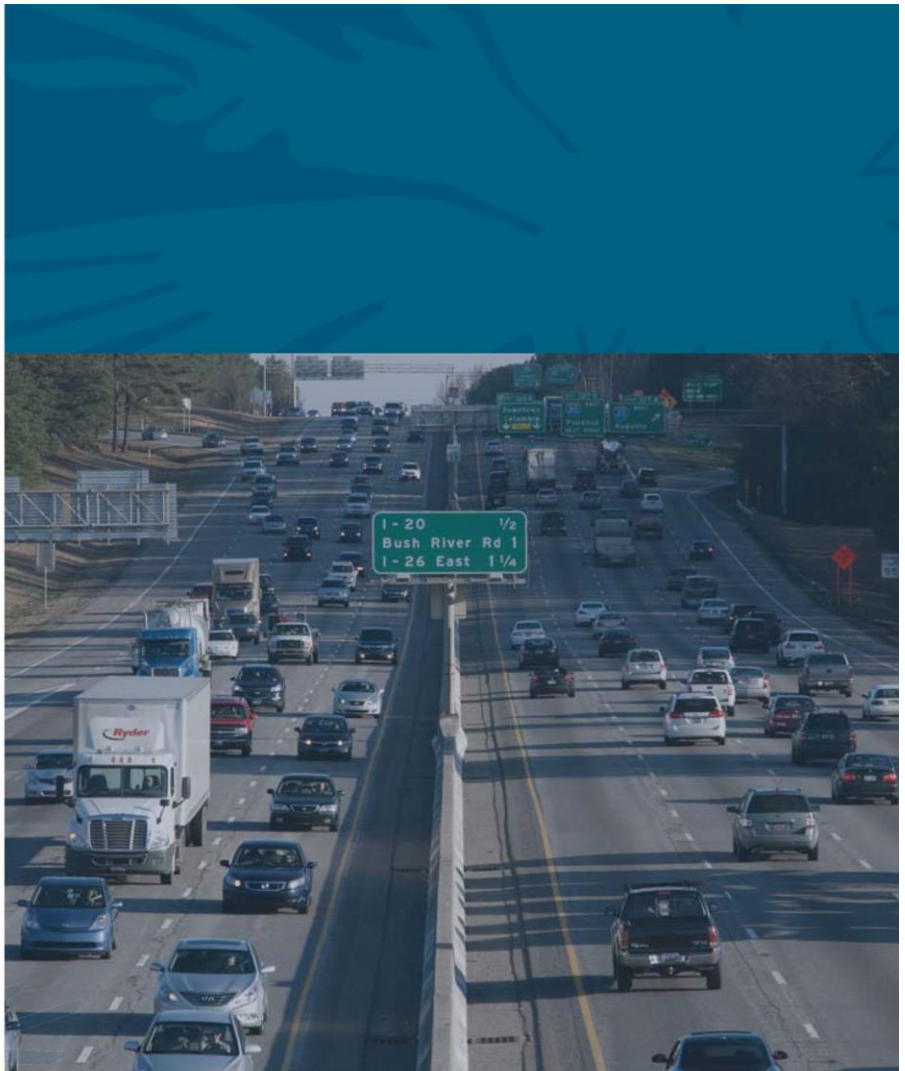
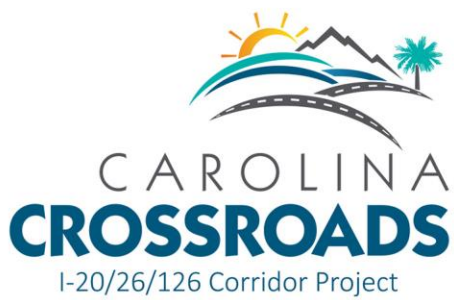


# Appendix D—Alternatives Traffic Analysis Technical Memo - Part 1



# Alternatives Traffic Analysis

*Carolina Crossroads  
I-20/26/126 Corridor Improvement Project  
Lexington and Richland Counties, South Carolina*

*DEIS July 23, 2018*



Prepared for South Carolina Department of Transportation  
and the Federal Highway Administration



# Alternatives Traffic Analysis Technical Memo

Carolina Crossroads

I-20/26/126 Corridor Improvement Project

Lexington and Richland Counties, South Carolina

DEIS July 23, 2018

Prepared for  
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and the Federal Highway Administration

Prepared by



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

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## 1 Introduction

### 1.1 Project Description

STV, in cooperation with HDR and Mead & Hunt (the project team), has been contracted by the South Carolina Department of Transportation (SCDOT) to provide engineering services necessary for the preparation of an Environmental Impact Statement (EIS), right of way plans, and final construction plans for roadways and bridges for the proposed Carolina Crossroads I-20/26/126 Corridor Project.

The proposed project is a transportation corridor improvement project located in Lexington and Richland counties. To date, the project area has been defined as a mainline corridor including I-20 from the Saluda River to the Broad River (approximately four miles), I-26 from Broad River Road to US-378 (approximately nine miles), and I-126 from I-26 to Colonial Life Boulevard (approximately one mile). **Figure 1.1** illustrates the extent of the Carolina Crossroads study area.

The I-20/26/126 corridor is a vital link in South Carolina, serving residents, commuters, travelers, and commerce. Due to nearby residential and commercial development, proximity to downtown Columbia, traffic volumes, and the overall geometric layout, including 12 interchange points, the I-20/26/126 corridor has become one of the most congested interstate sections in South Carolina. The purpose of the proposed project is to address this congestion and enhance safety throughout the corridor.

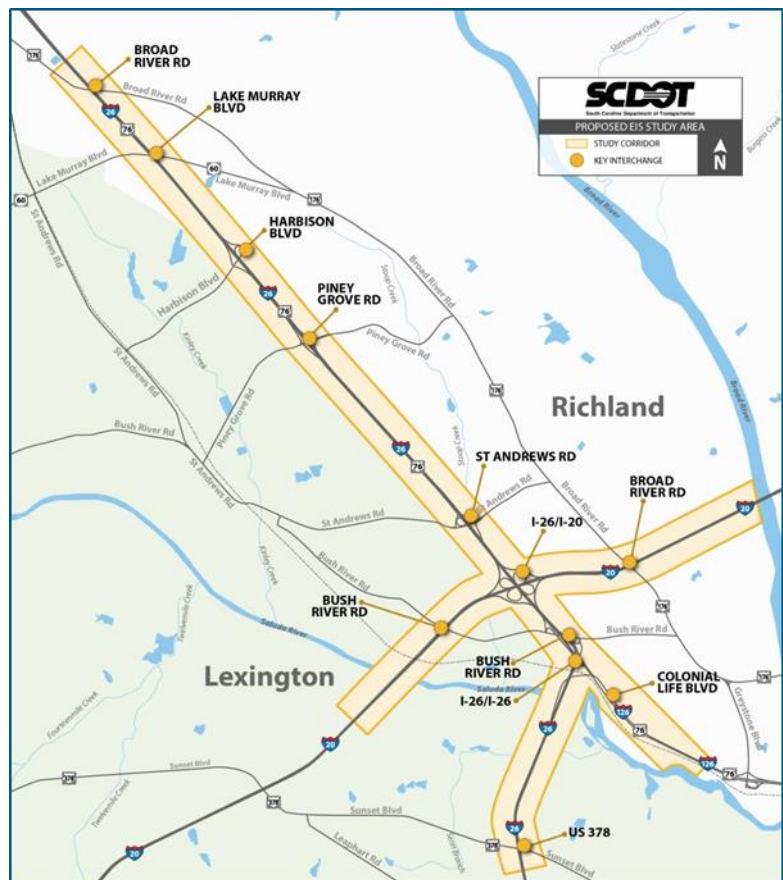


Figure 1-1 - Carolina Crossroads Study Area

### 1.2 Purpose of Representative Alternative Traffic Analysis

The traffic analysis of the Representative Alternatives (RA) consisted of an iterative process involving the development of traffic projections incorporating previously collected data, screening of interchange Accessory Options (AO) that led to the development of the individual RA, evaluating microsimulation networks of individual RA concepts that included microsimulation model calibration, review of areas of congestion within

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each alternative, and preparation of measures of effectiveness to facilitate the comparison of individual RA. As areas of congestion and improvements in conceptual design of the RA were addressed, the microsimulation networks were modified to incorporate improvements to the original RA concept. Detailed information regarding the alternatives development and screening process is contained in the *Alternatives Development and Screening Report*.

Travel demand modeling was also performed for those RA that included major new alignment segments between I-26 and I-20 as an alternative to maintaining the existing I-20/I-26 system interchange.

### 1.3 Coordination of Alternative Traffic Analysis

The traffic analysis of the RA included coordination among the other activities taking place internal to the Carolina Crossroads project, as well as coordination with other SCDOT projects.

As mentioned previously, the traffic analysis of the RA included interaction with the development of the conceptual roadway design of each RA. In addition to the interactive RA development, the Alternative Traffic Analysis was also coordinated with internal project activities, such as the preparation of planning documents and the development of noise and air quality assessments.

Coordination with other major SCDOT planning projects in the Columbia area was also a necessity. These projects included the *I-26 Widening from Mile Marker 85 to Mile Marker 101*, and the *I-20/26/77 Corridor Management Plan* planning study.

The *I-26 Widening from Mile Marker 85 to Mile Marker 101* project is evaluating the proposed widening of I-26 from approximately 1.6 miles west of SC 202 (Exit 85) to the west end of the Carolina Crossroads project at Exit 101. The project includes traffic analysis, conceptual roadway design, and planning document preparation.

The I-20/26/77 Corridor Management Plan encompasses approximately 100 miles of interstate routes on I-20, I-26, I-77, I-126 and SC 277 in and around the Columbia area. This planning study was to identify evaluate the feasibility of strategies to provide congestion relief and improved capacity on the interstate routes. Since the Carolina Crossroads study area is a subset of the larger regional freeway network under study as part of I-20/26/77 Corridor Management Plan, it was desirable to share traffic data and coordinate on elements of the network microsimulation. The sharing of information between the two projects was intended to achieve the consistent use and application of microsimulation model networks, traffic data and analysis techniques, and trip tables used in dynamic traffic assignment in the overlapping portions of the study area.

This report summarizes the procedures and methodologies used in preparing the traffic analysis used to compare the ten RA. The ten RA consisted of nine potential build conditions (RA1 – RA9) and a no-build alternative (RA10).

## 2 Traffic Projections

Traffic projections were developed to provide estimates of 2040 traffic volumes used in the development and assessment of each of the ten RA.

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### 2.1 Development of Traffic Projections

Two methods were used to develop traffic projections that were applied to elements of the RA development and to the microsimulation of each RA. The first method involved the use of historic traffic data to estimate system-wide annual growth rates to be applied against existing traffic. The second method involved the use of origin-destination data collected as part of the Carolina Crossroads data collection and developed into regional trip tables used in the microsimulation model. This second method will be discussed in **Section 4**

#### **Microsimulation Traffic Modeling.**

Previously collected existing traffic volume data were used as the basis for the development of the future traffic projections used in the preliminary screening of interchange AO and for high level assessment of freeway ramps, and in the microsimulation model network.

#### 2.1.1 EXISTING TRAFFIC VOLUMES

Extensive traffic data collection was performed as part of the Carolina Crossroads project. The data collection effort is summarized in a separate technical report *Traffic Data Collection, Carolina Crossroads*. Data that was collected included vehicle classification/volume counts at the I-20/I-26 and I-26/I-126 system interchanges, ramp termini turning movement counts, data from mainline Automatic Traffic Recorders (ATR), and regional and ramp-to-ramp origin-destination information.

Project Team members met in an Alternatives Workshop held in March 2016 to discuss potential interchange and network improvement options. During this workshop, it was apparent that the original turning movement traffic data collection was insufficient to cover the extent of turning movement counts needed to evaluate the improvement option concepts. It was decided to extend the turning movement count coverage to include certain intersections adjacent to the ramp termini intersections where the original turning movement counts were collected. Collecting data at these adjacent intersections allowed for the investigation of interchange AO to extend beyond the footprint of the ramp termini. The data collection also allowed accurate traffic volumes to be used in preparing the arterial interchange and the overall network microsimulation models.

The turning movement count data was collected by SCDOT. The list of the locations of the additional turning movement counts and the turning movement count data are contained in **Appendix A**. The original ramp termini turning count data is contained in Appendix E of the *Traffic Data Collection, Carolina Crossroads* report.

A review of the combined turning movement count and system interchange counts indicated that the system-wide morning peak hour was 7:30 to 8:30 AM and the system-wide afternoon peak hour was 4:45 to 5:45 PM. At the system ramps, the morning peak hour was found to be between 7:00 and 8:00 AM, while the afternoon peak was found to be 4:00 to 5:00 PM.

Mainline volume data derived from the ATR were combined with the system ramp volumes and the turning movement ramp peak hour volumes to develop existing balanced traffic volumes for the study area. Selection of the mainline volumes was based on directional volumes during the morning (7:00 AM to 10:00 AM) and afternoon (4:00 PM to 6:00 PM) peak periods for weekdays (Tuesday, Wednesday, and Thursday). Mainline



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estimated peak hour volumes on I-26 and I-126 were derived from ATR data obtained from station P-0021, which is located on I-126 between the Greystone Boulevard interchange and the bridge over Broad River, and station P-0095, which is located on I-26 between the Lake Murray Boulevard interchange (Exit 102) and the Harbison Boulevard interchange (Exit 103). Mainline estimated peak hour volumes on I-20 were derived from ATR data obtained from station P-0126, which is located on I-20 at milepost 66.3 near the bridge over the Broad River, and station P-0086 on I-20 between the Bush River Road interchange (Exit 63) and the US 378 interchange (Exit 61). The locations of the ATR stations are shown in **Figure 2-1**.

The entire collected ATR data, generally covering the period between January 1, 2014 and January 31, 2015, was used to determine the directional freeway volumes by balancing freeway segment volumes selected at an ATR station through the network by adding and subtracting ramp volumes entering and exiting the freeways via service interchange ramps. This was done individually for each direction of I-26/I-126 and I-20 for each peak hour to provide a conservative estimate of freeway traffic volumes for use in the preliminary development of alternatives. Starting with a 10<sup>th</sup> highest hourly volume, and after accounting for on- and off-ramp volumes between the count stations, the resulting volume was compared against the hourly volumes at the count station at the opposite end of the network. When starting with a 10<sup>th</sup> highest hourly volume at station P-0021, the resulting volume on the segment containing station P-0095 was reviewed. Similarly, starting with a 10<sup>th</sup> highest volume at station P-0095, the resulting volumes on the segment containing station P-0021 was reviewed. A similar approach was taken for both directions of I-20 between stations P-0126 and P-0086.

For example, as shown in **Table 2.1**, the following freeway volumes from the P-0095 and P-0021 stations were compared for westbound I-26/I-126 during the weekday morning peak period:

- The 10<sup>th</sup> highest westbound volume at station P-0095 (2,586 vehicles per hour) results in a volume of 1,771 vehicles per hour at station P-0021. This volume (1,771 vehicles per hour) is equivalent to the 163<sup>rd</sup> highest westbound hourly volume observed at station P-0021.
- The westbound volume (2,411 vehicles per hour) associated with the 10<sup>th</sup> highest two-way volume (7,521 vehicles per hour) at station P-0095, results in a volume of 1,596 vehicles per hour at station P-0021. The 2,411 vehicles per hour volume at station P-0095 is the 166<sup>th</sup> highest hourly westbound volume at that station, while the 1,596 vehicles per hour volume at station P-0021 is equivalent to the 285<sup>th</sup> highest hourly westbound volume.
- The 10<sup>th</sup> highest westbound volume at station P-0021 (2,023 vehicles per hour) results in a volume of 2,838 vehicles per hour at station P-0095. This volume exceeds the highest observed morning westbound volume (2,647 vehicles per hour) at station P-0095 by 191 vehicles per hour.
- The westbound volume (1,973 vehicles per hour) associated with the 10<sup>th</sup> highest two-way volume (7,340 vehicles per hour) at station P-0021, results in a volume of 2,788 vehicles per hour at station P-0095. The 1,973 vehicles per hour volume at station P-0021 is the 25<sup>th</sup> highest hourly westbound volume at that station, while the 2,788 vehicles per hour at station P-0095 is 141 vehicles more than the highest observed morning westbound volume (2,647 vehicles per hour) at station P-0095.

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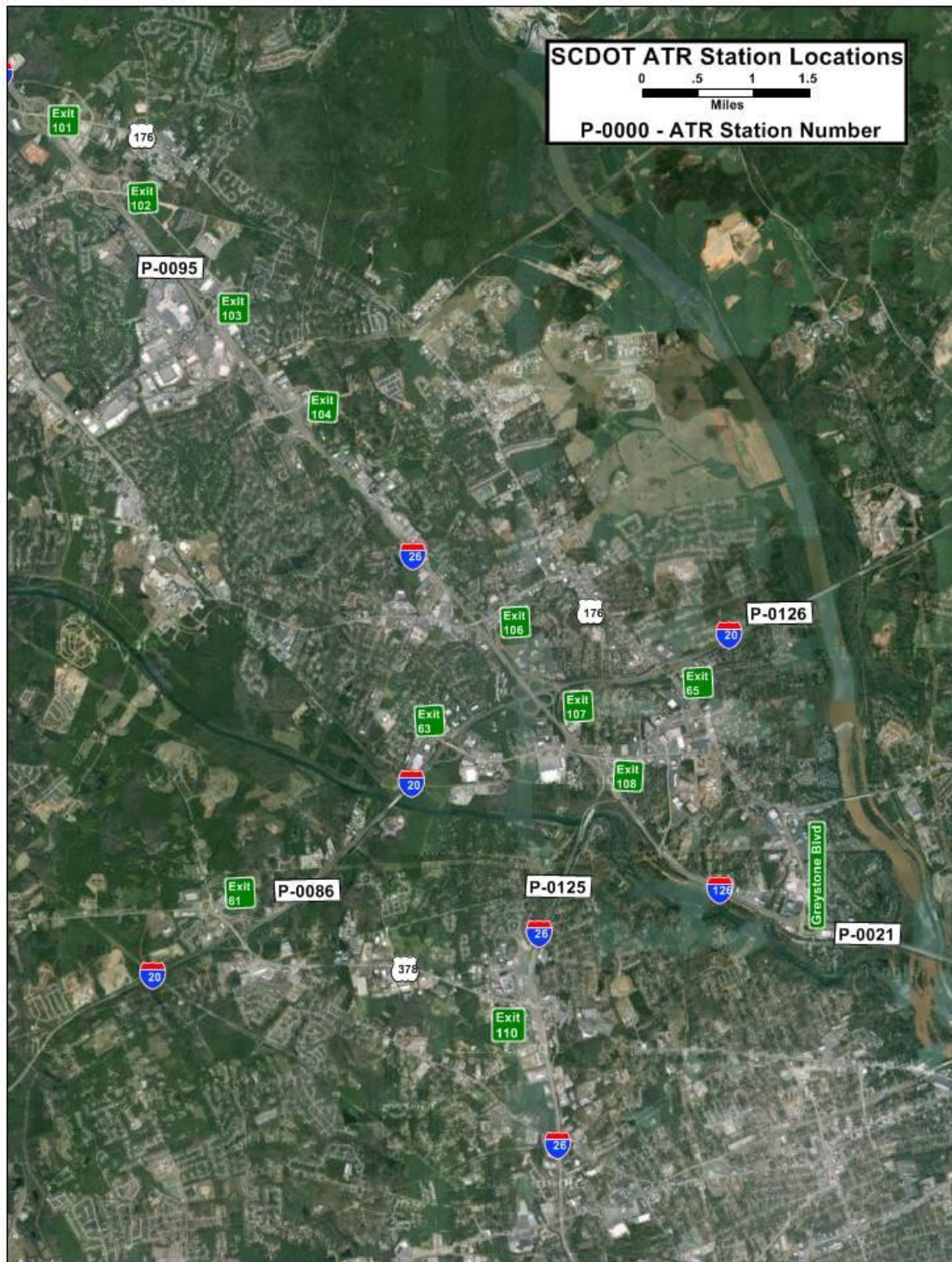


Figure 2-1: SCDOT ATR Station Location

## Alternatives Traffic Analysis Technical Memo

**Table 2.1 - I-26/I-126 Westbound AM ATR Station Volume Comparison**

I-26/I-126 Westbound - AM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour Date/Time	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly Volume	Starting Volume P-0095	Δ Ramp Volume P-0021 P-0095	Ending Volume P-0021	P-0021 # Highest Hourly Volume
P-0095	2,647	1st		P-0021	2,238	1st					
WB	2,586	10	06/05/2014	WB	1,679	229	10	2,586	815	1,771	163
EB	4,243	165	8	EB	4,894	193	65	2,494	815	1,679	229
Total	6,829	144	THU	Total	6,573	207					
WB	2,411	166	02/25/2014	WB	1,704	203	166	2,411	815	1,596	285
EB	5,110	6	8	EB	5,152	78	34	2,519	815	1,704	203
Total	7,521	10	TUE	Total	6,856	129					
WB	2,230	277	05/06/2014	WB	2,023	10	> 1st	2,838	815	2,023	10
EB	4,254	164	9	EB	5,149	80	277	2,230	815	1,415	312
Total	6,484	206	TUE	Total	7,172	49					
WB	2,402	178	03/25/2014	WB	1,973	25	> 1st	2,788	815	1,973	25
EB	4,134	189	9	EB	5,367	20	178	2,402	815	1,587	287
Total	6,536	197	TUE	Total	7,340	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

Using this methodology, the following volumes were selected at their respective count stations and used to estimate mainline segment volumes along their respective routes in each direction during the morning and afternoon peak periods. In some instances, the observed volume at the upstream station was chosen, resulting in a more conservative volume estimated at the downstream station. In other instances, a more conservative volume could be estimated at the upstream station by selecting the observed volume at the downstream ATR station.

### Eastbound I-26/I-126

#### AM Peak

Station P-0095's 10<sup>th</sup> highest eastbound AM peak period volume (5,056 vehicles per hour recorded from 8:00 to 9:00 AM on Thursday, May 29, 2014) results in an estimated downstream eastbound volume of 6,267 vehicles per hour at station P-0021; this estimated volume exceeds the highest observed weekday AM eastbound peak period volume at station P-0021 (5,612 vehicles per hour) by 655 vehicles per hour. **Table 2.2** summarizes the I-26/I-126 eastbound AM peak hour ATR count station volume comparison.

#### PM Peak

Station P-0021's 10<sup>th</sup> highest two-way PM peak period volume (7,919 vehicles per hour recorded from 6:00 to 7:00 PM on Thursday, March 27, 2014) with a westbound volume of 3,069 vehicles per hour (9<sup>th</sup> highest observed PM eastbound peak period volume at station P-0021) results in an estimated upstream eastbound volume of 4,034 vehicles per hour at station P-0095; this estimated volume exceeds the



## Alternatives Traffic Analysis Technical Memo

highest observed weekday PM eastbound peak period volume at station P-0095 (3,974 vehicles per hour) by sixty vehicles per hour. **Table 2.3** summarizes the I-26/I-126 eastbound PM peak hour ATR count station volume comparison.

**Table 2.2 - I-26/I-126 Eastbound AM ATR Station Volume Comparison**

I-26/I-126 Eastbound - AM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly	Starting Volume P-0095	Δ Ramp Volume P-0021	Ending Volume P-0021	P-0021 # Highest Hourly
P-0095	5,275	1st		P-0021	5,612	1st					
WB	2,591	8	05/29/2014	WB	1,700	206	10	5,056	1211	6,267	> 1st
EB	5,056	10	8	EB	4,851	209	288	3,640	1211	4,851	209
Total	7,647	2	THU	Total	6,551	214					
WB	2,411	166	02/25/2014	WB	1,704	203	6	5,110	1211	6,321	> 1st
EB	5,110	6	8	EB	5,152	78	231	3,941	1211	5,152	78
Total	7,521	10	TUE	Total	6,856	129					
WB	2,388	188	09/25/2014	WB	1,874	108	170	4,225	1211	5,436	10
EB	3,435	297	9	EB	5,436	10	297	3,435	1211	4,646	262
Total	5,823	293	THU	Total	7,310	14					
WB	2,402	178	03/25/2014	WB	1,973	25	186	4,156	1211	5,367	20
EB	4,134	189	9	EB	5,367	20	189	4,134	1211	5,345	24
Total	6,536	197	TUE	Total	7,340	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

**Table 2.3 - I-26/I-126 Eastbound PM ATR Station Volume Comparison**

I-26/I-126 Eastbound - PM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly	Starting Volume P-0095	Δ Ramp Volume P-0021	Ending Volume P-0021	P-0021 # Highest Hourly
P-0095	3,974	1st		P-0021	3,580	1st					
WB	4,684	117	05/08/2014	WB	4,770	147	10	3,770	-965	2,805	40
EB	3,770	10	18	EB	2,903	25	3	3,868	-965	2,903	25
Total	8,454	22	THU	Total	7,673	48					
WB	4,939	8	05/01/2014	WB	4,929	54	27	3,633	-965	2,668	481
EB	3,633	27	18	EB	2,675	81	26	3,640	-965	2,675	81
Total	8,572	10	THU	Total	7,604	73					
WB	4,716	101	12/04/2014	WB	4,773	146	> 1st	4,011	-965	3,046	10
EB	3,743	11	18	EB	3,046	10	11	3,743	-965	2,778	48
Total	8,459	21	THU	Total	7,819	15					
WB	5,008	4	03/27/2014	WB	4,850	91	> 1st	4,034	-965	3,069	9
EB	3,534	53	18	EB	3,069	9	53	3,534	-965	2,569	132
Total	8,542	12	THU	Total	7,919	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

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## Westbound I-26/I-126

### AM Peak

Station P0021's 10<sup>th</sup> highest westbound AM peak period volume (2,023 vehicles per hour recorded from 9:00 to 10:00 AM on Tuesday, May 6, 2014) results in an estimated downstream westbound volume of 2,838 vehicles per hour at station P-0095; this estimated volume exceeds the highest observed weekday AM westbound peak period volume at station P-0095 (2,647 vehicles per hour) by 191 vehicles per hour.

**Table 2.1** (shown previously) summarizes the I-26/I-126 westbound AM peak hour ATR count station volume comparison.

### PM Peak

Station P-0021's 10<sup>th</sup> highest westbound PM Peak period volume (5,062 vehicles per hour recorded from 6:00 to 7:00 PM on Wednesday, February 19, 2014) results in an estimated downstream westbound volume of 5,416 vehicles per hour at station P-0095; this estimated volume exceeds the highest observed weekday PM westbound peak period volume at station P-0095 (5,054 vehicles per hour) by 362 vehicles per hour. **Table 2.4** summarizes the I-26/I-126 westbound PM peak hour ATR count station volume comparison.

**Table 2.4 - I-26/I-126 Westbound PM ATR Station Volume Comparison**

I-26/I-126 Westbound - PM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly	Starting Volume P-0095	Δ Ramp Volume P-0021	Ending Volume P-0021	P-0021 # Highest Hourly
P-0095	5,054	1st		P-0021	5,198	1st					
WB	4,931	10	04/29/2014	WB	4,736	176	9	4,931	354	4,577	256
EB	3,205	187	18	EB	2,533	151	> 1st	5,090	354	4,736	176
Total	8,136	89	TUE	Total	7,269	161					
WB	4,939	8	05/01/2014	WB	4,929	54	8	4,939	354	4,585	255
EB	3,633	27	18	EB	2,675	81	> 1st	5,283	354	4,929	54
Total	8,572	10	THU	Total	7,604	73					
WB	4,842	25	02/19/2014	WB	5,062	10	> 1st	5,416	354	5,062	10
EB	3,506	64	18	EB	2,930	21	25	4,842	354	4,488	289
Total	8,348	41	WED	Total	7,992	6					
WB	5,008	4	03/27/2014	WB	4,850	91	> 1st	5,204	354	4,850	91
EB	3,534	53	18	EB	3,069	9	4	5,008	354	4,654	222
Total	8,542	12	THU	Total	7,919	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes



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### Eastbound I-20

#### AM Peak

Station P-0086's 10<sup>th</sup> highest two-way peak period volume (7,419 vehicles per hour recorded from 8:00 to 9:00 AM on Tuesday, May 27, 2014) with an eastbound volume of 5,145 vehicles per hour (second highest observed AM eastbound peak period volume at station P-0086) results in an estimated downstream eastbound volume of 5,404 vehicles per hour at station P-0126; this estimated volume exceeds the highest observed weekday AM eastbound peak period volume at station P-0126 (5,280 vehicles per hour) by 124 vehicles per hour. **Table 2.5** summarizes the I-20 eastbound AM peak hour ATR count station volume comparison.

**Table 2.5 - I-20 Eastbound AM ATR Station Volume Comparison**

I-20 Eastbound - AM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly	Starting Volume P-0095	Δ Ramp Volume P-0021	Ending Volume P-0021	P-0021 # Highest Hourly
P-0086	5,194	1st		P-0126	5,280	1st					
WB	2,244	105	02/20/2014	WB	4,625	9	10	5,021	259	5,280	1
EB	5,021	10	8	EB	5,219	4	22	4,960	259	5,219	4
Total	7,265	24	THU	Total	9,844	2					
WB	2,274	80	05/27/2014	WB	4,285	62	2	5,145	259	5,404	> 1st
EB	5,145	2	8	EB	5,280	1	10	5,021	259	5,280	1
Total	7,419	10	TUE	Total	9,565	14					
WB	2,823	2	04/09/2014	WB	4,497	27	35	4,915	259	5,174	10
EB	4,835	71	8	EB	5,174	10	71	4,835	259	5,094	30
Total	7,658	2	WED	Total	9,671	4					
WB	2,174	187	03/25/2014	WB	4,512	22	75	4,820	259	5,079	38
EB	4,951	25	8	EB	5,079	38	25	4,951	259	5,210	4
Total	7,125	71	TUE	Total	9,591	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

#### PM Peak

Station P-0086's 10<sup>th</sup> highest eastbound peak period volume (3,245 vehicles per hour recorded from 6:00 to 7:00 PM on Thursday, May 22, 2014) results in an estimated downstream eastbound volume of 4,654 vehicles per hour at station P-0126; this estimated volume would be ranked as the 4<sup>th</sup> highest weekday PM eastbound peak period volume among the observed volumes at station P-0126. **Table 2.6** summarizes the I-20 eastbound PM peak hour ATR count station volume comparison.

## Alternatives Traffic Analysis Technical Memo

**Table 2.6 - I-20 Eastbound PM ATR Station Volume Comparison**

I-20 Eastbound - PM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0095 # Highest Hourly	Starting Volume P-0095	Δ Ramp Volume P-0021	Ending Volume P-0021	P-0021 # Highest Hourly
P-0086	3,619	1st		P-0126	4,863	1st					
WB	3,986	231	05/22/2014	WB	4,529	288	10	3,245	1409	4,654	4
EB	3,245	10	18	EB	4,573	11	23	3,164	1409	4,573	11
Total	7,231	89	THU	Total	9,102	177					
WB	4,612	18	01/29/2015	WB	5,068	107	36	3,117	1409	4,526	290
EB	3,117	36	18	EB	4,460	28	59	3,051	1409	4,460	28
Total	7,729	10	THU	Total	9,528	48					
WB	3,639	300	11/26/2014	WB	4,117	337	20	3,183	1409	4,592	10
EB	3,165	23	18	EB	4,592	10	23	3,165	1409	4,574	10
Total	6,804	199	WED	Total	8,709	267					
WB	4,591	22	11/05/2014	WB	5,379	17	46	3,095	1409	4,504	17
EB	3,175	22	18	EB	4,504	17	22	3,175	1409	4,584	10
Total	7,766	7	WED	Total	9,883	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

### Westbound I-20

#### AM Peak

Station P-0126's 10<sup>th</sup> highest westbound peak period volume (4,622 vehicles per hour recorded from 8:00 to 9:00 AM on Wednesday, March 19, 2014) results in an estimated downstream westbound volume of 2,519 vehicles per hour at station P-0086; this estimated volume would be ranked as the 8<sup>th</sup> highest weekday AM westbound peak period volume among the observed volumes at station P-0086.

**Table 2.7** summarizes the I-20 westbound AM peak hour ATR count station volume comparison.

#### PM Peak

Station P-0126's 10<sup>th</sup> highest westbound peak period volume (5,490 vehicles per hour recorded from 6:00 to 7:00 PM on Thursday, March 13, 2014) results in an estimated downstream westbound volume of 4,684 vehicles per hour at station P-0086; this estimated volume would be ranked as the 3<sup>rd</sup> highest weekday PM westbound peak period volume among the observed volumes at station P-0086. **Table 2.8** summarizes the I-20 westbound PM peak hour ATR count station volume comparison.

While some of the estimates exceed the observed highest directional hourly volume recorded at the ATR, this was considered acceptable and reasonable for their general use as a starting point for evaluating the potential number of lanes needed along mainline segments.

## Alternatives Traffic Analysis Technical Memo

**Table 2.7 - I-20 Westbound AM ATR Station Volume Comparison**

I-20 Westbound - AM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0086 # Highest Hourly	Starting Volume P-0086	Δ Ramp Volume P-0126	Ending Volume P-0126	P-0126 # Highest Hourly
P-0086	2,865	1st		P-0126	4,804	1st					
WB	2,494	10	05/22/2014	WB	4,315	54	10	2,494	-2103	4,597	13
EB	4,829	72	8	EB	4,984	72	131	2,212	-2103	4,315	54
Total	7,323	19	THU	Total	9,299	50					
WB	2,274	80	05/27/2014	WB	4,285	62	80	2,274	-2103	4,377	38
EB	5,145	2	8	EB	5,280	1	173	2,182	-2103	4,285	62
Total	7,419	10	TUE	Total	9,565	14					
WB	2,190	160	03/19/2014	WB	4,622	10	8	2,519	-2103	4,622	10
EB	4,587	140	8	EB	4,764	131	160	2,190	-2103	4,293	58
Total	6,777	134	WED	Total	9,386	37					
WB	2,174	187	03/25/2014	WB	4,512	22	14	2,409	-2103	4,512	22
EB	4,951	25	8	EB	5,079	38	187	2,174	-2103	4,277	64
Total	7,125	71	TUE	Total	9,591	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

**Table 2.8 - I-20 Westbound PM ATR Station Volume Comparison**

I-20 Westbound - PM Peak Hour											
ATR Station	Volume	# Highest Hour	10th Highest Hour	ATR Station	Volume	# Highest Hour	P-0086 # Highest Hourly	Starting Volume P-0086	Δ Ramp Volume P-0126	Ending Volume P-0126	P-0126 # Highest Hourly
P-0086	4,729	1st		P-0126	5,912	1st					
WB	4,653	10	09/18/2014	WB	5,164	60	10	4,653	-806	5,459	13
EB	3,060	54	18	EB	4,342	69	81	4,358	-806	5,164	60
Total	7,713	12	THU	Total	9,506	54					
WB	4,612	18	01/29/2015	WB	5,068	107	18	4,612	-806	5,418	14
EB	3,117	36	18	EB	4,460	28	111	4,262	-806	5,068	107
Total	7,729	10	THU	Total	9,528	48					
WB	4,632	13	03/13/2014	WB	5,490	10	3	4,684	-806	5,490	10
EB	3,010	75	18	EB	4,471	24	13	4,632	-806	5,438	14
Total	7,642	21	THU	Total	9,961	7					
WB	4,591	22	11/05/2014	WB	5,379	17	25	4,573	-806	5,379	17
EB	3,175	22	18	EB	4,504	17	22	4,591	-806	5,397	15
Total	7,766	7	WED	Total	9,883	10					

0,000 - Volume from ATR Station Data

>1st - calculated volume is higher than highest recorded weekday ATR volume

0,0000 - Volume calculated using Δ ramp volumes

The existing peak hour volumes along the interstate and at the interchanges, including turning movement counts at the ramp terminal intersections, are contained in **Appendix B**.

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### 2.1.2 2040 TRAFFIC VOLUMES

The first traffic projection method used to estimate 2040 traffic volumes was based on changes to historic annual average daily traffic (AADT) volumes obtained from SCDOT and from growth forecasts in the South Carolina Statewide Model (SCSWM). The historic AADT for the multiple study area freeway segments and interchange arterial segments were assessed, as were the differences in SCSWM link volume forecasts in the existing and future E+C model network within the study area. From this assessment, a general annual growth rate of 1.0 percent was established and used to factor existing peak hour volumes to create 2040 peak hour volume estimates for use in the capacity screening.

The second method involved modifying and using trip tables developed as part of the I-20/26/77 Corridor Management Plan. These trip tables were developed by the travel demand modeling consultants working on the I-20/26/77 Corridor Management Plan, and were initially derived from SCSWM trip tables. From the SCSWM existing and future network daily trip tables, morning and afternoon peak hour subarea trip tables were prepared. A general annual growth rate of 0.7 percent was derived from those trip tables. The trip tables were used in the microsimulation of alternatives and will be discussed in **Section 4 Microsimulation Traffic Modeling**.

Projected traffic volumes were developed using the existing peak hour volumes along the mainline interstate and at the interchanges and applying a general uniform annual growth rate to those volumes to estimate 2040 morning and afternoon peak hour traffic. For the traffic volume projections used in the capacity screening, a one percent annual growth rate was used to estimate 2040 peak hour traffic volumes. The 2040 peak hour traffic volumes were applied in the generalized interstate/interchange capacity screenings used to develop the individual RA from a range of prospective Accessory Options (AO) at each interchange. The estimated 2040 volumes along the interstate and at the interchanges, including turning movement counts at the ramp terminal intersections, are contained in **Appendix C**.

The differences in the growth rates result from the different methodologies used to estimate the rates. For the capacity screening, historic and projected trends in more general average annual daily volumes were used to develop the 1.0 percent growth rate. For the microsimulation models, the 0.7 percent growth rate is an overall average rate within the study area derived from the peak hour trip tables, which in turn were based on the zonal trip generation estimates from the SCSWM socio-economic/land use assumptions and traffic zone origin-destination estimates.

The trip tables used in the microsimulations would reflect changes in peak hour trip generation arising from forecast changes in SCSWM zonal socio-economic inputs, such as population and employment, as well as changes in the distribution of trips between zones. As a result, some zones may be estimated to experience traffic growth at a slightly higher rate, while traffic in other zones may be estimated to grow at a lower rate. The peak hour trip tables are better suited for microsimulation analyses of peak hour conditions that incorporate the dynamic assignment of traffic through the existing, future no-build, and future improvement alternative study area networks.

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While the growth rates differ, they are appropriate for their individual applications, and should not produce significantly different results. Assuming application of the growth rates over a 25 year period (such as between 2015 and 2040), the 1.0 percent annual growth rate would produce a compounded growth factor of 1.28, while a 0.7 percent annual rate would produce a factor of 1.19. Applied to the same base year volume, the overall difference between the resulting volumes estimated using these rates is approximately 7.5 percent. This is within generally observed weekday, weekly, and monthly variations typically encountered with peak hour volumes.

### 3 Capacity Screening

Capacity screenings were performed for existing and 2040 no-build traffic conditions and for a range of multiple 2040 AOs at each interchange. The capacity screening was intended to be a quick, sketch planning level assessment of the potential operation of elements at each of the study area interchanges. The elements assessed included adjacent freeway segments, interchange arterials, and interstate ramps.

The sketch planning assessments were performed by evaluating existing and estimated future traffic volumes using capacity “rules of thumb” for the various facilities to estimate the operational level of service (LOS). Two primary sources were used for the “rules of thumb” for the various facility types: the Florida Department of Transportation’s (FDOT) **2012 Generalized Service Volume Tables**<sup>1</sup> (2012 GSVT) and chapter seven of the Massachusetts Department of Transportation’s (MassDOT) 2006 **Project Development & Design Guide**<sup>2</sup>.

#### 3.1 Capacity Screening Threshold Volumes

The FDOT 2012 Generalized Service Volume Tables contain nine tables for planning level assessments of various roadway facilities, including freeways and signalized state arterials, located in urbanized areas, areas transitioning into urbanized areas (or areas outside of urbanized areas with a population exceeding 5,000 people), and rural undeveloped areas and cities (or developed areas with a population less than 5,000 people). LOS thresholds are provided for facilities within those area types based on annual average daily volumes, peak hour two-way volumes, and peak hour directional volumes. Since the available data provides for the directional assessment of freeway segments and for signalized state arterials, and since the study area can be considered an urbanized area, *Table 7 – Generalized Peak Hour Directional Volumes for Florida’s Urbanized Areas* (2012 GSVT:Table 7) was used in the sketch planning assessments for those facilities. A copy of this table is contained in **Appendix D**.

Chapter seven, section seven of the MassDOT Design Guide includes information on the geometric design of interchange ramps. Section 7.7.2 of the Design Guide refers to ramp capacity and includes *Exhibit 7-27 – Approximate Service Volumes for Signal-lane Ramps* (MassDOT Exhibit 7-27) that outlines LOS criteria for ramps

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<sup>1</sup><http://www.fdot.gov/planning/systems/programs/sm/los/pdfs/fdot%202012%20generalized%20service%20volume%20tables.pdf>

<sup>2</sup> [http://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH\\_7\\_a.pdf](http://www.massdot.state.ma.us/Portals/8/docs/designGuide/CH_7_a.pdf)

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based on the ramp design speed. MassDOT Exhibit 7-27 was used as the basis for the sketch planning assessments for interchange ramps. A copy of Section 7.7.2 from the Design Guide is contained in **Appendix D**.

### 3.1.1 FREEWAY CAPACITY SCREENING THRESHOLD VOLUMES

**Table 3.1** summarizes the Freeway LOS criteria derived from the 2012 GSVT:Table 7. The volume values in the columns represent the upper limit for that LOS for the given number of lanes. For example, a two lane freeway segment with a directional peak hour volume less than 2,200 vehicles per hour would be classified as operating at a potential LOS B. With a directional peak hour volume of 4,000 vehicles per hour, the two lane freeway segment would be classified as operating at a potential LOS E. For a directional peak hour volume at or above 4,020 vehicles per hour, the two lane freeway segment would be classified as operating at a potential LOS F.

**Table 3.1 Freeway LOS Volume Thresholds**

Lanes	Freeway LOS			
	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

Source: Table 7 – Generalized Peak Hour Directional Volumes for Florida’s Urbanized Areas

As previously discussed, directional volumes were estimated on all the freeway segments approaching or between service interchanges located along I-20, I-26, and I-126. Consequently, individual freeway segments were evaluated using this criteria.

### 3.1.2 ARTERIAL CAPACITY SCREENING THRESHOLD VOLUMES

**Table 3.2** summarizes the LOS criteria derived from the 2012 GSVT:Table 7 for State Signalized Arterials. The volume values again represent the upper limit for that LOS for a given number of lanes. Additionally, the State Signalized Arterials are separated into classes I, II, and III on the basis of the ratio of the number of signalized intersections per mile of arterial roadway.

Class I arterials (which average less than two signals per mile) have a *maximum* LOS D volume threshold. Depicted in **Table 3.2** with three asterisks (“\*\*\*”), volumes above this threshold would result in the possible LOS for a State Signalized Arterial to be considered as LOS F. If volumes exceed the LOS D threshold volume, the intersections along the arterial, which primarily control actual arterial LOS, are considered as having reached capacity, which in turn causes the arterial operation to operate at LOS F.

Similarly, Class II arterials (which average between two and 4½ signals per mile) and Class III arterials, which average more than 4½ signal per mile, have a *minimum* potential LOS of LOS C. Depicted in **Table 3.2** with two asterisks (“\*\*”), arterial volumes up to the LOS C threshold volumes are considered to result in the arterial operating at a potential LOS C.



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**Table 3.2 – Arterial LOS Volume Thresholds**

Class I	Lanes	State Signalized Arterials			
		B	C	D	E
0 - 1.99 signals/mile	1	510	820	880	***
	2	1,560	1,890	1,960	***
	3	2,400	2,860	2,940	***
	4	3,240	3,830	3,970	***
<b>Class II</b>	1	**	560	810	860
2 - 4.5 signals/mile	2	**	1,330	1,770	1,870
	3	**	2,080	2,680	2,830
	4	**	2,830	3,590	3,780
<b>Class III/IV</b>	1	**	270	630	790
>4.5 signals per mile	2	**	670	1,500	1,700
	3	**	1,050	2,330	2,570
	4	**	1,440	3,170	3,450

Source: Table 7 – Generalized Peak Hour Directional Volumes for Florida’s Urbanized Areas

Since the turning movement count data obtained at the ramp terminal intersections can be separated into peak hour directional volumes on each arterial, these planning LOS criteria were used to evaluate the arterials at the service interchanges. The arterial class was determined based on the existing number of signals along the arterial in the area of the service interchange and the total distance between the signals.

### 3.1.3 RAMP CAPACITY SCREENING THRESHOLD VOLUMES

**Table 3.3** summarizes the LOS criteria derived from MassDOT Exhibit 7-27. The volume values used in the table were taken from the 45-50 miles per hour ramp design speed column. While MassDOT Exhibit 7-27 is for single lane ramps, a footnote to the Exhibit advises to multiply the thresholds by 1.8 to obtain service volumes for two lane ramps. The values shown in **Table 3.3** for two lane ramps were calculated based on this guidance.

Additionally, loop ramp volumes thresholds were not explicitly listed in MassDOT Exhibit 7-27, but were derived based on the text of section 7.7.2, which states that “*The capacity of a loop ramp is about 1,250 pcph*”<sup>3</sup> (where pcph is passenger cars per hour). The loop ramp volume thresholds were calculated by dividing the single lane ramp LOS threshold volume by the single lane ramp LOS E threshold volume and multiplying it by 1,250.

**Table 3.3 - Ramp LOS Volume Thresholds**

Lanes	Ramp LOS (45-50 mph)			
	B	C	D	E
1	1,000	1,250	1,325	1,650
2	1,800	2,250	2,385	2,970
Loop Ramp	758	947	1,004	1,250

<sup>3</sup> 2006 Design Guide, page 7-52

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The service interchange ramp volumes, derived from peak hour turning movement counts, and the system ramp volumes, derived from vehicle classification counts, were used with these volume thresholds to evaluate the potential LOS on the ramps.

### 3.1.4 LOS SCREENING PROCESS

While the freeway, state signalized arterial and ramp volume threshold tables permit specific LOS classifications, the output of the screening process was to identify a facility as operating *under*, *near*, and *over* capacity. To be considered *under capacity*, facility volumes had to fall in the LOS B, LOS C, or LOS D threshold ranges. To be considered *near capacity*, facility volumes had to fall in the LOS E threshold range. To be considered *over capacity*, facility volumes had to fall in the LOS F threshold range.

## 3.2 Existing/No-Build Capacity Screening

The existing and 2040 no-build traffic conditions were assessed to establish the general baseline condition of the existing network's freeway segments, state signalized arterials, and ramps using the previously established LOS volume thresholds and classifying the operation on the individual facilities as under, near, or over capacity.

To facilitate summarizing the information, interchanges are described based their individual exit numbers. Street names will be omitted. Interchanges located on I-26 are numbered between 101 and 110. Interchanges located on I-20 are numbered between 63 and 65. For reference, the interchange numbers used in the screening are as follows:

- Exit 101 (Broad River Road)
- Exit 102 (Lake Murray Boulevard)
- Exit 103 (Harbison Boulevard)
- Exit 104 (Piney Grove Road)
- Exit 106 (St Andrews Road)
- Exit 107/64 (I-20/I-26 System Interchange)
- Exit 108 (Bush River Road)
- Exit 108B (I-20/I-126 System Interchange)
- Exit 110 (Sunset Boulevard/US 378)
- Exit 63 (Bush River Road)
- Exit 65 (Broad River Road)

The individual exit capacity screening inputs and results are contained in **Appendix E**.

### 3.2.1 CAPACITY SCREENING – EXISTING CONDITIONS

The existing volumes for the freeway segments, arterials, and ramps were used to complete the screening for existing conditions. The results of the screening are summarized in **Table 3.4**.

The results for the freeway segments shown at each exit were derived from the inbound freeway segment volume at the interchange and are based on the volume thresholds shown in **Table 3.1**. For example, the results for the eastbound freeway segment are based on the volume approaching Exit 103 from Exit 102, while the results for the westbound freeway segment are based on the volume approaching Exit 103 from Exit 104. At Exit 108B, the results for the eastbound freeway segment are based on the eastbound volume between the eastbound off-ramp to Exit 108 and the eastbound on-ramp from Exit 108; while the results for the westbound freeway segment are based on the volume approaching from Exit 110.

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The results for the arterials at each exit were derived using the highest volume approaching either of the ramp intersections at each interchange and the volume thresholds shown in **Table 3.2**. There are no arterial facilities located at the system ramp interchanges at Exits 107/64 and 108B; therefore, no screening results are provided for arterials at those exits.

The results for the ramps follow a general pattern applicable at each interchange except at Exit 108B. For off- and on-ramps, the results were based on the volume thresholds for one or two lane ramps as shown in **Table 3.3**, while the loop ramp results were based on the loop ramp threshold volumes. Where ramps of a particular type are not present at an interchange, no results are provided.

At Exit 108B, there are a mix of ramps and freeway segments that do not fall under the general pattern.

The segments, shown in **Figure 3.1**, are summarized are as follows:

- EB/SB Off – the two lane eastbound freeway segment of I-26 east before the merge of the eastbound on-ramp from Exit 108; this segment was evaluated using freeway segment criteria and not ramp criteria
- EB/SB Loop On – the single lane flyover ramp from westbound I-126 to eastbound I-26; this segment was evaluated using ramp criteria
- EB/SB Loop Off – the three lane eastbound freeway segment that becomes I-126 eastbound; this segment was evaluated using freeway segment criteria and not ramp criteria
- WB/NB Off – the two lane westbound flyover ramp from westbound I-26 that continues as westbound I-26 at the merge with westbound I-126 segments/ramps; this segment was evaluated using ramp criteria
- WB/NB Loop On – the two lane westbound freeway segment from westbound I-126 that merges to the left of the westbound I-26 flyover ramps; this segment was evaluated using freeway segment criteria
- WB/NB Loop Off – the single lane ramp from westbound I-126 that leads to the I-20 ramps at the system interchange (without the westbound on-ramp traffic from Exit 108); this segment was evaluated using ramp criteria
- WB/NB On – the single lane ramp from westbound I-26 to eastbound I-126; this segment was evaluated using ramp criteria.

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**Figure 3-1 - Exit 108B Ramp Descriptions in Table 3.4**

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**Table 3.4 Existing Condition Screening Summary**

Exit #	Peak Hour	Existing Conditions											
		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
101	AM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
	PM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
102	AM	Under	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
	PM	Under	Under	Under	Near	Under	-	Under	Under	Under	-	Under	Under
103	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	Under	Under
	PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	Under	Under
104	AM	Under	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	PM	Under	Near	Under	Under	Under	-	-	Under	Under	-	-	Under
106	AM	Over	Under	Under	Under	Under	Under	-	Under	Under	-	Under	Under
	PM	Under	Under	Under	Under	Under	Under	-	Under	Under	-	Under	Under
107/64	AM	Under	Under	-	-	Under	Under	Over	Under	Under	Under	Under	Under
	PM	Under	Under	-	-	Under	Under	Near	Under	Under	Under	Near	Near
108	AM	Under	Under	Under	Under	Under	Under	-	-	Under	Under	-	-
	PM	Under	Under	Under	Over	Under	Under	-	-	Under	Under	-	-
108B	AM	Near	Under	-	-	Under	Under	Under	-	Under	Near	Under	Under
	PM	Under	Under	-	-	Under	Under	Under	-	Near	Over	Under	Under
110	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
	PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
63	AM	Under	Under	Under	Under	Under	Under	-	Under	Under	-	-	Under
	PM	Under	Under	Under	Near	Under	Under	-	Under	Under	-	-	Under
65	AM	Under	Under	Over	Under	Under	-	-	Under	Under	-	-	Under
	PM	Under	Under	Near	Near	Under	-	-	Under	Under	-	-	Under

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The screening shows that the eastbound segment approaching Exit 106 is currently operating over capacity during the morning peak hour. The arterial segments at Exit 110 (Sunset Boulevard) are over capacity during both peak hours, while the southbound approach at Exit 65 (Broad River Road) and the westbound approach at Exit 108 (Bush River Road) are over capacity in the morning and afternoon peak hours respectively. Two ramps are currently over capacity: the loop off-ramp from eastbound I-26 to eastbound I-20 at Exit 107 in the morning peak hour, and the two lane freeway segment from westbound I-126 (analyzed as a freeway segment) in the afternoon peak hour.

### 3.2.2 2040 NO-BUILD CAPACITY SCREENING

The existing volumes for the freeway segments, arterials, and ramps were increased using a one percent annual growth rate to estimate 2040 volumes. These volumes were then used to complete the screening for 2040 No-Build conditions. The results of the screening are summarized in **Table 3.5**.

As would be expected with continued growth in traffic and no increase in roadway capacity, the 2040 No-Build capacity screening has more freeway segments, arterials and ramps that are projected to be over capacity.

## 3.3 Preliminary Interchange Alternatives Capacity Screening

Preliminary alternatives were developed for each of the interchanges throughout the study area. The concepts were designated as “Accessory Options” and numbered. They are referenced as AO1, AO2, AO3, etc.

The capacity of the individual AO were screened similar to the existing and 2040 no-build capacity screenings. In addition to the capacity screenings, the AO were also analyzed using Synchro/SimTraffic software and, where roundabouts were included in the AO concept, with SIDRA software to further assess intersection operations, identify the need for additional capacity and turn lanes to be incorporated into the AO.

Where possible, the FHWA’s Capacity Analysis for Planning of Junctions (CAP-X) Excel-based spreadsheet was used to assess proposed interchange configurations. CAP-X allows for a planning-level assessment and comparison of a range of conventional and innovation intersection, roundabout and interchange configurations. For interchanges, CAP-X assesses diamond, partial cloverleaf (with diagonally opposite loop ramps in two quadrants), displaced left turn, double crossover diamond (diverging diamond), and single point interchanges. Volumes, truck percentages, and growth rates are input, along with number of turn lanes at ramp intersections. Using these inputs, CAP-X calculates volume-capacity (v/c) ratios for portions of the interchange and an overall v/c, and compares and ranks the results. These comparisons were also included in the preliminary alternative capacity screening.

To facilitate the capacity screening and review of intersection operations and in keeping with the general nature of the assessments, Synchro template files were used to evaluate most of the consistently common interchange AO. The use of template files eliminated the need to devote substantial effort to develop multiple, often complex, individual interchange models at each interchange location. At each interchange where template files were used, the volumes were modified to correspond with traffic volumes at the individual interchange.



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**Table 3.5 2040 No-Build Condition Screening Summary**

2040 No-Build Conditions													
Exit #	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
101	AM	Near	Under	Under	Under	Under	-	Under	Under	Under	-	Under	Under
	PM	Under	Over	Under	Over	Under	-	Under	Under	Under	-	Under	Under
102	AM	Over	Under	Over	Under	Under	-	Under	Under	Under	-	Under	Under
	PM	Under	Over	Near	Over	Under	-	Under	Under	Under	-	Under	Under
103	AM	Over	Under	Under	Under	Under	-	-	Under	-	-	Under	Under
	PM	Under	Over	Over	Over	Under	-	-	Under	-	-	Near	Under
104	AM	Over	Under	Under	Under	Under	-	-	Under	Under	-	-	Under
	PM	Near	Over	Under	Over	Under	-	-	Under	Under	-	-	Under
106	AM	Over	Under	Under	Under	Under	Near	-	Near	Under	-	Under	Under
	PM	Over	Under	Under	Under	Under	Near	-	Under	Under	-	Under	Under
107/64	AM	Over	Under	-	-	Under	Near	Over	Over	Under	Under	Under	Near
	PM	Under	Under	-	-	Under	Under	Over	Under	Under	Under	Over	Over
108	AM	Over	Under	Over	Under	Under	Under	-	-	Under	Under	-	-
	PM	Under	Under	Under	Over	Under	Under	-	-	Under	Under	-	-
108B	AM	Over	Under	-	-	Over	Under	Over	Under	Over	Over	Under	Under
	PM	Under	Under	-	-	Under	Under	Under	Under	Over	Over	Over	Under
110	AM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
	PM	Under	Under	Over	Over	Under	-	-	Under	Under	-	-	Under
63	AM	Over	Under	Over	Under	Under	Under	-	Under	Under	-	-	Under
	PM	Under	Under	Near	Over	Under	Under	-	Under	Under	-	-	Under
65	AM	Near	Near	Over	Under	Under	-	-	Under	Under	-	-	Under
	PM	Under	Over	Over	Over	Under	-	-	Under	Under	-	-	Under

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While the template files did not replicate the exact footprint, alignment and orientation of individual interchanges, it was easy to adjust the template file geometry to match the AO design concepts. Overall, using the template files where appropriate allowed for a fast assessment of the AO consistent with the planning sketch level capacity assessment methodology. Template files were generally used in evaluating Diverging Diamond Interchanges (DDI) and Single Point Urban Interchanges (SPUI).

For AO that were too complex to use the template files, the AO were more precisely modeled using Synchro/SimTraffic to facilitate the assessment. In some cases, such as where Tight Urban Diamond Interchanges (TUDI) were evaluated, a single detailed TUDI model was developed for one interchange and re-used at other interchanges.

The use of template files or the re-use of an interchange model for multiple interchanges was not possible for each AO. Several AO were too complex to be screened using either the general capacity assessment methodology, the Synchro/SimTraffic template files, or re-used interchange models. For the complex AO, a detailed Synchro/SimTraffic was used to more accurately model the AO.

Several of the alternatives incorporated roundabouts at either the ramp intersections or at intersections adjacent to the interchanges. In these cases, SIDRA was used to evaluate the roundabout operation.

CAP-X was also used to evaluate each service interchange, though not every AO could be evaluated in CAP-X.

The following sections list the various AO options and assessment methods at each interchange to identify AO that would be incorporated into system-wide Representative Alternatives. Information from these assessments was incorporated into the level 1A screening of options discussed in Section 4.4 of the *Alternatives Development and Screening Report*.

### 3.3.1 AO1 – AO5 (EXIT 65)

The following are a list of the AO developed and screened for Exit 65.

- AO1 – Diverging Diamond Interchange (Synchro Template)
- AO2 – Roundabout Interchange (SIDRA)
- AO3 – Single Point Urban Interchange (Synchro Template)
- AO4 – Stacked Diamond Interchange (detailed Synchro model)
- AO5 – Offset/Displaced Left Interchange (detailed Synchro model)

Note: The use of CAP-X was applicable for comparing AO1, AO3, and AO5.

Existing traffic operations at Exit 65 are complicated by:

- High left turn volumes onto eastbound I-20 during both peak hours (existing peak hour traffic is over 700 vehicles in the morning and 500 vehicles in the afternoon)
- High left turn volumes from the westbound off-ramp during both peak hours (existing peak hour traffic is approximately 500 vehicles in the morning and nearly 400 vehicles in the afternoon)

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- Extremely high right turn volumes from the westbound off-ramp to Broad River Road during both peak hours (existing peak hour traffic is over 700 vehicles in the morning, and nearly 1000 vehicles in the afternoon)
- High directional through volumes on Broad River Road crossing the interchange during both peak hours
- Limited opportunity to provide additional through lanes through the interchange area without widening the Broad River Road approaches to the interchange from their current five lane cross-section
- Closely spaced adjacent signals (Briargate Circle is located approximately 550 feet north of the westbound ramp signal; Longcreek Drive is located approximately 860 feet south of the eastbound ramp signal) and multiple businesses with driveways located between the ramp intersections and the adjacent signalized intersections.
- The westbound off-ramp was widened in 2005 to mitigate the queuing of the heavy traffic volumes on the ramp from backing up into mainline I-20. It is desirable to avoid re-introducing extensive ramp queuing in the proposed AO concepts.

### 3.3.1.1 Exit 65 AO1 – Diverging Diamond Interchange

The proposed diverging diamond interchange (DDI) maintained two through lanes in each direction on Broad River Road through the interchange area. The eastbound off-ramp consisted of a single lane exiting I-26, and provided a separate left turn and separate right turn lane at Broad River Road. The eastbound on-ramp included a single left turn and single right turn lane from Broad River Road, creating a two lane on-ramp that merged into a single lane. The westbound off ramp included four turn lanes at Broad River Road: dual left turn and dual right turn lanes. The westbound on-ramp included a single left turn lane and single right turn lane from Broad River Road, creating a two lane on-ramp that merged into a single lane. The initial AO1 concept evaluated is shown in **Figure 3-2**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The analysis indicated AO1 was undersized as proposed. Under 2040 traffic volumes, the westbound ramp intersections operates near capacity during the morning peak hour, and over capacity during the afternoon peak hour. The eastbound ramp intersection operates under capacity.

At a minimum, dual left turn lanes are required to accommodate the high volume of left turn traffic to and from eastbound I-20. At least two right turn lanes are needed to accommodate the extremely high right turn traffic from the westbound off-ramp; three right turn lanes would be preferable, but would require downstream widening of Broad River Road to provide three northbound lanes. At least three through lanes would be needed at the crossovers for traffic entering the interchange, making the crossing over I-20 at least six lanes wide. Traffic signals would be required at the intersections of the left and right turn lanes exiting from the off-ramps in addition to the crossover intersections. AO1 was not selected to be incorporated into the representative alternatives.

### 3.3.1.2 Exit 65 AO2 – Roundabout Interchange

The proposed roundabout interchange incorporated two-lane roundabouts in place of traffic signals at the ramp intersections with Broad River Road. Two lanes in each direction were maintained on Broad River Road through the interchange area. The eastbound and westbound off-ramps approach to the roundabouts would provide

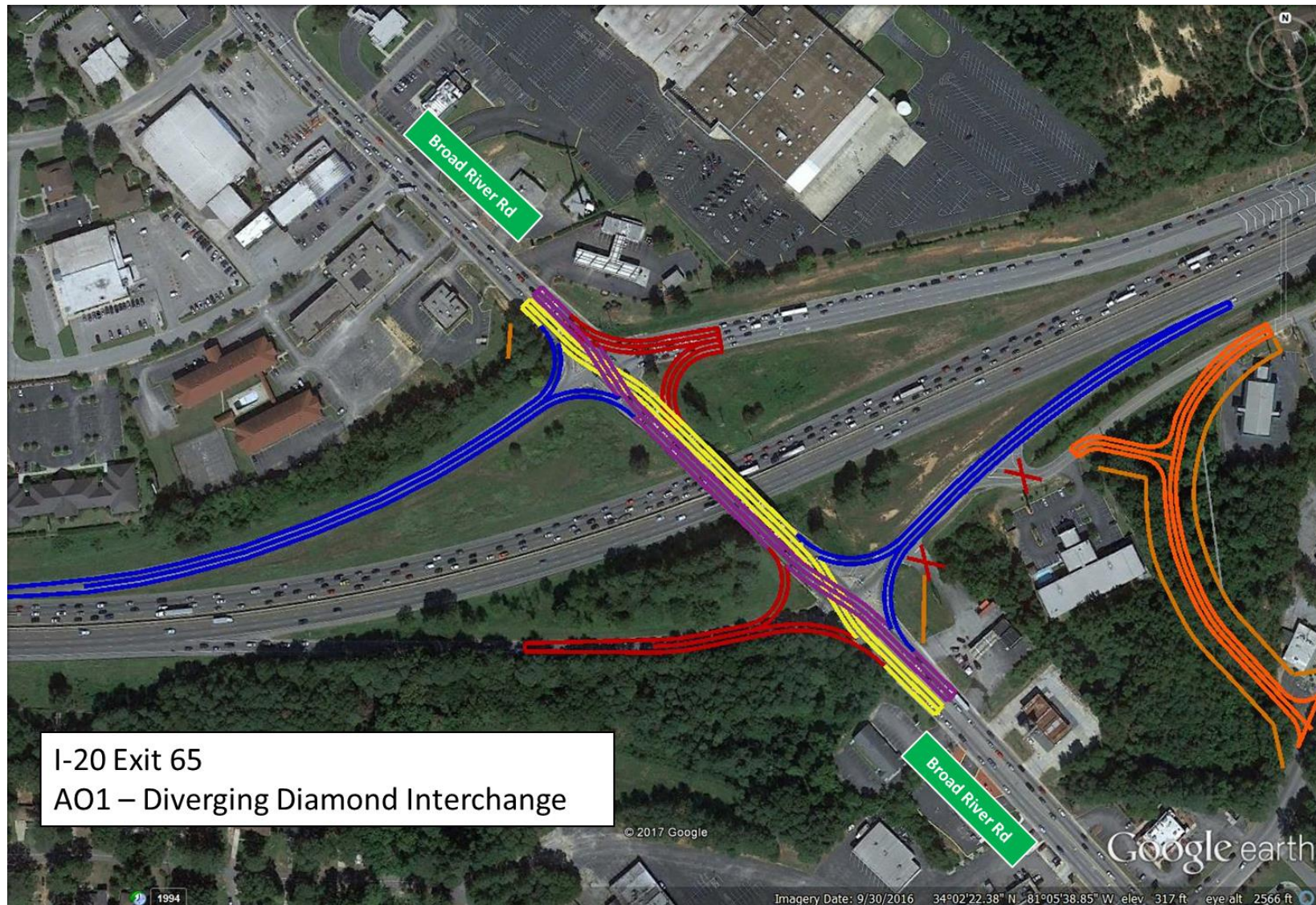
## Alternatives Traffic Analysis Technical Memo

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two lanes, and the on-ramp approaches departing from the roundabouts would provide one lane. The initial AO2 concept evaluated is shown in **Figure 3-3**.



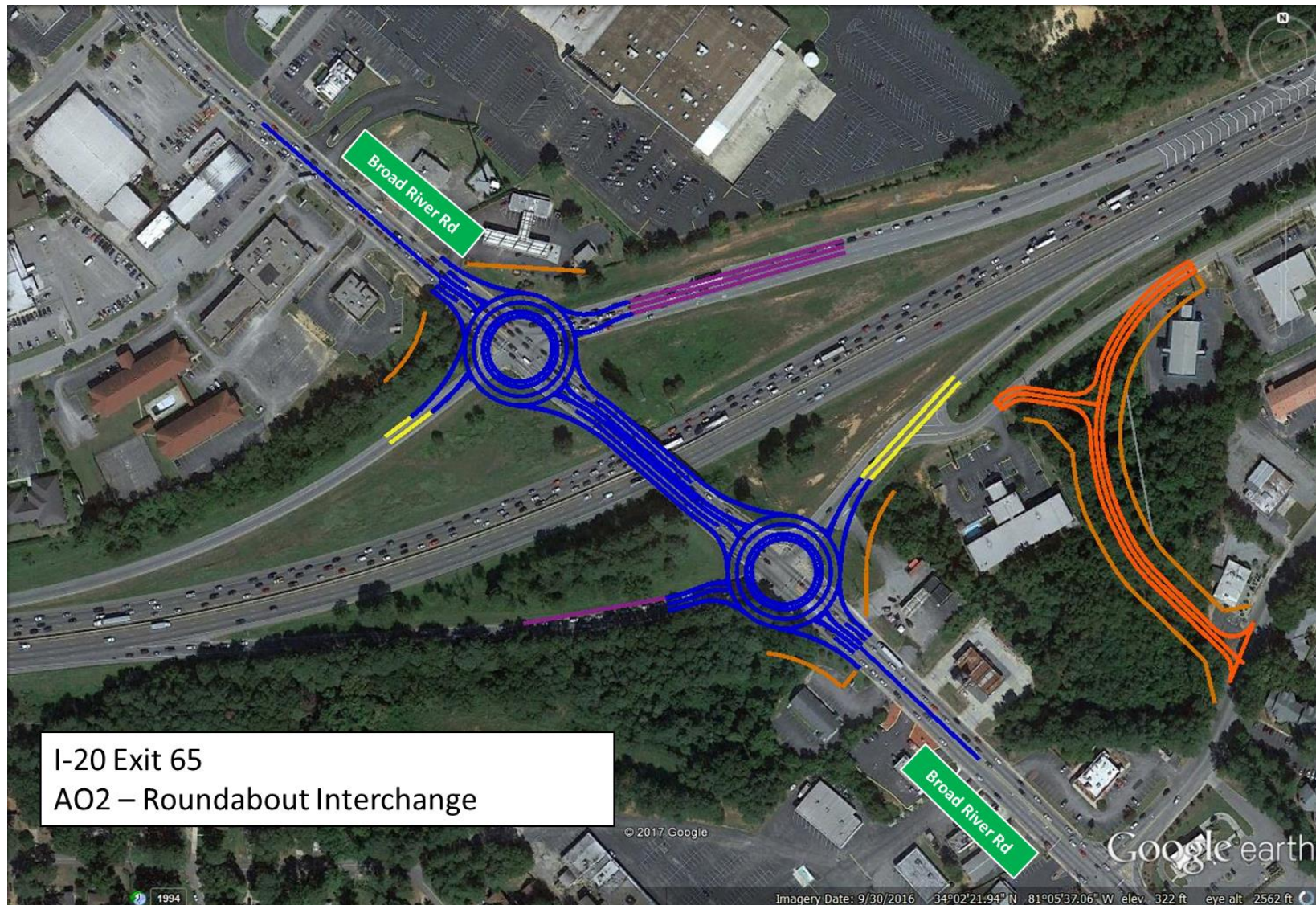
## Alternatives Traffic Analysis Technical Memo



**Figure 3-2 - AO1: Exit 65 Diverging Diamond Interchange**  
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## Alternatives Traffic Analysis Technical Memo



**Figure 3-3 - AO2: Exit 65 Roundabout Interchange**

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The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The analysis indicated the two-lane roundabouts at AO2, would operate over capacity under 2040 traffic volumes. Incorporating additional lanes in the roundabouts would not be feasible. AO2 was not selected to be incorporated into the representative alternatives.

### 3.3.1.3 Exit 65 AO3 – Single Point Urban Interchange

The proposed single point urban interchange (SPUI) maintained two through lanes in each direction on Broad River Road through the interchange area. The eastbound off-ramp consisted of a single lane exiting I-26, which splits to provide a separate left turn and separate right turn lane to Broad River Road. The single lane eastbound on-ramp included a single left turn and single right turn lane from Broad River Road, with right turn traffic entering the on-ramp yielding to left turn traffic. The westbound off ramp included four turn lanes at Broad River Road: dual left turn and dual right turn lanes. The westbound on-ramp included a single left turn lane and single right turn lane from Broad River Road, creating a two lane on-ramp that merged into a single lane. The initial AO3 concept evaluated is shown in **Figure 3-4**.

The capacity screening incorporated the use of the Synchro Template file for a SPUI. The analysis indicated AO3 was undersized as proposed. Under 2040 traffic volumes, the SPUI intersection operates near capacity during the morning peak hour, and over capacity during the afternoon peak hour.

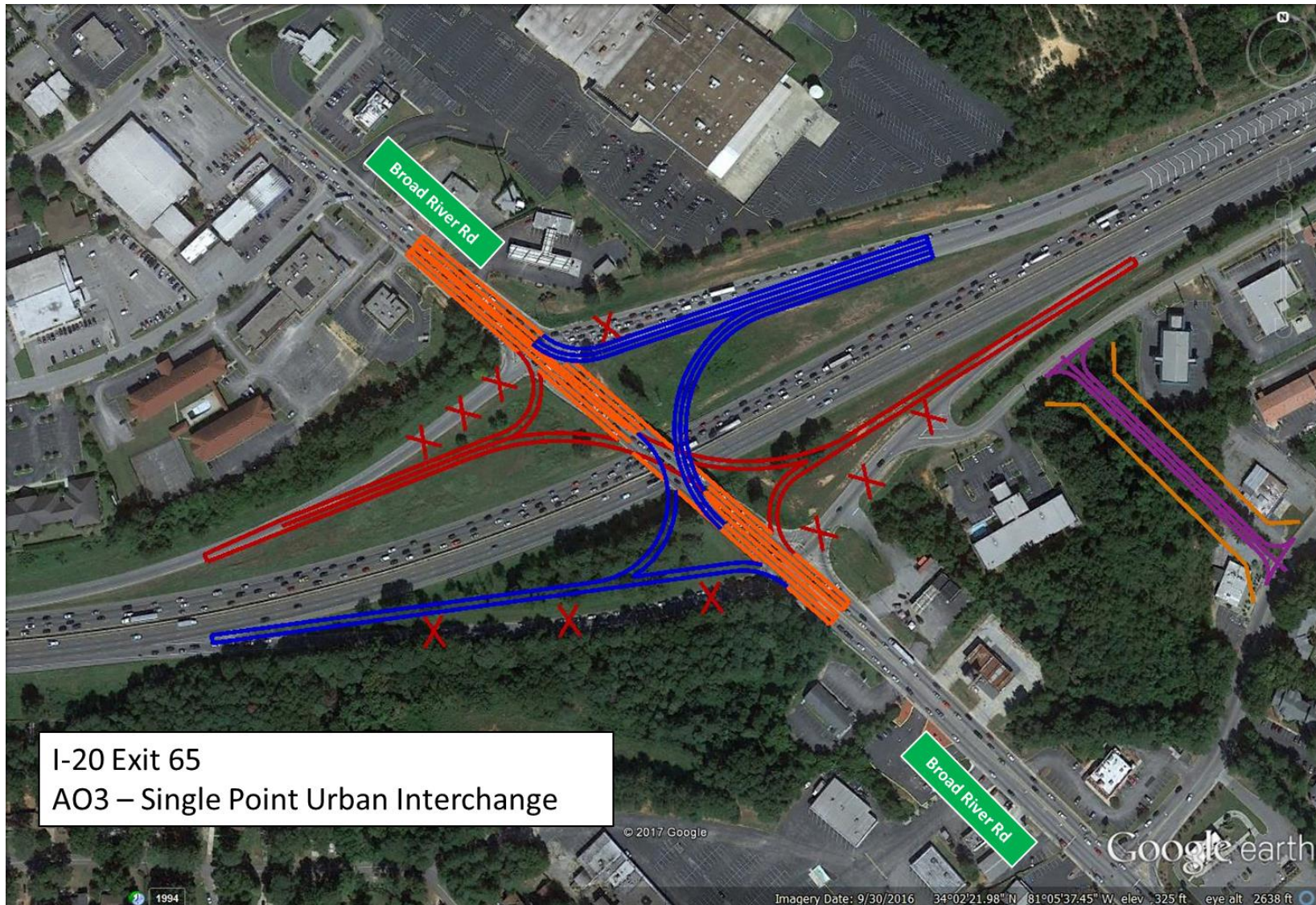
Modifying the initial concept to provide dual left turn lanes from southbound Broad River Road to the eastbound on-ramp improved the intersection condition to under capacity during the morning peak hour; its condition in the afternoon peak hour continues to be over capacity. Providing a third right turn lane on the westbound off-ramp would improve the intersection condition to near capacity during the afternoon peak hour, but would require downstream widening of Broad River Road to provide three northbound lanes. In addition to signaling the Broad River Road left turn and through movements (right turns onto the on-ramps would yield to left turn traffic entering the on-ramps), the left and right turn movements from the off-ramps would also have to be signaled (instead of providing a yield or stop condition for the off-ramp right turn movements). AO3 was selected to be evaluated further as part of the representative alternatives RA1, RA4, RA5, RA8, and RA9.

### 3.3.1.4 Exit 65 AO4 – Stacked Diamond Interchange

The proposed stacked diamond interchange carried one through lane in each direction on Broad River Road elevated above the existing interchange area, including the eastbound and westbound ramps intersections. The elevated section was conceived as beginning and ending at the adjacent intersections of Marley Drive/Briargate Circle (located approximately 1,025 feet north of the westbound ramp intersection) and Longcreek Drive (located approximately 860 feet south of the eastbound ramp intersection) and would function as a bypass of the interchange ramp intersections. The concept also included another lane in each direction running at the approximate current elevation of the bridge. These lanes are primarily intended to provide access to and from the interchange ramps, but would also provide another way for traffic to travel through the interchange area along Broad River Road. Left turns would be prohibited at the end of the stacked lanes for traffic traveling away from the interchange in each direction. The initial AO4 concept evaluated is shown in **Figure 3-5**.



## Alternatives Traffic Analysis Technical Memo

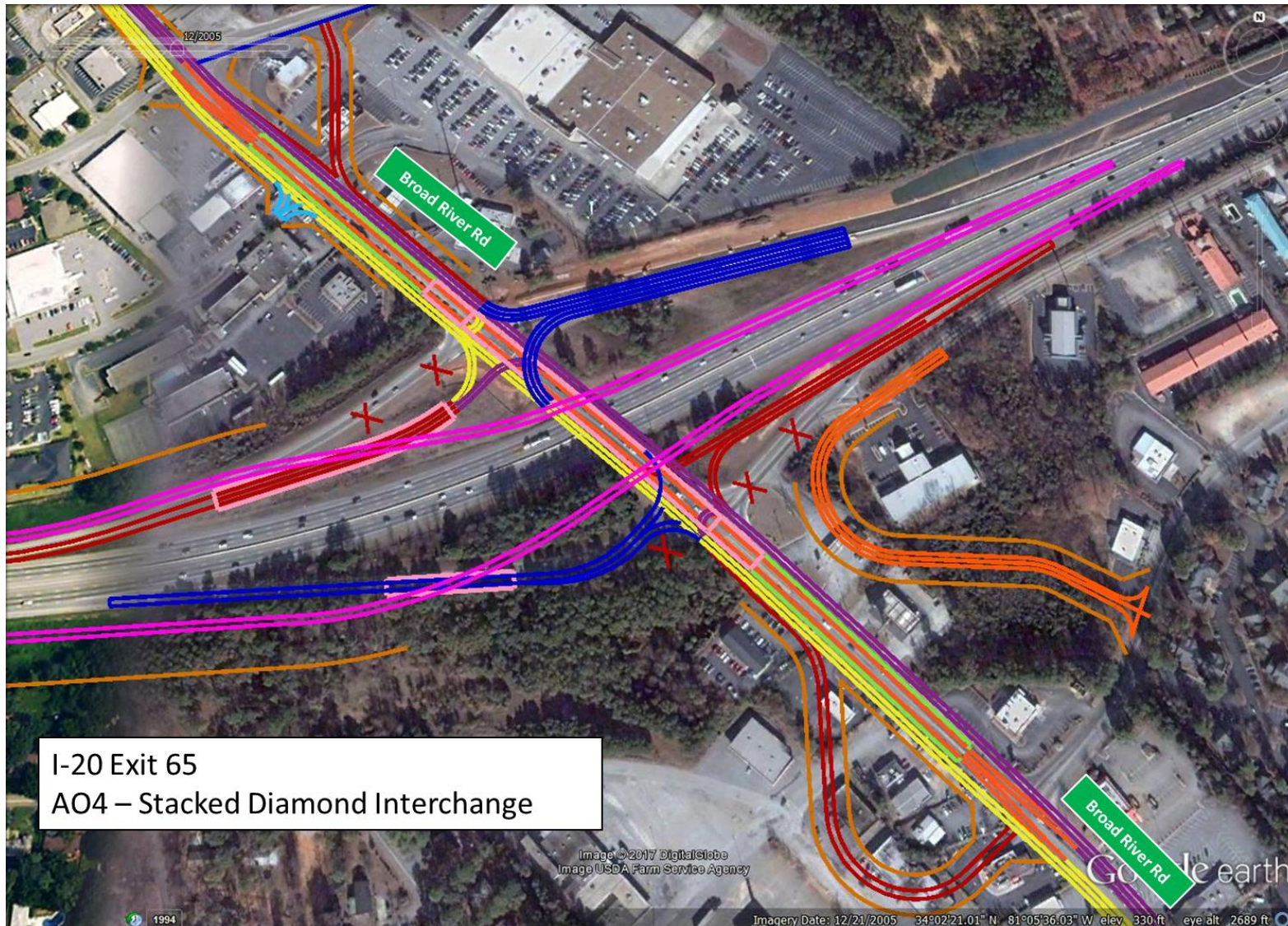


**Figure 3-4 - AO3: Exit 65 Single Point Urban Interchange**

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## Alternatives Traffic Analysis Technical Memo



**Figure 3-5 - AO4: Exit 65 Stacked Diamond Interchange**  
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The advantage that was sought in AO4 was the removal of some of the through traffic traveling on Broad River Road through the ramp intersections. This would generally permit a reduction in the amount of time allocated towards moving traffic along Broad River Road, allowing it to be re-allocated to moving traffic on and off the ramps.

The single lane eastbound off-ramp would provide separate left turn and right turn lanes at Broad River Road. The eastbound the on-ramp would have separate single lanes for southbound left turning and northbound right turning traffic entering from Broad River Road, and would maintain two lanes for a short distance down the ramp until it merged into one lane prior to entering eastbound I-20. The westbound off-ramp would provide two left turn lanes and two right turn lanes to Broad River Road. The section of southbound Broad River Road between the westbound ramp and the eastbound ramp intersections would have to have to lanes to accommodate the traffic from the dual left turn lanes on the westbound off-ramp. The westbound on-ramp would have separate lanes for the left and right turning traffic entering from Broad River Road and would maintain two lanes for a short distance down the ramp until it merged into one lane prior to entering westbound I-20.

In the vicinity of the westbound ramp intersection, the u-turn would be provided to allow southbound traffic on Broad River Road to travel back to the north. A similar u-turn would be present in the vicinity of the eastbound ramp intersection to permit northbound Broad River Road traffic to travel back to the south.

AO4 also included two short connector roads. In the northbound direction on Broad River Road, a connection would exit from the right side of the road to Marley Drive. In the southbound direction, a connector would exit from the right side of the road to align opposite Longcreek Drive. These connections were provided due to the removal of left turn movements from the end of the stacked lanes. Between the westbound ramp intersection and the connector to Marley Road, Broad River Road would have to have two lanes to accommodate the dual right turn lanes on the westbound off-ramp adjacent to the northbound stacked lane. The connector roads would function as a lane drop, reducing the through portion of Broad River Road to one lane.

The capacity screening of AO4 was performed using a detailed Synchro model created specifically to assess this concept. The assessment indicated that the ramp intersections would operate under capacity in isolation, but that traffic would back up through the interchange due to the over capacity condition at the intersections at the ends of the stacked section. The addition of the stacked lanes complicated the signal operation at those intersections, requiring an additional phase to be incorporated into the signal operation to split running the traffic from the stacked lane and the adjacent Broad River Road lane. Left turn traffic entering the eastbound on-ramp also experienced delay due to having only a single lane to accommodate the high volume of traffic making this movement.

Efforts were made to improve the concept, such as providing two through lanes on the northbound side of the stacked roadway, and extending the two lane section accommodating the westbound off-ramp right turn traffic to the end of the stacked section at Marley Drive. The intersections at the end of the stacked sections operated near capacity under existing traffic volumes, and over capacity under 2040 volumes. Extensive queuing was



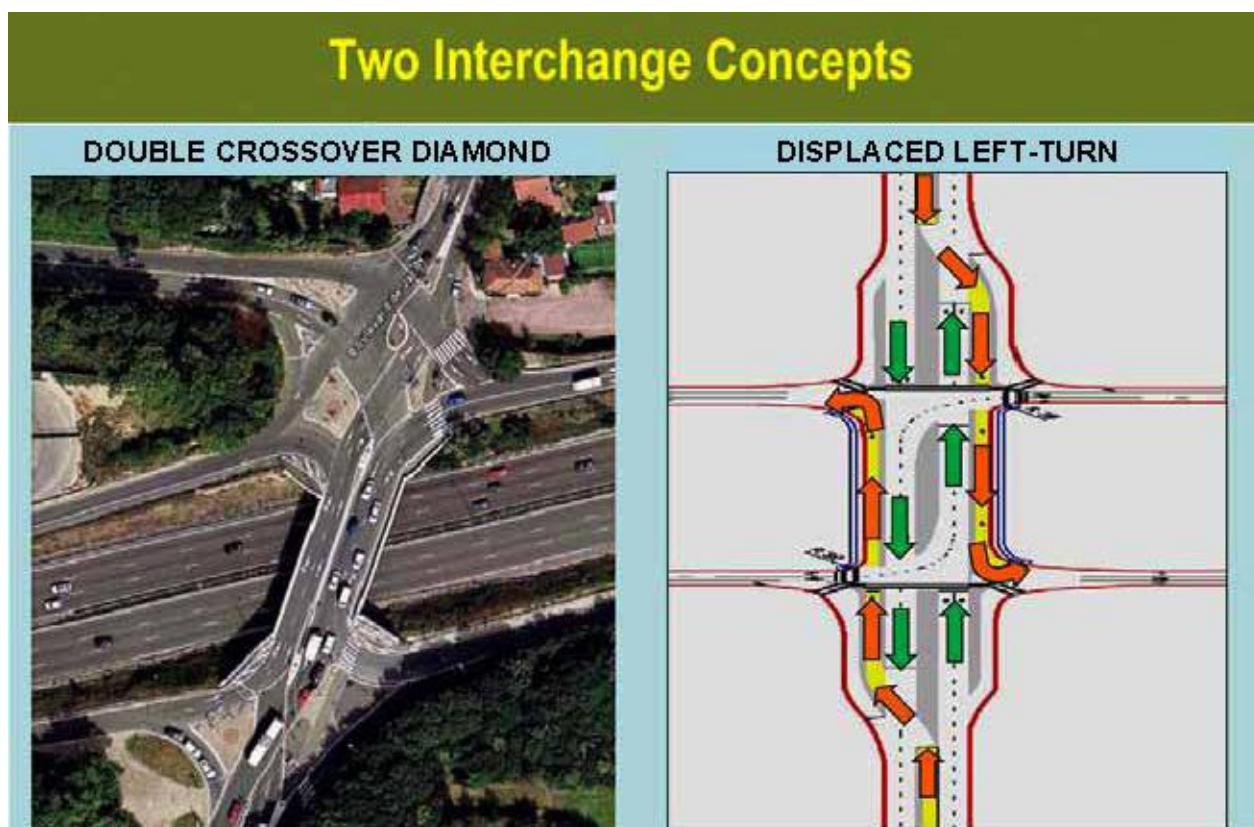
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observed in simulations of both peak hours under existing traffic. AO4 was not selected to be evaluated further as part of the representative alternatives.

### 3.3.1.5 Exit 65 AO5 –Offset/Displaced Left Interchange

The proposed offset left interchange (also known as a displaced left interchange) is similar to a DDI. In an offset left interchange, the left turn movements are displaced to the opposite side of the road at an intersection adjacent to and upstream from the ramp intersections, where in a DDI, the crossover takes place at or adjacent to the ramp intersections. The two interchange types can be compared in **Figure 3.6**.

**Figure 3-6 Comparison of DDI/Double Crossover and Displaced Left Interchanges**



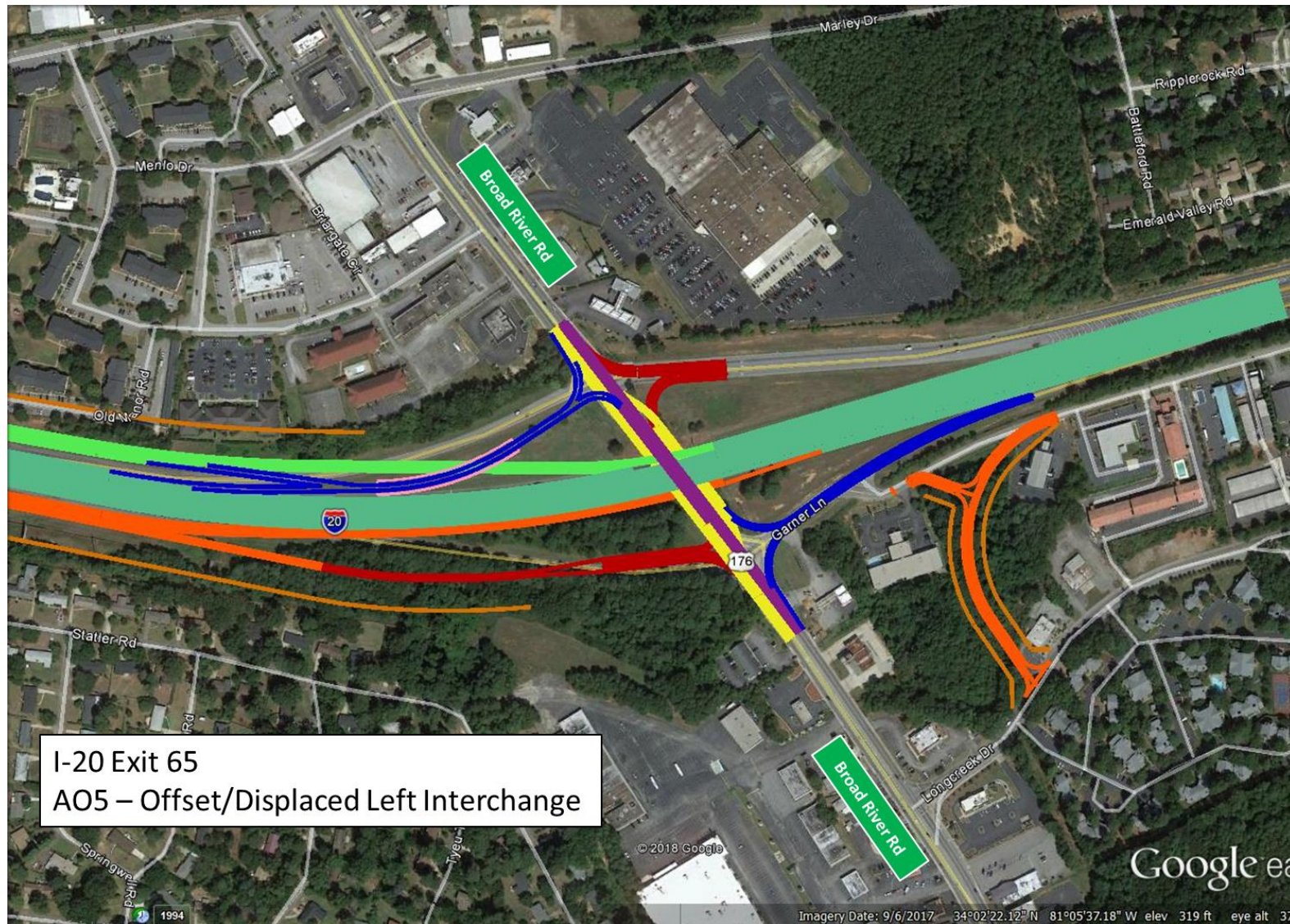
Source: Figure 2 - <https://www.fhwa.dot.gov/publications/research/safety/09060/001.cfm>

The concept for AO5 is technically more of a partial DDI than it is an offset left interchange. It can be considered “partial”, because only the left turns for southbound Broad River Road are displaced; the northbound left turn are not displaced. It is also more of a DDI because the displacement takes place at the westbound ramp intersection as opposed to the upstream adjacent intersection at Marley Drive.

