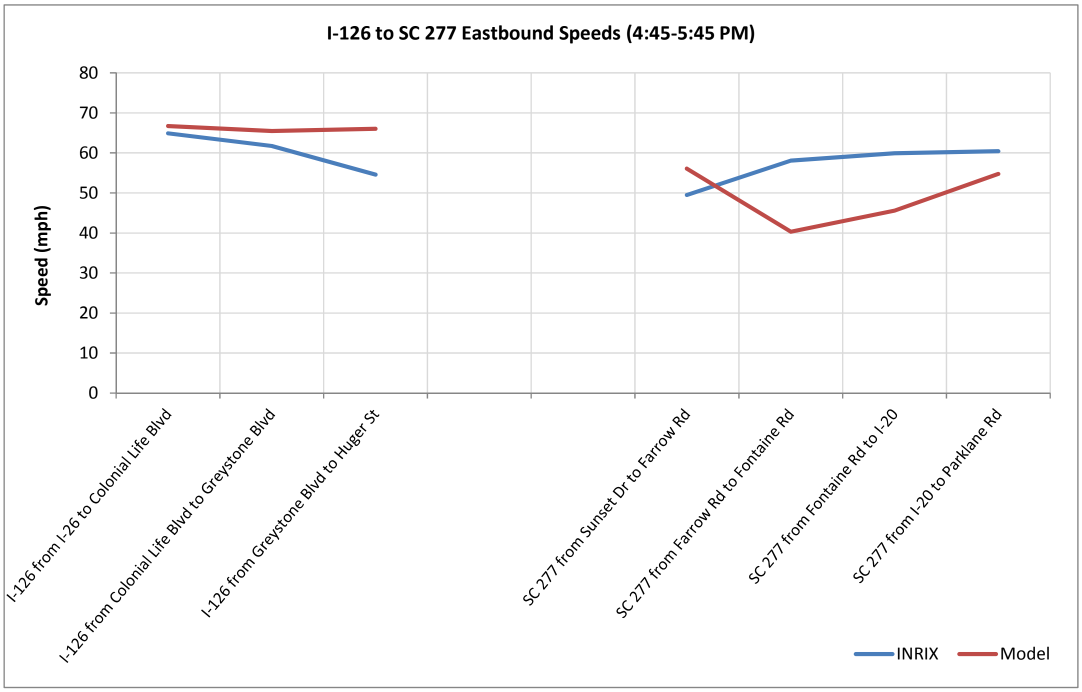


Figure 51. I-126 / SC-277 Eastbound Speeds: PM Peak Hour

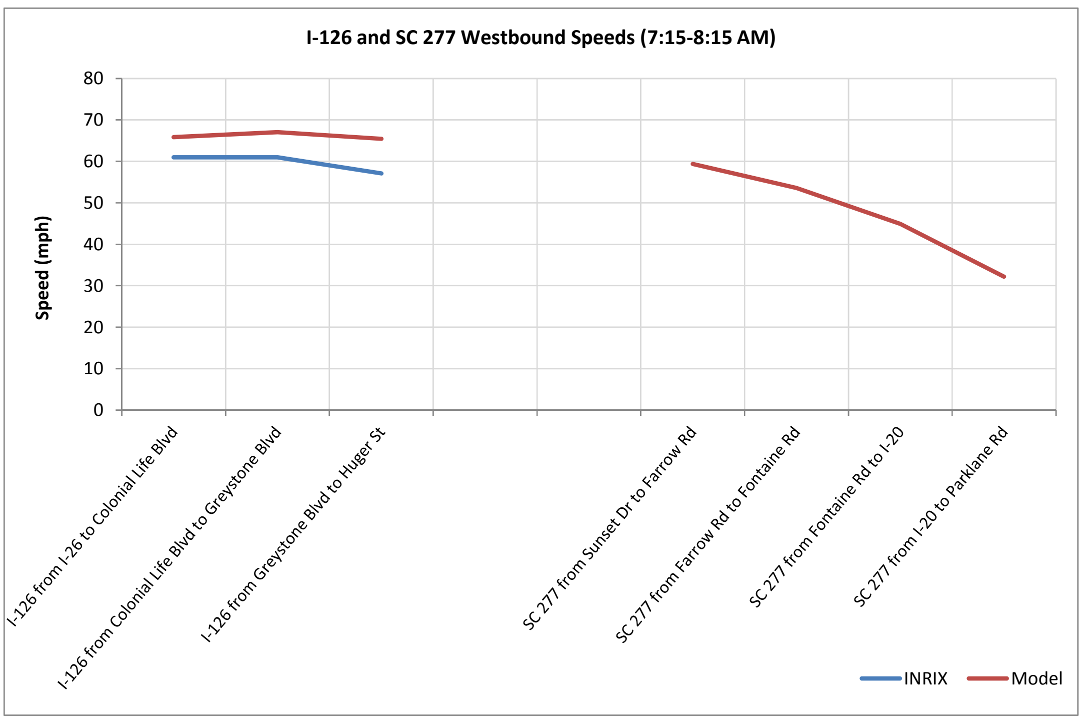


Figure 52. I-126 / SC-277 