In the original AO5 concept, southbound Broad River crosses over at the westbound ramp intersection with one lane crossing over to the left, and two through lanes continuing through on the right. The northbound lanes on Broad River Road are similar to the existing configuration. The initial AO5 concept is shown in **Figure 3-7**.



## Alternatives Traffic Analysis Technical Memo



**Figure 3-7 - A05: Exit 65 Offset/Displaced Left Interchange**

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The original AO5 concept included a two lane eastbound off-ramp that would provide a separate left turn and two right turn lanes at Broad River Road. The eastbound on-ramp would accept one left turn lanes from the crossover portion of the interchange and a single right turn lane, in which traffic would yield to left turning traffic entering the single lane on-ramp. The westbound off-ramp consisted of dual left turn lanes and dual right turn lanes. The dual left turn lanes turn into the crossover portion of the interchange. The westbound on-ramp would have separate lanes for the left and right turning traffic entering from Broad River Road. Right turn traffic would yield to left turn traffic before entering the single lane ramp.

In the original AO5 concept, the interchange overpass portion of Broad River Road would include two lanes on the southbound crossover, three northbound lanes (one full length left turn lane to the westbound on-ramp and two through lanes), and a two lane southbound through section, creating a seven lane wide bridge.

The capacity screening of AO5 was performed using a detailed Synchro model created specifically to assess this concept. The assessment of the original AO5 concept indicated that the concept needed to be revised to accommodate the high volume of left turn traffic entering the eastbound on-ramp. This traffic could not be accommodated on a single lane ramp, which resulted in observations of backups of left turn traffic upstream on Broad River Road. The revised AO5, which shown in **Figure 3-8**, incorporated dual southbound left turns at the crossover at the westbound ramp intersection, and maintained two through lanes. At the eastbound ramp intersection, dual left turn lanes were provided with right turn traffic yielding to the left turn traffic entering the two lane on-ramp. The interchange overpass was expanded to a seven lane bridge, since the crossover section was increased to three lanes to accommodate the left turn traffic from the westbound off-ramp and the traffic crossing the overpass to turn left on the eastbound on-ramp.

The two ramp intersections were assessed to operate under capacity in the 2040 morning peak hour. In the 2040 afternoon peak hour, the westbound ramp intersection was assessed as operating near capacity while the eastbound ramp intersection was assessed as operating under capacity. Observations of the simulations indicated there was significant queuing of left turn traffic heading to the eastbound on-ramp at the crossover intersection during both peak hours. During the afternoon peak hour, significant queuing was also observed on the northbound through lanes of Broad River Road. In both simulations, the off-ramp traffic worked well, and AO5 seemed to best handle the high volume of right turn traffic on the westbound off-ramp. AO5 was selected to be evaluated further as part of the representative alternatives RA2, RA3, RA6, and RA7.

### 3.3.1.6 Exit 65 CAP-X Review

The Exit 65 traffic volumes and interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo interchange, followed by the Displaced Left Turn (DLT), and the SPUI interchanges. The DDI and Traditional Diamond interchange both had equivalent ratings and were ranked last.

#### Partial Cloverleaf Interchange

A ParClo interchange would be a reasonable option for handling the higher volume movements using loop ramps. CAP-X only assesses ParClo interchanges with loop off-ramps replacing left turn movements from off-



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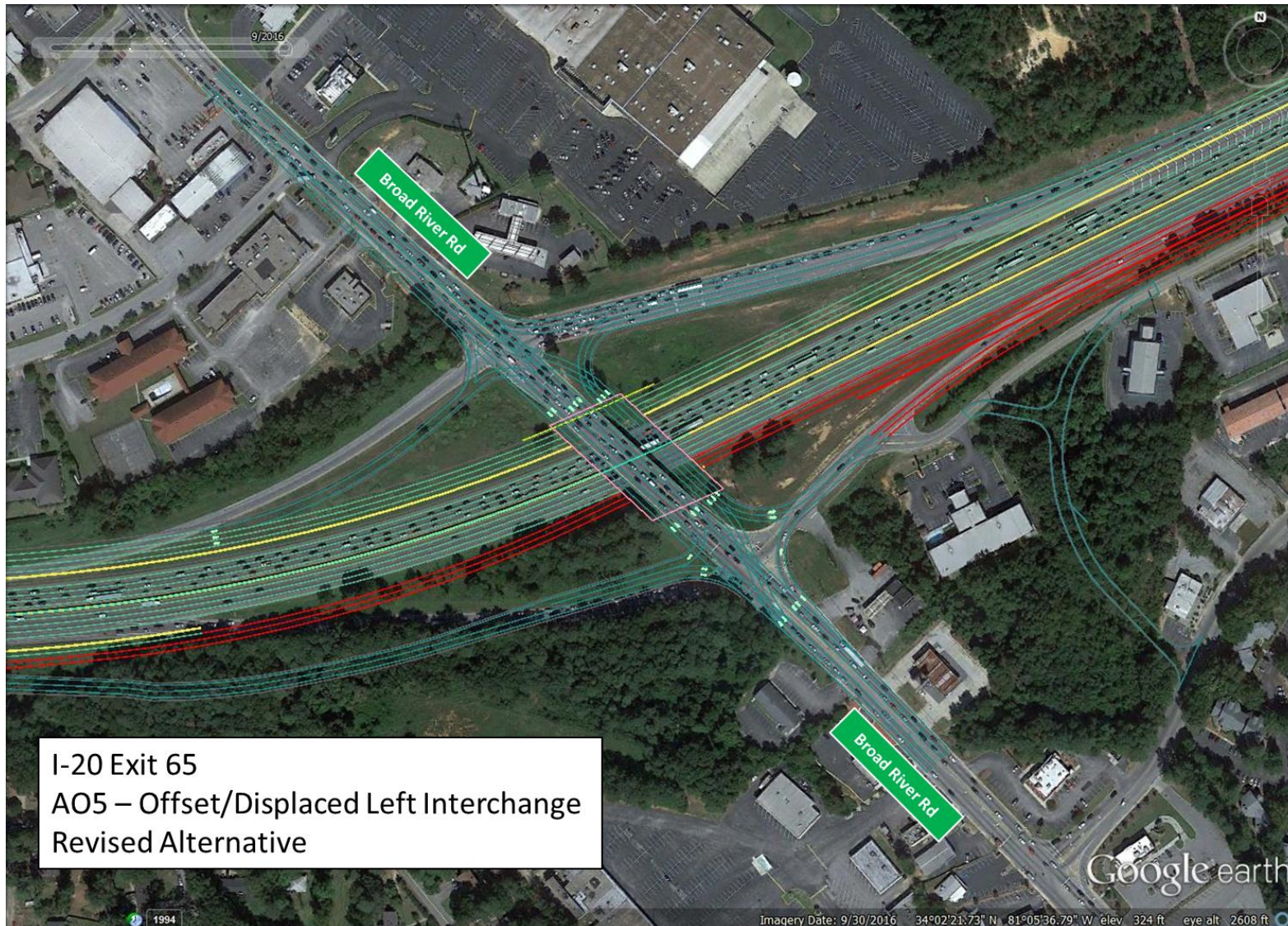


Figure 3-8 - AO5: Exit 65 Revised Offset/Displaced Left Interchange

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ramps. It does not consider loop on-ramps replacing left turn on-ramp movements. So in this example, a ParClo would shift the eastbound and westbound off-ramp left turn traffic to loop ramps in the northwest and southeast interchange quadrants. This would be effective in processing the high westbound left turn traffic, but the eastbound left turn traffic is likely not high enough to warrant constructing a loop ramp. Though CAP-X cannot assess it, it is likely that a more efficient ParClo option would include the westbound loop off-ramp, as well as an eastbound loop on-ramp to eliminate the need for dual left turn lanes to accommodate traffic turning left onto the eastbound on-ramp.

Despite being highly rated in the CAP-X assessment, a ParClo interchange could not be constructed within the existing interchange footprint, and would likely require the acquisition of a number of businesses in the northwest quadrant of the interchange.

### Displaced Left Turn Interchange

The DLT interchange was also rated highly in the CAP-X assessment. This would appear to validate the AO5 concept, except that AO5 is more accurately described as a Partial Diverging Diamond interchange. A true DLT would locate the left turn crossovers upstream at the next adjacent intersections (Marley Drive/Briargate Circle to the north and Longcreek Drive to the south). The additional number of lanes needed between these intersections to accommodate the displaced left turn lanes would impact businesses that are located between these intersections and the interchange ramps. A true DLT could not be constructed within the existing interchange footprint.

These interchange concepts could be revisited in the future if AO3 and AO5 do not provide effective traffic flow in the representative alternatives, and if the resulting impacts to businesses along Broad River Road resulting from these options are considered acceptable trade-offs.

### 3.3.2 AO6 – AO10 (EXIT 63)

The following are a list of the AO developed and screened for Exit 63.

- AO6 – Diverging Diamond Interchange (Synchro Template)
- AO7 – Offset Diamond (detailed Synchro model)
- AO8 – Partial Cloverleaf Interchange (detailed Synchro Model)
- AO9 – Roundabout Interchange (SIDRA)
- AO10 – Single Point Urban Interchange (Synchro Template)

Note: The use of CAP-X was applicable for AO6, AO8, and AO10.

Existing traffic operations at Exit 63 are complicated by:

- High left turn volumes onto westbound I-20 during the afternoon peak hour (existing afternoon peak hour traffic is about 400 in the afternoon)
- High left turn volumes from the eastbound off-ramp during both peak hours (existing peak hour traffic is approximately 350 vehicles in the morning and around 400 vehicles in the afternoon)



## Alternatives Traffic Analysis Technical Memo

- High right turn volumes from the eastbound off-ramp during the morning peak hour (existing peak hour traffic is approximately 550 vehicles during the morning peak hour)
- High right turn volumes from the westbound off-ramp to Bush River Road during both peak hours (existing peak hour traffic is about 450 vehicles in the morning, and over 300 vehicles in the afternoon)
- High through volumes on Bush River Road.
  - Traffic entering the interchange area from the east are approximately 500 vehicles during the morning peak hour and about 1,350 vehicles during the afternoon peak hour
  - High volumes of traffic enter the interchange area from the west in both peak hours (approximately 1,400 vehicle enter during the morning peak hour and 1,300 during the afternoon peak hour)
  - Traffic exiting the area to the east of the interchange are approximately 1,400 vehicles during the morning peak hour and over 900 vehicles during the afternoon peak hour
  - Traffic exiting the interchange area along westbound Bush River Road is approximately 1,100 vehicles during the morning peak hour and exceeds 1,500 vehicles per hour in the afternoon peak hour.
- West of the interchange are three conditions that contribute to congestion in the Exit 63 interchange area:
  - The intersection of the Berryhill Road frontage road connecting St Andrews Road and Bush River Road is located immediately adjacent to the westbound ramp intersection. The signals at the two intersections operate using a single controller, and contribute to congestion along Bush River Road.
  - Between Rockland Road, which is located approximately 480 feet east of the westbound ramp intersection, and Outlet Pointe Boulevard, which is located approximately 500 feet west of the Berryhill Road intersection, there are five signalized intersections with approximately 2,000 feet.
  - Immediately west of Outlet Pointe Boulevard, Bush River Road is reduced from a five lane section to a two-lane section, creating a choke-point for the high westbound through traffic.

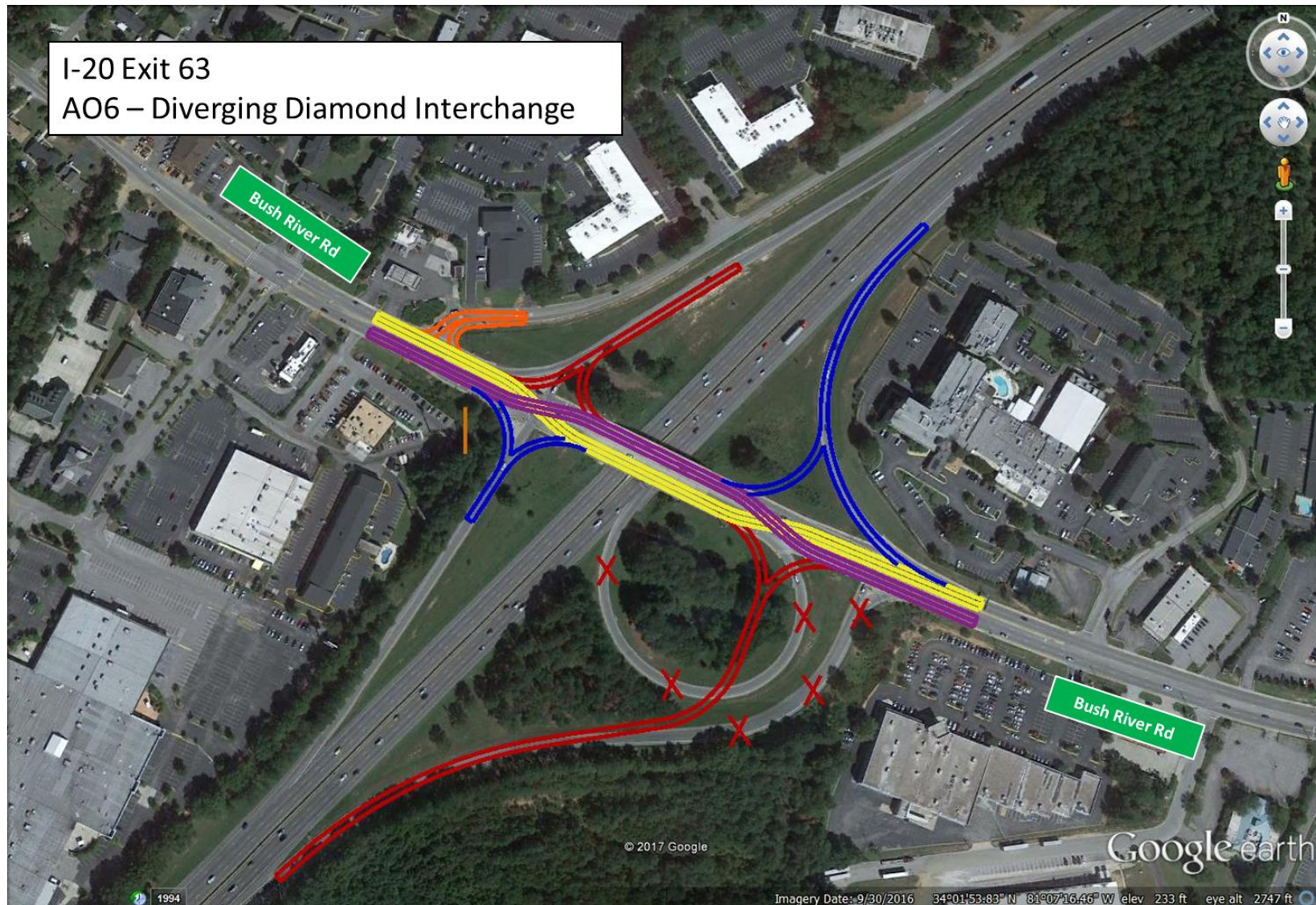
### 3.3.2.1 Exit 63 AO6 – Diverging Diamond Interchange

The proposed diverging diamond interchange (DDI) maintained two through lanes in each direction on Bush River Road through the interchange area. The eastbound off-ramp consisted of a single lane exiting I-20, and provided a separate left turn and separate right turn lane at Bush River Road. The eastbound on-ramp included a single left turn and single right turn lane from Bush River Road, with the right turn movement yielding to the left turn movement on the single lane ramp. The westbound off ramp consisted of a single lane exiting I-20, and originally provided only for single separate left turn and right turn lanes at Bush River Road. The westbound on-ramp included a single left turn lane and single right turn lane from Bush River Road, with the right turn movement yielding to the left turn movement on the single lane ramp. The initial AO6 concept evaluated is shown in **Figure 3-9**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The analysis indicated AO6 was undersized as proposed. The capacity assessment indicated that the eastbound and westbound off-ramps were required dual left turn lanes and dual right turn lanes to accommodate the high volume of turning traffic



## Alternatives Traffic Analysis Technical Memo



**Figure 3-9 - AO6: Exit 63 Diverging Diamond Interchange**

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from the ramps. AO6 was also modified to provide three lanes on the westbound side of the DDI to facilitate two left turn lanes to the westbound on-ramp. Observations of SimTraffic simulations indicated that during the afternoon peak hour with 2040 traffic, the westbound traffic still creates congestion on the westbound crossover section, which in turn causes periodic queuing on the eastbound off-ramp.

While the Synchro template file used in the capacity assessment was not modified to incorporate the adjacent Berryhill Road intersection, the final version of AO6 included converting Berryhill Road to a right-in/right out intersection at Bush River Road. Also included in the final version of AO6 was an overpass connecting Rockland Road to Executive Center Drive to access to Berryhill Road from Bush River Road. AO6 was selected to be incorporated into the representative alternatives RA1 and RA3.

### 3.3.2.2 Exit 63 AO7 – Offset Diamond Interchange

The proposed offset diamond interchange carries two through lanes in each direction on Bush River Road. The interchange ramps would be elevated and aligned to intersection a single intersection located approximately where the eastbound loop on-ramp diverges from Bush River Road. The single lane eastbound and westbound off-ramps would provide separate left turn and right turn lanes at Bush River Road. The eastbound and westbound on-ramps would have separate single lanes for eastbound left turning and westbound right turning traffic entering from Bush River Road, and would maintain two lanes for a short distance down the ramp until it merged into one lane. A particular advantage of AO7 was the combining of the two ramp signals and relocating the signals between the adjacent signals at Rockland Drive and Berryhill Road. AO7 would also permit full access to and from Berryhill Road. The initial AO7 concept evaluated is shown in **Figure 3-10**.

The capacity screening of AO7 was performed using a detailed Synchro model created specifically to assess this concept. The assessment indicated that dual eastbound and westbound left turn lanes were required to carry traffic from Bush River Road to the on-ramp. Additionally, due to the high volume of left turn traffic on the eastbound on-ramp, the approach was modified to provide two left turn lanes and a separate right turn lane.

Observations of simulations of the 2040 traffic on the modified version of AO7 indicated that the high volume of westbound traffic on Bush River Road turning left onto the westbound on-ramp would likely not be able to be accommodated with two left turn lanes. Left turn traffic was observed to spill out of the left turn lanes, blocking through traffic and increasing congestion. AO7 was selected to be evaluated further as part of the representative alternatives RA4 and RA6.

### 3.3.2.3 Exit 63 AO8 – Partial Cloverleaf Interchange

The proposed partial cloverleaf interchange eliminates the ramps on the east side of the interchange. A westbound loop off-ramp would replace the existing single lane off-ramp. The eastbound on-ramp would be removed, and the westbound Bush River Road traffic turning right onto that on-ramp would now turn left. The westbound loop off-ramp and the westbound on-ramp intersection would also be aligned to opposite Berryhill Road, eliminating one signalized intersection in the interchange area. Eastbound Bush River Road would carry three lanes across the bridge to provide for the weaving section between the two ramps. In the initial AO8



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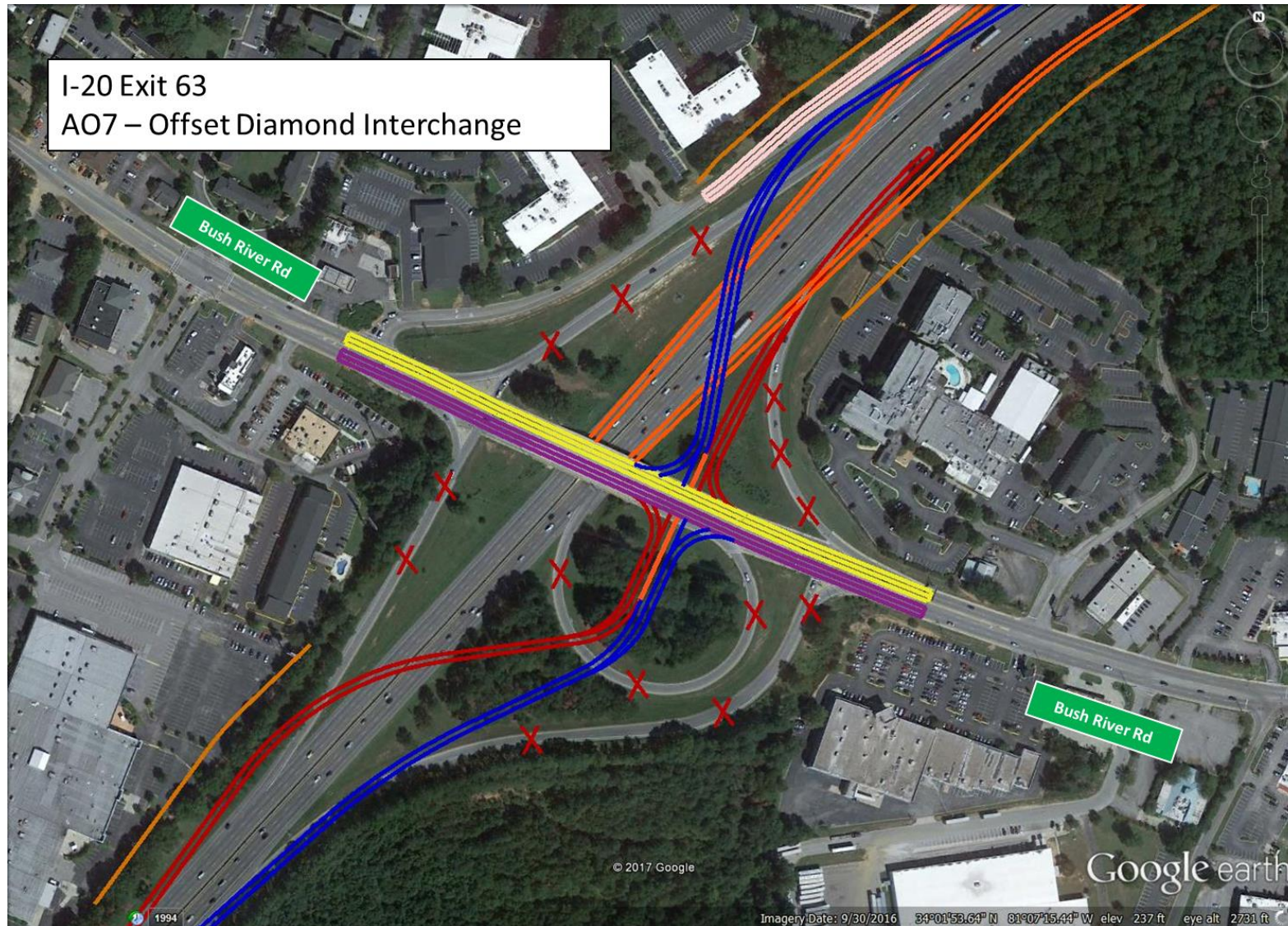


Figure 3-10 - AO7: Exit 63 Offset Diamond Interchange

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concept, westbound Bush River Road would also carry three lanes across the bridge. The initial AO8 concept evaluated is shown in **Figure 3-11**.

The capacity screening of AO8 was performed using a detailed Synchro model created specifically to assess this concept. The assessment indicated that ramp intersections would function under capacity. However, to achieve better intersection operations at the westbound on-ramp intersection, a second westbound left turn lane on Bush River Road to the westbound on-ramp was added to the concept.

It should be noted that the ParClo interchange proposed in AO8 could not be constructed within the existing interchange footprint, and would likely require the acquisition of businesses in the northwest quadrant of the interchange where the westbound loop off-ramp and westbound on-ramp would be relocated.

Observations of simulations of the 2040 traffic on the modified version of AO8 indicated that this alternative appeared to best handle the high volume of traffic at the interchange. AO8 was selected to be evaluated further as part of the representative alternatives RA5 and RA7.

### 3.3.2.4 Exit 63 AO9 – Roundabout Interchange

The proposed roundabout interchange incorporated two-lane roundabouts in place of traffic signals at the ramp intersections with Bush River Road. Roundabouts were also included at the adjacent Bush River Road intersections with Berryhill Road and Outlet Pointe Boulevard. Two lanes in each direction were maintained on Bush River Road through the interchange area. The interchange ramps would remain unchanged, with the exception of the westbound off-ramp, which was originally intended to include a direct u-turn lane from the ramp to Berryhill Road. The initial AO9 concept evaluated is shown in **Figure 3-12**.

The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The assessment indicated the two-lane roundabouts at the ramp intersections, would operate at or over capacity under existing traffic volumes, and over capacity under 2040 volumes. Incorporating additional lanes in the roundabouts would not be feasible. AO9 was not selected to be incorporated into the representative alternatives.

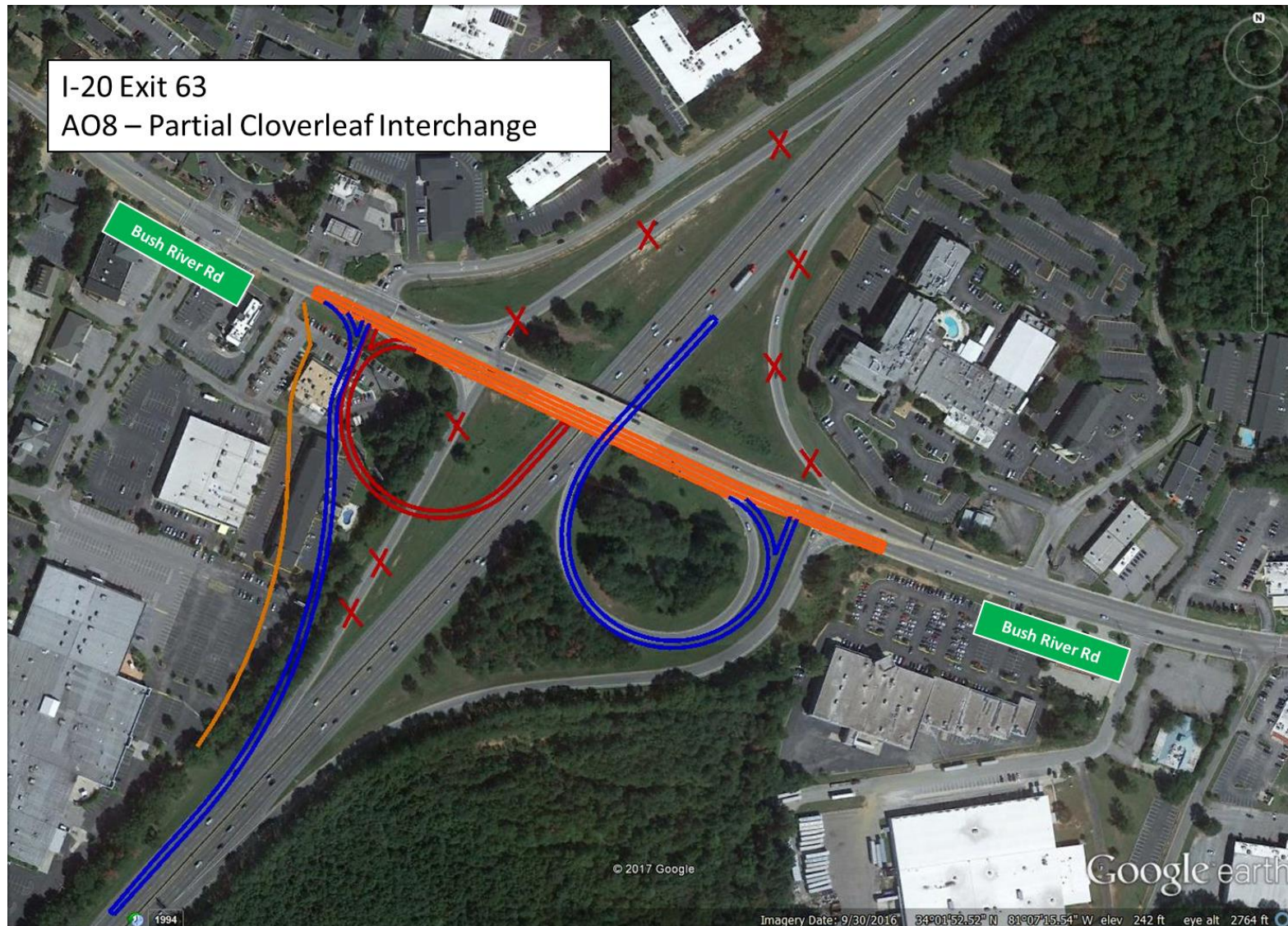
### 3.3.2.5 Exit 63 AO10 – Single Point Urban Interchange

The proposed single point urban interchange (SPUI) maintained two through lanes in each direction on Bush River Road through the interchange area. The eastbound and westbound off-ramps consisted of a single lane exiting I-20, which separates to provide a separate left turn and separate right turn lane to Bush River Road. The single lane eastbound and westbound on-ramps included a single left turn and single right turn lane from Bush River Road, with right turn traffic entering the on-ramp yielding to left turn traffic. The initial AO10 concept evaluated is shown in **Figure 3-13**.

The capacity screening incorporated the use of the Synchro Template file for a SPUI. The analysis indicated AO10 was undersized as proposed. Under 2040 traffic volumes, the SPUI intersection operates over capacity during both peak hours.



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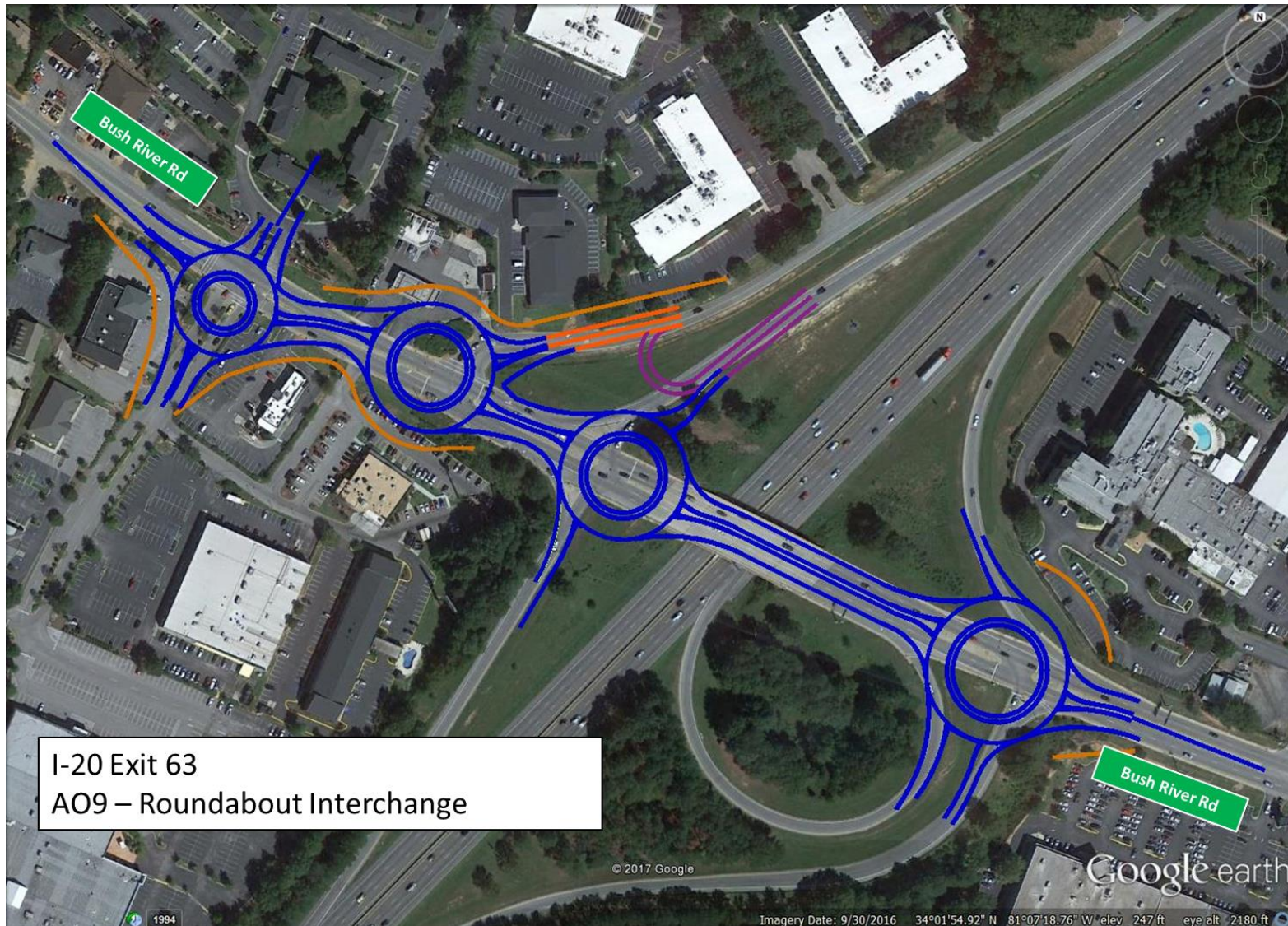


**Figure 3-11 - AO8: Exit 63 Partial Cloverleaf Interchange**

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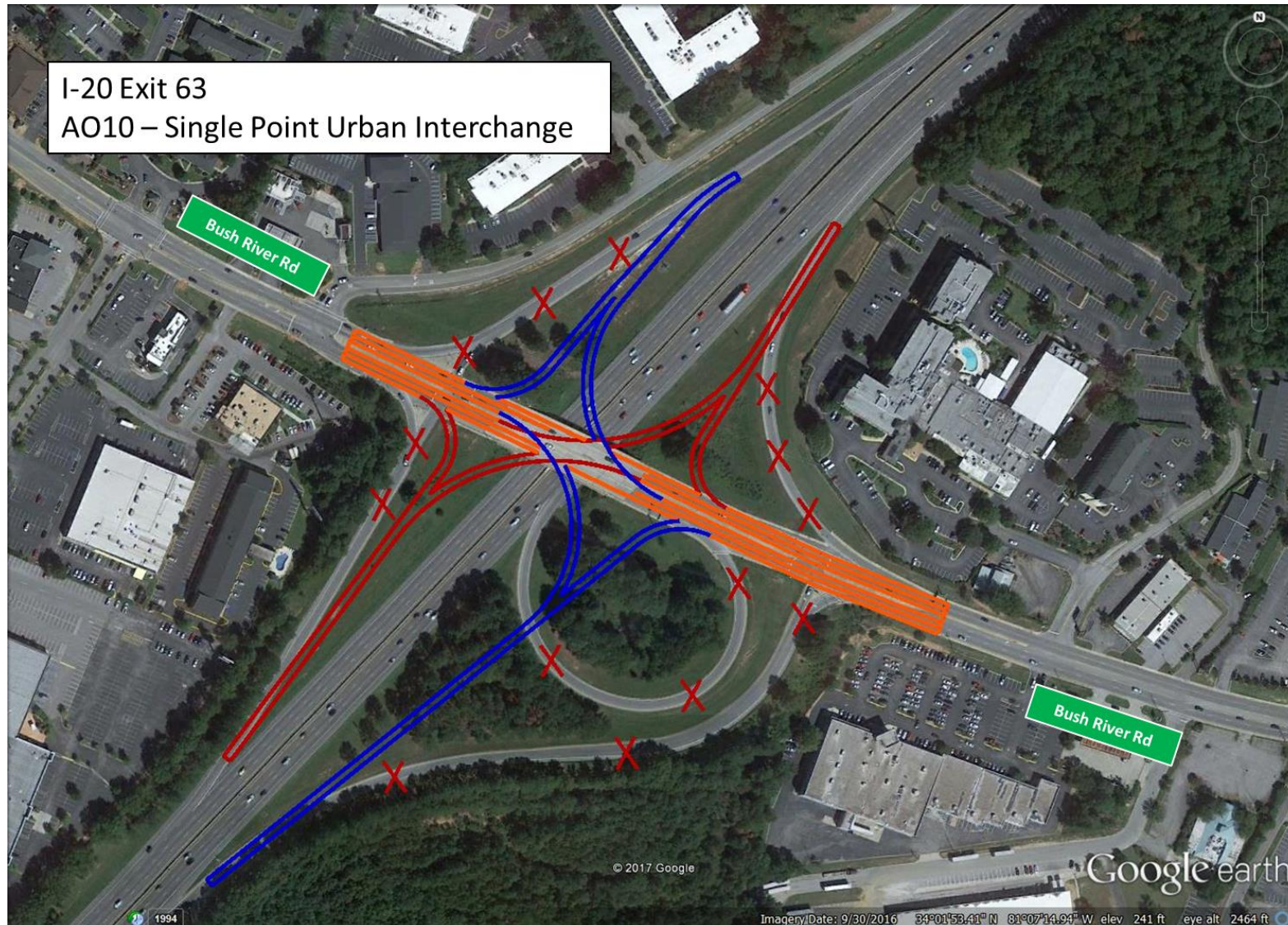


**Figure 3-12 - AO9: Exit 63 Roundabout Interchange**

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## Alternatives Traffic Analysis Technical Memo



**Figure 3-13 - AO10: Exit 63 Single Point Urban Interchange**  
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The initial concept was modified to provide dual left turn lanes in each direction on Bush River Road, dual left turn lanes on the eastbound off-ramp, and dual right turn lanes on both off-ramps. With these modifications, the single point intersection was assessed to operate under capacity during both peak hours. Observations of the simulations of the alternative indicated that, with the additional turn lanes, there was occasional queuing on eastbound Bush River Road during the morning peak hour. This would likely only be alleviated by providing an additional eastbound through lanes through the SPUI. AO10 was selected to be evaluated further as part of the representative alternatives RA2 and RA9.

### 3.3.2.6 Exit 63 CAP-X Review

The Exit 63 traffic volumes and interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo interchange, followed by the SPUI, and displaced left turn (DLT) interchanges. The DDI and Traditional Diamond interchange both had equivalent ratings and were ranked fourth and fifth respectively. The CAP-X results accurately reflect the results of the capacity screening of AO8 and AO10. A DLT was not considered as one of the Exit 63 interchange options.

#### Partial Cloverleaf Interchange

As demonstrated in the capacity screening of AO8, a ParClo interchange would be a reasonable option for handling the higher volume movements using loop ramps. However, CAP-X only assesses ParClo interchanges with loop off-ramps replacing left turn movements from off-ramps. It does not consider loop on-ramps replacing left turn on-ramp movements. Though CAP-X cannot assess AO8, which includes the eastbound loop on-ramp, the observations of the simulations indicate AO8 would likely perform well.

It should be noted that the ParClo interchange proposed in AO8 could not be constructed within the existing interchange footprint, and would likely require the acquisition of businesses in the northwest quadrant of the interchange where the westbound loop off-ramp and westbound on-ramp would be relocated.

#### Displaced Left Turn Interchange

The DLT interchange option was the third highest rated in the CAP-X assessment. This concept was not developed as a design alternative at Exit 63. Were such a concept to be considered, the left turn movements at the ramps would have to be displaced upstream of the ramp intersections, most likely at Outlet Pointe Boulevard and at Rockland Road. The additional number of lanes needed between these intersections to accommodate the displaced left turn lanes would impact businesses that are located between these intersections and the interchange ramps. A true DLT could not be constructed within the existing interchange footprint.

### 3.3.3 AO11 – AO16, AO48 (EXIT 106)

The following are a list of the AO developed and screened for Exit 106.

- AO11 – Diverging Diamond Interchange (Synchro Template)



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- AO12 – St Andrews Flyover (Capacity Screening Assessment)
- AO13 – Single Point Urban Interchange (Synchro Template)
- AO14 – Modified Diverging Diamond/Woodland Hills (detailed Synchro model)
- AO15 – Diverging Diamond/Frontage Road (detailed Synchro model)
- AO16 – Split Ramp Roundabouts Intersections (SIDRA)
- AO48 – Roundabout Intersections (SIDRA)

Note: The use of CAP-X was applicable for AO11, and AO13.

Existing traffic operations at Exit 106 are complicated by:

- Proximity to the I-20/I-26 system interchange.
- The atypical westbound off-ramp configuration. Approximately 570 feet from the off-ramp gore point, a right turn lane is provided to a short ramp. This ramp is signed to direct traffic to Burning Tree Road and Fernandina Road. Traffic intending to travel to Fernandina Road is supposed to use the ramp and turn left on Burning Tree Road, which intersects opposite Fernandina Road at St Andrews Road. Only traffic traveling to eastbound St Andrews Road are intended to use the entire ramp to travel to its intersection with St Andrews Road. However, many drivers do not use the signed connection to Fernandina Road via Burning Tree Road, and attempt to cross two lanes of traffic to access the eastbound left turn lane to Fernandina Road from the end of the westbound off-ramp.
- The proximity of adjacent intersections to the ramp intersections.
  - Woodland Hills Road, which connects to a large residential subdivision, intersects the south side of St Andrews Road opposite the eastbound off-ramp intersection. There is about 60 feet separation from the eastbound curb line of St Andrews Road and the westbound curb lane of the Frontage Road/Berryhill Road that intersects Woodland Hills Road.
  - Fernandina Road is located approximately 180 feet from the westbound I-26 ramp intersections. Only traffic traveling through on eastbound St Andrews Road should use the ramp intersection with St Andrews Road. The drivers that use the eastbound ramp to St Andrews Road to turn left on to Fernandina Road have to cross two lanes of traffic to access the eastbound left turn lane. Due to the short distance, this can create safety and operational issues.
- High volumes of traffic on the loop on-ramp from westbound St Andrews Road to eastbound I-26 during both peak hours (existing peak hour traffic is approximately 900 vehicles in the morning and afternoon peak hours). This high volume of traffic will require multiple turn lanes in a traditional diamond interchange set-up, as well as several innovative interchange concepts. The high volume of loop ramp traffic for 2040 conditions results in the loop ramp being assessed as near capacity during both 2040 peak hours.
- High volume of on-ramp traffic from eastbound St Andrews to eastbound I-26 during both peak hours. Extremely high volumes of existing traffic uses the eastbound on-ramp during the morning peak hour (approaching 1,200 vehicles per hour). There is also a high volume of traffic on the ramp during the afternoon peak hour (about 700 vehicles per hour).
- High volume of westbound off-ramp traffic on an atypical ramp configuration, along with the ramp intersection on St Andrews Road almost immediately adjacent to the St Andrews Road intersection at Fernandina Road. The high volume of existing traffic (about 760 vehicles during the morning peak hour and about 400 vehicles during the afternoon peak hour) using the westbound off-ramp during both peak hours has two options.

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- Approximately 60 percent of the morning peak hour traffic (about 450 vehicles per hour) and 80 percent of the afternoon peak hour traffic (about 300 vehicles per hour) continue to the ramp terminus at St Andrews Road.
- The remaining traffic (about 300 vehicles in the morning peak hour and 100 vehicles in the afternoon peak hour) uses the short ramp to access Burning Tree Road.
  - In the morning peak hour, about half the traffic turns left towards St Andrews and to continue on to Fernandina Road. The remaining traffic turns right to Burning Tree Road, which provides access to several office parks and residential areas located in the northeast quadrant of the I-20/I-26 system interchange.
  - In the afternoon peak hour, about 75 percent of the traffic turn left towards Fernandina Road.
- Relatively high existing westbound loop off-ramp traffic (about 350 vehicles during the morning peak hour and over 600 vehicles per hour in the afternoon peak hour). These volumes would require multiple left turn lanes in the ramp concepts that eliminate the loop ramp, such as a diamond, DDI, or SPUI.

### 3.3.3.1 Exit 106 AO11 – Diverging Diamond Interchange

The proposed diverging diamond interchange (DDI) maintained two through lanes in each direction on St Andrews Road through the interchange area. The eastbound and westbound off-ramps consisted of a single lane exiting I-26, and provided a separate left turn and separate right turn lane at St Andrews Road. The eastbound and westbound on-ramps included a single left turn and single right turn lane from St Andrews Road, with the right turn movement yielding to the left turn movement on the single lane ramp. AO11 did not alter the spacing between the westbound ramps and Burning Tree Road/Fernandina Road. However, it required the shifting of the Woodland Hills Road intersection to a relocation of the Frontage Road/Berry Hill Road intersection approximately 350 feet west of the existing Woodland Hills Road intersection. The initial AO11 concept evaluated is shown in **Figure 3-14**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The analysis indicated AO11 was significantly undersized as proposed. The combined traffic that would be relocated from the eastbound on-ramp (existing volume approaching 1,200 vehicles per hour in the morning peak hour and 700 vehicles per hour in the afternoon peak hour), and the eastbound loop on-ramp (approximately 900 vehicles per hour during both peak hours) would total about 2,100 vehicles per hour entering the eastbound on-ramp from the DDI in the morning peak hour and 1,600 vehicles per hour in the afternoon peak hour). This would require at least a two lane on-ramp to operate under capacity.

Additionally, since the 900 vehicles currently using the existing eastbound loop on-ramp in both peak hours would be shifted to a westbound left turn movement on St Andrews Road to access the eastbound on-ramp. Without sufficient through lanes and left turn lanes at the interchange, this volume of traffic is unlikely to be accommodated, creating extensive back-ups onto westbound St Andrews Road in both peak hours.

The Synchro template file for AO11 was modified to determine necessary improvements to the DDI concept to obtain acceptable operation in simulation observations with 2040 traffic volumes. These included providing a



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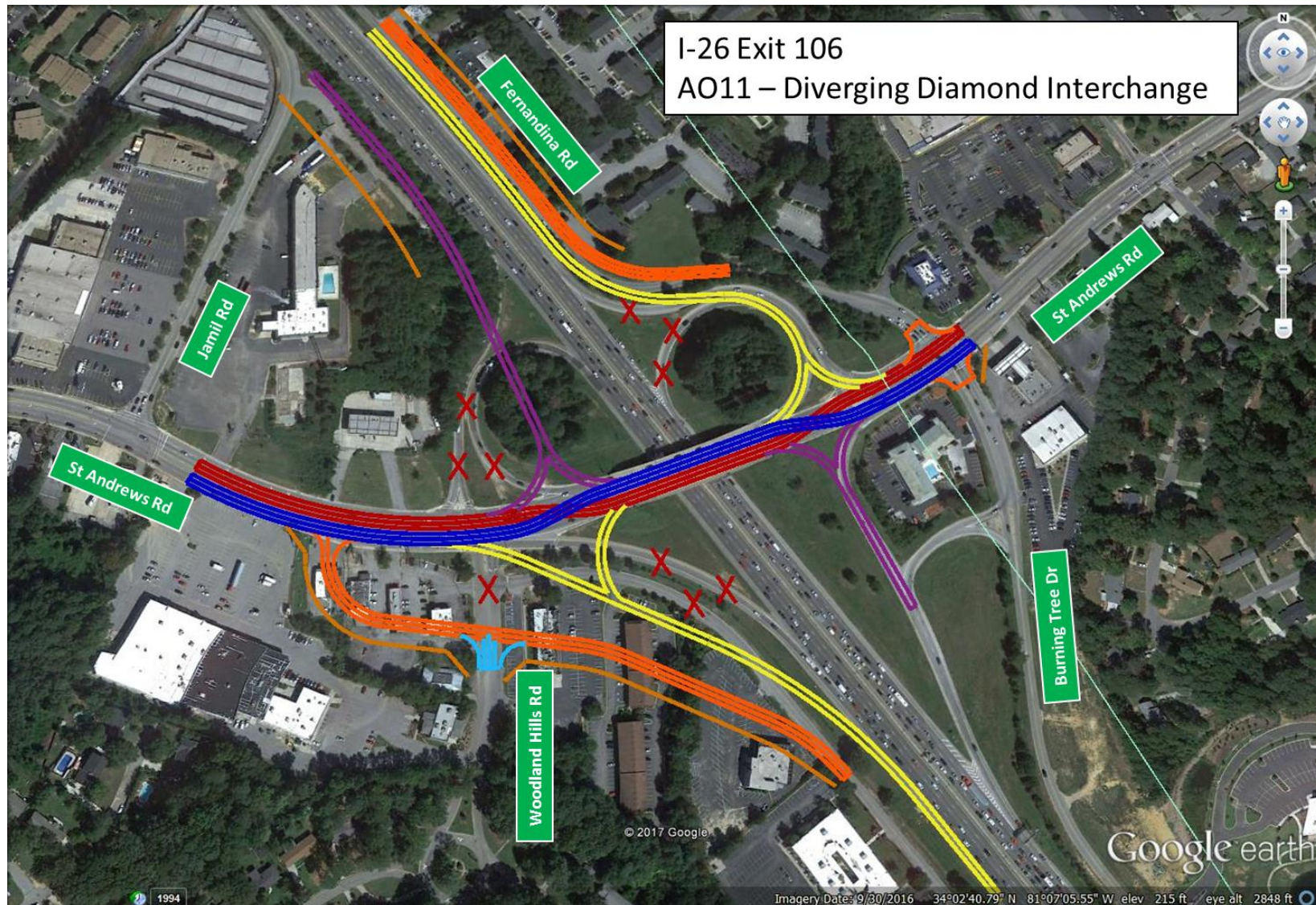


Figure 3-14 - AO11: Exit 106 Diverging Diamond Interchange

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separate eastbound right turn lane and two westbound left turn lanes to create a three lane eastbound on-ramp to I-26. To accommodate this, four westbound lanes and three eastbound lanes would be required on the crossover section of the interstate overpass. Dual left turn lanes were also provided on the westbound off-ramp to accommodate the existing heavy volume of traffic on the westbound loop off-ramp. Since these improvements were not considered feasible, AO11 was not selected to be incorporated into the representative alternatives.

### 3.3.3.2 Exit 106 AO12 – St Andrews Flyover Interchange

AO12 considered the replacement of a typical interchange with a directional flyover ramps to/from the east on I-26.

Single lane interchange ramps from westbound St Andrews Road to eastbound I-26, and from westbound I-26 to westbound St Andrews Road would be separated from the other interchange ramps and elevated over St Andrews Road. The eastbound off-ramp would be relocated to the east of its existing location and would provide separate left turn and right turn lanes to St Andrews Road. The single lane flyover ramp from westbound St Andrews Road would begin to the east of the existing Fernandina Road/Burning Tree Road intersection and would connect with a single lane on-ramp from eastbound St Andrews Road to form a two lane ramp that would merge to a single lane prior to entering eastbound I-26. Due to the beginning of the flyover ramp from westbound St Andrews Road to eastbound I-26 being located east of Fernandina Road/Burning Tree Road, traffic from those roads could not enter I-26 eastbound.

The existing westbound off-ramp would be modified to eliminate the right turn connection to Burning Tree Road. Burning Tree Road would be maintained between this connection and St Andrews Road, but Fernandina Road would be reconfigured to begin on Burning Tree Road south of the current connection from the ramp, and be routed to run parallel and adjacent to the interstate and the proposed westbound flyover ramp. It would cross under St Andrews Road before intersecting existing Fernandina Road. This would divert all traffic that currently travels to Burning Tree Road or to Fernandina Road using the connection to ramp intersection on St Andrews Road that is separated from Fernandina Road by approximately 200 feet. It would also reroute existing traffic between Fernandina Road and St Andrews Road via Burning Tree Road. For example, all the existing left turn movements from eastbound St Andrews Road to Fernandina Road would, in AO12, become right turn movements onto Burning Tree Road. That traffic would turn right from Burning Tree Road onto the new Fernandina connector. Similarly, existing traffic traveling south on Fernandina Road to St Andrews Road would be routed under St Andrews Road to Burning Tree Road, where it would turn left towards St Andrews Road. These diversions of traffic to/from Fernandina Road via Burning Tree Road would overwhelm the Burning Tree Road intersections with the proposed connector and with St Andrews Road.

The existing westbound loop off-ramp would be replaced by a single lane flyover ramp that would intersect westbound St Andrews Road within 300 feet of the Jamil Road intersection. The westbound on-ramp would be similar to the existing on-ramp: it would consist of separate lanes accepting left and right turn traffic from St Andrews Road. However, instead of right turn traffic yielding to left turn traffic entering the ramp, both accepting lanes would continue down the ramp before merging prior to entering I-26 westbound. Woodland



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Hills Road and the Frontage Road/Berryhill Road would be reconfigured and would intersect St Andrews Road further west closer to Jamil Road. The westbound flyover ramp would merge into westbound St Andrews Road approximately opposite this intersection, making it impossible for traffic from westbound I-26 to access Woodland Hills Road/Berryhill Road. The initial AO12 concept evaluated is shown in **Figure 3-15**.

The capacity screening of AO12 was performed using the LOS thresholds used to evaluate existing and 2040 No-Build conditions. A single lane eastbound on-ramp, made up of the on-ramp from eastbound St Andrews Road and the proposed westbound flyover, was assessed to be over capacity under existing volumes during the morning peak hour and near capacity in the afternoon peak hour, and over capacity in both peak hour with 2040 traffic volumes. The westbound flyover off-ramp was assessed to be near capacity in both peak hours under 2040 traffic. Due to these assessments, along with the adverse operation at St Andrews Road/Burning Tree Road as a result of the Fernandina Connector, and the placement of the flyover ramps making some movements impossible to complete, AO12 was not selected to be evaluated further as part of the representative alternatives.

### 3.3.3.3 Exit 106 AO13 – Single Point Urban Interchange

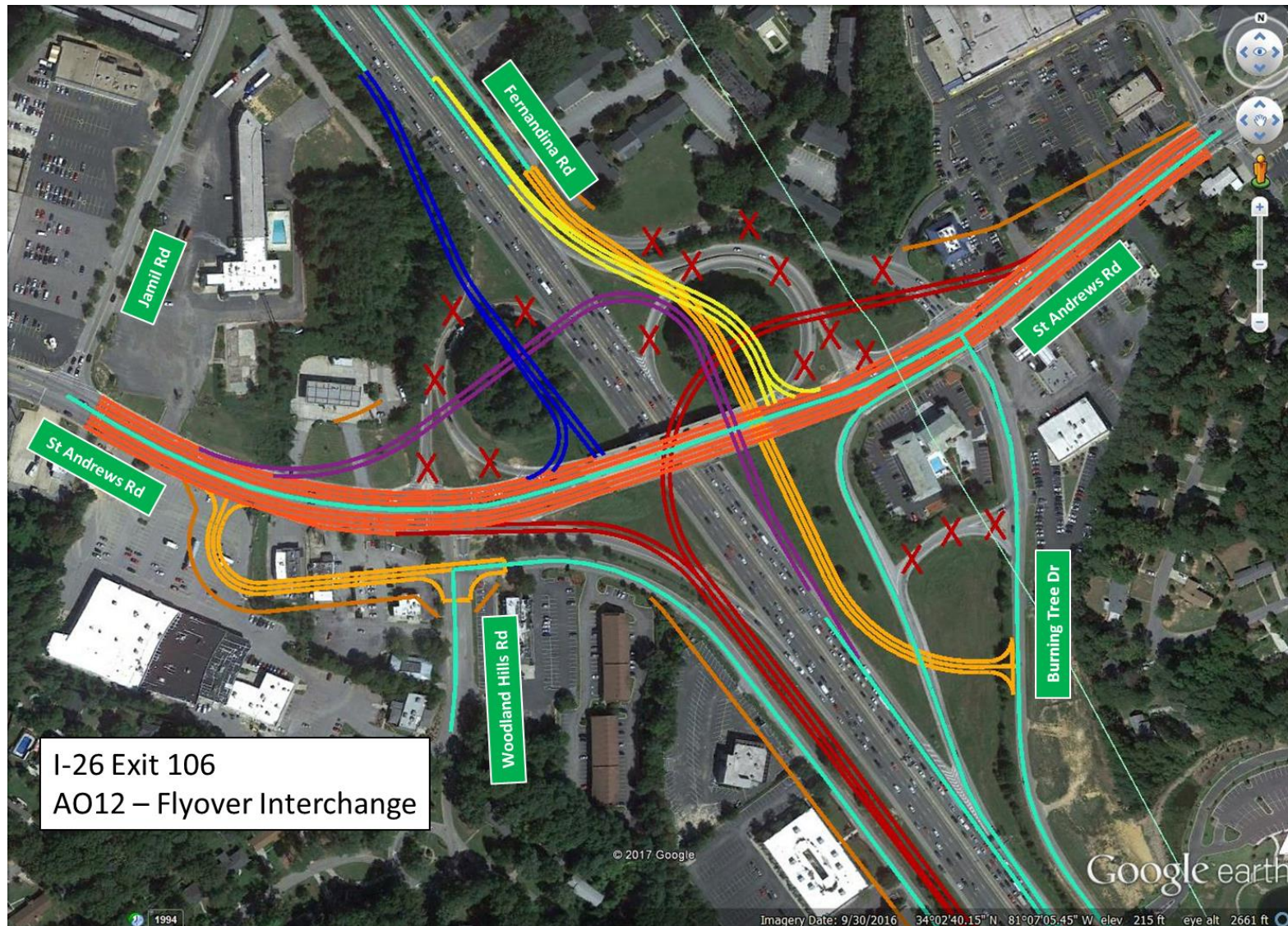
The proposed single point urban interchange (SPUI) created maintained two through lanes in each direction on St Andrews Road through the interchange area. The eastbound and westbound off-ramps consisted of a single lane exiting I-26, which separates to provide a separate left turn and separate right turn lane to St Andrews Road. The single lane eastbound and westbound on-ramps included a single left turn and single right turn lane from St Andrews Road, with right turn traffic entering the on-ramp yielding to left turn traffic. The initial AO13 concept evaluated is shown in **Figure 3-16**.

The capacity screening incorporated the use of the Synchro Template file for a SPUI. The analysis indicated AO13 was undersized as proposed. Under 2040 traffic volumes, the SPUI intersection operates over capacity during both peak hours

The initial concept was modified to provide two through lane in each direction through the SPUI intersection and dual left turn lanes from westbound St Andrews Road to the eastbound on-ramp. The eastbound right turn movement from St Andrews Road to the on-ramp was given its own lane on the on-ramp. The resulting three lane ramp section narrowed to the minimum two lane on-ramp required to accommodate the high volume of traffic entering eastbound I-26 from Exit 106. The westbound off-ramp also was modified to incorporate dual left turn lanes.

Observations of the simulations of the alternative indicated that, with the additional turn lanes, the SPUI intersection should operate well with revised geometry. However, there were substantial left turn queues observed on the westbound dual left turn lanes onto the eastbound on-ramp. Queue lengths in the simulation approached 400 feet with 2040 traffic in the morning peak hour and 650 feet in the afternoon peak hour. These queues would extend past the location of the existing Fernandina Road/Burning Tree Road intersection. Excessive queuing in either direction would likely result in potentially severe back-ups on St Andrews Road, Fernandina Road, Burning Tree Road and Jamil Road. These interactions were not modeled in the template

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**Figure 3-15 - AO12: Exit 106 Flyover Interchange**

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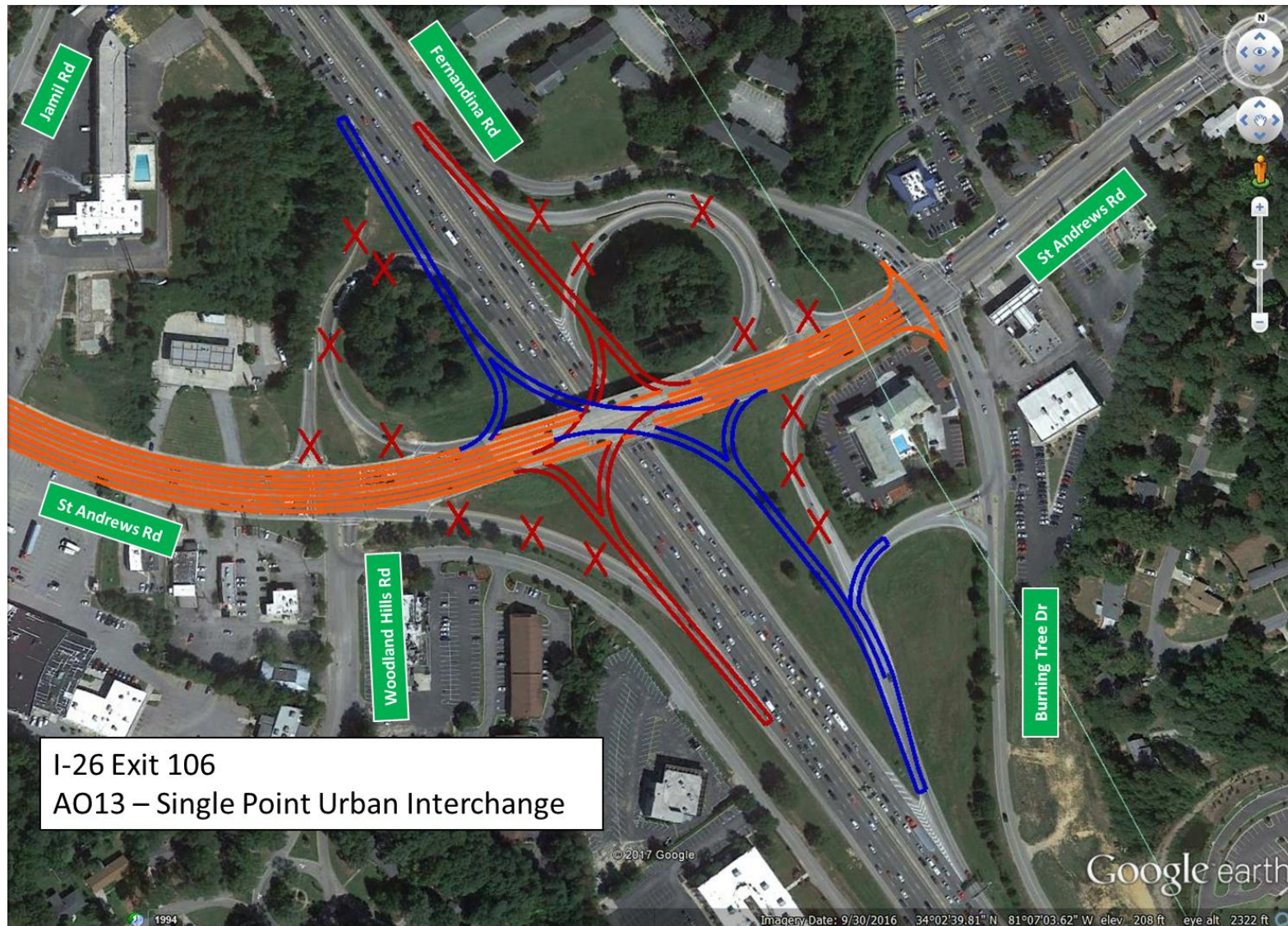


Figure 3-16 - AO13: Exit 106 Single Point Urban Interchange

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intersection, but are noted and will be observed in the development of the representative alternative microsimulation networks incorporating AO13. AO13 was selected to be evaluated further as part of the representative alternatives RA1, RA5, RA7, and RA8.

### 3.3.3.4 Exit 106 AO14 – Modified Diverging Diamond Interchange

The proposed diverging diamond interchange (DDI) evaluated in AO11 was modified to maintain the existing intersection of Woodland Hills Road and St Andrews Road in its current location. In AO11, Woodland Hills Road and the Frontage Road/Berryhill Road were realigned and their intersection with St Andrews Road was relocated to the west closer to Jamil Road. To be able to keep the adjacent intersections at their current locations, the DDI ramps to/from I-26 have to be closer together. This shortens the crossover sections of the overpass, but lengthens the storage areas between the crossover intersections and the next adjacent upstream intersections. AO 14 also maintains signal control at the present location of the Woodland Hills intersection.

The original AO14 concept maintained two through lanes in each direction on St Andrews Road through the interchange area. The eastbound and westbound off-ramps consisted of a single lane exiting I-26, and provided a separate left turn and separate right turn lane at St Andrews Road. The eastbound and westbound on-ramps included a single left turn and single right turn lane from St Andrews Road, with the right turn movement yielding to the left turn movement on the single lane ramp. The initial AO14 concept evaluated is shown in **Figure 3-17**.

The capacity screening incorporated the use of a detailed Synchro model to reflect the more closely spaced intersections a DDI. The analysis indicated AO14 was significantly undersized as proposed. The combined traffic that would be relocated from the eastbound on-ramp (existing volume approaching 1,200 vehicles per hour in the morning peak hour and 700 vehicles per hour in the afternoon peak hour), and the eastbound loop on-ramp (approximately 900 vehicles per hour during both peak hours) would total about 2,100 vehicles per hour entering the eastbound on-ramp from the DDI in the morning peak hour and 1,600 vehicles per hour in the afternoon peak hour). This would require at least a two lane on-ramp to operate under capacity.

Additionally, since the 900 vehicles currently using the existing eastbound loop on-ramp in both peak hours would be shifted to a westbound left turn movement on St Andrews Road to access the eastbound on-ramp. Without sufficient through lanes and left turn lanes at the interchange, this volume of traffic is unlikely to be accommodated, creating extensive back-ups onto westbound St Andrews Road in both peak hours.

The Synchro template file for AO14 was modified to determine necessary improvements to the DDI concept to obtain acceptable operation in simulation observations with 2040 traffic volumes. These included providing a separate eastbound right turn lane and two westbound left turn lanes to create a three lane eastbound on-ramp to I-26. Dual left turn lanes and dual right turn lanes were also provided on the westbound off-ramp to accommodate the existing heavy combined volume of traffic using both the existing westbound off-ramp and the westbound loop off-ramp.

Under existing traffic volumes, simulations of the concept were observed to perform well with the exception of excessive queuing of traffic waiting to enter the eastbound on-ramp in the morning peak hour. However, during



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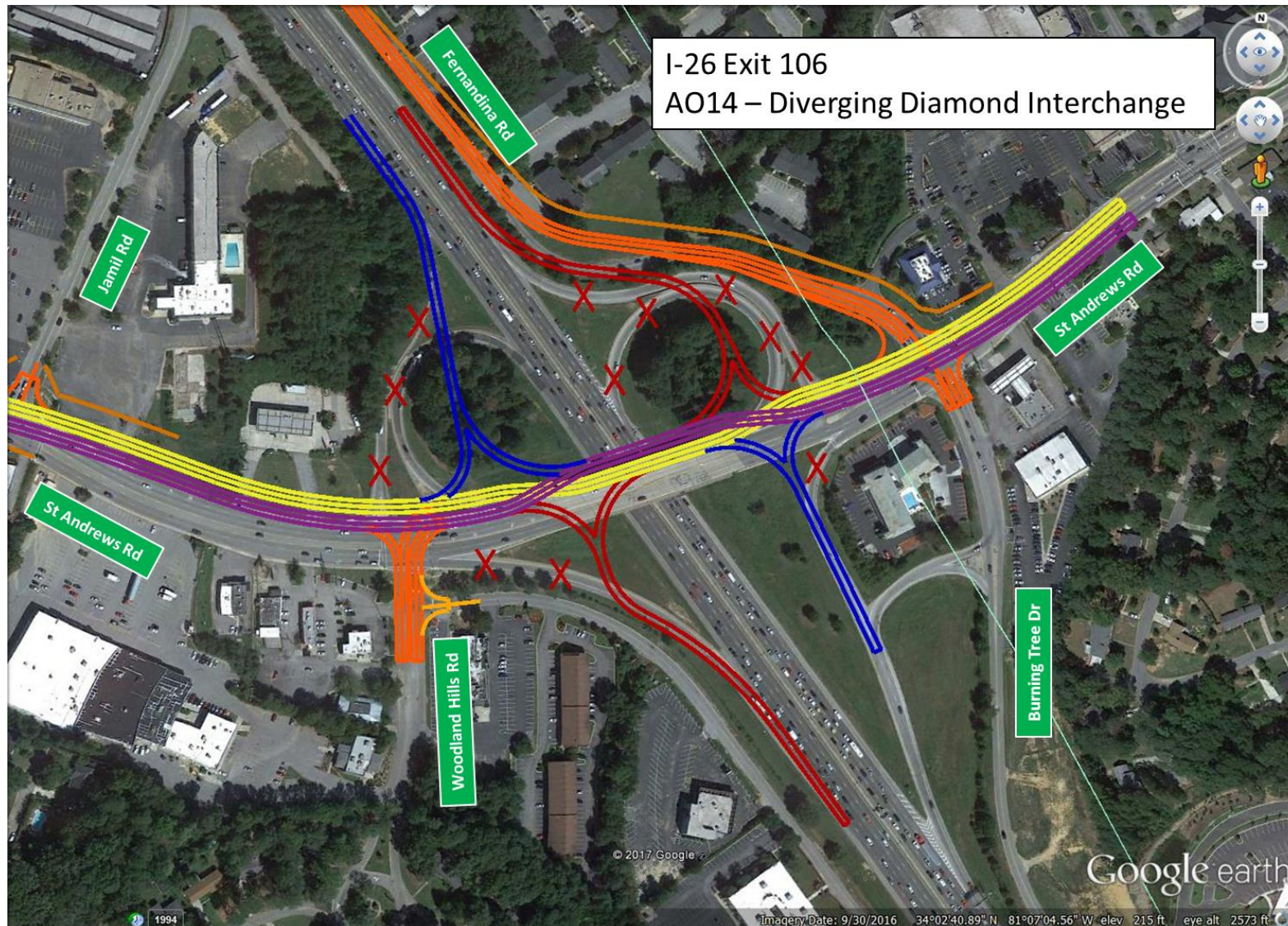


Figure 3-17 - AO14: Exit 106 Diverging Diamond Interchange

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the afternoon peak hour, there was excessive queueing and delay noted on the westbound St Andrews Road approach and the northbound Burning Tree Road approach to the intersection of St Andrews Road and Fernandina Road/Burning Tree Road, along with excessive queueing of left turning traffic on the westbound off-ramp. These observations are the result of the more detailed examination of AO14 as opposed to using the DDI template file used for AO11. By including the adjacent intersections and their traffic, and assuming the signals along St Andrews Road are interconnected, the signal operation is affected and likely more realistic than that in the template files omitting the adjacent intersections.

Simulations of AO14 under 2040 traffic volume indicated increased queueing observed in the simulations of AO14 under existing traffic. In the morning peak hour, in addition to the queueing of eastbound St Andrews Road traffic lining up to enter the eastbound on-ramp, additional queueing also was observed on the southbound approach of Fernandina Road and the westbound approach of St Andrews Road at its intersection with Fernandina Road/Burning Tree Road and on the westbound off-ramp. In the afternoon peak hour, the queueing observed with existing traffic increased under the estimated 2040 volumes. Since maintaining the existing location of the Woodland Hills Road intersection with St Andrews Road in AO14 was preferable to the realignment and relocation included in AO11, AO14 was selected to be incorporated into the representative alternatives RA2 and RA6.

### 3.3.3.5 Exit 106 AO15 – Modified Diverging Diamond Interchange/Frontage Roads

The proposed diverging diamond interchange (DDI) evaluated in AO11 and AO14 was modified to incorporate significant changes to the adjacent frontage roads of Jamil Road, Woodland Hills Road, Berryhill Road, Burning Tree Road, and Fernandina Road, including limiting the movements to/from Fernandina Road/Burning Tree Road to right turns in/out at St Andrews Road, and the use of roundabouts at frontage road intersections.

The original AO15 concept maintained two through lanes in each direction on St Andrews Road through the interchange area. The eastbound and westbound off-ramps consisted of a single lane exiting I-26, and provided a separate left turn and separate right turn lane at St Andrews Road. The eastbound and westbound on-ramps included a single left turn and single right turn lane from St Andrews Road, with the right turn movement yielding to the left turn movement on the single lane ramp.

On the west side of the interchange, Jamil Road was realigned slightly at its bend located approximately 900 feet from St Andrews Road, with a roundabout placed at the bend to connect to a new roadway that would intersect Woodland Hills Road and the Frontage Road/Berryhill Road at another roundabout. This connection would not intersect St Andrews Road. Traffic from Woodland Hills Road that would want to access St Andrews Road would have to travel on the connector to the Jamil Roundabout, then south on Jamil Road before turning left onto St Andrews Road.

On the east side of the interchange, the St Andrews Road intersection with Fernandina Road and Berryhill Road was converted to provide right turns in and out of the side streets. A new direct connection between Fernandina Road and Burning Tree Road was included in AO15, with roundabouts at the connector intersections.

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AO15 created a number of complex traffic movements. Traffic exiting the westbound off-ramp or traveling eastbound on St Andrews Road that currently turns left onto Fernandina Road would turn right onto Burning Tree Road, then double back through the roundabout on the connector to Fernandina Road. Traffic turning left from Burning Tree Road onto westbound St Andrews Road would instead use the roundabout and connector to St Andrews Road, then use the other roundabout to head back on Fernandina Road to turn right onto St Andrews Road. The initial AO15 concept evaluated is shown in **Figure 3-18**.

The capacity screening incorporated the use of a detailed Synchro model created to model the changes in frontage road access and the revised connections. Adjustments made to the DDI concept in AO11 and AO14 were incorporated into the first attempts to model AO15. This included increasing the number of lanes on the crossover section of the overpass from two to three lanes in each direction, with three westbound through lanes through the crossover area. Additional modifications were incorporated into the AO15 network to improve poor operations observed in the simulations. These improvements included providing dual left and right turn lanes on the westbound off-ramp as well as dual left turn lanes from westbound St Andrews Road to the eastbound on-ramp increasing from two to three lanes the number of lanes entering the westbound DDI crossover.

The observation of the simulations of existing traffic on AO15 indicated serious flaws in the concept, especially with the connection roadways, the roundabout intersections and the conversion of the intersection of Burning Tree Road/Fernandina Road to right turn in/out. In the morning peak hour, significant queuing was observed in simulations on the westbound off-ramp, westbound St Andrews Road approaching the intersection, and along the Fernandina Road/Burning Tree Road connector. In the afternoon peak hour simulation, gridlock on the Burning Tree Road/Fernandina Road connector was so severe that it led to gridlock throughout the entire interchange.

Additional modifications to the concept were developed and simulated. These included replacing the roundabouts on the Burning Tree/Fernandina connectors with stop sign controlled T-intersections, and with signal controlled intersections, increasing the number of lanes on the Burning Tree/Fernandina connector and the providing three right turn lanes from Fernandina Road to St Andrews Road, and eventually abandoning the Burning Tree Road/Fernandina Road connector altogether and returning to a signalized intersection with all traffic movements at the Burning Tree Road/Fernandina Road intersection with St Andrews Road. Simulations of this final option with existing traffic appeared to provide the best operation. However, simulations of this option under design year traffic indicated the concept would not accommodate anticipated future volumes, even with additional capacity such as a third left turn lane on the westbound off-ramp, triple left turn lanes on Burning Tree Road and dual right turn lanes on Fernandina Road. This last version of AO15, which is also depicted in **Figure 3-19**, was incorporated into the representative alternatives RA4 and RA9.



## Alternatives Traffic Analysis Technical Memo

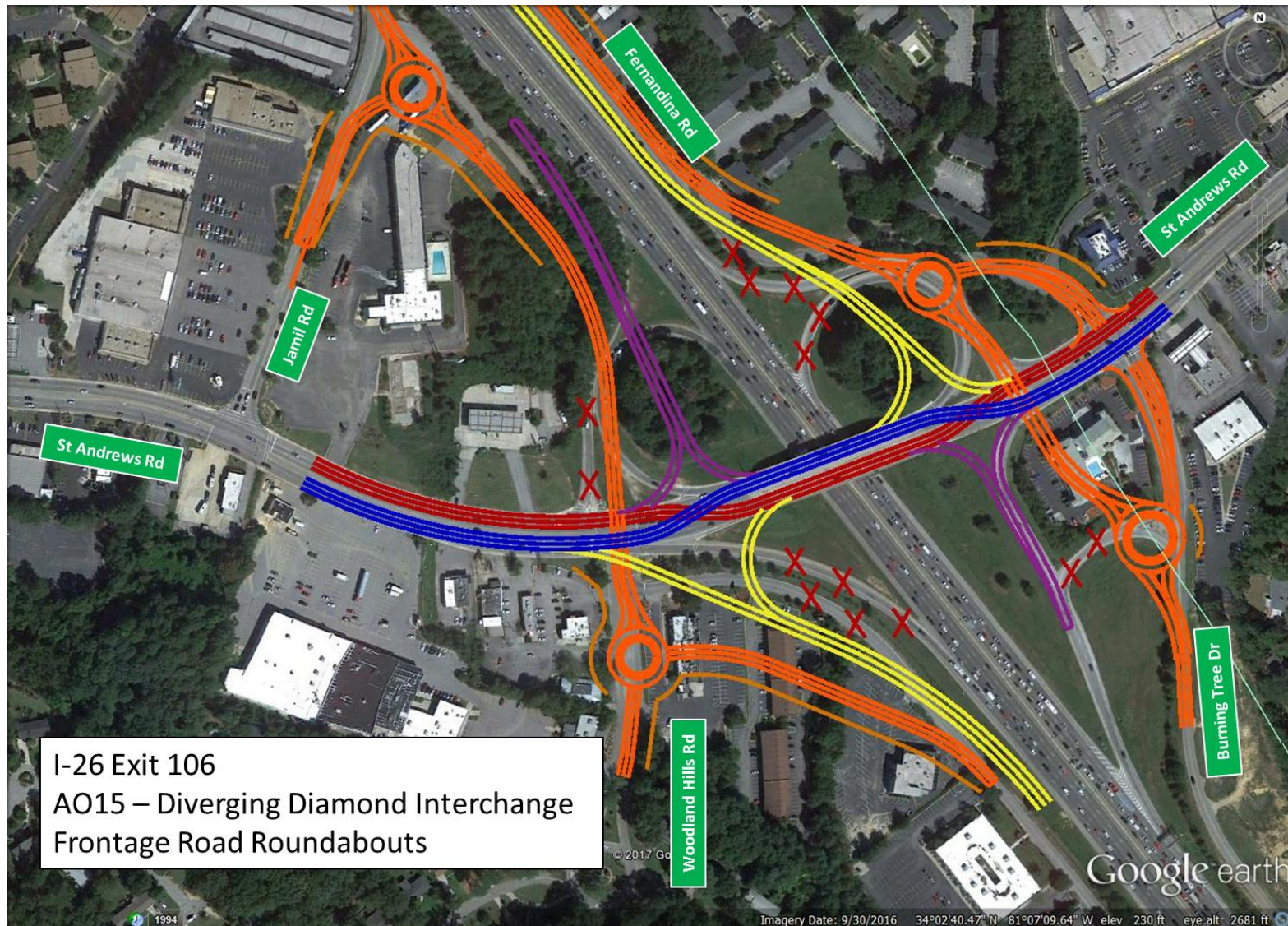
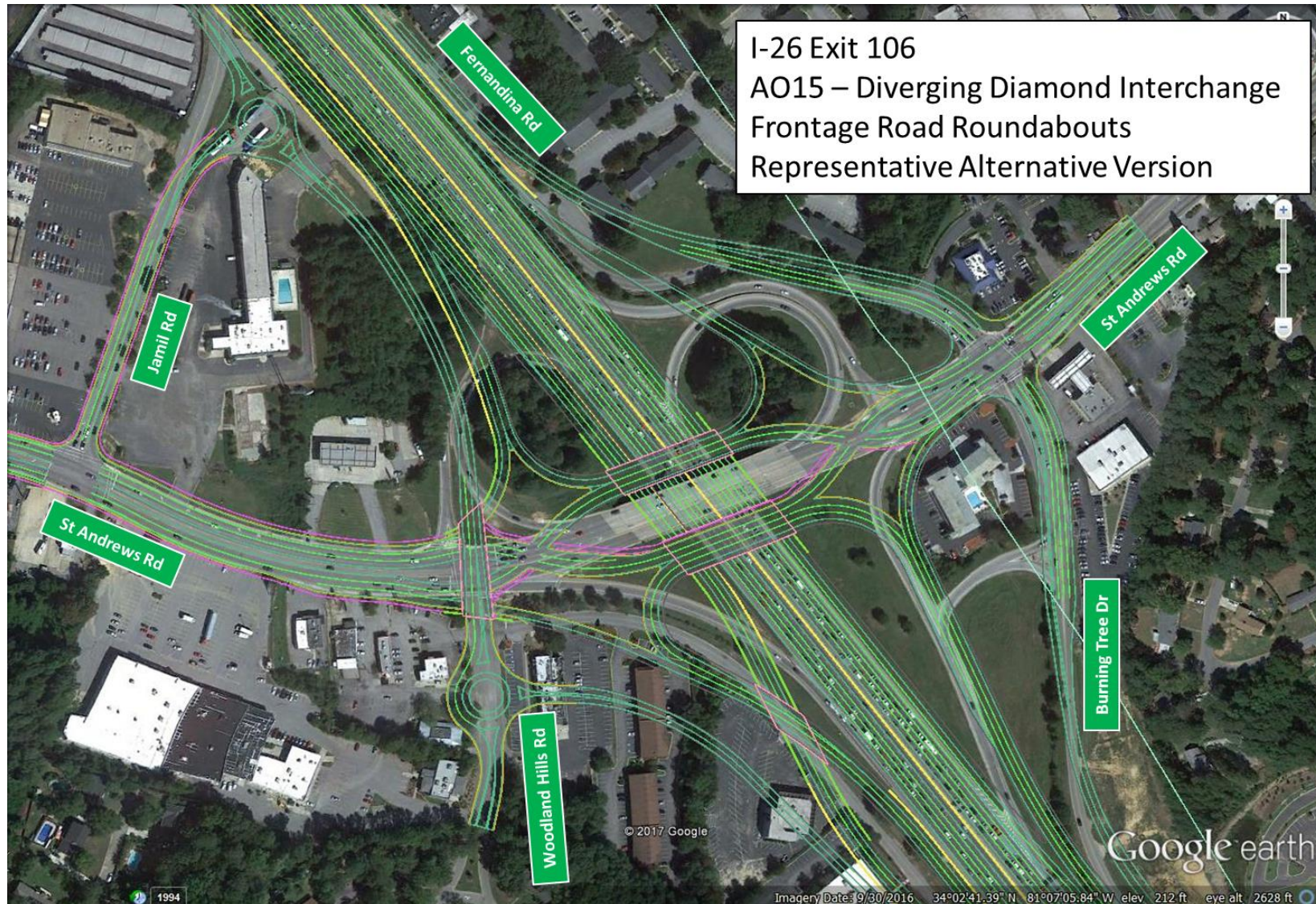


Figure 3-18 - AO15: Exit 106 Diverging Diamond Interchange with Frontage Road Roundabouts  
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**Figure 3-19 - AO15: Exit 106 Revised Diverging Diamond/Frontage Road Roundabouts**

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### 3.3.3.6 Exit 106 AO16 – Split Ramp Interchange/Frontage Road Roundabouts

The proposed split ramp interchange concept was an atypical interchange configuration. The original concept for AO16 incorporated a westbound off-ramp similar to those in the AO11, AO14, and AO15 concepts, and provided two left turn lanes and one right turn lane to St Andrews Road. The single lane westbound on-ramp was created using new connections to Fernandina Road and Burning Tree Road via roundabouts located several hundred feet from their intersection with St Andrews Road, similar to AO15. Similar to AO15, the movements to/from St Andrews Road to Fernandina Road and Burning Tree Road were limited to right turns in/out.

On the west side of the interchange, the eastbound off-ramp was relocated to the west of the existing off-ramp and provided widely separated two lane left turn and one lane right turn roadways intersecting St Andrews Road. Woodland Hills Road was limited to right turns in/out from St Andrews Road. The eastbound on-ramp was made up with a one lane connection from Jamil Road (via a roundabout) and a two lane connection from St Andrews Road. In the original concept of AO16, the portion of the eastbound on-ramp from St Andrews Road ran between and then over the separated left turn and right turn roadways making up the eastbound off-ramp. The eastbound ramp from St Andrews merged with an on-ramp connection from a roundabout on Jamil Road. St Andrews Road carried three lanes westbound and two lanes eastbound through the interchange. The initial AO16 concept evaluated is shown in **Figure 3-20**.

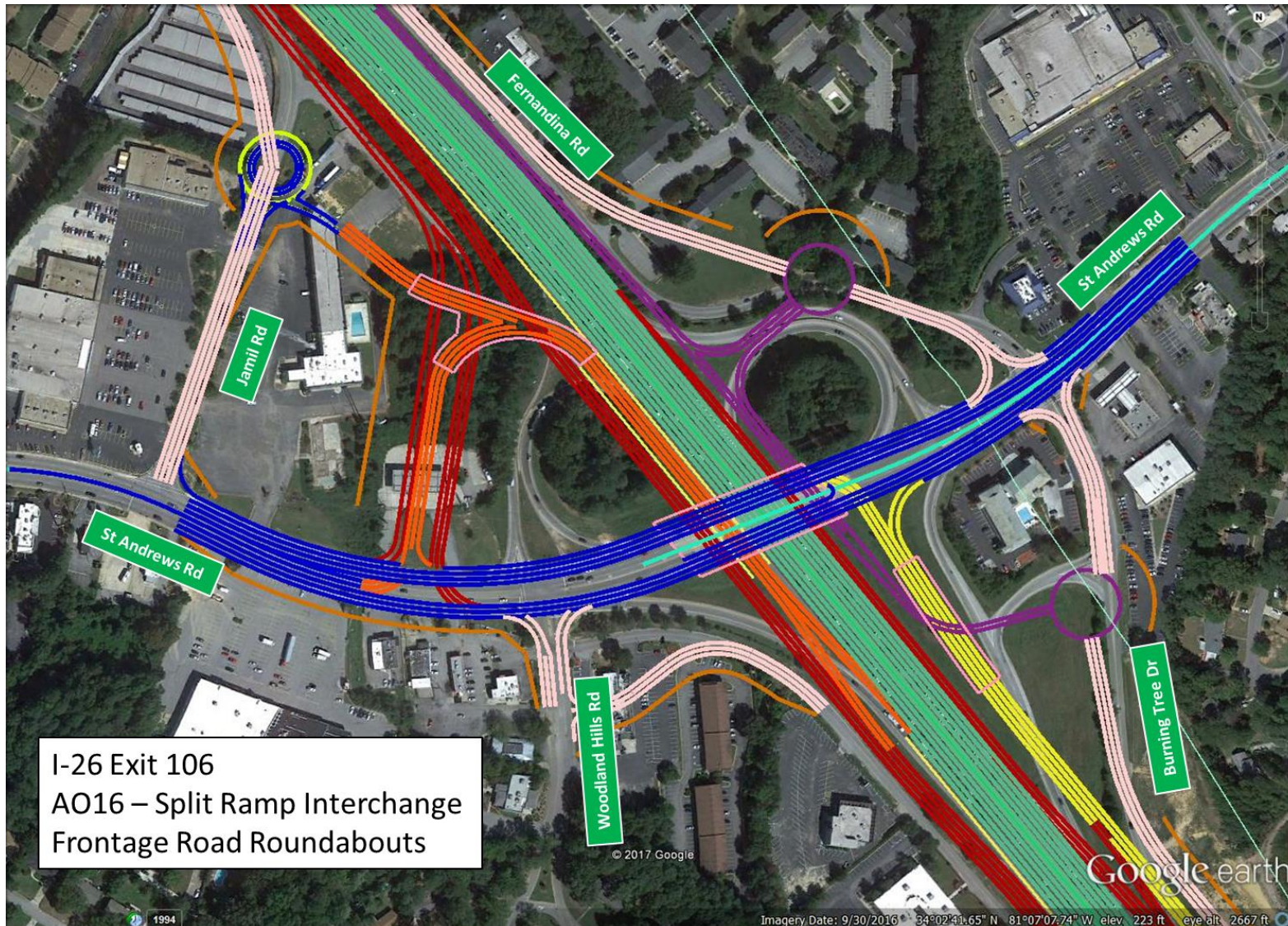
As in AO15, the frontage road connections introduced a number of complex traffic movements. Traffic from the westbound off-ramp that is heading to Fernandina Road has to combine with the right turn traffic traveling to Burning Tree Road. At the proposed roundabout on Burning Tree Road, the Fernandina Road traffic turns to the right to the connector roadway running under the westbound off-ramp and the St Andrews Road overpass, turning right back to Fernandina Road. Existing traffic that turns left from Burning Tree Road on to westbound St Andrews Road would use the connector and roundabouts to reach Fernandina Road to make a right turn onto westbound St Andrews Road.

Westbound on-ramp traffic movements from St Andrews Road also became more complex. From westbound St Andrews Road, traffic would turn right onto Fernandina Road, travel through the roundabout and use the connector to turn right onto the on-ramp. From eastbound St Andrews Road, traffic would turn right on to Burning Tree Road, travel through the roundabout, under the westbound off-ramp and St Andrews Road to reach the on-ramp.

Also complicating the operation of AO16 was the right in/out operation at Woodland Hills Road. Traffic from Woodland Hills Road and the Frontage Road/Berryhill Road wanting to travel to the west on St Andrews Road is forced to turn right onto St Andrews Road, cross the interchange, turn right onto Burning Tree Road, travel through the roundabout to the new connection to travel to Fernandina Road, travel through the new roundabout on Fernandina Road to turn right onto St Andrews round before traveling back across the interchange on westbound St Andrews Road. Traffic wanting to turn left into Woodland Hills Road has to make u-turns from westbound St Andrews Road at either the new eastbound ramp or Jamil Road intersections to turn right into Woodland Hills.



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**Figure 3-20 - AO16: Exit 106 Split Ramp Interchange with Frontage Road Roundabouts**

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For the eastbound on-ramps, the high volume of traffic using the existing on-ramp and loop on-ramp are redirected to the proposed ramps from St Andrews Road and Jamil Road. All of the traffic using the existing loop on-ramp would turn right from westbound St Andrews Road onto the new on-ramp roadway. A portion of the existing traffic entering the eastbound on-ramp would use the proposed ramp connection from the proposed roundabout on Jamil Road, while the remaining traffic would turn on two left turn lanes from eastbound St Andrews Road to the new on-ramp roadway. Traffic from Jamil Road entering the on-ramp would yield to the on-ramp roadway traffic from St Andrews Road.

The capacity screening incorporated the use of a detailed Synchro model created to model the changes in frontage road access and the revised connections. The observation of the simulations of existing traffic on AO16 immediately indicated serious flaws in the original AO16 concept resulting in extensive queuing and delays, especially with the connection roadways, the roundabout intersections, and the conversion of the intersection of Burning Tree Road/Fernandina Road to right turn in/out operation. As in AO15, the right in/out operation at Burning Tree Road/Fernandina Road overloads the new connector roadways and roundabouts. This condition is worsened in AO16 by also making all westbound on-ramp traffic use portions of the new connectors, Fernandina Road, and Burning Tree Road.

Additional modifications to the concept were iteratively developed and simulated. These included reinstating the full access for Fernandina Road at a signalized intersection with St Andrews Road (Burning Tree Road would continue to operate right in/out), replacing the roundabouts on the Burning Tree/Fernandina connectors with unsignalized T-intersections, adding a second right turn lane on the westbound off-ramp, increase the number of lanes on the Burning Tree Road, Fernandina Road, and Jamil Road connectors, and finally eliminating the Fernandina Road/Burning Tree Road connectors, incorporating a westbound on-ramp at a signalized intersection with the westbound off-ramp, and reinstating full access to/from Burning Tree Road at the signalized intersection with Fernandina Road. Traffic turning left into and out of Woodland Hills Road were still required to make u-turns, but the u-turn for the traffic traveling to westbound St Andrews Highway was relocated to the westbound ramp intersection.

Observations of AO16 under existing traffic indicated this revision to the concept functioned well, with some moderate queuing observed under existing afternoon peak hour traffic for westbound St Andrews Road traffic entering the interchange area, and on the Burning Tree Road approach to St Andrews Road.

Reviews of the simulation operation using estimated 2040 volumes resulted in some additional improvements that were incorporated into the concept. These included providing three lanes on the eastbound ramp connector from St Andrews Road, including triple eastbound left turn lanes and dual westbound right turn lanes onto the connector from St Andrews Road, providing triple left turn lanes from the westbound off-ramp, and a separate eastbound u-turn lane and left turn lane on St Andrews Road at the westbound ramp intersection; and providing dual right turn lanes from Fernandina Road and dual left turn lanes from Burning Tree Road to accommodate traffic turning onto westbound St Andrews Road. The simulations of the final alternative appeared to function well, with moderate queuing observed on the westbound left turn to Burning Tree Road and the westbound off-ramp right turn movements in the morning peak hour, and on the northbound Burning

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Tree Road approach during the afternoon peak hour. This last version of AO16, which is depicted in **Figure 3-21** was incorporated into the representative alternative RA3.

### 3.3.3.7 Exit 106 AO48 – Roundabout Interchange

The proposed roundabout interchange at Exit 106 incorporated two-lane roundabouts in place of traffic signals at the ramp intersections with St Andrews Road. Roundabouts were also included at the adjacent St Andrews Road intersections with Jamil Road and with Fernandina/Burning Tree Road, as well as at the Burning Tree Road intersection with the ramp connector from the westbound off-ramp. Two lanes in each direction were maintained on St Andrews Road through the interchange area. The interchange ramps would remain unchanged. The initial AO48 concept evaluated is shown in **Figure 3-22**.

The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The assessment indicated the two-lane roundabouts at the ramp intersections, would operate over capacity under existing and 2040 traffic volumes. Incorporating additional lanes in the roundabouts would not be feasible. AO48 was not selected to be incorporated into the representative alternatives.

### 3.3.3.8 Exit 106 CAP-X Review

The Exit 106 traffic volumes and interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo interchange, followed by DDI, and displaced left turn (DLT) interchanges (not considered as one of the Exit 106 interchange options). The Traditional Diamond interchange and SPUI were ranked fourth and fifth respectively.

#### Partial Cloverleaf Interchange

The existing Exit 106 is a ParClo interchange with an eastbound loop on-ramp and a westbound loop off-ramp. CAP-X only assesses ParClo interchanges with loop off-ramps and does not consider loop on-ramps. Though CAP-X cannot assess the existing interchange, it is clear that the existing interchange configuration is a result of the very high directional movements using the interchange.

#### Displaced Left Turn Interchange

The DLT interchange option was the third highest rated in the CAP-X assessment. This concept was not developed as a design alternative at Exit 106. Were such a concept to be considered, the left turn movements at the ramps would have to be displaced upstream of the ramp intersections, most likely at Jamil Road and at Fernandina Road/ Burning Tree Road.



## Alternatives Traffic Analysis Technical Memo

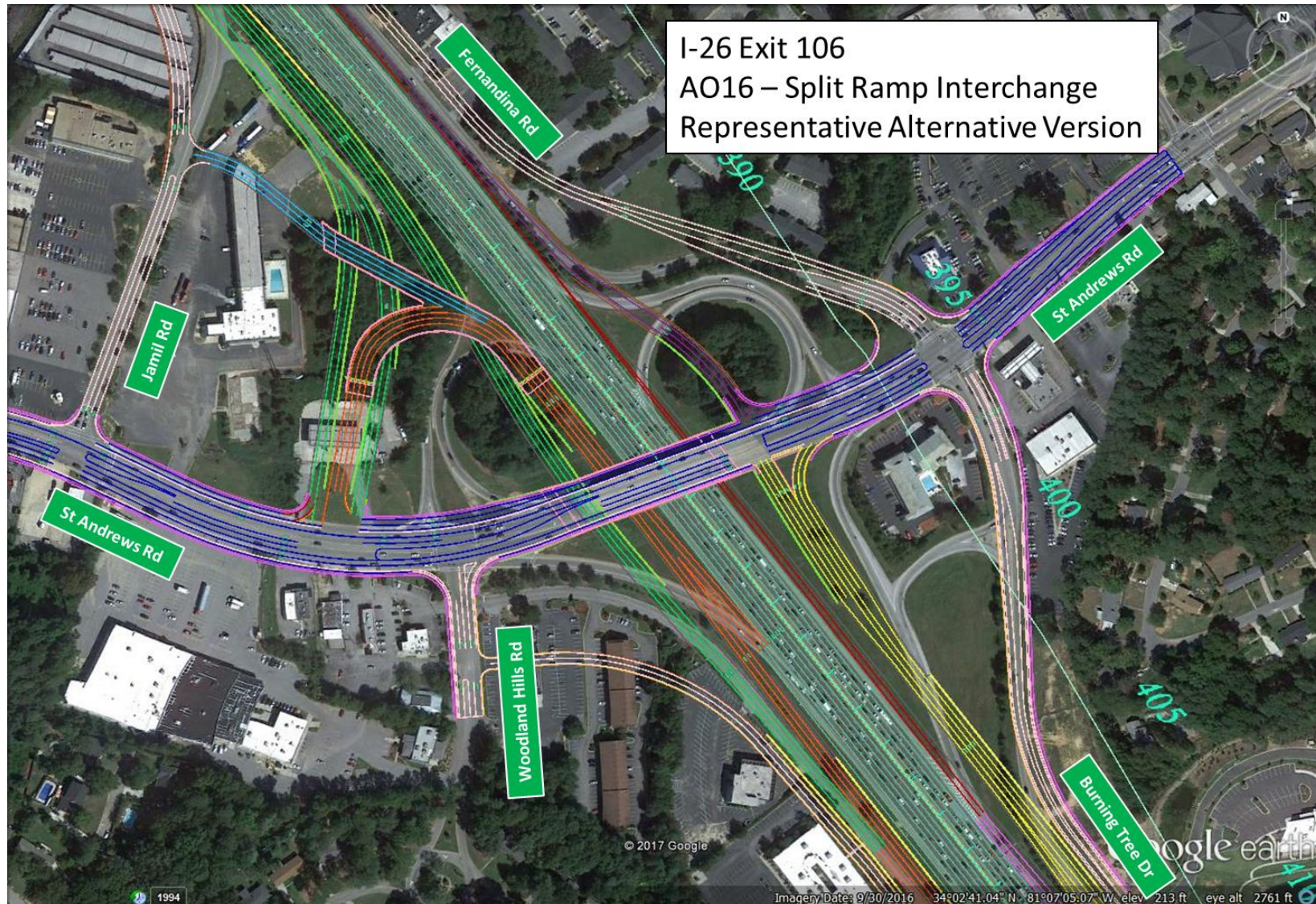


Figure 3-21 - AO16: Exit 106 Revised Split Ramp Interchange  
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## Alternatives Traffic Analysis Technical Memo

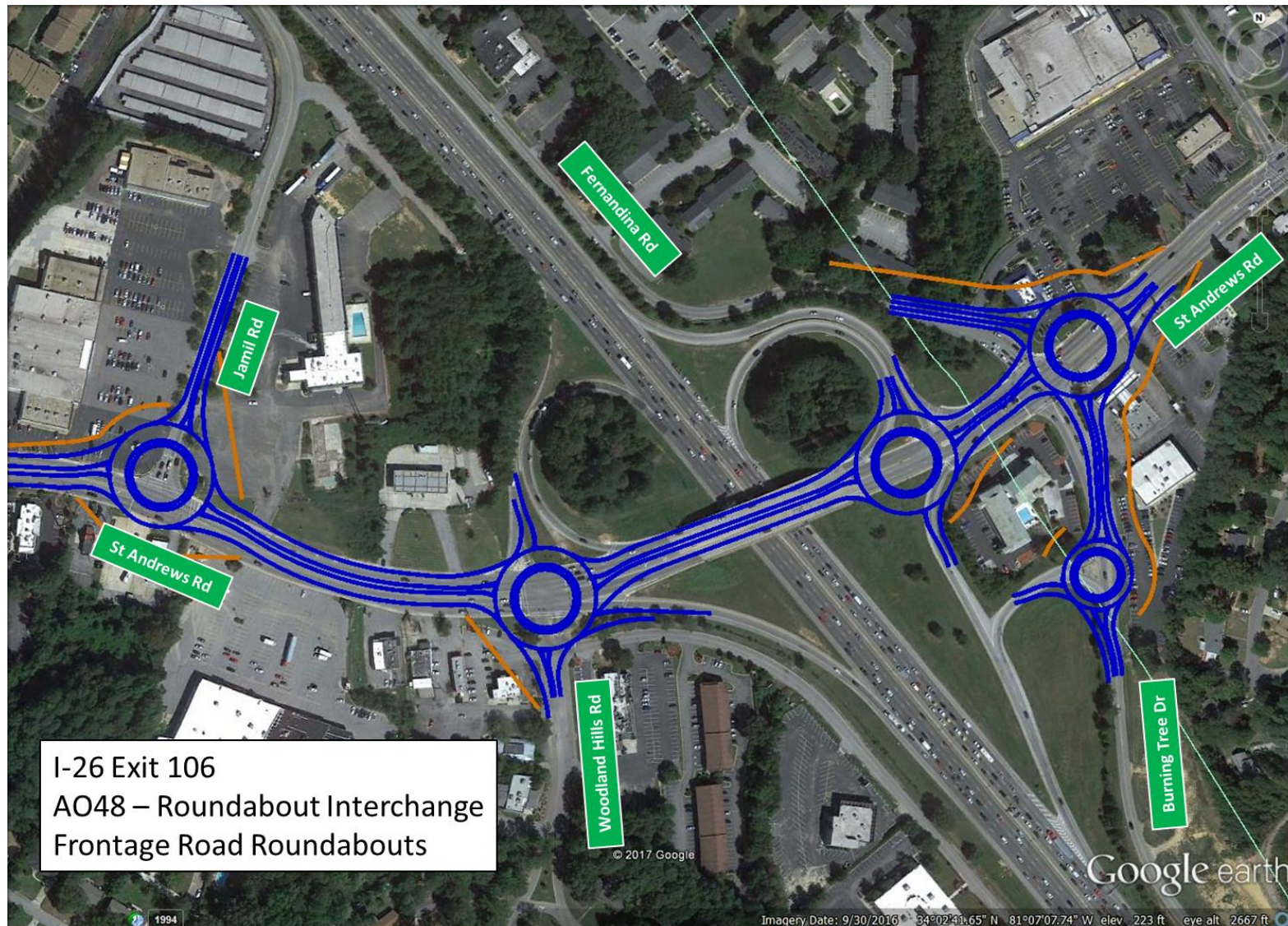


Figure 3-22 - AO48: Exit 106 Roundabout Interchange with Frontage Road Roundabouts

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### 3.3.4 AO17 – AO22 (EXIT 107/64)

The following are a list of the AO developed and screened for the I-20/I-26 System Interchange.

- AO17 – I-20/I-26 Turbine Interchange (capacity assessment)
- AO18 – I-20/I-26 Directional with Interior Right Exits (capacity assessment)
- AO19 – I-20/I-26 Directional with Loop (I-20 EB to I-26 WB) and Ramps (capacity assessment)
- AO20 – I-20/I-26 Directional with Two Loop Ramps (I-20 EB to I-26 WB; I-20 WB to I-26 EB) (capacity assessment)
- AO21 – I-20/I-26 Turbine Braided-Directional with Two Loop Ramps (I-20 EB to I-26 WB) (capacity assessment)
- AO22 - I-20/I-26 Semi-Directional with Two Loop Ramps (I-20 EB to I-26 WB) (capacity assessment)

Existing traffic operations at the I-20/I-26 system interchange at Exit 107/64 are complicated by:

- The cloverleaf design that introduces short weaving sections carrying high volumes of weaving traffic between loop ramps in each direction on I-26 and I-20.
- High existing volumes of ramp traffic on the loop ramp from eastbound I-26 to eastbound I-20 (1,830 vehicles per hour in the morning peak hour and 1,610 vehicles per hour in the afternoon peak hour).
- High existing volumes of traffic on the loop ramp from westbound I-20 to eastbound I-26 in the morning peak hour (1,040 vehicles)
- High existing volumes of traffic on the ramp from eastbound I-20 to eastbound I-26 in the morning peak hour (1,690 vehicles)
- High existing volumes of traffic on the loop ramp from westbound I-26 to westbound I-20 in the afternoon peak hour (1,550 vehicles)
- High existing volumes on the ramp from westbound I-20 to westbound I-26 (1,460 vehicles per hour in the morning peak hour and 1,830 vehicles per hour in the afternoon peak hour).
- The proximity of Exit 107 on I-26 to Exit 106
  - A high volume of traffic traveling through an area with complex weaving movements in a short distance between the loop on ramp from westbound St Andrews Road and the on-ramp from eastbound St Andrews Road at Exit 106 and the Exit 107 ramps.
  - The high volume of traffic traveling through an area with complex weaving movements in a short distance between the Exit 107 and the westbound off-ramp to eastbound St Andrews Road and the westbound loop off-ramp to westbound St Andrews Road
- The proximity of Exit 107 on I-26 to Exit 108
  - There is a short weaving section between the on-ramp to eastbound I-26 from eastbound I-20 and the off-ramp to Bush River Road at Exit 108
  - There is a short distance weaving distance for traffic entering eastbound I-26 from Exit 107 to position themselves to either continue eastbound on I-26 or towards downtown Columbia on I-126.
  - The two lane ramps from westbound I-26 split three lanes originating from I-126 westbound (two lanes to the left, one to the right) with the five lanes creating a short weaving section with complex weaving movements and high traffic volumes positioning to enter ramps to I-20.
- The proximity of Exit 64 on I-20 to Exit 63
  - A short weaving section is introduced on westbound I-20 between the ramp from eastbound I-26 and the off-ramp to Exit 63.



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- The proximity of Exit 64 on I-20 to Exit 65
  - On eastbound I-20, there is approximately 750 feet between the end of the acceleration lane taper from the ramp from westbound I-20 and the beginning of the deceleration lane taper to the eastbound off-ramp to Exit 65.
  - On westbound I-20, there is approximately 700 feet from the end of the acceleration lane taper from the on-ramp from Exit 65 to the beginning of the diverging taper to the off-ramp to westbound I-26.
    - Due to the congestion caused by downstream complex weaving movements and high traffic volumes on westbound I-26 to Exit 106, the high volume of traffic on the ramp from westbound I-20 to westbound I-26, and the short distance between the Exit 65 on-ramp, traffic on westbound I-20 frequently backs from the ramp to westbound I-26 onto westbound I-20. Drivers try to avoid the back-up of traffic heading to the ramp by traveling in the center westbound mainline lane and attempting to cut in to gaps between cars, creating a safety problem and additional congestion to traffic properly using the center lane to travel through the ramp area.

Because of the complexity of modeling the interchange concepts, capacity assessments based on the existing and estimated future volumes, and the ramp LOS thresholds were performed for each ramp in the AO concepts. Since the AO concepts incorporated collector-distributor roads, volume estimates were based on adjacent service ramp volume and network origin-destination data. This results in system ramps having volumes lower than recorded traffic data. If ramps were assessed to be at or over-capacity with these volumes, the initial designs would not handle higher volumes.

The ramps at the system interchanges may be described as “left turn” or “right turn” ramps. For traffic traveling on eastbound I-26, a left turn ramp would take traffic to eastbound I-20 (the freeway direction to their left), while the right turn ramp would take traffic to westbound I-20. Under existing conditions, eastbound I-26 would use the loop ramp to eastbound I-20 as the left turn ramp. In the proposed concepts, these ramps may be replaced with flyover ramps or other directional ramps to complete the same “left turn”.

All of the Exit 107/64 interchange concepts were incorporated into the representative alternatives.

### 3.3.4.1 Exit 107/64 AO17 – I-20/I-26 Turbine Interchange

The proposed system interchange at Exit 107/64 developed as AO 17 is a Turbine Interchange. A capacity screening using estimated future volumes was performed on the initial AO17 concept. Generally, the ramps in the proposed concept were assessed to be under capacity. There were several ramps that were at capacity (LOS E) during one or both of the peak hours. There were no ramps that were identified as over capacity.

The results of the capacity screening were used by the roadway engineers to improve and enhance the design to accommodate the estimated future traffic to improve the assessment of the at capacity ramps to under capacity. The initial AO 17 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-23**. AO17 as was incorporated into representative alternative RA1.



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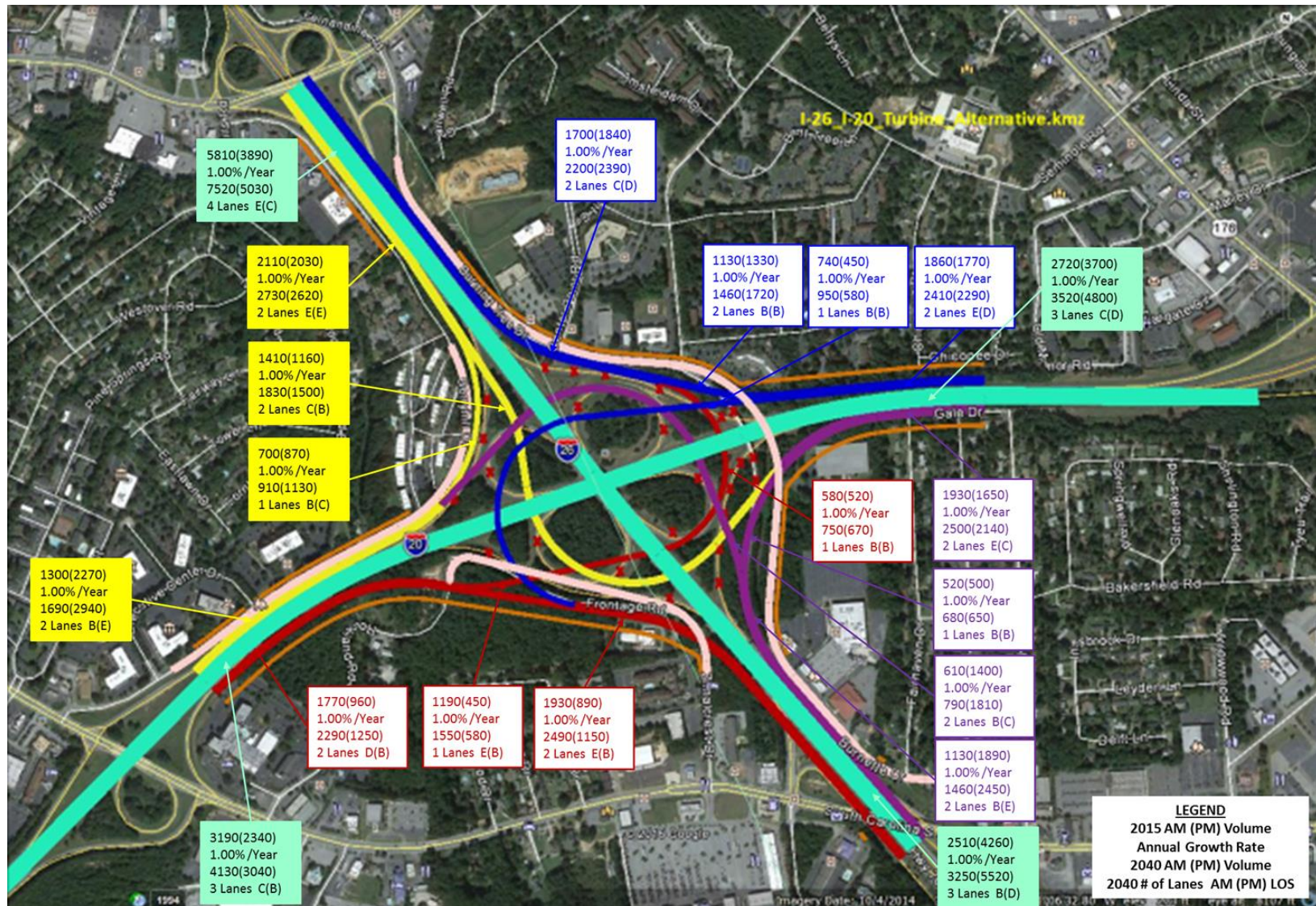


Figure 3-23 – AO 17 Turbine Interchange Concept and Capacity Screening Results

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### 3.3.4.2 Exit 107/64 AO18 – I-20/I-26 Directional Interchange with Interior Right Ramps

The proposed system interchange at Exit 107/64 developed as AO18 is described as a Directional Interchange with Interior Right Exit Ramps. The left turn ramps from eastbound I-26 ramps to eastbound I-20, and from westbound I-26 to westbound I-20 are similar to the turbine ramps in AO17. The left turn ramps from I-20 eastbound and I-20 westbound are within the I-26 left turn ramps. The right turn ramps on all four freeway approaches to the interchange, rather than being routed outside of the left turn ramps as in AO17, are routed inside the left turn ramps on shorter length and smaller radii curves.

A capacity screening using the existing and estimated future volumes was performed on the initial AO18 concept. The capacity of the ramps in the initial version of AO18 were assessed to operate under capacity under 2040 traffic, with the exception of the two lane ramp taking westbound I-20 traffic to both directions on I-26. This design of the ramp would need to be increased to three lanes to be assessed as under capacity.

The initial AO18 concept and the results of the capacity screening using estimated 2040 volumes are shown in **Figure 3-24**. AO18 was incorporated into representative alternative RA2.

### 3.3.4.3 Exit 107/64 AO19 – I-20/I-26 Directional Interchange with Loop and Ramps

The proposed system interchange at Exit 107/64 developed as AO19 is described as a Directional Interchange with Loop and Ramp. The concept is similar to more typical directional interchange concepts, with the exception of maintaining the loop ramp from eastbound I-20 to westbound I-26. The interchange is likely to require more levels of crossing ramps than either AO17 or AO18. The loop ramp that was retained in AO19 was chosen for the eastbound I-20 to westbound I-26 traffic movement as this is the lowest volume ramp movement at the existing system interchange, and would therefore be more likely to be assessed as under capacity under the estimated 2040 traffic than would the other ramps.

A capacity screening using the existing and estimated future volumes was performed on the initial AO19 concept. For the most part, the ramps in the proposed concepts were assessed to be under capacity. There were several ramps that were at capacity (LOS E) during one or both of the peak hours. There were no ramps that were identified as over capacity.

The results of the capacity screening were used by the roadway engineers to improve and enhance the design to accommodate the estimated future traffic to improve the assessment of the at capacity ramps to under capacity. The initial AO19 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-25**. AO19 was incorporated into representative alternative RA6.



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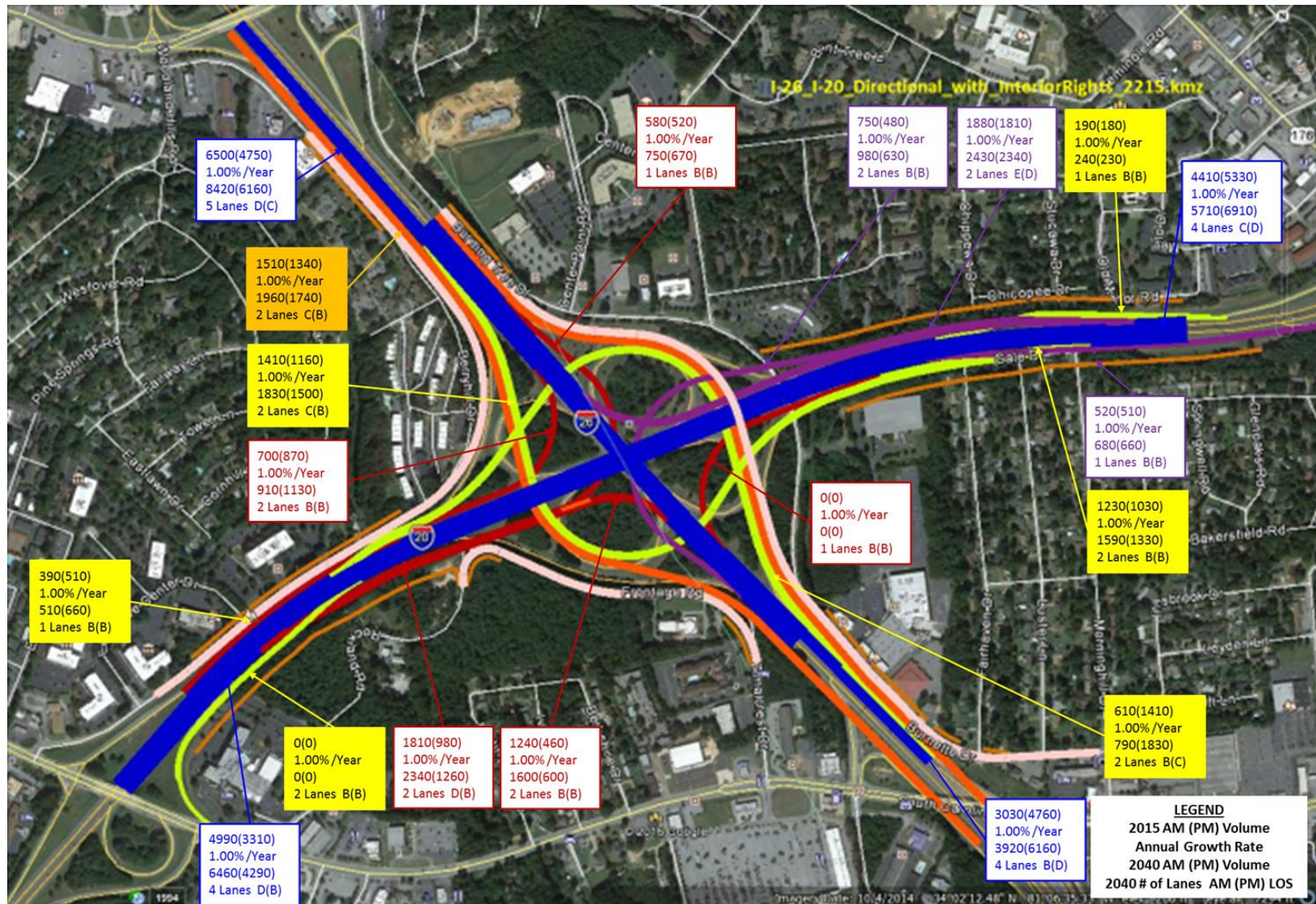


Figure 3-24 AO18 Directional Interchange with Interior Right Exit Ramps Concept and Capacity Screening Results



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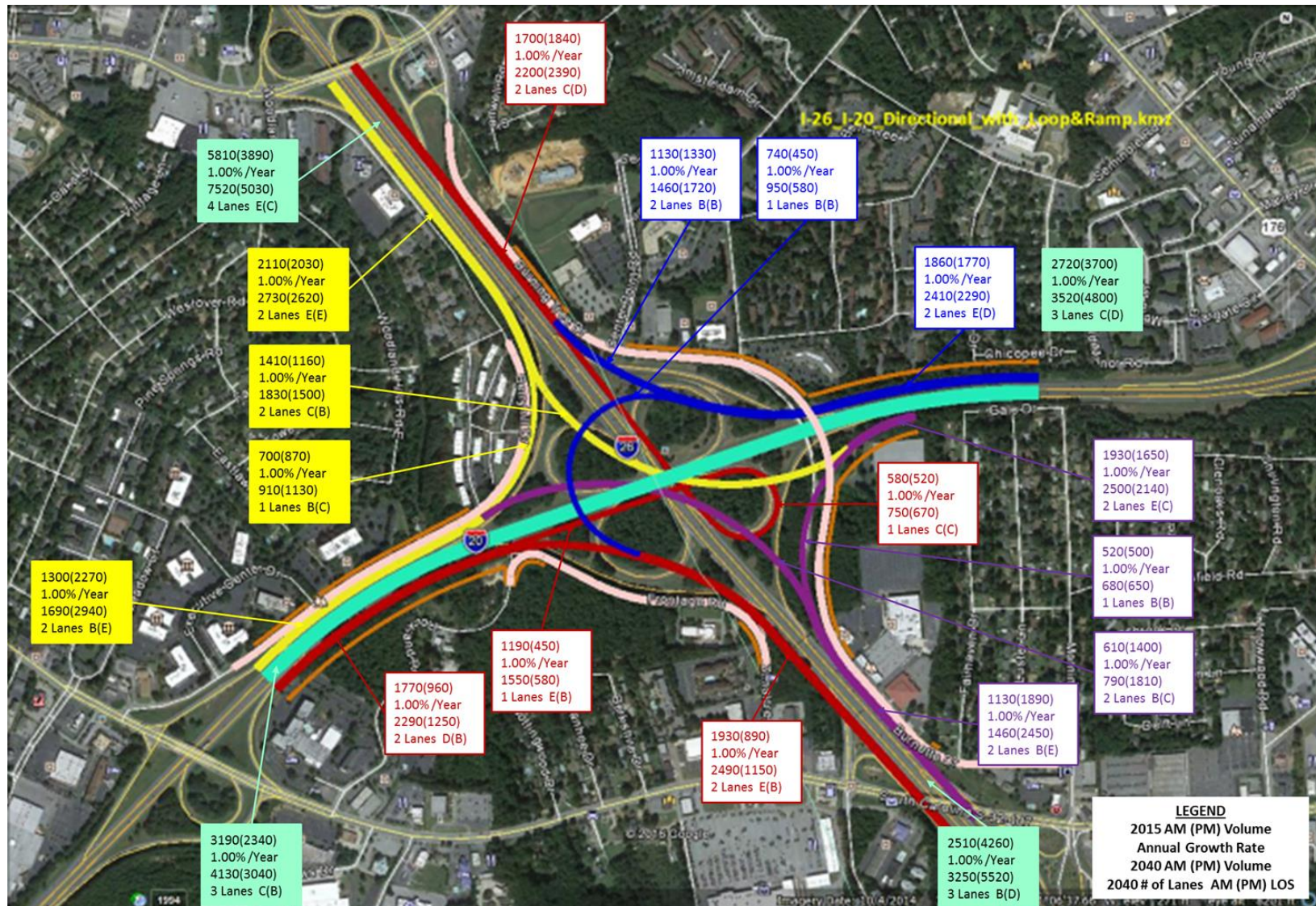


Figure 3-25 - AO 19 - Directional Interchange with Loop and Ramp Concept and Capacity Screening Results

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### 3.3.4.4 Exit 107/64 AO20 – I-20/I-26 Directional Interchange with Two Loop Ramps

The proposed system interchange at Exit 107/64 developed as AO20 is identical to AO19, except a second loop ramp is retained for traffic traveling from westbound I-20 to eastbound I-26. This loop ramp was chosen since it carries the second lowest volume of ramp at the existing system interchange.

A capacity screening using the existing and estimated future volumes was performed on the initial AO20 concept. For the most part, the ramps in the proposed concepts were assessed to be under capacity. There were several ramps that were at capacity (LOS E) during one or both of the peak hours. There were no ramps that were identified as over capacity.

The results of the capacity screening were used by the roadway engineers to improve and enhance the design to accommodate the estimated future traffic to improve the assessment of the at capacity ramps to under capacity. The initial AO20 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-26**. AO20 was incorporated into representative alternatives RA5.

### 3.3.4.5 Exit 107/64 AO21 – I-20/I-26 Turbine Braided-Directional with Two Loop Ramps

The proposed AO21 concept at the system interchange incorporates a variety of interchange ramp elements. Elements of the Turbine interchange from AO17 are maintained from moving traffic to and from I-26 to I-20. The loop ramps from AO20 are also maintained. Braided ramps are introduced to move traffic to and from anticipated collector-distributor roadways traversing the interchange area.

The capacity screening using the existing and estimated future volumes performed on AO21 indicated that most ramps were assessed to be under capacity. Several ramps that were assessed to be at capacity are located just prior to ramps diverging or just after ramps merging. The anticipated two lane westbound I-20 collector-distributor road section was assessed to operate over capacity.

The results of the capacity screening were used by the roadway engineers to improve and enhance the design to accommodate the estimated future traffic to improve the assessment of at capacity and over capacity ramps to under capacity. The initial AO21 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-27**. AO21 was incorporated into representative alternative RA3.

### 3.3.4.6 Exit 107/64 AO22 – I-20/I-26 Semi-Directional Interchange with Two Loop Ramps

The proposed AO22 concept at the system interchange is incorporates directional ramps and the two loop ramps in AO21 and AO22 along with the introduction of some collector-distributor roadways through the interchange area.

The capacity screening using the existing and estimated future volumes performed on AO22 indicated that most ramps were assessed to be under capacity. Several ramps were assessed to be at capacity during one or both peak hours. A single lane flyover ramp from eastbound I-26 to eastbound I-20 was assessed to be over capacity during the morning peak hour and at capacity during the afternoon peak hour.



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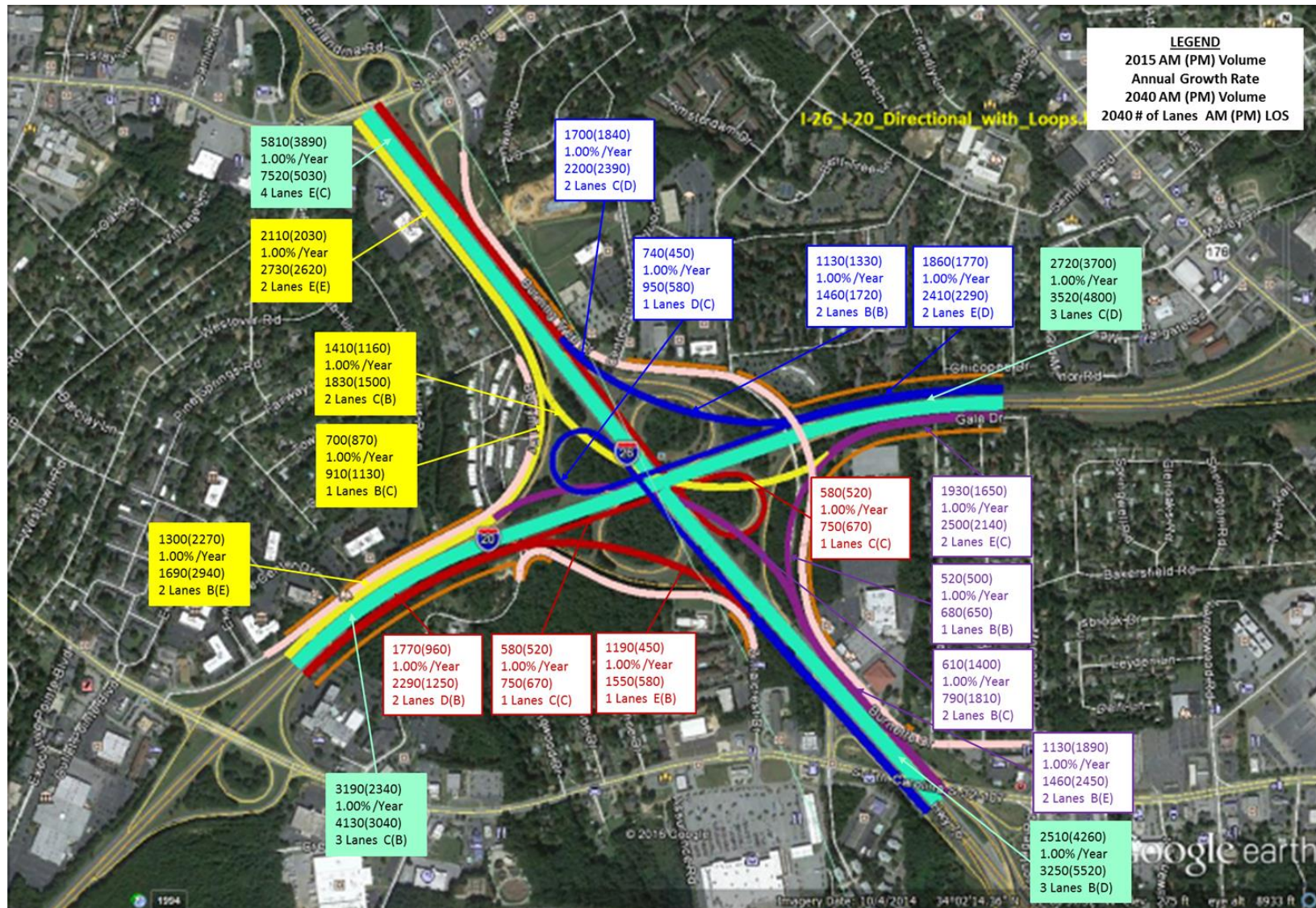


Figure 3-26 AO20 Directional Interchange with Two Loop Ramps Concept and Capacity Screening Results



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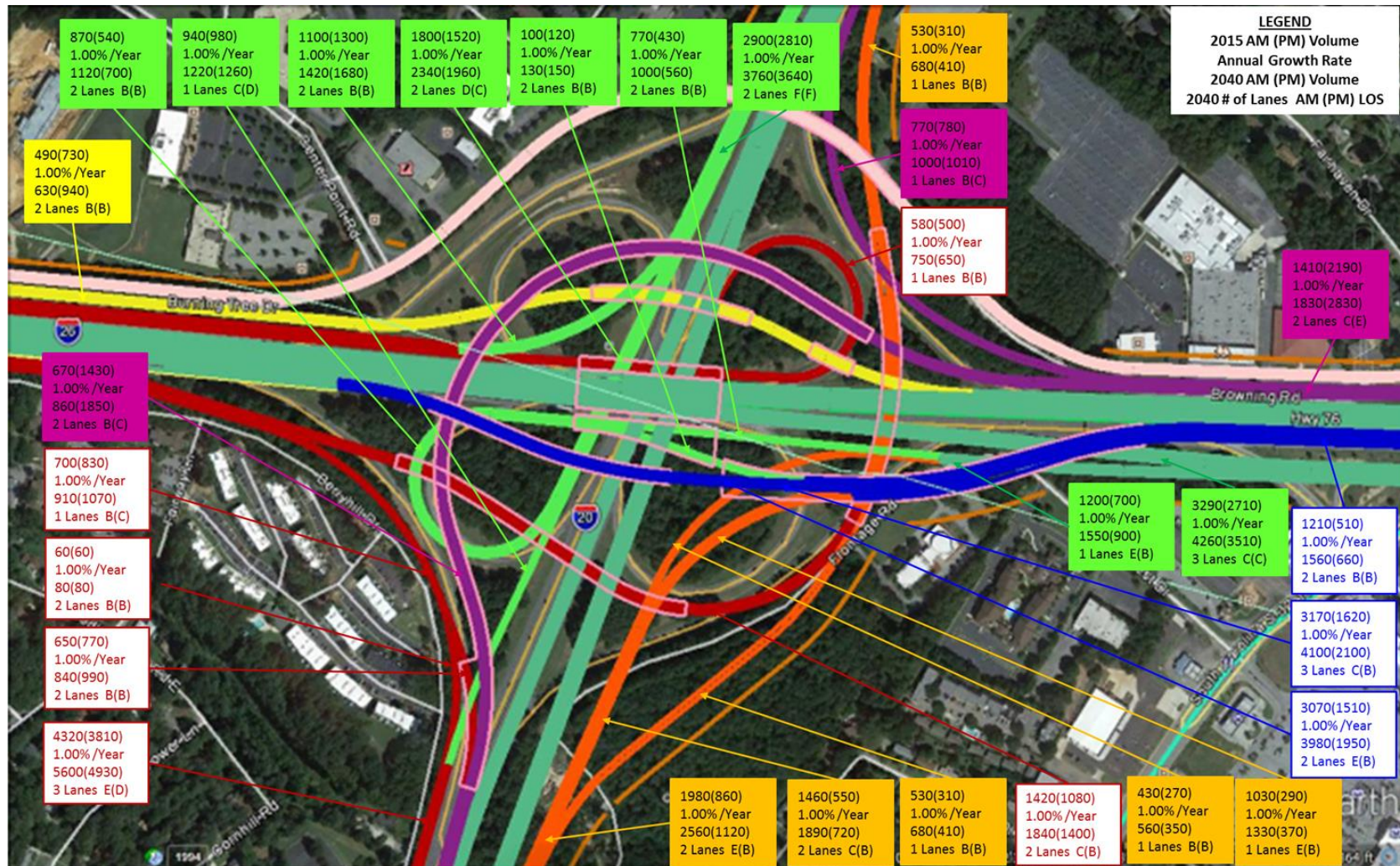


Figure 3-27 AO21 Turbine/Braided Interchange with Two Loops Concept and Capacity Screening Results

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The results of the capacity screening were used by the roadway engineers to improve and enhance the design to accommodate the estimated future traffic to improve the assessment of at capacity and over capacity ramps to under capacity. The initial AO 22 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-28**. AO22 was incorporated into representative alternative RA4.

### 3.3.5 AO23 – AO26 (EXIT 108/108B)

The following are a list of the AO developed and screened for Exit 108 (the service interchange at Bush River Road) and at Exit 108B (the I-26/I-126 system interchange).

- AO23 – Offset Diamond at Exit 108 (detailed Synchro model)
- AO24 – I-26/I-126 Semi-Directional Flyover (capacity assessment)
- AO25 – I-26/I-126 C-D Road Connections (capacity assessment)
- AO26 – I-26/I-126 Braided C-D Road Connections (capacity assessment; detailed Synchro model)

Existing traffic operations at Exit 108 are complicated by:

- Its proximity to Exit 107 which
  - Creates a short weaving section between the ramp from eastbound I-20 to eastbound I-26 and the eastbound off-ramp to Exit 108.
  - Causes traffic from westbound I-26 to perform complex weaving movements to travel to the ramps to eastbound and westbound I-20 and to Exit 106 after I-26 merges into the three lanes from westbound I-126
  - Congestions created by the complex weaving area downstream of the merge of westbound I-26 with westbound I-126 results in substantial traffic back-ups on the mainline lanes of westbound I-26
- Congestion along Bush River Road causes the intersection of Bush River Road with the westbound I-26 off-ramp/Morninghill Drive to be over capacity during the afternoon peak hour, resulting in substantial queuing on the off-ramp approach to the intersection.

Existing traffic operations at the I-26/I-126 system interchange at Exit 108B are complicated by:

- Last minute positioning of traffic on eastbound I-26 just prior to the I-126 split.
- Three lanes continuing through to I-126 towards downtown Columbia to the left of the two lanes continuing east on I-26 gives the impression that the I-26 mainline is more of an off-ramp than a continuation of the interstate.
- Downstream congestion beginning at the merge of the two lanes of westbound I-26 between three lanes of westbound I-126 (two lanes to the left and one to the right of the merging I-26 lanes) and continuing through complex weaving movements at the system interchange at Exit 107 and the service interchange of Exit 106 results in stop-and-go traffic on westbound I-126 during the afternoon peak hour.



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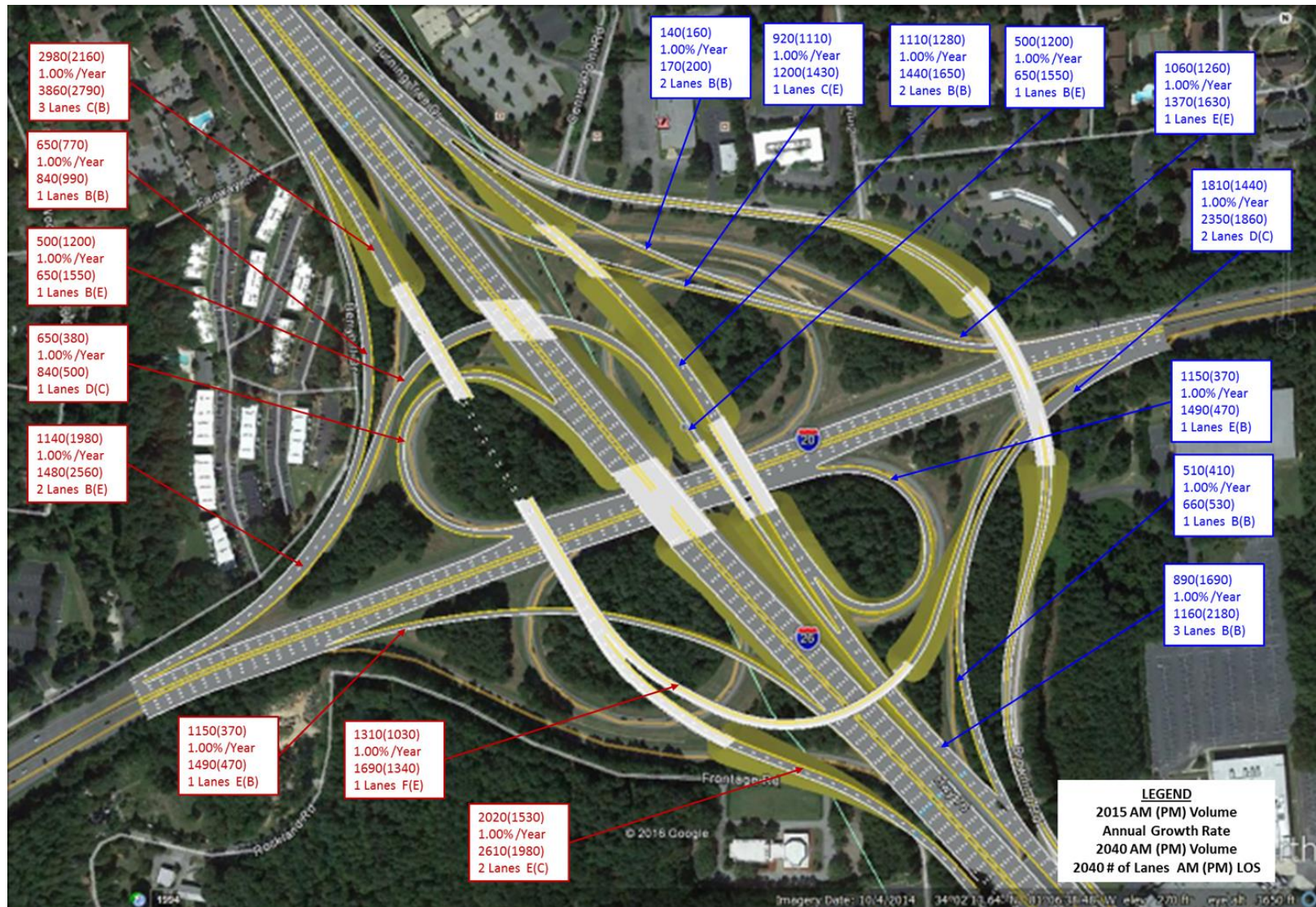


Figure 3-28 AO22 Semi-Directional Interchange with Two Loops Concept with Capacity Screening Results



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### 3.3.5.1 Exit 108 AO23 – Offset Diamond Interchange

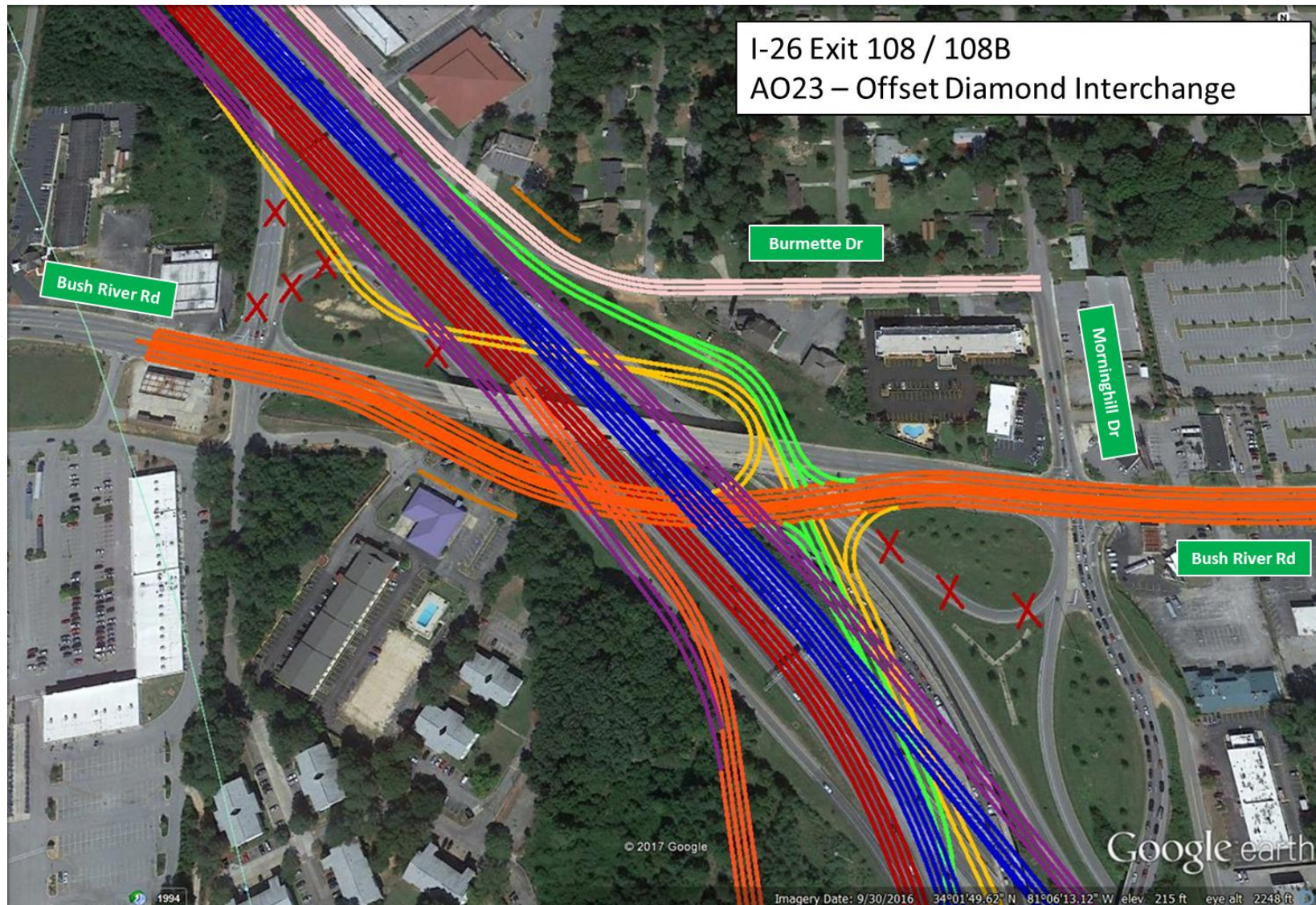
The proposed offset diamond interchange at Exit 108 relocates the existing ramps to/from I-26 and combines them into a single intersection on Bush River Road located approximately 600 feet west of the existing westbound off-ramp/Morninghill Drive intersection. The eastbound off-ramp would crossover I-26 before curving into the north approach of the new intersection. The eastbound on-ramp would exit to the south of the intersection, cross over I-26 and I-126, and run parallel to or merge with the flyover ramp from westbound I-126 to eastbound I-26. The westbound off-ramp would initially follow its current route, but would bend to crossover I-126 into the south approach of the new intersection. The westbound on-ramp would exit to the north of the intersection and merge into westbound I-26 at approximately the same location as the current merge from the westbound on-ramp/I-126 ramp to I-20. A new Bush River Road overpass over I-26 would be constructed on the south side of the existing overpass.

The proposed intersection of the offset diamond ramps and Bush River Road was initially considered to provide a continuation of the existing five lane cross section on Bush River Road. The westbound approach of Bush River Road would incorporate a separate left turn lane for traffic entering the eastbound on-ramp, two through lanes, and a separate right turn lane for traffic entering the westbound on-ramp. The eastbound approach of Bush River Road would provide a separate left turn lane for traffic entering the westbound on-ramp, two through lanes, and a separate right turn lane for traffic entering the eastbound on-ramp. The southbound approach of the intersection, would be the terminus of the eastbound off-ramp, and initially was to provide separate left and right turn lanes at Bush River Road. The northbound approach was initially assumed to require a separate left turn lane and a channelized separate right turn lane. The intersection would operate under signal control. Both on-ramps would start with two lanes before merging to one lane prior to entering I-26.

The concept of the Offset Diamond Interchange intersection at Bush River Road is shown in **Figure 3-29** and the I-26/I-126 system interchange portion of AO23 is shown in **Figure 3-30**

The capacity screening of AO23 was performed using a detailed Synchro model created specifically to assess this concept. The assessment indicated that dual left and right turn lanes would be needed on the westbound off-ramp approach to the proposed intersection. With these additions, observation of simulations indicated that Bush River Road would still experience queuing during the afternoon peak hour at the Morninghill Drive intersection. Westbound queues at the Morninghill Drive intersection would meter traffic entering the proposed ramp intersection, while queues from the high volume of eastbound left turns onto Morninghill Drive would have a tendency to back up out of the short left turn lane that is back-to-back with the westbound left turn lane to the eastbound on-ramp. The high volume of existing eastbound left turn traffic to Morninghill Drive (about 200 vehicles per hour in the morning peak hour and over 400 vehicles per hour in the afternoon peak hour) would also likely require a second left turn lane, with downstream improvements on Morninghill Drive to accept traffic from both turn lanes, to improve the intersection operation.

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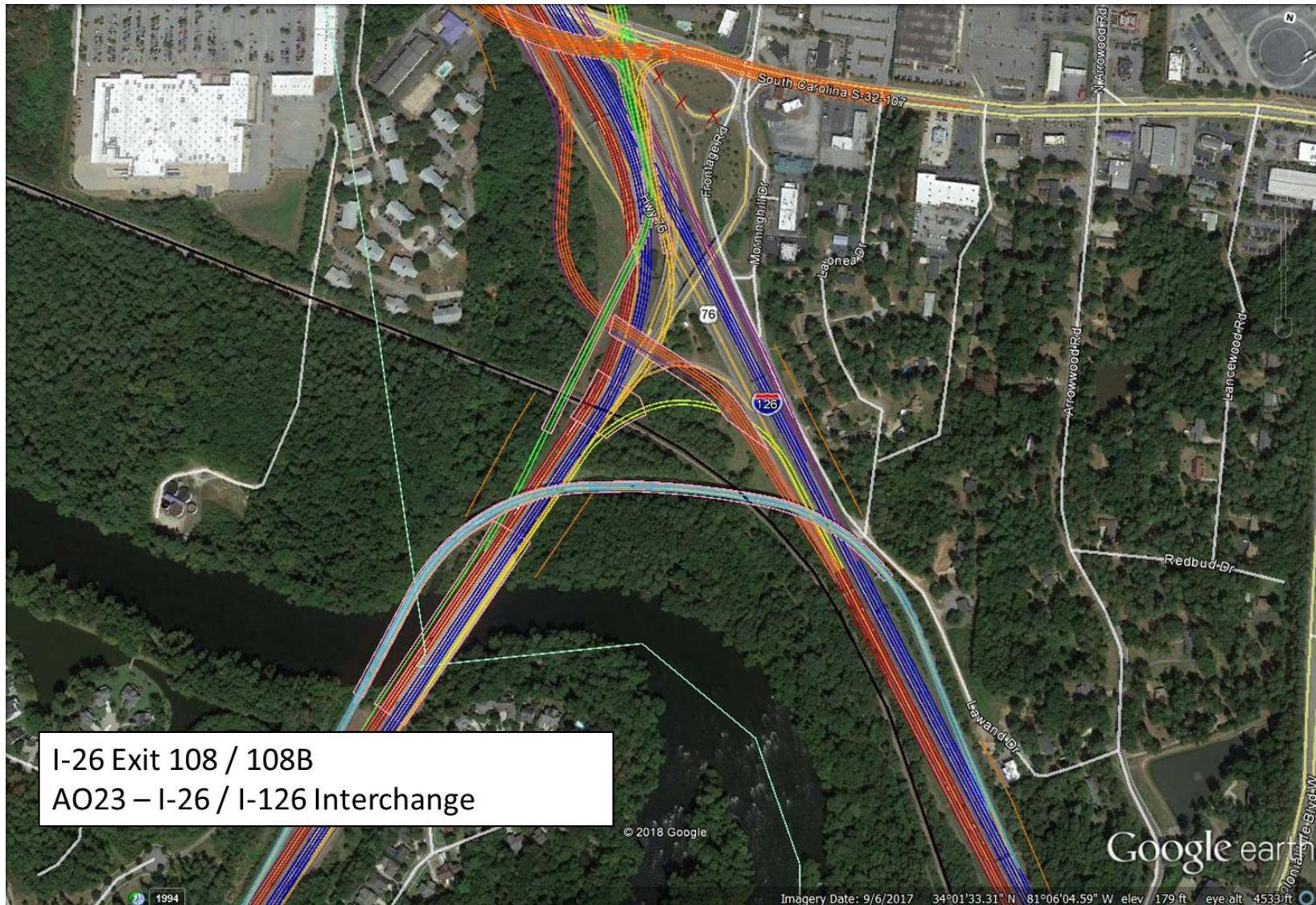


**Figure 3-29 AO23 Offset Diamond Intersection Concept on Bush River Road**

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**Figure 3-30 - AO23 I-26/I-126 System Interchange Concept**

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The estimated increase in 2040 traffic volumes resulted an over capacity traffic assessment eastbound during the morning peak hour and westbound during the afternoon peak hour. Observations of simulations of the 2040 traffic on AO23 indicated that substantial queuing would occur in the eastbound direction at the proposed ramp intersection during both peak hours, with excessive afternoon peak hour queuing observed on the eastbound off-ramp, the eastbound left turn to Morninghill Drive, and the westbound through traffic at Morninghill Drive. The close spacing of the signalized intersection of Morninghill Drive and the proposed ramp intersection contributes to the congestion observed in the simulations. On the basis of the intersection operation, AO23 was not selected to be evaluated further as part of the representative alternatives. Since the intersection operation precluded moving AO23 forward, no capacity screening was performed on the proposed I-26/I-126 ramp configuration that was part of AO23.

### 3.3.5.2 Exit 108/108B AO24 – I-126 Semi-Directional Flyover Interchange

The initial proposed AO24 concept incorporated several major changes at Exits 108 and 108B. The on-and off-ramps to Exit 108 were entirely eliminated from the concept. Traffic currently using these ramps would re-route to either the I-20 – Bush River Road service interchange (Exit 63) or to a modified Colonial Life Boulevard interchange that would include an eastbound off-ramp and westbound on-ramp. In the latter case, traffic currently using the Bush River Road service interchange would travel along Colonial Life Boulevard and through its intersection with Bush River Road.

Changes to the Exit 108B system interchange consisted of re-routing traffic so that eastbound I-26 would be the continuous movement to through traffic on the interstate (instead of to eastbound I-126 under existing conditions), while traffic to eastbound I-126 would use a right side exit before returning to its current alignments east of the existing westbound I-26 overpasses. Finally, the existing flyover ramp from westbound I-126 to eastbound I-26 would be replaced by a tighter flyover ramp located closer to the existing Bush River Road overpass.

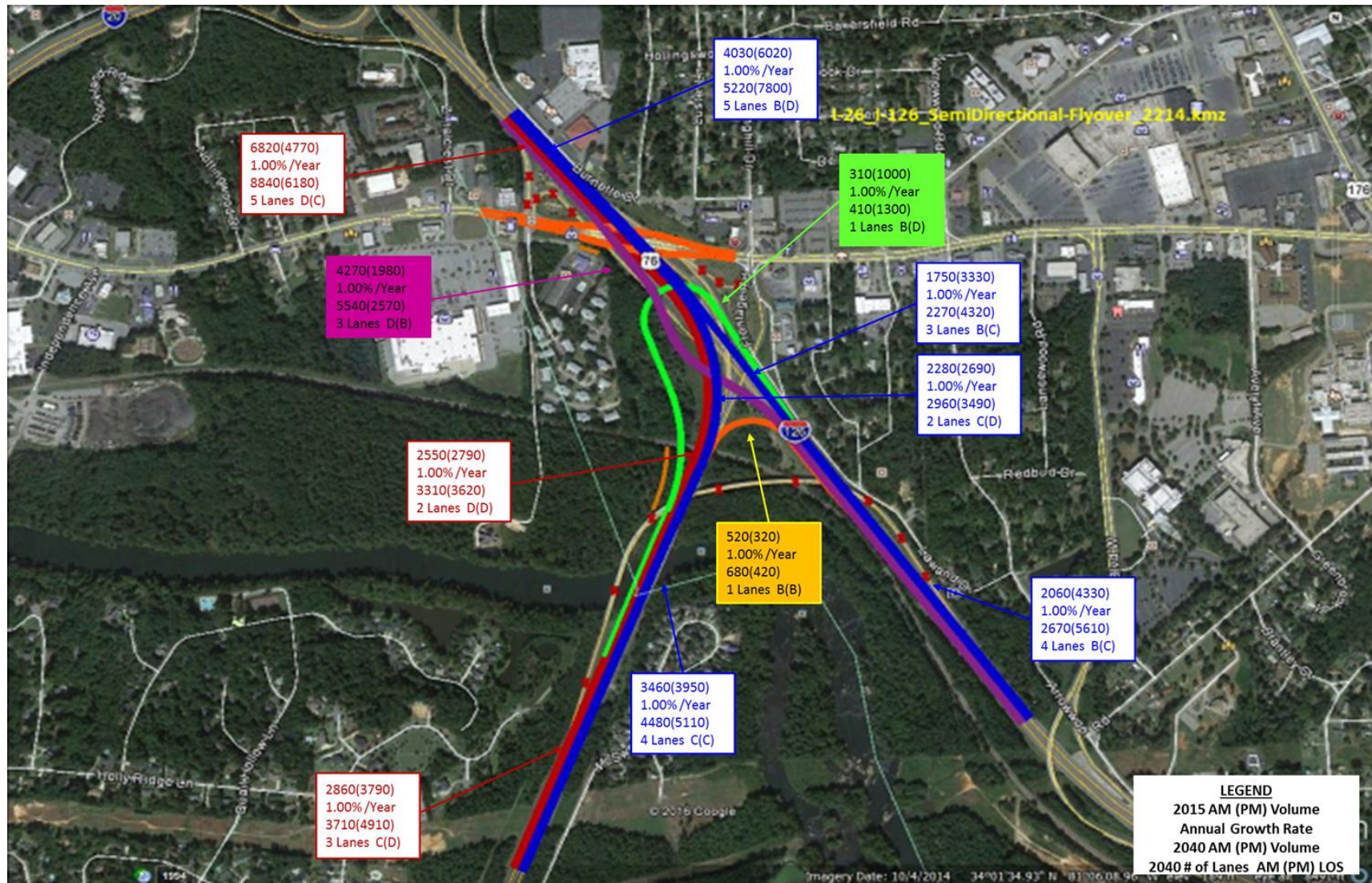
The capacity screening using the existing and estimated future volumes performed on AO24 indicated that all ramps were assessed to be under capacity. The initial AO 24 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-31**. AO24 was selected to be evaluated further as part of representative alternatives RA1, RA2, RA5, RA6, RA7, and RA8.

### 3.3.5.3 Exit 108/108B AO25 – I-126/Bush River Road with C-D Connections

The proposed AO25 concept maintains the existing ramp configuration at Exit 108. There is some adjustment to the location of ramps between I-26 and I-126 at Exit 108B. The ramp from westbound I-26 to eastbound I-126 is located south of the railroad overpass on westbound I-26, requiring a new railroad crossing closer to eastbound I-126. The alignment of the other ramps are generally the same, but have increased separate provided between them, and additional ramps to frontage roads connecting to and through Exit 107 are also provided.

The capacity screening using the existing and estimated future volumes performed on AO25 indicated that most ramps were assessed to be under capacity. Several ramps were assessed to be at capacity, and no ramps were assessed to be over capacity. The initial AO25 concept and the results of the capacity screening using estimated

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**Figure 3-31 AO24 Semi-Directional Flyover with Capacity Screening Results**



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2040 traffic are shown in **Figure 3-32** and **Figure 3-33**. AO25 was selected to be evaluated further as part of representative alternative RA4.

### 3.3.5.4 Exit 108/108B AO26 – I-126/Bush River Road Turbine Braided Ramps

The proposed AO26 concept incorporates a variety of interchange ramp elements that change access to Bush River Road. The existing eastbound ramps are eliminated, as is their intersection with Bush River Road. The eastbound off-ramp is relocated to make a tight turn back to the north to intersection Bush River Road opposite Morninghill Drive. The existing westbound off-ramp to Bush River Road is relocated to exit to a new full interchange at Colonial Life Boulevard. The eastbound and westbound on-ramps begin at the intersection opposite Morninghill Drive. The two ramps run together for approximately 1,250 feet, at which point the eastbound on-ramp continues to the south, crossing over I-26 before merging into eastbound I-26 upstream of the location where the ramp from westbound I-126 merges into eastbound I-26. The westbound on-ramp follows a tight curve, making a 180 degree curve to return to merge into westbound I-26 west of the Bush River Road overpass. The concept also incorporates collector-distributor roads to separate traffic heading to I-20 from mainline I-26.

The capacity screening using the existing and estimated future volumes performed on AO26 indicated that most ramps were assessed to be under capacity. Several ramps were assessed to be at capacity, and no ramps were assessed to be over capacity. The initial AO 26 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-34**.

A capacity assessment was also performed on the proposed ramp intersection opposite Morninghill Drive on Bush River Road using a detailed Synchro model created for this intersection. The original concept of the ramps intersecting Bush River Road is shown in **Figure 3-35**.

For the initial capacity assessment of this intersection, the geometry on the approaches of existing intersection was maintained, with traffic redistributed to reflect the relocation of ramp movement through this intersection. The redistributed volumes significantly increased the volume of westbound left turns at the intersection to the on-ramps (approximately 250 vehicles per hour in the morning peak hour and almost 500 vehicles during the afternoon peak hour). This led to a revision to the intersection concept to include dual westbound left turn lanes, and providing three lanes on the on ramp section departing the intersection to the south (one lane for the westbound on-ramp and two lanes for the eastbound on-ramp). With this addition, no operational issues were observed in simulations of existing traffic. In both peak hours, the capacity assessment indicated the intersection was at capacity.

Under estimated 2040 morning peak hour traffic volumes, queues on the eastbound approach to the intersection were observed in the simulations. These queues are caused by the high volume of eastbound right turn traffic onto the on-ramps and through traffic. There is also a high estimated volume of left turn traffic from southbound Morninghill Drive onto eastbound Bush River Road that experiences queuing as well. Under estimated 2040 afternoon peak hours, congestion and queuing was observed in the simulations on both Bush

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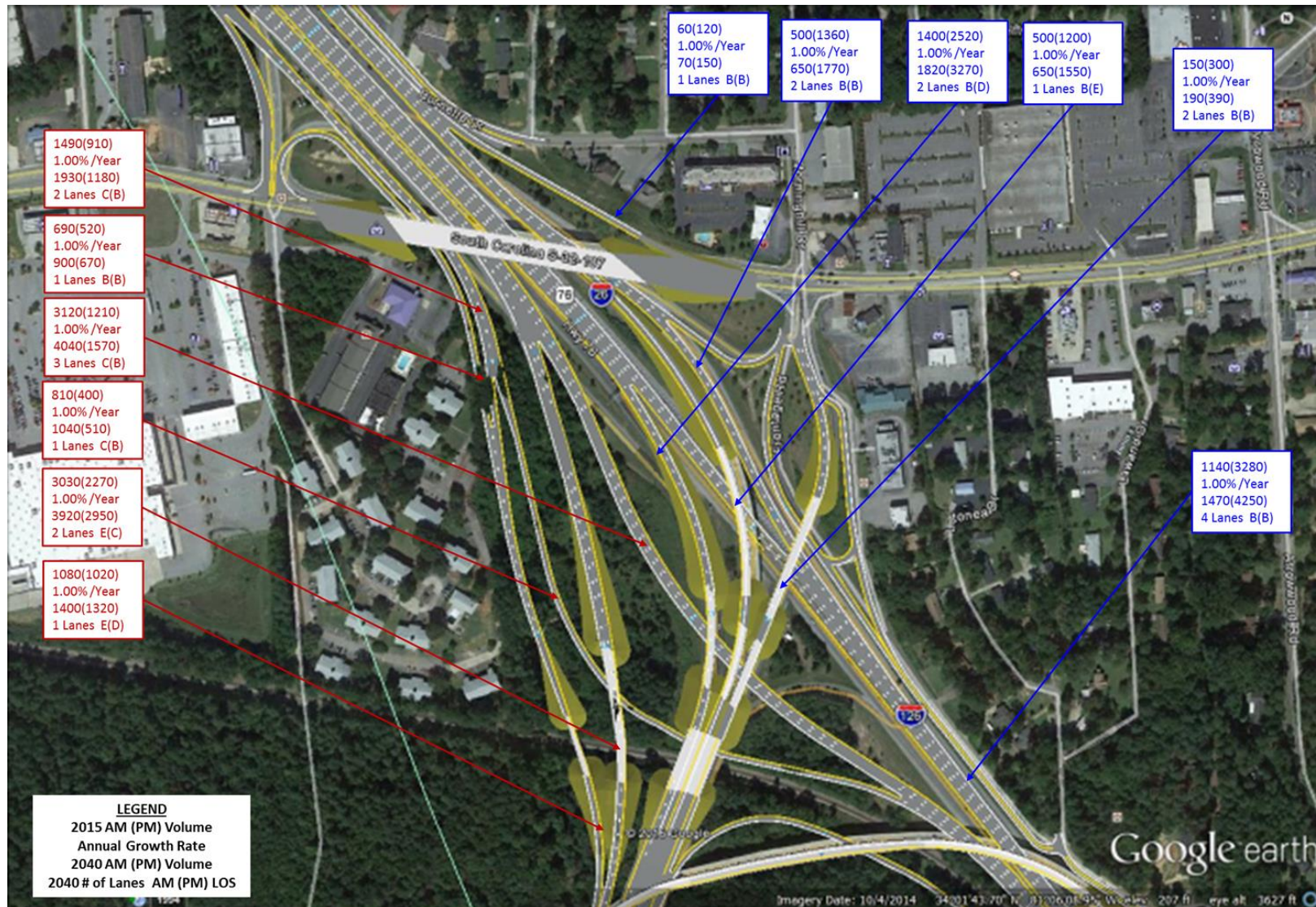


Figure 3-32 AO25 I-26/I-126 C-D Connections with Capacity Screening Results (north section)



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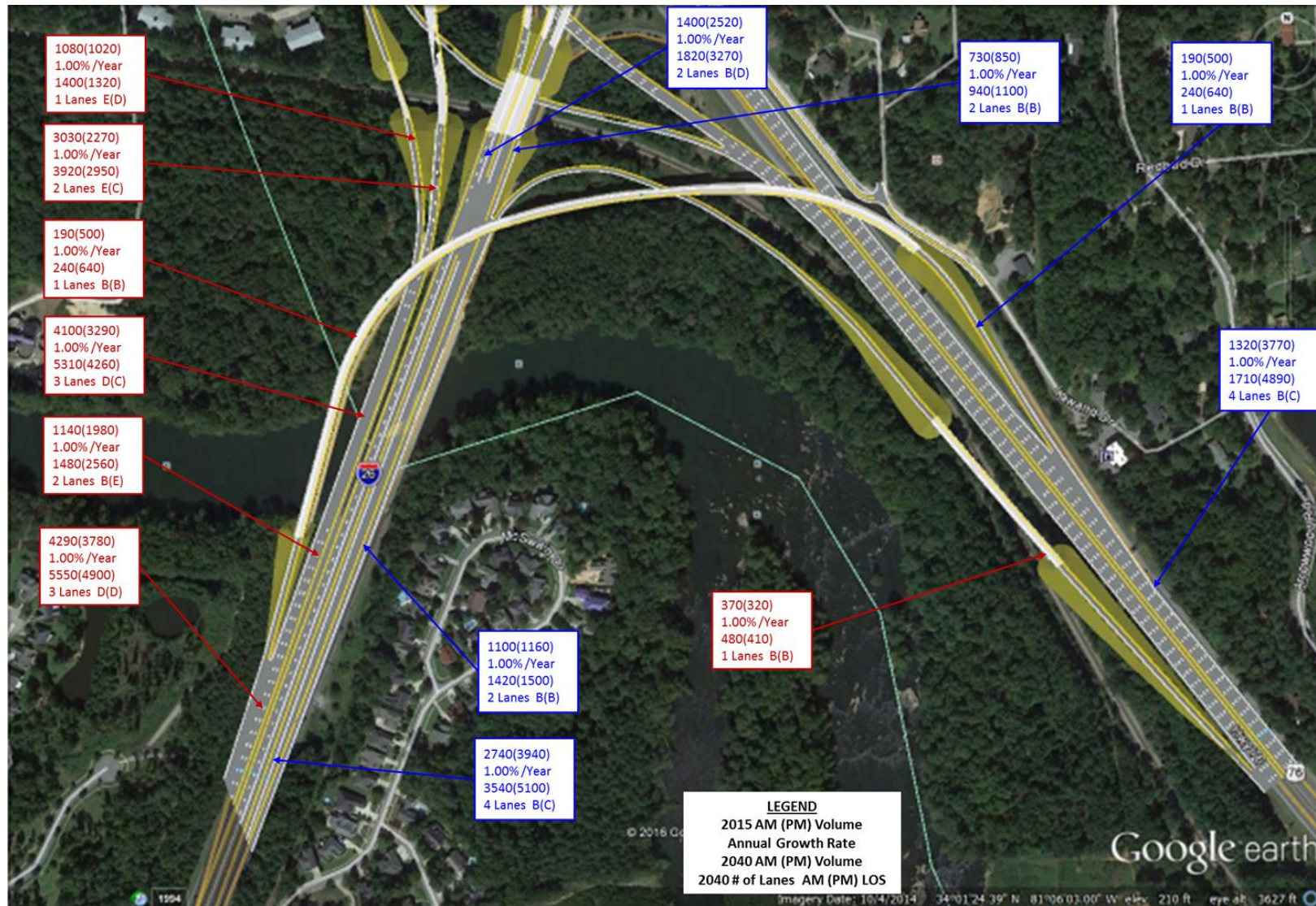


Figure 3-33 AO25 I-26/I-126 C-D Connections with Capacity Screening Results (south section)



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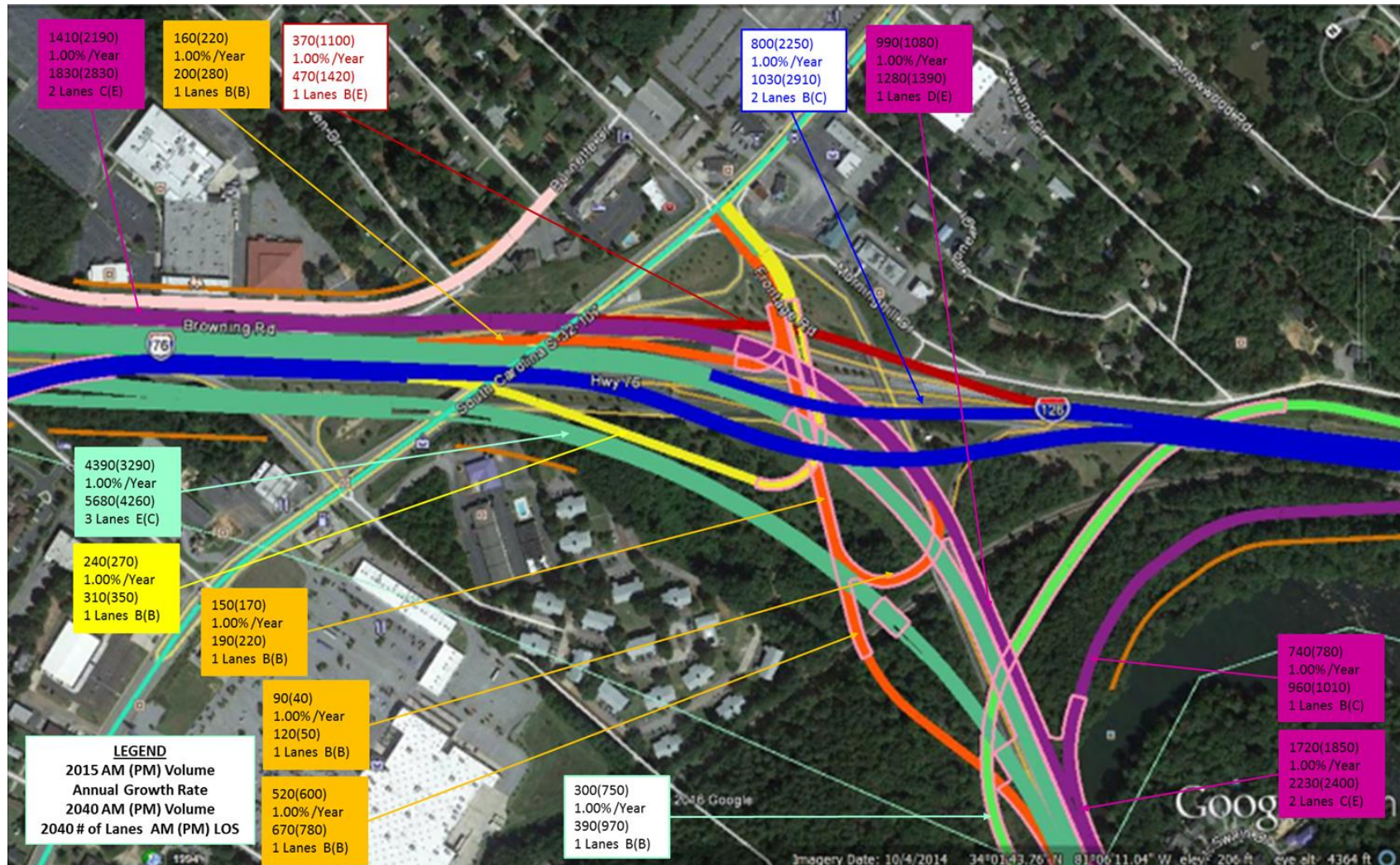
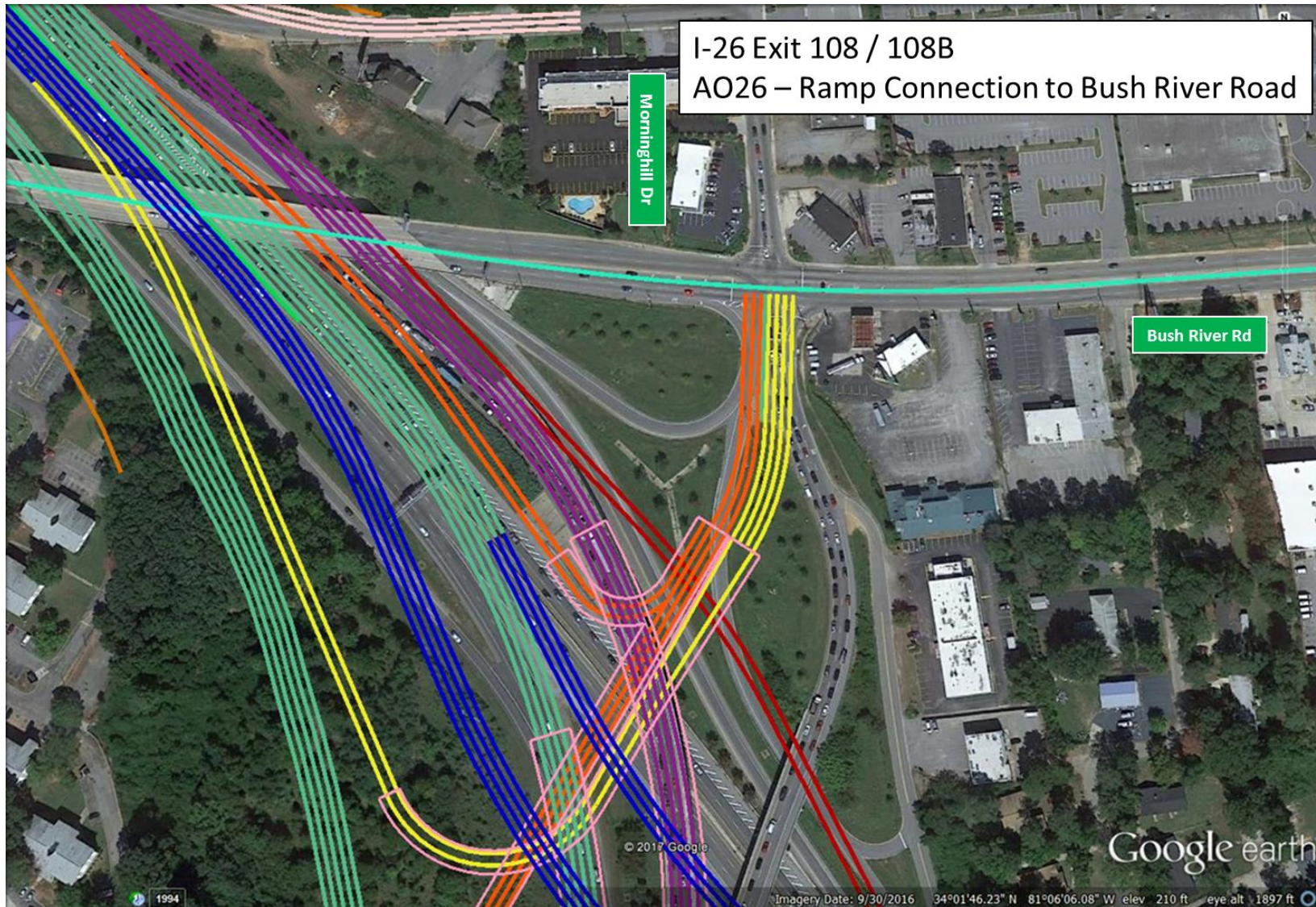


Figure 3-34 AO26 I-26/I-126 Braided C-D Roads with Capacity Screening Results



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**Figure 3-35 AO26 - Ramp Connections to Bush River Road**

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River Road approaches and on the southbound Morninghill Drive approach to the intersection. In both peak hours, the capacity assessment indicated the intersection was at capacity.

Based on the results of the capacity assessment of the ramp intersection, AO26 was recommended to be evaluated further as part of representative alternative RA3.

### 3.3.6 AO27 – AO29 (NEW CONNECTORS)

The following are a list of the AO developed and screened for new limited access roadways connecting I-20 and I-126.

- AO27 – East-West Connector (capacity screening)
- AO28 – East-West Connector with Bush River Road Access (capacity screening; detailed Synchro model)
- AO29 – Southern Connector with I-26 Turbine Interchange (capacity screening)

Three proposed connector concepts were developed to investigate if limited access roadways constructed on new alignment between I-20 and I-126 could reduce congestion through the existing I-20/I-26 and I-26/I-126 system interchanges. These connectors were evaluated using capacity screening based on the turning movement volume and mainline interstate volumes with an estimated distribution using origin-destination volume data. The new connector alternatives were also modeled in the SCSWM. The results of the travel demand modeling effort will be discussed further in **Section 5.2 Travel Demand Modeling**.

#### 3.3.6.1 AO27 – East-West Connector

The proposed east-west connector consists of a limited access facility connecting I-20 on the west to I-126 on the east. The alignment of the connector runs generally parallel to and to the north of the Saluda River. Aside from the existing ramps connecting westbound I-126 to eastbound I-26, and westbound I-26 to eastbound I-126, no other ramps are provided between the connector and I-26. At the west end of the proposed connector, ramps are provided connecting eastbound I-20 to the eastbound connector, and the westbound connector to westbound I-20. No ramps are provided from westbound I-20 to the eastbound connector or from the westbound connector to eastbound I-20. These movements to use the I-20/I-26 system interchange at Exit 107/64. At the east end of the proposed connector, ramps are provided connecting the eastbound connector to eastbound I-126 and westbound I-126 to the westbound connector.

The capacity screening using the existing and estimated future volumes performed on AO27 indicated that the ramps and connector segments were assessed to be under capacity. The initial AO 27 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-36**. AO27 was evaluated further as part of representative alternative RA7.

#### 3.3.6.2 AO28 – East-West Connector with Bush River Road Access

The proposed east-west connector with Bush River Road access consists of a limited access facility connecting I-20 on the west to I-126 on the east. The alignment of the connector runs generally parallel to and to the south of the Norfolk – Southern Railroad, and also to Bush River Road to the north and the Saluda River to the south.



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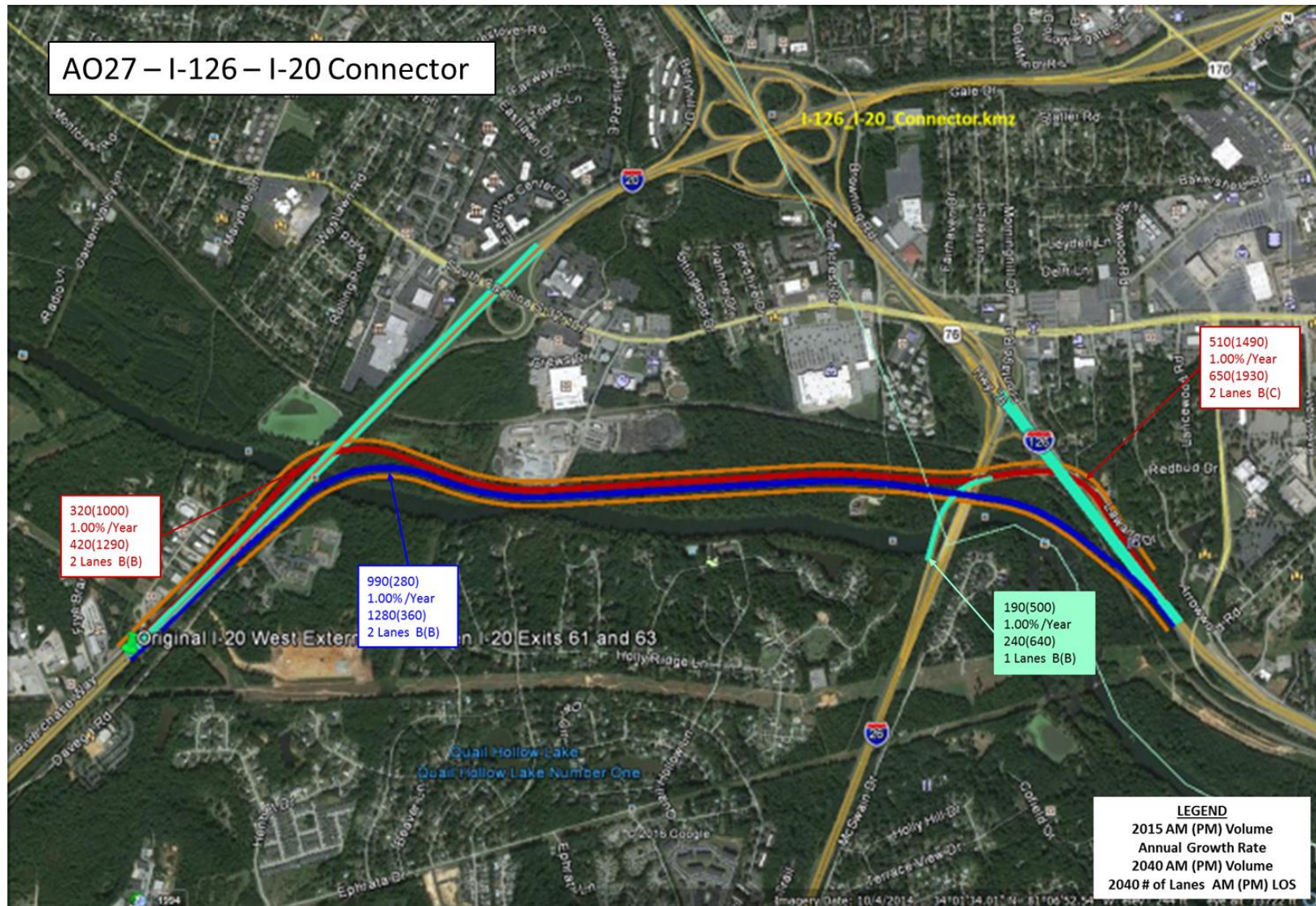


Figure 3-36 - AO27 Initial Concept and Capacity Screening Results

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The western end of the connector replaces existing Exit 63 and its connections to Bush River Road, and provides full access to the east and west on I-20. With access to Bush River Road at Exit 63 removed, an interchange located approximately midway in the connector is proposed to provide access to Bush River Road approximately opposite Nottingwood Drive. Both directions of the connector provide access to eastbound I-26, and access from westbound I-26 is provided to the eastbound connector that terminates at eastbound I-126. At the east end of the connector, the westbound connector begins on westbound I-126, and the eastbound connector ends on eastbound I-126.

With these new connections between I-26 and I-126, the existing ramps between westbound I-26 and eastbound I-126 and from westbound I-126 to eastbound I-26 would be removed. Also removed were all of the Exit 108 ramps to and from Bush River Road.

A fully directional I-20/I-26 system interchange would remain as part of this connector concept.