Westbound Speeds: AM Peak Hour

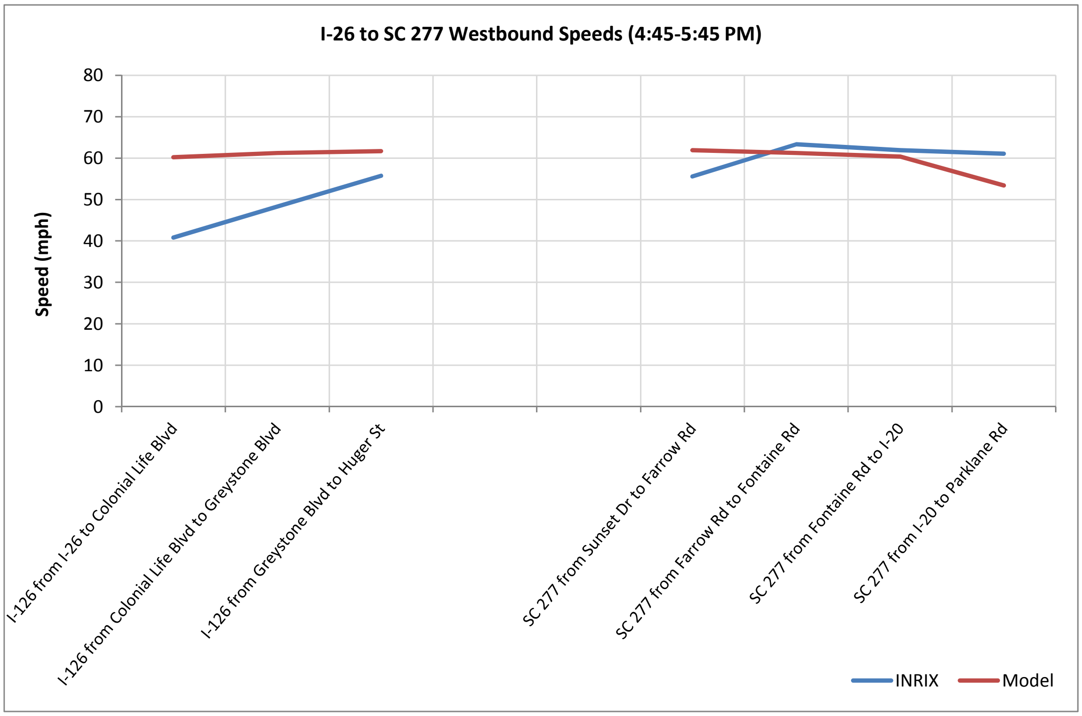


Figure 53. I-126 / SC-277 Westbound Speeds: PM Peak Hour

APPENDIX A: EXISTING CONGESTION OBSERVATIONS