The capacity screening using the existing and estimated future volumes performed on the initial AO28 concept indicated that most of the ramps and connector segments were assessed to be under capacity using estimated 2040 traffic. Several ramps and connector segments were assessed to be near capacity and/or over capacity during one or both peak hours. These include the two lane section of the westbound I-20 collector-distributor road between Exit 65 and Exit 63 (at or over capacity in both peak hours), and the two lane westbound I-26 collector-distributor road between Exit 108 and Exit 107 (over capacity during the afternoon peak hour).

The initial AO 28 concept and the results of the capacity screening using estimated 2040 traffic are shown in **Figure 3-37**.

The capacity screening of AO28 was performed using a detailed Synchro model created specifically to assess this ramp intersection opposite Nottingwood Drive. The proposed intersection was initially assessed assuming two through lanes and a separate right turn lane on eastbound Bush River Road, dual left turn lanes and two through lanes on westbound Bush River Road, and dual left turn lanes and a separate right turn lane on the northbound ramp approach. For the purpose of the assessment, Nottingwood Drive was not included.

With the elimination of Exits 63 and 108 and the rerouting of that ramp traffic to this proposed interchange, turn volumes would be extremely high. During the morning peak hour, over 600 vehicles per hour were estimated to turn right onto the new on-ramp, and about 850 were assumed to turn left from the dual left turn lanes. From the off-ramp, about 850 vehicles were estimated to turn left and over 700 vehicles were estimated to turn right. During the afternoon peak hour, about 800 vehicles per hour were estimated to turn right onto the new ramp, and nearly 1,400 vehicles were estimated to turn left from westbound Bush River Road. About 850 vehicles and 600 vehicles were estimated to turn left and right from the off-ramp approach to the intersection. The initial intersection concept is shown in **Figure 3-38**.

The assessment indicated that, under existing traffic volumes, the intersection would be at capacity – assuring that the intersection would be assessed as being over capacity with estimated 2040 traffic volumes.



## Alternatives Traffic Analysis Technical Memo

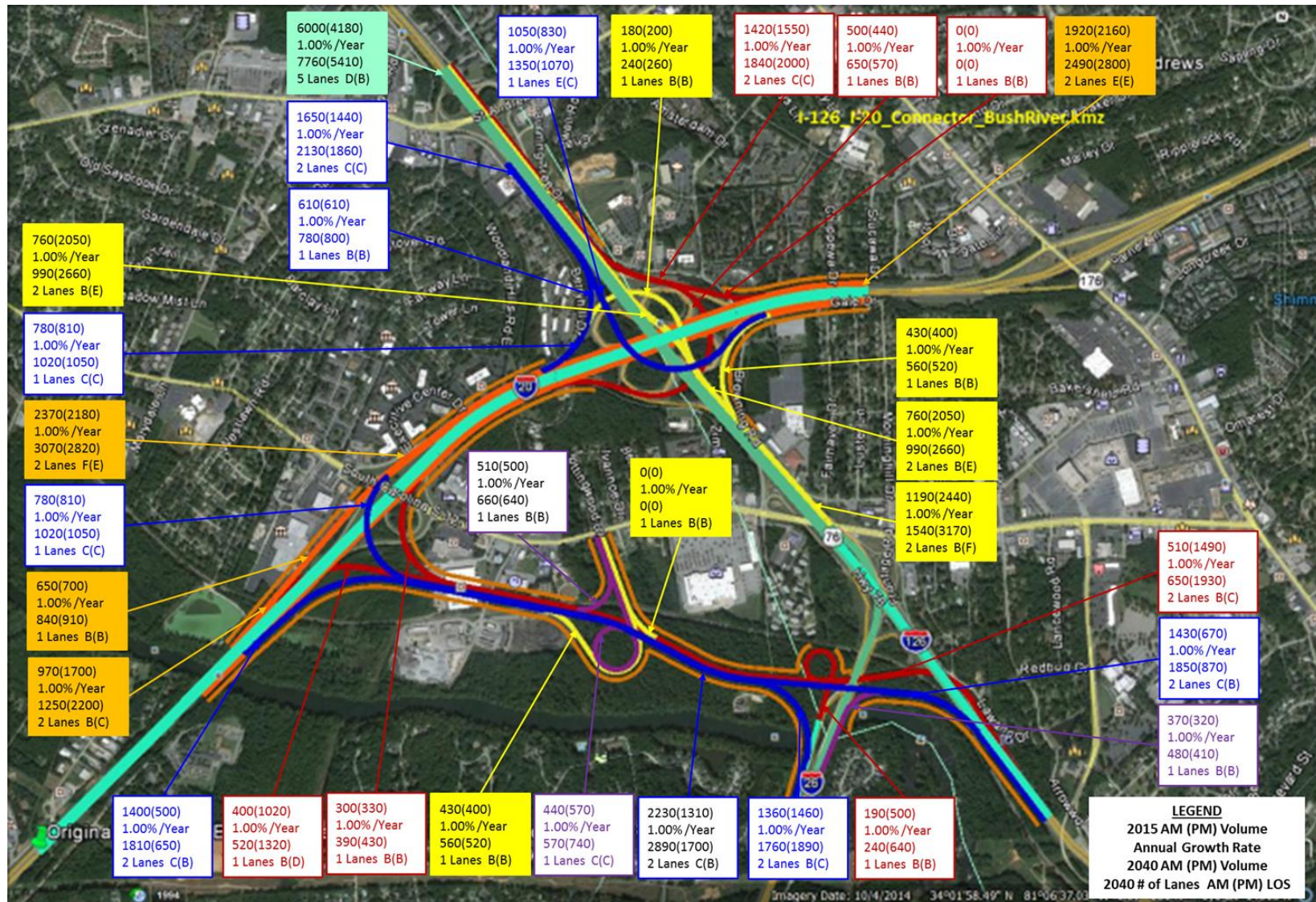


Figure 3-37 AO28 I-126/I-20 Connector, Bush River Connection - Capacity Assessment Results



## Alternatives Traffic Analysis Technical Memo

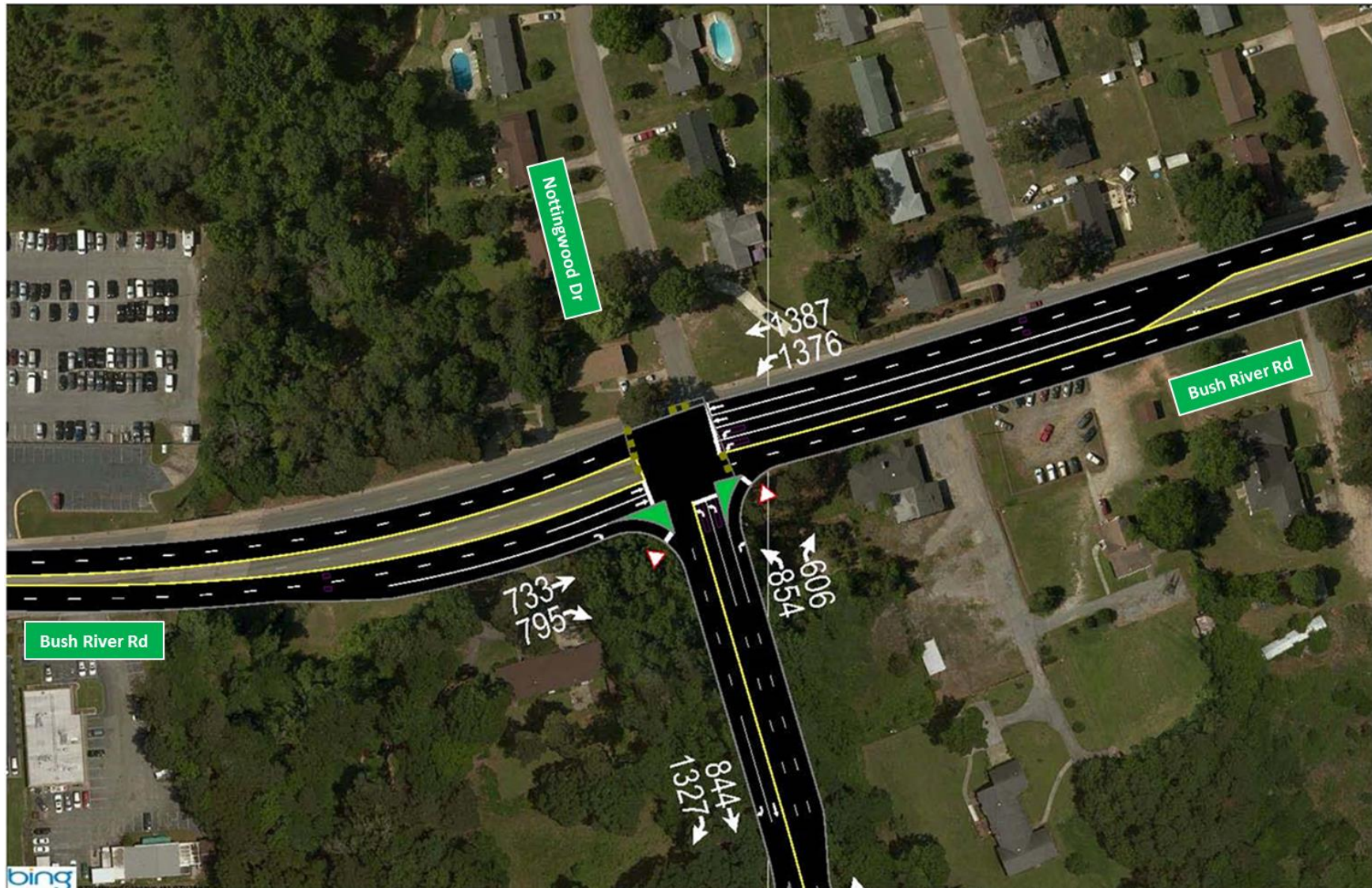


Figure 3-38 - AO28 - I-126/I-20 Connector - Bush River Road Ramp Intersection (Existing PM Volumes)

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The connector concept received additional modification and development by the roadway engineers after the initial capacity screening. The most significant modifications were reintroducing the eastbound off-ramp from I-20 to Bush River Road and adding a westbound on-ramp from Bush River Road to I-20 near the existing Exit 63. The westbound off-ramp from I-26 to Bush River Road was reinstated into the concept along its current alignment, and a new on-ramp from Bush River Road to eastbound I-26 was also introduced. These modifications were intended to address the over capacity conditions introduced at the ramp intersection opposite Nottingwood Drive.

With the redistribution of traffic resulting from these additional ramps, the three ramp intersections along Bush River Road (revised Exit 63, proposed connector, revised Exit 108) were assessed to operate under capacity with existing traffic volumes in the morning and afternoon peak hours. With estimated 2040 traffic volumes, the Exit 108 ramp intersection with Bush River Road was assessed as being at capacity during the morning peak hour and over capacity in the afternoon peak hour. The capacity of the other two ramp intersections was assessed to be under capacity in both peak hours. AO28 was evaluated further as part of representative alternative RA8.

### 3.3.6.3 AO29 – Southern Connector with I-26 Turbine Interchange

The proposed southern connector was an east-west connector consisting of a limited access facility connecting I-20 on the west to I-126 on the east, and incorporating a turbine interchange at I-26 on its alignment. The alignment of the connector runs generally along the existing electric power easement about 1,900 feet south of the Saluda River.

At the west end of the proposed connector, ramps are provided to and from both directions on I-20. Where the connector crosses I-26, a fully directional turbine interchange is proposed. At the east end of the connector, the eastbound connector ends at eastbound I-126, and the westbound connector begins at westbound I-126. The existing I-20/I-26 system interchange is removed from AO29. Exit 63 and Exit 108 would provide full directional access to I-20 and I-26 respectively. The initial AO 27 concept is shown in **Figure 3-39**.

A capacity screening could not be performed using the existing and estimated future volumes due to the difficulty in performing a sketch level origin-destination analysis to assign traffic to the new facilities and interchanges. The SCSWM assignments for this alternative were used to assess the potential utility of AO29. Information on the assessment using the SCSWM can be found in **Section 5.2**.

A visual review of the connector concept identifies obvious flaws. For example, traffic traveling from eastbound I-26 to eastbound I-20 currently use the existing I-20/I-26 system interchange at Exit 107/64. In AO29, this traffic would travel eastbound on I-26 past the location of the existing system interchange, travel through the proposed turbine interchange ramp to the westbound connector, travel through the ramp to eastbound I-20, travel again past the location of the existing system interchange before reaching the location where the existing ramp from eastbound I-26 merges with eastbound I-20. A similarly long, circuitous route is required to travel from westbound I-20 to westbound I-26.

## Alternatives Traffic Analysis Technical Memo

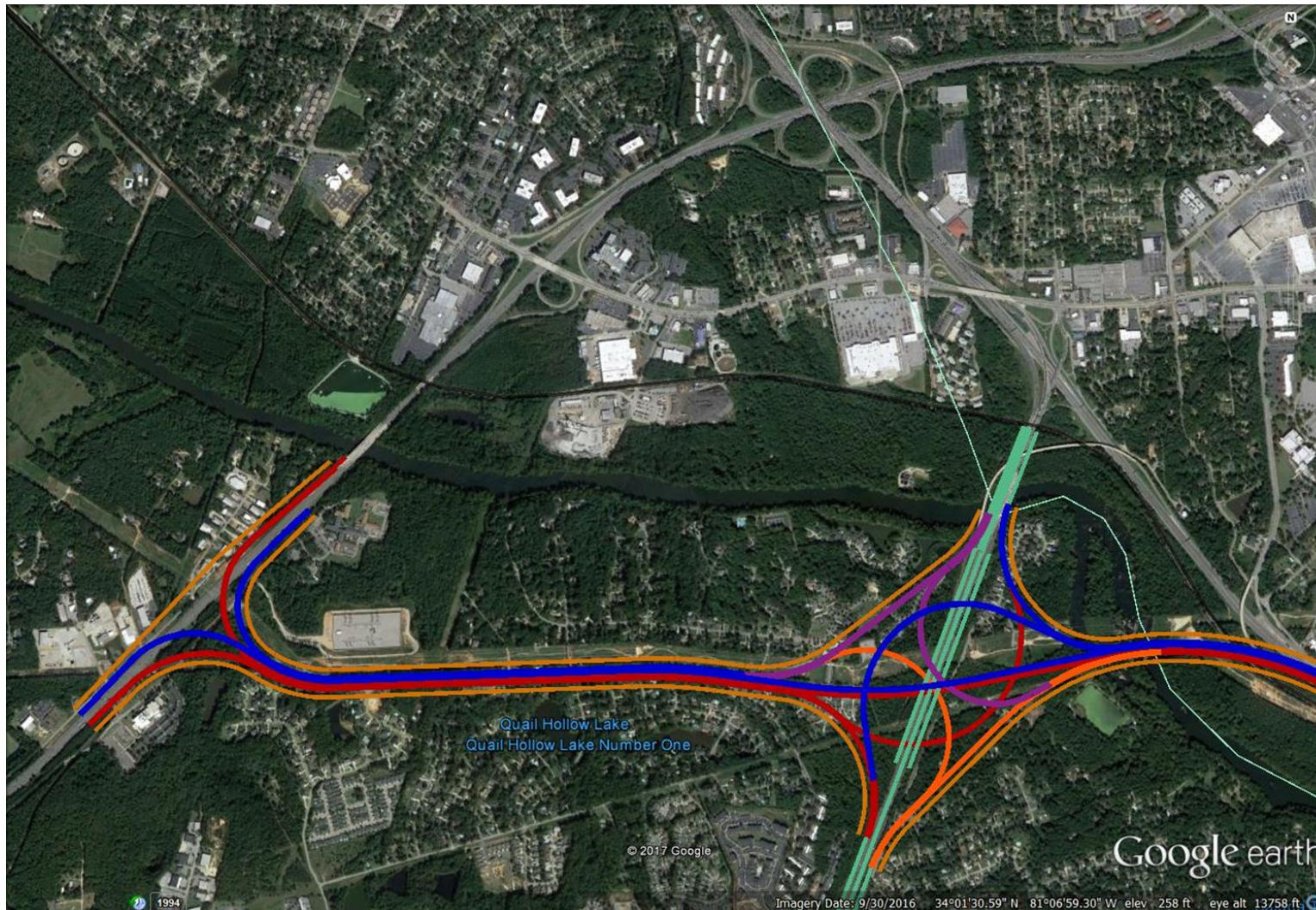


Figure 3-39 AO29 - Southern Connector with I-26 Turbine Interchange



## Alternatives Traffic Analysis Technical Memo

In both instances, drivers familiar with the area would likely avoid the circuitous and lengthy routing and exit at service interchanges to complete part of the trip. For example, traffic traveling from eastbound I-26 to eastbound I-20 may exit at either Exit 106 or Exit 108, travel east on the arterial roadways (St Andrews Road and Bush River Road respectively) to Broad River Road where I-20 eastbound would be accessed via Exit 65. This diversion of mainline traffic to surface streets to complete travel that would normally be completed entirely on the interstate system would lower travel on the interstate, but increase travel, perhaps significantly, on these arterials. It can be readily concluded that this could be contrary to the purpose and need of the project.

The connector concept received additional modification and development by the roadway engineers after the initial capacity screening. The most significant modification was the addition of ramps from westbound I-26 to the westbound connector, and from the eastbound connector to eastbound I-26. AO29 was evaluated further as part of representative alternative RA9.

### 3.3.7 AO30 – AO33 (EXIT 104)

The following are a list of the AO developed and screened for Exit 104.

- AO30 – Improvements to Existing Interchange (detailed Synchro model)
- AO31 – Diverging Diamond Interchange (Synchro Template)
- AO32 – Single Point Urban Interchange (Synchro Template)
- AO33 – Roundabout Interchange (SIDRA)

Note: The use of CAP-X was applicable for AO30, AO31, and AO32.

Existing traffic operations at Exit 104 are complicated by:

- The use of the interchange by traffic avoiding Exit 103 and Harbison Boulevard. This leads to higher left turn volumes on the westbound off-ramp traveling westbound on Piney Grove Road through the interchange to turn right onto Bower Parkway. Traffic frequently slows on westbound Piney Grove Road as traffic turning from both left turn lanes positions to enter the curb lane to turn right to Bower Parkway.

#### 3.3.7.1 Exit 104 AO30 – Improvements to Existing Interchange

AO30 consists of evaluating improvements to the existing diamond interchange at Exit 104. The proposed modifications would revise the approaches to the interchange from two to three entering through lanes in each direction on Piney Grove Road. Separate right turn lanes would be maintained in each direction to the interstate on-ramps. The eastbound ramp intersection was modified to provide dual westbound left turn lanes to the eastbound on-ramp extending back to the westbound ramp intersection to provide maximum turn lane storage. At the westbound ramp intersection, the existing configuration of the eastbound approach would remain unchanged: a single left turn lane and two through lanes. The off-ramp approaches would remain unchanged, with the eastbound off-ramp providing separate left and right turn lanes at Piney Grove Road. The westbound off-ramp would remain dual left turn lanes and a separate right turn lane at Piney Grove Road. The westbound on-ramp would remain unchanged from its existing configuration, which provides two lanes to accommodate the left turn and right turn movements entering the ramp before narrowing to a single lane to

## Alternatives Traffic Analysis Technical Memo

enter westbound I-26. The eastbound on-ramp, which is similarly configured today, would be modified to three initial lanes to accommodate the second left turn movement from westbound Piney Grove Road. These three lanes would narrow to a single lane entering eastbound I-26. The initial AO30 concept evaluated is shown in **Figure 3-40**.

Two intersections adjacent to the interchange influence interchange operation. As mentioned previously, the intersection of Bower Parkway/Jamil Road, located approximately 750 feet west of the eastbound ramp intersection, provides alternative access to the retail development located along Harbison Boulevard via Bower Parkway. The Fernandina Road intersection, located approximately 800 feet east of the westbound ramp intersection provides access to a discount club center. Both intersections connect the frontage road systems running parallel to each side of the interstate that, through various connections, provide alternative routes to I-126 between Exit 101 and Exit 108.

The capacity screening incorporated the use of a detailed Synchro model for the interchange area. . The capacity assessment with estimated 2040 volumes indicated the modifications to the existing interchange proposed as part of AO30 would result in under capacity ramp intersections and Piney Grove Road arterial sections. AO30 was selected to be incorporated into representative alternatives RA1, RA5, and RA7.

It should be noted, however, that observations of the simulations indicated that congestion at the adjacent Piney Grove Road intersections with Bower Parkway/Jamil Road and Fernandina Road, which are assessed to be over and at capacity respectively, would create congestion that would affect the interchange area. The Bower Parkway/Jamil Road intersection especially impacts all westbound movements and movements feeding into the westbound movements, such as the westbound off-ramp left turn movement. Queuing resulting from this over capacity intersection, extend back through the interchange area and the Fernandina Road intersection.

### 3.3.7.2 Exit 104 AO31 – Diverging Diamond Interchange

The proposed DDI maintained two through lanes and a separate right turn lane in each direction entering the Piney Grove Road interchange area. Three lanes are provided between the crossovers, one lane for left turn movements onto the on-ramps and two through lanes in the eastbound direction, and one left turn lane, a shared left turn-through lane and one through lane in the westbound direction. The westbound off-ramp included dual left turn and dual right turn lanes, while the eastbound off-ramp provided separate left and right turn lanes. The eastbound on-ramp had three lane to accept traffic from the two westbound left turn movements and the eastbound right turn movement. The westbound on-ramp had separate lanes accepting traffic from the eastbound left turn and westbound right turn movement. Both on-ramps merged into a single lane entering I-26. The initial AO31 concept evaluated is shown in **Figure 3-41**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The DDI template file was not modified to include the adjacent intersections at Bower Parkway/Jamil Road or Fernandina Road. The screening indicated the AO31 intersections would be under capacity under existing and estimated 2040 traffic volumes. Observations of simulations indicated queuing of westbound off-ramp left turn traffic was likely to



## Alternatives Traffic Analysis Technical Memo

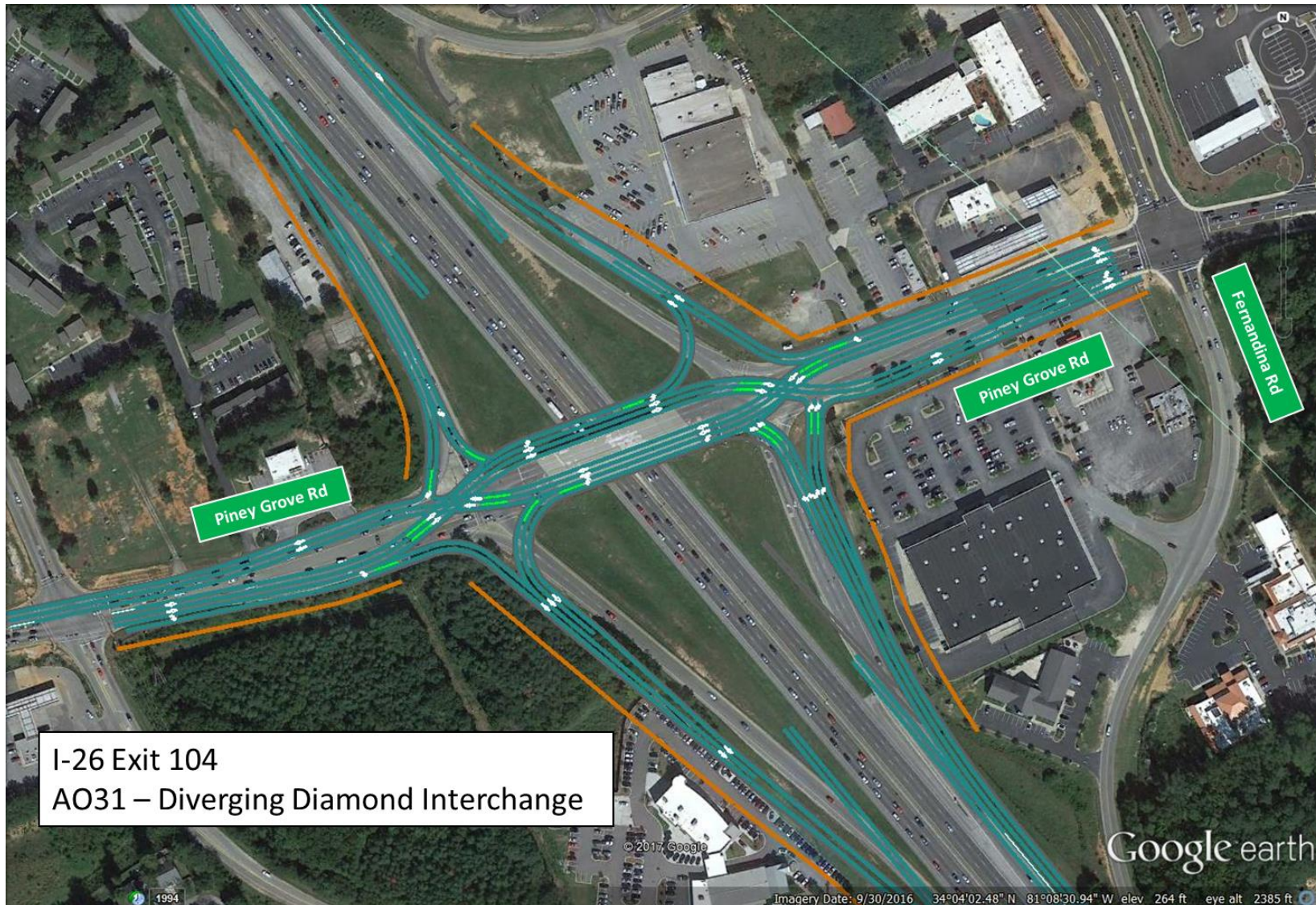


**Figure 3-40 - AO30: Exit 104 Improvements to Existing Interchange**

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**Figure 3-41 - AO31: Exit 104 Diverging Diamond Interchange**

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occur in the afternoon peak hour with estimated 2040 volumes. AO31 was selected to be incorporated into representative alternatives RA2, RA6, and RA8.

### 3.3.7.3 Exit 104 AO32 – Single Point Urban Interchange

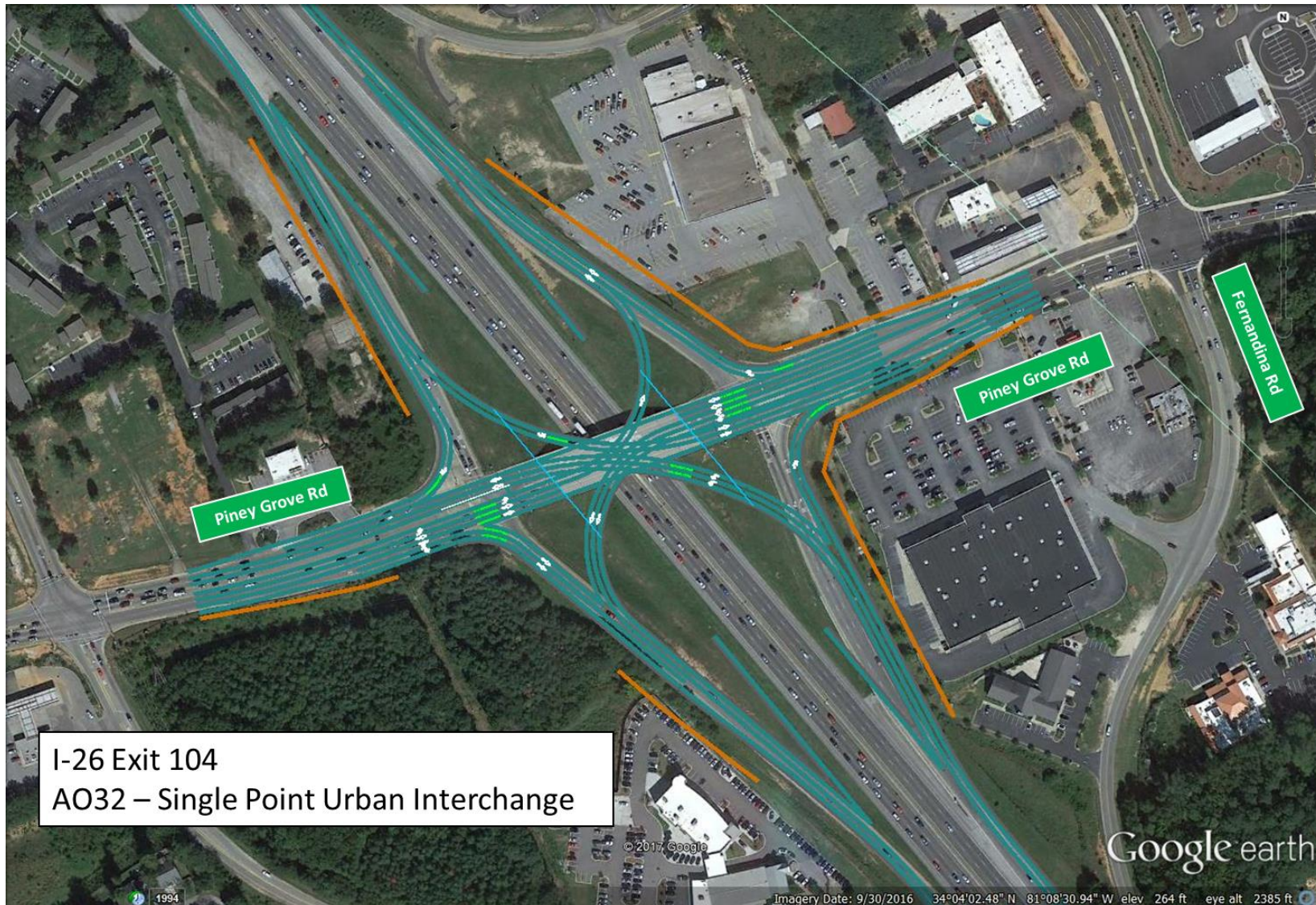
The proposed SPUI has two through lanes entering and exiting the interchange area from each direction on Piney Grove Road. In the eastbound direction, the two entering lanes widen to a four lanes, which include two through lanes, a shared through-right turn lane, and a separate right turn lane. Two right turn lanes enter the eastbound on-ramp, and the eastbound approach continues to the signal with three lanes: a separate left turn lane for traffic entering the westbound on-ramp and two through lanes, which continue to exit the interchange area. In the westbound direction, two entering lanes widen to five lanes, which includes four through lanes and a separate right turn lane that enters the westbound on-ramp. The four through lanes continue to the west, becoming two left turn lanes to the eastbound on-ramp and two through lanes at the signal. The two through lanes continue west and exit the interchange area. The eastbound off-ramp has separate left and right turn lanes, while the westbound off-ramp has dual left turn lanes and a separate right turn lane. The eastbound on-ramp merges the two lanes from the eastbound right turn movements entering the ramp and the two westbound left turn movements entering the ramp. These lanes eventually merge into a single lane on-ramp that enters eastbound I-26. The westbound on-ramp consists of a single lane from the westbound right turn movement and a single lane from the eastbound left turn movement entering the ramp. Both lane merge into a single lane that enters westbound I-26. The initial AO32 concept evaluated is shown in **Figure 3-42**.

The capacity screening incorporated the use of the Synchro Template file for a SPUI. The SPUI template file was modified to adjust for the proposed number of lanes in the AO32 SPUI concept, but was not modified to include the adjacent intersections at Bower Parkway/Jamil Road or Fernandina Road. The influence of these adjacent intersections is not incorporated in the capacity screening. The screening indicated the AO32 SPUI intersection would be under capacity under existing and estimated 2040 traffic volumes. Observations of simulations indicated no significant queuing occurring with estimated 2040 volumes. AO32 was selected to be incorporated into representative alternatives RA3, RA4, RA9.

### 3.3.7.4 Exit 104 AO33 – Roundabout Interchange

The proposed roundabout interchange incorporated two-lane roundabouts in place of traffic signals at the ramp intersections with Piney Grove Road. Two lanes in each direction were maintained on Piney Grove Road through the interchange area. The eastbound Piney Grove Road approach to the roundabout at the eastbound ramp intersection would provide two lanes entering the roundabout. The westbound Piney Grove Road approach to the roundabout at the westbound ramp intersection would provide two lanes entering the roundabout and a right turn roundabout bypass lane. The eastbound off-ramp approach to the roundabouts would provide two lanes, while the westbound off-ramp approach would provide two lanes to the roundabout and a right turn roundabout bypass lane. The eastbound on-ramp approach departing from the roundabout would provide one lane, while the westbound on-ramp approach would provide two lanes – one lane exiting the roundabout and the westbound right turn roundabout bypass lane – which would merge into a single lane prior to entering westbound I-26. The initial AO33 concept evaluated is shown in **Figure 3-43**.

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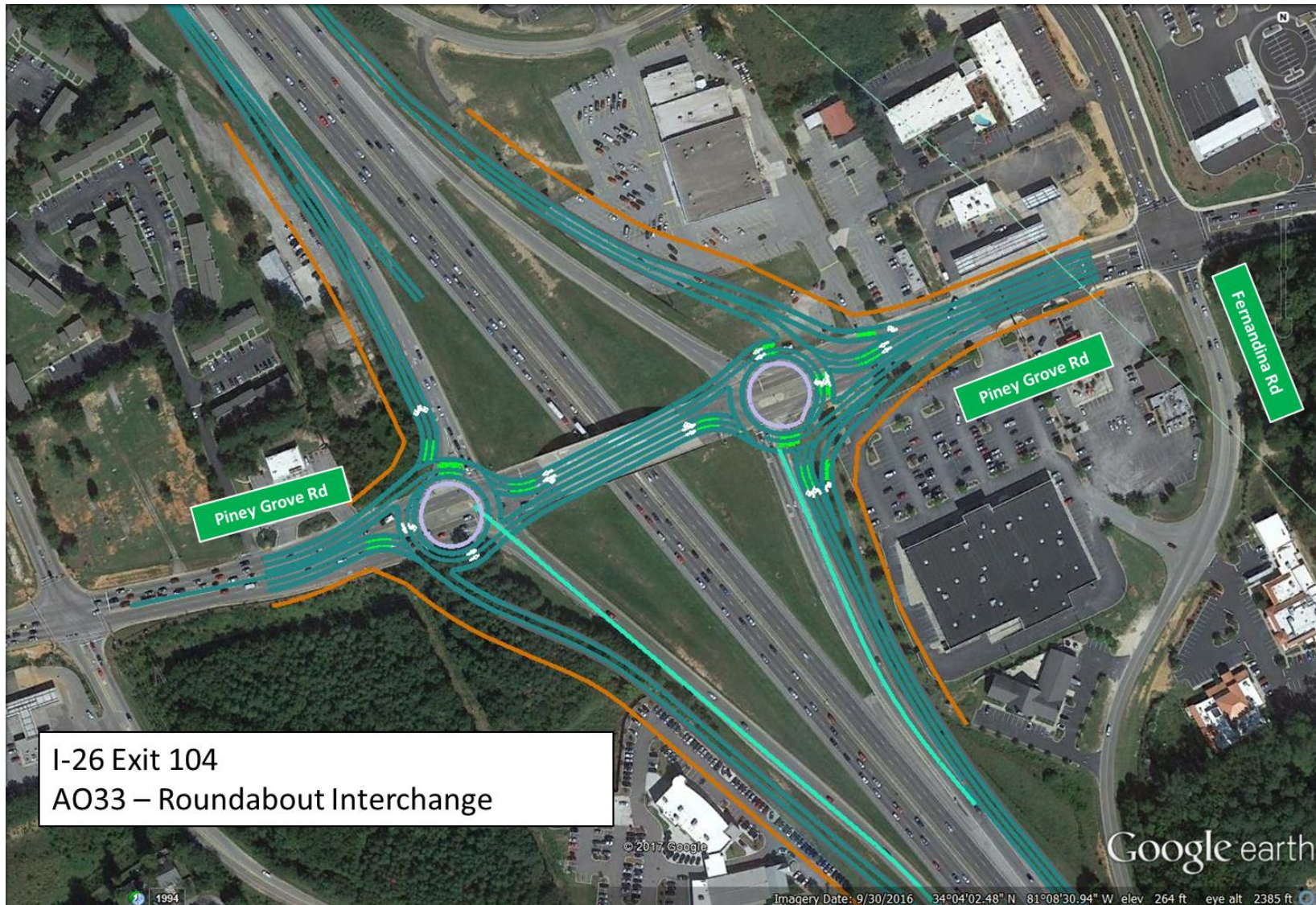


**Figure 3-42 - AO32: Exit 104 Single Point Urban Interchange**

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**Figure 3-43 - AO33: Exit 104 Roundabout Interchange**

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The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The analysis indicated the two-lane roundabouts at AO33, would be over capacity under existing and 2040 traffic volumes at the eastbound ramp intersection. Incorporating additional lanes in the roundabouts would not be feasible. AO33 was not selected to be incorporated into the representative alternatives.

### 3.3.7.5 Exit 104 CAP-X Review

The Exit 104 traffic volumes and interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a DDI interchange, followed by the Displaced Left Turn (DLT), and the ParClo interchanges. The Traditional Diamond interchange was ranked ahead of the SPUI, which ranked last.

#### Displaced Left Turn Interchange

The DLT interchange was the second highest rated option in the CAP-X assessment. A DLT at Exit 104 would locate the left turn crossovers upstream at the next adjacent intersections (Bower Parkway/Jamil Road to the west and Fernandina Road to the east). The DLT crossover at Bower Parkway appears to be feasible, but constructing the crossover at Fernandina Road would be complicated by the business located between it and the westbound off-ramp intersection.

### 3.3.8 AO34 (EXIT 103-104)

AO 34 was specifically developed to access the operation of a split diamond interchange between Exit 103 and 104. The split diamond interchange would have the westbound off-ramp and eastbound on-ramp at Exit 104, and the eastbound off-ramp and westbound on-ramp at Exit 103. The interchanges would be connected by frontage roads that would allow traffic to travel between the interchanges without re-entering the interstate.

- AO34 – Split Diamond between Exits 103 and 104 (detailed Synchro model)

#### 3.3.8.1 Exit 103-104 AO34 – Split Diamond Interchange

The proposed split diamond interchange would connect Exit 103 and Exit 104 with two-way connector roads on each side of the interstate. The eastbound split diamond connector road would begin opposite the eastbound off-ramp to Exit 103, replace the existing on-ramp with a two way, four lane road that would be realigned to intersect existing Saturn Parkway. The connector road would run parallel to eastbound I-26 along Saturn Parkway, and then would be extended to continue along and extend past existing Giles Parkway, where it would intersect the existing eastbound off-ramp to Exit 104 at Piney Grove Road. The eastbound on-ramp at Exit 104 would remain at its existing location. In addition to handling ramp traffic at the two interchanges, intersections would be provided with Saturn Parkway at two locations.

The westbound split diamond connector road would begin opposite the westbound off-ramp to Exit 104, replace the existing westbound on-ramp with a two-way, four lane road that would intersect existing Fernandina Road where that road turns to run parallel to westbound I-26. The connector road would run along the existing alignment of Fernandina Road to its intersection with Fernandina Court. The connector would follow



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Fernandina Court, and would be extended to intersect Woodcross Drive. The connector would then follow the existing alignment of Woodcross Drive to its intersection at Harbison Boulevard opposite the existing westbound on-ramp. In addition to its intersections with Fernandina Road and Woodcross Drive, the connector would also have an intersection to maintain access to the restaurants and Home Depot store in the southeast quadrant of Exit 103.

The configuration of Exit 104 would largely remain the same as existing conditions along Piney Grove Road and the eastbound on-ramp and westbound off-ramp. The east connector road (parallel to westbound I-26) would have two lanes exiting the Piney Grove Road intersection with the westbound off-ramp, and was assumed to provide a separate left turn lane and separate right turn lane from the southbound approach of the proposed connector road. The west connector road (parallel to eastbound I-26) would similarly have two lanes existing the Piney Grove Road intersection with the eastbound on-ramp, and was assumed to provide a shared left turn-through lane and separate right turn lane on the southbound approach of the proposed connector road.

The configuration of Exit 103 would be modified by the elimination of the westbound loop off-ramp. Two lanes would be provided in each direction on Harbison Boulevard across the overpass, with left turn lanes provided at each intersection and a right turn lane provided to the east connector road. Two lanes would exit the eastbound off-ramp intersection on the Connector Road toward Exit 104, and the northbound approach intersecting opposite the eastbound ramp was initially considered to provide separate left and right turn lanes. The northbound approach of the connector road opposite the westbound on-ramp would have two lanes exiting the intersection to the south and was initially considered to provide a shared left turn-through lane and separate right turn lane on the northbound approach of the connector road.

A capacity screening for the split diamond concept of AO34 was prepared using detailed Synchro models for Exit 103 and 104 and assuming the connector roadways were one-way only. This assumption was due to the difficulty of estimating how two way traffic would travel between the two two-way roadways connecting the interchanges. For example, existing traffic turning right from the westbound loop-off ramp at Exit 103 to westbound Harbison Boulevard would have two options to complete this move in the split diamond concept: in both cases, they would exit on the westbound off-ramp at Exit 104 and either continue through on the east connector road to turn left onto westbound Harbison Boulevard, or turn left onto westbound Piney Grove Road, turn right onto the west connector, and then turn left onto westbound Harbison Boulevard opposite the eastbound off-ramp (these options ignore using Bower Parkway to access Harbison Boulevard from Piney Grove Road). Similar multiple pathways are available for traffic movements between the on and off-ramps at Exit 103 and 104.

Simulations of the existing and 2040 traffic on the original concept quickly indicated that modifications made to the existing configuration of Exit 104 in AO30 were necessary at Exit 104 in AO34 (including providing three westbound lanes on Piney Grove Road entering the interchange area and dual left turn lanes on westbound Piney Grove Road to the eastbound on-ramp). In addition, the relocation of the westbound loop off-ramp traffic (almost 500 vehicles per hour in the morning peak hour and about 800 vehicles per hour in the afternoon peak hour) from Exit 103 to Exit 104 required the addition of two through lanes on the westbound off-ramp at Exit

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104. Similarly, the eastbound on-ramp traffic that would be relocated from Exit 103 to Exit 104 (almost 600 vehicles per hour in the morning peak hour and about 850 vehicles per hour in the afternoon peak hour) required two southbound lane on the connector to allow traffic to enter the eastbound on-ramp at Exit 104.

To accommodate existing volumes, observations in the simulations of Exit 103 indicated that additional lanes were needed to accommodate the eastbound off-ramp movements relocated from Exit 104 to the eastbound off-ramp through movement at Exit 103, as well as the northbound left turn movement from the east connector to westbound Harbison Boulevard (about 450 vehicles per hour in the morning peak hour and approaching 900 vehicles per hour in the afternoon peak hour). The concept was revised to provide a separate through lane on the eastbound off-ramp approach to Exit 103, dual left turn lanes to facilitate turns from eastbound Harbison Boulevard onto the westbound on-ramp, dual left turn lanes on the northbound approach of the east connector road to facilitate left turns onto westbound Harbison Boulevard, and providing three westbound through lanes on Harbison Boulevard through the eastbound ramp intersection.

With the additional improvements, observations of the simulations with 2040 traffic volumes indicated that Exit 104 would perform well in both peak hours. At Exit 103, the interchange was observed as performing well during the morning peak hour, but the eastbound approach of Harbison Boulevard at the eastbound ramp intersection was noted observed as being overly congested during the afternoon peak hour. The initial AO34 concept evaluated is shown in **Figure 3-44**. AO34 was not selected to be incorporated into the representative alternatives since the additional improvements necessary to achieve observably acceptable operations in the simulations with 2040 traffic volume were likely to be infeasible, and the concept without modification would be assessed as over capacity.

### 3.3.9 AO35 – AO39 (EXIT 103)

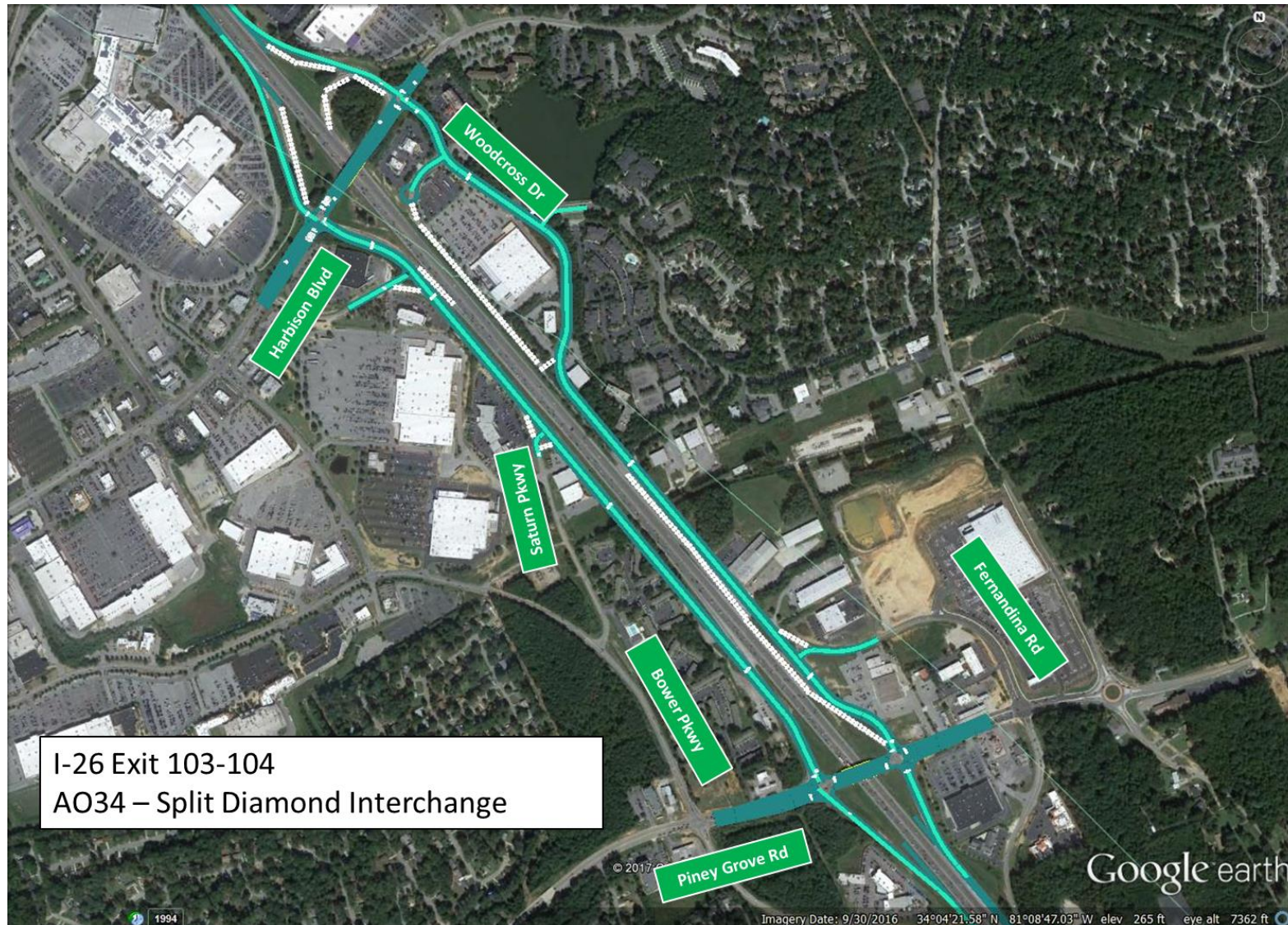
The following are a list of the AO developed and screened for Exit 103.

- AO35 – Tight Urban Diamond Interchange (detailed Synchro model)
- AO36 – Diverging Diamond Interchange (Synchro Template)
- AO37 – Single Point Urban Interchange (Synchro Template)
- AO38 – Roundabout Interchange (SIDRA)
- AO39 – Offset Single Point Urban Interchange (detailed Synchro model)
- AO49 – Do Nothing

Note: The use of CAP-X was applicable for AO35, AO36, and AO37.



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**Figure 3-44 - AO34: Exits 103 and 104 Split Diamond Interchange**  
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Existing traffic operations at Exit 103 are complicated by:

- A Partial Cloverleaf interchange design that incorporates a westbound loop off-ramp. The westbound ramp intersection is aligned opposite Woodcross Drive, which connects to the Fernandina Road frontage road system running generally parallel to westbound I-26 between Harbison Boulevard at Exit 103 and Piney Grove Road at Exit 104. Woodcross Drive also provides access to single family and multifamily residential developments that are part of the Harbison planned community.
- High volume of traffic attracted to the Columbiana Mall and the large amount of adjacent retail development. The existing high volume right turn movement from the westbound loop off-ramp (about 350 vehicles per hour during the morning peak hour and about 700 vehicles per hour during the afternoon peak hour) is oriented towards the west and the retail centers on the west side of the interstate. These volumes are higher on weekends when more shoppers patronize the retail developments.
- Even with a free flow movement provided to the right turn traffic on the westbound loop off-ramp, during periods with high off-ramp traffic, queues regularly back up onto the mainline lanes of westbound I-26. This blocks the right most lane on westbound I-26 and can also result in instances where drivers in the center lane temporarily block traffic in an effort to jump into gaps into the queued exit ramp traffic, affecting operations and safety.

### 3.3.9.1 Exit 103 AO35 – Tight Urban Diamond Interchange

AO35 consists of evaluating a proposed tight urban diamond interchange (TUDI) to replace the existing partial cloverleaf interchange at Exit 103. The proposed TUDI would maintain the configuration of the eastbound ramp intersection but shift it closer to the overpass. The westbound loop off-ramp would be replaced with a westbound off-ramp aligned opposite the westbound on-ramp. The westbound ramp intersection would also be shifted closer to the overpass. The separation between the ramp intersections would decrease from approximately 950 feet to about 500 feet. The Woodcross Drive approach to Harbison Boulevard would remain in place, but would function as a T-intersection with the relocation of the westbound on-ramp. The relocated westbound ramp intersection would be located approximately 225 feet west of the Woodcross Drive T-intersection. The eastbound ramp, westbound ramp, and Woodcross Drive intersections are expected to operate under traffic signal control.

At the eastbound ramp intersection, separate left and right turn lanes would be maintained on the off-ramp approach. The westbound approach to the intersection would include a left turn lane for traffic turning onto the eastbound on-ramp, along with three through lanes. In the original AO35 concept, the three westbound through lanes would merge into two through lanes prior to their intersection with the next adjacent signal at Saturn Parkway. The eastbound approach to the intersection would consist of two through lanes and a separate right turn lane to the eastbound on-ramp. The eastbound on-ramp would leave the intersection with two lanes, which would merge into a single lane prior to entering eastbound I-26.

The westbound off-ramp would consist of a single lane diverging from westbound I-26, which widens to provide dual left turn lanes and a separate right turn lane the ramp's intersection with Harbison Boulevard. The eastbound approach to the intersection would consist of a separate left turn lane for traffic turning onto the westbound on-ramp, and two through lanes. The westbound approach would consist of two through lanes and



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a separate right turn lane which would drop and direct traffic on the westbound on-ramp. The westbound on-ramp would depart from the intersection with two lanes that would merge into one lane prior to entering westbound I-26.

Woodcross Drive would continue to intersect Harbison Boulevard at its existing location. In the initial AO35 concept, Woodcross Drive was assumed to provide a separate left turn and separate right turn lane. Eastbound Harbison Boulevard provides a separate through lane and a shared through-right turn lane. Westbound Harbison Boulevard provides a separate left turn lane for traffic turning onto Woodcross Drive, and three through lanes. The rightmost through lane function as a direct lane taking traffic to the right turn lane drop at the westbound ramp intersection. The initial AO35 concept evaluated is shown in **Figure 3-45**.

The capacity screening incorporated the use of a detailed Synchro model developed for the assessment of the interchange ramps at Exit 104. The operation of the adjacent Woodcross Drive and Saturn Parkway intersections were not included in the screening. The capacity assessment with estimated 2040 volumes indicated the proposed AO35 concept would result in under capacity ramp intersections. AO35 was selected to be incorporated into the representative alternatives RA1, RA4, and RA8.

It should be noted, however, that the reduction in spacing between the ramp intersection signals, along with the close spacing between those signals and the next adjacent intersections with Woodcross Drive (approximately 225 feet east of the westbound ramp intersection) and with Saturn Parkway (approximately 715 feet from the eastbound ramp intersection, an increase of about 160 feet from the 550 feet spacing between the existing intersections) may complicate the operation of the four signals located at or adjacent to the AO35 interchange. Coordination between these intersections will be essential to the successful operation of the concept. Additionally, it may be necessary to provide for a second left turn lane from Woodcross Drive onto westbound Harbison Boulevard to reduce the amount of signal cycle time needed to serve the side street traffic demand so the more time can be allocated to through traffic movements on Harbison Boulevard.

Additionally, downstream traffic operations on Harbison Boulevard at the many closely spaced congested signalized intersections may adversely affect the interchange operation with queue spillbacks metering the amount of traffic that can exit the interstate ramps. One recommendation to resolve a downstream chokepoint is to extend, rather than merge, the third westbound through lane at Saturn Parkway. Carrying a third through lane through the Saturn Parkway intersection and dropping it as a right turn lane to the mall entrance at Columbiana Circle would be preferable than merging it prior to the Saturn Parkway intersection.

### 3.3.9.2 Exit 103 AO36 – Diverging Diamond Interchange

The proposed DDI maintained two through lanes and a separate right turn lane in each direction entering the Harbison Boulevard interchange area. Three lanes are provided in each direction between the crossovers, with one lane for left turn movements onto the on-ramps and two through lanes through the overpass area. The westbound off-ramp included dual left turn lanes and a single right turn lane, while the eastbound off-ramp provided separate left and right turn lanes. The eastbound and westbound on-ramps have two lanes to accept traffic from the westbound left turn and the eastbound right turn movements. Both on-ramps initially begin

## Alternatives Traffic Analysis Technical Memo

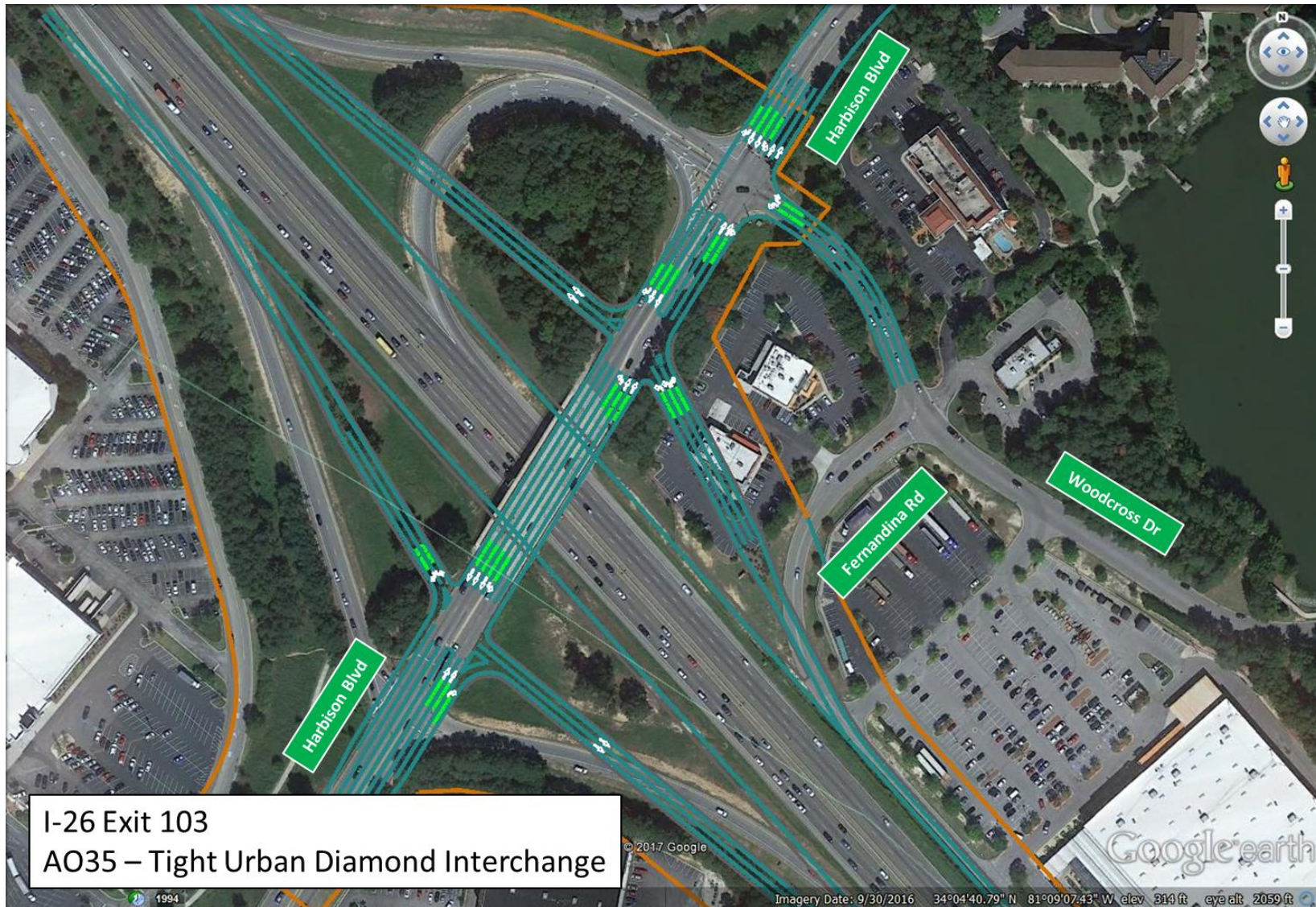


Figure 3-45 - AO35: Exit 103 Tight Urban Diamond Interchange

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with two lanes, and merge into a single lane prior to entering I-26. The initial AO36 concept evaluated is shown in **Figure 3-46**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The DDI template file was not modified to include the adjacent intersections at Woodcross Drive or Saturn Parkway. The screening indicated the AO36 intersections would be under capacity during both peak hours under existing traffic and under estimated 2040 traffic volumes in the morning peak hour. Observations of simulations during the afternoon peak hour indicated queuing of westbound off-ramp left turn traffic was likely to occur with estimated 2040 volumes. AO36 was not selected to be incorporated into the representative alternatives.

### 3.3.9.3 Exit 103 AO37 – Single Point Urban Interchange

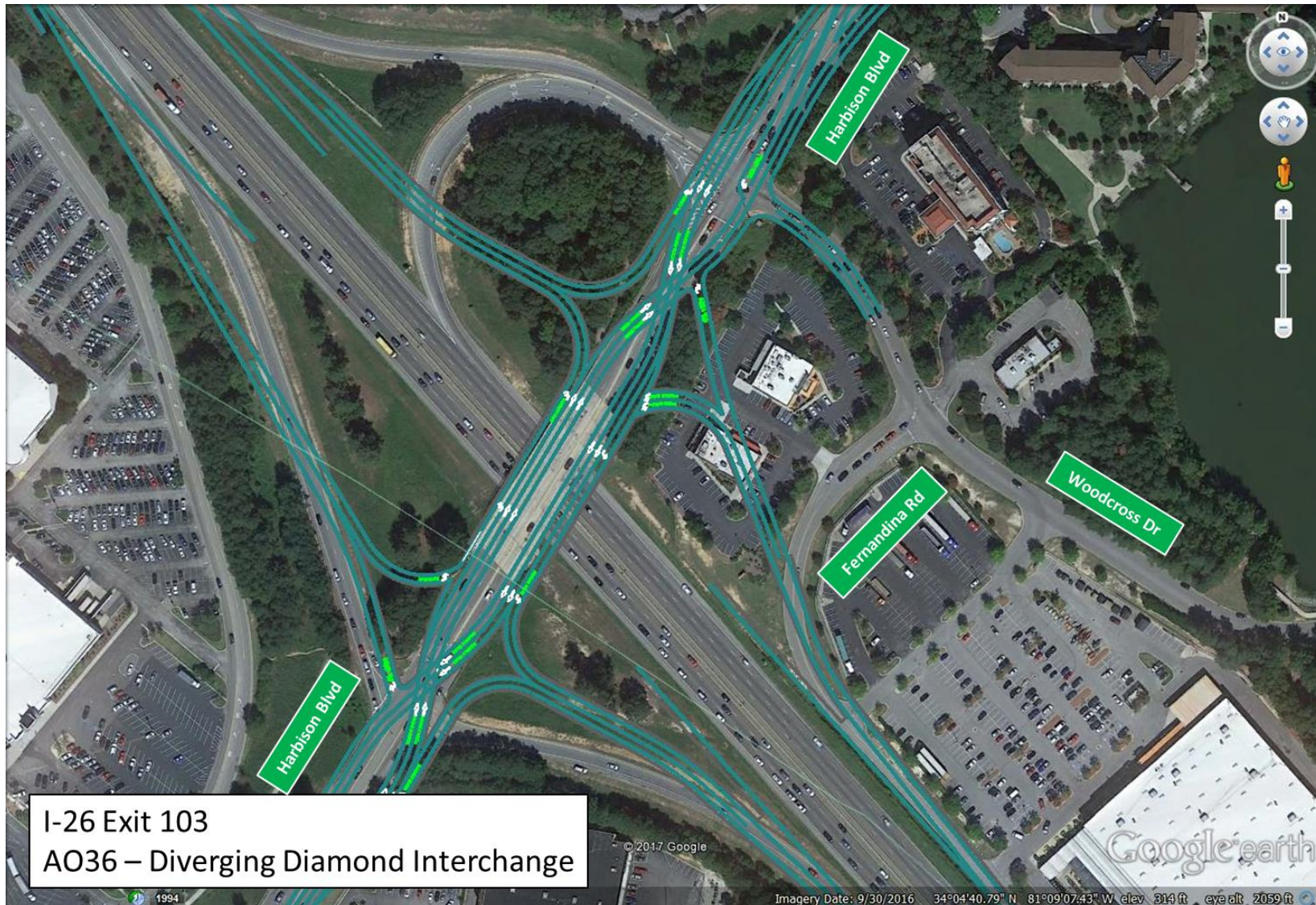
The proposed SPUI has two through lanes entering and exiting the interchange area from each direction on Harbison Boulevard. In the eastbound direction, the two entering lanes widen to four lanes, which include a long left turn lane leading to the SPUI signal, two through lanes, a separate right turn lane that enters the eastbound on-ramp. The eastbound approach continues to the signal with three lanes: a separate left turn lane for traffic entering the westbound on-ramp and two through lanes, which continue to exit the interchange area. In the westbound direction, three entering lanes consist of a long left turn lane leading to the SPUI signal, a separate through lane, and a shared through-right turn lane, from where the right turn traffic enters the westbound on-ramp. The three lanes continue to the west, becoming a separate left turn lane to the eastbound on-ramp and two through lanes at the signal. The two through lanes continue west and exit the interchange area. The eastbound off-ramp has separate left and right turn lanes, while the westbound off-ramp has dual left turn lanes and a separate right turn lane. The eastbound and westbound on-ramps merge the two lanes from the right turn movements entering the ramps and the left turn movements entering the ramps. These lanes eventually merge into a single lane on-ramp that enters eastbound and westbound I-26. The initial AO37 concept evaluated is shown in **Figure 3-47**.

The capacity screening incorporated the use of the Synchro Template file for a SPUI. The SPUI template file was modified to adjust for the proposed number of lanes in the AO37 SPUI concept, but was not modified to include the adjacent intersections at Woodcross Drive and Saturn Parkway. The influence of these adjacent intersections is not incorporated in the capacity screening. The screening indicated the AO37 SPUI intersection would be under capacity under existing and estimated 2040 traffic volumes. Observations of simulations indicated no significant queuing occurring with estimated 2040 volumes. AO37 was selected to be incorporated into the representative alternatives RA2 and RA6.

### 3.3.9.4 Exit 103 AO38 – Roundabout Interchange

The proposed roundabout interchange incorporated a revision of the existing partial cloverleaf interchange to a diamond interchange with two-lane roundabouts in place of traffic signals at the ramp intersections with Harbison Boulevard. At the eastbound ramp roundabout intersection, the eastbound Harbison Boulevard approach to the roundabout at the eastbound ramp intersection would provide two lanes entering the roundabout and a right turn bypass lane that takes traffic directly to the eastbound on-ramp. The westbound approach and the eastbound off-ramp approach would provide two lanes entering the roundabout. The

## Alternatives Traffic Analysis Technical Memo

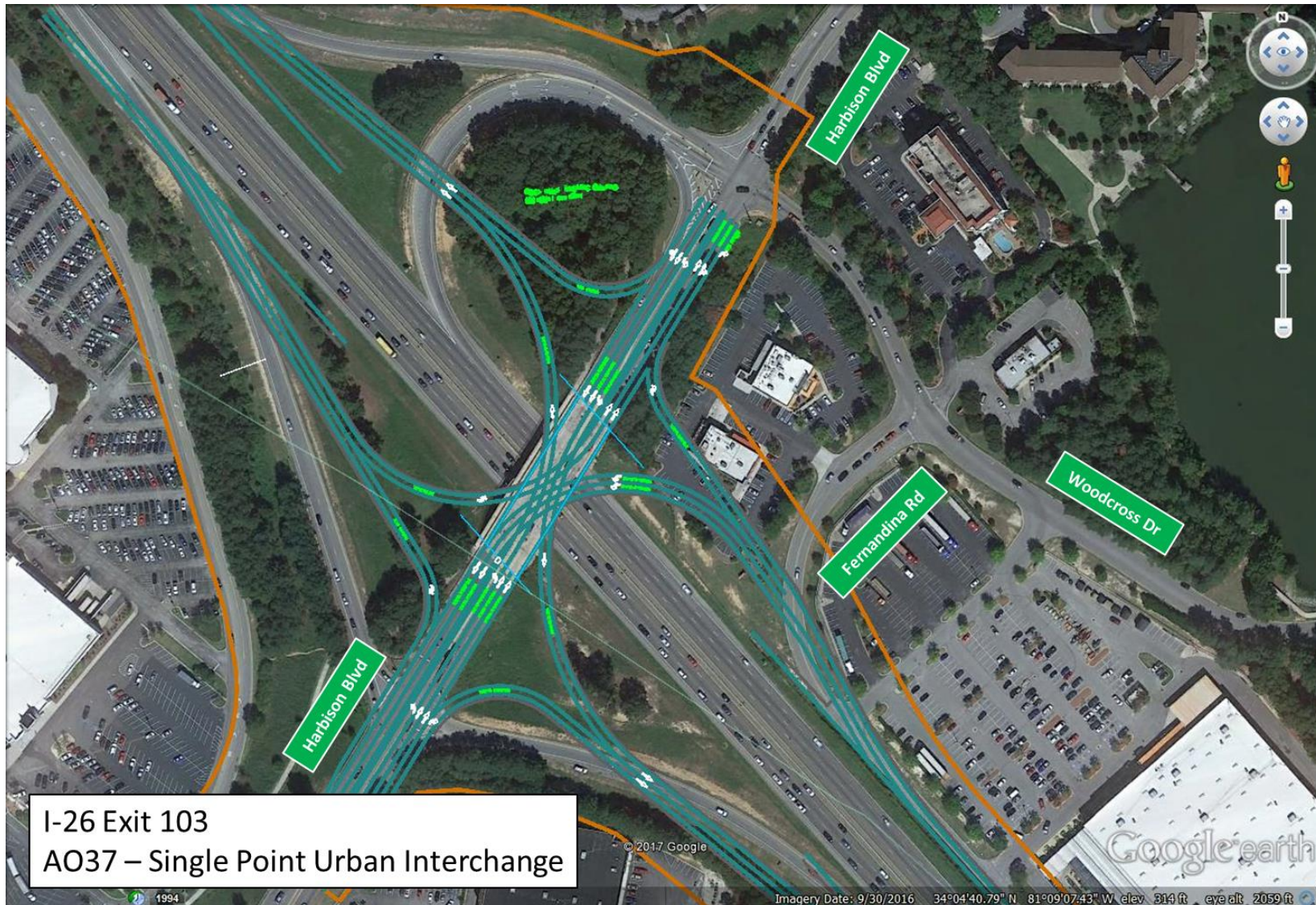


**Figure 3-46 - AO36: Exit 103 Diverging Diamond Interchange**

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**Figure 3-47 - AO37: Exit 103 Single Point Interchange**

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eastbound on-ramp approach departing from the roundabout would provide two lanes: one from the eastbound roundabout bypass lane and one coming from the roundabout to permit westbound traffic to enter the on-ramp. These two lanes would merge into a single lane prior to entering eastbound I-26.

Two lanes in each direction were maintained on Harbison Boulevard through the interchange area. At the westbound ramp roundabout intersection, the westbound and eastbound Harbison Boulevard approaches to the roundabout would provide two lanes entering the roundabout. Woodcross Drive would also enter this roundabout with two lanes and a right turn roundabout bypass lane. A single lane would exit the roundabout to Woodcross Drive. The westbound on-ramp approach would provide one lane exiting the roundabout. The initial AO38 concept evaluated is shown in **Figure 3-48**.

The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The analysis indicated individual approaches the two-lane roundabouts in AO38 would be over capacity under existing and 2040 traffic volumes. Under existing traffic, the eastbound off-ramp approach to the eastbound ramp roundabout intersection was assessed as being at capacity, while the westbound off-ramp approach to the westbound ramp roundabout was assessed as over capacity during the afternoon peak hour. Under 2040 estimated volumes at the westbound ramp roundabout intersection, the westbound Harbison Boulevard approach and the westbound off-ramp approach were assessed to be over capacity during the morning and afternoon peak hours, while the Woodcross Drive approach was assessed to be at capacity during the afternoon peak hour. At the eastbound ramp roundabout intersection, the eastbound off-ramp approach and the eastbound Harbison Boulevard approach were assessed as over capacity during the afternoon peak hour. Since incorporating additional lanes in the roundabouts would not be feasible, AO38 was not selected to be incorporated into the representative alternatives.

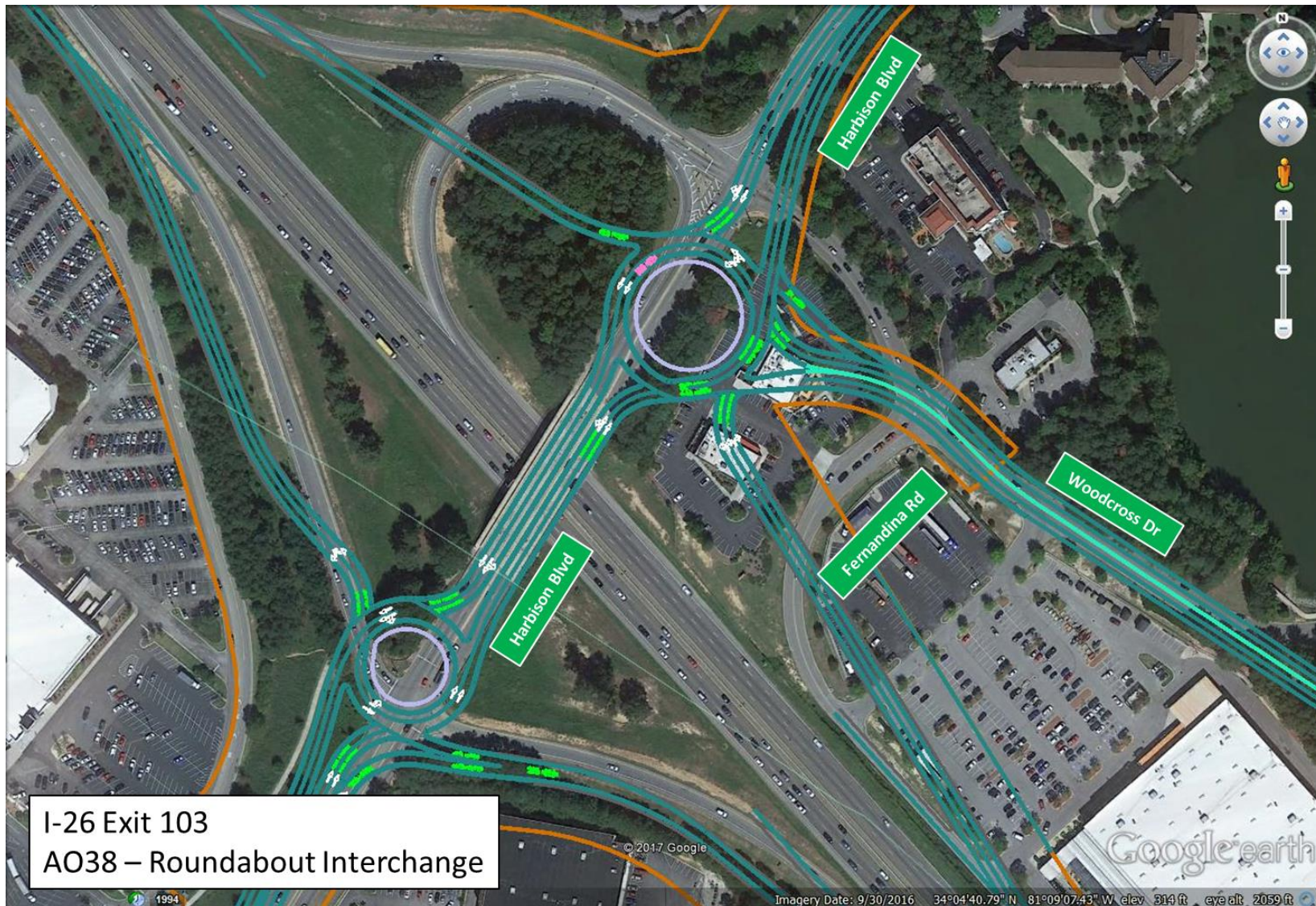
### 3.3.9.5 Exit 103 AO39 – Offset Single Point Urban Interchange

The proposed offset SPUI interchange concept in AO39 moves the westbound off-ramp approach to align approximately opposite the eastbound off-ramp approach which, in the concept, is shifted to the east by approximately 140 feet from the existing eastbound ramp intersection. The eastbound on-ramp would also be shifted east to be aligned generally opposite the eastbound on-ramp. Woodcross Drive would remain at its existing intersection location on Harbison Boulevard, but the westbound on-ramp intersection was proposed to be relocated approximately 300 feet closer to the westbound mainline from its current location opposite Woodcross Drive. An illustration of the original AO39 concept is contained in **Figure 3-49**.

At the eastbound ramp intersection (with the relocated westbound off-ramp), the eastbound off-ramp approach was designed to provide dual left turn lanes and a separate right turn lane. The westbound off-ramp approach would curve over the mainline lanes in both directions of I-26, and intersect Harbison Boulevard with dual left turn lanes and a separate right turn lane. Eastbound Harbison Boulevard would enter the intersection with two through lanes and a separate right turn lane to the eastbound on-ramp. Westbound Harbison Boulevard would provide a separate left turn lane from traffic entering the eastbound on-ramp, and two through lanes.



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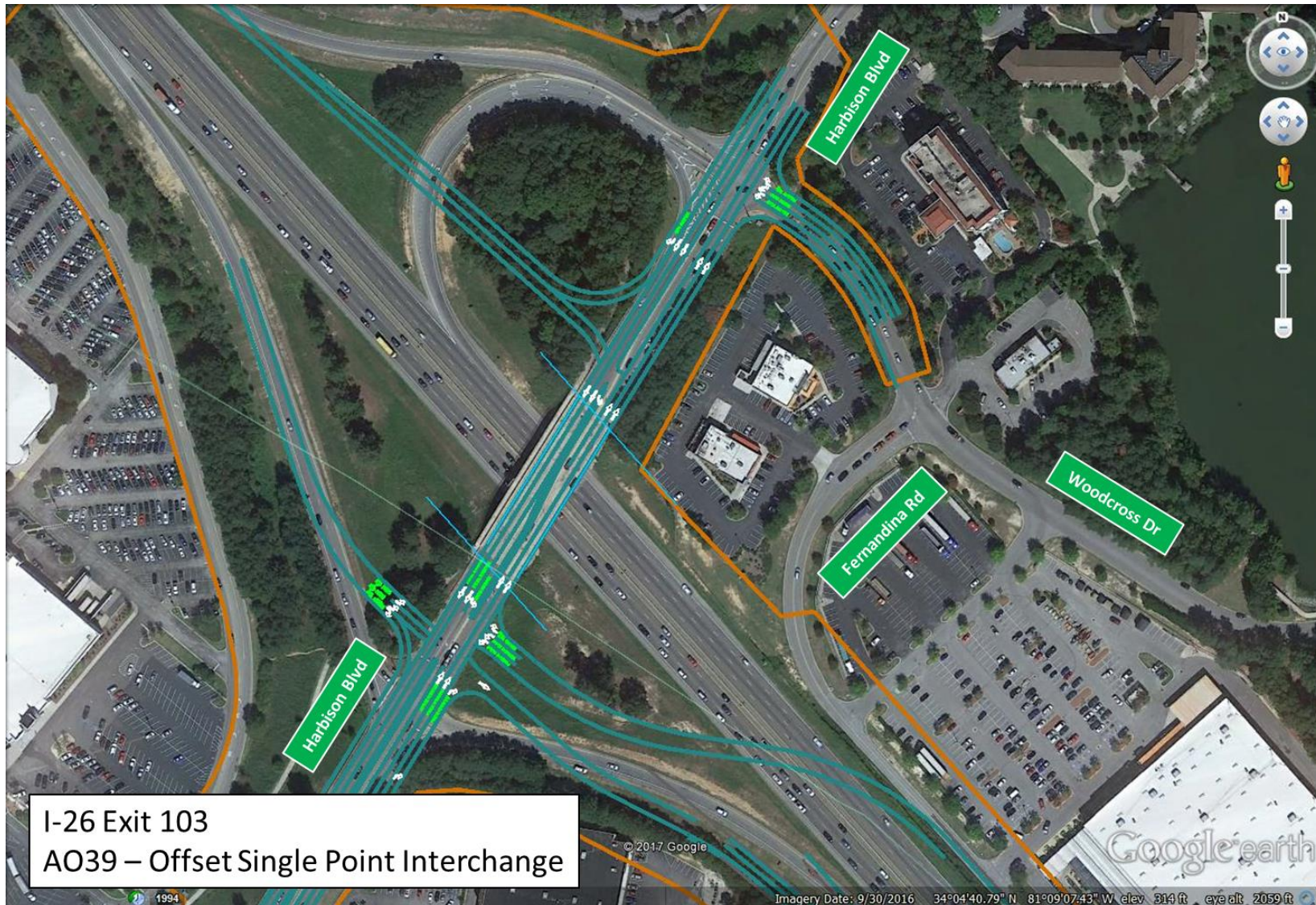


**Figure 3-48 - AO38: Exit 103 Roundabout Interchange**

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**Figure 3-49 - AO39: Exit 103 Offset Single Point Interchange**

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To the east across the overpass, Harbison Boulevard would provide to through lanes in each direction, with a fifth lane allocated to back-to-back left turn lanes to the on-ramps.

Eastbound Harbison Boulevard would consist of a separate left turn lane for traffic turning onto the westbound on ramp and two through lanes. The westbound approach of Harbison Boulevard would have two through lanes and a separate right turn lane for traffic turning onto the westbound on-ramp. The westbound on-ramp would be made of up separate lanes accepting the left turn and right turn movements from Harbison Boulevard. The ramp would merge into a single lane before entering westbound I-26.

The Woodcross Drive approach to its intersection with Harbison Boulevard was assumed to provide dual left turn lanes and a separate right turn lane at the T-intersection created by the relocation of the westbound on-ramp.

The capacity screening incorporated the use of a detailed Synchro model developed for the offset SPUI concept. The initial capacity screening indicated that the dual left turn lanes provided in AO39 on the eastbound off-ramp approach were not necessary: a single left turn lane would be sufficient. However, due to the configuration of the eastbound off-ramp and the realigned westbound off-ramp, split signal phasing would most likely be required to serve both ramp movements without conflict to the opposing left turn movements, and was incorporated into the model. Under existing traffic volume, the eastbound/relocated westbound off-ramp intersection was assessed to be under capacity during both peak hours, though some off-ramp queuing for the westbound off-ramp left turn movement was observed in the simulations during the afternoon peak hour. Under 2040 traffic volumes, the eastbound/relocated westbound off-ramp intersection was assessed to be under capacity during the morning peak hour and over capacity during the afternoon peak hour, when sizeable queues were observed in eastbound off-ramp right turn traffic and westbound off-ramp left turn traffic. This is largely due to not being able to accommodate the high volume of westbound off-ramp traffic and Harbison Boulevard through traffic with the split signal phasing for the off-ramps diverting so much of the cycle length away from the arterial through phases. Consequently, AO39 was not selected to be incorporated into the representative alternatives.

### 3.3.9.6 Exit 103 AO49 – Do-Nothing (No-Build)

A no-build, do-nothing alternative at Exit 103 was incorporated into the AO for cases where a Representative Alternative may be developed that did not require modification to the existing Harbison Boulevard interchange. The do-nothing alternative would largely keep the existing interchange configuration intact, with modifications made to accommodate the mainline widening and to adjust the connections of the interchange ramps with the mainline. The do-nothing alternative was selected to be incorporated into representative alternatives RA3, RA7, and RA 9.

### 3.3.9.7 Exit 103 CAP-X Review

The Exit 103 traffic volumes and proposed interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated

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interchange concept was a ParClo, followed by the Displaced Left Turn (DLT), the SPUI, and the DDI interchanges. The Traditional Diamond interchange ranked last.

### Partial Cloverleaf Interchange

The CAP-X ParClo concept includes the westbound loop off-ramp incorporated into the existing interchange configuration and assumed an eastbound loop off-ramp. The probable reason the existing interchange lacks the eastbound loop off-ramp is because the existing eastbound off-ramp left turn traffic, which would be relocated to a loop off-ramp, is too low (about 30 vehicles in the morning peak hour and about 80 vehicles in the afternoon peak hour) to warrant the loop off-ramp. Therefore, a full ParClo concept is not a feasible choice.

### Displaced Left Turn Interchange

The DLT interchange was the second highest rated option in the CAP-X assessment. A DLT at Exit 103 would locate the left turn crossovers upstream at the next adjacent intersections. To the west of the interchange, that crossover would likely occur at the signalized intersection of Harbison Boulevard and Saturn Parkway. To the east of the interchange, the existing signalized intersection of Woodcross Road/westbound ramps is too close to be the crossover location. A crossover could occur at the currently unsignalized T-intersection of Harbison Boulevard and Parkridge Drive, combined with the realignment of Woodcross Road across from Parkridge Drive. This intersection would have to be signalized to permit the displacing of the left turn movement.

### 3.3.10 AO40 – AO42 (EXIT 102)

The following are a list of the AO developed and screened for Exit 102.

- AO40 – Diverging Diamond Interchange (Synchro Template )
- AO41 – Roundabout Interchange (SIDRA)
- AO42 –Tight Urban Diamond Interchange (Detailed Synchro Model)
- AO50 – Do Nothing

Note: The use of CAP-X was applicable for AO40, AO42, and AO50.

Existing traffic operations at Exit 102 are complicated by:

- Moderately high volumes of traffic oriented to the west to access the Town of Irmo and the retail areas along Harbison Boulevard via Columbiana Drive. This leads to:
  - Moderately high eastbound on-ramp volumes between 700 and 800 vehicles per hour during both peak hours
  - Moderate to moderately high westbound off-ramp volumes (approximately 450 vehicles per hour during the morning peak hour and about 600 vehicles per hour in the afternoon peak hour)
- Off-ramp lanes merging into westbound Lake Murray Boulevard from the westbound loop off-ramp and the eastbound off-ramp and into eastbound Lake Murray Boulevard from the eastbound loop off-ramp.
- The short distance between the westbound off-ramp and the intersection of Lake Murray Boulevard and Kinley Road. There is approximately 400 feet between the off-ramp gore point on eastbound Lake Murray Boulevard and the beginning of the taper for the eastbound left turn lane used by traffic turning



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left onto Kinley Road. Because of the high volume of eastbound left turn movements at Kinley Road coming from the westbound off-ramp, multiple lane weaving movements take place at in a short distance.

### 3.3.10.1 Exit 102 AO40 – Diverging Diamond Interchange

The proposed DDI maintained two through lanes and a separate right turn lane in each direction entering the Lake Murray Boulevard interchange area. Two lanes are provided in each direction between the crossovers, with left turn movements onto the on-ramps taking place from the outside through lane. The westbound off-ramp included dual left turn lanes and a single right turn lane, while the eastbound off-ramp provided separate left and right turn lanes. The eastbound and westbound on-ramps have a single lane each that merge into a single lane on-ramp, with the right turn traffic from Lake Murray Boulevard yielding to left turn traffic entering the ramps. The initial AO40 concept evaluated is shown in **Figure 3-50**.

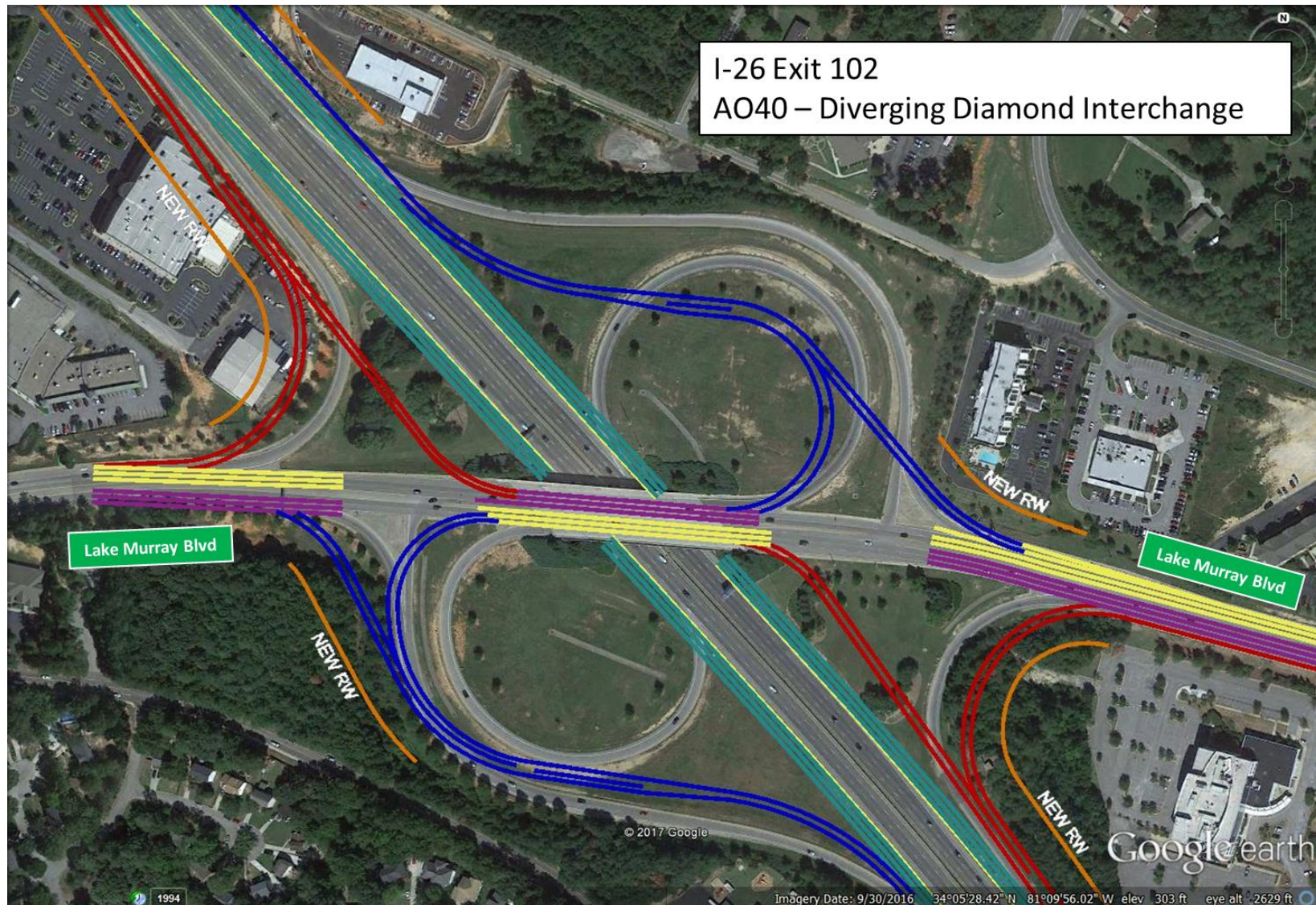
The capacity screening incorporated the use of the Synchro Template file for a DDI. The screening indicated the AO40 intersections would be under capacity during both peak hours under existing traffic and under estimated 2040 traffic volumes in both peak hours. Observations of simulations during the afternoon peak hour indicated queuing of westbound off-ramp left turn traffic was likely to occur with estimated 2040 volumes. Additionally, congestion was frequently observed in both directions of the crossover sections of the DDI. AO40 was not selected to be incorporated into the representative alternatives.

### 3.3.10.2 Exit 102 AO41 – Roundabout Interchange

The proposed roundabout interchange incorporated a revision of the existing partial cloverleaf interchange to a diamond interchange with two-lane roundabouts in place of traffic signals at the ramp intersections with Lake Murray Boulevard. At the eastbound ramp roundabout intersection, the eastbound Lake Murray Boulevard approach to the roundabout would provide two lanes entering the roundabout and a right turn bypass lane that takes traffic directly to the eastbound on-ramp. The westbound approach would provide two lanes entering the roundabout. The eastbound off-ramp approach would provide a separate roundabout bypass right turn lane generally following the alignment of the existing eastbound off-ramp to westbound Lake Murray Boulevard, while a single lane entering the roundabout would replace the loop off-ramp to facilitate the flow of traffic onto eastbound Lake Murray Boulevard. The eastbound on-ramp approach departing from the roundabout would provide two lanes: one from the eastbound roundabout bypass lane and one coming from the roundabout. These two lanes would merge into a single lane prior to entering eastbound I-26.

Two lanes in each direction were maintained on Lake Murray Boulevard through the interchange area. At the westbound ramp roundabout intersection, the westbound and eastbound Lake Murray Boulevard approaches to the roundabout would provide two lanes entering the roundabout. The westbound approach would include a right turn roundabout bypass lane. The westbound off-ramp approach would consist of a single lane that widens to two lanes. Traffic traveling east on Lake Murray Boulevard would turn right using a roundabout bypass lane, while traffic traveling west on Lake Murray Boulevard would enter the roundabout on a single lane. The westbound on-ramp approach would begin with two lanes: one lane exiting the roundabout and the other

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**Figure 3-50 - AO40: Exit 102 Diverging Diamond Interchange**

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lane originating from the westbound right turn bypass lane. The two lanes would merge into a single on-ramp lane prior to entering westbound I-26. The initial AO41 concept evaluated is shown in **Figure 3-51**.

The capacity screening incorporated the use of SIDRA to analyze the roundabout operation. The screening indicated the approaches of the two-lane roundabouts in AO41 would be over capacity under 2040 traffic volumes. Since incorporating additional lanes in the roundabouts would not be feasible, AO41 was not selected to be incorporated into the representative alternatives.

### 3.3.10.3 Exit 102 AO42 – Tight Urban Diamond Interchange

AO42 consists of evaluating a proposed tight urban diamond interchange (TUDI) to replace the existing partial cloverleaf interchange at Exit 102. The proposed TUDI would locate the eastbound ramp intersection near the existing location of the eastbound on-ramp on Lake Murray Boulevard and the westbound ramp intersection near the existing location of the westbound on-ramp. The separation between the ramp intersections would be about 1,030 feet.

At the eastbound ramp intersection, separate left and right turn lanes would be maintained on the off-ramp approach. The westbound approach to the intersection would include a left turn lane for traffic turning onto the eastbound on-ramp, along with two through lanes. The eastbound approach to the intersection would consist of two through lanes and a separate right turn lane to the eastbound on-ramp. The eastbound on-ramp would leave the intersection with two lanes, which would merge into a single lane prior to entering eastbound I-26.

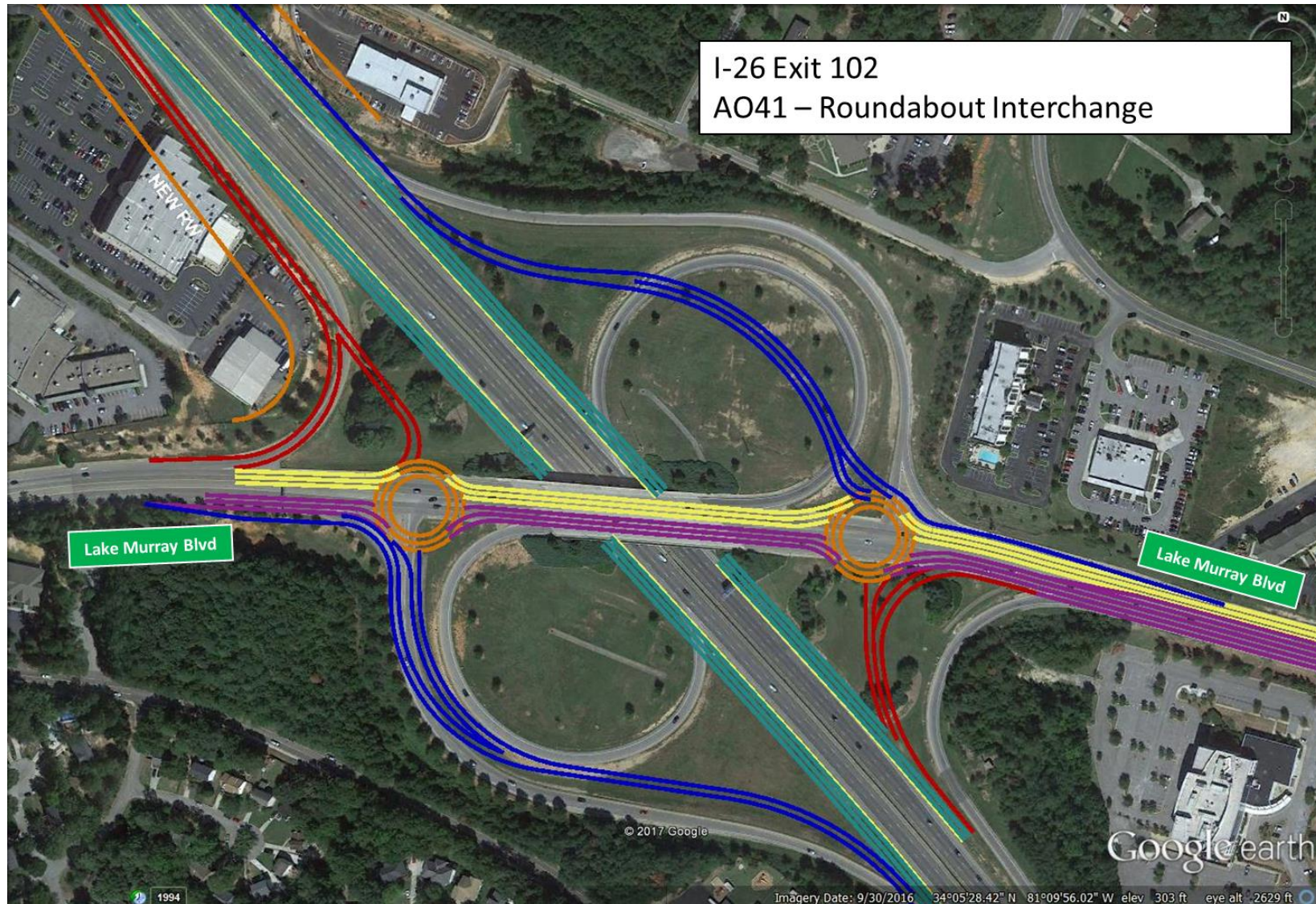
The westbound off-ramp would consist of a single lane diverging from westbound I-26, which widens to provide separate left turn and right turn lanes at the ramp's intersection with Lake Murray Boulevard. The eastbound approach to the intersection would consist of a separate left turn lane for traffic turning onto the westbound on-ramp, and two through lanes. The westbound approach would consist of two through lanes and a separate right turn lane which for traffic entering the westbound on-ramp. The westbound on-ramp would depart from the intersection with two lanes that would merge into one lane prior to entering westbound I-26. The right turn movements to both on-ramps would yield to left turning traffic. The initial AO42 concept evaluated is shown in **Figure 3-52**.

The capacity screening incorporated the use of the detailed Synchro model developed for Exit 104. The capacity assessment with estimated 2040 volumes indicated the proposed AO42 concept would result in under capacity ramp intersections. However, a second westbound left turn lane would be required on the westbound off-ramp to accommodate 2040 traffic volumes. AO42 was selected to be incorporated into the representative alternatives RA2 and RA6.

### 3.3.10.4 Exit 102 AO50 – Do-Nothing (No-Build)

A no-build, do nothing alternative at Exit 102 was incorporated into the AO for cases where a Representative Alternative may be developed that did not require modification to the existing Lake Murray Boulevard interchange. The do-nothing alternative would largely keep the existing interchange configuration intact, with modifications made to accommodate the mainline widening and to adjust the connections of the interchange

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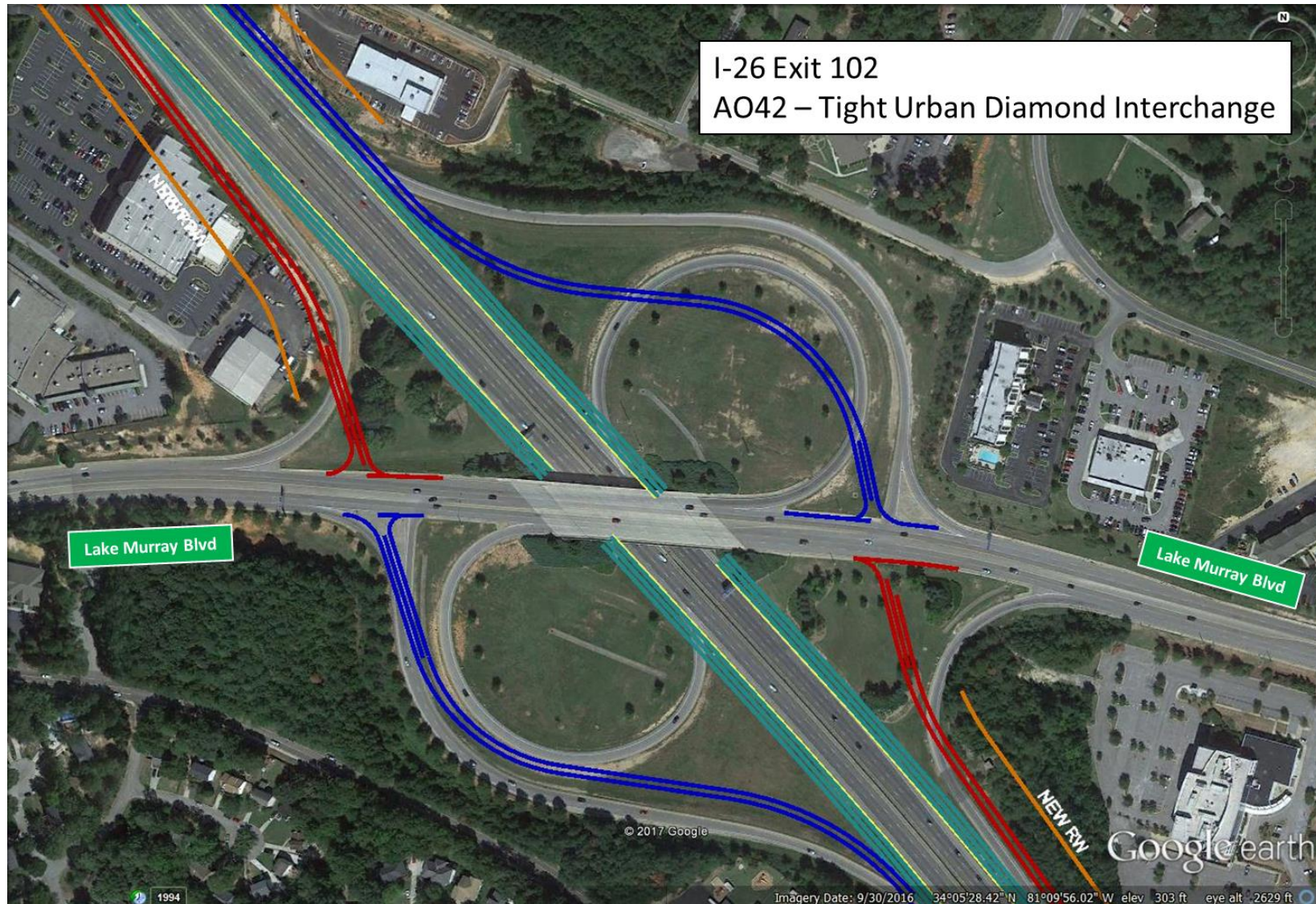


**Figure 3-51 - AO41: Exit 102 Roundabout Interchange**

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**Figure 3-52 - AO42: Exit 102 Tight Urban Diamond Interchange**

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ramps with the mainline. The do-nothing alternative was selected for representative alternatives RA1, RA3, RA4, RA5, RA7, RA8, and RA9.

### 3.3.10.5 Exit 102 CAP-X Review

The Exit 102 traffic volumes and proposed interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo, followed by the Displaced Left Turn (DLT), the DDI, and the SPUI interchanges. The Traditional Diamond interchange ranked last.

#### Partial Cloverleaf Interchange

The CAP-X ParClo concept reflects the existing interchange configuration, with loop off-ramps provided in the eastbound and westbound directions of I-26. The ParClo configuration was selected as the preferred alternative for Exit 102 prior to the interchange's construction in the late 1990's.

#### Displaced Left Turn Interchange

The DLT interchange was the second highest rated option in the CAP-X assessment. A DLT at Exit 102 would locate the left turn crossovers upstream at the next adjacent intersections. To the west of the interchange, that crossover would likely occur at the signalized intersection of Lake Murray Boulevard and Columbiana Drive. To the east of the interchange, the crossover would likely occur at the signalized intersection of Lake Murray Boulevard and Kinley Road/Parkridge Drive.

### 3.3.11 AO40 – AO42 (EXIT 101)

The following are a list of the AO developed and screened for Exit 101.

- AO43 – Diverging Diamond Interchange (Synchro Template)
- AO44 – Roundabout Interchange (SIDRA)
- AO45 – Tight Urban Diamond Interchange (Detailed Synchro Model)
- AO51 – Do Nothing

Note: The use of CAP-X was applicable for AO43, AO44, and AO51.

Existing traffic operations at Exit 101 are complicated by:

- Moderate left turn volumes onto eastbound I-26 during both peak hours (existing peak hour traffic is about 250 vehicles in the morning peak hour and about 300 vehicles in the afternoon peak hour). However, a single left turn lane with protected-permitted left turn phasing (with a flashing yellow arrow display for the permitted movement) is provided to the on-ramp, which allows for the left turn traffic to be served under a protected phase during periods of heavy demand.
- High right turn volumes from eastbound Broad River Road to the eastbound on-ramp during both peak hours (existing peak hour traffic is approximately 600 vehicles in the morning and about 550 vehicles in the afternoon).



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Broad River Road provides two through lanes in each direction through the interchange area. However, Broad River Road narrows to a single lane each way within a relatively short distance from the interchange. Approximately 1,400 feet west of the eastbound off-ramp intersections, Broad River Road is reduced to two lanes just west of its intersection with Royal Tower Drive. Approximately 1,500 feet east of the westbound off-ramp intersections, Broad River Road is reduced to two lanes east of its intersection with Western Lane.

### 3.3.11.1 Exit 101 AO43 – Diverging Diamond Interchange

The proposed DDI maintained two through lanes and a separate right turn lane in each direction entering the Broad River Road interchange area. Two lanes are provided in each direction between the crossovers, with left turn movements onto the on-ramps taking place from the outside through lane. The westbound off-ramp included dual left turn lanes and a single right turn lane, while the eastbound off-ramp provided separate left and right turn lanes. The eastbound and westbound on-ramps have a single lane each that merge into a single lane on-ramp, with the right turn traffic from Broad River Road yielding to left turn traffic entering the ramps. The initial AO40 concept evaluated is shown in **Figure 3-53**.

The capacity screening incorporated the use of the Synchro Template file for a DDI. The screening indicated the AO43 intersections would be under capacity during both peak hours under existing traffic and under estimated 2040 traffic volumes in both peak hours. Observations of simulations during the afternoon peak hour indicated queuing of westbound off-ramp left turn and right turn traffic was likely to occur with estimated 2040 volumes. AO43 was selected to be incorporated into the representative alternatives RA3 and RA6.

### 3.3.11.2 Exit 101 AO44 – Roundabout Interchange

The proposed roundabout interchange incorporated a revision of the existing partial cloverleaf interchange to a diamond interchange with two-lane roundabouts in place of traffic signals at the ramp intersections with Broad River Road. At the eastbound ramp roundabout intersection, the eastbound Broad River Road approach to the roundabout would provide two lanes entering the roundabout and a right turn bypass lane that takes traffic directly to the eastbound on-ramp. The westbound approach would provide two lanes entering the roundabout. The eastbound off-ramp approach would provide a separate right turn bypass lane, while a single lane entering the roundabout would facilitate the flow of traffic onto eastbound Broad River Road. The eastbound on-ramp approach departing from the roundabout would provide two lanes: one from the eastbound roundabout bypass lane and one coming from the roundabout. These two lanes would merge into a single lane prior to entering eastbound I-26.

Two lanes in each direction were maintained on Broad River Road through the interchange area. At the westbound ramp roundabout intersection, the eastbound Broad River Road approach to the roundabout would provide two lanes entering the roundabout. The westbound approach would also consist of two lanes entering the roundabout, and would include a right turn roundabout bypass lane to the westbound on-ramp. The westbound off-ramp approach would consist of a single lane that widens to two lanes. Traffic traveling east on Broad River Road would turn right using a roundabout bypass lane, while traffic traveling west on Broad River Road would enter the roundabout on a single lane. The westbound on-ramp approach would begin with two lanes: one lane exiting the roundabout and the other lane originating from the westbound right turn bypass

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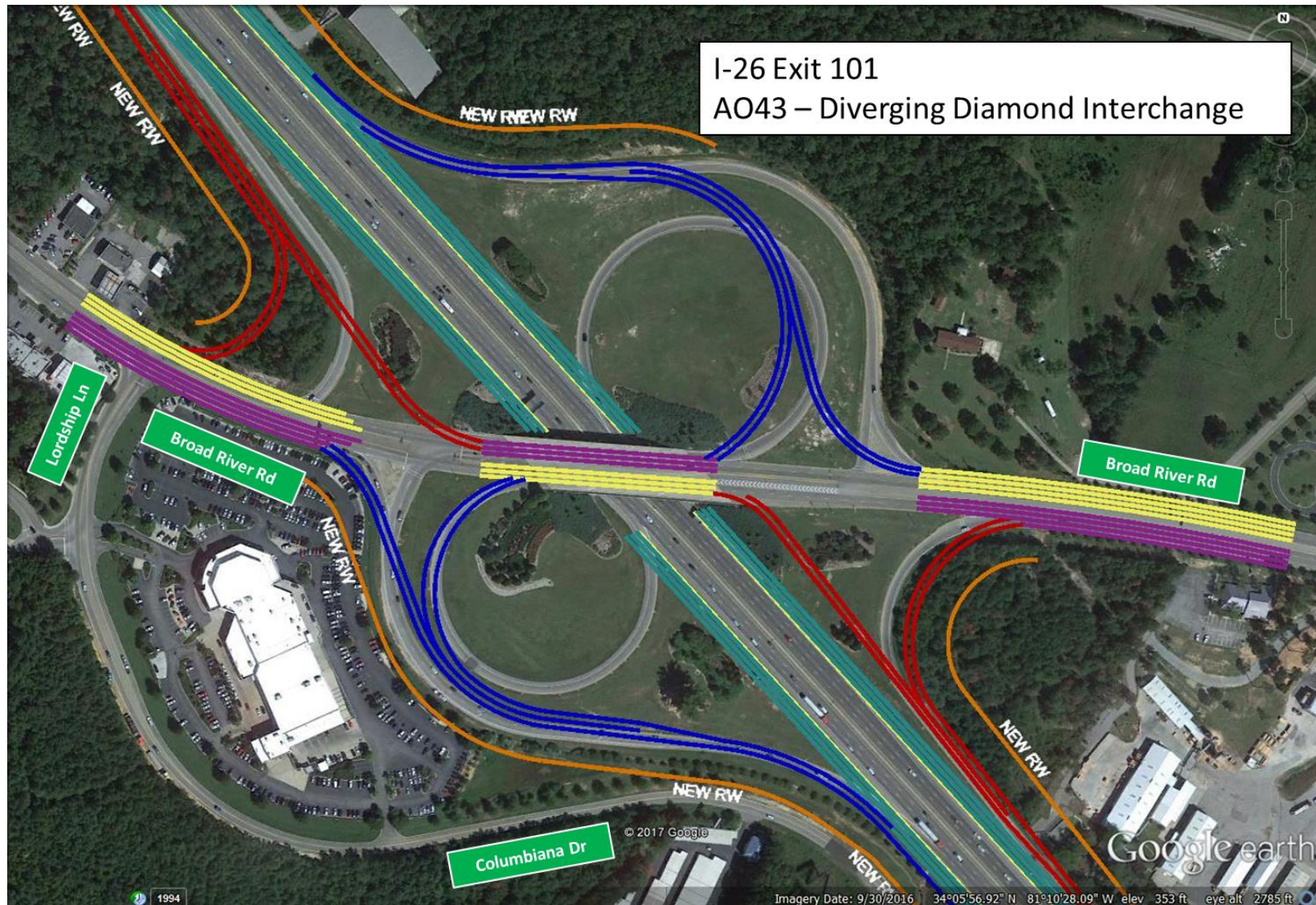


Figure 3-53 - AO43: Exit 101 Diverging Diamond Interchange

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lane. The two lanes would merge into a single on-ramp lane prior to entering westbound I-26. The initial AO44 concept evaluated is shown in **Figure 3-54**.

The capacity screening incorporated the use of SIDRA to assess the roundabout operation. The screening indicated the off-ramp approaches to the two-lane roundabouts in AO44 would be over capacity under 2040 traffic volumes. Since incorporating additional lanes in the roundabouts would not be feasible, AO44 was not selected to be incorporated into the representative alternatives.

### 3.3.11.3 Exit 101 AO45 – Tight Urban Diamond Interchange

AO45 consists of evaluating a proposed tight urban diamond interchange (TUDI) to replace the existing partial cloverleaf interchange at Exit 101. The proposed TUDI would locate the eastbound ramp intersection near the existing location of the eastbound on-ramp on Broad River Road and the westbound ramp intersection near the existing location of the westbound on-ramp. The separation between the ramp intersections would be about 980 feet.

At the eastbound ramp intersection, separate left and right turn lanes would be maintained on the off-ramp approach. The westbound approach to the intersection would maintain the existing dual left turn lanes for traffic turning onto the eastbound on-ramp, along with three through lanes. The eastbound approach to the intersection would consist of two through lanes and a separate right turn lane to the eastbound on-ramp. The eastbound on-ramp would leave the intersection with two lanes, which would merge into a single lane prior to entering eastbound I-26.

The westbound off-ramp would consist of a single lane diverging from westbound I-26, which widens to provide separate left turn and right turn lanes at the ramp's intersection with Broad River Road. The eastbound approach to the intersection would consist of a separate left turn lane for traffic turning onto the westbound on-ramp, and two through lanes. The westbound approach would consist of two through lanes and a separate right turn lane which for traffic entering the westbound on-ramp. The westbound on-ramp would depart from the intersection with two lanes that would merge into one lane prior to entering westbound I-26. The right turn movements to both on-ramps would yield to left turning traffic. The initial AO45 concept evaluated is shown in **Figure 3-55**.

The capacity screening incorporated the use of the detailed Synchro model developed for Exit 104 modified to account for the differences in the design concept at Exit 101. The capacity assessment with estimated 2040 volumes indicated the proposed AO45 concept would result in under capacity ramp intersections. However, a second westbound left turn lane would be required on the westbound off-ramp to accommodate 2040 traffic volumes, especially during the afternoon peak hour, as observations of the simulations indicated there was moderate to significant left turn queuing occurring on the westbound off-ramp. AO45 was selected to be incorporated into the representative alternative RA2.

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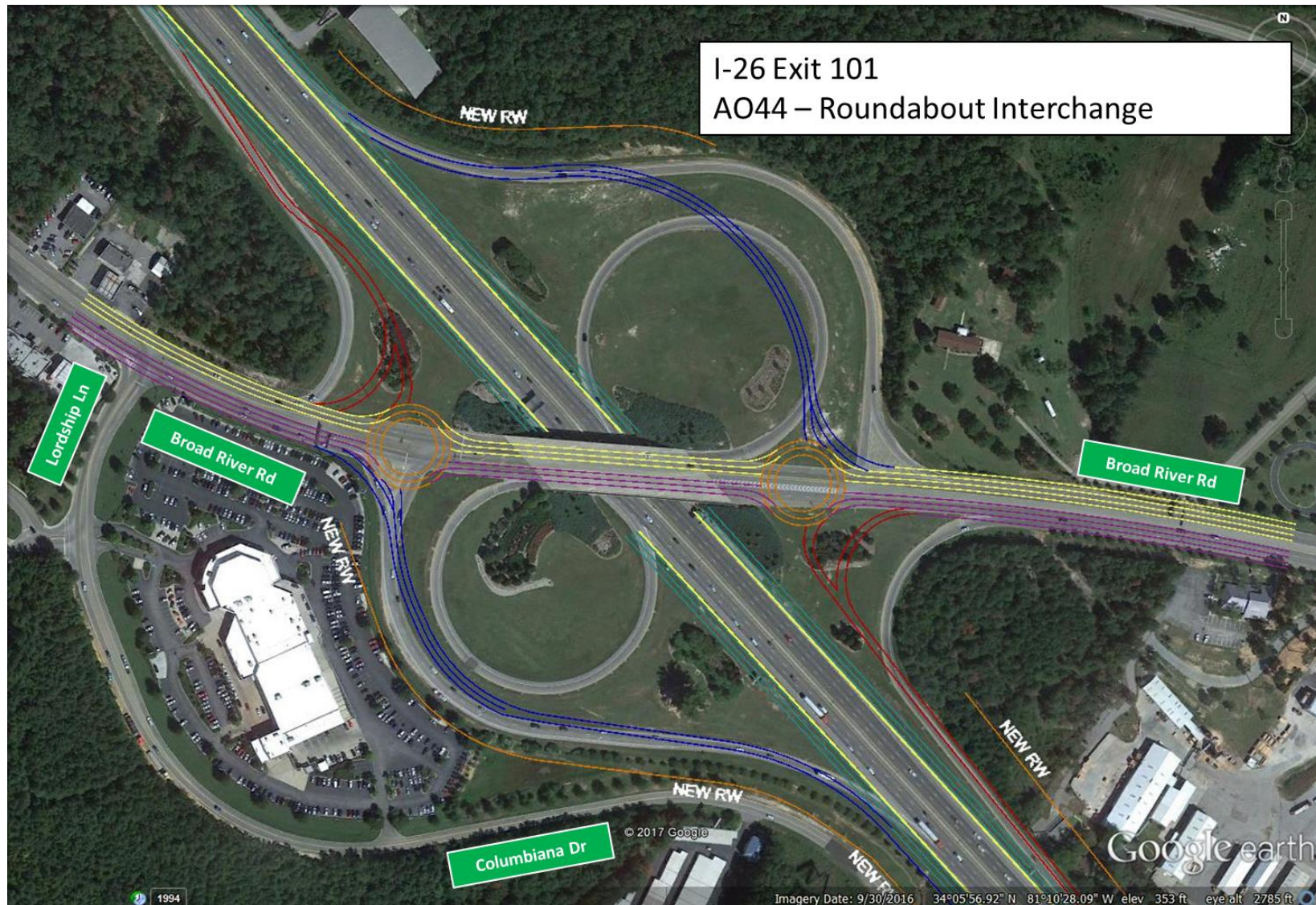
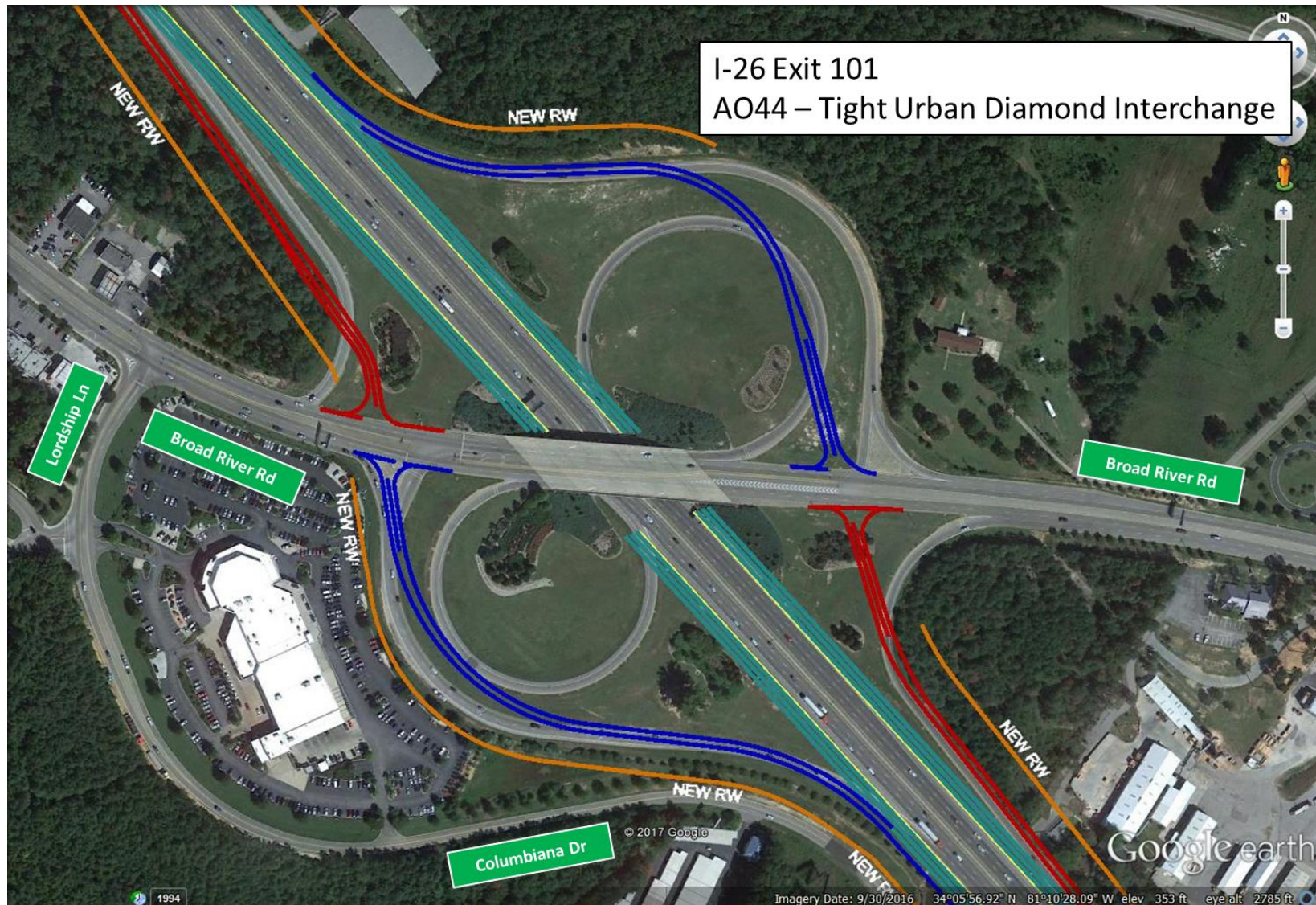


Figure 3-54 - AO44: Exit 101 Roundabout Interchange

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**Figure 3-55 - AO44: Exit 101 Tight Urban Diamond Interchange**

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### 3.3.11.4 Exit 101 AO51 – Do-Nothing (No-Build)

A no-build, do nothing alternative at Exit 101 was incorporated into the AO for cases where a Representative Alternative may be developed that did not require modification to the existing Broad River Road interchange. The do-nothing alternative would largely keep the existing interchange configuration intact, with modifications made to accommodate the mainline widening and to adjust the connections of the interchange ramps with the mainline. The do-nothing alternative was incorporated into representative alternatives RA1, RA4, RA5, RA7, RA8, and RA9.

### 3.3.11.5 Exit 101 CAP-X Review

The Exit 101 traffic volumes and proposed interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo, followed by the DDI and the Displaced Left Turn (DLT). The SPUI and Traditional Diamond interchange configurations ranked last.

#### Partial Cloverleaf Interchange

The CAP-X ParClo concept reflects the existing interchange configuration, with loop off-ramps provided in the eastbound and westbound directions of I-26. An obsolete ParClo configuration with loop ramps in the same quadrants of the existing interchange, was replaced at Exit 101 in the late 1990's.

#### Diverging Diamond Interchange

The DDI had the second highest ranking of the CAP-X interchange alternatives, though it was just slightly higher ranked than the Displaced Left Turn Interchange configuration

#### Displaced Left Turn Interchange

The DLT interchange was the third highest rated option in the CAP-X assessment, close to the DDI rating. A DLT at Exit 101 would locate the left turn crossovers upstream at the next adjacent intersections. To the west of the interchange, that crossover would likely occur at the signalized intersection of Broad River Road with Lordship Lane/Columbiana Drive. To the east of the interchange, the crossover would likely occur at the signalized intersection of Broad River Road and Western Lane. However, this intersection is located approximately 1,650 feet east of the westbound on-ramp intersection, which may farther than is typically considered for a DLT.

## 3.3.12 AO46 – AO47 (EXIT 110)

The following are a list of the AO developed and screened for Exit 110.

- AO46 – Eastbound Off-Ramp Extension (No Assessment)
- AO47 – Eastbound Direct Hospital Access (No Assessment)



## Alternatives Traffic Analysis Technical Memo

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Note: The use of CAP-X was applicable for AO46.

Existing traffic operations at Exit 110 are complicated by:

- High existing ramp volumes during the morning and afternoon peak hours.
  - Eastbound off-ramp (approximately 1,000 vehicles per hour in the morning peak hour and 800 vehicles per hour in the afternoon peak hour)
  - Eastbound on-ramp (about 700 vehicles per hour in the morning peak hour and 850 vehicles per hour in the afternoon peak hour)
  - Westbound off-ramp (about 900 vehicles per hour in the morning peak hour and 800 vehicles per hour in the afternoon peak hour).
  - Westbound on-ramp (about 850 vehicles per hour during both peak hours)
- High directional volumes of through traffic in each direction approaching the interchange on Sunset Boulevard
  - Existing eastbound volumes approaching the interchange are approximately 2,000 vehicles per hour during the morning peak hour and over 1,800 vehicles per hour during the afternoon peak hour.
    - Approximately 45 percent of the eastbound traffic approaching the interchange during the morning peak hour turns onto I-26; about 55 percent turns onto I-26 during the afternoon peak hour.
    - Approximately 50 percent of the westbound traffic approaching the interchange during the morning peak hour turns on to I-26; about 35 percent turns onto I-26 during the afternoon peak hour.
- The high volume of traffic traveling through the interchange along Sunset Boulevard causes substantial delay to right turn traffic on the off-ramps, especially on the eastbound off-ramp during the morning peak hour and throughout the day.
- The short distance between the off-ramp right turn lanes and the adjacent signalized intersections.
  - There is approximately 400 feet between the eastbound off-ramp right turn lane and the westbound stop line at the signalized intersection with E Hospital Drive/Harbor Drive. This short distance, the high volume of traffic traveling through the interchange, the high right turn volume from the eastbound off-ramp, and the driveway to the gas station located between the off-ramp and the signalized intersection contribute to congestion in the interchange area and to the creation of eastbound off-ramp queuing.
  - There is approximately 525 feet between the westbound off-ramp right turn lane and the eastbound stop line at the signalized intersection with McSwain Drive/Chris Drive. This short distance, the high volume of traffic traveling through the interchange, and the driveways to businesses located between McSwain Drive/Chris Drive and the interchange, contribute to congestion in the interchange area.
- The high volumes of traffic generated by Lexington Medical Center and the proximity of the intersections providing access to the hospital, contributes to congestion along the arterial.
- The stop sign control of the off-ramp right turn movements may not be efficient in moving traffic off the ramps. If feasible, consideration should be given to using other traffic control methods for these movements, such as placing the right turn movements under traffic signal control, to enhance traffic flow and safety and reduce queuing on the off-ramp.

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### 3.3.12.1 Exit 110 AO46 – Eastbound Off-Ramp Extension

AO46 consists of an extension of the existing eastbound off-ramp to Exit 110. The existing off-ramp is approximately 1,400 feet long from the gore of where it diverges from eastbound I-26 to the stop line at Sunset Boulevard. The final approximately 700 feet of the ramp to the right turn stop line is marked for multiple lanes (two left turn lanes and the one right turn lane) of vehicle storage for the turn movements at the intersection. Despite the length of the ramp and the storage distances provided by the intersection turn lanes, the eastbound right turn movement frequently backs up along the ramp to the mainline during the peak hours, and long queues are common during other times of day.

AO46 extends the length of the ramp to a length of approximately 3,900 feet. The eastbound off-ramp diverges from eastbound I-26 and quickly widens to provide two lanes for about 3,200 feet. In the remaining 700 feet, the ramp widens to provide the current turn lane storage to the intersection with Sunset Boulevard.

A capacity screening was not performed for the proposed AO46 as the concept does not provide any change to the operation of the Exit 110 intersections. Rather, AO46 increases the amount of vehicle storage on the off-ramp to reduce or eliminate the possibility of ramp queues backing up onto mainline eastbound I-26.

The AO46 concept is shown in **Figure 3-56**. AO46 was selected to be incorporated into the representative alternatives RA1, RA3, RA4, RA5, RA7, RA8, and RA9.

### 3.3.12.2 Exit 110 AO47 – Eastbound Direct Hospital Access

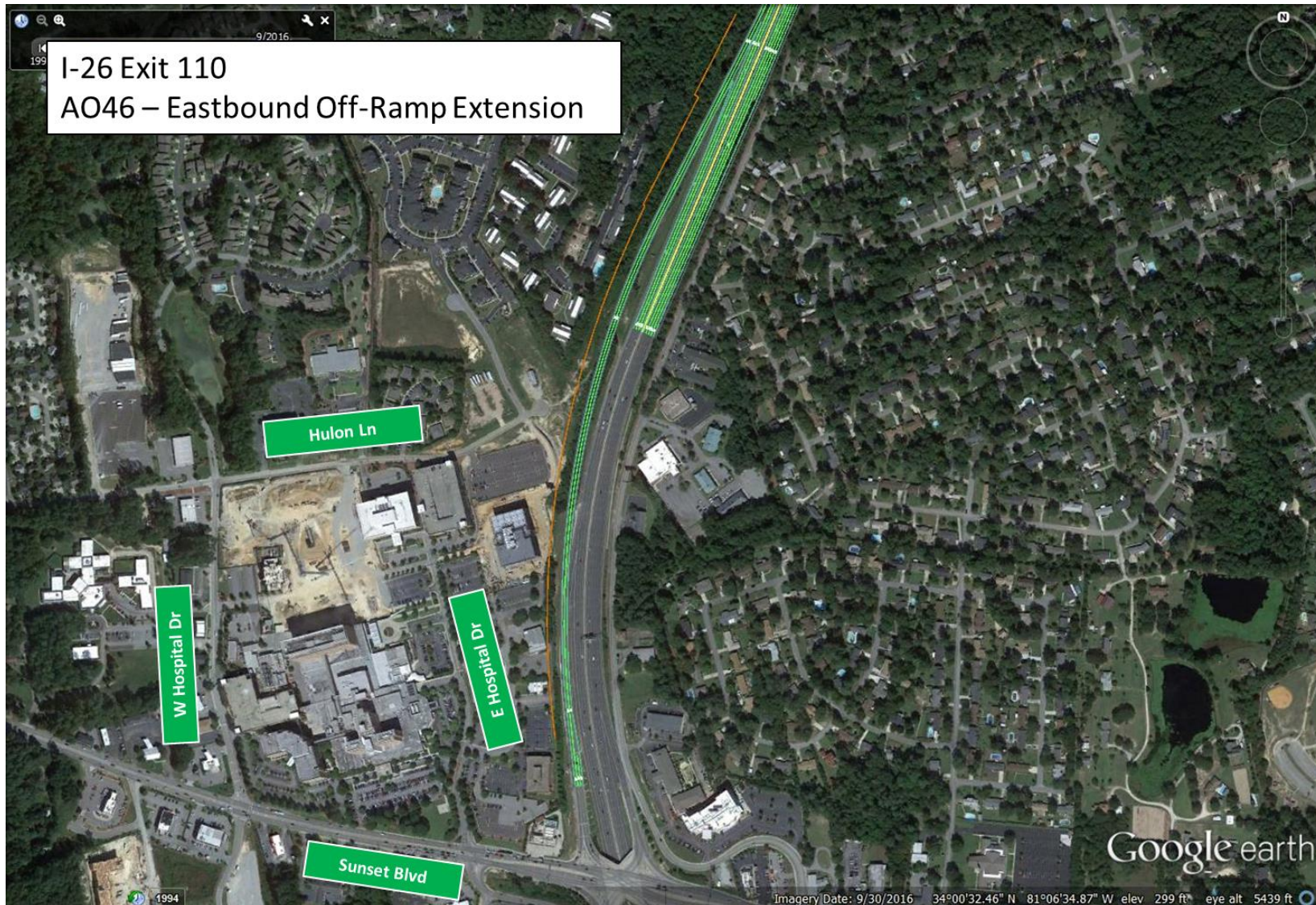
AO47 consists of the AO46 extension of the existing eastbound off-ramp to Exit 110, and includes a direct connection from the off-ramp to the north end of the hospital campus beginning approximately 2,450 feet from the eastbound right turn stop line. This one-way connection from the eastbound off-ramp would intersect Hulon Lane at its intersection with Two Mac Lane/N Hospital Drive. The eastbound portion of Hulon Lane would be modified to intersection Two Mac Lane/N Hospital Drive to discourage wrong-way entry movements onto the off-ramp.

A capacity screening was not performed for the proposed AO47 since at the time of the evaluation, there was insufficient traffic data to determine the volume of traffic that uses the eastbound off-ramp, turns right onto westbound Sunset Boulevard, and turns right into the hospital campus at E Hospital Drive, West Hospital Drive or the driveway located between those two roadways. Therefore, the level of improvement to the operation of the SPUI at Exit 110 through the diversion of traffic to the hospital via the direct ramp access could not be evaluated. The AO47 concept is shown in **Figure 3-57**.

In reviewing the development of AO47, it was noted that the level of interest the hospital management would have for the proposed direct access was unknown. The likelihood of SCDOT and/or FHWA approving a direct access from the eastbound off-ramp into the hospital property was similarly unknown. For these reasons, AO47 was selected to be incorporated into the representative alternatives RA2 and RA6.



## Alternatives Traffic Analysis Technical Memo

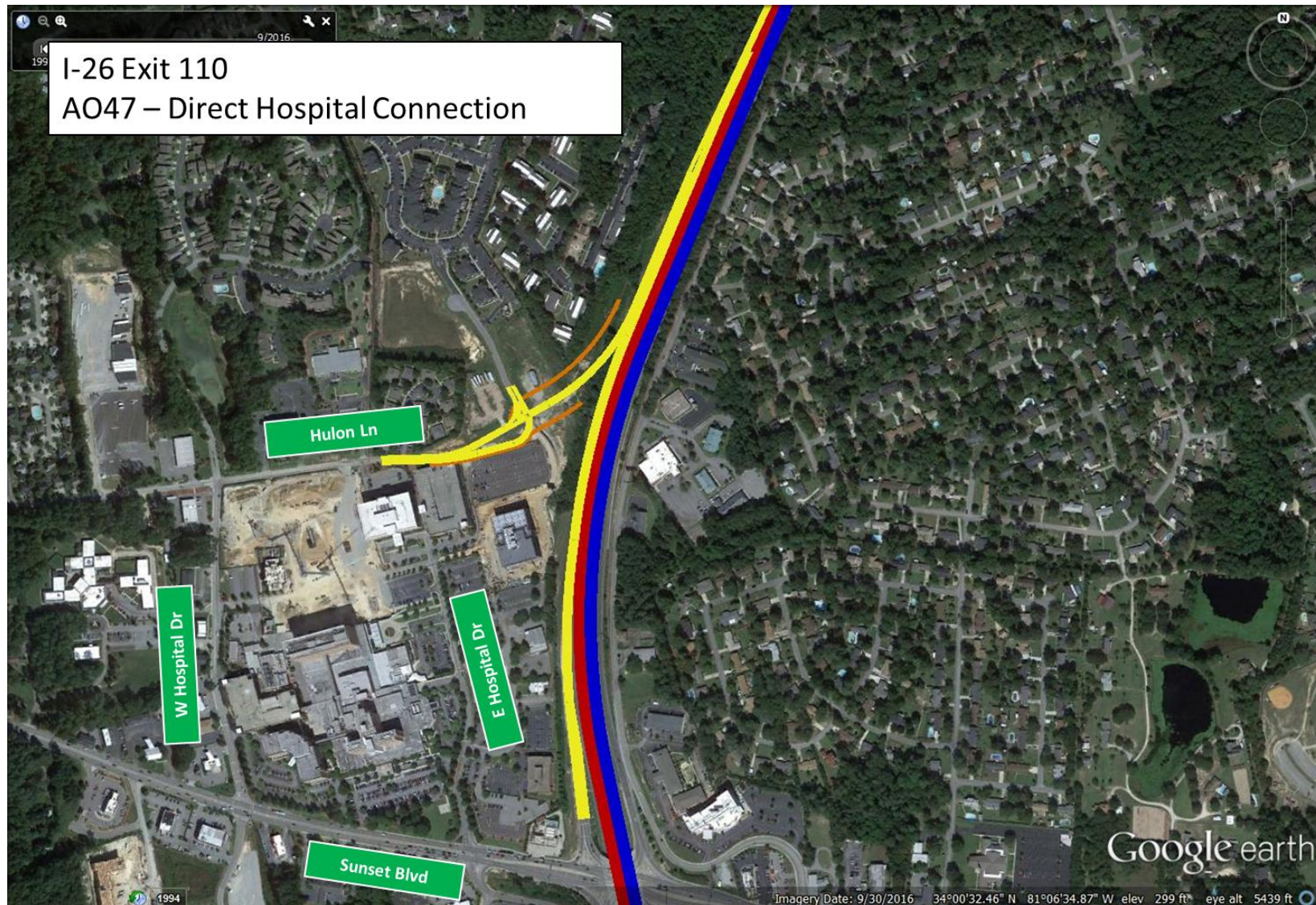


**Figure 3-56 - AO46: Exit 110 Eastbound Off-Ramp Extension**

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**Figure 3-57 - AO47: Exit 110 Direct Hospital Connection**

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### 3.3.12.3 Exit 110 CAP-X Review

The Exit 110 traffic volumes and proposed interchange geometry were entered into the CAP-X spreadsheet to determine which interchange alternatives scored the highest using the CAP-X methodology. The best rated interchange concept was a ParClo, followed by a DDI, the Displaced Left Turn (DLT) and the SPUI. The Traditional Diamond interchange configuration ranked last.

#### Partial Cloverleaf Interchange

The CAP-X ParClo concept would not be a feasible option at Exit 110 given the proximity of development in the all quadrants of the interchange.

#### Diverging Diamond Interchange

The DDI had the second highest ranking of the CAP-X interchange alternatives, though it was just slightly higher ranked than the Displaced Left Turn Interchange and SPUI interchange configurations. Given that the existing Exit 110 SPUI interchange was completed in late 2005/early 2006, it is unlikely that the replacement of the SPUI interchange would be considered.

#### Displaced Left Turn Interchange

The DLT interchange was the third highest rated option in the CAP-X assessment, closely following the DDI rating and ranked just above the SPUI option. A DLT at Exit 110 would locate the left turn crossovers upstream at the next adjacent intersections. To the west of the interchange, that crossover would likely occur at the signalized intersection of E Hospital Drive/Harbor Drive. To the east of the interchange, the crossover would likely occur at the signalized intersection of McSwain Drive/Chris Drive. The construction of the displaced left turn lanes would likely impact businesses located between these intersections and the interchange.

### 3.3.13 AO52 – AO55 (COLONIAL LIFE BOULEVARD)

The following are a list of the AO developed and screened for the I-126 interchange at Colonial Life Boulevard.

- AO52 – Tight Diamond with Braided Ramps (Detailed Synchro Model)
- AO53 – Diamond with Free Flow Ramps (No Assessment)
- AO54 – Tight Urban Diamond (No Assessment)

Existing traffic operations at the Colonial Life Boulevard interchange are characterized by:

- Directional ramps oriented to I-126 only towards the east to the City of Columbia; there are no ramps to/from the west on either I-126 or I-26 from Colonial Life Boulevard.
  - Existing traffic traveling to the west on I-26 must use the existing westbound on ramp at Bush River Road (Exit 108)
  - Existing traffic traveling to the east on I-26 must use the existing eastbound on-ramp at Bush River Road (Exit 108)

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- Moderate traffic volumes using the on-ramp to eastbound I-126 from Colonial Life Boulevard (about 550 vehicles per hour during the morning peak hour and about 350 vehicles per hour during the afternoon peak hour).
- Low to moderate traffic volumes using the westbound I-126 off-ramp to Colonial Life Boulevard (about 250 vehicles per hour during the morning peak hour and approximately 750 vehicles per hour in the afternoon peak hour).

A key element of the AO52, AO53, and AO54 concepts is the elimination of the Exit 108 ramps to Bush River Road. Eliminating the Bush River Road ramps removes a service interchange within the complex system interchanges serving I-20/I-26 and I-26/I-126 at Exits 107 and 108. Traffic currently using the eastbound off-ramp to Bush River Road would be rerouted to the eastbound I-126 ramp system and exit at Colonial Life Boulevard. Traffic currently using the westbound off-ramp to Bush River Road would be rerouted on a ramp along with traffic traveling to eastbound I-126, but would turn left onto Colonial Life Boulevard instead of continuing through to eastbound I-126. Traffic currently using the eastbound on-ramp from Bush River Road to eastbound I-26 would have the option of using either the Bush River Road interchange with I-20 (Exit 63), traveling through the proposed I-20/I-26 system interchange to eastbound I-26, or traveling east from the existing on-ramp intersection on Bush River Road to turn right onto Colonial Life Boulevard to use the proposed westbound on-ramp from Colonial Life Boulevard to eastbound I-26. Existing traffic using the westbound on-ramp from Bush River Road to westbound I-26 would similarly be re-routed to the east through the Colonial Life Boulevard intersection to access the westbound on-ramp to westbound I-26 from the proposed Colonial Life Boulevard interchange.

### 3.3.13.1 Colonial Life Boulevard AO52 – Tight Diamond with Braided Ramps

AO52 consists of a proposed fully directional tight urban diamond interchange (TUDI) with braided ramps providing access to/from Colonial Life Boulevard instead of the partial interchange providing access to/from I-126 towards the City of Columbia. The westbound off-ramp from I-126 and the eastbound on-ramp to I-126 would intersect a new overpass with a separation of approximately 375 feet. The westbound off-ramp would consist of a single lane diverging from I-126 at about the same location as the existing off-ramp and would intersect the new Colonial Life Boulevard interchange with a single right turn lane to northbound Colonial Life Boulevard. The eastbound on-ramp would consist of a single lane for traffic turning left from the Colonial Life Boulevard. This lane would be joined to its right by a lane carrying traffic from westbound I-26 to eastbound I-126. The two lanes would merge into a single lane that would enter eastbound I-126 at about the same location as the existing on-ramp.

The eastbound off-ramp would combine two ramps from I-26. One eastbound off-ramp would provide access to Colonial Life Boulevard for traffic traveling from eastbound I-26 to eastbound I-126. A new ramp would replace the existing ramp between westbound I-26 to eastbound I-126. Traffic on this ramp would be combined with traffic currently using the existing westbound off-ramp from I-26 that intersects Bush River Road opposite Morninghill Drive. This existing ramp to Bush River Road would be eliminated. As the ramp from westbound I-26 approaches Colonial Life Boulevard, traffic would be divided so that traffic continuing eastbound to enter I-126 would continue through the interchange unimpeded while the traffic traveling to Colonial Life Boulevard



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would run adjacent to the off-ramp from eastbound I-26/I-126, providing dual left turn lanes for traffic to travel north on Colonial Life Boulevard. Two lanes would be maintained across the overpass, through the westbound ramp intersection and would continue to the north on Colonial Life Boulevard.

Southbound Colonial Life Boulevard would extend two lanes into the interchange area approaching the westbound ramp intersection. At the westbound ramp intersection, southbound Colonial Life Boulevard would consist of a separate through lane that continues across the overpass to the eastbound ramp intersection and a separate right turn lane for traffic to turn onto the westbound on-ramp. The westbound on-ramp would depart from Colonial Life Boulevard with two lanes that separates traffic from the single southbound right turn lane on Colonial Life Boulevard. Of these two lanes, the left lane would provide access to westbound I-26, and the right lane would provide access to eastbound I-26. The lane to eastbound I-26 will merge with an off-ramp from westbound I-126 to eastbound I-26, which would be braided under the ramp to westbound I-26. The combined traffic would use either the existing flyover ramp from westbound I-126 to eastbound I-26, or a replacement flyover ramp constructed adjacent to and parallel with the existing ramp.

The ramp intersections with Colonial Life Boulevard are expected to be controlled by traffic signals. The initial AO52 concept evaluated is shown in **Figure 3-58**.

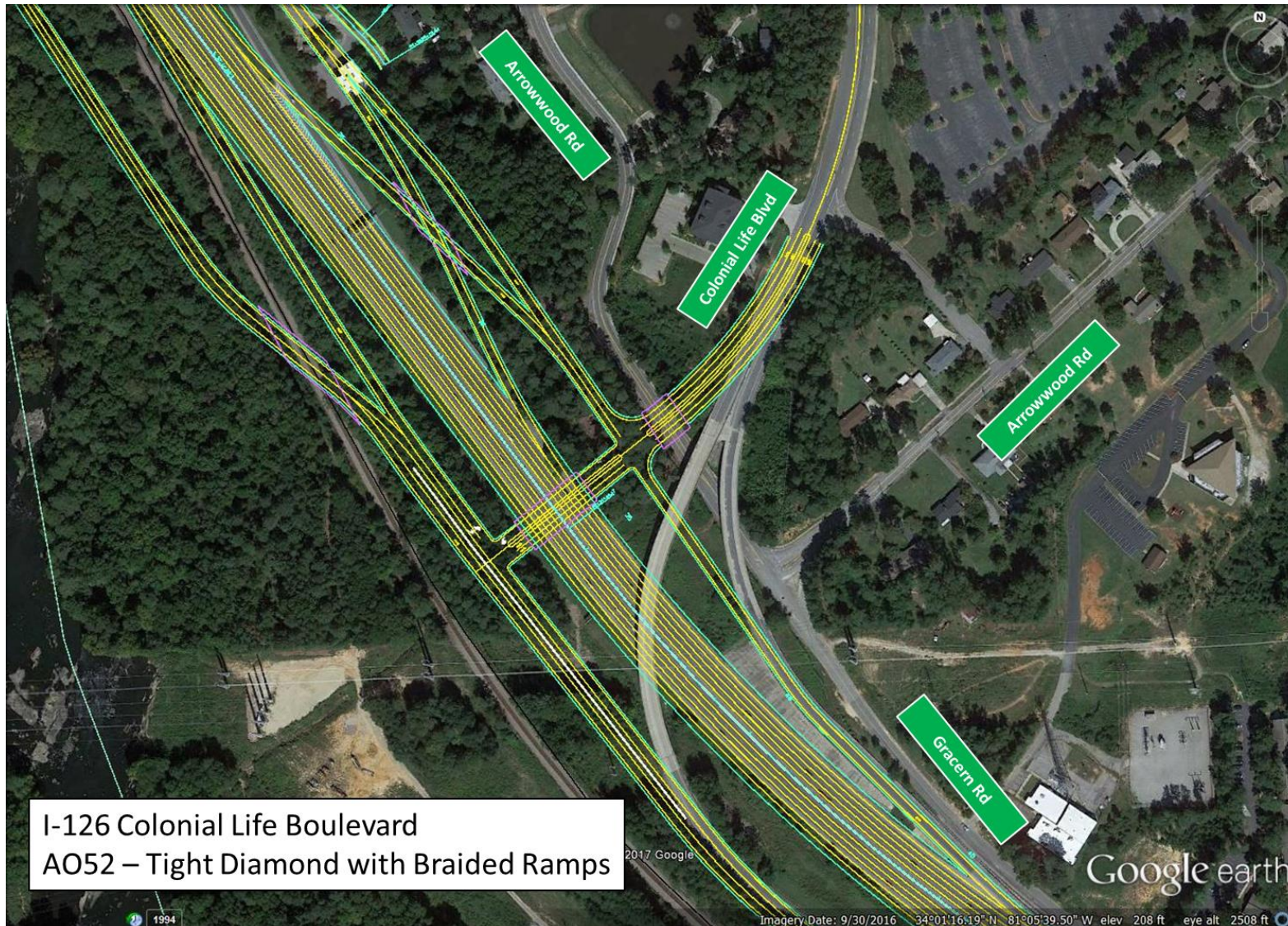
The capacity screening of AO52 was to incorporate the use of the detailed Synchro model developed to assess the operation of the proposed interchange configuration. While the capacity screening using the Synchro model indicated the ramp intersections would be under capacity under existing traffic, observations of simulations with existing afternoon peak hour traffic showed extensive queuing at the off-ramp approaches to the intersections.

As inputs into the detailed Synchro model, estimates of the existing traffic volume that would be rerouted from the current Exit 108 ramps to/from Bush River Road to the proposed interchange via Colonial Life Boulevard were calculated from existing peak hour turning movement counts at the ramp intersections. This resulted in a significant volume of traffic diverted to the proposed Colonial Life Boulevard full access interchange from the Bush River Road ramps at Exit 108.

For example, the existing off-ramp traffic to Bush River Road from eastbound and westbound I-26 would result in an estimated eastbound off-ramp left turn volume of about 850 vehicles during the morning peak hour and approximately 1,250 vehicles during the afternoon peak hour. Traffic currently using the eastbound on-ramp to eastbound I-26 (approximately 500 vehicles per hour in the morning peak hour and 600 vehicles per hour in the afternoon peak hour) and the traffic currently using the westbound on-ramp to westbound I-26 (approximately 150 vehicles per hour in the morning peak hour and 250 vehicles per hour in the afternoon peak hour) would combine (about 650 vehicles per hour total in the morning peak hour and about 850 vehicles per hour in the afternoon peak hour ) to turn right from southbound Colonial Life Boulevard on to the westbound on-ramp.

The rerouting of traffic also increased the estimated volume of several of the turning movements at the intersection of Colonial Life Boulevard with Bush River Road. For example, the existing northbound left turn volume from Colonial Life Boulevard to westbound Bush River Road was estimated to increase by approximately 400 vehicles per hour in the morning peak hour and 750 vehicles per hour in the afternoon peak hour due to the

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**Figure 3-58 - AO52: Colonial Life Boulevard Tight Diamond with Braided Ramps**

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re-routing of off-ramp traffic from the existing ramps to Bush River Road to the proposed Colonial Life Boulevard interchange. These volumes, added to existing traffic volumes at the Bush River Road intersection with Colonial Life Boulevard has the potential to overwhelm the operation of that intersection.

Other estimated volumes rerouted to and in addition to the existing traffic at the intersection of Colonial Life Boulevard and Bush River Road include the northbound right turn movement from Colonial Life Boulevard to eastbound Bush River Road (about 350 vehicles per hour in both the morning and afternoon peak hour), the eastbound right turn movement from Bush River Road to southbound Colonial Life Boulevard (about 400 vehicles per hour in the morning peak hour and 350 vehicles per hour in the afternoon peak hour), and the westbound left turn movement from Bush River Road to southbound Colonial Life Boulevard (about 300 vehicles per hour during the morning peak hour and about 550 vehicles per hour during the afternoon peak hour).

Based on the complexity of these movements and the alternative routing options available to traffic using the existing ramps to and from Bush River Road, it was decided that the assessment of the operation of AO52 should be based on the dynamic traffic assignment in the network microsimulation of the individual representative alternatives. This is likely to be more accurate than the 'all-or-nothing' rerouting of traffic assumed in the capacity screening. Therefore, AO52 was selected to be incorporated into the representative alternatives RA1 and RA5.

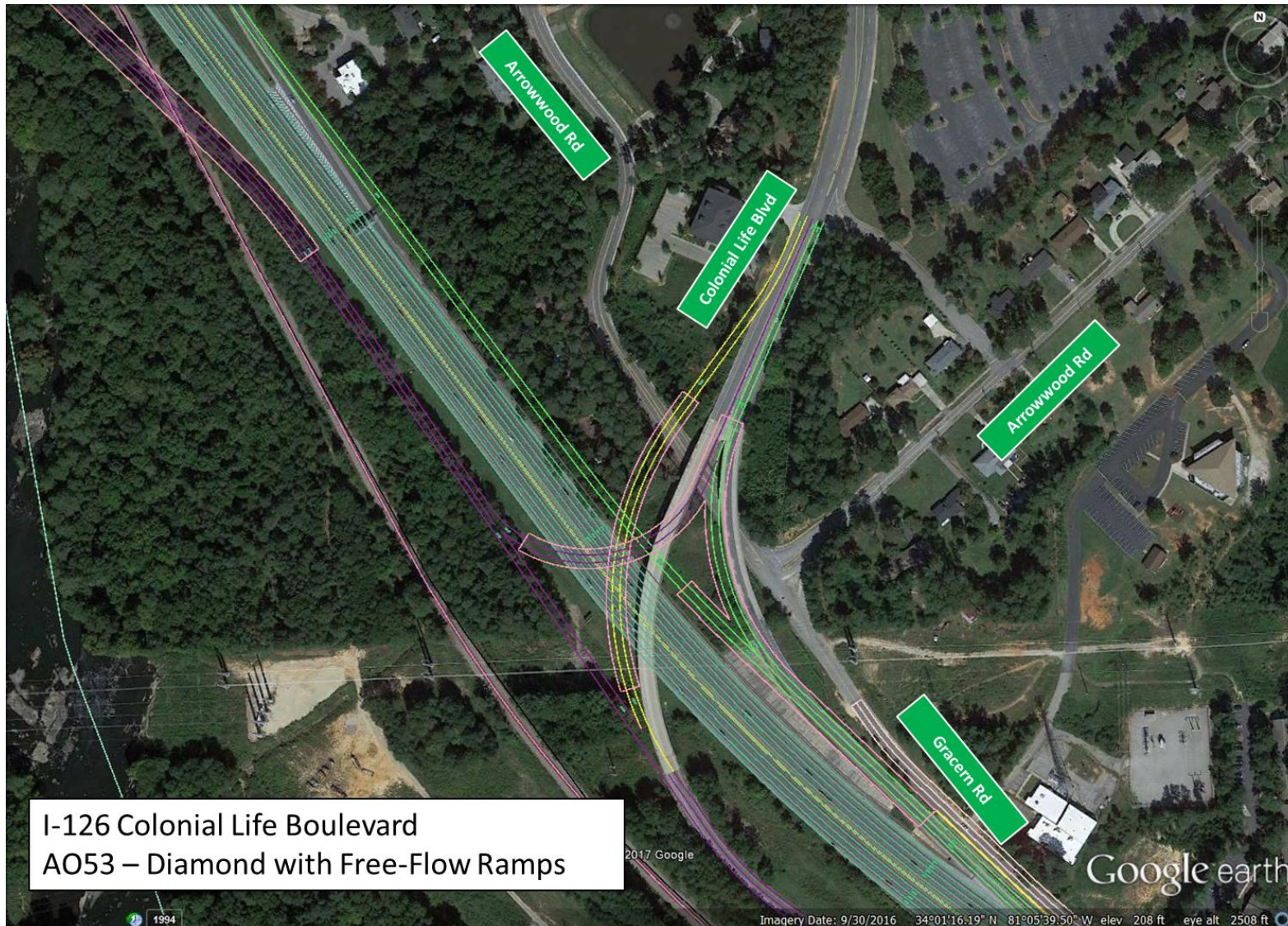
### 3.3.13.2 Colonial Life Boulevard AO53 – Diamond with Free-Flow Ramps

AO53 consists of a partially directional interchange that introduces modifications to the existing interchange configuration. The westbound off-ramp would consist of a two lane ramp diverging from I-126 at about the same location as the existing off-ramp. The off-ramp combines the traffic to the existing off-ramp to eastbound I-26 (left lane) and the traffic exiting to Colonial Life Boulevard. The existing eastbound on-ramp would consist of a single lane for traffic traveling from Colonial Life Boulevard to eastbound I-126 along a new alignment roughly parallel to the existing overpass and merging into eastbound I-126 at about the same location as the existing on-ramp.

An addition to the existing ramp modifications is the addition of a free-flow ramp from westbound I-26 to Colonial Life Boulevard. This two lane ramp would replace the existing one lane ramp and be on new alignment connecting westbound I-26 to eastbound I-126. As the ramp alignment runs parallel to and adjacent to eastbound I-126, the left lane crosses over I-126 and the eastbound on-ramp from Colonial Life Boulevard before merging into the westbound off-ramp lane to Colonial Life Boulevard. The right lane continues to merge with the eastbound on-ramp from Colonial Life Boulevard.

AO53 does not provide a ramp from Colonial Live Boulevard to either westbound I-26 or eastbound I-26. AO53 was developed as part of a larger concept that maintained access to Bush River Road from eastbound and westbound I-26 (AO26). The initial AO53 concept evaluated is shown in **Figure 3-59**. Based on the complexity of the ramp movements and necessary interaction with AO26, it was decided that the capacity assessment of AO53 should be based on the dynamic traffic assignment in the network microsimulation of the individual representative alternatives. AO53 was incorporated into the representative alternatives RA2, RA3, and RA6.

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**Figure 3-59 - AO53: Colonial Life Boulevard Diamond with Free-Flow Ramps**

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### 3.3.13.3 Colonial Life Boulevard AO54 – Tight Urban Diamond

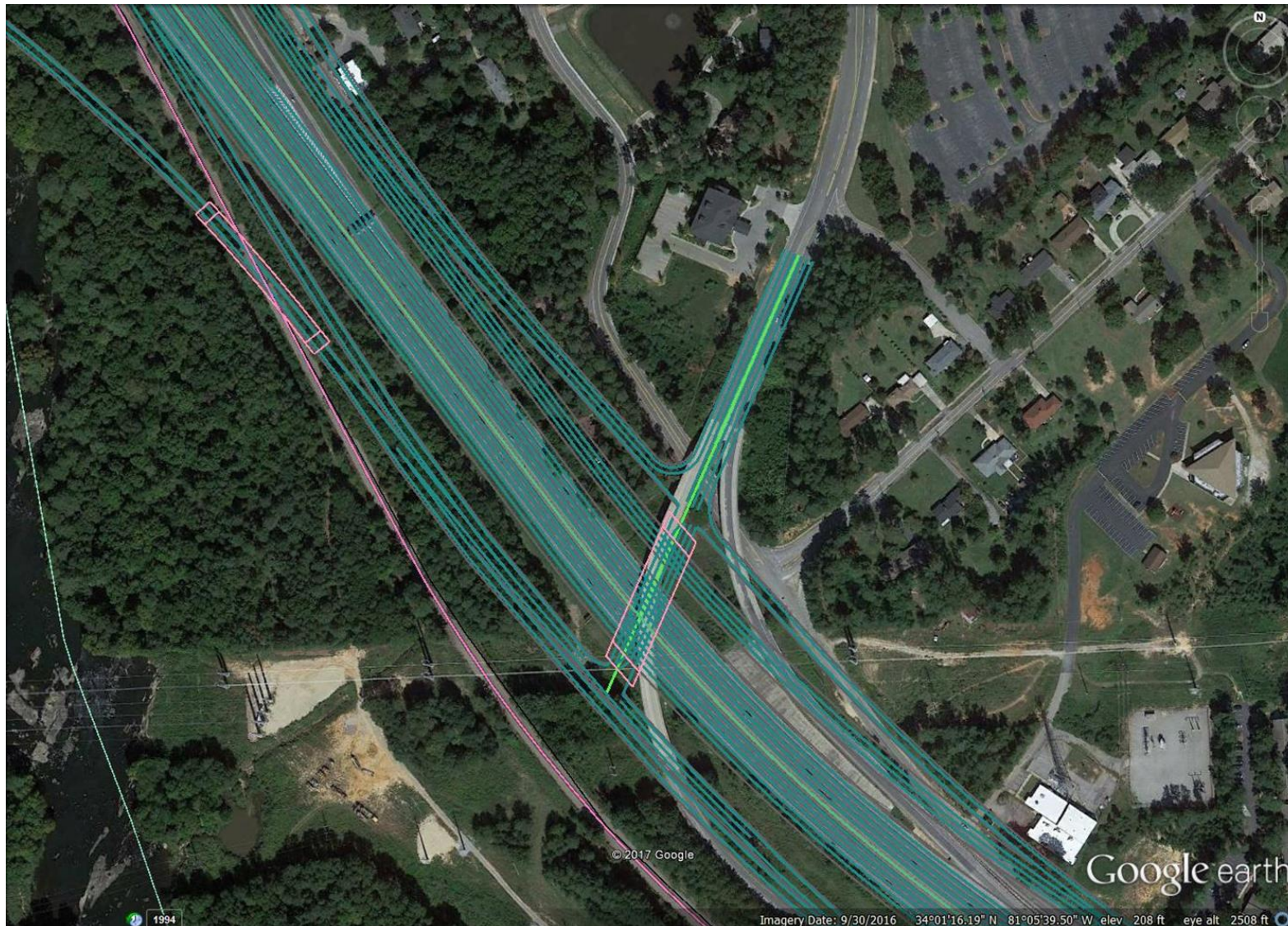
AO54 consists of a proposed fully directional tight urban diamond interchange (TUDI) without braided ramps that is included as part of AO27. Like AO52, AO54 provides access to/from Colonial Life Boulevard instead of the partial interchange providing access to/from I-126 towards the City of Columbia.

The westbound off-ramp from diverges from I-126 with two lanes which split downstream to a two lane ramp to eastbound I-26 and a single lane off-ramp which intersects Colonial Life Boulevard with a right turn lane for traffic to turn onto northbound Colonial Life Boulevard. The westbound on-ramp begins with a single separate southbound right turn lane from Colonial Life Boulevard creating a two lane ramp. Downstream, the ramp splits, with the left lane merging into the two lane ramp to eastbound I-26 and the westbound AO27 connector and the right lane continuing westbound to merge into westbound I-126 before continuing on to merge into westbound I-26.

The eastbound off-ramp to Colonial Life Boulevard is made up of two lanes: one lane originates from the proposed eastbound connector developed in AO27 and the other from eastbound I-126. The ramp from the connector splits into two separate lanes. The right lane continues unimpeded through the Colonial Life interchange area to towards eastbound I-126 and the left lane runs parallel to and joins the ramp from eastbound I-126 to form two left turn lanes at the Colonial Life Boulevard interchange overpass. The overpass carries two lanes northbound from these left turn lanes through the interchange area to northbound Colonial Life Boulevard. The eastbound on-ramp begins as a single southbound left turn lane that is the end of the single lane crossing through the interchange area. This lane creates the on-ramp, which merges downstream with the ramp from the connector that crosses through the interchange area to a single lane ramp that enters eastbound I-126.

The initial AO54 concept evaluated is shown in **Figure 3-60**. Based on the complexity of the ramp movements and necessary interaction with AO27, it was decided that the capacity assessment of AO54 should be based on the dynamic traffic assignment in the network microsimulation of the individual representative alternatives. AO54 was incorporated into the representative alternative RA7.

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**Figure 3-60 - AO54: Colonial Life Boulevard Tight Diamond Interchange**

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### 3.4 Development of Representative Alternatives

With the completion of the development and capacity assessments of the various AO, the project team began the development of Representative Alternatives. The Representative Alternatives were developed to incorporate various combinations of AO at each of the interchanges throughout the study area to create a set of comprehensive project area networks that represent proposed improvement options within the Carolina Crossroads study area. The process of the development and evaluation of the various representative alternatives is described in more detail in Section 4.5 of the *Alternatives Development and Screening Report*. A brief summary of that process follows.

#### 3.4.1 DEVELOPMENT OF REPRESENTATIVE ALTERNATIVES

The project team developed a set of nine combinations of AO at the interchanges within the study area. The roadway designers and engineers created the necessary additional roadway connections to make the individual AO function as an independent network. When the individual networks, numbered from RA1 to RA9, were conceptually designed, microsimulation traffic models were constructed for each of the concepts.

The microsimulation traffic models were developed by modifying the existing/no-build networks (designated as RA10) to maintain as much of the unchanging elements of those networks while modifying and adding links to the network as necessary to replicate the individual RA network conceptual designs.

**Table 3.6** summarizes the AO combinations incorporated into RA1 through RA9.

**Table 3.6 - Representative Alternatives**

Representative Alternative*	1	2	3	4	5	6	7	8	9
I-20/26/126 System/System	AO17 Turbine	AO18 Directional w/ Interior Rights	AO21 Turbine Braided	AO22 Semi-Dir w/ 2 Loops	AO20 Turbine Directional	AO19 Directional w/ Loop & Ramp	AO27 E-W Connector	AO28 E-W Connector Bush River	AO29 Southern Connector
I-20/Broad	AO3	AO5	AO5	AO3	AO3	AO5	AO5	AO3	AO3
I-20/Bush	AO6	AO10	AO6	AO7	AO8 (5)	AO7	AO8	AO8	AO10
I-26/Bush	AO24	AO24	AO26	AO25	AO24	AO24	AO24	AO24	AO29
I-26/378	AO46	AO47	AO46	AO46	AO46	AO47	AO46	AO46	AO46
I-26/St. Andrews	AO13	AO14 (3)	AO16	AO15	AO13	AO14	AO13	AO13	AO15
I-26/Piney Grove	AO30	AO31	AO32	AO32	AO30	AO31	AO30	AO31	AO32
I-26/Harbison	AO35	AO37	AO49	AO35	AO35	AO37	AO49	AO35	AO49
I-26/Lake Murray	AO50	AO42	AO50	AO50	AO50	AO42	AO50	AO50	AO50
I-26/Broad	AO51	AO45	AO43	AO51	AO51	AO43	AO51	AO51	AO51
East-West Connector	NA	NA	NA	NA	NA	NA	AO27	AO28	AO29(2)

\* Alternative 10 - 'No-build' or 'Do Nothing' Alternative is retained for comparison purposes.

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### 4 Microsimulation Traffic Modeling

A series of traffic analyses were performed to assess existing and future operations of the I-26/I-20/I-126 study area. The analyses included:

- A traffic forecasting analysis to estimate future no-build and build condition traffic volumes
- Freeway segment operations analysis for existing, future no-build and future representative alternatives
- Freeway ramp merge/diverge area analysis for existing, future no-build and future representative alternatives
- Signalized and unsignalized intersection analysis for existing, future no-build and future representative alternatives

The individual interchanges were modeled using Synchro/SimTraffic to analyze and simulate the arterial and intersection operations and to aid in the development of traffic control and geometric recommendations. Traffic simulation models were created for the entire study area and at individual interchange locations for the existing, future no-build, and future representative alternatives. The entire study area was modeled using TransModeler 4.0, a micro-simulation software, to analyze and simulate the freeway operation.

#### 4.1 Regional Microsimulation Network

A traffic microsimulation model was developed by Stantec for use in the I-20/26/77 Corridor Management Plan study. This calibrated Columbia model was provided to the Carolina Crossroads team for use in these analyses. The draft *Traffic Microsimulation Model Calibration Report* prepared by Stantec is included in Appendix K.

#### 4.2 Additional Data Collection

In order to further develop the microsimulation network, additional data was collected, including traffic volume data, traffic signal plans and traffic signal timing plans.

##### 4.2.1 DATA COLLECTION LOCATIONS

- Bower Parkway at Park Terrace Drive
- Broad River Road at Arrowwood Road/Means Avenue
- Broad River Road at Dutch Square Boulevard
- Broad River Road at Greystone Boulevard
- Broad River Road at Longcreek Drive
- Broad River Road at Marley Drive/Menlo Drive
- Broad River Road at Omarest Drive
- Bush River Road at Arrowwood Road
- Bush River Road at Ashland Road/Marydale Lane
- Bush River Road at Broad River Road
- Bush River Road at Colonial Life Boulevard
- Bush River Road at Independence Avenue
- Bush River Road at Outlet Pointe Boulevard
- Bush River Road at Zlmalcrest Drive



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- Columbiana Drive at Columbia Avenue/Gateway Academy Driveway
- Columbiana Drive at Columbiana Circle/Lanneau Court
- Columbiana Drive at Crossbow Drive/Texas Roadhouse Driveway
- Harbison Boulevard at Bower Parkway
- Harbison Boulevard at Columbiana Circle/Park Terrace Drive
- Harbison Boulevard at Columbiana Drive/Chick-Fil-A Driveway
- Harbison Boulevard at Rooms 2 Go/Pier 1 Driveways
- Harbison Boulevard/Emory Lane @ St Andrews Road
- Lake Murray Boulevard at College Street
- Lake Murray Boulevard at Columbiana Drive
- Lake Murray Boulevard at Kinley Road/Parkridge Drive
- Piney Grove Road at Bower Parkway/Jamil Road
- St Andrews Road at Sidney Road
- St Andrews Road at Ashland Road
- St Andrews Road at Broad River Road
- St Andrews Road at Jamil Road
- St Andrews Road at Kay St/Chartwell Road
- Sunset Boulevard at East Hospital Drive
- Sunset Boulevard at McSwain Drive/Chris Drive
- Sunset Boulevard at West Hospital Drive/Sunset Court
- Sunset Boulevard at Whippoorwill Drive/Keckley Drive

### 4.3 Existing Microsimulation Network

TransModeler 4.0 was used to analyze the Carolina Crossroads study area. The I-20/26/77 Corridor Management Plan (CMP) Study included a calibrated TransModeler model comprised of 110 miles of interstate and freeway, including six system interchanges and 43 service interchanges, in addition to 70 miles of highway, arterial, and local streets. This Columbia network, which included the full project limits of the Carolina Crossroads study area, was provided to develop the existing microsimulation network. Once the Columbia model was reviewed, the Carolina Crossroads network was extracted. A more detailed review was then conducted to assess the operation of the study area. Additional intersections were added, and input volume was verified and adjusted based on existing traffic count data.

#### 4.3.1 REVIEW OF CORRIDOR NETWORK

The I-20/26/77 CMP Columbia model was reviewed as part of the preliminary process of modifying the network. The Carolina Crossroads study area roadway network was reviewed for geometry, lane use, and intersection control based on existing conditions.

#### 4.3.2 DEVELOPMENT OF CAROLINA CROSSROADS NETWORK

The Carolina Crossroads existing network was extracted from the calibrated Columbia network. Freeways and arterials outside of the study area were removed from the model to develop a condensed microsimulation network. All entry and exit points, such as external nodes and centroids within the study area were preserved.

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### 4.3.3 DEVELOPMENT OF ORIGIN-DESTINATION TRIP TABLE

The origin-destination (O-D) trip tables included in the Columbia network from the I-20/26/77 CMP were comprised of 170 external nodes and 65 centroids for a total of 235 unique entry and exit points. These unique entry and exit points were developed from subarea trip matrices output from the South Carolina Statewide Model (SCSWM) and directly correlate with the centroid connectors within the planning model. According to the I-20/27/77 CMP study, the AM and PM peak hour existing trip tables were then estimated based on the subarea seed trip tables of the SCSWM along with traffic counts in the TransModeler's Origin Destination Matrix Estimation (ODME) procedure. The dimensions of the trip matrices were 235 by 235. The origin-destination matrix development and matrix estimation procedure are discussed in section 2.4 of the I-20/26/77 CMP draft *Traffic Microsimulation Model Calibration Report*.

Within the Columbia network, auto and truck trip matrices were separated based on their own vehicle fleet characteristics. Auto trip matrices included "User A" and "User B" vehicles that accounted for the volume using the I-126 WB expressway to I-20 EB/WB. Each trip matrix from the Columbia network was then aggregated down matching the condensed existing model for Carolina Crossroads. External nodes which were removed as part of the modification to the study area network were combined, and their trips were assigned to the ten (10) newly created external nodes. Those external nodes are as follows:

- I-20 WB West of Exit 61
- I-20 EB West of Exit 61
- I-26 EB West of Exit 101
- I-26 WB West of Exit 101
- I-20 EB East of Exit 68
- I-20 WB East of Exit 68
- I-26 SB South of US 378 (Exit 110)
- I-26 NB South of US 378 (Exit 110)
- I-126 EB End of I-126
- I-126 WB End of I-126

The aggregation of the trip tables between the Columbia network and the Carolina Crossroads network was an iterative process, and as the model was adjusted during the calibration process, further modifications were required. This resulted in a final dimension of the trip matrices to be 102 x 102, including 56 external nodes and 46 centroids.

## 4.4 Arterial Microsimulation

The individual interchanges were modeled using Synchro/SimTraffic to analyze and simulate the arterial and intersection operations and to aid in the development of traffic control and geometric recommendations. The arterials coded into the TransModeler network were verified and adjusted based on existing conditions and collected traffic data. It was identified that the Columbia network was modeled to be high level along the arterials and did not include all of the signalized intersections within the Carolina Crossroads study area. Additional intersections were coded into the network that were missing from the Columbia network. The



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purpose of adding these intersections, were to reflect a more realistic and detailed model for calibration purposes.

### 4.4.1 CREATION OF INTERCHANGE ARTERIAL NETWORKS

Synchro models of the existing arterial interchanges were created utilizing the previously collected traffic counts, signal plans and signal timing plans. These models were used to analyze arterial and intersection operations for major corridors within the network.

## 4.5 Microsimulation Model Calibration

Model calibration deals with refining the model's operation through observation of the simulation and detection of probable anomalies in the output and trip tables. Parameters in each model are modified through an iterative process so that observed traffic conditions, like travel speeds and link flows, are more accurately matched to predefined criteria.

### 4.5.1 REVIEW OF MICROSIMULATIONS

INRIX speed data provided for the Carolina Crossroads project and observations of queueing and speed along the I-20 corridor from the I-20/26/77 CMP were used to calibrate the Existing Conditions AM and PM peak hour models. General parameters, such as stopped gap and critical distance, were maintained from the Columbia network which is further described in section 3.1.2 of the I-20/26/77 CMP draft *Traffic Microsimulation Model Calibration Report*. Additional local parameters, such as lane connector bias at merge points and link speeds, were adjusted to improve free-flow speed and match INRIX data along the interstate mainlines. **Table 4-1** summarizes the changes in freeway driver behavior parameters.

**Table 4-1: Calibration Parameter Assumptions**

Parameter	Calibration Change
Stopped Gap	The mean distance was decreased from 8 feet to 6 feet.
Critical Distance	Decreased by 750 feet, to ranging from between 500 feet to 2,750 feet.
Lane Bias at Merge Points	Decreased from 1.00 to 0.60.
Link Speed	Adjusted link speeds to match INRIX data for select links.

During visual inspection of the simulation model, the point where interstate I-126 terminates approaching downtown Columbia processed the vehicles at a faster rate than observed during the AM peak hour. As a result, volume was added along Huger Street to simulate observed traffic flow conditions. Also at Exit 58 (US 1), off-ramp right-turn movement could not process the input vehicles when coded as a STOP sign. Though STOP signs currently control the off-ramp right-turn movement, YIELD signs were used for calibration purposes to simulate realistic driver behavior for vehicles exiting I-20.

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### 4.5.2 CALIBRATION RESULTS

#### Calibration Criteria

Page 64 of the *FHWA Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software* outlines the microsimulation model calibration criteria developed by WDOT, which includes three metrics: traffic flow, travel times, and visual audits. Formulas for the first two metrics verify that the criteria thresholds are not violated, while satisfaction of the third depends on engineering judgement.

*Appendix B: Confidence Intervals* of the *FHWA Guidelines* suggests that, to account for the stochastic nature of traffic and to ensure that the mean statistics taken from the model are within an acceptable confidence interval of the true mean, each model should be run a certain number of randomly seeded runs. Based on the standard deviation of a sample of link speeds and flows from the TransModeler networks, it was determined that at least ten (10) simulation runs per model are required to maintain a 95% confidence interval.

#### Traffic Flow

Existing traffic flows on the mainline segments and interchange ramps were compared to the average link flows from the microsimulation runs at the same locations for both the AM and PM peak periods. In addition to an overall comparison of total model flow to total count volume, the *FHWA Guidelines* divide volumes into three categories, with separate criteria for each. The Guidelines also include the GEH statistic, computed as follows:

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

In which:

$E$  = model estimated volume

$V$  = field count

**Table 4-2** depicts the comparison of the mainline and ramp count locations for the morning and afternoon peak period models, inclusive of the calibration targets and flow statistics.



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**Table 4-2: Traffic Flow Calibration Statistics**

Hourly Flows - Model v. Observed	Target	AM Peak Hour		PM Peak Hour	
		Total Links	% of Cases	Total Links	% of Cases
Individual Link Flows					
Within 15% for 700 veh/h < flow < 2700 veh/h	> 85% of cases	30	87%	27	85%
Within 100 veh/h for flows < 700 veh/h	> 85% of cases	56	86%	57	72%
Within 400 veh/h for flows > 2700 veh/h	> 85% of cases	32	88%	34	74%
Average Link Flows Criteria Compliance	> 85% of cases	118	86%	118	75%
Sum of All Links					
Sum of Link Flows	Within 5% of sum of all link counts		211,167		213,909
Sum of Counts			208,140		223,305
% Difference [abs(flow - count)/count]			1.45%		4.21%
Links with GEH statistic < 5	> 85% of cases	118	100%	112	95%

As shown in **Table 4-2**, the flow statistics satisfied the range of criteria targets for each volume category during the morning peak hour. During the afternoon peak hour, link flows fall slightly short of satisfying the range of criteria for link volumes less than 700 veh/h and link volumes greater than 2,700 veh/hr. It is worth noting, however, that the network-wide cumulative link flow difference during afternoon peak hour is within 5% of the counts. In addition, 95% of all links fall within a GEH value of less than five (5) in both the morning and afternoon peak hour models, satisfying the threshold.

### Travel Speeds

The *FHWA Guidelines* suggest comparing the modeled vehicle travel speeds to those collected in the field; the modeled speeds should fall within 15% of the existing ones for greater than 85% of the segments to consider a model calibrated. Travel speeds for specific routes, however, are not provided in TransModeler outputs; rather, travel speeds are obtained from the simulation and compared with the model input speeds. **Table 4-3** provides a summary of the network segments and the percentage of which met the 15% threshold.

**Table 4-3: Travel Speeds Calibration Statistics**

Target	AM Peak Hour		PM Peak Hour	
	Segments	Within 15%	Segments	Within 15%
Within 15% of observed travel speeds	36	30	36	27
		83.33%		75.00%

Although the travel speeds do not fully meet the 85% target threshold, it should be noted that the I-20/I-26/I-126 system interchange was modeled to capture observed queues documented in the field. The corresponding speeds are, in general, slower than the INRIX data, therefore allowing for a more conservative analysis of Existing conditions. A summary of the link flows, speeds, and observed queues are provided in **Appendix F**.

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### Visual Audits

Visual audits were conducted by observing simulation runs while referring to recorded field traffic conditions, with the review focusing on vehicle speeds and queuing along the interstates, in addition to any related on- and off-ramps. Specific adjustments made to the Columbia network from the I-20/26/77 CMP study were maintained and verified within the Carolina Crossroads study are. The visual audit helped to identify TransModeler default parameters, including free flow speeds and headways, to be updated and better calibrate the network to existing conditions.

## 4.6 No-Build Microsimulation Network

The 2040 No-Build microsimulation network included SCDOT programmed projects to reflect additional capacity along I-20 and I-26. The 2040 No-Build volumes were developed using a 0.70 percent annual growth rate from the I-20/26/77 CMP study.

### 4.6.1 PROGRAMMED PROJECTS

The programmed and funded freeway projects incorporated into the existing network to create the No-Build network include:

- I-20 Widening MM49 – MM60 (west of Exit 61)
- I-26 Widening MM85 – MM101 (west of Exit 101)

### 4.6.2 ORIGIN-DESTINATION TRIP TABLES

The socio-economic data used in the SCSWM was developed as part of the Columbia Area Transportation Study (COATS) *Moving the Midlands 2040 Long Range Transportation Plan*, August 2015. The 2040 socio-economic data was developed using 2010 census information that was disaggregated to the individual traffic analysis zones. The 2040 socio-economic data forecasts were developed by establishing control numbers disaggregated to census tracts and further disaggregated to traffic analysis zones based on growth and development trend analyses. Other information from local and regional plans were also incorporated, with the 2010 base year and 2040 horizon year data reviewed, approved and adopted for use in the Long Range Transportation Plan.

The land use data in the SCSWM were updated in July 2015 based on COATS employment estimates and amended by SCDOT. Additional revisions to the land use data were made in April 2016 based on COATS and SCDOT guidance and validated by the I-20/26/77 CMP study team. These data were used in SCSWM runs by the I-20/26/77 CMP study team and existing year and 2040 origin-destination trip tables were produced.

According to the I-20/27/77 CMP study, the AM and PM peak hour 2040 trip tables for the Columbia network were developed based on the subarea analysis of the SCSWM trip tables. The zonal growth rates between the subarea base year and subarea future year matrices were applied to the calibrated Columbia Network existing trip tables to develop the 2040 trip tables. Any intrazonal shifts in traffic over time from the current and future year subarea matrices were distributed to ensure that the intended 2040 growth forecasts from the SCSWM were reflected in the 2040 trip tables for the peak hour operational analyses. These 2040 auto trip tables were



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acquired from the I-20/26/77 CMP study model which were then aggregated to match the Carolina Crossroads matrix developed for the Existing Conditions model. An average growth rate of 0.70 percent was then confirmed within the Carolina Crossroads study area and applied to the existing trip tables.

### 4.7 No-Build Arterial Microsimulation

Upon completion of the Existing arterial Synchro networks, 2040 traffic projections were applied to develop the No-Build arterial network models. Existing configurations were maintained.

### 4.8 Analysis of Existing and No-Build Models

The freeway, merge and diverge densities for the I-26, I-20, and I-126 segments were obtained from the TransModeler microsimulation output files, which include an average of ten (10) runs. In calculating density TransModeler determines the segments and lanes within the influence area for freeway, merge and diverge analysis based on roadway classification. The HCM methodology is applied, considering only the vehicles within the influence area.

Unlike HCS, a macroscopic/deterministic model, TransModeler is a microscopic behavior-based multi-purpose traffic simulation program. TransModeler accounts for the interaction between the passenger cars and other vehicle types within the traffic stream, while HCS does not. In TransModeler, the density is calculated at each time step of the simulation for the entire peak hour per iteration, and is considered to be a more accurate measure of density.

It should be noted that due to the high demand volumes, the network was not able to accommodate the demand volume in both the Existing and No-Build simulations. Extensive queuing was observed outside of the network, particularly in the No-Build scenario, at the end of the peak hour simulation during both the morning and afternoon peak hours.

#### 4.8.1 EXISTING NETWORK RESULTS

##### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 4-4**, **Table 4-5** and **Table 4-6** for I-26, I-20 and I-126, respectively.

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**Table 4-4: I-26 Freeway Segment Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101 to Exit 102	C	26.0	B	18.0
Exit 102 to Exit 103	F	53.6	C	25.5
Exit 103 to Exit 104	F	52.7	C	24.8
Exit 104 to Exit 106	F	62.6	E	42.1
Exit 106 to Exit 107	F	78.9	D	32.1
I-126 Diverge to I-126 Merge	D	32.5	E	38.7
Exit 108 to Exit 110	D	32.2	F	74.3
<b>I-26 Westbound</b>				
Exit 110 to Exit 108	C	20.9	C	23.7
I-126 Diverge to I-126 Merge	D	34.5	F	85.2
Exit 107 to Exit 106	D	27.8	F	110.5
Exit 106 to Exit 104	D	34.4	F	47.8
Exit 104 to Exit 103	D	27.5	E	40.5
Exit 103 to Exit 102	C	22.5	E	36.1
Exit 102 to Exit 101	B	15.5	F	62.0

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-5: I-20 Freeway Segment Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
west of Exit 61	E	44.6	C	21.3
Exit 61 to Exit 63	D	32.6	C	18.8
Exit 63 to Exit 64	C	19.1	B	13.6
Exit 64 to Exit 65	C	25.0	C	21.1
Exit 65 to Exit 68	E	35.7	D	27.3
<b>I-20 Westbound</b>				
Exit 68 to Exit 65	D	29.3	F	51.1
Exit 65 to Exit 64	E	38.0	F	75.8
Exit 64 to Exit 63	B	12.9	C	21.4
Exit 63 to Exit 61	B	14.3	D	27.2
west of Exit 61	B	15.6	D	34.1

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-6: I-126 Freeway Segment Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
I-26 to Colonial Life Blvd	D	29.9	B	14.6
Colonial Life Blvd to Greystone Blvd	B	15.7	A	8.6
Greystone Blvd to Huger St	D	26.8	B	13.6
<b>I-126 Westbound</b>				
Huger St to Greystone Blvd	B	13.4	D	26.9
Greystone Blvd to Colonial Life Blvd	B	13.7	F	61.1
Colonial Life Blvd to I-26	C	18.6	F	97.1

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The analysis results for the freeway segments, summarized in **Table 4-4**, **Table 4-5** and **Table 4-6**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segments between Exit 103 and Exit 107 operate at LOS F. All other segments along I-26 eastbound, and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segment west of Exit 61, and the freeway segment east of Exit 68, and the westbound I-20 freeway segment between Exit 65 and Exit 64 operate at LOS E, while other I-20 segments operate at LOS D or better.
  - All I-126 freeway segments during the morning peak hour operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound freeway segment between Exit 104 and Exit 106, and the diverge to I-126 operate at LOS E, while the freeway segment between Exit 108 and Exit 110 operate at LOS F. I-26 westbound segments operate at LOS E or worse from the I-26/I-126 merge to Exit 101.
  - I-20 eastbound freeway segments operate at LOS D or better. I-20 westbound freeway segments between Exit 68 and Exit 64 operate at LOS F, while all other westbound segments operate at LOS D or better.
  - I-126 eastbound freeway segments operate at LOS B or better, while I-126 westbound freeway segments operate at LOS D or worse.

### Ramp Merge Analysis

A summary of the Ramp Merge Analyses results is shown in **Table 4-7**, **Table 4-8** and **Table 4-9** for I-26, I-20 and I-126, respectively. The merge analysis results for the eastbound on-ramp at Exit 101 and the westbound on-ramp from Exit 102 are summarized in these tables although each ramp are the entry lanes of existing weaving sections between Exit 101 and Exit 102.

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**Table 4-7: I-26 Ramp Merge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101	C	26.0	B	18.0
Exit 102	F	52.7	C	24.8
Exit 103	F	64.3	C	27.2
Exit 104	F	61.2	D	32.7
Exit 106 Loop	F	54.2	E	35.4
Exit 106	F	78.9	D	32.1
Exit 107 Loop	F	54.2	E	35.4
Exit 107	F	79.8	D	32.0
Exit 108	D	33.9	E	40.8
Exit 108 (I-126)	C	23.1	E	36.7
Exit 110	B	14.8	B	17.7
<b>I-26 Westbound</b>				
Exit 110	B	13.8	B	19.1
Exit 108 (I-126)	E	37.1	F	144.5
Exit 108	C	24.8	F	107.6
Exit 107 Loop	C	26.3	F	104.2
Exit 107	C	27.8	F	110.5
Exit 106	C	23.9	E	36.2
Exit 104	B	19.3	D	32.2
Exit 103	C	21.1	E	37.0
Exit 102	B	15.5	F	62.0
Exit 101	C	21.0	F	93.2

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-8: I-20 Ramp Merge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
Exit 61 Loop	C	24.9	B	14.7
Exit 61	D	29.2	B	16.6
Exit 63 Loop	C	20.2	B	14.5
Exit 63	B	18.9	B	13.4
Exit 64 Loop	D	32.9	C	25.7
Exit 64	C	24.3	C	20.6
Exit 65	D	32.7	C	23.7
Exit 68	C	26.6	C	22.3
<b>I-20 Westbound</b>				
Exit 68	C	21.0	D	33.0
Exit 65	E	38.0	F	75.8
Exit 64 Loop	B	19.4	C	26.8
Exit 64	B	12.9	C	21.4
Exit 63	B	12.6	C	22.6
Exit 61	B	12.6	D	30.0

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-9: I-126 Ramp Merge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
Colonial Life Blvd	B	15.7	A	8.6
Greystone Blvd	B	19.5	B	10.1
<b>I-126 Westbound</b>				
Greystone Blvd	B	11.6	D	30.6

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The analysis results for the ramp merge areas, summarized in **Table 4-7**, **Table 4-8** and **Table 4-9**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge areas between Exit 102 and Exit 107 operate at LOS F, while I-26 westbound merge area at Exit 108 operates at LOS E. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 65, where the merge area operates at LOS E.
  - I-126 merge areas during the morning peak hour operate at LOS B.
- During the afternoon peak hour:
  - I-26 eastbound merge areas between Exit 104 and Exit 108 operate at LOS D or E, while all other segments operate at LOS C or better. All I-26 westbound merge areas operate at LOS E or worse with the exception of Exit 110 and Exit 104 merge areas which operate at LOS B and LOS D, respectively.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 65, where the merge area operates at LOS F.
  - I-126 merge areas during the evening peak hour operate at LOS D or better.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analyses results is shown in **Table 4-10**, **Table 4-11** and **Table 4-12** for I-26, I-20 and I-126, respectively. The diverge analysis results for the eastbound off-ramp at Exit 102 and the westbound off-ramp from Exit 101 are summarized in these tables although each ramp are the exit-only lanes of existing weaving sections between Exit 101 and Exit 102.

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**Table 4-10: I-26 Ramp Diverge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101	E	40.2	C	25.6
Exit 101 Loop	C	22.0	B	16.5
Exit 102	C	26.0	B	18.0
Exit 102 Loop	C	24.8	B	18.9
Exit 103	F	53.6	C	25.5
Exit 104	F	65.2	D	28.4
Exit 106	F	51.7	D	30.9
Exit 107	F	78.9	D	32.1
Exit 107 Loop	F	54.2	E	35.4
Exit 108	F	79.8	D	32.0
I-26 to I-26	F	52.6	E	39.8
Exit 110	F	46.6	F	89.7
<b>I-26 Westbound</b>				
Exit 110	C	22.8	C	24.6
Exit 108	C	24.8	F	107.6
Exit 107	C	24.8	F	107.6
Exit 107 Loop	C	26.3	F	104.2
Exit 106	C	27.8	F	110.5
Exit 106 Loop	C	26.3	F	85.9
Exit 104	D	29.2	E	41.0
Exit 103	B	18.8	D	29.2
Exit 102	C	20.2	E	38.4
Exit 102 Loop	B	16.7	D	34.6
Exit 101	B	15.5	F	62.0
Exit 101 Loop	B	12.2	F	75.2

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-11: I-20 Ramp Diverge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
Exit 61	E	37.1	B	19.5
Exit 63	F	54.2	C	23.0
Exit 64	B	19.1	B	13.6
Exit 64 Loop	D	32.9	C	25.7
Exit 65	C	25.0	C	21.1
Exit 68	E	36.2	C	25.0
<b>I-20 Westbound</b>				
Exit 68	D	29.5	E	35.3
Exit 65	B	19.8	C	25.1
Exit 64	E	38.4	F	76.5
Exit 64 Loop	B	19.4	C	26.8
Exit 63	B	12.9	C	21.4
Exit 61	B	18.0	E	41.4

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-12: I-126 Ramp Diverge Capacity Analysis TransModeler Results – Existing Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
Greystone Blvd	B	15.4	A	9.9
<b>I-126 Westbound</b>				
Greystone Blvd	B	15.2	C	27.8
Colonial Life Blvd	B	11.5	E	35.3

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The analysis results for the ramp diverge areas, summarized in **Table 4-10**, **Table 4-11** and **Table 4-12**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas between Exit 103 and Exit 110 operate at LOS F, while the Exit 101 diverge area operates at LOS E. All other ramp merge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound diverges areas operate at LOS D or better with the exception of Exit 61, Exit 63 and Exit 68, where the diverge areas operates at LOS E, LOS F and LOS E, respectively. I-20 westbound diverge areas operate at LOS D or better with the exception of Exit 64, which operates at LOS E.
  - All I-126 diverge areas during the morning peak hour operate at LOS B.
- During the afternoon peak hour:
  - I-26 eastbound diverge areas between Exit 104 and Exit 108 operate at LOS D or E, while the diverge area of Exit 110 operates at LOS F. All other eastbound segments operate at LOS C or better. All I-26 westbound diverge areas operate at LOS E or worse with the exception of Exit 110 and Exit 103 and the Exit 102 loop ramp areas which operate at LOS C, LOS D and LOS D, respectively.
  - I-20 eastbound diverge areas operate at LOS C or better. The westbound diverge areas operate at LOS C with the exception of Exit 64, which operates at LOS F and Exit 68 and Exit 61 which operate at LOS E.
  - I-126 diverge areas at Colonial Life Blvd operates at LOS E, while all other diverge areas operate at LOS C or better.

### 4.8.2 NO-BUILD NETWORK RESULTS

The No-Build Alternative assessment can be found in section 4.5.2.1 of the *Alternatives Development and Screening Report*.

#### Basic Freeway Segment Analysis

A summary of the No-Build Basic Freeway Segment Analysis results is shown in **Table 4-13**, **Table 4-14** and **Table 4 15** for I-26, I-20 and I-126, respectively.

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**Table 4-13: I-26 Freeway Segment Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101 to Exit 102	F	126.8	C	22.8
Exit 102 to Exit 103	F	118.2	D	30.1
Exit 103 to Exit 104	F	123.0	D	29.4
Exit 104 to Exit 106	F	80.2	F	74.7
Exit 106 to Exit 107	F	104.1	F	84.9
I-126 Diverge to I-26 Merge	E	37.2	F	130.1
Exit 108 to Exit 110	F	82.5	F	130.8
<b>I-26 Westbound</b>				
Exit 110 to Exit 108	D	29.8	F	76.5
I-126 Diverge to I-26 Merge	E	41.4	F	157.3
Exit 107 to Exit 106	D	33.2	F	123.2
Exit 106 to Exit 104	E	40.5	F	47.4
Exit 104 to Exit 103	D	31.7	E	39.5
Exit 103 to Exit 102	D	26.7	E	38.5
Exit 102 to Exit 101	B	17.6	C	23.6

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-14: I-20 Freeway Segment Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
west of Exit 61	F	52.4	B	17.7
Exit 61 to Exit 63	F	69.9	C	22.6
Exit 63 to Exit 64	C	19.7	B	15.6
Exit 64 to Exit 65	D	26.7	C	22.7
Exit 65 to Exit 68	E	39.9	D	29.2
<b>I-20 Westbound</b>				
Exit 68 to Exit 65	E	41.5	F	69.9
Exit 65 to Exit 64	F	70.7	F	90.5
Exit 64 to Exit 63	E	43.0	C	19.5
Exit 63 to Exit 61	B	17.0	E	40.9
west of Exit 61	B	12.1	C	21.3

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-15: I-126 Freeway Segment Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
I-26 to Colonial Life Blvd	D	30.0	B	16.2
Colonial Life Blvd to Greystone Blvd	B	16.4	A	10.5
Greystone Blvd to Huger St	D	27.8	B	14.4
<b>I-126 Westbound</b>				
Huger St to Greystone Blvd	B	15.2	F	73.1
Greystone Blvd to Colonial Life Blvd	B	15.5	F	106.5
Colonial Life Blvd to I-26	C	22.8	F	125.1

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The No-Build analysis results for the freeway segments, summarized in **Table 4-13**, **Table 4-14** and **Table 4-15** indicate the following:

- During the morning peak hour:
  - All I-26 eastbound freeway segments operate at LOS E and F. I-26 westbound freeway segments from I-126 Diverge to I-126 Merge and from Exit 106 to Exit 104 also operate at LOS E. All other segments operate at LOS D or better.
  - I-20 eastbound freeway segments from west of Exit 61 to Exit 63 operate at LOS F, and the eastbound segment between Exit 65 and Exit 68 operates at LOS E. I-26 westbound segments from Exit 68 to Exit 63 operate at LOS E and F. All other segments operate at LOS D or better.
  - All I-126 freeway segments operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound and westbound freeway segments between Exit 104 and Exit 110 operate at LOS F. I-26 westbound segments between Exit 104 and Exit 102 operate at LOS E. All other I-26 freeway segments operate at LOS D or better.
  - I-20 westbound freeway segments between Exit 68 and Exit 64 operate at LOS F, and the I-20 westbound segment between Exit 63 and Exit 61 operates at LOS E. All other freeway segments, including all eastbound segments, operate at LOS D or better.
  - I-126 eastbound freeway segments operate at LOS B or better, while I-126 westbound freeway segments operate at LOS F.

### Ramp Merge Analysis

A summary of the Ramp Merge Analyses results is shown in **Table 4-16**, **Table 4-17** and **Table 4-18** for I-26, I-20 and I-126, respectively. The merge analysis results for the eastbound on-ramp at Exit 101 and the westbound on-ramp from Exit 102 are summarized in these tables although each ramp are the entry lanes of existing weaving sections between Exit 101 and Exit 102.

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**Table 4-16: I-26 Ramp Merge Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101	F	126.8	C	22.8
Exit 102	F	123.0	D	29.4
Exit 103	F	109.3	F	48.1
Exit 104	F	87.0	F	66.6
Exit 106 Loop	F	58.2	F	81.4
Exit 106	F	104.1	F	84.9
Exit 107 Loop	F	58.2	F	81.4
Exit 107	F	92.1	F	87.4
Exit 108	E	40.3	F	132.8
Exit 108 (I-126)	F	46.4	F	150.5
Exit 110	B	16.3	B	17.7
<b>I-26 Westbound</b>				
Exit 110	B	15.6	F	67.8
Exit 108 (I-126)	F	47.7	F	185.1
Exit 108	D	29.5	F	135.9
Exit 107 Loop	D	32.2	F	124.7
Exit 107	D	33.2	F	123.2
Exit 106	D	28.7	D	34.8
Exit 104	C	22.8	D	31.3
Exit 103	C	24.8	E	36.4
Exit 102	B	17.6	C	23.6
Exit 101	A	7.2	A	9.0

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-17: I-20 Ramp Merge Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
Exit 61 Loop	F	103.6	B	16.9
Exit 61	F	71.2	B	19.5
Exit 63 Loop	C	20.7	B	17.0
Exit 63	B	19.5	B	15.4
Exit 64 Loop	D	33.2	D	29.9
Exit 64	C	25.8	C	22.3
Exit 65	E	37.1	C	25.5
Exit 68	D	28.2	C	26.2
<b>I-20 Westbound</b>				
Exit 68	C	27.6	F	58.1
Exit 65	F	70.7	F	90.5
Exit 64 Loop	C	24.8	C	27.5
Exit 64	E	43.0	B	19.5
Exit 63	B	13.2	C	22.8
Exit 61	B	10.1	B	16.7

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-18: I-126 Ramp Merge Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
Colonial Life Blvd	B	15.7	A	8.6
Greystone Blvd	B	19.5	B	10.1
<b>I-126 Westbound</b>				
Greystone Blvd	B	11.6	D	30.6

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The No-Build analysis results for the ramp merge areas, summarized in **Table 4-16**, **Table 4-17** and **Table 4-18**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge areas between Exit 101 and Exit 107, and at Exit 108 (I-126), operate at LOS F. The I-26 eastbound merge area at Exit 108 operates at LOS E. The I-26 westbound merge area at Exit 108 (I-126) also operates at LOS F. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound merge areas at Exit 61 operate at LOS F and at Exit 65 operate at LOS E. I-20 westbound merge areas at Exit 65 operate at LOS F and at Exit 64 operate at LOS E. All other ramp merge areas operate at LOS D or better.
  - All I-126 merge areas operate at LOS B.
- During the afternoon peak hour:
  - I-26 eastbound merge areas between Exit 103 and Exit 108 (I-126) operate at LOS F. I-26 westbound merge areas between Exit 110 and Exit 110 also operate at LOS F, and the westbound merge area at Exit 103 operates at LOS E. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of westbound merge areas between Exit 68 and Exit 65, which operate at LOS F.
  - All I-126 eastbound merge areas operate at LOS B or better, and the westbound merge area at Greystone Boulevard operates at LOS D.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analyses results is shown in **Table 4-19**, **Table 4-20** and **Table 4-21** for I-26, I-20 and I-126, respectively. The diverge analysis results for the eastbound off-ramp at Exit 102 and the westbound off-ramp from Exit 101 are summarized in these tables although each ramp are the exit-only lanes of existing weaving sections between Exit 101 and Exit 102.

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**Table 4-19: I-26 Ramp Diverge Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-26 Eastbound</b>				
Exit 101	F	94.5	B	15.2
Exit 101 Loop	F	109.7	B	19.1
Exit 102	F	126.8	C	22.8
Exit 102 Loop	F	111.1	C	22.2
Exit 103	F	118.2	D	30.1
Exit 104	F	107.0	F	50.8
Exit 106	F	68.7	F	63.4
Exit 107	F	104.1	F	84.9
Exit 107 Loop	F	58.2	F	81.4
Exit 108	F	92.1	F	87.4
I-26 to I-26	F	55.9	F	135.5
Exit 110	F	101.3	F	146.0
<b>I-26 Westbound</b>				
Exit 110	F	52.1	F	81.3
Exit 108	D	29.5	F	135.9
Exit 107	D	29.5	F	135.9
Exit 107 Loop	D	32.2	F	124.7
Exit 106	D	33.2	F	123.2
Exit 106 Loop	D	30.0	F	94.5
Exit 104	D	34.4	E	40.1
Exit 103	C	22.0	D	28.9
Exit 102	C	25.3	E	37.3
Exit 102 Loop	B	19.0	C	26.9
Exit 101	B	17.6	C	23.6
Exit 101 Loop	B	14.9	C	20.2

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 4-20: I-20 Ramp Diverge Capacity Analysis TransModeler Results – No-Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-20 Eastbound</b>				
Exit 61	F	65.4	B	17.1
Exit 63	F	67.7	C	26.8
Exit 64	B	19.7	B	15.6
Exit 64 Loop	D	33.2	D	29.9
Exit 65	C	26.7	C	22.7
Exit 68	F	46.8	C	27.9
<b>I-20 Westbound</b>				
Exit 68	E	37.7	F	75.1
Exit 65	C	24.5	C	25.6
Exit 64	F	71.4	F	91.4
Exit 64 Loop	C	24.8	C	27.5
Exit 63	E	43.0	B	19.5
Exit 61	C	22.1	F	92.4

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 4-21: I-126 Ramp Diverge Capacity Analysis TransModeler Results – No Build Conditions**

Segment	RA10 (No Build) Conditions			
	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Density <sup>2</sup>	LOS <sup>1</sup>	Density <sup>2</sup>
<b>I-126 Eastbound</b>				
Greystone Blvd	B	15.9	D	32.7
<b>I-126 Westbound</b>				
Greystone Blvd	B	19.3	F	85.3
Colonial Life Blvd	B	13.4	F	72.1

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The No-Build analysis results for the ramp diverge areas, summarized in **Table 4-19**, **Table 4-20** and **Table 4-21**, indicate the following:

- During the morning peak hour:
  - All I-26 eastbound diverge areas and the westbound diverge area at Exit 110 operate at LOS F. All other ramp diverge areas operate at LOS D or better.
  - I-20 eastbound diverge areas at Exit 61, Exit 63, and Exit 68 operate at LOS F. I-20 westbound diverge areas at Exit 64 operate at LOS F, and at Exit 68 and Exit 63 operate at LOS E. All other ramp diverge areas operate at LOS D or better.
  - All I-126 diverge areas operate at LOS B.
- During the afternoon peak hour:
  - I-26 eastbound diverge areas between Exit 104 and Exit 110 and I-26 westbound diverge areas between Exit 110 and Exit 106 Loop operate at LOS F. I-26 westbound diverge areas at Exit 104 and Exit 102 operate at LOS E. All other ramp diverge areas operate at LOS D or better.
  - I-20 westbound diverge areas at Exit 68, Exit 64, and Exit 61 operate at LOS F. All other ramp diverge areas, including all eastbound diverge areas, operate at LOS D or better.
  - I-126 westbound diverge areas operate at LOS F, and the I-126 eastbound diverge area at Greystone Boulevard operates at LOS D.

## 5 Representative Alternative Microsimulation Modeling

Ten (10) representative alternatives were created by the design team. Each of these representative alternatives were modeled utilizing TransModeler. The breakdown of which AOs were used in each Representative Alternative are shown in **Table 5.1**. The results of the microsimulation modeling were incorporated into sub-sections of level 1B screening discussed in section 4.5.2 of the *Alternatives Development and Screening Report*.

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**Table 5.1 Breakdown of Representative Alternatives**

Representative Alternative	1	2	3	4	5	6	7	8	9
I-20/26/126 System/System	AO17 Turbine	AO18 Directional w/ Interior Rights	AO21 Turbine Braided	AO22 Semi-Dir w/ 2 Loops	AO20 Turbine Directional	AO19 Directional w/ Loop & Ramp	AO27 E-W Connector	AO28 E-W Connector Bush River	AO29 Southern Connector
I-20/Broad	AO3	AO5	AO5	AO3	AO3	AO5	AO5	AO3	AO3
I-20/Bush	AO6	AO10	AO6	AO7	AO8 (5)	AO7	AO8	AO8	AO10
I-26/Bush	AO24	AO24	AO26	AO25	AO24	AO24	AO24	AO24	AO29
I-26/378	AO46	AO47	AO46	AO46	AO46	AO47	AO46	AO46	AO46
I-26/St. Andrews	AO13	AO14 (3)	AO16	AO15	AO13	AO14	AO13	AO13	AO15
I-26/Piney Grove	AO30	AO31	AO32	AO32	AO30	AO31	AO30	AO31	AO32
I-26/Harbison	AO35	AO37	AO49	AO35	AO35	AO37	AO49	AO35	AO49
I-26/Lake Murray	AO50	AO42	AO50	AO50	AO50	AO42	AO50	AO50	AO50
I-26/Broad	AO51	AO45	AO43	AO51	AO51	AO43	AO51	AO51	AO51
East-West Connector	NA	NA	NA	NA	NA	NA	AO27	AO28	AO29(2)

\* Alternative 10 - 'No-build' or 'Do Nothing' Alternative is retained for comparison purposes.

### 5.1 Development of the Representative Alternative Networks

The design files for each of the Representative Alternatives were converted to KMZ files to be imported into the TransModeler microsimulation network. The existing TransModeler network was modified to match the geometry of the KMZ files while maintaining the all external nodes and centroids of the existing network. Therefore, the same origin-destination trip tables were used for each of the alternatives. After updating the geometry to match the design of the representative alternatives, intersection controls were added for the new geometry. Where necessary, Synchro was utilized to develop basic traffic signal timing plans at the signal-controlled intersections based on initial AO analysis described in Section 3.3.

A simulation-based, Dynamic Traffic Assignment (DTA) was utilized in TransModeler to create new paths and assign demand volumes across the network for each of the Representative Alternatives with the intention of User Equilibrium. It is reasonable to assume that simulation models are better predictors of congested networks and may achieve enhanced results than a static traffic assignment method. With each DTA iteration, TransModeler will compute a relative gap between the previous iteration and an equilibrium solution. The DTA was run for 100 simulations with a goal of reaching a relative gap of 0.001. Each model was not able to converge due to the congestion, especially outside the project limits. Additional adjustments were made to the path assignments to remove unreasonable paths created by the DTA. It was assumed that the RA10 (No-Build) network paths remained consistent from the Existing conditions. Therefore, a DTA was not utilized in the analysis of RA10.

Once the traffic demand was distributed to the network, visual observations of the simulations were completed for each RA. Choke points in the network were identified, and where possible, were addressed by the design



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team. The TransModeler networks were revised to update any revisions from the design team. This was an iterative process to develop the final representative alternative networks. **Appendix G** contains the microsimulation reviews which identified the choke points and were coordinated with the design team.

### 5.2 Travel Demand Modeling

The South Carolina Statewide Travel Demand Model (SCSWM) was used to evaluate three AO alternatives and two Representative Alternatives (RA). The three AO alternatives involved new roadway connections between I-20 and I-26. The two RA were modifications to the existing interstate network and interchanges that had been screened and selected for further evaluation as Reasonable Alternatives.

In each case, separate network files were developed in the SCSWM from the “Existing plus Committed” (EC) network. The TransCAD geographic file for the base EC network was exported and saved separately for each alternative. These networks were then modified to represent each proposed alternative. Complete individual runs of the SCSWM were performed using each separate alternative network.

The SCSWM produces estimates of daily traffic for the individual alternative networks. No adjustments or comparisons of the daily traffic volume estimates to collected peak hour volumes were considered necessary for this level of assessment of the alternatives, which included the review of minimum travel time routes through network elements. Had it been necessary to evaluate peak hour volume estimates, a conversion factor (such as 10%) would have been applied to the daily volumes to estimate design-hour volumes for the network elements.

The first alternatives modeled were those involving proposed facilities on new alignment and were developed and assessed as part of the AO review. Unlike the other AO evaluations taking place at existing interchanges, these proposed facilities on new alignment had no existing volumes to adjust and evaluate. Daily volumes assigned via the SCSWM would aid in assessing the effectiveness of diverting traffic from the existing system interchanges to the proposed facilities and in determining the number of lanes needed to accommodate design year traffic. The AO facilities modeled included:

- AO27 – East-West Connector (described in Section 3.3.6.1)
- AO28 – East-West Connector with Bush River Road Access (described in Section 3.3.6.2)
- AO29 – Southern Connector with I-26 Turbine Interchange (described in Section 3.3.6.3)

Each of these AO, along with additional AO improvements at service interchanges were developed into separate individual RA. AO27 was developed into RA7; AO28 was developed into RA8; and AO29 was developed into RA9. Since the goal was to evaluate the regional distribution of traffic on the proposed connectors, only the AO elements of the new connectors were modeled along with proposed modifications to the system interchanges proposed as part of the RA. Modifications to the various service interchanges in each RA were not incorporated into the individual SCSWM networks for the new connector alternatives and were not considered as part of the assessment of these alternatives.

The two RA that were modeled, RA1 and RA5, had been evaluated and moved forward from the Representative Alternatives to the Reasonable Alternatives. The modifications made to the SCSWM network for these

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alternatives incorporated the complete network modifications at the system and service interchanges in each RA, and included the C-D Road systems along I-26 and I-20. The SCSWM network modifications for these two RA were developed directly from the microsimulation networks by importing the microsimulation networks into TransCAD and removing the existing network links to be replaced by the proposed alternatives.

### 5.2.1 AO27 – EAST-WEST CONNECTOR

As described in Section 3.3.6.1, the proposed east-west connector was modeled as a limited access facility running generally parallel to and north of the Saluda River. Its only connections are the existing ramps connecting westbound I-126 to eastbound I-26, and westbound I-26 to eastbound I-126, ramps connecting eastbound I-20 to the eastbound connector and the westbound connector to westbound I-20, and ramps connecting the eastbound connector to eastbound I-26 and eastbound I-126, and a ramp connecting westbound I-126 to the westbound connector. No ramps are provided from westbound I-20 to the eastbound connector or from the westbound connector to eastbound I-20. These movements use the I-20/I-26 AO17 Turbine system interchange at Exit 107/64 and C-D Roads connector to I-20 and I-26. The SCSWM network modifications made for AO27 and AO17 are shown in **Figure 5-1**. The white roadways depict links in the EC network, while the green roadways depict the links added to the network for AO27 and AO17.

**Figure 5-2** shows the 2040 daily traffic assignment from the SCSWM run. The results of the assignment indicate the westbound connector would carry approximately 11,400 trips per day and the eastbound connector would carry about 12,600 trips per day (24,000 total trips). The forecast volume on the ramp from the eastbound connector to eastbound I-26 was essentially zero, as was the volume on the ramp from the westbound I-126 C-D road to eastbound I-20.

In both instances, the travel times along routes between various origins and destinations showed traffic expected to use these ramps were assigned along other routes. **Figure 5-3** illustrates some of the shortest travel time routes starting on westbound I-126 to multiple points, and from eastbound I-20 to eastbound I-26.

The eastbound connector traffic to eastbound I-26 was routed along US 378 (shown in **Figure 5-3** in light blue), which is parallel to and provides a shorter path in the model network than the proposed connector. Instead of traffic being assigned on the ramp from the westbound I-126 C-D road through the AO17 system interchange to eastbound I-20, the model assigns traffic from westbound I-126 traveling to the east on I-20 via Greystone Boulevard and Broad River Road (shown in **Figure 5-3** in green).

AO 27 was incorporated as a key element in RA7, which is discussed as part of the level 1B screening in section 4.5.2.9 of the *Alternatives Development and Screening Report*.

### 5.2.2 AO28 – EAST-WEST CONNECTOR WITH BUSH RIVER ROAD ACCESS

As described in Section 3.3.6.2, the proposed east-west connector with Bush River Road access is a limited access facility connecting I-20 on the west to I-126 on the east. The connector runs generally parallel to, and to the south of, the Norfolk – Southern Railroad. It is also generally parallel to Bush River Road to the north and the Saluda River to the south.



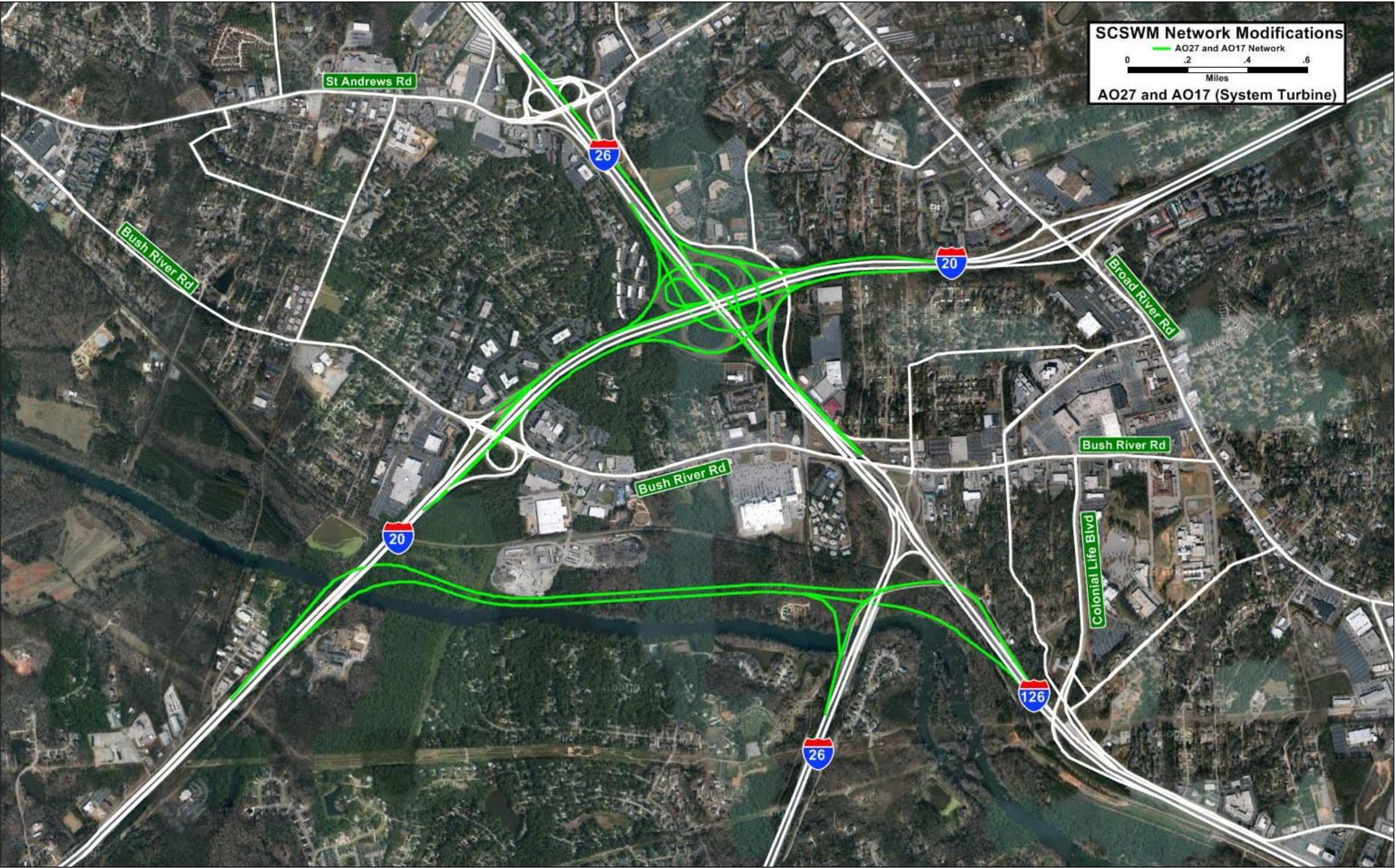


Figure 5-1 - AO 27/AO17 SCSWM Network Modifications



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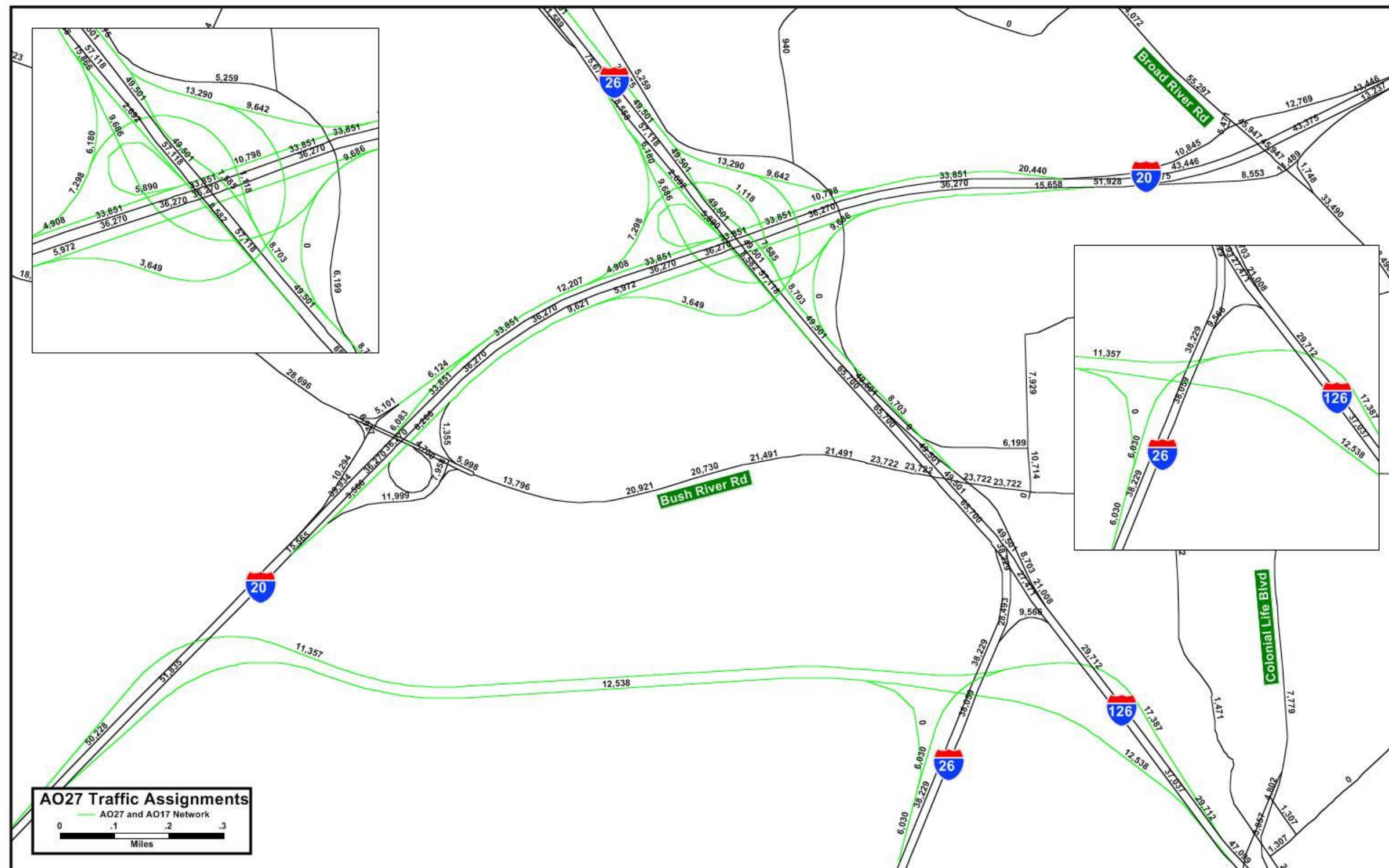


Figure 5-2: AO27 SCSWM 2040 Daily Volume



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Figure 5-3: AO27 SCSWM Select Shortest Travel Time Paths

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The existing I-20 interchange at Exit 63 and its connections to Bush River Road are removed as are the ramps to and from Bush River Road at the existing I-26 interchange at Exit 108. The connector provides full access to the east and west on I-20. A proposed interchange is located approximately midway along the connector is to provide access to Bush River Road approximately opposite Nottingwood Drive. This interchange replaces the removed interchanges at Exit 63 and Exit 108.

The proposed connector directly ties in to I-126 on its eastern end.

Both directions of the connector provide access to eastbound I-26, but there is no direct access provided to or from westbound I-26 from the connector. Rather than using the connector to access westbound I-26 near I-126, traffic from eastbound I-20 would use the proposed I-20/I-26 system interchange; traffic from westbound I-126 would use a comparable connection similar to the existing connection that merges with I-26 westbound lanes in the vicinity of the Bush River Road overpass.

The I-20/I-26 system interchange would fully directional movements, except for two movements to eastbound I-26 that would be diverted to the connector. The movement from westbound I-20 to eastbound I-26 would continue through the I-20/I-26 system interchange, travel eastbound on the connector, and connect to either eastbound I-26 or eastbound I-126. The movement from eastbound I-20 to eastbound I-26 would enter the connector south of the Bush River Road bridge over I-20. This movement would also tie into either eastbound I-26 or eastbound I-126 at the east end of the proposed connector.

The SCSWM network modifications made for AO28 and at the I-20/I-26 system interchange as part of RA8 are shown in **Figure 5-4**. The white roadways depict links in the EC network, while the blue roadways depict the links present in the network for AO28.

**Figure 5-5** shows the 2040 daily traffic assignment from the SCSWM run. The results of the assignment indicate that, west of the proposed Bush River Road interchange, the westbound connector is estimated to carry approximately 16,300 trips per day and the eastbound connector is estimated to carry about 23,100 trips per day (39,400 total trips). The majority of the trips would be oriented to/from the west on I-20.

East of the proposed interchange, the westbound connector would carry an estimated 15,500 trips per day while the eastbound connector would carry an estimated 22,600 trips per day (38,100 total trips). The majority of these trips would be oriented to/from the east on I-126.

The proposed interchange would carry approximately 34,700 two-way trips per day between the connector and Bush River Road.

Travel time paths between select origins and destinations for AO 28 are shown in **Figure 5-6**. **Figure 5-6** shows similar travel paths between most of the AO28 origin-destination pairs that were plotted in **Figure 5-3** for AO27. A big difference is in the path between traffic on westbound I-126 traveling to Bush River Road west of I-20. In AO27, this traffic progressed from westbound I-126 to westbound I-26, into the I-20/I-26 system interchange to westbound I-20 before exiting at Exit 63. In AO28, the path for the same origin-destination pair, shown in light



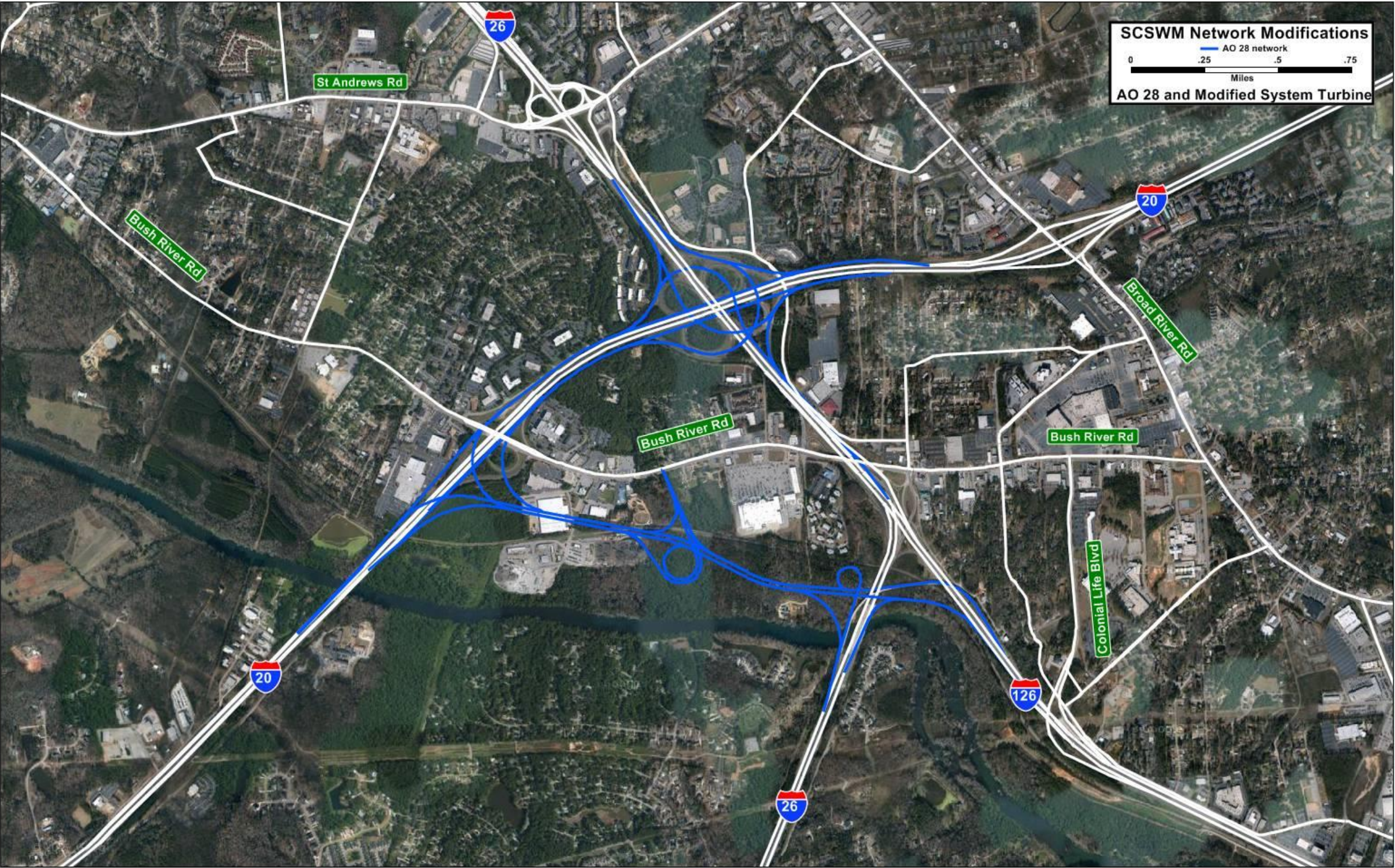


Figure 5-4: AO28 SCSWM Network Modifications



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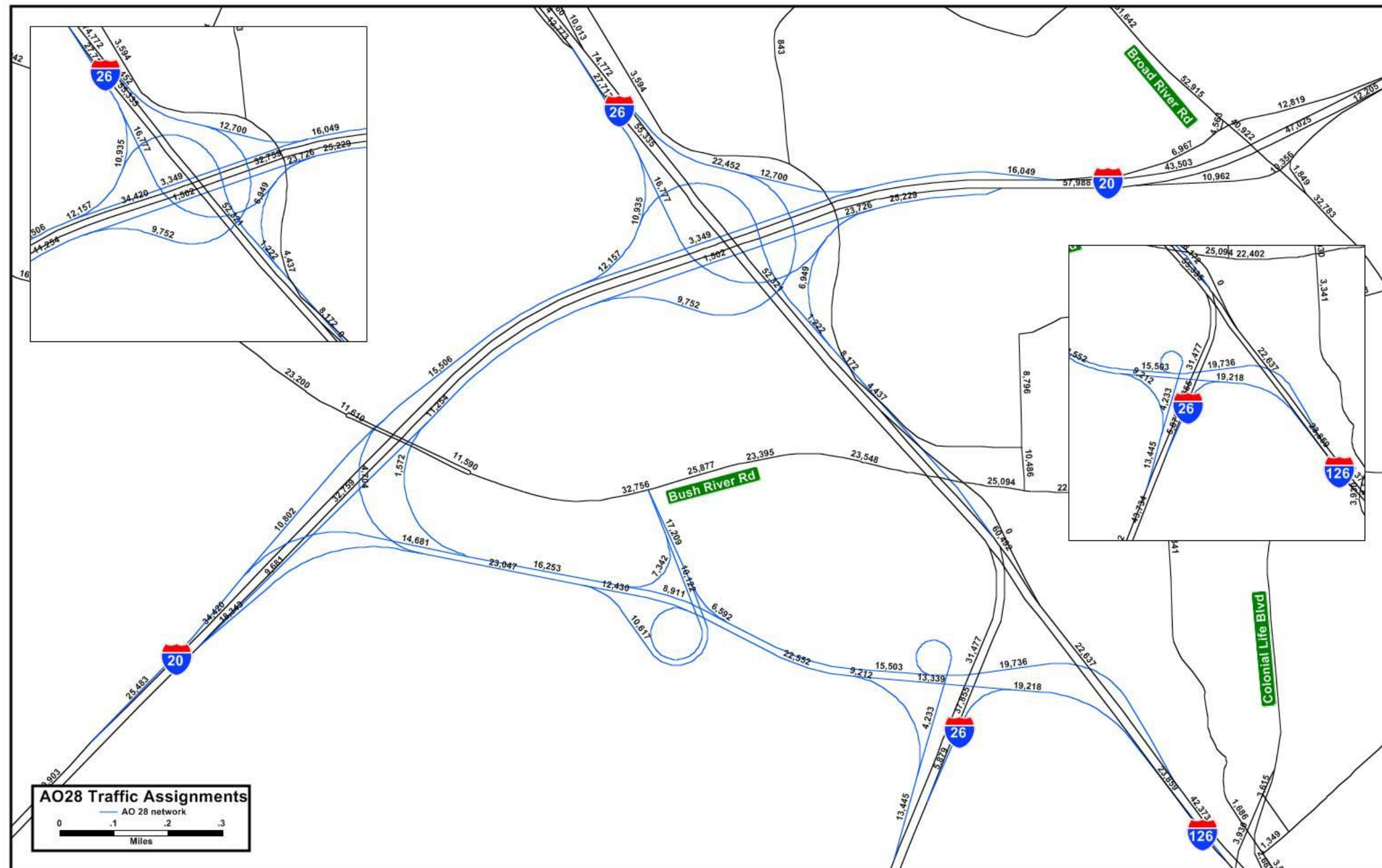


Figure 5-5: A028 SCSWM 2040 Daily Volume



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Figure 5-6: AO28 SCSWM Select Shortest Travel Time Paths

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orange, uses the connector and the proposed interchange on Bush River Road to reach the Bush River Road destination west of I-20.

Traffic from eastbound I-20 to eastbound I-26 continues to be routed via a shorter path along US 378 (shown in **Figure 5-6** in light blue), rather than along the proposed connector. Traffic westbound on I-126 also continues to be routed via Greystone Boulevard and Broad River Road to reach I-20 at Exit 65 (shown in **Figure 5-6** in green).

AO 28 was incorporated as a key element in RA8, which is discussed as part of the level 1B screening in section 4.5.2.10 of the *Alternatives Development and Screening Report*.

### 5.2.3 AO29 – SOUTHERN CONNECTOR WITH TURBINE SYSTEM INTERCHANGE

As described in Section 3.3.6.3, the proposed southern connector was an east-west, limited-access connection between I-20 on the west to I-126 on the east. The alignment of the connector runs generally along the existing electric power easement about 1,900 feet south of the Saluda River.

AO29 as modeled in the SCSWM provides ramps to/from both direction on I-20 at the west end of the connector, eliminates the I-20/I-26 system interchange, maintains the I-26 Exit 108 and I-20 Exit 63 interchanges at Bush River Road, and implements a turbine interchange along the connector at I-26. I-126 traffic traveling to/from the west on I-26 are re-routed through the new I-26/connector turbine interchange. The eastbound connector ends at eastbound I-126, and the westbound connector begins at westbound I-126. The SCSWM network modifications made for AO29 as part of RA9 are shown in **Figure 5-7**. The white roadways depict links in the EC network, while the red roadways depict the links present in the network for AO29.

**Figure 5-8** shows the 2040 daily traffic assignment from the SCSWM run. The results of the assignment indicate that, west of the proposed turbine interchange at I-26, the westbound connector is estimated to carry approximately 23,400 trips per day and the eastbound connector is estimated to carry about 26,100 trips per day (49,100 total). The majority of the trips would be oriented to/from the west on I-20.

East of the proposed I-26 turbine interchange, the westbound connector would carry an estimated 37,500 trips per day from westbound I-126, while the eastbound connector would carry an estimated 39,200 trips per day to eastbound I-126 (76,500 total trips). The majority of these trips would be oriented to/from the east on I-126.

Travel times paths between select origins and destinations for AO 29 are shown in **Figure 5-9**. While the model assignments predict a high volume of traffic using the connector, the circuitous routing between some origins and destinations lead to traffic exiting the interstate and traveling along arterials prior to re-entering an interstate. For example, it is intended for eastbound traffic on I-26 at the St Andrews Road on-ramp traveling to westbound I-20 to continue eastbound on I-26 to the proposed turbine interchange, and travel westbound on the connector before entering I-20. The SCSWM shortest travel time path for this movement (shown in light blue in **Figure 5-9**, would route from eastbound I-26 to westbound I-20 along Bush River Road.

Other travel time paths show similar avoidance of the connector. Routes to or from the east on I-20 (east of the Broad River Road interchange), would have shorter travel times using surface arterials to access the ramps



## Alternatives Traffic Analysis Technical Memo

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to/from I-26 at Bush River Road rather than traveling westbound along I-20 and then eastbound on the proposed connector. These paths are shown in **Figure 5-9** in green and brown.

AO 29 was incorporated as a key element in RA9, which is discussed as part of the level 1B screening in section 4.5.2.2 of the *Alternatives Development and Screening Report*.



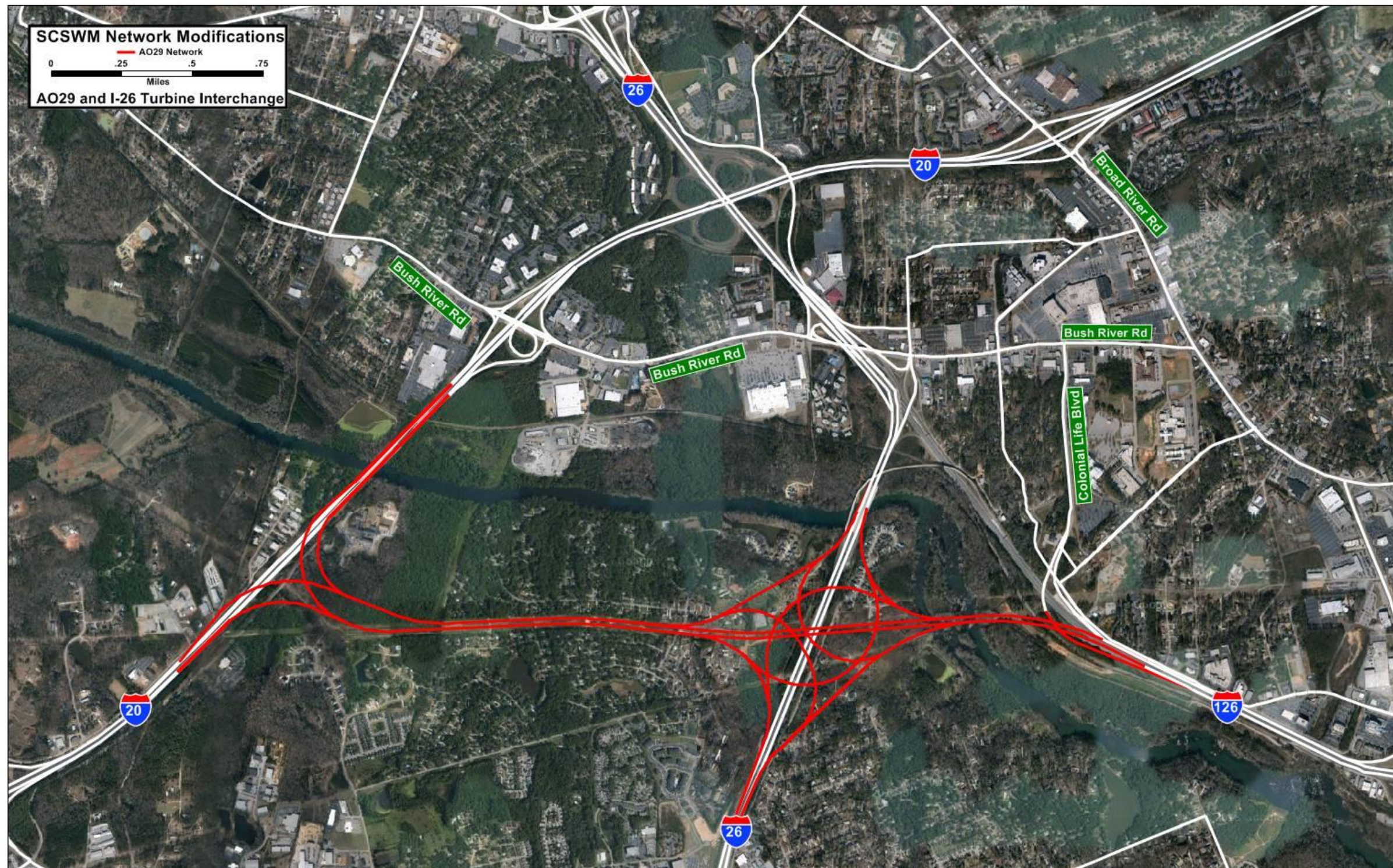


Figure 5-7: AO29 SCSWM Network Modifications



# Alternatives Traffic Analysis Technical Memo

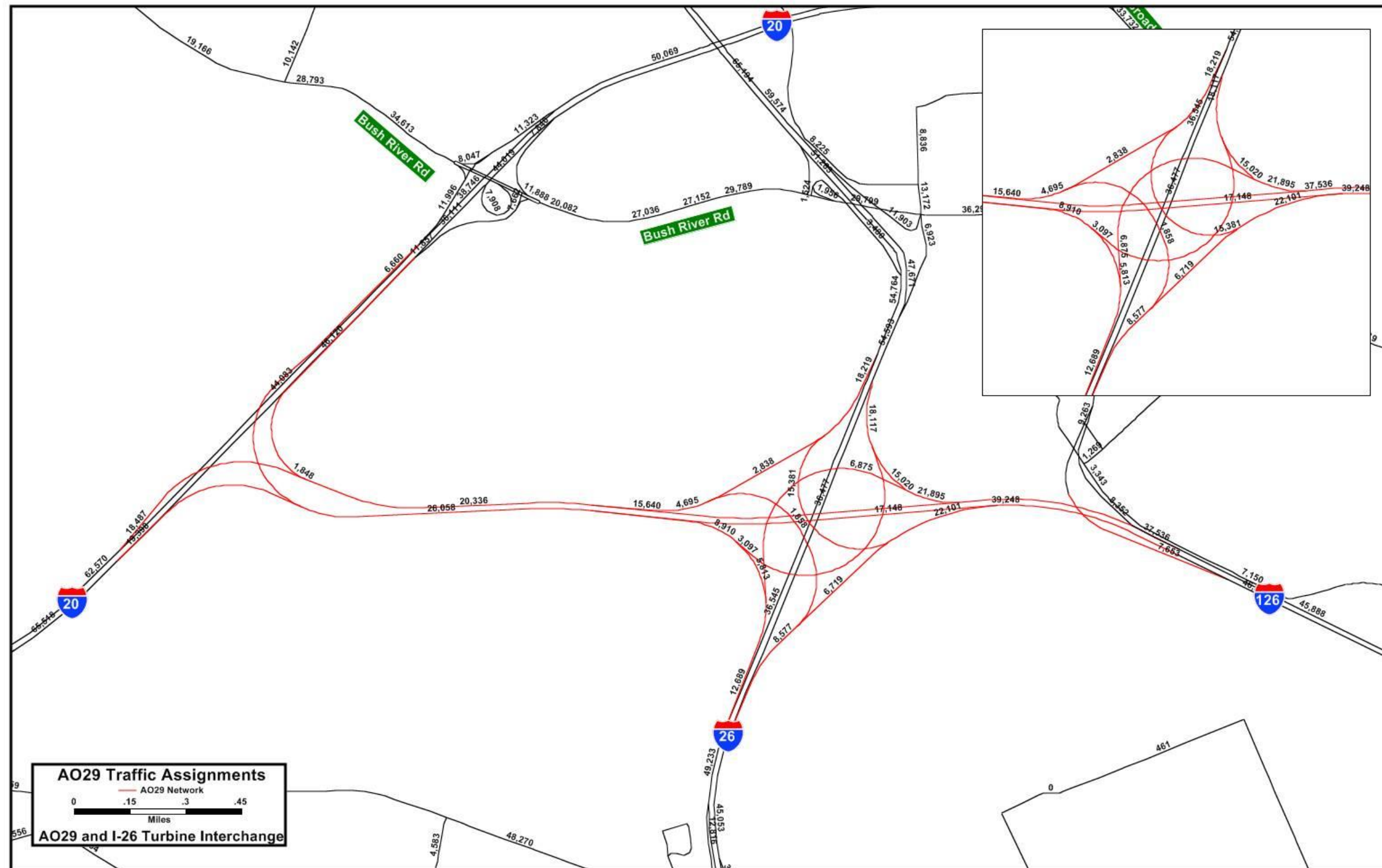


Figure 5-8: AO29 SCSWM 2040 Daily Volume

# Alternatives Traffic Analysis Technical Memo

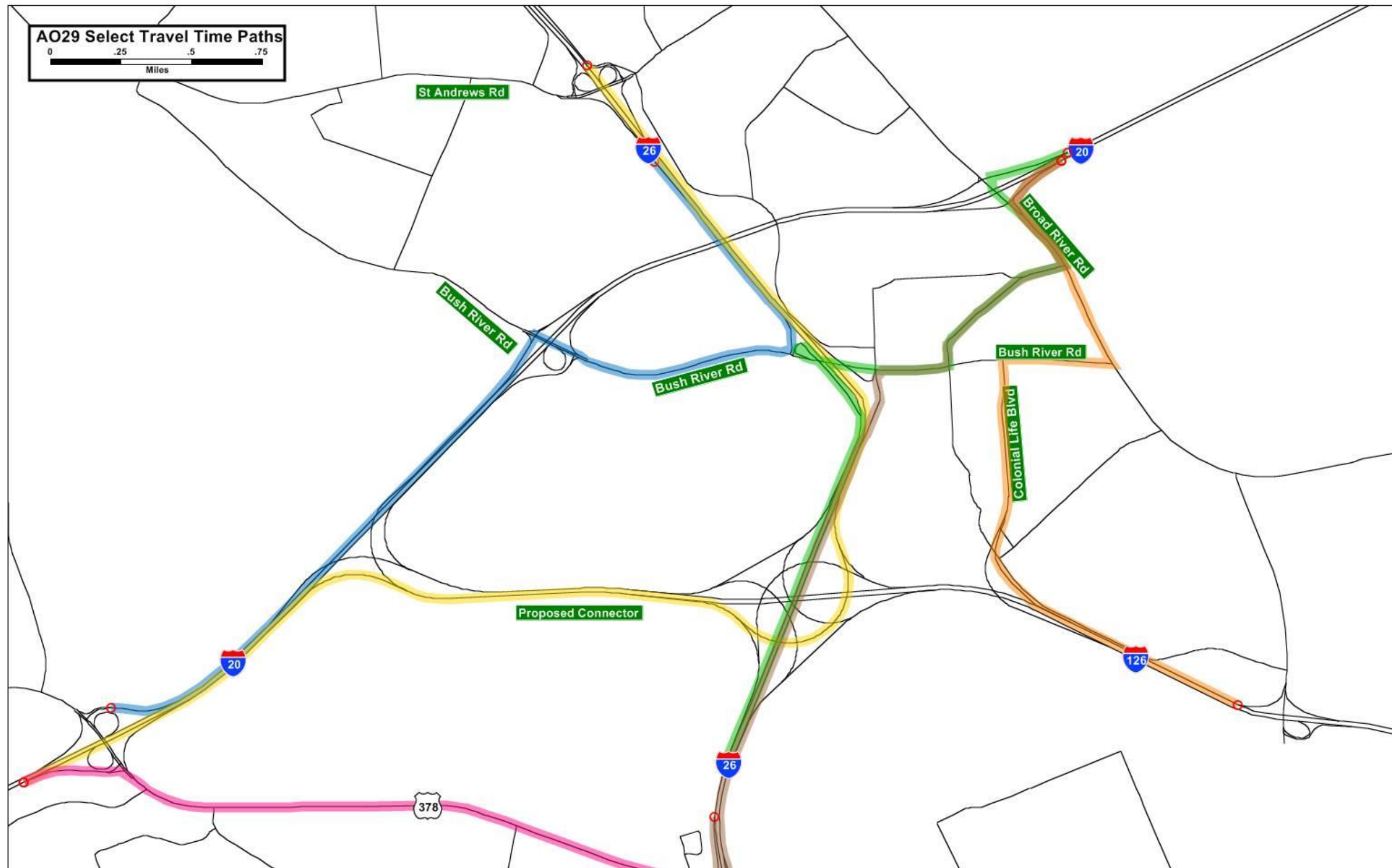


Figure 5-9: AO29 SCSWM Select Shortest Travel Time Paths



## Alternatives Traffic Analysis Technical Memo

Consistent with the travel time paths for AO27 and AO28 shown in **Figure 5-3** and **Figure 5-6** respectively, paths from eastbound I-20 to eastbound I-26 continues to be routed via a shorter path along US 378 (shown in **Figure 5-9** in pink), rather than along the proposed connector. Traffic westbound on I-126 also continues to be routed via Greystone Boulevard and Broad River Road to reach I-20 at Exit 65 (shown in **Figure 5-9** in orange).

### 5.2.4 MODELING OF EC NETWORK

The SCSWM EC network represents the “No-Build Network for the 2040 design year. This network includes the existing network, and planned and programmed projects funded and anticipated to be constructed by the design year. A SCSWM assignment for the EC network was run, and an overview of the EC network LOS is shown in **Figure 5.10**. Individual plots of the EC interchange and mainline volumes and planning LOS are contained in **Appendix H**.

The EC network LOS is based on SCDOT volume/capacity ratio (V/C) planning criteria. SCDOT’s planning LOS are based on V/C calculated using daily assignments and the daily capacity thresholds for various roadway functional classifications and numbers of lanes. The V/C criteria used for SCDOT’s Planning LOS are shown in **Table 5.2**.

**Table 5.2 – SCDOT Planning LOS Criteria**

SCDOT Planning LOS V/C Thresholds					
A	B	C	D	E	F
<0.50	0.50-0.75	0.75-1.00	1.00-1.15	1.15-1.35	>1.35

It is important to note that SCDOT’s planning LOS establishes that a V/C of 1.00 defines the threshold between LOS C and LOS D. Typically, a V/C of 1.0 is considered to be the threshold between LOS E and LOS F, since a V/C=1.0 represents when the volume on the link equals the available link capacity. Therefore, any link identified as operating at LOS D in the SCSWM is technically over capacity since the estimated AADT assigned to the link is greater than the daily capacity for that link, based on the number of lanes on the link and the link’s functional classification. As projects move from this general planning stage to more detailed peak hour operational capacity analyses, close attention must be given to links assigned LOS D by the SCSWM to ensure peak hour operations do not fail.

### 5.2.5 MODELING OF REASONABLE ALTERNATIVE RA1 NETWORK

The SCSWM EC network for RA1 incorporates elements of many AO at the interchanges in the network, along with the addition of C-D roads along I-20 and I-26, widening the mainline of I-20 and I-26, realigning the connection from eastbound I-26 to I-126, the elimination of the I-26 ramps to Bush River Road at Exit 108, and the modification of the partial Colonial Life Boulevard interchange on I-126 to a fully directional interchange. The I-20/I-26 system interchange is replaced with a turbine interchange. In RA1, a DDI is provided at Exit 63 (Bush River Road). **Table 5.1** lists the various AO options that have been incorporated in the development of RA1. The entire proposed alignment of RA1 is shown in **Figure 5.11** and an overview of the network LOS is shown in **Figure 5.12**. Individual plots of the RA1 interchange and mainline volumes and planning LOS are

## Alternatives Traffic Analysis Technical Memo

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contained in **Appendix I**. RA1 is discussed as part of the level 1B screening in section 4.5.2.3 in the *Alternatives Development and Screening Report*.



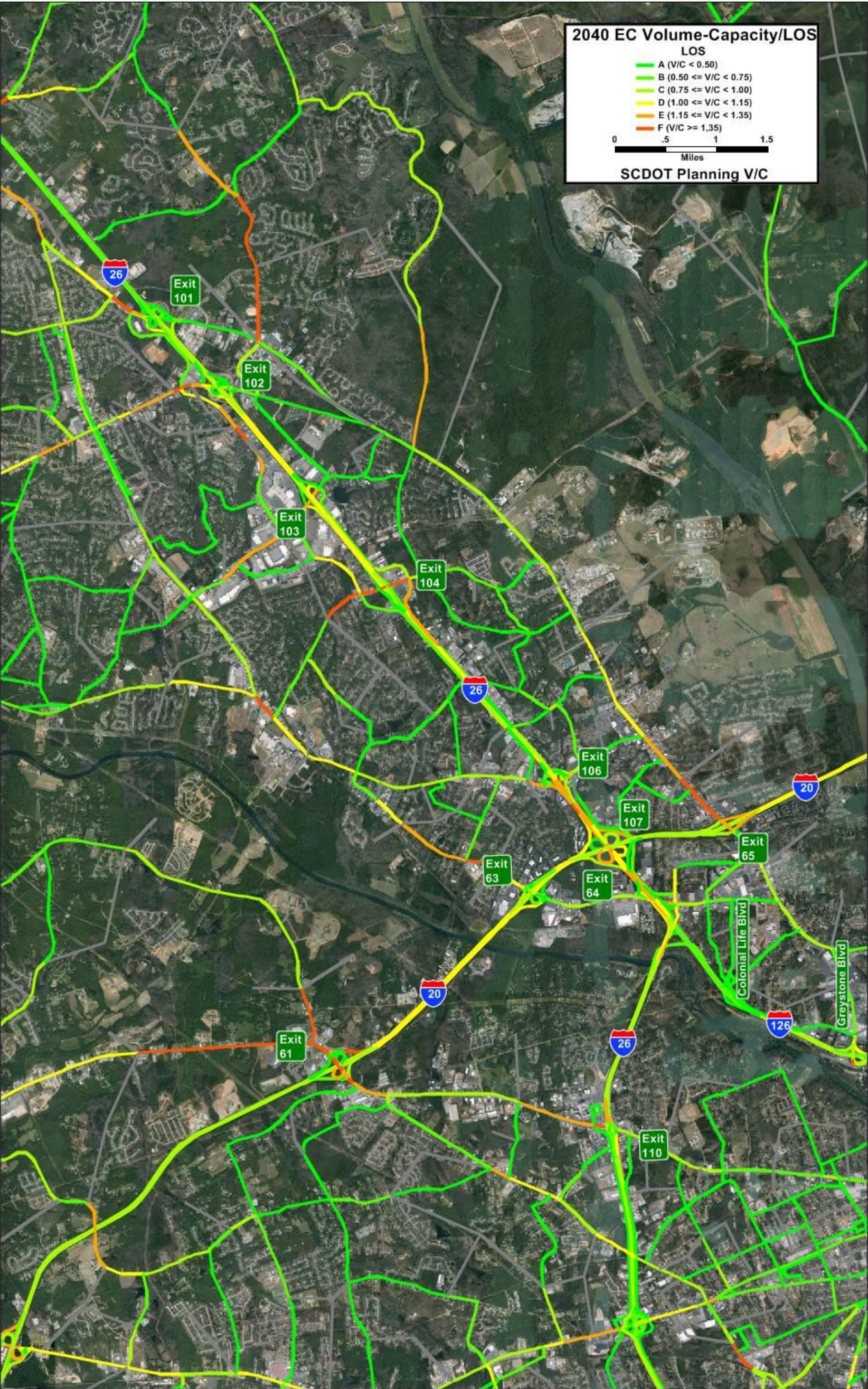


Figure 5-10: EC SCDOT Planning LOS Overview



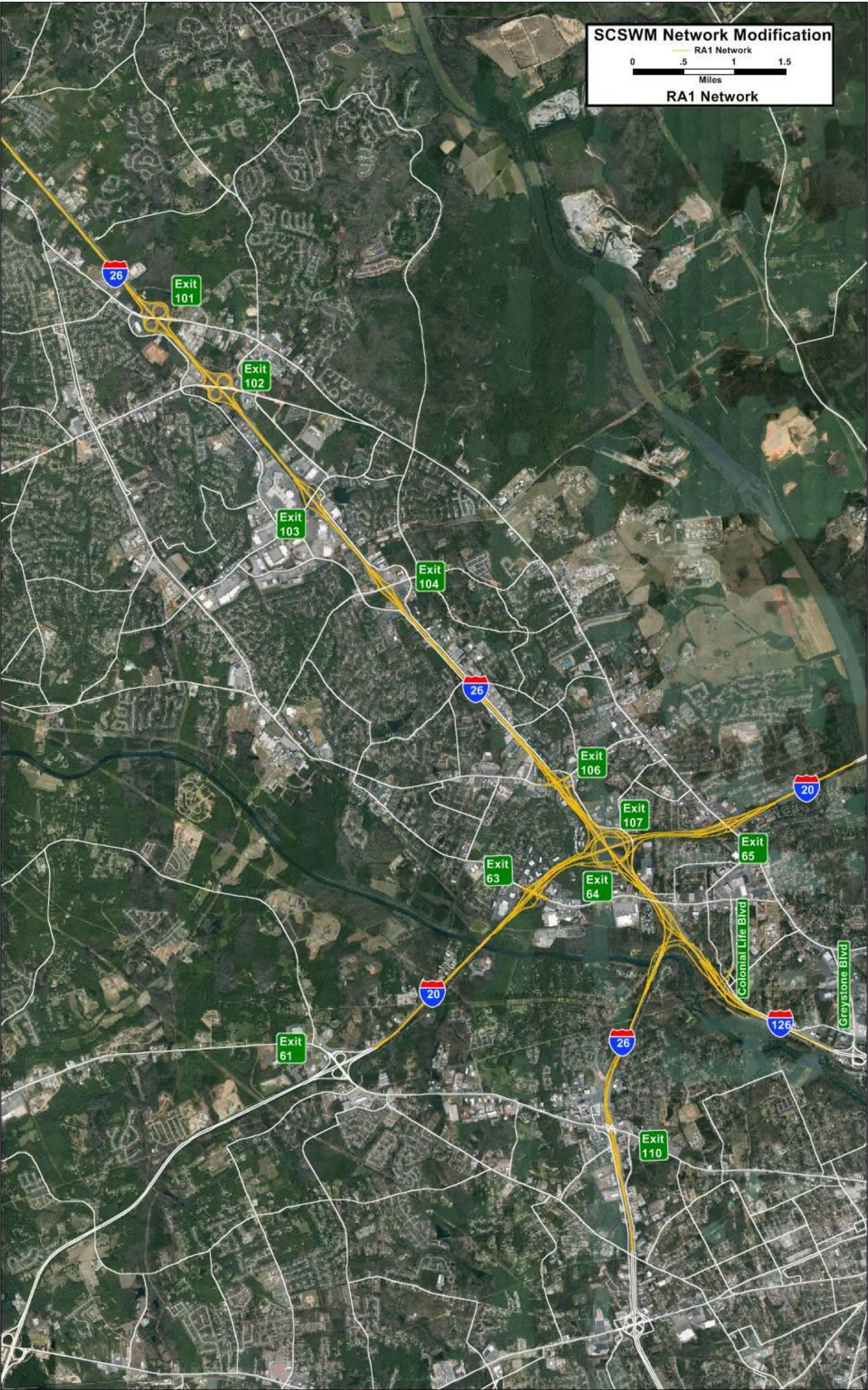


Figure 5-11: SCSWM RA1 Network



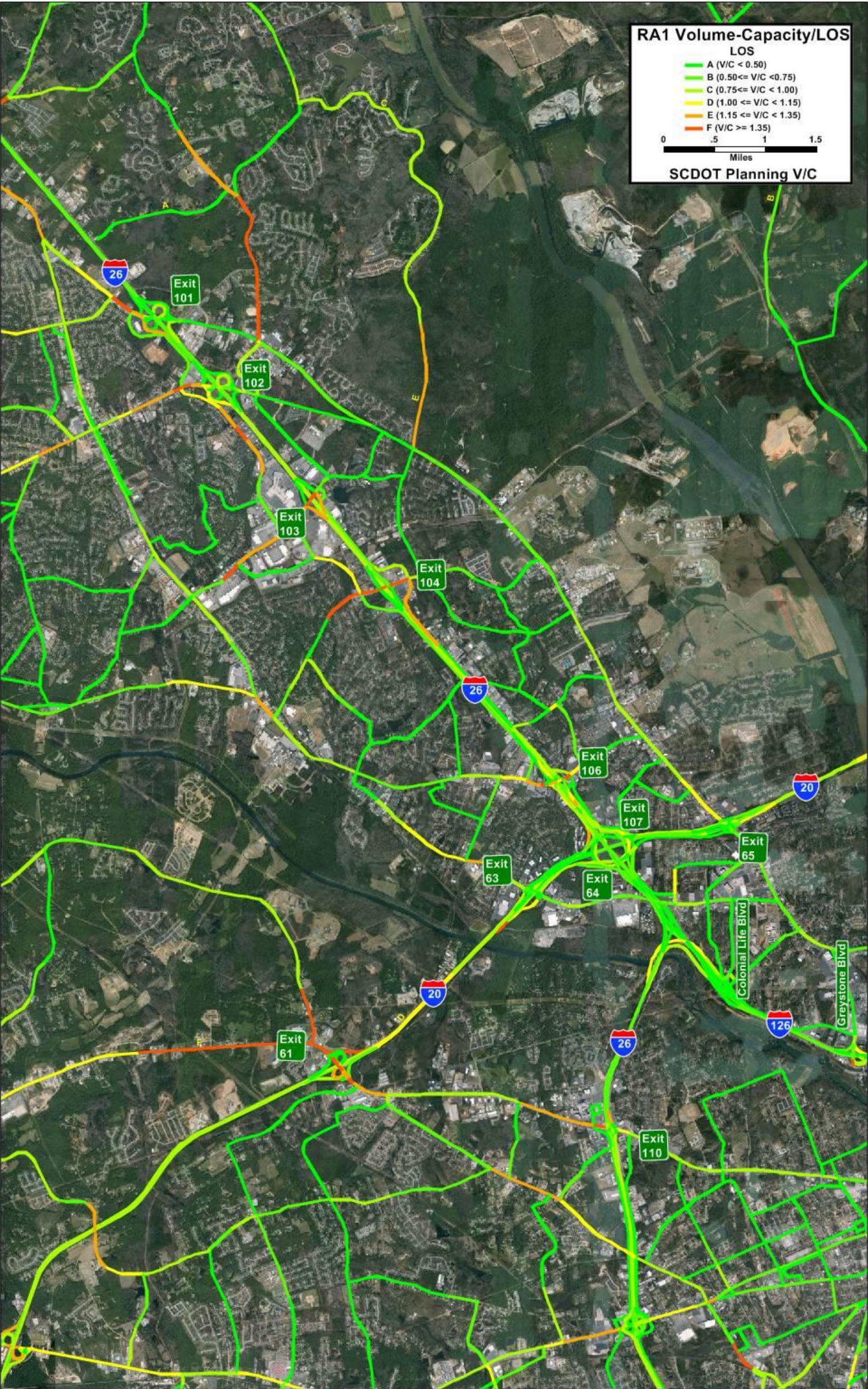


Figure 5-12: RA1 SCDOT Planning LOS Overview



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### 5.2.6 MODELING OF REASONABLE ALTERNATIVE RA5 NETWORK

The SCSWM EC network for RA5 incorporates elements of many AO at the interchanges in the network, along with the addition of C-D roads along I-20 and I-26, widening the mainline of I-20 and I-26, realigning the connection from eastbound I-26 to I-126, the elimination of the I-26 ramps to Bush River Road at Exit 108, and the modification of the partial Colonial Life Boulevard interchange on I-126 to a fully directional interchange. The I-20/I-26 system interchange is replaced with a directional turbine interchange that includes loop ramps for westbound I-20 traffic traveling to eastbound I-26/I-126, and for eastbound I-20 traffic traveling to westbound I-26. In RA5, a partial cloverleaf interchange is provided at Exit 63, with loop ramps provided on the west side of Bush River Road. **Table 5.1** lists the various AO options that have been incorporated in the development of RA5. The entire proposed alignment of RA5 is shown in **Figure 5.13**. An overview of the network LOS for RA5 is shown in **Figure 5.14**. Individual plots of the RA5 interchange and mainline volumes and planning LOS are contained in **Appendix J**.

RA5 is discussed as part of the level 1B screening in section 4.5.2.7 in the *Alternatives Development and Screening Report*.

### 5.2.7 COMPARISON OF EC, RA1, AND RA5 NETWORKS

Plot of the links assessed to operate at LOS D, LOS E, and LOS F in the model assignments can be visually compared to assess the effectiveness of RA1 and RA5 in improving capacity compared to the EC network. **Figure 5.15** shows the links of the SCSWM EC network projected to operate at LOS D, LOS E, and LOS F. **Figure 5.16** shows these links for RA1, and **Figure 5.17** shows the links for RA5.

Comparing the three figures indicates that RA1 and RA5 will result in fewer mainline freeway segments and ramps operating at LOS D, LOS E or LOS F when compared to the EC network.



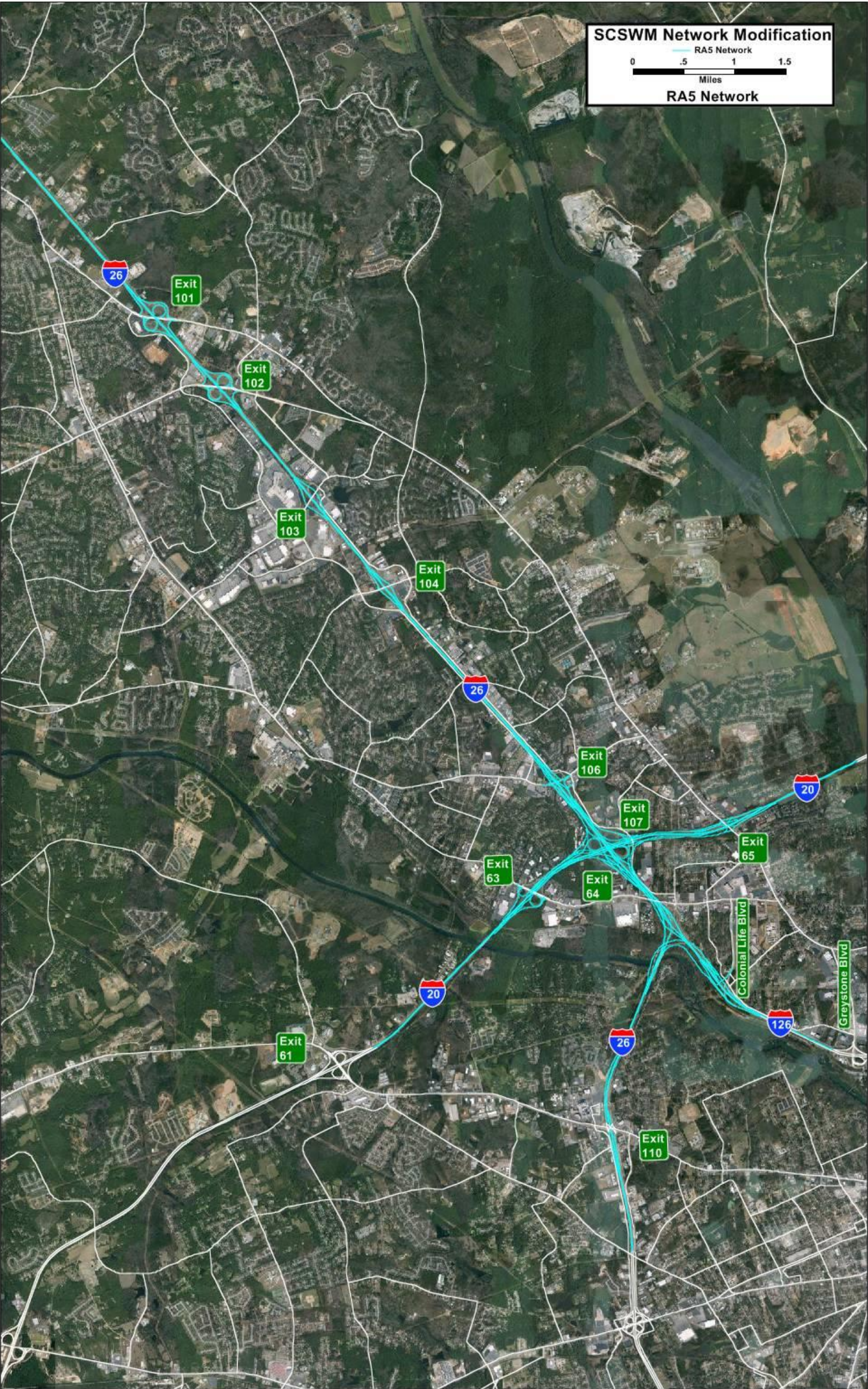


Figure 5-13: SCSWM RA5 Network



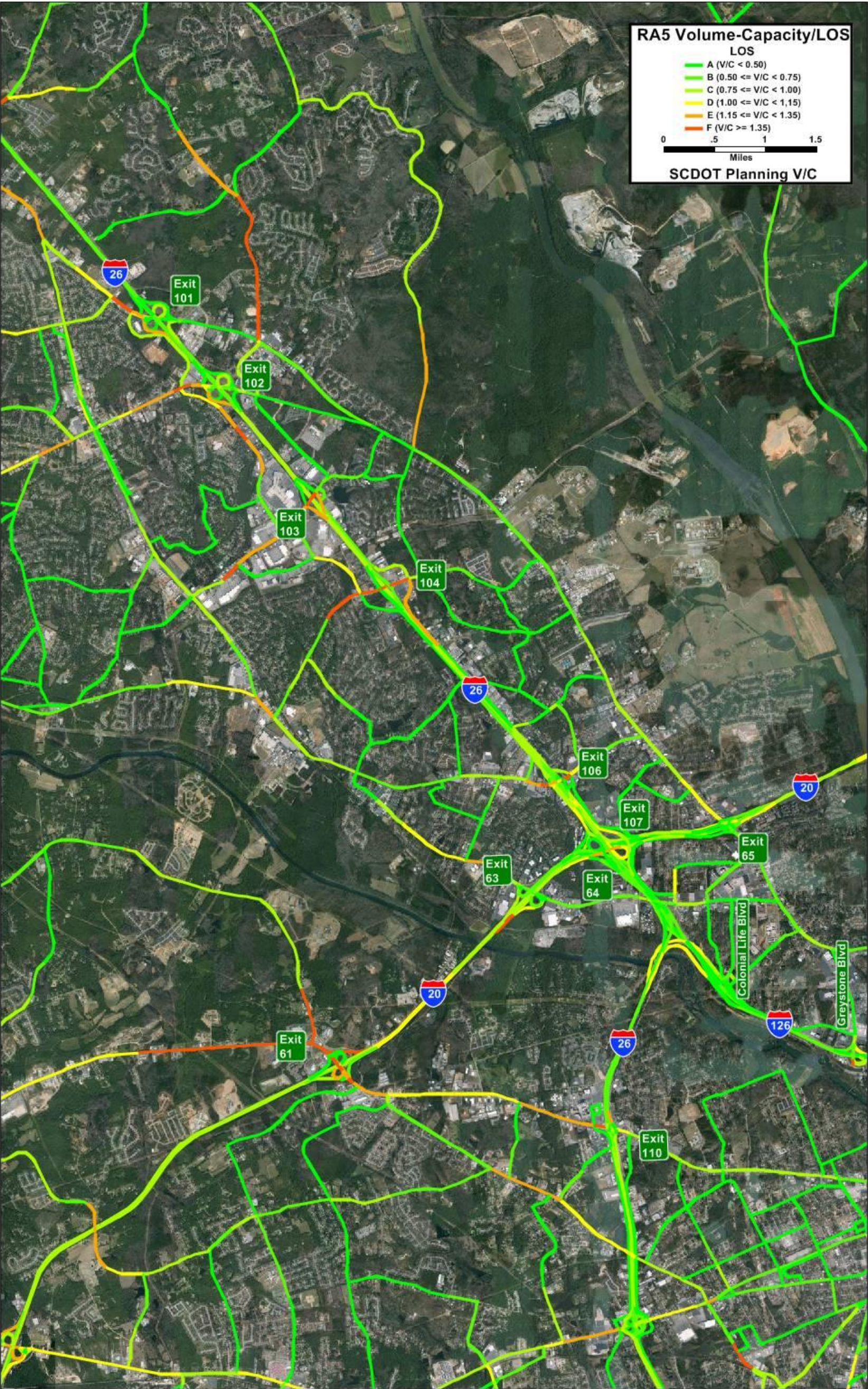


Figure 5-14: RA5 SCDOT Planning LOS Overview



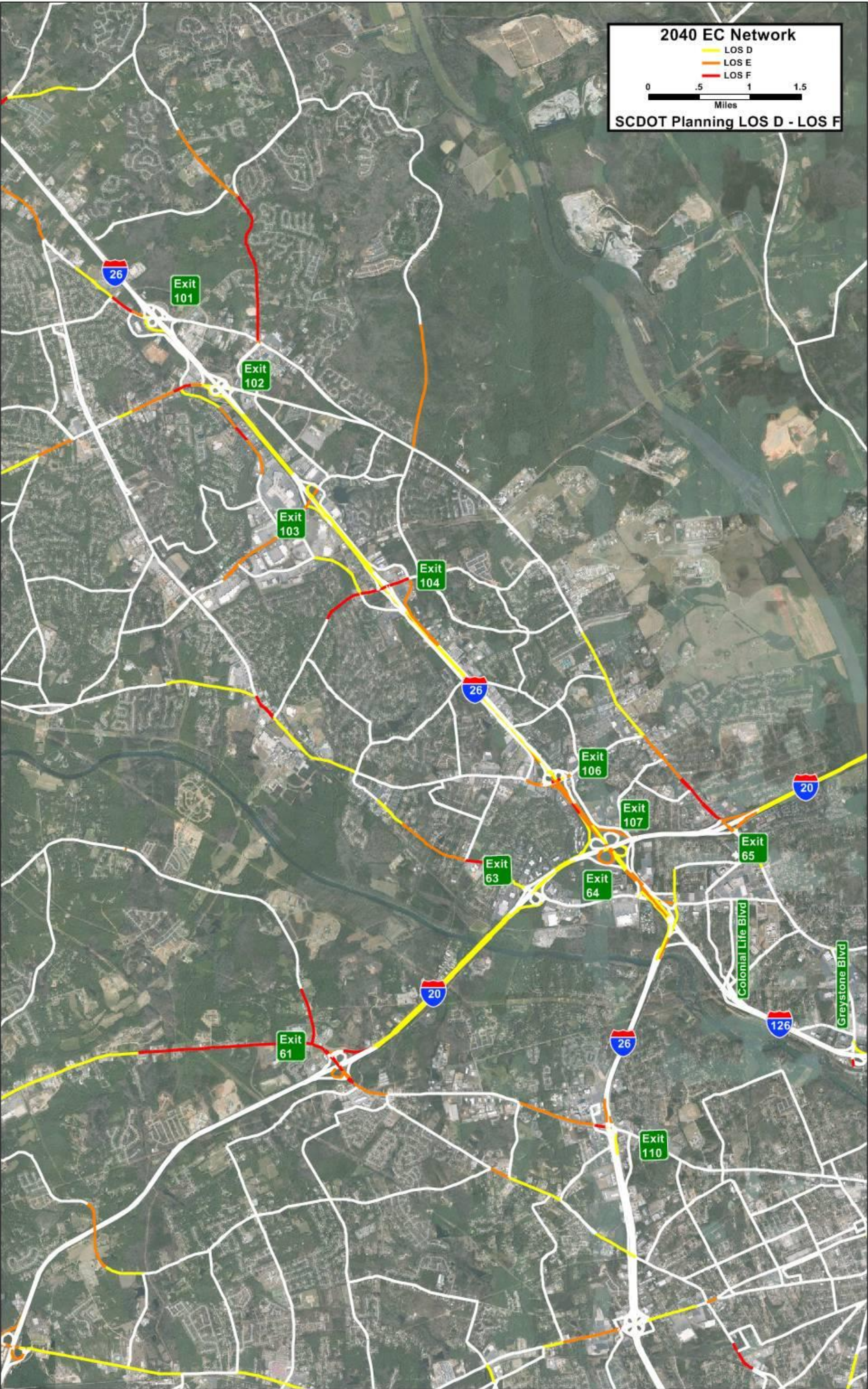


Figure 5-15: 2040 EC LOS D to LOS F Network Links



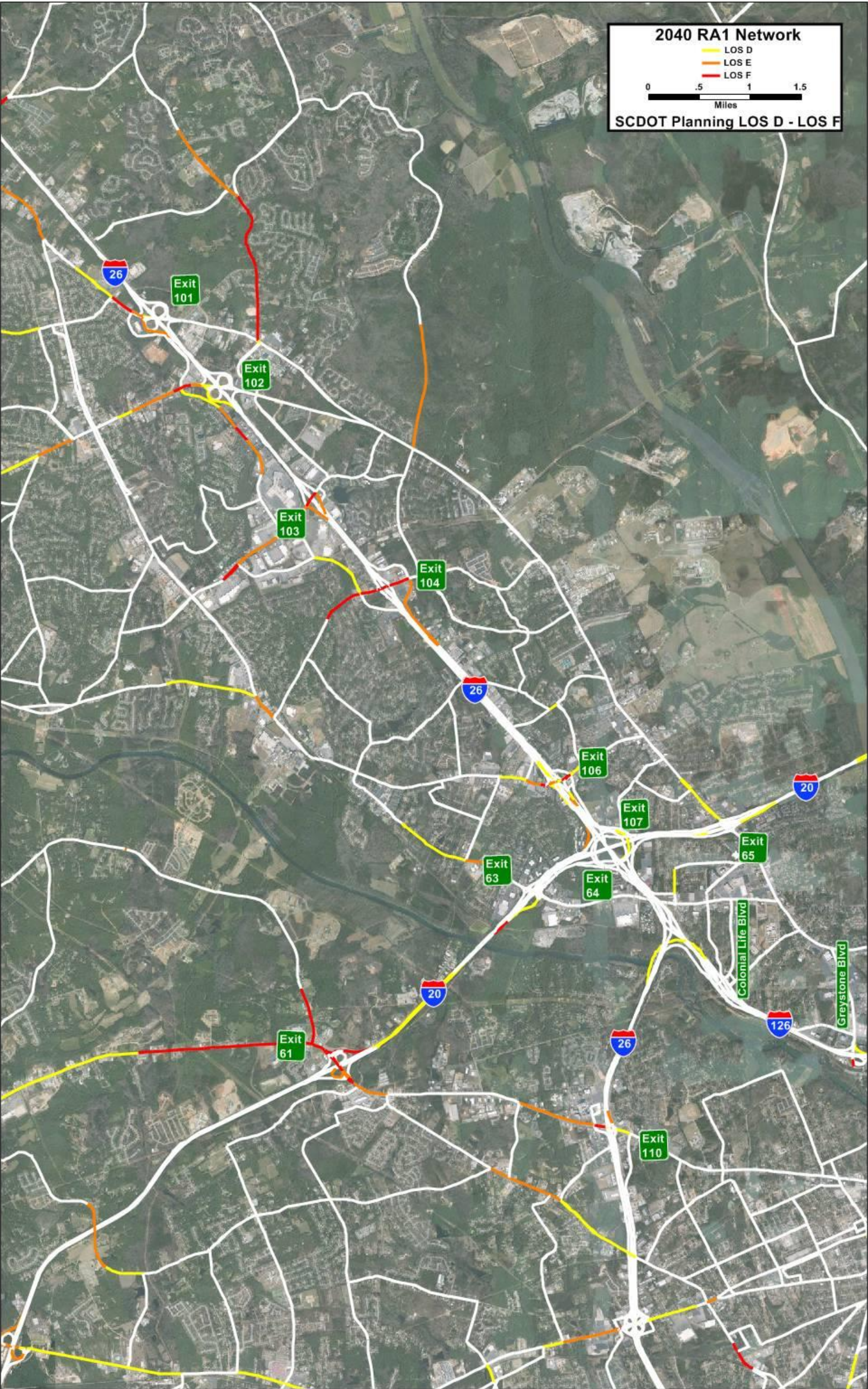


Figure 5-16: 2040 RA1 LOS D to LOS F Network Links



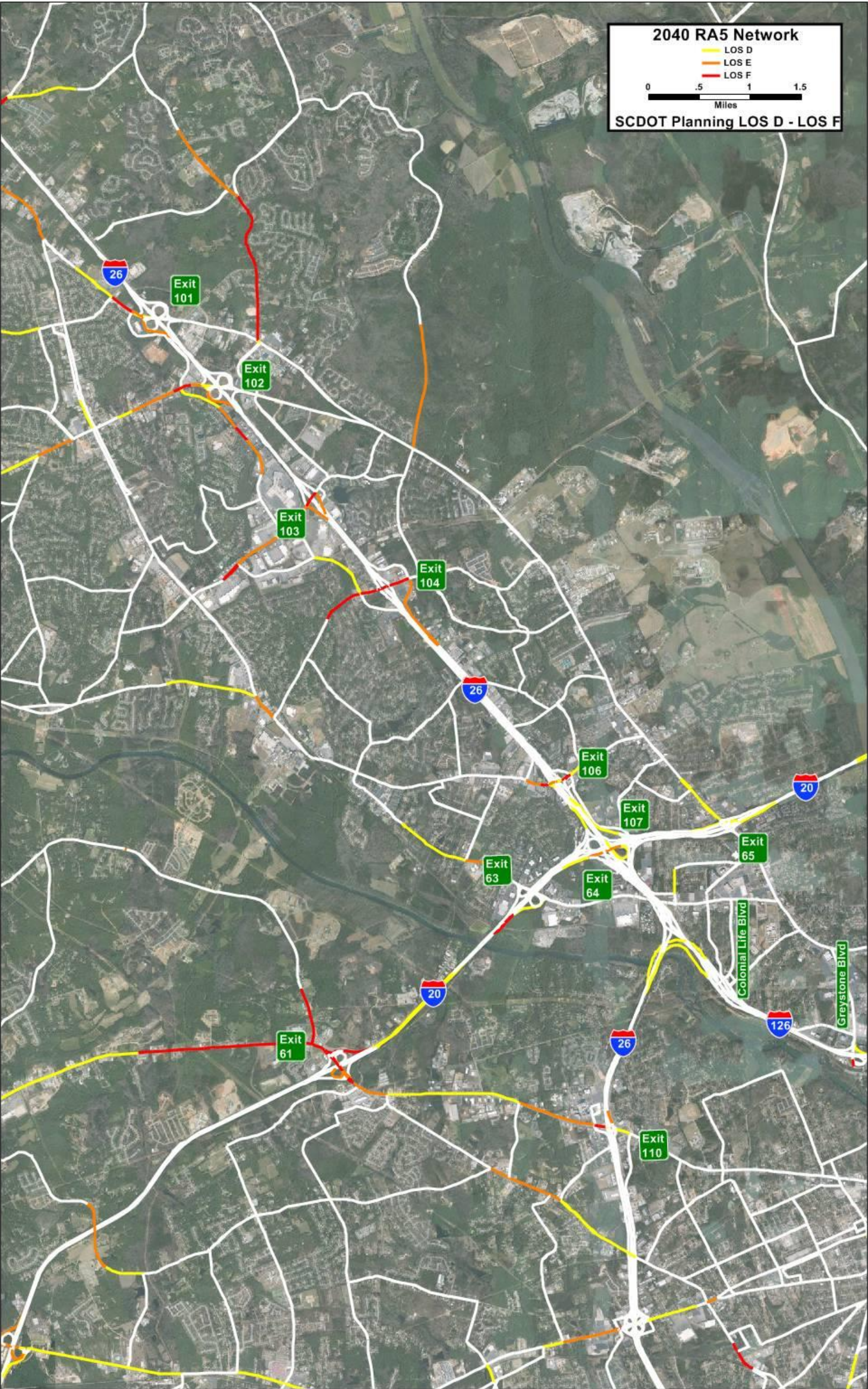


Figure 5-17: 2040 RA5 LOS D to LOS F Network Links



## Alternatives Traffic Analysis Technical Memo

### 5.3 Analysis of Representative Alternatives

Each of the representative alternative TransModeler networks were run for the AM and PM Peak hours for 5 simulations runs and averaged to develop the outputs for the measures of effectiveness (MOEs). The following MOEs were analyzed for the representative alternative analysis:

- Mainline Volumes
- Mainline, Merge, and Diverge Density, v/C, and LOS
- Mainline Travel Times
- Arterial Travel Times
- Intersection LOS and Delay
- External to External Speeds and Travel Times

Discussion of the level 1B screening of the representative alternatives can be found in subsections under section 4.5.2 of the *Alternatives Development and Screening Report*.

#### 5.3.1 RA1 ANALYSIS RESULTS

##### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.3**, **Table 5.4** and **Table 5.5** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA1 in section 4.5.2.3 of the *Alternatives Development and Screening Report*.

**Table 5.3: I-26 Mainline Volume TransModeler Results – RA1**

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,623	2,861	3,610	5,433
Exit 101 to Exit 102 (Lake Murray Boulevard)	5,494	3,540	4,415	6,899
Exit 102 to Exit 103 (Harbison Boulevard)	5,809	3,991	4,989	7,045
Exit 103 to Exit 104 (Piney Grove Road)	6,413	4,559	5,639	7,584
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	7,188	4,946	6,380	7,987
Exit 106 to Exit 107	5,852	3,182	4,810	5,788
I-26 to I-26	2,044	2,189	2,258	2,454
Exit 108 to Exit 110 (Sunset Boulevard)	3,191	2,189	3,437	2,454
southeast of Exit 110	3,451	4,299	4,016	4,762



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**Table 5.4: I-20 Mainline Volume TransModeler Results – RA1**

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,285	1,884	2,971	3,819
Exit 61 to Exit 63 (Bush River Road/CD Road)	5,302	2,920	3,870	5,206
Exit 63 to Exit 65 (Broad River Road)	2,240	1,976	1,596	2,386
Exit 65 to Exit 68 (Monticello Road)	5,363	5,714	5,059	6,200
east of Exit 68	4,886	5,737	5,091	5,856

**Table 5.5: I-126 Mainline Volume TransModeler Results – RA1**

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-26 to Colonial Life Blvd	4,946	1,932	3,583	4,628
I-126 to I-26 WB	-	1,932	-	4,628
I-126 from Colonial Life Blvd to Greystone Blvd	5,947	3,229	3,810	7,181
I-126 from Greystone Blvd to Huger St	5,741	3,439	3,679	6,968

### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.6**, **Table 5.7** and **Table 5.8** for I-26, I-20 and I-126, respectively.

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Table 5.6: I-26 Basic Freeway Segment TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	C	21.4	0.46	C	18.1	0.37
Exit 102 to Exit 103	C	26.0	0.61	C	23.1	0.52
Exit 103 to Exit 104	C	25.8	0.53	C	22.0	0.47
Exit 104 to Exit 107/Exit 106	E	35.6	0.60	C	24.3	0.53
Exit 107/106 to I-26 Split	F	77.9	0.52	E	36.8	0.43
I-26 to I-126	C	25.5	0.56	B	16.8	0.38
I-26 Split to Exit 110	C	18.6	0.40	F	45.2	0.46
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	C	19.6	0.44	C	20.6	0.48
I-126 to I-26	C	22.0	0.46	C	22.7	0.51
I-26 Mege to Exit 106	B	15.7	0.34	D	28.8	0.59
Exit 106 to Exit 104	D	29.2	0.55	F	63.4	0.89
Exit 104 to Exit 103	C	22.1	0.38	D	33.1	0.63
Exit 103 to Exit 102	B	15.6	0.42	D	29.0	0.73
Exit 102 to Exit 101	B	14.2	0.29	D	26.9	0.57

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.7: I-20 Basic Freeway Segment TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	E	44.5	0.60	C	25.7	0.41
Exit 61 to Exit 63	F	46.8	0.74	C	22.4	0.54
Exit 63 to Exit 68	D	30.5	0.56	D	28.3	0.53
Exit 65 to Exit 68	-	-	-	-	-	-
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	D	30.4	0.79	E	39.8	0.86
Exit 65 to Exit 63	A	6.6	0.16	A	6.4	0.20
Exit 63 to Exit 61	B	13.8	0.30	F	81.8	0.54
west of Exit 61	B	17.3	0.26	E	37.9	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.8: I-126 Basic Freeway Segment TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	C	19.9	0.55	C	18.5	0.40
Colonial Life Blvd to Greystone Blvd	C	25.8	0.62	B	15.9	0.40
Greystone Blvd to Huger St	D	28.8	0.60	B	15.9	0.38
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	14.9	0.36	D	31.3	0.73
Greystone Blvd to Colonial Life Blvd	B	16.4	0.34	E	38.4	0.75
Colonial Life Blvd to I-26	-	-	-	D	26.7	0.64

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA1 analysis results for the freeway segments, summarized in **Table 5.6**, **Table 5.7** and **Table 5.8** indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segments between Exit 104 and the I-26 Split operate at LOS E or F. All other segments along I-26 eastbound, and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segments west of Exit 61 to Exit 63 operate at LOS E or F, while other I-20 segments operate at LOS D or better.
  - All I-126 freeway segments during the morning peak hour operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound freeway segment between Exit 106/107 and the I-26 split operates at an LOS E, and the I-26 split to Exit 110 operate at LOS F. I-26 westbound segments operate at LOS F from the Exit 106 to Exit 104, while all other segments operate at LOS D or better.
  - I-20 eastbound freeway segments operate at LOS D or better. I-20 westbound freeway segments between Exit 68 and Exit 65 as well as west of Exit 61 to Exit 63 operate at LOS E or F, while all other westbound segments operate at LOS D or better.
  - I-126 eastbound freeway segments operate at LOS C or better, while I-126 westbound freeway segments operate at LOS D or worse.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.9**, **Table 5.10** and **Table 5.11** for I-26, I-20 and I-126, respectively.

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Table 5.9: I-26 Ramp Merge TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	21.4	0.46	B	18.1	0.37
Exit 102	C	23.4	0.49	C	22.0	0.42
Exit 103	C	25.8	0.53	C	22.0	0.47
Exit 104	E	35.6	0.50	C	24.3	0.44
Exit CD Road	F	77.9	0.52	E	36.8	0.43
Exit 107 (From I-20)	B	12.6	0.27	B	15.5	0.29
Exit 108 (I-126)	B	18.6	0.32	F	45.2	0.37
Exit 110	B	18.3	0.36	B	19.1	0.42
<b>I-26 Westbound</b>						
Exit 110	B	18.6	0.44	B	19.0	0.48
Exit 108 (I-126)	B	15.3	0.34	C	26.6	0.59
Exit 107 (From I-20)	B	20.0	0.36	F	98.3	0.58
Exit 106	C	26.6	0.45	F	73.8	0.72
Exit 104	B	14.2	0.38	C	20.2	0.63
Exit 103	B	15.6	0.33	D	29.0	0.59
Exit 102	B	14.2	0.29	C	26.9	0.57
Exit 101	B	11.4	0.24	C	22.1	0.45

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.10: I-20 Ramp Merge TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	C	24.1	0.46	B	16.4	0.35
Exit 61	F	46.8	0.56	C	22.4	0.40
Exit 65	D	30.5	0.45	D	28.3	0.42
Exit 65 (From CD)	B	15.2	0.36	B	16.8	0.32
Exit 68	C	26.2	0.51	D	28.1	0.53
<b>I-20 Westbound</b>						
Exit 68	D	30.4	0.60	E	39.8	0.65
Exit 65 (From CD)	A	6.6	0.16	A	6.4	0.20
Exit 63 (From CD)	A	9.7	0.21	C	20.2	0.35
Exit 63	B	11.9	0.24	F	46.7	0.45
Exit 61 Loop	A	8.8	0.18	B	14.5	0.38
Exit 61	B	12.5	0.20	D	29.0	0.40

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.11: I-126 Ramp Merge TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	C	21.7	0.50	B	14.3	0.32
Greystone Blvd	C	26.3	0.60	B	13.1	0.38
<b>I-126 Westbound</b>						
Colonial Life Blvd	A	8.9	0.27	C	22.1	0.66
Greystone Blvd	B	16.4	0.34	E	38.4	0.75

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA1 analysis results for the ramp merge areas, summarized in **Table 5.9**, **Table 5.10** and **Table 5.11** indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge area at the CD Road operates at LOS F and at Exit 104 operate at LOS E. All other ramp merge areas operate at LOS C or better.

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- I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 61, where the merge area operates at LOS F.
- I-126 merge areas during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 eastbound merge areas at the CD road and Exit 108 operate at LOS E and F, respectively, while all other segments operate at LOS C or better. All I-26 westbound merge areas operate at LOS D or better with the exception of Exit 107 and Exit 106 merge areas which operate at LOS F.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 63 and Exit 68, where the merge area operates at LOS F and LOS E, respectively.
  - I-126 merge areas during the evening peak hour operate at LOS C or better, with the exception of the westbound Greystone Blvd merge area which operate at LOS E.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.12**, **Table 5.13** and **Table 5.14** for I-26, I-20 and I-126, respectively.

**Table 5.12: I-26 Ramp Diverge TransModeler Results – RA1**

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	23.5	0.48	B	18.1	0.38
Exit 101 Loop	B	17.7	0.37	B	13.5	0.29
Exit 102	C	21.4	0.46	B	18.1	0.37
Exit 102 Loop	C	20.1	0.43	B	16.5	0.35
Exit 103	C	23.4	0.60	C	22.2	0.52
Exit 104	C	25.8	0.53	C	22.0	0.47
Exit 106	F	89.1	0.54	D	29.9	0.50
Exit 107	F	45.3	0.56	C	26.7	0.53
Exit 110	B	19.2	0.40	F	48.2	0.45
<b>I-26 Westbound</b>						
Exit 110	D	28.9	0.45	F	65.1	0.49
Exit 107/I-126	C	20.2	0.44	C	21.1	0.48
Exit 106	B	14.0	0.34	C	25.1	0.59
Exit 104	C	26.7	0.44	F	73.6	0.71
Exit 103	B	14.2	0.38	C	21.3	0.63
Exit 102	B	18.7	0.41	D	34.5	0.73
Exit 102 Loop	B	16.5	0.31	C	27.0	0.57
Exit 101	B	14.2	0.29	C	26.9	0.57
Exit 101 Loop	B	10.9	0.26	C	22.1	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.13: I-20 Ramp Diverge TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	D	29.2	0.44	B	18.5	0.31
Exit 63/64/65	C	22.8	0.43	B	17.0	0.32
Exit 68	E	38.2	0.71	D	32.5	0.70
<b>I-20 Westbound</b>						
Exit 68	E	39.6	0.79	F	66.1	0.81
Exit 65	D	33.2	0.38	E	43.1	0.43
Exit 65 (CD Road to I-26)	C	25.0	0.33	D	29.0	0.39
Exit 63	A	6.7	0.16	A	6.4	0.20
Exit 61	D	28.9	0.30	F	68.7	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.14: I-126 Ramp Diverge TransModeler Results – RA1

Segment	RA1 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Boulevard	B	19.9	0.55	B	18.5	0.40
Greystone Boulevard	C	22.0	0.49	B	14.6	0.32
<b>I-126 Westbound</b>						
Greystone Boulevard	B	17.1	0.36	D	32.1	0.73
Colonial Life Boulevard	B	15.3	0.27	E	42.7	0.60
Colonial Life Boulevard to I-26 EB	B	13.3	0.30	E	38.1	0.68
Exit 107 (I-20)	B	11.2	0.27	D	29.5	0.66

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA1 analysis results for the ramp diverge areas, summarized in **Table 5.12**, **Table 5.13** and **Table 5.14** indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas between Exit 106 and Exit 107 operate at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound and westbound diverges areas operate at LOS D or better with the exception of Exit 68, where the diverge areas operates at LOS E in both directions.
  - All I-126 diverge areas during the morning peak hour operate at LOS C or better.

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- During the afternoon peak hour:
  - I-26 eastbound diverge area at Exit 110 operates at LOS F. All other eastbound segments operate at LOS D or better. All I-26 westbound diverge areas operate at LOS D or better with the exception of Exit 110 and Exit 104 which operate at LOS F.
  - I-20 eastbound diverge areas operate at LOS D or better. The westbound diverge areas operate at LOS D or better with the exception of Exit 65, which operates at LOS E and Exit 68 and Exit 61 which operate at LOS F.
  - I-126 diverge areas at Colonial Life Blvd operates at LOS E, while all other diverge areas operate at LOS D.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.15**.

**Table 5.15: Mainline Travel Time TransModeler Results – RA1**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.76	00:46	00:45	58.6	60.4	0.90	00:54	00:58	59.9	56.5
Exit 102 to Exit 103 (Harbison Boulevard)	1.21	01:15	01:13	58.3	59.8	1.04	01:01	01:07	61.3	55.9
Exit 103 to Exist 104 (Piney Grove Road)	0.89	00:56	00:53	56.9	59.6	0.95	00:57	01:00	60.3	56.5
Exit 104 to Exit 107 (I-20)/ Exit106 (St. Andrews Road)	1.74	02:33	01:52	41.0	56.0	2.43	03:01	05:16	48.3	27.7
Exit 106 to I-26/I-126 Split	1.23	02:21	01:31	31.2	48.2	0.69	00:41	00:45	60.5	54.9
I-26 to I-126	1.22	01:14	01:15	59.4	58.3	0.73	00:42	00:42	62.8	62.8
I-26/I-126 Split to Exit 110 (Sunset Boulevard)	1.63	01:35	01:56	61.8	50.7	1.47	01:25	01:26	62.5	61.7
Total	8.67	10:40	09:26	48.7	55.2	8.21	08:41	11:13	56.7	43.9
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63/64	1.83	02:42	01:50	40.7	59.8	2.32	02:26	04:31	18.7	30.8
Exit 63/64 to Exit 65	2.55	02:29	02:26	61.4	62.6	1.39	01:21	01:19	33.7	63.6
Exit 65 to Exist 68 (Monticello Road)	2.51	02:49	02:36	53.6	58.1	2.99	03:25	04:07	13.3	43.5
Total	6.89	08:00	06:52	51.7	60.2	6.69	07:12	09:56	55.8	40.4
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Blvd	1.13	01:20	01:18	50.8	52.0	0.97	00:56	01:08	48.4	51.4
Colonial Life Blvd to Greystone Blvd	1.49	01:32	01:28	58.3	61.1	1.13	01:06	01:37	41.4	41.8
Total	2.61	02:52	02:46	54.8	56.8	2.11	02:02	02:46	62.1	45.8

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.16**.

**Table 5.16: Arterial Travel Time TransModeler Results – RA1**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	6.7	26:55	19:38	15.0	20.6	7.3	18:59	19:56	23.1	22.0
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	03:51	05:01	23.9	18.3	1.5	03:27	04:08	25.4	21.2
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	03:14	04:13	20.5	15.8	1.1	03:04	03:37	21.6	18.4
Piney Grove Road (west of Exit 104 to Broad River Road)	1.5	04:38	04:13	20.0	22.0	1.5	06:35	04:56	14.1	18.8
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	08:56	04:29	6.9	13.8	1.0	04:31	04:18	13.7	14.4
Bush River Road (west of Exit 63 to Broad River Road)	2.0	05:59	06:10	20.0	19.4	2.0	05:54	05:53	20.6	20.6
Location	Northbound					Southbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.6	01:47	02:00	21.3	18.9	0.6	02:30	02:31	15.1	15.0



## Alternatives Traffic Analysis Technical Memo

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.18**.

### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.17**.

**Table 5.17: External to External Speed and Travel Time TransModeler Results – RA1**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.84	18:45	13:28	44.3	61.7
To I-20 WB (west of Exit 61)	16.11	21:29	20:16	45.0	47.7
To I-20 EB (east of Exit 68)	15.64	25:59	19:08	36.1	49.1
To I-126 EB (Greystone Blvd)	14.78	21:21	14:56	41.5	59.4
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.85	13:14	23:26	62.8	35.5
To I-20 EB (east of Exit 68)	8.40	10:26	11:09	48.3	45.2
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	16:41	10:33	39.9	63.1
To I-26 WB (west of Exit 101)	16.64	22:33	29:08	44.3	34.3
To I-126 EB (east of Greystone Blvd)	10.33	17:37	11:03	35.2	56.1
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	10:52	15:47	61.3	42.2
To I-26 EB (east of Exit 110)	8.92	10:13	13:51	52.4	38.7
To I-26 WB (west of Exit 101)	15.29	16:21	29:35	56.1	31.0
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	14:43	26:40	60.2	33.2
To I-20 WB (west of Exit 61)	10.64	11:03	15:24	57.8	41.5

## 5.3.2 RA2 ANALYSIS RESULTS

### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.19**, **Table 5.20** and **Table 5.21** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA2 in section 4.5.2.4 of the *Alternatives Development and Screening Report*.

Table 5.18: Intersection and LOS TransModeler Results – RA1

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	B	17.7	A	4.0
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	B	15.2	F	85.1
100000151	Broad River Road (US 176) at I-26 EB On-ramp	A	3.9	A	4.4
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	1.9	A	2.3
4	Broad River Road (US 176) at Western Lane	B	11.6	A	9.1
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	C	34.5	E	63.3
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	2.3	A	9.1
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.5	B	13.8
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	B	14.7	C	20.2
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	15.1	B	11.4
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	7.4	C	26.2
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	5.2	B	11.9
104	Harbison Boulevard (S-757) at I-26 EB Ramps	B	16.0	B	11.7
99	Harbison Boulevard (S-757) at I-26 WB Ramps	C	20.5	D	42.1
100000165	Harbison Boulevard (S-757) at Woodcross Drive	B	19.9	D	40.5
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	E	69.8	D	48.7
71	Piney Grove Road at I-26 EBR Off-ramp <sup>1</sup>	C	31.0	C	31.3
100000174	Piney Grove Road at I-26 EB Ramps	B	18.2	C	24.0
100000177	Piney Grove Road at I-26 WB Ramps	B	11.1	B	10.3
89	Piney Grove Road at I-26 WBR Off-ramp <sup>1</sup>	C	28.2	C	24.2
100000399	Piney Grove Road at Fernandina Road	C	24.3	D	35.8
Exit 106					
100000348	St. Andrews Road at Jamil Road	B	19.1	B	12.8
127	St. Andrews Road at Woodland Hills Road	B	13.9	A	8.8
40	St. Andrews Road at I-26 SPUI Intersection	D	30.6	E	41.2
100000182	St. Andrews Road at I-26 WBR Off-ramp	F	173.6	F	200.3
100000358	St. Andrews Road at Fernandina Road/Burning Tree Drive	C	17.2	D	30.0
100000354	St. Andrews Road at Kay Street / Chartwell Road	C	30.1	B	13.8
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	A	9.6	A	9.1
100000898	Bush River Road at Driveway	A	4.2	A	5.3
100000252	Bush River Road at Morninghill Drive	C	22.9	C	21.3
100000184	Bush River Road at Arrowwood Road	B	16.2	B	19.4
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	D	45.1	F	159.4
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	46.3	F	79.9
100000903	Sunset Boulevard (US 378) at I-26 Single Point Ramps Intersection	C	22.4	C	31.7
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	D	33.6	F	55.6
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	6.8	F	80.0
Exit 63					
14	Bush River Road at Berryhill Drive <sup>1</sup>	B	10.4	B	17.4
134	Bush River Road at I-20 WB Ramps DDI Intersection	B	10.3	B	12.8
48	Bush River Road at I-20 EB Ramps DDI Intersection	B	11.2	B	10.5
120	Bush River Road at Rockland Road	A	5.7	B	14.7
100000255	Bush River Road at Independence Avenue	B	17.0	C	20.7
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	D	44.7	C	34.8
54	Broad River Road at I-20 WB Ramps	C	26.4	B	13.5
79	Broad River Road at I-20 Single Point Ramps Intersection	C	31.3	C	31.6
100000190	Broad River Road at I-20 EB Ramps <sup>1</sup>	E	78.3	D	43.8
100000195	Broad River Road at Longcreek Drive	A	5.1	A	4.2
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	60.8	D	38.1
100000037	Broad River Road (US 176) at Harbison Boulevard	B	14.0	C	23.2
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	22.1	C	20.5
100000068	Broad River Road (US 176) at Piney Grove Road	A	5.3	B	10.4
100000339	Broad River Road (US 176) at St. Andrews Road	F	131.7	D	44.5
100000349	Broad River Road (US 176) at St. Andrews Parkway	C	33.8	C	21.1
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	F	92.7	E	73.1
41	Broad River Road (US 176) at Dutch Square Boulevard	A	6.3	C	27.3
100000046	Broad River Road (US 176) at Bush River Road	C	27.3	E	71.2
100000266	Broad River Road (US 176) at Greystone Boulevard	B	12.3	B	14.6
100000265	Greystone Boulevard at Stoneridge Drive	C	23.9	D	48.9
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	E	37.2	C	21.3
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	C	25.0	F	70.6
100000262	Bush River Road at Colonial Life Boulevard	B	18.0	C	22.8
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	E	37.2	A	4.1
100000374	Park Terrance Drive at Bower Parkway	A	8.7	B	11.2
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					



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Table 5.19: I-26 Mainline Volume TransModeler Results – RA2

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,816	3,211	3,608	5,118
Exit 101 to Exit 102 (Lake Murray Boulevard)	5,438	3,839	4,246	5,918
Exit 102 to Exit 103 (Harbison Boulevard)	4,997	4,130	4,886	6,098
Exit 103 to Exit 104 (Piney Grove Road)	4,937	4,634	5,777	6,903
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	5,027	5,298	5,612	7,900
Exit 106 to Exit 107	1,629	5,141	1,646	7,885
I-26 Diverge to I-126 Merge	2,944	1,687	3,122	2,170
Exit 108 to Exit 110 (Sunset Boulevard)	3,813	4,601	4,330	5,067
southeast of Exit 110	3,234	4,388	4,309	4,774

Table 5.20: I-20 Mainline Volume TransModeler Results – RA2

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,437	1,952	2,948	3,763
Exit 61 to Exit 63 (Bush River Road/CD Road)	4,748	2,797	4,110	4,918
Exit 63 to Exit 65 (Broad River Road)	2,312	1,236	1,577	1,491
Exit 65 to Exit 68 (Monticello Road)	5,751	4,488	5,246	4,785
east of Exit 68	5,268	5,215	5,273	4,522

Table 5.21: I-126 Mainline Volume TransModeler Results – RA2

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-26 to Colonial Life Blvd	3,748	1,829	3,118	4,079
I-126 from Colonial Life Blvd to Greystone Blvd	5,274	3,322	3,899	7,218
I-126 from Greystone Blvd to Huger St	5,390	3,514	3,564	7,003

## Alternatives Traffic Analysis Technical Memo

### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.22**, **Table 5.23** and **Table 5.24** for I-26, I-20 and I-126, respectively.

**Table 5.22: I-26 Basic Freeway Segment TransModeler Results – RA2**

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	F	76.1	0.57	B	17.0	0.44
Exit 102 to Exit 103	B	14.1	0.52	C	18.6	0.51
Exit 103 to Exit 104	B	12.1	0.51	C	23.9	0.60
Exit 104 to Exit 106	F	139.9	0.52	F	114.4	0.58
Exit 106 to Exit 107	B	12.1	0.24	B	13.1	0.24
I-26 to I-26	B	13.2	0.41	B	13.6	0.43
Exit 108 to Exit 110	C	21.0	0.53	C	21.3	0.60
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	D	26.5	0.48	C	24.6	0.53
I-126 Diverge to I-126 Merge	B	12.5	0.23	B	13.2	0.30
Exit 107 to Exit 106	C	19.4	0.38	F	57.1	0.58
Exit 106 to Exit 104	C	19.4	0.39	F	74.8	0.59
Exit 104 to Exit 103	C	23.4	0.48	F	58.2	0.72
Exit 103 to Exit 102	B	16.5	0.43	C	23.0	0.64
Exit 102 to Exit 101	B	13.9	0.40	D	33.8	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 5.23: I-20 Basic Freeway Segment TransModeler Results – RA2**

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	F	46.3	0.62	C	25.4	0.41
Exit 61 to Exit 63	F	59.3	0.66	E	40.8	0.57
Exit 63 to Exit 65	A	10.9	0.24	A	7.9	0.16
Exit 65 to Exit 68	D	33.0	0.73	D	32.1	0.73
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	F	101.6	0.62	F	108.3	0.66
Exit 65 to Exit 63	A	8.2	0.17	A	9.0	0.21
Exit 63 to Exit 61	D	29.3	0.39	F	86.2	0.68
west of Exit 61	C	18.1	0.27	E	36.2	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 5.24: I-126 Basic Freeway Segment TransModeler Results – RA2**

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	B	14.1	0.57	B	12.2	0.47
Colonial Life Blvd to Greystone Blvd	C	21.6	0.55	B	16.0	0.41
Greystone Blvd to Huger St	C	24.8	0.56	B	15.0	0.37
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	16.0	0.37	D	30.9	0.73
Greystone Blvd to Colonial Life Blvd	B	16.3	0.35	F	58.1	0.75
Colonial Life Blvd to I-26	B	12.8	0.27	D	29.7	0.60

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA2 analysis results for the freeway segments, summarized in **Table 5.22**, **Table 5.23** and **Table 5.24** indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segments between Exit 101 to 102 and 104 to 106 operate at LOS F. All other segments along I-26 eastbound, and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segments west of Exit 61 to Exit 63 operate at LOS E or F. The westbound freeway segment from Exit 68 to Exit 65 operates at LOS F, while all other I-20 segments operate at LOS D or better.
  - All I-126 freeway segments during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 eastbound freeway segment between 104 and Exit 106 operates at an LOS F. I-26 westbound segments operate at LOS F from the Exit 107 to Exit 103, while all other segments operate at LOS D or better.
  - I-20 eastbound freeway segments operate at LOS D or better except from Exit 61 to Exit 63 which operates at LOS E. I-20 westbound freeway segments between Exit 68 and Exit 65 as well as west of Exit 61 to Exit 63 operate at LOS E or F, while all other westbound segments operate at LOS A.
  - I-126 eastbound freeway segments operate at LOS B, while I-126 westbound freeway segments operate at LOS D or worse.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.25**, **Table 5.26** and **Table 5.27** for I-26, I-20 and I-126, respectively.

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Table 5.25: I-26 Ramp Merge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	F	76.1	0.57	B	17.0	0.44
Exit 102	B	14.1	0.42	B	18.6	0.41
Exit 103	B	12.1	0.41	C	23.9	0.48
Exit 104	F	125.3	0.47	F	98.9	0.50
Exit CD Road	F	139.9	0.52	F	114.4	0.58
Exit 107 (From I-20)	B	13.2	0.31	B	13.6	0.33
Exit 108 (I-126)	C	21.0	0.40	C	21.3	0.45
Exit 110	B	14.8	0.34	C	21.2	0.45
<b>I-26 Westbound</b>						
Exit 110	D	28.1	0.38	C	27.6	0.42
Exit 108 (I-126)	B	18.1	0.31	D	29.0	0.56
Exit 107 (From I-20)	B	19.4	0.38	F	57.1	0.59
Exit 106	B	19.4	0.39	F	74.8	0.59
Exit 104	C	27.2	0.47	F	80.6	0.67
Exit 103	B	16.5	0.34	C	23.0	0.51
Exit 102	B	13.9	0.32	D	33.8	0.49
Exit 101	B	18.3	0.33	C	25.8	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.26: I-20 Ramp Merge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	C	27.1	0.44	B	19.5	0.36
Exit 65	D	29.6	0.48	C	27.2	0.44
Exit 68	D	29.9	0.57	D	30.1	0.55
<b>I-20 Westbound</b>						
Exit 68	F	82.6	0.53	F	99.2	0.50
Exit 64 (From CD)	B	10.0	0.19	C	24.7	0.33
Exit 63	B	13.4	0.23	F	63.1	0.42
Exit 61	B	13.6	0.20	D	29.4	0.39

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.27: I-126 Ramp Merge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	C	20.5	0.55	B	14.1	0.41
Greystone Blvd	C	23.3	0.56	B	12.2	0.37
<b>I-126 Westbound</b>						
Greystone Blvd	B	18.3	0.35	F	58.0	0.76
Colonial Life Blvd	B	10.3	0.27	F	61.8	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA2 analysis results for the ramp merge areas, summarized in **Table 5.25**, **Table 5.26** and **Table 5.27** indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge area at the Exit 101, Exit 104, and CD Road operates at LOS F. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 68, where the westbound merge area operates at LOS F.
  - I-126 merge areas during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 eastbound merge areas at the CD road and Exit 104 operate at LOS F, while all other segments operate at LOS C or better. All I-26 westbound merge areas operate at LOS D or better with the exception of Exit 107, Exit 106, and Exit 104 merge areas which operate at LOS F.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 63 and Exit 68, where the merge area operates at LOS F in the westbound direction.
  - I-126 eastbound merge areas during the evening peak hour operate at LOS B, whereas westbound merge areas operate at LOS F.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.28**, **Table 5.29** and **Table 5.30** for I-26, I-20 and I-126, respectively.

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Table 5.28: I-26 Ramp Diverge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	D	30.5	0.67	C	20.2	0.50
Exit 102	F	76.1	0.55	B	17.0	0.44
Exit 103	B	15.6	0.52	C	20.3	0.51
Exit 104	B	12.5	0.41	C	24.0	0.48
Exit 106	F	139.9	0.52	F	114.4	0.58
Exit 110	C	24.2	0.53	C	24.0	0.60
<b>I-26 Westbound</b>						
Exit 110	D	30.8	0.46	E	40.0	0.49
Exit 108 (CD Road/I-126)	C	26.5	0.48	C	24.6	0.53
Exit 104	C	27.2	0.47	F	80.6	0.67
Exit 103	C	22.9	0.50	F	65.2	0.71
Exit 102	B	16.6	0.43	C	23.1	0.64
Exit 101	B	14.0	0.40	D	34.1	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.29: I-20 Ramp Diverge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	E	35.4	0.46	B	18.5	0.31
Exit 63	F	55.6	0.51	E	40.8	0.43
Exit 68	E	42.5	0.80	E	37.7	0.73
<b>I-20 Westbound</b>						
Exit 68	F	84.1	0.69	F	131.1	0.61
Exit 65	F	88.0	0.49	F	98.3	0.50
Exit 61	F	51.6	0.37	F	95.1	0.66

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.30: I-126 Ramp Diverge TransModeler Results – RA2

Segment	RA2 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Boulevard	B	14.1	0.43	B	12.2	0.35
Greystone Boulevard	B	19.3	0.44	B	15.6	0.32
<b>I-126 Westbound</b>						
Greystone Boulevard	B	18.4	0.37	D	33.4	0.73
Colonial Life Boulevard	C	21.0	0.35	F	70.2	0.75

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA2 analysis results for the ramp diverge areas, summarized in **Table 5.28**, **Table 5.29** and **Table 5.30** indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas between Exit 102 and Exit 106 operate at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound and westbound diverges areas operate at LOS E or worse in both directions.
  - All I-126 diverge areas during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 eastbound diverge area at Exit 106 operates at LOS F. All other eastbound segments operate at LOS C or better. All I-26 westbound diverge areas operate at LOS D or better with the exception of Exit 103 and Exit 104 which operate at LOS F, and Exit 110 which operates at LOS E.
  - I-20 eastbound and westbound diverge areas operate at LOS E or worse except for eastbound at Exit 61 which operates at LOS B.
  - I-126 westbound diverge area at Colonial Life Blvd operates at LOS F, while all other diverge areas operate at LOS D or better.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.31**.

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**Table 5.31: Mainline Travel Time TransModeler Results – RA2**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.76	01:16	00:45	36.1	60.8	1.23	01:11	01:23	62.0	53.1
Exit 102 to Exit 103 (Harbison Boulevard)	1.15	01:09	01:08	59.5	60.3	1.08	01:03	01:08	61.2	57.1
Exit 103 to Exit 104 (Piney Grove Road)	0.95	00:58	01:00	58.8	57.7	0.85	00:51	01:24	59.4	36.3
Exit 104 to Exit 106 (St. Andrews Road)	1.78	07:00	04:56	15.2	21.6	1.39	01:45	03:50	47.4	21.6
Exit 106 to I-126	2.55	02:46	02:46	55.6	55.5	2.61	03:02	03:56	51.6	39.9
I-126 to Exit 110 (Sunset Boulevard)	1.53	01:29	01:30	61.8	61.5	1.31	01:23	01:21	57.1	58.1
Total	8.72	14:38	12:04	35.8	43.4	8.46	09:16	13:02	54.8	38.9
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63/64/65 (Bush River Road)	1.52	02:42	02:14	33.7	40.9	4.08	04:41	06:07	52.3	40.0
Exit 63/64/65 to Exit 68 (Monticello Road)	5.11	05:18	05:06	57.8	60.2	2.71	08:33	10:39	19.0	15.3
Total	6.63	08:01	07:19	49.7	54.3	6.79	13:13	16:46	30.8	24.3
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Blvd	0.59	00:36	00:35	58.9	60.3	0.99	01:01	01:42	57.8	34.9
Colonial Life Blvd to Greystone Blvd	1.40	01:22	01:22	61.3	61.4	1.14	01:06	01:54	62.0	36.1
Total	1.99	01:58	01:57	60.5	61.1	2.13	02:08	03:36	60.0	35.5

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.32**.

**Table 5.32: Arterial Travel Time TransModeler Results – RA2**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	7.9	45:12	25:03	10.4	18.8	7.9	22:32	28:59	20.9	16.3
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	06:54	06:18	13.4	14.7	1.5	04:11	04:31	21.1	19.6
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	04:15	04:58	15.3	13.1	1.1	03:20	03:22	19.4	19.2
Piney Grove Road (west of Exit 104 to Broad River Road)	1.6	06:00	05:10	15.6	18.1	1.6	07:19	05:30	12.8	17.1
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	04:27	06:24	13.7	9.5	1.0	04:41	05:30	13.0	11.0
Bush River Road (west of Exit 63 to Broad River Road)	2.0	07:47	07:58	15.1	14.7	2.0	06:36	08:00	17.8	14.7
Location	Northbound					Southbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.7	02:15	02:40	17.5	14.7	0.7	02:21	02:15	16.7	17.4

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.33**.



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Table 5.33: Intersection and LOS TransModeler Results – RA2

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
106	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	C	28.1	A	10.0
108	Broad River Road (US 176) at I-26 EBR Off-ramp <sup>1</sup>	A	0.8	A	0.1
101	Broad River Road (US 176) at I-26 EB Ramps	B	18.2	B	11.7
104	Broad River Road (US 176) at I-26 WB Ramps	B	16.9	C	22.9
100000522	Broad River Road (US 176) at I-26 WBR Off-ramp <sup>1</sup>	A	5.7	A	2.8
4	Broad River Road (US 176) at Western Lane	C	30.1	B	11.9
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	D	52.8	F	98.8
103	Lake Murray Boulevard (SC 60) at I-26 EB Off-Ramp	B	17.1	A	9.4
100000169	Lake Murray Boulevard (SC 60) at I-26 WB Ramps	C	30.7	D	45.4
100000516	Lake Murray Boulevard (SC 60) at I-26 WBR Off-Ramp <sup>1</sup>	A	0.6	A	6.8
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	C	24.3	C	33.1
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	C	32.4	A	9.7
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	6.8	C	27.4
100000362	Harbison Boulevard (S-757) at Saturn Parkway	B	10.3	A	8.3
112	Harbison Boulevard (S-757) at I-26 EBR Off-Ramp	A	2.5	A	2.8
121	Harbison Boulevard (S-757) at I-26 SPUI Interchange	D	37.6	D	38.9
99	Harbison Boulevard (S-757) at I-26 WBR Off-Ramp	A	3.4	B	14.7
100000165	Harbison Boulevard (S-757) at Woodcross Drive	B	17.1	C	28.9
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	F	82.1	E	65.6
152	Piney Grove Road at West DDI Intersection	B	15.8	B	18.2
100000174	Piney Grove Road at I-26 EBL Off-Ramp	A	0.6	B	10.4
123	Piney Grove Road at I-26 WBL Off-Ramp	B	16.4	B	11.2
154	Piney Grove Road at East DDI Interchange	C	22.2	B	14.2
100000399	Piney Grove Road at Fernandina Road	C	26.4	D	36.2
Exit 106					
100000348	St. Andrews Road at Jamil Road	E	60.4	D	44.2
100000178	St. Andrews Road at West DDI Intersection	B	19.5	B	14.2
54	St. Andrews Road at I-26 EBL Off-Ramp	A	0.2	A	0.3
45	St. Andrews Road at I-26 WBL Off-Ramp	A	8.5	A	6.5
142	St. Andrews Road at East DDI Intersection	B	11.0	B	19.5
100000354	St. Andrews Road at Kay Street / Chartwell Road	C	27.9	E	56.2
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	B	10.3	B	11.0
100000898	Bush River Road at Driveway	A	6.4	A	4.0
100000252	Bush River Road at Morninghill Drive	B	19.1	C	21.6
100000184	Bush River Road at Arrowwood Road	C	27.2	C	21.7
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	F	148.1	D	35.6
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	46.4	E	45.9
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	26.5	C	24.0
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	D	29.2	F	50.1
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	5.8	D	35.4
Exit 63					
171	Bush River Road at Outlet Pointe Boulevard / E Meadow Court	B	11.4	C	30.3
164	Bush River Road at I-20 EBR Off-Ramp	B	10.5	A	5.1
64	Bush River Road at I-20 SPUI Interchange	D	36.0	D	37.1
100000142	Bush River Road at I-20 WBR Off-Ramp	A	5.3	A	4.4
100000255	Bush River Road at Independence Avenue	D	50.2	E	64.5
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	C	32.3	C	21.6
91	Broad River Road at I-20 WB Ramps	D	42.4	D	48.2
37	Broad River Road at I-20 WBL Off-Ramp	A	4.8	A	3.6
98	Broad River Road at I-20 EB Ramps	B	17.9	B	18.4
100000195	Broad River Road at Longcreek Drive	A	1.4	A	5.8
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	66.6	E	60.2
100000037	Broad River Road (US 176) at Harbison Boulevard	D	37.3	B	19.4
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	31.1	C	20.7
100000068	Broad River Road (US 176) at Piney Grove Road	D	46.4	B	12.3
100000339	Broad River Road (US 176) at St. Andrews Road	F	207.4	E	55.3
100000349	Broad River Road (US 176) at St. Andrews Parkway	B	11.5	B	14.6
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	E	74.5	C	34.3
41	Broad River Road (US 176) at Dutch Square Boulevard	A	5.7	D	45.2
100000046	Broad River Road (US 176) at Bush River Road	F	93.7	F	120.2
100000266	Broad River Road (US 176) at Greystone Boulevard	B	15.9	B	18.9
100000265	Greystone Boulevard at Stoneridge Drive	D	37.9	C	33.1
100000188	Greystone Boulevard at I-126 WB Ramps	A	4.6	A	1.6
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	E	42.5	F	67.9
100000262	Bush River Road at Colonial Life Boulevard	B	16.7	C	20.9
166	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	7.7	C	17.4
163	Colonial Life Boulevard at I-126 EB Ramps	C	20.4	B	15.0
100000374	Park Terrance Drive at Bower Parkway	D	51.2	B	13.6
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					

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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.34**.

**Table 5.34: External to External Speed and Travel Time TransModeler Results – RA2**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.86	21:19	14:39	39.0	56.8
To I-20 WB (west of Exit 61)	16.07	27:54	22:11	34.6	43.5
To I-20 EB (east of Exit 68)	15.55	27:48	18:52	33.6	49.4
To I-126 EB (Greystone Blvd)	14.81	29:30	18:28	30.1	48.1
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 101)	13.87	13:23	15:21	62.2	54.2
To I-20 EB (east of Exit 68)	8.45	09:31	09:50	53.2	51.6
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	17:19	10:57	38.4	60.8
To I-26 WB (west of Exit 101)	16.28	22:56	22:08	42.6	44.1
To I-126 EB (east of Greystone Blvd)	10.36	24:10	13:11	25.7	47.1
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	15:34	23:38	42.8	28.2
To I-26 EB (east of Exit 110)	8.61	16:26	22:50	31.4	22.6
To I-26 WB (west of Exit 101)	15.35	21:06	30:42	43.6	30.0
I-126 WB from East of Greystone Blvd					
To I-26 WB (west of Exit 101)	14.75	14:52	19:02	59.5	46.5
To I-20 WB (west of Exit 61)	10.67	11:05	16:08	57.8	39.7

### 5.3.3 RA3 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume results is shown in **Table 5.35**, **Table 5.36** and **Table 5.37** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA3 in section 4.5.2.5 of the *Alternatives Development and Screening Report*.



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Table 5.35: I-26 Mainline Volume TransModeler Results – RA3

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,811	3,285	3,592	5,194
Exit 101 to Exit 102 (Lake Murray Boulevard)	6,205	4,165	4,470	6,330
Exit 102 to Exit 103 (Harbison Boulevard)	6,193	4,500	5,106	6,997
Exit 103 to Exist 104 (Piney Grove Road)	6,620	5,113	5,567	6,775
Exit 104 to Exit 106 (St. Andrews Road)	6,932	5,436	6,062	7,858
Exit 106 to Exit 107 (I-20)	6,425	5,257	4,696	7,938
I-26 to I-26	3,917	2,241	3,544	2,551
Exit 108 to Exit 110 (Sunset Boulevard)	4,609	4,379	4,790	5,116
southeast of Exit 110	3,841	4,335	4,534	4,733

Table 5.36: I-20 Mainline Volume TransModeler Results – RA3

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,420	2,061	2,957	3,745
Exit 61 to Exit 63 (Bush River Road)	5,590	3,246	4,061	4,794
Exit 63 to Exit 64 (I-26)	2,853	2,075	2,005	3,570
Exit 64 to Exit 65 (Broad River Road)	2,218	1,590	1,462	2,175
Exit 65 to Exit 68 (Monticello Road)	6,071	5,707	5,336	6,100
east of Exit 68	5,682	5,855	5,359	5,787

Table 5.37: I-126 Mainline Volume TransModeler Results – RA3

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-126/I-26 Split	5,517	1,937	3,197	4,357
I-126 from I-26 to Colonial Life Blvd	5,501	2,615	3,197	5,903
I-126 from Colonial Life Blvd to Greystone Blvd	6,759	3,396	3,889	7,452
I-126 from Greystone Blvd to Huger St	6,469	3,524	3,779	6,992

# Alternatives Traffic Analysis Technical Memo

## Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.38**, **Table 5.39** and **Table 5.40** for I-26, I-20 and I-126, respectively.

**Table 5.38: I-26 Basic Freeway Segment TransModeler Results – RA3**

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	C	24.3	0.52	C	18.1	0.37
Exit 102 to Exit 103	B	17.4	0.86	B	15.8	0.71
Exit 103 to Exit 104	D	31.7	0.55	C	21.5	0.46
Exit 104 to Exit 106	F	94.4	0.58	E	43.2	0.51
Exit 106 to Exit 107	D	31.9	0.48	C	20.6	0.35
I-26 to I-26	C	23.4	0.54	C	22.2	0.49
Exit 108 to Exit 110	A	0.0	0.51	A	0.0	0.53
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	B	15.2	0.31	B	15.1	0.35
I-26 to I-26	D	33.5	0.31	F	112.8	0.35
Exit 107 to Exit 106	D	28.3	0.39	F	72.9	0.59
Exit 106 to Exit 104	D	27.8	0.48	F	98.0	0.70
Exit 104 to Exit 103	B	17.7	0.71	F	69.5	0.94
Exit 103 to Exit 102	C	23.2	0.38	E	37.9	0.58
Exit 102 to Exit 101	B	17.3	0.35	C	24.6	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.39: I-20 Basic Freeway Segment TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	F	46.0	0.61	C	25.7	0.41
Exit 61 to Exit 63	F	54.6	0.78	C	23.9	0.56
Exit 63 to Exit 64	B	15.5	0.32	B	11.4	0.22
Exit 64 to Exit 65	B	13.6	0.25	A	9.6	0.16
Exit 65 to Exit 68	F	52.2	0.63	D	33.8	0.56
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	F	47.9	0.59	F	52.2	0.64
Exit 65 to Exit 64	A	3.7	0.18	A	5.1	0.24
Exit 64 to Exit 63	A	8.3	0.23	C	23.8	0.40
Exit 63 to Exit 61	B	15.4	0.34	F	110.7	0.50
west of Exit 61	C	19.8	0.43	E	36.4	0.78

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.40: I-126 Basic Freeway Segment TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	E	37.9	0.77	B	16.7	0.44
Colonial Life Blvd to Greystone Blvd	C	20.9	0.70	B	14.0	0.41
Greystone Blvd to Huger St	D	33.5	0.67	B	16.3	0.39
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	C	19.9	0.37	D	32.4	0.73
Greystone Blvd to Colonial Life Blvd	B	16.1	0.35	F	52.3	0.78
Colonial Life Blvd to I-26	E	42.7	0.81	F	66.4	0.80

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA3 analysis results for the freeway segments, summarized in **Table 5.38**, **Table 5.39** and **Table 5.40** indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segment between Exit 104 and Exit 106 operate at LOS F. All other segments along I-26 eastbound, and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segments west of Exit 61 to Exit 63 and from Exit 65 to Exit 68 operate at LOS F. The westbound freeway segment from Exit 68 to Exit 65 operates at LOS F, while all other I-20 segments operate at LOS C or better.

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- All I-126 freeway segments during the morning peak hour operate at LOS D or better except between I-26 and Colonial Life Blvd in both directions which operate at LOS E.
- During the afternoon peak hour:
  - I-26 eastbound freeway segment between 104 and Exit 106 operates at an LOS E. I-26 westbound segments operate at LOS F from the I-26 to Exit 103 and LOS E from Exit 103 to Exit 102, while all other segments operate at LOS C or better.
  - I-20 eastbound freeway segments operate at LOS D or better. I-20 westbound freeway segments between Exit 68 and Exit 65 as well as west of Exit 61 to Exit 63 operate at LOS E or F, while all other westbound segments operate at LOS C or better.
  - I-126 eastbound freeway segments operate at LOS B, while I-126 westbound freeway segments operate at LOS D or worse.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.41**, **Table 5.42** and **Table 5.43** for I-26, I-20 and I-126, respectively.

**Table 5.41: I-26 Ramp Merge TransModeler Results – RA3**

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	24.3	0.52	B	18.1	0.37
Exit 102	B	17.4	0.86	B	15.8	0.71
Exit 103	B	15.9	0.46	B	16.6	0.39
Exit 104	F	87.0	0.48	E	36.2	0.42
Exit 106	D	31.9	0.48	C	20.6	0.35
Exit 107	C	20.4	0.33	B	17.9	0.30
Exit 108	B	20.0	0.47	C	20.8	0.46
Exit 108 (I-126)	C	25.0	0.41	C	22.9	0.43
Exit 110	B	19.0	0.40	C	23.0	0.47
<b>I-26 Westbound</b>						
Exit 110	B	18.2	0.37	C	21.4	0.43
Exit 108 (I-126)	B	15.8	0.28	C	25.9	0.47
Exit 107	D	28.3	0.39	F	72.9	0.59
Exit 106	C	23.5	0.40	F	79.2	0.60
Exit 104	B	17.7	0.71	F	69.5	0.94
Exit 103	B	14.3	0.38	B	18.2	0.58
Exit 102	B	17.3	0.35	C	24.6	0.53
Exit 101	B	19.3	0.34	C	26.9	0.54

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.42: I-20 Ramp Merge TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	F	74.7	0.51	B	18.9	0.38
Exit 61	F	56.3	0.59	C	22.9	0.42
Exit 63/64	C	21.6	0.44	C	21.2	0.37
Exit 65	E	37.5	0.52	D	30.8	0.45
Exit 68	D	30.5	0.59	D	30.3	0.56
<b>I-20 Westbound</b>						
Exit 68	E	40.3	0.61	F	49.4	0.65
Exit 65	A	3.7	0.14	A	5.1	0.19
Exit 64 WB	A	8.3	0.23	C	23.8	0.40
Exit 64 EB	B	12.5	0.25	E	44.5	0.39
Exit 63	B	12.3	0.27	F	95.4	0.42
Exit 61	B	15.8	0.22	D	32.2	0.39
Exit 61	B	15.8	0.22	D	32.2	0.39

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.43: I-126 Ramp Merge TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	C	20.9	0.56	B	14.0	0.32
Greystone Blvd	D	28.5	0.68	B	14.4	0.39
<b>I-126 Westbound</b>						
Greystone Blvd	B	16.1	0.28	F	52.3	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA3 analysis results for the ramp merge areas, summarized in **Table 5.41**, **Table 5.42** and **Table 5.43** indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge area at Exit 104 operates at LOS F. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound ramp merge areas at Exit 61 operate at LOS F, and at Exit 65 operates at LOS E. I-20 westbound merge area at Exit 68 operates at LOS E. All other ramp merge areas operate at LOS D or better.

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- I-126 merge areas during the morning peak hour operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound merge area at Exit 104 operate at LOS E, while all other segments operate at LOS C or better. All I-26 westbound merge areas operate at LOS C or better with the exception of Exit 107, Exit 106, and Exit 104 merge areas which operate at LOS F.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of Exit 63 and Exit 68, where the merge area operates at LOS F and Exit 64 EB which operates at LOS E in the westbound direction.
  - I-126 eastbound merge areas during the evening peak hour operate at LOS B, whereas westbound merge areas operate at LOS F.

### Ramp Diverge Analysis

A summary of the Ramp Diverge results is shown in **Table 5.44**, **Table 5.45** and **Table 5.46** for I-26, I-20 and I-126, respectively.

**Table 5.44: I-26 Ramp Diverge TransModeler Results – RA3**

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	21.6	0.50	B	16.0	0.37
Exit 102	C	24.3	0.52	B	18.1	0.37
Exit 102 Loop	B	19.9	0.47	B	14.3	0.35
Exit 103	B	17.4	0.86	B	15.8	0.71
Exit 104	D	28.7	0.55	B	17.7	0.46
Exit 106/107	F	91.8	0.57	E	41.8	0.50
Exit 108	C	26.7	0.54	B	14.8	0.33
I-26 to I-26	D	31.9	0.48	C	20.6	0.35
Exit 110	C	25.2	0.51	C	22.9	0.53
<b>I-26 Westbound</b>						
Exit 110	F	64.6	0.45	E	36.2	0.49
Exit 107/I-126	B	17.7	0.36	B	19.9	0.43
Exit 106	B	15.8	0.28	C	25.9	0.47
Exit 104	C	27.5	0.45	E	41.6	0.65
Exit 103	B	17.7	0.71	F	69.5	0.94
Exit 102	B	16.4	0.62	C	23.3	0.97
Exit 102 Loop	B	15.2	0.34	C	20.6	0.53
Exit 101	B	17.3	0.35	C	24.6	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.45: I-20 Ramp Diverge TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	D	33.8	0.46	C	20.6	0.31
Exit 63/64/65	C	20.6	0.46	B	16.2	0.34
Exit 64 Loop	A	8.7	0.25	A	7.6	0.18
Exit 68	E	44.5	0.83	E	35.3	0.74
<b>I-20 Westbound</b>						
Exit 68	E	42.7	0.81	F	66.4	0.80
Exit 65	F	64.2	0.47	F	69.8	0.51
Exit 64/63	D	31.4	0.35	D	32.9	0.40
Exit 61	D	30.6	0.34	F	100.0	0.46

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.46: I-126 Ramp Diverge TransModeler Results – RA3

Segment	RA3 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Greystone Blvd	C	22.2	0.56	B	14.7	0.32
<b>I-126 Westbound</b>						
Greystone Blvd	B	19.9	0.37	D	32.4	0.73
Colonial Life Blvd	B	16.2	0.28	F	53.2	0.61

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA3 analysis results for the ramp diverge areas, summarized in **Table 5.44**, **Table 5.45** and **Table 5.46** indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge area for Exit 106/107 operates at LOS E. I-26 westbound diverge area at Exit 110 operates at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound and westbound diverge areas at Exit 68 operate at LOS E. The I-20 westbound diverge area at Exit 65 operates at LOS F. All other diverge areas operate at LOS D or better in both directions.
  - All I-126 diverge areas during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:

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- I-26 eastbound diverge area at Exit 106 operates at LOS F. All other eastbound segments operate at LOS C or better. All I-26 westbound diverge areas operate at LOS C or better with the exception of Exit 103 which operates at LOS F, and Exit 104 and Exit 110 which operate at LOS E.
- I-20 eastbound diverge areas operate at LOS C or better with the exception of Exit 68, which operates at LOS E. All I-20 westbound diverge areas operate at LOS D or worse.
- I-126 westbound diverge area at Colonial Life Blvd operates at LOS F, while all other diverge areas operate at LOS D or better.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.47**.

**Table 5.47: Mainline Travel Time TransModeler Results – RA3**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.83	00:51	00:49	59.2	60.7	0.87	00:53	00:54	59.2	57.8
Exit 102 to Exit 103 (Harbison Boulevard)	1.23	01:15	01:13	58.6	60.6	1.25	00:50	00:53	89.9	85.6
Exit 103 to Exit 104 (Piney Grove Road)	0.91	01:06	00:56	49.9	58.3	1.23	01:13	02:10	60.7	33.9
Exit 104 to Exit 106 (St. Andrews Road)	1.69	05:04	02:28	20.0	41.0	2.53	03:05	05:45	49.3	26.5
Exit 106/107 to Exit 108 (I-26/Bush River Road)	0.96	01:32	01:12	37.8	48.0	-	-	-	-	-
Exit 108/107 to Exit 106 (St Andrews Road)	-	-	-	-	-	1.02	01:04	01:07	57.6	54.9
Exit 108 to Exit 110 (Sunset Boulevard)	2.92	03:14	03:14	54.2	54.3	-	-	-	-	-
Exit 110 to Exit 108/107 (I-20)	-	-	-	-	-	1.61	01:36	01:36	60.7	60.2
Total	8.55	13:01	09:53	39.4	51.9	8.52	08:41	12:25	58.9	41.1
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63 (Bush River Road)	1.82	03:28	01:51	31.5	59.0	-	-	-	-	-
Exit 63/64 to Exit 61 (Sunset Blvd)	-	-	-	-	-	3.42	03:45	08:55	54.7	23.0
Exit 63 to Exit 64 (I-26)	1.23	01:27	01:26	50.8	51.5	-	-	-	-	-
Exit 65 to Exit 63/64 (I-26)	-	-	-	-	-	0.36	00:34	00:31	37.5	41.3
Exit 64 to Exit 68 (Monticello Road)	3.82	05:11	04:09	44.2	55.1	-	-	-	-	-
Exit 68 to Exist 65 (Broad River Road)	-	-	-	-	-	2.96	04:05	04:56	43.5	36.1
Total	6.87	10:06	07:26	40.8	55.4	6.74	08:24	14:22	48.1	28.2
I-126 between I-26 and Greystone Blvd										
I-26 to Exit 108(Bush River Road)	0.34	00:27	00:24	44.2	49.8	-	-	-	-	-
Colonial Life Boulevard to Exit 107 (I-20)	-	-	-	-	-	1.11	01:10	02:02	57.3	32.9
Exit 108 to Greystone Blvd	1.97	02:26	01:56	48.8	61.5	-	-	-	-	-
Greystone Blvd to Colonial Life Blvd	-	-	-	-	-	1.31	01:06	01:48	71.1	43.6
Total	2.31	02:53	02:20	48.0	59.5	2.43	02:17	03:50	64.0	37.9

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.48**.



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**Table 5.48: Arterial Travel Time TransModeler Results – RA3**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	7.1	20:58	25:13	20.2	16.8	6.4	19:42	20:01	19.3	19.0
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.6	03:58	04:14	23.6	22.1	1.5	03:41	04:05	24.2	21.8
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	03:11	03:36	20.8	18.5	1.1	03:47	03:16	17.3	20.0
Piney Grove Road (west of Exit 104 to Broad River Road)	1.7	05:07	04:24	19.5	22.6	1.7	05:40	04:41	17.6	21.3
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	06:50	07:37	8.7	7.8	1.0	03:40	04:02	16.2	14.7
Bush River Road (west of Exit 63 to Broad River Road)	2.1	04:26	04:48	28.5	26.4	1.8	05:40	08:23	19.2	13.0
Location	Northbound					Southbound				
	Length (mi)	Travel Time		Average Speed		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.4	01:28	02:36	15.7	8.9	0.4	00:51	01:00	29.8	25.6

## Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.49**.

Table 5.49: Intersection and LOS TransModeler Results – RA3

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	A	0.0	A	3.4
67	Broad River Road (US 176) at I-26 EBR Off-ramp <sup>1</sup>	B	14.7	B	19.5
174	Broad River Road (US 176) at West DDI Intersection	B	17.1	B	17.6
100000151	Broad River Road (US 176) at I-26 EBL Off-ramp	B	11.0	A	8.9
108	Broad River Road (US 176) at I-26 WBL Off-ramp	B	15.1	B	16.5
173	Broad River Road (US 176) at East DDI Intersection	B	16.1	C	20.3
4	Broad River Road (US 176) at Western Lane	B	18.4	C	24.0
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	D	36.6	F	82.0
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	2.7	A	2.6
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.2	A	2.4
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	B	16.5	C	24.7
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	14.3	B	14.1
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	8.9	C	30.3
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	9.0	B	12.9
118	Harbison Boulevard (S-757) at I-26 EB Ramps	C	34.2	B	16.9
113	Harbison Boulevard (S-757) at I-26 WB Ramps / Woodcross Drive	B	17.5	D	36.7
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	D	48.6	E	56.8
100000497	Piney Grove Road at I-26 EB Ramps	D	52.7	D	35.2
128	Piney Grove Road at I-26 SPUI Interchange	D	38.1	D	42.7
38	Piney Grove Road at I-26 WB Ramps	D	52.2	D	54.6
100000399	Piney Grove Road at Fernandina Road	C	33.8	D	47.0
Exit 106					
93	St. Andrews Road at Jamil Road	B	18.7	B	19.2
167	St. Andrews Road at I-26 EB Ramps	B	15.0	C	20.2
100000182	St. Andrews Road at I-26 WB Ramps	A	3.9	A	4.3
37	St. Andrews Road at Fernandina Road / Burning Tree Drive	C	21.8	E	73.8
100000354	St. Andrews Road at Kay Street / Chartwell Road	B	19.3	B	16.3
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	A	7.9	A	5.9
100000898	Bush River Road at Driveway	A	3.3	A	7.3
100000252	Bush River Road at EB Ramp/Morninghill Drive	C	31.2	E	71.3
100000184	Bush River Road at Arrowwood Road	B	14.4	E	57.3
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	B	11.8	D	39.7
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	B	10.1	F	80.6
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	25.8	C	29.9
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	A	8.6	B	13.9
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	C	26.5	D	39.9
Exit 63					
14	Bush River Road at Berryhill Drive <sup>1</sup>	A	9.4	B	14.9
61	Buish River Road at West DDI Intersection (I-20 EB Ramps)	B	12.1	B	13.8
48	Bush River Road at East DDI Intersection (I-20 WB Ramps)	B	10.5	B	14.0
147	Bush River Road at Rockland Road	A	6.1	B	15.6
136	Bush River Road at Independence Avenue	C	24.3	C	26.9
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	B	17.8	C	20.2
57	Broad River Road at I-20 WB Ramps	B	15.2	C	26.3
141	Broad River Road at I-20 EB Ramps	B	14.8	B	18.2
100000195	Broad River Road at Longcreek Drive	A	4.3	A	8.3
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	67.5	F	81.8
100000037	Broad River Road (US 176) at Harbison Boulevard	B	18.4	E	68.1
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	25.0	F	91.5
100000068	Broad River Road (US 176) at Piney Grove Road	A	4.9	B	18.8
100000339	Broad River Road (US 176) at St. Andrews Road	D	37.6	E	69.4
100000349	Broad River Road (US 176) at St. Andrews Parkway	B	12.2	C	22.0
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	A	9.1	F	86.2
41	Broad River Road (US 176) at Dutch Square Boulevard	A	6.2	C	29.3
100000046	Broad River Road (US 176) at Bush River Road	C	24.3	D	36.4
100000266	Broad River Road (US 176) at Greystone Boulevard	B	12.6	B	15.0
100000265	Greystone Boulevard at Stoneridge Drive	C	25.2	E	62.1
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	A	0.8	A	2.2
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	A	0.9	A	3.6
100000262	Bush River Road at Colonial Life Boulevard	B	18.3	D	44.6
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	F	50.2	D	27.9
100000374	Park Terrance Drive at Bower Parkway	B	11.7	B	17.0
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					



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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.50**.

**Table 5.50: External to External Speed and Travel Time TransModeler Results – RA3**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.82	20:30	13:33	40.4	61.2
To I-20 WB (west of Exit 61)	16.07	24:21	23:13	39.6	41.5
To I-20 EB (east of Exit 68)	15.61	25:50	17:32	36.2	53.4
To I-126 EB (Greystone Blvd)	14.78	23:01	15:01	38.5	59.1
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.85	13:27	23:29	61.8	35.4
To I-20 EB (east of Exit 68)	8.44	10:31	09:27	48.1	53.6
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.09	18:23	11:08	36.2	59.8
To I-26 WB (west of Exit 101)	16.71	22:57	30:59	43.7	32.4
To I-126 EB (east of Greystone Blvd)	10.35	18:53	10:54	32.9	57.0
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	11:40	17:48	57.1	37.4
To I-26 EB (east of Exit 110)	9.03	11:27	14:37	47.3	37.1
To I-26 WB (west of Exit 101)	15.34	17:18	32:02	53.2	28.7
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	15:03	27:44	58.8	31.9
To I-20 WB (west of Exit 61)	10.72	11:12	18:37	57.4	34.5

### 5.3.4 RA4 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.51**, **Table 5.52** and **Table 5.53** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA4 in section 4.5.2.6 of the *Alternatives Development and Screening Report*.

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Table 5.51: I-26 Mainline Volume TransModeler Results – RA4

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,816	3,352	3,614	5,391
Exit 101 to Exit 102 (Lake Murray Boulevard)	6,093	4,302	4,448	6,785
Exit 102 to Exit 103 (Harbison Boulevard)	6,337	4,590	5,052	7,299
Exit 103 to Exist 104 (Piney Grove Road)	6,894	5,167	5,548	7,757
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	7,830	5,666	6,257	8,322
Exit 106 to Exit 107	6,149	3,438	4,356	5,779
I-26 to I-26	3,317	1,722	3,139	2,001
I-26 to I-126	5,367	1,746	3,043	3,794
Exit 108 to Exit 110 (Sunset Boulevard)	4,168	4,455	4,514	5,066
southeast of Exit 110	3,707	4,407	4,391	4,603

Table 5.52: I-20 Mainline Volume TransModeler Results – RA4

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,422	2,104	2,959	3,743
Exit 61 to Exit 63 (Bush River Road/CD Road)	5,449	3,155	3,892	5,060
Exit 63 to Exit 64 (Broad River Road)	3,200	1,566	2,267	2,185
	2,849	2,121	1,916	2,512
Exit 65 to Exit 68 (Monticello Road)	6,055	5,770	5,348	6,167
east of Exit 68	5,686	5,815	5,231	5,803

Table 5.53: I-126 Mainline Volume TransModeler Results – RA4

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-26 to Colonial Life Blvd	6,145	2,984	3,397	6,540
I-126 from Colonial Life Blvd to Greystone Blvd	6,839	3,408	3,913	7,305
I-126 from Greystone Blvd to Huger St	6,523	3,534	3,719	6,797



# Alternatives Traffic Analysis Technical Memo

## Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.54**, **Table 5.55** and **Table 5.56** for I-26, I-20 and I-126, respectively.

**Table 5.54: I-26 Basic Freeway Segment TransModeler Results – RA4**

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	C	22.8	0.56	C	22.8	0.56
Exit 102 to Exit 103	D	26.6	0.66	C	23.5	0.53
Exit 103 to Exit 104	D	28.6	0.57	C	22.6	0.46
Exit 104 to Exit 106	E	44.7	0.57	C	23.8	0.46
Exit 106 to Exit 107	F	108.0	0.55	D	29.1	0.39
I-26 to I-26	E	39.2	0.74	E	38.6	0.70
Exit 108 to Exit 110	C	21.4	0.43	C	22.0	0.47
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	C	19.8	0.46	C	21.6	0.53
I-26 to I-26	D	26.4	0.43	C	23.0	0.50
Exit 107 to Exit 106	C	24.5	0.31	C	25.2	0.51
Exit 106 to Exit 104	D	27.2	0.50	E	37.6	0.74
Exit 104 to Exit 103	C	21.8	0.43	D	31.5	0.65
Exit 103 to Exit 102	C	20.2	0.48	E	36.1	0.76
Exit 102 to Exit 101	C	18.4	0.36	D	27.5	0.57

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

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Table 5.55: I-20 Basic Freeway Segment TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	F	45.9	0.61	C	25.6	0.41
Exit 61 to Exit 63	F	68.7	0.75	C	23.2	0.54
Exit 63 to Exit 64	B	14.4	0.33	A	10.7	0.24
Exit 64 to Exit 65	B	12.7	0.30	A	9.2	0.20
Exit 65 to Exit 68	E	42.3	0.62	D	34.5	0.56
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	E	38.5	0.48	E	41.6	0.51
Exit 65 to Exit 64	A	7.9	0.22	A	7.8	0.26
Exit 64 to Exit 63	A	9.6	0.16	B	12.1	0.23
Exit 63 to Exit 61	C	19.2	0.44	F	99.8	0.72
west of Exit 61	C	20.3	0.29	E	36.7	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.56: I-126 Basic Freeway Segment TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	B	17.2	0.51	A	9.8	0.28
Colonial Life Blvd to Greystone Blvd	C	23.7	0.71	C	21.6	0.41
Greystone Blvd to Huger St	E	44.7	0.67	B	15.9	0.39
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	16.2	0.37	D	29.7	0.71
Greystone Blvd to Colonial Life Blvd	B	17.1	0.36	D	34.3	0.76
Colonial Life Blvd to I-26	-	-	-	-	-	-

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA4 analysis results for the freeway segments, summarized in **Table 5.54**, **Table 5.55** and **Table 5.56** indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segment between Exit 104 and I-26 to I-26 operate at LOS E or F. All other segments along I-26 eastbound, and all I-26 westbound segments operate at LOS D or better.



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- I-20 eastbound freeway segments west of Exit 61 to Exit 63 operate at LOS F and from Exit 65 to Exit 68 operate at LOS E. The westbound freeway segment from Exit 68 to Exit 65 operates at LOS E, while all other I-20 segments operate at LOS C or better.
- All I-126 freeway segments during the morning peak hour operate at LOS C or better except eastbound between Greystone Blvd and Huger St which operate at LOS E.
- During the afternoon peak hour:
  - I-26 eastbound freeway segment between I-26 and I-26 operates at an LOS E. I-26 westbound segments operate at LOS E from the Exit 106 to Exit 104 and Exit 103 to Exit 102, while all other segments operate at LOS D or better.
  - I-20 eastbound freeway segments operate at LOS D or better. I-20 westbound freeway segments between Exit 68 and Exit 65 as well as west of Exit 61 to Exit 63 operate at LOS E or F, while all other westbound segments operate at LOS B or better.
  - I-126 eastbound freeway segments operate at LOS C or better, while I-126 westbound freeway segments operate at LOS D.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.57**, **Table 5.58** and **Table 5.59** for I-26, I-20 and I-126, respectively.

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Table 5.57: I-26 Ramp Merge TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	24.1	0.51	B	17.8	0.37
Exit 102	C	26.5	0.53	C	23.4	0.42
Exit 103	D	28.6	0.58	C	22.6	0.46
Exit 104	C	22.2	0.55	B	18.4	0.43
Exit 106	F	108.0	0.55	D	29.1	0.39
Exit 107 Loop	F	125.0	0.64	F	47.6	0.47
Exit 107 (CD Road From I-20)	F	89.1	0.77	F	51.0	0.55
Exit 108	C	22.8	0.56	C	22.8	0.56
Exit 108 (From I-126)	C	21.4	0.43	C	22.0	0.47
Exit 110	B	17.5	0.39	C	21.1	0.46
<b>I-26 Westbound</b>						
Exit 110	B	19.0	0.47	C	20.8	0.53
Exit 108 (I-126)	C	24.5	0.31	C	25.2	0.51
Exit 107 (From I-20)	C	25.8	0.41	E	36.7	0.61
Exit 106	C	27.0	0.42	E	36.3	0.62
Exit 104	C	21.8	0.43	D	31.5	0.65
Exit 103	C	20.2	0.38	E	36.1	0.61
Exit 102	B	18.4	0.36	C	27.5	0.57
Exit 101	B	19.3	0.28	F	48.2	0.47

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.58: I-20 Ramp Merge TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	F	69.2	0.50	B	17.4	0.36
Exit 61	F	74.1	0.57	C	21.4	0.41
Exit 63	A	8.6	0.33	A	8.2	0.24
Exit 64	B	15.2	0.39	B	18.9	0.35
Exit 65	E	41.5	0.51	D	30.6	0.45
Exit 68	D	31.6	0.59	D	29.5	0.55
<b>I-20 Westbound</b>						
Exit 68	D	30.7	0.61	E	41.0	0.65
Exit 64 (From CD from I-26)	B	11.1	0.23	E	42.6	0.40
Exit 63	B	19.5	0.26	F	96.7	0.45
Exit 61 Loop	A	9.2	0.20	B	13.7	0.37
Exit 61	B	15.3	0.22	D	29.3	0.39

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.59: I-126 Ramp Merge TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Exit 108 (From I-26 WB)	B	17.2	0.51	A	9.8	0.28
Colonial Life Blvd	C	23.7	0.71	C	21.6	0.41
Greystone Blvd	D	31.2	0.68	B	12.2	0.39
<b>I-126 Westbound</b>						
Greystone Blvd	B	17.1	0.36	D	34.3	0.76

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA4 analysis results for the ramp merge areas, summarized in **Table 5.57**, **Table 5.58** and **Table 5.59** indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge areas from Exit 106 to Exit 107 operate at LOS F. All other ramp merge areas operate at LOS D or better.
  - I-20 eastbound ramp merge areas at Exit 61 operate at LOS F. All other ramp merge areas operate at LOS D or better.

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- I-126 merge areas during the morning peak hour operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound merge areas at Exit 107 operate at LOS F, while all other segments operate at LOS D or better. All I-26 westbound merge areas operate at LOS D or better with the exception of Exit 107, Exit 106, and Exit 104 merge areas which operate at LOS E and Exit 101 which operates at LOS F.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of westbound Exit 68 to Exit 63, where the merge area operates at LOS E or F.
  - I-126 merge areas during the evening peak hour operate at LOS D or better.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.60**, **Table 5.61** and **Table 5.62** for I-26, I-20 and I-126, respectively.

**Table 5.60: I-26 Ramp Diverge TransModeler Results – RA4**

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	24.8	0.50	B	17.7	0.38
Exit 101 Loop	B	17.9	0.39	B	13.6	0.29
Exit 102	C	24.1	0.51	B	17.8	0.37
Exit 102 Loop	C	21.6	0.47	B	16.9	0.35
Exit 103	C	26.6	0.66	C	23.5	0.53
Exit 104	D	28.6	0.57	C	22.6	0.46
Exit 106/107	E	44.7	0.57	C	23.8	0.46
Exit 108 (To I-26 and to I-126)	F	47.7	0.77	D	31.2	0.55
Exit 110	C	21.4	0.43	C	22.0	0.47
<b>I-26 Westbound</b>						
Exit 110	D	32.9	0.46	F	67.6	0.48
Exit 108/107/106	C	23.0	0.31	C	25.1	0.35
Exit 104	D	30.1	0.47	D	33.6	0.69
Exit 103	C	21.8	0.43	D	31.5	0.65
Exit 102	C	20.2	0.48	E	36.3	0.76
Exit 102 Loop	B	18.4	0.37	D	28.2	0.58
Exit 101	B	18.4	0.36	C	27.5	0.57
Exit 101 Loop	B	13.8	0.32	C	21.1	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.61: I-20 Ramp Diverge TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	D	30.4	0.46	B	18.5	0.31
Exit 63/64	D	34.9	0.45	B	15.3	0.32
Exit 65	A	8.9	0.33	A	8.0	0.24
Exit 68	E	39.9	0.82	F	47.1	0.73
<b>I-20 Westbound</b>						
Exit 68	E	41.2	0.81	F	68.4	0.80
Exit 65	D	32.5	0.40	E	40.9	0.43
Exit 64	D	30.9	0.36	C	27.9	0.37
Exit 63	A	8.0	0.22	A	7.7	0.26
Exit 61	C	20.5	0.33	F	99.5	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.62: I-126 Ramp Diverge TransModeler Results – RA4

Segment	RA4 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Greystone Boulevard	C	24.0	0.57	C	23.0	0.33
<b>I-126 Westbound</b>						
Greystone Boulevard	C	23.4	0.37	D	31.0	0.71
Colonial Life Boulevard	B	18.4	0.35	E	36.4	0.76
To I-26 EB	B	13.7	0.25	D	28.2	0.55

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA4 analysis results for the ramp diverge areas, summarized in **Table 5.60**, **Table 5.61** and **Table 5.62** indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge area for Exit 106/107 operates at LOS E and Exit 108 operates at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound and westbound diverge areas at Exit 68 operate at LOS E. All other diverge areas operate at LOS D or better in both directions.
  - All I-126 diverge areas during the morning peak hour operate at LOS C or better.
- During the afternoon peak hour:

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- I-26 westbound diverge area at Exit 110 operates at LOS F and at Exit 102 operates at LOS E. All other diverge areas operate at LOS D or better.
- I-20 eastbound diverge areas operate at LOS B or better with the exception of Exit 68, which operates at LOS F. All I-20 westbound diverge areas operate at LOS C or better with the exception of Exit 68 and 61 which operate at LOS F and Exit 65 which operates at LOS E.
- I-126 westbound diverge area at Colonial Life Blvd operates at LOS E, while all other diverge areas operate at LOS D or better.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.63**.

**Table 5.63: Mainline Travel Time TransModeler Results – RA4**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.78	00:48	00:46	59.0	61.0	0.90	00:54	00:58	59.8	56.3
Exit 102 to Exit 103 (Harbison Boulevard)	1.21	01:16	01:13	57.6	59.4	1.02	01:01	01:10	59.8	52.2
Exit 103 to Exit 104 (Piney Grove Road)	0.90	00:59	00:56	55.3	58.3	0.97	00:59	01:03	59.4	55.3
Exit 104 to Exit 106 (St. Andrews Road)	1.75	02:13	01:55	47.4	54.8	1.63	01:55	01:59	50.9	49.2
Exit 106 to I-126 Split	1.63	02:55	02:06	33.4	46.6	1.80	02:16	02:22	47.8	45.7
I-126 to Exit 110 (Sunset Boulevard)	2.20	02:17	02:18	57.8	57.3	1.81	01:48	01:52	60.6	58.4
Total	8.47	10:27	09:14	48.6	55.0	8.13	08:53	09:23	54.9	51.9
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63 (Bush River Road)	1.77	03:51	01:48	27.6	58.9	2.32	02:20	06:17	20.1	22.1
Exit 63 to Exit 65 (Broad River Road)	1.47	01:23	01:22	63.8	64.5	1.38	01:19	01:19	35.7	63.0
Exit 65 to Exit 68 (Monticello Road)	3.63	04:14	03:55	51.4	55.6	3.00	03:25	04:19	13.7	41.8
Total	6.87	09:28	07:05	43.6	58.1	6.70	07:04	11:55	57.0	33.8
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Blvd	1.22	01:19	01:14	55.1	59.3	1.00	01:02	01:07	45.0	53.6
Colonial Life Blvd to Greystone Blvd	0.77	00:49	00:54	56.2	51.0	1.12	01:05	01:14	43.2	54.2
Total	1.98	02:08	02:08	55.6	55.8	2.11	02:08	02:21	59.7	53.9

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.64**.

**Table 5.64: Arterial Travel Time TransModeler Results – RA4**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	6.8	25:36	24:56	16.0	16.4	7.4	17:51	21:25	24.8	20.7
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	04:10	04:25	22.0	20.8	1.5	03:09	03:46	27.8	23.2
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	02:54	03:32	22.8	18.7	1.1	02:33	03:42	25.8	17.8
Piney Grove Road (west of Exit 104 to Broad River Road)	1.5	04:45	04:32	19.2	20.2	1.5	04:33	04:45	20.1	19.2
St. Andrews Road (west of Exit 106 to Broad River Road)	1.1	06:06	04:57	10.4	12.8	1.1	06:28	07:22	10.0	8.8
Bush River Road (west of Exit 63 to Broad River Road)	1.9	08:00	07:36	13.9	14.6	1.9	06:05	08:20	18.3	13.3
Location	Northbound					Southbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.6	01:27	01:38	23.5	21.0	0.6	01:55	01:43	17.8	20.0

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.65**.



Table 5.65: Intersection and LOS TransModeler Results – RA4

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	C	22.5	B	11.0
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	C	19.2	D	36.9
100000151	Broad River Road (US 176) at I-26 EB On-ramp	A	9.1	A	5.0
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	2.2	A	2.2
4	Broad River Road (US 176) at Western Lane	C	24.4	D	39.9
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	D	47.9	F	92.7
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	2.8	A	3.8
100000520	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.8	A	3.8
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	B	16.7	B	17.9
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	14.0	B	11.6
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	3.7	C	23.5
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	3.3	A	4.4
100000173	Harbison Boulevard (S-757) at I-26 EB Ramps	B	19.9	B	16.2
100000503	Harbison Boulevard (S-757) at I-26 EB On-Ramp <sup>1</sup>	A	0.0	A	0.0
136	Harbison Boulevard (S-757) at I-26 WB On-Ramp <sup>1</sup>	A	0.0	A	0.0
99	Harbison Boulevard (S-757) at I-26 WB Ramps	C	21.7	D	36.3
100000165	Harbison Boulevard (S-757) at Woodcross Drive	B	17.9	D	41.2
Exit 104					
100000174	Piney Grove Road at Bower Parkway / Jamil Road	C	34.6	E	59.6
100000463	Piney Grove Road at I-26 EBR Off-Ramp <sup>1</sup>	B	11.6	F	87.8
46	Piney Grove Road at I-26 Ramps	C	28.0	C	33.9
54	Piney Grove Road at I-26 WBR Off-Ramp <sup>1</sup>	F	69.1	E	41.2
100000177	Piney Grove Road at Fernandina Road	C	34.8	D	39.4
Exit 106					
100000348	St. Andrews Road at Jamil Road	B	12.1	D	35.4
69	St. Andrews Road at I-26 EBR Off-Ramp <sup>1</sup>	B	16.2	B	13.0
100000178	St. Andrews Road at West DDI Intersection	C	19.2	D	25.2
104	St. Andrews Road at I-26 EBL Off-Ramp	C	19.6	B	11.7
131	St. Andrews Road at I-26 WBL Off-Ramp	C	20.0	C	20.9
100000182	St. Andrews Road at East DDI Intersection	C	20.6	B	11.2
100000900	St. Andrews Road at I-26 WBR Off-Ramp	A	7.9	A	5.3
110	St. Andrews Road at Fernandina Road/Burning Tree Drive	F	52.8	F	146.0
100000354	St. Andrews Road at Kay Street / Chartwell Road	E	57.2	E	55.7
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	A	8.9	A	9.7
30	Bush River Road at I-26 EB Ramps/Days Inn Driveway	D	35.0	C	27.2
100000252	Bush River Road at Morninghill Drive	C	21.0	C	35.0
100000184	Bush River Road at Arrowwood Road	C	21.9	C	30.3
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	E	56.9	E	71.0
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	42.1	E	44.4
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	25.6	C	24.8
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	E	47.7	F	58.7
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	4.2	C	27.6
Exit 63					
14	Bush River Road at Frontage Road	C	20.2	D	46.1
8	Bush River Road at I-20 Single Point Ramps Intersection	D	45.7	E	56.0
52	Bush River Road at Independence Avenue	B	16.2	B	15.7
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	C	33.2	C	28.0
100000189	Broad River Road at I-20 WBR Off-Ramp	B	10.5	B	10.4
79	Broad River Road at I-20 Single Point Ramps Intersection	D	37.3	D	36.5
100000190	Broad River Road at I-20 EBR Off-Ramp	A	4.8	A	8.4
100000195	Broad River Road at Longcreek Drive	A	4.8	A	4.2
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	69.7	F	116.2
100000037	Broad River Road (US 176) at Harbison Boulevard	B	18.3	B	16.4
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	24.2	C	24.4
100000068	Broad River Road (US 176) at Piney Grove Road	A	5.3	A	7.8
100000339	Broad River Road (US 176) at St. Andrews Road	F	112.3	D	36.5
100000349	Broad River Road (US 176) at St. Andrews Parkway	C	32.3	B	15.1
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	E	67.2	D	35.7
41	Broad River Road (US 176) at Dutch Square Boulevard	A	6.1	C	30.9
100000046	Broad River Road (US 176) at Bush River Road	D	50.5	C	29.9
100000266	Broad River Road (US 176) at Greystone Boulevard	B	12.6	B	12.4
100000265	Greystone Boulevard at Stoneridge Drive	C	22.9	E	62.1
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	F	56.2	D	26.2
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	C	24.9	F	74.6
100000262	Bush River Road at Colonial Life Boulevard	B	17.8	C	23.4
100000374	Park Terrance Drive at Bower Parkway	A	9.1	A	6.7
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					

## Alternatives Traffic Analysis Technical Memo

### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.66**.

**Table 5.66: External to External Speed and Travel Time TransModeler Results – RA4**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.84	20:54	13:50	39.7	60.0
To I-20 WB (west of Exit 61)	16.07	23:00	21:52	41.9	44.1
To I-20 EB (east of Exit 68)	15.56	25:45	18:53	36.3	49.4
To I-126 EB (Greystone Blvd)	14.77	21:27	14:34	41.3	60.8
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.86	13:48	24:25	60.3	34.1
To I-20 EB (east of Exit 68)	8.46	11:38	11:49	43.7	43.0
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	18:04	10:47	36.9	61.8
To I-26 WB (west of Exit 101)	16.76	25:10	29:49	40.0	33.7
To I-126 EB (east of Greystone Blvd)	10.43	20:00	11:11	31.3	55.9
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	10:55	16:48	61.1	39.7
To I-26 EB (east of Exit 110)	9.02	12:38	14:12	42.8	38.1
To I-26 WB (west of Exit 101)	15.29	16:38	29:46	55.2	30.8
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	15:16	27:10	58.0	32.6
To I-20 WB (west of Exit 61)	10.61	10:51	16:25	58.7	38.8

### 5.3.5 RA5 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.67**, **Table 5.68** and **Table 5.69** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA5 in section 4.5.2.7 of the *Alternatives Development and Screening Report*.



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Table 5.67: I-26 Mainline Volume TransModeler Results – RA5

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	6,171	3,330	3,612	5,489
Exit 101 to Exit 102 (Lake Murray Boulevard)	7,288	4,164	4,466	6,133
Exit 102 to Exit 103 (Harbison Boulevard)	7,228	4,543	4,961	6,422
Exit 103 to Exit 104 (Piney Grove Road)	7,548	5,064	5,808	6,999
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	8,652	5,577	6,377	7,915
Exit 106 to Exit 107	7,065	3,517	4,536	5,413
I-126 Diverge to I-126 Merge	3,653	2,297	3,569	2,522
Exit 108 to Exit 110 (Sunset Boulevard)	4,306	4,484	4,865	5,086
southeast of Exit 110	3,779	4,414	4,519	4,811

Table 5.68: I-20 Mainline Volume TransModeler Results – RA5

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,414	2,133	2,942	3,885
Exit 61 to Exit 63 (Bush River Road/CD Road)	5,401	3,469	4,003	5,235
Exit 63 to Exit 65 (Broad River Road)	2,403	1,842	1,590	2,353
Exit 65 to Exit 68 (Monticello Road)	6,070	5,734	5,353	6,079
east of Exit 68	5,742	5,839	5,368	5,778

Table 5.69: I-126 Mainline Volume TransModeler Results – RA5

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-26 to Colonial Life Blvd	6,564	2,845	3,604	5,868
I-126 from Colonial Life Blvd to Greystone Blvd	7,231	3,452	3,964	6,837
I-126 from Greystone Blvd to Huger St	6,646	3,560	3,771	7,013

## Alternatives Traffic Analysis Technical Memo

### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.70**, **Table 5.71** and **Table 5.72** for I-26, I-20 and I-126, respectively.

**Table 5.70: I-26 Basic Freeway Segment TransModeler Results – RA5**

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	D	31.5	0.61	B	17.7	0.37
Exit 102 to Exit 103	D	34.6	0.75	C	23.4	0.52
Exit 103 to Exit 104	D	31.2	0.63	C	24.6	0.48
Exit 104 to Exit 107/Exit 106	F	46.0	0.72	C	25.3	0.53
Exit 107/106 to I-26 Split	F	60.3	0.78	B	17.8	0.50
I-126 Diverge to I-126 Merge	D	26.6	0.54	D	26.3	0.53
I-26 Split to Exit 110	C	23.2	0.45	D	27.0	0.51
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	C	21.5	0.47	C	23.1	0.53
I-126 Diverge to I-126 Merge	D	34.8	0.60	D	30.7	0.66
I-26 Merge to Exit 106	C	21.6	0.39	D	29.5	0.60
Exit 106 to Exit 104	D	27.8	0.58	F	59.6	0.82
Exit 104 to Exit 103	D	27.6	0.42	D	33.7	0.58
Exit 103 to Exit 102	C	22.9	0.47	D	29.9	0.67
Exit 102 to Exit 101	B	17.2	0.35	C	23.1	0.51

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 5.71: I-20 Basic Freeway Segment TransModeler Results – RA5**

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	F	46.1	0.61	C	25.6	0.41
Exit 61 to Exit 63	D	27.9	0.45	C	19.2	0.33
Exit 63 to Exit 65	A	10.7	0.25	A	7.5	0.17
Exit 65 to Exit 68	F	48.3	0.84	D	33.2	0.74
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	E	42.5	0.81	F	68.6	0.80
Exit 65 to Exit 63	E	43.2	0.80	F	49.6	0.84
Exit 63 to Exit 61	A	9.0	0.19	A	10.5	0.25
west of Exit 61	B	17.3	0.36	F	91.7	0.55

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 5.72: I-126 Basic Freeway Segment TransModeler Results – RA5**

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	E	36.9	0.73	C	21.1	0.40
Colonial Life Blvd to Greystone Blvd	D	32.7	0.75	C	19.3	0.41
Greystone Blvd to Huger St	E	37.7	0.69	B	16.2	0.39
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	16.0	0.37	D	30.9	0.73
Greystone Blvd to Colonial Life Blvd	B	16.5	0.36	F	53.1	0.71
Colonial Life Blvd to I-26	A	10.8	0.30	E	41.1	0.61

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA5 analysis results for the freeway segments, summarized in **Table 5.70**, **Table 5.71** and **Table 5.72**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segments between Exit 104 and Exit 107/106 to I-26 Split operate at LOS F. All other segments along I-26 eastbound and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segments west of Exit 61 and between Exit 65 and Exit 68 operate at LOS F. I-20 westbound freeway segments between Exit 68 and Exit 63 operate at LOS E. All other I-20 segments operate at LOS D or better.
  - I-126 eastbound segments from I-26 to Colonial Life Boulevard and Greystone Boulevard to Huger Street operate at LOS E. All other I-126 freeway segments operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound freeway segments between Exit 106 and Exit 104 operate at LOS F. All other segments along I-26 westbound and all I-26 eastbound segments operate at LOS D or better.
  - I-20 westbound freeway segments between Exit 68 and Exit 63 and west of Exit 61 operate at LOS F. All other I-20 segments, including all eastbound segments, operate at LOS D or better.
  - I-126 westbound freeway segments from Greystone Boulevard to I-26 operate at LOS E and F. All other I-126 segments operate at LOS D or better, including all eastbound segments.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.73**, **Table 5.74** and **Table 5.75** for I-26, I-20 and I-126, respectively.

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Table 5.73: I-26 Ramp Merge TransModeler Results – RA5

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	D	31.5	0.61	B	17.7	0.37
Exit 102	D	31.9	0.60	C	23.0	0.41
Exit 103	D	31.2	0.63	C	24.6	0.49
Exit 104	D	34.0	0.61	C	23.3	0.44
Exit 106	F	60.3	0.63	B	17.8	0.40
Exit 107 (From I-20)	C	27.0	0.54	C	27.3	0.53
Exit 108 (I-126)	C	23.2	0.45	C	27.0	0.51
Exit 110	B	19.1	0.39	C	22.8	0.47
<b>I-26 Westbound</b>						
Exit 110	C	21.4	0.38	C	23.6	0.42
Exit 108 (I-126)	C	25.9	0.49	D	32.5	0.72
Exit 107 (From I-20)	C	21.7	0.40	E	40.6	0.58
Exit 106	C	25.6	0.39	F	70.6	0.57
Exit 104	B	14.9	0.42	B	17.6	0.58
Exit 103	B	18.9	0.38	C	24.1	0.53
Exit 102	B	17.2	0.35	C	23.1	0.51
Exit 101	B	15.4	0.28	C	24.1	0.46

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.74: I-20 Ramp Merge TransModeler Results – RA5

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	F	103.1	0.49	B	18.0	0.37
Exit 61	F	81.7	0.57	C	21.5	0.42
Exit 65	F	47.9	0.52	C	27.5	0.45
Exit 65 (From CD)	B	16.8	0.34	B	17.8	0.29
Exit 68	D	32.0	0.60	D	31.2	0.56
<b>I-20 Westbound</b>						
Exit 68	D	34.4	0.61	E	42.7	0.64
Exit 65	A	5.6	0.15	A	6.3	0.20
Exit 64 (From CD)	A	9.9	0.21	B	12.0	0.27
Exit 63 (From CD)	B	11.4	0.25	B	18.9	0.37
Exit 63	B	15.3	0.29	F	66.9	0.45
Exit 61 Loop	A	8.9	0.21	B	14.1	0.38
Exit 61	B	15.3	0.22	D	33.0	0.41

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.75: I-126 Ramp Merge TransModeler Results – RA5

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	D	30.7	0.60	C	23.3	0.33
Greystone Blvd	D	32.7	0.70	B	13.2	0.39
<b>I-126 Westbound</b>						
Colonial Life Blvd	B	15.2	0.29	E	37.9	0.58
Greystone Blvd	B	10.8	0.30	E	41.1	0.61

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA5 analysis results for the ramp merge areas, summarized in **Table 5.73**, **Table 5.74** and **Table 5.75**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound merge areas from Exit 106 to Exit 107 operate at LOS F. All other ramp merge areas operate at LOS D or better, including all westbound merge areas.
  - I-20 eastbound ramp merge areas at Exit 61 and Exit 65 operate at LOS F. All other ramp merge areas operate at LOS D or better, including all westbound merge areas.

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- I-126 merge areas all operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 westbound merge areas from Exit 106 to Exit 107 operate at LOS F. All other ramp merge areas operate at LOS D or better, including all eastbound merge areas.
  - I-20 eastbound and westbound merge areas operate at LOS D or better with the exception of westbound Exit 68 to Exit 63, where the merge area operates at LOS E or F.
  - I-126 eastbound merge areas all operate at LOS D or better, while all westbound merge areas operate at LOS E.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.76**, **Table 5.77** and **Table 5.78** for I-26, I-20 and I-126, respectively.

**Table 5.76: I-26 Ramp Diverge TransModeler Results – RA5**

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	D	33.5	0.64	B	17.4	0.38
Exit 101 Loop	C	26.1	0.50	B	14.9	0.29
Exit 102	D	31.5	0.61	B	17.7	0.37
Exit 102 Loop	C	27.7	0.56	B	17.8	0.35
Exit 103	D	32.0	0.75	C	23.1	0.52
Exit 104	D	31.2	0.63	C	24.6	0.48
Exit 106 (CD Road to I-20)	D	34.9	0.72	C	25.2	0.53
Exit 106	C	22.0	0.64	B	13.0	0.42
Exit 107 (CD Road to I-126)	F	57.9	0.78	C	26.2	0.50
Exit 110	C	23.2	0.45	C	27.0	0.51
<b>I-26 Westbound</b>						
Exit 110	D	30.2	0.46	F	53.7	0.50
Exit 107/I-126	D	29.9	0.47	D	31.9	0.53
Exit 106/CD Road	D	29.4	0.49	F	53.2	0.72
Exit 104	C	23.6	0.46	F	49.6	0.66
Exit 103	B	16.2	0.42	C	20.1	0.58
Exit 102	B	19.1	0.47	C	24.4	0.67
Exit 102 Loop	B	17.7	0.35	C	22.2	0.52
Exit 101	B	17.2	0.35	C	23.1	0.51
Exit 101 Loop	B	13.6	0.32	B	18.7	0.49

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.77: I-20 Ramp Diverge TransModeler Results – RA5

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	D	30.9	0.46	B	18.4	0.31
Exit 63/64	C	24.2	0.45	C	21.0	0.33
Exit 68	E	43.4	0.84	E	36.8	0.74
<b>I-20 Westbound</b>						
Exit 68	E	42.5	0.81	F	68.6	0.80
Exit 65	E	35.9	0.40	E	41.8	0.42
Exit 64 (CD Road to I-26)	C	26.5	0.35	C	25.5	0.38
Exit 63 (CD Road)	A	6.1	0.19	A	6.7	0.24
Exit 61	E	35.1	0.36	F	75.9	0.53

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.78: I-126 Ramp Diverge TransModeler Results – RA5

Segment	RA5 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Boulevard	E	36.9	0.73	C	21.1	0.40
Greystone Boulevard	D	31.0	0.60	C	24.7	0.33
<b>I-126 Westbound</b>						
Greystone Boulevard	B	18.0	0.37	D	33.1	0.73
Colonial Life Boulevard	B	15.4	0.29	E	43.6	0.57
Colonial Life Boulevard to I-26 EB	B	14.6	0.31	F	56.5	0.65
Exit 107 (I-20)	B	10.8	0.30	E	41.1	0.61

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA5 analysis results for the ramp diverge areas, summarized in **Table 5.76**, **Table 5.77** and **Table 5.78**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas for Exit 107 (CD Road to I-126) operate at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound diverge areas at Exit 68 and westbound diverge areas from Exit 68 to Exit 65 and at Exit 61 operate at LOS E. All other diverge areas operate at LOS D or better in both directions.
  - All I-126 diverge areas operate at LOS D or better, with the exception of the eastbound diverge area at Colonial Life Boulevard which operates at LOS E.

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- During the afternoon peak hour:
  - I-26 westbound diverge areas at Exit 110 and from Exit 106/CD Road to Exit 104 operate at LOS F. All other diverge areas, including all eastbound diverge areas, operate at LOS D or better.
  - I-20 westbound diverge areas at Exit 68 and Exit 61 operate at LOS F, while the eastbound diverge area at Exit 68 and the westbound diverge area at Exit 65 operate at LOS E. All other diverge areas operate at LOS D or better.
  - I-126 westbound diverge areas at Colonial Life Boulevard and Exit 107 operate at LOS E and F. All other diverge areas, including all eastbound diverge areas, operate at LOS D or better.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.79**.

**Table 5.79: Mainline Travel Time TransModeler Results – RA5**

Segments	Eastbound						Westbound					
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)			
		AM	PM	AM	PM		AM	PM	AM	PM		
I-26 between Exit 101 and Exit 110												
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.76	00:49	00:45	55.6	60.1	1.00	01:01	01:03	58.8	57.3		
Exit 102 to Exit 103 (Harbison Boulevard)	1.21	01:19	01:13	55.4	59.7	0.86	00:51	00:55	60.1	56.7		
Exit 103 to Exit 104 (Piney Grove Road)	0.89	00:58	00:54	54.8	59.5	0.95	00:57	00:59	60.0	57.6		
Exit 104 to Exit 107 (I-20) / Exit 106 (St. Andrews Road)	1.77	02:18	01:51	46.2	57.7	2.80	03:04	04:32	54.7	37.0		
Exit 106 to I-26/I-126 Split	1.22	02:13	01:26	33.0	51.0	0.32	00:25	00:30	46.3	38.7		
I-26 to I-126	1.23	01:25	01:26	51.8	51.7	0.73	00:59	01:00	44.3	43.6		
I-26/I-126 Split to Exit 110 (Sunset Boulevard)	1.60	01:35	01:37	60.7	59.3	1.46	01:27	01:28	60.5	59.5		
Total	8.68	10:38	09:12	49.0	56.6	8.11	08:44	10:27	55.7	46.6		
I-20 between Exit 61 and Exit 68												
Exit 61 to Exit 63/64	1.81	04:34	01:53	23.9	57.7	2.16	02:21	04:30	19.3	28.8		
Exit 63/64 to Exit 65	2.58	02:29	02:26	62.0	63.4	1.36	01:17	01:17	35.2	63.8		
Exit 65 to Exit 68 (Monticello Road)	2.52	03:31	02:43	43.0	55.7	3.00	03:46	04:47	12.0	37.6		
Total	6.91	10:34	07:02	39.2	58.9	6.52	07:24	10:35	52.9	37.0		
I-126 between I-26 and Greystone Blvd												
I-26 to Colonial Life Blvd	0.76	00:57	00:54	47.9	50.9	0.98	01:02	02:08	43.7	27.6		
Colonial Life Blvd to Greystone Blvd	1.49	01:36	01:37	55.7	55.1	1.12	01:06	01:44	41.2	38.6		
Total	2.25	02:33	02:31	52.8	53.6	2.10	02:08	03:52	58.9	32.5		

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.80**.

**Table 5.80: Arterial Travel Time TransModeler Results – RA5**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	7.9	20:05	25:12	23.5	18.7	7.9	23:16	29:26	20.3	16.0
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	04:37	04:20	19.9	21.2	1.5	04:11	03:50	21.0	22.9
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	03:28	04:35	19.0	14.4	1.1	03:13	03:17	20.5	20.1
Piney Grove Road (west of Exit 104 to Broad River Road)	1.5	05:05	04:29	18.3	20.7	1.5	07:48	04:22	11.9	21.3
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	05:52	03:58	10.5	15.4	1.0	08:51	04:27	6.9	13.8
Bush River Road (west of Exit 63 to Broad River Road)	2.0	07:02	08:03	17.2	15.0	2.0	06:04	06:12	19.9	19.5
Location	Northbound					Southbound				
	Length (mi)	Travel Time		Average Speed		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.6	01:59	02:33	19.4	15.1	0.6	02:39	02:28	14.5	15.6

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.81**.



Table 5.81: Intersection and LOS TransModeler Results – RA5

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	C	21.6	D	38.5
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	C	21.4	C	18.8
100000151	Broad River Road (US 176) at I-26 EB On-ramp	A	8.1	A	6.0
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	2.1	A	1.9
4	Broad River Road (US 176) at Western Lane	B	10.9	B	10.2
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	E	59.3	E	72.6
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	3.3	A	3.1
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.3	A	3.2
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	B	16.6	C	23.4
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	13.8	B	10.5
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	7.9	C	32.6
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	2.8	C	21.1
8	Harbison Boulevard (S-757) at I-26 EB Ramps	C	21.8	B	14.0
99	Harbison Boulevard (S-757) at I-26 WB Ramps	B	19.9	C	28.9
100000165	Harbison Boulevard (S-757) at Woodcross Drive	C	31.0	C	28.7
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	E	65.3	E	73.2
83	Piney Grove Road at EBR Off-Ramp	A	0.0	A	0.0
100000174	Piney Grove Road at I-26 EB Ramps	C	26.0	C	24.9
100000177	Piney Grove Road at I-26 WB Ramps	B	13.1	B	18.6
89	Piney Grove Road at WBR Off-Ramp	A	0.0	A	0.0
100000399	Piney Grove Road at Fernandina Road	C	31.5	D	41.3
Exit 106					
100000348	St. Andrews Road at Jamil Road	C	22.7	A	9.4
100000182	St. Andrews Road at Woodland Hill Road	D	40.1	B	10.3
98	St. Andrews Road at I-26 SPUI	C	27.4	C	32.8
100000900	St. Andrews Road at I-26 WBR Off-Ramp <sup>2</sup>	C	15.8	C	21.1
100000358	St. Andrews Road at Burning Tree Drive/Fernandina Road	D	52.9	C	33.7
100000354	St. Andrews Road at Kay Street / Chartwell Road	F	81.3	B	14.8
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	A	9.1	A	9.6
30	Bush River Road at Days Inn Driveway	A	4.6	A	8.7
100000252	Bush River Road at Morninghill Drive	C	21.3	B	19.5
100000184	Bush River Road at Arrowwood Road	C	20.1	B	18.6
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	C	27.2	E	60.0
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	37.4	F	66.1
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	26.1	C	25.2
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	E	45.2	F	54.3
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	3.6	B	15.6
Exit 63					
100000446	Bush River Road at Berryhill Drive/WB On-Ramp	B	14.6	B	16.6
118	Bush River Road at I-20 EBL Off-Ramp	A	9.0	B	14.6
21	Bush River Road at I-20 EBR Off-Ramp <sup>1</sup>	A	1.9	C	20.9
100000255	Bush River Road at Independence Avenue	B	12.1	B	19.4
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	B	15.3	C	26.3
100000189	Broad River Road at I-20 WB Ramps	A	8.8	B	10.2
79	Broad River Road at I-20 Single Point Ramps Intersection	C	31.3	C	28.4
100000190	Broad River Road at I-20 EB Ramps <sup>1</sup>	B	14.2	F	68.1
100000195	Broad River Road at Longcreek Drive	A	5.1	A	5.8
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	58.4	F	114.1
100000037	Broad River Road (US 176) at Harbison Boulevard	D	41.3	D	39.4
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	28.8	D	37.0
100000068	Broad River Road (US 176) at Piney Grove Road	A	5.8	B	14.5
100000339	Broad River Road (US 176) at St. Andrews Road	C	28.6	D	40.8
100000349	Broad River Road (US 176) at St. Andrews Parkway	B	10.4	B	14.7
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	A	9.3	C	29.7
41	Broad River Road (US 176) at Dutch Square Boulevard	A	7.5	E	70.1
100000046	Broad River Road (US 176) at Bush River Road	D	47.5	F	105.1
100000266	Broad River Road (US 176) at Greystone Boulevard	B	13.7	B	13.6
100000265	Greystone Boulevard at Stoneridge Drive	C	26.9	C	34.5
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	F	91.8	E	42.6
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	D	34.9	F	95.0
100000262	Bush River Road at Colonial Life Boulevard	B	15.2	C	21.2
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	1.3	F	332.5
100000374	Park Terrance Drive at Bower Parkway	B	12.1	B	12.1
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					

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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.82**.

**Table 5.82: External to External Speed and Travel Time TransModeler Results – RA5**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.84	15:30	13:23	53.6	62.1
To I-20 WB (west of Exit 61)	16.07	17:24	19:02	55.4	50.6
To I-20 EB (east of Exit 68)	15.39	18:22	16:01	50.3	57.7
To I-126 EB (Greystone Blvd)	14.78	17:20	14:29	51.2	61.2
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 101)	13.85	13:16	14:48	62.7	56.2
To I-20 EB (east of Exit 68)	8.40	09:57	09:43	50.7	51.9
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	18:52	10:47	35.3	61.8
To I-26 WB (west of Exit 101)	16.71	23:54	19:34	42.0	51.2
To I-126 EB (east of Greystone Blvd)	10.37	19:52	11:19	31.3	54.9
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	11:11	16:27	59.6	40.5
To I-26 EB (east of Exit 110)	9.05	10:50	14:13	50.1	38.2
To I-26 WB (west of Exit 101)	15.33	16:01	21:24	57.4	43.0
I-126 WB from East of Greystone Blvd					
To I-26 WB (west of Exit 101)	14.75	14:29	18:36	61.1	47.6
To I-20 WB (west of Exit 61)	10.46	10:55	16:01	57.5	39.2

### 5.3.6 RA6 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.83**, **Table 5.84** and **Table 5.85** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA6 in section 4.5.2.8 of the *Alternatives Development and Screening Report*.



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Table 5.83: I-26 Mainline Volume TransModeler Results – RA6

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,733	2,975	3,580	5,370
Exit 101 to Exit 102 (Lake Murray Boulevard)	5,121	3,583	4,307	6,569
Exit 102 to Exit 103 (Harbison Boulevard)	5,370	3,851	4,708	7,170
Exit 103 to Exist 104 (Piney Grove Road)	5,123	4,499	5,093	7,662
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	5,433	4,974	5,394	7,816
Exit 106 to Exit 107	1,593	4,084	1,644	6,695
I-26 to I-26	3,266	2,186	3,280	2,549
Exit 108 to Exit 110 (Sunset Boulevard)	3,858	4,363	4,597	4,940
southeast of Exit 110	3,415	4,034	4,415	4,684

Table 5.84: I-20 Mainline Volume TransModeler Results – RA6

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,229	1,856	2,977	3,767
Exit 61 to Exit 63 (Bush River Road/CD Road)	4,646	3,028	3,686	4,983
Exit 63 to Exit 65 (Broad River Road)	2,143	1,371	1,557	1,978
Exit 65 to Exit 68 (Monticello Road)	5,537	5,340	5,243	6,214
east of Exit 68	5,146	5,344	5,251	5,804

Table 5.85: I-126 Mainline Volume TransModeler Results – RA6

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-26 to Colonial Life Blvd	4,832	1,903	3,197	4,153
I-126 to I-26 WB	-	2,623	-	5,641
I-126 from Colonial Life Blvd to Greystone Blvd	4,836	3,162	3,201	6,305
I-126 from Greystone Blvd to Huger St	5,683	3,251	3,594	6,870

## Alternatives Traffic Analysis Technical Memo

### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.86**, **Table 5.87** and **Table 5.88** for I-26, I-20 and I-126, respectively.

**Table 5.86: I-26 Basic Freeway Segment TransModeler Results – RA6**

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	D	31.2	0.43	B	16.9	0.36
Exit 102 to Exit 103	C	24.7	0.56	C	22.3	0.49
Exit 103 to Exit 104	B	15.4	0.53	C	19.8	0.53
Exit 104 to Exit 106	F	135.2	0.56	F	80.8	0.57
Exit 106 to Exit 107	B	12.2	0.24	B	12.9	0.24
I-26 to I-26	C	23.0	0.48	C	24.1	0.49
Exit 108 to Exit 110	C	18.9	0.40	C	21.9	0.48
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	C	21.3	0.45	C	23.3	0.51
I-26 to I-26	D	33.5	0.36	F	112.8	0.42
Exit 107 to Exit 106	C	19.3	0.30	C	25.7	0.50
Exit 106 to Exit 104	D	30.2	0.55	F	48.9	0.86
Exit 104 to Exit 103	C	20.2	0.47	F	61.5	0.80
Exit 103 to Exit 102	C	21.0	0.40	E	43.7	0.75
Exit 102 to Exit 101	B	15.3	0.30	C	25.4	0.55

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 5.87: I-20 Basic Freeway Segment TransModeler Results – RA6**

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	F	46.3	0.59	C	25.8	0.41
Exit 61 to Exit 63	F	97.4	0.65	F	84.1	0.51
Exit 63 to Exit 65	B	12.6	0.30	A	9.8	0.22
Exit 65 to Exit 68	D	34.0	0.76	D	32.4	0.73
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	F	69.7	0.53	F	93.0	0.63
Exit 65 to Exit 63	A	9.3	0.19	B	12.2	0.27
Exit 63 to Exit 61	B	16.1	0.42	F	82.3	0.69
west of Exit 61	B	17.7	0.26	E	37.2	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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**Table 5.88: I-126 Basic Freeway Segment TransModeler Results – RA6**

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	D	29.6	0.73	C	19.3	0.48
Colonial Life Blvd to Greystone Blvd	C	25.1	0.62	B	15.2	0.39
Greystone Blvd to Huger St	D	26.9	0.59	B	15.4	0.37
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	14.5	0.34	D	30.6	0.73
Greystone Blvd to Colonial Life Blvd	B	17.1	0.33	F	81.8	0.66
Colonial Life Blvd to I-26	-	-	-	-	-	-

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA6 analysis results for the freeway segments, summarized in **Table 5.86**, **Table 5.87** and **Table 5.88**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound freeway segments between Exit 104 and Exit 106 operate at LOS F. All other segments along I-26 eastbound and all I-26 westbound segments operate at LOS D or better.
  - I-20 eastbound freeway segments west of Exit 61 to Exit 63 operate at LOS F. I-20 westbound freeway segments between Exit 68 and Exit 65 also operate at LOS F. All other I-20 segments operate at LOS D or better.
  - I-126 freeway segments all operate at LOS D or better.
- During the afternoon peak hour:
  - I-26 eastbound freeway segments between Exit 104 and Exit 106 operate at LOS F. I-26 westbound freeway segments from I-26 to I-26 and Exit 106 to Exit 103 also operate at LOS F, and the westbound segment between Exit 103 and Exit 102 operates at LOS E. All other I-26 segments operate at LOS D or better.
  - I-20 westbound freeway segments between Exit 68 and Exit 65 and between Exit 63 and Exit 61 operate at LOS F, and segments west of Exit 61 operate at LOS E. I-20 eastbound segments between Exit 61 and 63 also operate at LOS F. All other I-20 segments operate at LOS D or better.
  - I-126 freeway segments all operate at LOS D or better with the exception of westbound segments from Greystone Boulevard to Colonial Life Boulevard, which operate at LOS F.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.89**, **Table 5.90** and **Table 5.91** for I-26, I-20 and I-126, respectively.

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Table 5.89: I-26 Ramp Merge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	D	31.2	0.43	B	16.9	0.36
Exit 102	B	18.6	0.45	B	16.7	0.39
Exit 103	B	15.4	0.43	B	19.8	0.42
Exit 104	E	43.2	0.45	C	26.4	0.45
Exit CD Road	B	10.5	0.23	B	12.6	0.25
Exit 107 (From I-20)	B	16.5	0.36	B	17.2	0.36
Exit 108 (I-126)	B	18.9	0.40	C	21.9	0.48
Exit 110	B	17.9	0.36	C	23.5	0.46
<b>I-26 Westbound</b>						
Exit 110	C	21.7	0.36	C	22.4	0.41
Exit 108 (I-126)	B	19.3	0.30	C	25.7	0.50
Exit 107 (From I-20)	C	26.6	0.36	F	49.3	0.56
Exit 106	C	25.7	0.44	E	39.8	0.70
Exit 104	C	20.2	0.38	F	61.5	0.64
Exit 103	B	15.9	0.32	E	37.9	0.60
Exit 102	B	15.3	0.30	C	25.4	0.55
Exit 101	B	13.1	0.25	C	22.5	0.45

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.90: I-20 Ramp Merge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	F	85.7	0.43	E	38.4	0.38
Exit 65	C	27.2	0.46	C	26.4	0.44
Exit 68	C	26.8	0.54	D	29.3	0.55
<b>I-20 Westbound</b>						
Exit 68	C	21.8	0.74	F	45.7	0.86
Exit 64 (From CD)	B	11.8	0.22	E	35.2	0.37
Exit 63	B	15.0	0.25	F	69.9	0.44
Exit 61	B	14.0	0.19	D	33.0	0.39

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.91: I-126 Ramp Merge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	C	20.7	0.62	B	13.1	0.39
Greystone Blvd	C	22.9	0.59	B	12.7	0.37
<b>I-126 Westbound</b>						
Greystone Blvd	B	17.1	0.33	F	81.8	0.66

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA6 analysis results for the ramp merge areas, summarized in **Table 5.89**, **Table 5.90** and **Table 5.91**, indicate the following:

- During the morning peak hour:
  - I-26 merge areas all operate at LOS D or better with the exception of the eastbound merge area at Exit 104, which operates at LOS E.
  - I-20 merge areas all operate at LOS D or better with the exception of the eastbound Exit 61 Loop merge area, which operates at LOS E.
  - I-126 merge areas all operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 westbound merge areas from Exit 107 (From I-20) to Exit 103 operate at LOS E and F. All other ramp merge areas operate at LOS C or better, including all eastbound merge areas.
  - I-20 westbound merge areas from Exit 68 to Exit 63 operate at LOS E and F, and the eastbound Exit 61 Loop merge area also operates at LOS E. All other I-20 merge areas operate at LOS D or better.
  - I-126 eastbound merge areas all operate at LOS B or better, while the westbound Greystone Boulevard merge area operates at LOS F.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.92**, **Table 5.93** and **Table 5.94** for I-26, I-20 and I-126, respectively.

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Table 5.92: I-26 Ramp Diverge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	26.2	0.49	B	16.2	0.37
Exit 102	D	31.2	0.43	B	16.9	0.36
Exit 103	C	23.0	0.56	C	20.3	0.49
Exit 104	B	14.5	0.43	B	16.8	0.42
Exit 106	F	135.2	0.56	F	80.8	0.57
Exit 110	B	18.9	0.40	C	21.9	0.48
<b>I-26 Westbound</b>						
Exit 110	C	27.1	0.42	F	66.2	0.48
Exit 108 (CD Road/I-126)	C	27.6	0.36	D	29.0	0.41
Exit 107/Exit 106	B	19.3	0.30	C	25.7	0.50
Exit 104	C	26.2	0.44	E	41.4	0.69
Exit 103	C	20.7	0.47	F	61.8	0.80
Exit 102	B	16.1	0.40	E	39.4	0.75
Exit 101	B	15.3	0.30	C	25.4	0.55

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.93: I-20 Ramp Diverge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	F	47.3	0.44	C	21.4	0.31
Exit 63	F	95.5	0.48	F	79.2	0.38
Exit 68	E	37.8	0.76	D	33.5	0.73
<b>I-20 Westbound</b>						
Exit 68	E	37.7	0.74	F	66.3	0.81
Exit 65	F	69.7	0.53	F	93.0	0.63
Exit 61	D	32.5	0.41	F	83.8	0.67

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.94: I-126 Ramp Diverge TransModeler Results – RA6

Segment	RA6 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Boulevard	C	27.8	0.55	B	18.2	0.36
Greystone Boulevard	C	21.0	0.49	B	13.4	0.31
<b>I-126 Westbound</b>						
Greystone Boulevard	B	16.4	0.34	F	48.4	0.72
Colonial Life Boulevard	B	17.1	0.33	F	81.8	0.66

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA6 analysis results for the ramp diverge areas, summarized in **Table 5.92**, **Table 5.93** and **Table 5.94**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas for Exit 106 operate at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS D or better.
  - I-20 eastbound and westbound diverge areas all operate at LOS E and F with the exception of the westbound Exit 61 merge area, which operates at LOS D.
  - I-126 diverge areas all operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 westbound diverge areas at Exit 110 and from Exit 104 Road to Exit 102 operate at LOS E and F. I-26 eastbound diverge areas at Exit 106 also operates at LOS F. All other diverge areas operate at LOS D or better.
  - I-20 westbound diverge areas at all operate at LOS F. The eastbound diverge area at Exit 63 also operates at LOS F. All other diverge areas operate at LOS D or better.
  - I-126 westbound diverge areas all operate at LOS F, and I-126 eastbound diverge areas all operate at LOS E.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.95**.

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Table 5.95: Mainline Travel Time TransModeler Results – RA6

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.83	01:03	00:48	47.3	62.4	1.26	01:13	01:16	62.1	59.5
Exit 102 to Exit 103 (Harbison Boulevard)	1.19	01:12	01:10	59.6	61.1	1.06	01:02	01:15	61.3	51.2
Exit 103 to Exit 104 (Piney Grove Road)	0.96	00:58	00:58	59.4	59.8	0.86	00:52	01:26	59.5	35.9
Exit 104 to Exit 106 (St. Andrews Road)	1.70	04:48	01:53	21.3	54.5	2.03	02:32	02:57	48.1	41.3
Exit 106 to Exit 107 (I-20)	1.90	02:07	02:07	53.9	53.9	1.12	01:21	01:24	49.7	48.0
Exit 108 to I-26	1.08	01:11	01:10	54.8	55.5	0.77	01:00	01:00	46.6	46.5
I-26 to Exit 110 (Sunset Boulevard)	1.23	01:10	01:12	63.0	61.7	1.47	01:30	01:30	58.9	58.6
Total	8.89	12:29	09:17	42.7	57.5	8.57	09:30	10:48	54.2	47.6
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63 (Bush River Road)	1.96	08:08	05:15	14.5	22.5	1.97	02:12	04:33	53.8	26.0
Exit 63 to Exit 65	2.52	02:20	02:17	65.0	66.1	2.73	02:30	02:38	65.5	62.4
Exit 65 to Exist 68 (Monticello Road)	2.49	02:46	02:35	54.1	57.9	2.65	04:15	03:59	37.4	40.0
Total	6.98	13:13	10:07	31.7	41.4	7.36	08:57	11:09	49.3	39.6
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Blvd	0.63	00:43	00:40	53.4	57.5	1.01	01:05	02:48	55.7	21.7
Colonial Life Blvd to Greystone Blvd	1.40	01:26	01:20	58.7	62.9	1.16	01:07	02:57	62.2	23.7
Total	2.04	02:09	02:00	56.9	61.1	2.18	02:13	05:45	59.0	22.7

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in Table 5.96.

Table 5.96: Arterial Travel Time TransModeler Results – RA6

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	6.8	19:08	18:23	21.2	22.1	6.2	21:01	17:51	17.6	20.7
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	04:37	03:51	19.9	23.9	1.5	03:08	03:52	27.9	22.6
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	03:49	03:32	17.1	18.5	1.0	06:04	03:22	10.4	18.7
Piney Grove Road (west of Exit 104 to Broad River Road)	1.6	05:26	04:11	17.4	22.6	1.6	07:48	04:17	12.2	22.1
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	13:27	03:39	4.3	16.0	1.0	03:13	04:25	18.2	13.2
Bush River Road (west of Exit 63 to Broad River Road)	2.0	09:01	06:27	13.3	18.6	1.7	06:14	07:39	16.4	13.3
Location	Northbound					Southbound				
	Length (mi)	Travel Time		Average Speed		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.4	00:31	01:34	44.6	14.9	0.4	01:23	00:48	18.6	32.2

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in Table 5.97.



Table 5.97: Intersection and LOS TransModeler Results – RA6

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
106	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	C	31.7	B	19.5
167	Broad River Road (US 176) at I-26 EBR Off-ramp	A	2.4	A	0.6
166	Broad River Road (US 176) at West DDI Intersection	B	12.8	B	10.8
105	Broad River Road (US 176) at I-26 EBL Off-ramp	A	7.7	A	5.3
181	Broad River Road (US 176) at I-26 WBL Off-ramp	B	11.0	C	16.7
113	Broad River Road (US 176) at East DDI Intersection	C	15.3	C	16.7
4	Broad River Road (US 176) at Western Lane	B	10.3	A	6.8
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	E	78.6	F	126.6
103	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp	B	13.1	B	13.4
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp	A	2.2	A	2.4
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	C	21.6	B	19.1
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	16.8	B	11.4
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	9.1	C	28.6
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	8.4	A	7.8
121	Harbison Boulevard (S-757) at I-26 SPUI Interchange	D	39.6	D	43.5
115	Harbison Boulevard (S-757) at I-26 WBR Ramp	A	3.5	A	3.5
100000165	Harbison Boulevard (S-757) at Woodcross Drive	C	23.2	C	27.1
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	F	82.9	E	62.2
173	Piney Grove Road at West DDI Intersection	B	15.9	C	20.5
122	Piney Grove Road at I-26 EBL Off-Ramp	B	12.4	B	18.1
123	Piney Grove Road at I-26 WBL Off-Ramp	B	16.1	B	12.9
171	Piney Grove Road at East DDI Intersection	C	22.2	B	16.3
162	Piney Grove Road at I-26 WBR Off-Ramps	A	1.7	A	1.4
100000399	Piney Grove Road at Fernandina Road	C	23.1	D	40.9
Exit 106					
100000348	St. Andrews Road at Jamil Road	D	47.8	E	62.2
100000178	St. Andrews Road at I-26 EBR Off-Ramp	A	0.6	A	1.7
193	St. Andrews Road at West DDI Intersection	C	21.1	C	15.3
195	St. Andrews Road at I-26 EBL Off-Ramp	A	6.8	A	2.9
48	St. Andrews Road at I-26 WBL Off-Ramp	A	5.8	A	6.0
62	St. Andrews Road at East DDI Intersection	A	8.4	A	9.9
142	St. Andrews Road at I-26 WBR Off-Ramp	B	11.1	B	12.9
100000354	St. Andrews Road at Kay Street / Chartwell Road	B	19.6	E	77.8
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	A	7.9	A	9.1
30	Bush River Road at Driveway	A	3.4	A	3.8
100000252	Bush River Road at Morninghill Drive	B	19.1	C	20.1
100000184	Bush River Road at Arrowwood Road	B	18.5	B	18.5
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	F	103.7	E	63.7
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	A	6.7	A	7.1
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	25.8	C	24.7
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	A	0.0	A	0.0
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	6.7	D	46.8
Exit 63					
14	Bush River Road at Berryhill Drive	B	10.0	C	32.3
81	Bush River Road at I-20 Ramps	D	37.2	D	39.6
100000255	Bush River Road at Independence Avenue	B	15.3	D	47.9
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	C	31.8	B	19.6
91	Broad River Road at I-20 WB Ramps	C	29.6	C	33.5
37	Broad River Road at I-20 WBL Off-Ramp	A	4.1	A	6.4
95	Broad River Road at I-20 EB Ramps	B	13.0	A	9.7
72	Broad River Road at Longcreek Drive	A	5.4	A	6.8
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	D	36.8	D	41.9
100000037	Broad River Road (US 176) at Harbison Boulevard	C	33.9	B	16.7
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	26.6	B	19.9
100000068	Broad River Road (US 176) at Piney Grove Road	B	16.5	A	7.5
100000339	Broad River Road (US 176) at St. Andrews Road	F	125.2	E	75.5
100000349	Broad River Road (US 176) at St. Andrews Parkway	A	9.7	B	14.6
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	B	16.9	C	32.4
41	Broad River Road (US 176) at Dutch Square Boulevard	A	6.3	C	21.7
100000046	Broad River Road (US 176) at Bush River Road	C	26.2	E	72.3
100000266	Broad River Road (US 176) at Greystone Boulevard	B	11.3	B	15.0
100000265	Greystone Boulevard at Stoneridge Drive	C	22.6	B	18.8
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	E	44.3	F	54.9
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	B	12.5	F	1619.7
100000262	Bush River Road at Colonial Life Boulevard	B	16.3	C	31.9
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	0.0	A	0.0
100000374	Park Terrance Drive at Bower Parkway	D	46.9	B	12.1
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					

## Alternatives Traffic Analysis Technical Memo

### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.98**.

**Table 5.98: External to External Speed and Travel Time TransModeler Results – RA6**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.86	19:53	13:30	41.8	61.6
To I-20 WB (west of Exit 61)	16.14	27:44	20:54	34.9	46.3
To I-20 EB (east of Exit 68)	15.42	28:04	17:47	33.0	52.0
To I-126 EB (Greystone Blvd)	14.77	24:26	15:30	36.3	57.2
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.87	13:51	24:13	60.0	34.4
To I-20 EB (east of Exit 68)	8.44	09:38	10:04	52.5	50.3
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	19:34	11:39	34.0	57.1
To I-26 WB (west of Exit 101)	16.72	26:53	30:18	37.3	33.1
To I-126 EB (east of Greystone Blvd)	10.36	22:42	16:18	27.4	38.1
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	11:13	15:52	59.4	42.0
To I-26 EB (east of Exit 110)	8.91	11:36	14:44	46.1	36.3
To I-26 WB (west of Exit 101)	15.30	17:35	30:12	52.2	30.4
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	15:16	29:36	58.0	29.9
To I-20 WB (west of Exit 61)	10.46	10:56	18:02	57.4	34.8

### 5.3.7 RA7 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.99**, **Table 5.100** and **Table 5.101** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA7 in section 4.5.2.9 of the *Alternatives Development and Screening Report*.



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Table 5.99: I-26 Mainline Volume TransModeler Results – RA7

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	3,551	2,035	3,278	3,884
Exit 101 to Exit 102 (Lake Murray Boulevard)	4,477	2,763	4,021	6,267
Exit 102 to Exit 103 (Harbison Boulevard)	4,591	3,001	4,426	6,900
Exit 103 to Exist 104 (Piney Grove Road)	4,836	3,303	4,942	7,020
Exit 104 to Exit 106 (St. Andrews Road)	5,507	3,734	5,654	7,345
Exit 106 to Exit 107 (I-20)	4,683	3,802	4,179	7,635
I-26 to I-26	2,416	2,281	2,780	3,796
Exit 108 to Exit 110 (Sunset Boulevard)	2,733	2,961	3,154	4,558
southeast of Exit 110	2,631	3,158	4,086	4,437

Table 5.100: I-20 Mainline Volume TransModeler Results – RA7

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	3,293	1,403	2,697	3,698
Exit 61 to East West Connector	4,603	2,174	3,811	4,995
East West Connector to Exit 63 (Bush River Road)	3,211	1,949	2,996	4,244
Exit 63 to Exit 64 (I-26)	1,735	1,006	1,391	1,903
Exit 64 to Exit 65 (Broad River Road)	1,714	1,019	1,389	1,911
Exit 65 to Exit 68 (Monticello Road)	3,362	4,142	4,829	5,794
east of Exit 68	2,856	4,234	4,736	5,487

Table 5.101: I-126 Mainline Volume TransModeler Results – RA7

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-126 from I-26 to Colonial Life Blvd	3,788	1,813	3,156	4,640
I-126 from Colonial Life Blvd to Greystone Blvd	4,714	2,408	3,349	6,677
I-126 from Greystone Blvd to Huger St	4,467	2,567	3,365	6,487

## Alternatives Traffic Analysis Technical Memo

### Basic Freeway Segment Analysis

A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.102**, **Table 5.103** and **Table 5.104** for I-26, I-20 and I-126, respectively.

**Table 5.102: I-26 Basic Freeway Segment TransModeler Results – RA7**

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	B	17.6	0.37	C	18.3	0.34
Exit 102 to Exit 103	C	20.7	0.48	C	22.6	0.46
Exit 103 to Exit 104	B	17.2	0.40	C	20.1	0.41
Exit 104 to Exit 106	D	29.8	0.49	D	31.5	0.50
Exit 106 to Exit 107	C	21.2	0.42	B	14.5	0.37
I-26 to I-26	B	15.3	0.34	C	19.1	0.39
Exit 108 to Exit 110	B	17.6	0.38	C	21.4	0.44
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	B	13.1	0.31	C	24.7	0.47
I-26 to I-26	D	33.5	0.35	F	112.8	0.58
Exit 107 to Exit 106	C	18.9	0.21	D	34.5	0.48
Exit 106 to Exit 104	C	21.1	0.33	F	78.2	0.65
Exit 104 to Exit 103	B	15.5	0.28	E	35.4	0.58
Exit 103 to Exit 102	C	23.2	0.31	E	37.9	0.72
Exit 102 to Exit 101	B	11.2	0.23	D	26.3	0.52

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.103: I-20 Basic Freeway Segment TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	D	33.2	0.46	C	25.7	0.37
Exit 61 to EW	B	17.3	0.38	B	15.8	0.32
EW to Exit 63	B	12.1	0.27	C	19.8	0.25
Exit 63 to Exit 64	A	7.9	0.18	A	7.3	0.14
Exit 64 to Exit 65	F	59.4	0.24	C	23.5	0.28
Exit 65 to Exit 68	F	80.3	0.35	D	33.6	0.50
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	D	26.6	0.58	E	40.1	0.80
Exit 65 to Exit 64	A	1.2	0.08	A	2.2	0.16
Exit 64 to Exit 63	A	4.4	0.10	A	9.3	0.20
Exit 63 to EW	A	8.9	0.20	C	21.5	0.44
EW to Exit 61	A	9.5	0.18	D	34.7	0.42
west of Exit 61	B	12.5	0.19	F	52.3	0.51

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.104: I-126 Basic Freeway Segment TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	B	17.3	0.39	B	17.4	0.33
Colonial Life Blvd to Greystone Blvd	C	21.3	0.49	B	16.0	0.35
Greystone Blvd to Huger St	C	24.4	0.47	B	16.0	0.35
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	11.3	0.27	D	30.4	0.68
Greystone Blvd to Colonial Life Blvd	A	9.5	0.20	D	27.3	0.56
Colonial Life Blvd to I-26	B	12.8	0.19	F	131.5	0.48

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA7 analysis results for the freeway segments, summarized in **Table 5.102**, **Table 5.103** and **Table 5.104**, indicate the following:

- During the morning peak hour:
  - I-26 freeway segments all operate at LOS D or better.
  - I-20 freeway segments all operate at LOS D or better with the exception of eastbound segments from Exit 64 to Exit 68, which operate at LOS F.

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- I-126 freeway segments all operate at LOS C or better.
- During the afternoon peak hour:
  - I-26 westbound freeway segments from I-26 to I-26 operate at LOS F, and westbound freeway segments from Exit 106 to Exit 102 operate at LOS E and F. All other I-26 segments operate at LOS D or better, including all eastbound segments.
  - I-20 westbound freeway segments west of Exit 61 operate at LOS F, and westbound segments from Exit 68 to Exit 65 operate at LOS E. All other I-20 segments operate at LOS D or better, including all eastbound segments.
  - I-126 freeway segments all operate at LOS D or better with the exception of westbound segments from Colonial Life Boulevard to I-26, which operate at LOS F.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.105**, **Table 5.106** and **Table 5.107** for I-26, I-20 and I-126, respectively.

**Table 5.105: I-26 Ramp Merge TransModeler Results – RA7**

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	B	17.6	0.37	B	18.3	0.34
Exit 102	B	15.5	0.38	B	17.3	0.37
Exit 103	B	17.2	0.34	C	20.1	0.34
Exit 104	B	16.2	0.39	B	18.2	0.39
Exit 106	C	21.2	0.42	B	14.5	0.37
Exit 107 Loop	F	46.4	0.42	B	19.8	0.39
Exit 107	B	12.4	0.29	B	15.3	0.33
East West Connector	B	12.1	0.28	B	16.7	0.37
Exit 110	B	13.4	0.28	C	23.0	0.43
<b>I-26 Westbound</b>						
Exit 110	A	9.9	0.26	B	17.0	0.40
I-26 to I-26	B	16.0	0.32	F	54.4	0.61
Exit 107	C	21.7	0.24	E	38.9	0.47
Exit 106	C	26.8	0.24	F	72.4	0.48
Exit 104	B	11.7	0.28	C	22.9	0.59
Exit 103	B	13.9	0.25	F	50.2	0.58
Exit 102	B	11.2	0.23	C	26.3	0.52
Exit 101	B	10.3	0.18	C	21.7	0.41

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.106: I-20 Ramp Merge TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	D	31.6	0.41	C	23.1	0.34
Exit 61	B	18.8	0.48	B	16.1	0.40
Exit 65	F	74.7	0.25	C	24.1	0.34
Exit 68	B	14.0	0.30	D	29.3	0.50
<b>I-20 Westbound</b>						
Exit 68	C	24.5	0.44	E	44.9	0.61
Exit 65	A	1.2	0.08	A	2.2	0.16
Exit 63	A	9.8	0.16	C	22.0	0.35
East West Connector	A	9.5	0.15	D	34.7	0.35
Exit 61	B	10.9	0.15	F	63.1	0.40

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.107: I-126 Ramp Merge TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	B	16.0	0.39	B	10.8	0.28
Greystone Blvd	C	23.2	0.47	B	14.8	0.35
<b>I-126 Westbound</b>						
Greystone Blvd	A	9.5	0.20	C	27.3	0.56

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA7 analysis results for the ramp merge areas, summarized in **Table 5.105**, **Table 5.106** and **Table 5.107**, indicate the following:

- During the morning peak hour:
  - I-26 merge areas all operate at LOS C or better with the exception of the eastbound merge area at Exit 107 Loop, which operates at LOS F.
  - I-20 merge areas all operate at LOS D or better with the exception of the eastbound Exit 65 merge area, which operates at LOS F.
  - I-126 merge areas all operate at LOS C or better.
- During the afternoon peak hour:

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- I-26 westbound merge areas from I-26 to Exit 106 operate at LOS E and F. The westbound merge area at Exit 103 also operates at LOS F. All other ramp merge areas operate at LOS C or better, including all eastbound merge areas.
- I-20 westbound merge areas at Exit 68 and Exit 61 operate at LOS E and F, respectively. All other I-20 merge areas operate at LOS D or better.
- I-126 merge areas all operate at LOS C or better.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.108**, **Table 5.109** and **Table 5.110** for I-26, I-20 and I-126, respectively.

**Table 5.108: I-26 Ramp Diverge TransModeler Results – RA7**

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	B	14.3	0.37	B	14.4	0.34
Exit 101 Loop	A	8.5	0.29	A	8.0	0.26
Exit 102	B	17.6	0.37	B	18.3	0.33
Exit 102 Loop	B	13.8	0.34	B	12.5	0.32
Exit 103	B	15.3	0.38	B	16.8	0.37
Exit 104	B	17.2	0.40	C	20.1	0.41
Exit 106	C	26.5	0.49	D	33.0	0.50
Exit 107	C	26.5	0.49	D	33.0	0.50
Exit 108	F	46.4	0.42	B	19.8	0.39
I-26 to I-26	B	15.3	0.34	B	19.1	0.39
East West Connector	B	14.1	0.32	C	22.3	0.49
Exit 110	B	12.1	0.28	B	16.7	0.37
<b>I-26 Westbound</b>						
Exit 110	C	20.6	0.33	D	29.3	0.46
Exit 108	B	13.1	0.31	C	24.7	0.47
Exit 107	B	16.0	0.32	F	54.4	0.61
Exit 104	C	27.1	0.33	F	75.8	0.65
Exit 103	B	12.9	0.27	C	26.6	0.58
Exit 102	B	14.4	0.31	F	51.5	0.72
Exit 102 Loop	B	14.4	0.24	D	31.5	0.55
Exit 101	B	11.2	0.23	C	26.3	0.52
Exit 101 Loop	B	10.8	0.21	C	20.7	0.47

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.



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Table 5.109: I-20 Ramp Diverge TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	C	24.5	0.34	C	21.0	0.28
East West Connector	B	16.9	0.32	B	16.8	0.26
Exit 63	C	24.7	0.25	D	32.1	0.36
Exit 64	B	18.2	0.27	F	60.1	0.25
Exit 65	B	18.2	0.27	F	60.1	0.25
Exit 68	F	90.6	0.37	E	37.4	0.66
<b>I-20 Westbound</b>						
Exit 68	D	28.7	0.59	F	66.2	0.76
Exit 65	F	50.8	0.34	F	66.2	0.48
Exit 64	C	24.7	0.25	D	32.1	0.36
Exit 63	C	24.7	0.25	D	32.1	0.36
Exit 61	B	10.4	0.22	F	50.7	0.49

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.110: I-126 Ramp Diverge TransModeler Results – RA7

Segment	RA7 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Greystone Blvd	B	17.7	0.39	B	13.2	0.28
<b>I-126 Westbound</b>						
Greystone Blvd	B	14.4	0.27	E	37.9	0.68
Colonial Life Blvd	A	9.5	0.20	C	27.3	0.56

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA7 analysis results for the ramp diverge areas, summarized in **Table 5.108**, **Table 5.109** and **Table 5.110**, indicate the following:

- During the morning peak hour:
  - I-26 eastbound diverge areas for Exit 108 operate at LOS F. All other ramp diverge areas in both the eastbound and westbound directions operate at LOS C or better.
  - I-20 eastbound diverge areas all operate at LOS C or better with the exception of the Exit 68 diverge area, which operates at LOS F. I-20 westbound diverge areas all operate at LOS D or better with the exception of the Exit 65 diverge area, which also operates at LOS F.
  - I-126 diverge areas all operate at LOS A or B.

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- During the afternoon peak hour:
  - I-26 westbound diverge areas at from Exit 107 to Exit 104 Road and at Exit 102 operate at LOS F. All other diverge areas operate at LOS D or better.
  - I-20 eastbound diverge areas from Exit 64 to Exit 68 and westbound diverge areas from Exit 68 to 65 and at Exit 61 operate at LOS E and F. All other diverge areas operate at LOS D or better.
  - I-126 diverge areas all operate at LOS C or better with the exception of Greystone Boulevard, which operates at LOS E.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.111**.

**Table 5.111: Mainline Travel Time TransModeler Results – RA7**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.83	00:52	00:50	57.9	59.4	0.82	00:49	00:52	59.7	56.3
Exit 102 to Exit 103 (Harbison Boulevard)	1.21	01:15	01:12	58.6	60.5	0.89	00:54	01:12	59.5	44.6
Exit 103 to Exit 104 (Piney Grove Road)	0.88	00:55	00:53	57.8	59.8	1.16	01:09	01:14	60.2	56.5
Exit 106 to Exit 107 (I-20) <sup>1</sup>	1.74	02:04	01:57	50.6	53.7	2.13	02:51	03:59	44.9	32.0
Exit 107 to Exit 106 (St. Andrews Road)	0.51	00:41	00:38	44.6	48.7	0.64	00:42	00:53	53.9	43.2
Exit 106 to I-26	1.15	01:55	01:26	36.1	47.9	0.41	00:26	00:43	56.6	34.3
I-26 to EW Connector	1.41	01:23	01:22	61.2	62.1	0.76	00:44	00:46	61.6	59.4
EW Connector to Exit 110 (Sunset Boulevard)	0.95	00:54	00:55	63.3	62.5	1.19	01:07	01:09	63.7	62.2
Total	8.69	09:58	09:13	52.3	56.6	7.98	08:43	10:47	55.0	44.4
I-20 between Exit 61 and Exit 68										
Exit 61 to EW Connector	1.52	01:41	01:33	54.1	59.0	0.81	00:52	01:31	56.3	31.9
EW Connector to Exit 63 (Bush River Road)	0.28	00:18	00:21	56.0	48.4	0.90	00:52	00:55	62.4	59.5
Exit 63 to Exit 65 (Broad River Road)	1.26	02:04	01:11	36.5	63.2	2.05	02:07	02:03	58.2	60.0
Exit 65 to Exist 68 (Monticello Road)	2.74	11:56	03:01	13.8	54.5	2.97	03:33	03:56	50.2	45.3
Total	5.80	15:59	06:06	21.8	57.0	6.73	07:23	08:25	54.6	48.0
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Boulevard	0.63	00:42	00:41	53.6	55.3	2.23	02:18	02:56	58.1	45.6
Colonial Life Boulevard to Greystone Blvd	1.51	01:32	01:26	59.2	63.2	0.86	00:51	00:54	61.1	57.1
Total	2.13	02:14	02:07	57.4	60.6	3.09	03:09	03:50	58.9	48.3
E-W Connector										
I-20 to I-26	1.03	01:12	01:08	51.2	54.0	1.31	01:26	01:27	55.3	54.2
Total	1.03	01:12	01:08	51.2	54.0	1.31	01:26	01:27	55.3	54.2

<sup>1</sup> I-26 EB Exit 107 prior to Exit 106

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.112**.



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**Table 5.112: Arterial Travel Time TransModeler Results – RA7**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	6.8	19:09	17:58	21.3	22.7	7.3	19:45	19:05	22.1	22.9
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	04:02	03:37	22.7	25.3	1.5	03:31	03:35	24.9	24.4
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	02:59	04:53	22.4	13.7	1.1	02:43	02:52	24.5	23.3
Piney Grove Road (west of Exit 104 to Broad River Road)	1.6	04:25	03:54	21.4	24.2	1.6	04:53	05:14	19.4	18.1
St. Andrews Road (west of Exit 106 to Broad River Road)	0.9	04:51	05:04	11.6	11.1	0.9	03:19	03:07	16.9	18.0
Bush River Road (west of Exit 63 to Broad River Road)	2.0	06:43	07:10	18.2	17.0	2.0	06:15	05:32	19.5	22.1
Location	Northbound					Southbound				
	Length (mi)	Travel Time		Average Speed		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.6	01:28	01:39	25.4	22.6	0.6	01:31	01:41	24.6	22.2

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.113**.

Table 5.113: Intersection and LOS TransModeler Results – RA7

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	B	19.9	A	9.1
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	B	16.3	B	15.5
100000151	Broad River Road (US 176) at I-26 EB On-ramp	B	10.0	A	5.9
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	2.3	A	1.8
4	Broad River Road (US 176) at Western Lane	A	9.9	A	9.6
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	D	37.1	D	39.6
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	3.5	A	3.0
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.4	A	4.0
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	B	13.2	B	13.5
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	12.1	B	14.4
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	4.5	C	29.8
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	3.6	B	12.1
99	Harbison Boulevard (S-757) at I-26 EB Ramps	B	17.6	B	19.8
100000165	Harbison Boulevard (S-757) at I-26 WB Ramps / Woodcross Drive	B	14.8	D	43.1
100000398	Harbison Boulevard (S-757) at Parkridge Drive	A	4.0	B	17.7
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	D	48.1	D	45.9
100000174	Piney Grove Road at I-26 EB Ramps	B	15.4	C	23.5
100000177	Piney Grove Road at I-26 WB Ramps	B	10.3	B	13.7
100000399	Piney Grove Road at Fernandina Road	B	14.1	C	29.7
Exit 106					
100000348	St. Andrews Road at Jamil Road	B	11.6	A	6.7
100000178	St. Andrews Road at Woodland Hills Road	A	5.3	A	7.4
100000180	St. Andrews Road at I-26 Ramps SPUI	D	25.1	D	38.2
100000358	St. Andrews Road at Fernandina Road / Burning Tree Drive	B	15.3	C	30.7
100000354	St. Andrews Road at Kay Street / Chartwell Road	B	17.5	B	12.4
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	B	10.3	A	8.5
100000898	Bush River Road at I-26 EB Off-Ramp / Driveway	A	6.6	A	8.5
100000252	Bush River Road at Morninghill Drive	C	20.9	B	17.0
100000184	Bush River Road at Arrowwood Road	B	15.7	B	16.0
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	A	6.5	B	12.6
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	47.7	E	43.5
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	27.3	C	23.3
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	E	45.7	A	8.2
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	2.5	B	16.4
Exit 63					
100000446	Bush River Road at Berryhill Drive/WB Ramps	B	14.0	B	16.8
49	Bush River Road at I-20 EB Off-Ramp	C	20.7	B	13.2
-	Bush River Road at Rockland Road <sup>1</sup>	-	-	-	-
100000255	Bush River Road at Independence Avenue	B	11.4	B	14.8
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	C	28.4	B	19.6
110	Broad River Road at I-20 WB Ramps	D	40.4	C	27.8
100000190	Broad River Road at I-20 EB Ramps / Garner Lane	B	11.7	B	13.6
100000195	Broad River Road at Longcreek Drive	A	4.9	A	4.2
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	D	41.5	E	59.2
100000037	Broad River Road (US 176) at Harbison Boulevard	B	16.1	B	14.0
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	28.3	B	18.0
100000068	Broad River Road (US 176) at Piney Grove Road	A	4.1	A	6.8
100000339	Broad River Road (US 176) at St. Andrews Road	C	31.7	D	37.6
100000349	Broad River Road (US 176) at St. Andrews Parkway	A	9.7	B	13.6
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	B	14.6	C	28.9
41	Broad River Road (US 176) at Dutch Square Boulevard	A	5.9	D	41.1
100000046	Broad River Road (US 176) at Bush River Road	C	25.5	D	48.7
100000266	Broad River Road (US 176) at Greystone Boulevard	B	13.3	B	13.6
100000265	Greystone Boulevard at Stoneridge Drive	C	23.2	C	33.3
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	D	32.5	B	13.5
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	C	24.4	F	52.0
100000262	Bush River Road at Colonial Life Boulevard	B	18.6	B	18.0
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	8.1	C	16.9
100000374	Park Terrance Drive at Bower Parkway	B	10.2	A	7.0
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					



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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.114**.

**Table 5.114: External to External Speed and Travel Time TransModeler Results – RA7**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.85	19:29	13:39	42.6	60.9
To I-20 WB (west of Exit 61)	16.08	21:57	19:28	44.0	49.6
To I-20 EB (east of Exit 68)	15.53	23:31	16:31	39.6	56.4
To I-126 EB (Greystone Blvd)	14.77	21:23	15:09	41.4	58.5
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.87	14:24	25:40	57.8	32.4
To I-20 EB (east of Exit 68)	8.47	10:52	09:40	46.8	52.6
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	19:41	10:45	33.8	62.0
To I-26 WB (west of Exit 101)	16.59	24:38	29:32	40.4	33.7
To I-126 EB (east of Greystone Blvd)	9.93	20:23	10:57	29.2	54.4
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	11:03	15:51	60.3	42.0
To I-26 EB (east of Exit 110)	9.60	13:51	14:59	41.6	38.4
To I-26 WB (west of Exit 101)	15.29	16:53	31:00	54.3	29.6
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	15:00	27:03	59.0	32.7
To I-20 WB (west of Exit 61)	9.98	10:23	14:03	57.6	42.6

### 5.3.8 RA8 ANALYSIS RESULTS

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.115**, **Table 5.116** and **Table 5.117** for I-26, I-20 and I-126, respectively. These measures of effectiveness were incorporated into the level 1B screening of RA8 in section 4.5.2.10 of the *Alternatives Development and Screening Report*.

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Table 5.115: I-26 Mainline Volume TransModeler Results – RA8

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,752	3,045	3,594	5,554
Exit 101 to Exit 102 (Lake Murray Boulevard)	6,040	3,962	4,482	6,761
Exit 102 to Exit 103 (Harbison Boulevard)	6,266	4,219	5,173	7,514
Exit 103 to Exist 104 (Piney Grove Road)	6,889	4,500	5,612	7,968
Exit 104 to Exit 106 (St. Andrews Road)	7,590	5,221	6,256	8,100
Exit 106 to Exit 107 (I-20)	6,226	3,214	4,498	5,675
I-26 to I-26	1,976	3,146	2,038	3,566
Exit 108 to Exit 110 (Sunset Boulevard)	4,123	4,192	4,621	5,035
southeast of Exit 110	3,540	3,993	4,362	4,570

Table 5.116: I-20 Mainline Volume TransModeler Results – RA8

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	4,373	1,945	2,969	4,032
Exit 61 to Exit 63 (Bush River Road)	5,484	3,297	4,050	5,757
Exit 63 to Exit 64 (I-26)	2,192	1,630	1,529	2,169
Exit 64 to Exit 65 (Broad River Road)	2,194	1,630	1,531	2,169
Exit 65 to Exit 68 (Monticello Road)	5,853	5,344	5,335	6,180
east of Exit 68	5,402	5,367	5,347	5,827

Table 5.117: I-126 Mainline Volume TransModeler Results – RA8

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-126 from I-26 to Colonial Life Blvd	3,966	2,940	2,184	6,795
I-126 from Colonial Life Blvd to Greystone Blvd	6,262	3,218	3,771	7,454
I-126 from Greystone Blvd to Huger St	6,085	3,230	3,675	6,920

### Basic Freeway Segment Analysis



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A summary of the Basic Freeway Segment Analysis results is shown in **Table 5.118**, **Table 5.119** and **Table 5.120** for I-26, I-20 and I-126, respectively.

**Table 5.118: I-26 Basic Freeway Segment TransModeler Results – RA8**

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101 to Exit 102	C	24.7	0.50	C	19.2	0.37
Exit 102 to Exit 103	D	28.9	0.65	C	26.0	0.54
Exit 103 to Exit 104	C	25.3	0.72	C	21.1	0.58
Exit 104 to Exit 106	C	25.2	0.63	C	20.5	0.52
Exit 106 to Exit 107	C	23.6	0.55	B	13.3	0.40
I-26 to I-26	B	12.0	0.27	B	13.3	0.28
Exit 108 to Exit 110	E	41.6	0.34	D	27.4	0.39
<b>I-26 Westbound</b>						
Exit 110 to Exit 108	C	20.2	0.44	C	23.0	0.52
I-26 to I-26	D	33.5	0.48	F	112.8	0.54
Exit 107 to Exit 106	C	19.8	0.36	D	33.3	0.63
Exit 106 to Exit 104	D	32.7	0.58	F	58.2	0.90
Exit 104 to Exit 103	C	21.6	0.47	F	45.8	0.83
Exit 103 to Exit 102	C	23.2	0.44	E	37.9	0.78
Exit 102 to Exit 101	B	14.8	0.33	C	20.4	0.56

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

**Table 5.119: I-20 Basic Freeway Segment TransModeler Results – RA8**

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
west of Exit 61	E	44.0	0.61	C	25.6	0.41
Exit 61 to Exit 63	F	62.0	0.57	C	22.6	0.42
Exit 63 to Exit 64	A	9.7	0.23	A	7.5	0.16
Exit 64 to Exit 65	B	11.7	0.30	A	8.7	0.21
Exit 65 to Exit 68	F	47.3	0.61	D	34.4	0.56
<b>I-20 Westbound</b>						
Exit 68 to Exit 65	D	34.7	0.74	E	41.1	0.86
Exit 65 to Exit 64	A	8.0	0.17	A	9.8	0.23
Exit 64 to Exit 63	A	8.0	0.17	A	9.8	0.23
Exit 63 to Exit 61	B	16.7	0.23	F	69.7	0.40
west of Exit 61	C	18.6	0.27	F	50.4	0.56

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

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Table 5.120: I-126 Basic Freeway Segment TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
I-26 to Colonial Life Blvd	D	27.2	0.59	B	14.3	0.32
Colonial Life Blvd to Greystone Blvd	D	28.3	0.65	B	17.1	0.39
Greystone Blvd to Huger St	D	33.2	0.63	B	15.7	0.38
<b>I-126 Westbound</b>						
Huger St to Greystone Blvd	B	14.4	0.34	D	30.5	0.72
Greystone Blvd to Colonial Life Blvd	B	15.4	0.34	D	34.7	0.78
Colonial Life Blvd to I-26	B	15.0	0.31	D	30.8	0.71

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA8 analysis results for the freeway segments, summarized in **Table 5.118**, **Table 5.119** and **Table 5.120**, indicate the following:

- During the morning peak hour:
  - I-26 freeway segments all operate at LOS D or better with the exception of from Exit 108 to Exit 110, which operate at LOS E.
  - I-20 eastbound freeway segments from west of Exit 61 to Exit 63 and from Exit 65 to Exit 68 operate at LOS E and F. All other freeway segments, including all westbound segments, operate at LOS D or better.
  - I-126 eastbound freeway segments all operate at LOS D, and I-126 westbound segments operate at LOS B.
- During the afternoon peak hour:
  - I-26 westbound freeway segments from I-26 to I-26 operate at LOS F, and westbound freeway segments from Exit 106 to Exit 102 operate at LOS E and F. All other I-26 segments operate at LOS D or better, including all eastbound segments.
  - I-20 westbound freeway segments from Exit 63 to west of Exit 61 operate at LOS F, and westbound segments from Exit 68 to Exit 65 operate at LOS E. All other I-20 segments operate at LOS D or better, including all eastbound segments.
  - I-126 eastbound freeway segments all operate at LOS B, and I-126 westbound segments operate at LOS D.

### Ramp Merge Analysis

A summary of the Ramp Merge Analysis results is shown in **Table 5.121**, **Table 5.122** and **Table 5.123** for I-26, I-20 and I-126, respectively.



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Table 5.121: I-26 Ramp Merge TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	24.7	0.50	B	19.2	0.37
Exit 102	C	24.4	0.52	C	25.9	0.43
Exit 103	C	25.3	0.57	C	21.1	0.47
Exit 104	C	25.2	0.63	C	20.5	0.52
Exit 106	C	23.6	0.55	B	13.3	0.40
E-W Connector	B	12.4	0.23	B	13.3	0.27
E-W Connector	E	37.2	0.29	C	24.1	0.32
Exit 110	B	17.3	0.37	C	21.4	0.45
<b>I-26 Westbound</b>						
Exit 110	B	15.5	0.35	B	18.2	0.42
Exit 107	C	26.0	0.38	E	35.7	0.59
Exit 106	E	36.7	0.47	F	78.3	0.73
Exit 104	C	21.6	0.38	F	45.8	0.66
Exit 103	B	16.8	0.35	E	36.6	0.63
Exit 102	B	14.8	0.33	C	20.4	0.56

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

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Table 5.122: I-20 Ramp Merge TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61 Loop	F	121.0	0.50	B	18.3	0.37
Exit 61	F	84.0	0.58	C	23.6	0.42
Exit 63	C	20.4	0.43	B	19.0	0.36
Exit 64	C	20.4	0.43	B	19.0	0.36
Exit 65	F	52.7	0.62	D	33.2	0.56
Exit 68	D	29.2	0.57	D	30.0	0.56
<b>I-20 Westbound</b>						
Exit 68	D	28.1	0.75	E	41.3	0.86
Exit 65	A	3.9	0.14	A	4.8	0.18
Exit 64	A	6.7	0.18	B	10.7	0.25
Exit 63	B	17.3	0.20	F	62.9	0.35
Exit 61	B	15.3	0.20	F	47.9	0.43

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.123: I-126 Ramp Merge TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Colonial Life Blvd	C	21.2	0.52	B	15.9	0.31
Greystone Blvd	D	30.6	0.64	B	12.9	0.38
<b>I-126 Westbound</b>						
Greystone Blvd	B	12.6	0.27	D	28.5	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA8 analysis results for the ramp merge areas, summarized in **Table 5.121**, **Table 5.122** and **Table 5.123**, indicate the following:

- During the morning peak hour:
  - I-26 merge areas all operate at LOS C or better with the exception of the eastbound merge area at E-W Connector and the westbound merge area at Exit 106, which operate at LOS F.
  - I-20 merge areas at Exit 61 and Exit 65 operate at LOS F. All other merge areas, including all westbound merge areas, operate at LOS D or better.
  - I-126 merge areas all operate at LOS D or better.
- During the afternoon peak hour:



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- I-26 westbound merge areas from Exit 107 to Exit 103 operate at LOS E and F. All other ramp merge areas operate at LOS C or better, including all eastbound merge areas.
- I-20 westbound merge areas from Exit 63 to Exit 61 operate at LOS F, and the Exit 68 merge area operates at LOS E. All other I-20 merge areas operate at LOS D or better.
- I-126 merge areas all operate at LOS D or better.

### Ramp Diverge Analysis

A summary of the Ramp Diverge Analysis results is shown in **Table 5.124**, **Table 5.125** and **Table 5.126** for I-26, I-20 and I-126, respectively.

**Table 5.124: I-26 Ramp Diverge TransModeler Results – RA8**

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>						
Exit 101	C	20.7	0.49	B	15.3	0.37
Exit 101 Loop	B	12.1	0.39	A	7.7	0.29
Exit 102	C	24.7	0.50	B	19.2	0.37
Exit 102 Loop	B	18.4	0.45	B	13.4	0.35
Exit 103	C	24.3	0.65	C	27.5	0.54
Exit 104	C	27.7	0.72	C	23.2	0.58
Exit 106	B	16.0	0.55	B	15.9	0.44
Exit 107	E	37.3	0.67	D	33.6	0.56
Exit 108	C	27.6	0.55	B	13.9	0.40
Exit 110	F	56.0	0.41	F	52.8	0.47
<b>I-26 Westbound</b>						
Exit 110	F	46.8	0.41	F	68.4	0.47
Exit 108	B	12.4	0.31	B	13.3	0.35
Exit 107	C	20.3	0.36	C	20.6	0.41
Exit 106	C	23.3	0.36	D	31.8	0.62
Exit 106 Loop	C	26.0	0.38	E	35.7	0.59
Exit 104	E	37.3	0.46	F	76.8	0.72
Exit 103	C	21.7	0.47	F	45.9	0.83
Exit 102	B	18.6	0.44	E	43.6	0.78
Exit 102 Loop	B	19.3	0.33	D	32.4	0.59
Exit 101	B	14.8	0.33	C	20.4	0.56
Exit 101 Loop	B	11.5	0.29	B	15.4	0.51

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

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Table 5.125: I-20 Ramp Diverge TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>						
Exit 61	D	33.0	0.46	C	20.8	0.31
Exit 63	C	25.6	0.46	B	19.1	0.34
Exit 64	A	7.1	0.25	A	9.2	0.21
Exit 65	A	7.1	0.25	A	9.2	0.21
Exit 68	E	39.7	0.80	E	40.3	0.74
<b>I-20 Westbound</b>						
Exit 68	E	37.3	0.75	F	66.8	0.81
Exit 65	D	31.3	0.37	E	41.8	0.43
Exit 64	A	6.7	0.18	B	10.7	0.25
Exit 63	B	17.3	0.20	F	62.9	0.35
Exit 61	C	21.2	0.34	F	79.3	0.59

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

Table 5.126: I-126 Ramp Diverge TransModeler Results – RA8

Segment	RA8 Conditions					
	AM Peak Hour			PM Peak Hour		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-126 Eastbound</b>						
Greystone Blvd	C	22.7	0.52	C	20.0	0.31
<b>I-126 Westbound</b>						
Greystone Blvd	B	16.2	0.34	D	31.0	0.72
Colonial Life Blvd	B	13.1	0.27	D	29.1	0.62

<sup>1</sup> Per Highway Capacity Manual 2010 criteria.

<sup>2</sup> Density expressed as PCE/per mile/per lane.

The RA8 analysis results for the ramp diverge areas, summarized in **Table 5.124**, **Table 5.125** and **Table 5.126**, indicate the following:

- During the morning peak hour:
  - I-26 diverge areas for Exit 110 operate at LOS F in both directions. The eastbound merge area at Exit 107 and the westbound merge area at Exit 104 operate at LOS E. All other ramp diverge areas operate at LOS C or better.
  - I-20 eastbound diverge areas all operate at LOS D or better, with the exception of both the eastbound and westbound Exit 68 diverge areas which operate at LOS E.
  - I-126 diverge areas all operate at LOS C or better.
- During the afternoon peak hour:



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- I-26 diverge areas for Exit 110 operate at LOS F in both directions. Diverge areas from Exit 106 Loop to Exit 102 operate at LOS E and F. All other diverge areas operate at LOS D or better.
- I-20 eastbound diverge area at Exit 68 operates at LOS E. I-20 westbound diverge areas from Exit 68 to Exit 65 and from Exit 63 to Exit 61 operate at LOS E and F. All other diverge areas operate at LOS C or better.
- I-126 diverge areas all operate at LOS D or better.

### Mainline Travel Time Analysis

A summary of the Mainline Travel Time Analysis results is shown in **Table 5.127**.

**Table 5.127: Mainline Travel Time TransModeler Results – RA8**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.76	00:47	00:46	57.4	59.2	0.83	00:53	00:56	57.1	53.4
Exit 102 to Exit 103 (Harbison Boulevard)	1.26	01:20	01:21	57.0	56.0	1.05	01:03	01:19	60.0	47.9
Exit 103 to Exit 104 (Piney Grove Road)	0.85	00:56	00:53	54.4	58.0	0.79	00:48	01:00	59.5	47.7
Exit 106 to Exit 107 (I-20) <sup>1</sup>	1.75	02:11	01:59	48.2	53.2	1.99	02:35	03:32	46.3	33.8
Exit 107 to Exit 106 (St. Andrews Road)	0.30	00:22	00:22	47.9	49.2	0.86	01:05	01:12	47.3	43.1
Exit 106 to Exit 108 (Bush River Road)	0.96	01:22	01:13	41.7	47.1	-	-	-	-	-
Exit 108 to I-26	0.39	00:31	00:30	44.8	47.3	-	-	-	-	-
I-26 to EW Connector	0.78	00:45	00:45	62.2	61.9	0.80	00:52	00:53	55.2	54.4
EW Connector to Exit 110 (Sunset Boulevard)	1.53	03:15	02:07	28.2	43.3	1.64	01:37	01:42	60.5	57.8
Total	8.57	11:31	09:55	44.7	51.8	7.96	08:53	10:34	53.8	45.2
I-20 between Exit 61 and Exit 68										
Exit 61 to EW Connector	1.76	05:05	01:49	20.7	58.0	1.12	01:36	03:08	41.9	21.5
EW Connector to Exit 63 (CD to I-20)	0.41	00:24	00:25	61.3	60.0	2.36	02:12	02:14	64.5	63.8
Exit 63 to Exit 65 (Broad River Road)	2.25	02:24	02:09	56.2	63.0	0.21	00:14	00:14	52.7	53.6
Exit 65 to Exist 68 (Monticello Road)	2.54	04:07	02:49	37.0	54.3	3.00	03:30	04:14	51.5	42.5
Total	6.96	12:01	07:11	34.8	58.1	6.69	07:32	09:49	53.3	40.9
I-126 between I-26 and Greystone Blvd										
I-26 to Colonial Life Boulevard	1.05	01:15	01:11	50.6	53.6	1.26	01:19	01:25	57.3	53.3
Colonial Life Boulevard to Greystone Blvd	0.67	00:44	00:50	55.1	48.4	1.12	01:06	01:16	61.6	53.0
Total	1.73	01:59	02:01	52.2	51.4	2.38	02:25	02:42	59.3	53.1
I-126 between I-26 and Greystone Blvd										
I-20 to I-26	1.02	01:09	01:06	52.8	55.2	1.24	01:19	01:22	56.6	54.6
Total	2.74	03:08	03:07	52.4	52.8	3.63	03:44	04:03	58.3	53.6

<sup>1</sup> I-26 EB Exit 107 prior to Exit 106

### Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.128**.

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**Table 5.128: Arterial Travel Time TransModeler Results – RA8**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	6.7	19:09	20:44	21.1	19.5	6.2	17:36	18:05	21.2	20.6
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.5	03:45	05:52	24.4	15.6	1.5	03:27	04:18	25.4	20.4
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	03:16	08:58	19.9	7.3	1.1	03:16	04:13	19.9	15.5
Piney Grove Road (west of Exit 104 to Broad River Road)	0.5	02:48	02:36	10.4	11.2	0.5	03:19	03:15	8.8	9.0
St. Andrews Road (west of Exit 106 to Broad River Road)	0.9	04:59	06:45	11.1	8.2	0.9	03:38	04:13	15.1	13.1
Bush River Road (west of Exit 63 to Broad River Road)	2.0	06:22	07:20	18.8	16.4	2.0	09:52	10:03	12.2	11.9
Location	Northbound					Southbound				
	Length (mi)	Travel Time		Average Speed		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.5	01:40	01:36	17.1	17.7	0.5	00:46	00:48	37.2	35.4

### Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.129**.



Table 5.129: Intersection and LOS TransModeler Results – RA8

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	B	10.5	B	19.2
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	B	16.3	B	15.5
100000151	Broad River Road (US 176) at I-26 EB On-ramp	B	12.7	A	8.5
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	1.0	A	0.8
4	Broad River Road (US 176) at Western Lane	B	12.9	A	9.2
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	C	24.0	D	49.7
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	3.9	A	5.3
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	3.2	A	6.1
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	D	47.2	C	34.7
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	15.6	B	13.9
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	8.8	D	38.9
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	8.2	D	48.7
99	Harbison Boulevard (S-757) at I-26 EB Ramps	C	24.2	D	50.2
100000165	Harbison Boulevard (S-757) at I-26 WB Ramps / Woodcross Drive	B	15.9	D	38.9
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	C	30.0	D	38.5
94	Piney Grove Road at West DDI Intersection	A	8.7	B	11.3
138	Piney Grove at EB I-26 Off-Ramp	A	3.2	A	5.3
140	Piney Grove Road at East DDI Intersection	A	9.0	A	5.6
137	Piney Grove at WB I-26 Off-Ramp (RT)	A	3.1	A	2.1
108	Piney Grove at WB I-26 Off-Ramp (LT)	B	10.1	A	6.2
100000399	Piney Grove Road at Fernandina Road	C	26.3	C	34.9
Exit 106					
100000348	St. Andrews Road at Jamil Road	B	12.1	C	21.5
100000178	St. Andrews Road at Woodland Hills Road	A	5.7	A	8.0
100000180	St. Andrews Road at I-26 Ramps SPUI	C	25.9	C	31.6
100000358	St. Andrews Road at Fernandina Road / Burning Tree Drive	B	17.3	C	24.9
100000354	St. Andrews Road at Kay Street / Chartwell Road	C	30.6	B	13.8
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	B	11.9	A	9.3
100000252	Bush River Road at Morninghill Drive/I-26 Ramps	C	26.8	C	27.8
100000184	Bush River Road at Arrowwood Road	B	12.0	C	20.1
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	F	97.8	E	65.3
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	E	47.7	E	43.5
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	28.8	C	26.4
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	E	45.7	A	8.2
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	B	13.9	B	16.5
Exit 63					
100000446	Bush River Road at Berryhill Drive	A	8.6	B	15.4
49	Bush River Road at I-20 Ramps	A	6.4	A	9.9
-	Bush River Road at Rockland Road <sup>1</sup>	-	-	-	-
100000255	Bush River Road at Independence Avenue	C	20.1	C	30.1
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	C	25.3	B	16.4
126	Broad River Road at I-20 WB Ramps	A	6.4	A	5.1
100000190	Broad River Road at I-20 SPUI	D	36.1	D	37.4
110	Broad River Road at I-20 EB Ramps / Garner Lane	A	1.4	A	2.3
100000195	Broad River Road at Longcreek Drive	A	5.3	A	4.6
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	58.6	F	93.1
100000037	Broad River Road (US 176) at Harbison Boulevard	B	17.0	B	13.8
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	D	36.9	C	29.9
100000068	Broad River Road (US 176) at Piney Grove Road	A	5.6	A	5.8
100000339	Broad River Road (US 176) at St. Andrews Road	C	31.9	D	44.6
100000349	Broad River Road (US 176) at St. Andrews Parkway	A	6.1	B	12.0
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	B	19.6	D	48.9
41	Broad River Road (US 176) at Dutch Square Boulevard	B	10.2	B	16.4
100000046	Broad River Road (US 176) at Bush River Road	C	33.0	D	44.3
100000266	Broad River Road (US 176) at Greystone Boulevard	B	11.8	B	11.7
100000265	Greystone Boulevard at Stoneridge Drive	C	27.9	C	27.3
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	D	32.5	B	13.5
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	C	24.4	F	52.0
100000262	Bush River Road at Colonial Life Boulevard	E	59.6	D	41.9
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	8.1	C	16.9
100000374	Park Terrance Drive at Bower Parkway	A	8.0	B	14.6
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					

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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis results is shown in **Table 5.130**.

**Table 5.130: External to External Speed and Travel Time TransModeler Results – RA8**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.85	19:29	13:39	42.6	60.9
To I-20 WB (west of Exit 61)	16.08	21:57	19:28	44.0	49.6
To I-20 EB (east of Exit 68)	15.53	23:31	16:31	39.6	56.4
To I-126 EB (Greystone Blvd)	14.77	21:23	15:09	41.4	58.5
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 110)	13.87	14:24	25:40	57.8	32.4
To I-20 EB (east of Exit 68)	8.47	10:52	09:40	46.8	52.6
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	19:41	10:45	33.8	62.0
To I-26 WB (west of Exit 101)	16.59	24:38	29:32	40.4	33.7
To I-126 EB (east of Greystone Blvd)	9.93	20:23	10:57	29.2	54.4
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.10	11:03	15:51	60.3	42.0
To I-26 EB (east of Exit 110)	9.60	13:51	14:59	41.6	38.4
To I-26 WB (west of Exit 101)	15.29	16:53	31:00	54.3	29.6
I-126 WB from East of Greystone Blvd					
To I-26 WB (wast of Exit 101)	14.75	15:00	27:03	59.0	32.7
To I-20 WB (west of Exit 61)	9.98	10:23	14:03	57.6	42.6

### 5.3.9 RA9 ANALYSIS RESULTS

During the development and microsimulation of RA9 it was determined that it was not a viable alternative due to both operational issues and land impacts. Therefore, no analysis results were developed for RA9. The level 1B screening of RA9 in section 4.5.2.2 of the *Alternatives Development and Screening Report*.



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### 5.3.10 RA10 (NO-BUILD) ANALYSIS RESULTS

RA10 (No-Build) is summarized in Section 4.8.2. Additional analysis comparative to the Representative Alternatives are provided below. These measures of effectiveness were incorporated into the level 1B screening of RA10 in section 4.5.2.1 of the *Alternatives Development and Screening Report*.

#### Mainline Volume Analysis

A summary of the Mainline Volume Analysis results is shown in **Table 5.131**, **Table 5.132** and **Table 5.133** for I-26, I-20 and I-126, respectively.

**Table 5.131: I-26 Mainline Volume TransModeler Results – RA10**

I-26 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 101 (Broad River Road)	4,387	2,950	3,628	4,399
Exit 101 to Exit 102 (Lake Murray Boulevard)	4,746	3,560	4,355	5,180
Exit 102 to Exit 103 (Harbison Boulevard)	4,552	4,190	4,766	5,853
Exit 103 to Exist 104 (Piney Grove Road)	4,880	4,772	5,163	6,033
Exit 104 to Exit 106 (St. Andrews Road)	5,447	5,148	5,350	6,114
Exit 106 to Exit 107 (I-20)	7,405	6,216	6,245	6,739
I-126 Diverge to I-126 Merge	2,765	2,926	2,305	2,319
Exit 108 to Exit 110 (Sunset Boulevard)	3,630	4,237	3,449	3,729
southeast of Exit 110	3,657	4,262	3,962	4,174

**Table 5.132: I-20 Mainline Volume TransModeler Results – RA10**

I-20 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
west of Exit 61 (Sunset Boulevard)	5,068	1,934	2,966	3,603
Exit 61 to Exit 63 (Bush River Road)	5,568	2,852	3,774	4,502
Exit 63 to Exit 64 (I-26)	5,063	2,987	3,781	4,093
Exit 64 to Exit 65 (Broad River Road)	5,278	4,261	4,200	4,507
Exit 65 to Exit 68 (Monticello Road)	5,724	5,566	4,665	5,743
east of Exit 68	5,413	5,599	4,797	5,501

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**Table 5.133: I-126 Mainline Volume TransModeler Results – RA10**

I-126 Mainline	Volume			
	AM		PM	
	EB	WB	EB	WB
Location				
I-126/I-26 Split	4,676	2,096	2,656	3,044
I-126 from I-26 to Colonial Life Blvd	5,384	2,561	2,944	3,585
I-126 from Colonial Life Blvd to Greystone Blvd	5,913	3,361	3,313	5,464
I-126 from Greystone Blvd to Huger St	5,897	3,566	3,384	5,972

### Basic Freeway Segment, Ramp Merge, and Ramp Diverge Analyses

A summary of the Basic Freeway Segment Analysis was previously shown in **Table 4-13**, **Table 4-14** and **Table 4-15** in Section 4.8.2 for I-26, I-20 and I-126, respectively.

A summary of the Ramp Merge Analysis was previously shown in **Table 4-16**, **Table 4-17** and **Table 4-18** in Section 4.8.2 for I-26, I-20 and I-126, respectively.

A summary of the Ramp Diverge Analysis was previously shown in **Table 4-19**, **Table 4-20** and **Table 4-21** in Section 4.8.2 for I-26, I-20 and I-126, respectively.

### Mainline Travel Time Analysis

A summary of The Mainline Travel Time Analysis results is shown in **Table 5.134**.



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**Table 5.134: Mainline Travel Time TransModeler Results – RA10**

Segments	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
I-26 between Exit 101 and Exit 110										
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.93	04:18	00:56	13.0	59.4	0.91	00:55	00:57	60.2	57.4
Exit 102 to Exit 103 (Harbison Boulevard)	1.29	06:22	01:20	12.1	58.0	0.76	00:45	00:51	60.2	53.4
Exit 103 to Exit 104 (Piney Grove Road)	0.83	03:40	01:11	13.5	42.3	1.23	01:15	01:23	59.3	53.1
Exit 104 to Exit 106 (St. Andrews Road)	2.20	06:42	04:32	19.7	29.0	1.98	02:21	03:00	50.5	39.7
Exit 106 to Exit 107 (I-20)	0.53	01:57	01:41	16.2	18.8	0.72	00:59	03:55	44.3	11.1
Exit 107 to Exit 108 (Bush River Road)	0.60	01:36	02:09	22.3	16.6	0.20	00:16	01:12	44.8	10.2
Exit 108 to I-26	0.42	00:42	01:55	36.5	13.3	0.02	00:02	00:08	39.6	8.7
I-26 to Exit 110 (Sunset Boulevard)	1.56	03:23	07:42	27.6	12.1	2.37	02:43	13:05	52.3	10.9
Total	8.35	28:41	21:26	17.5	23.4	8.20	09:16	24:32	53.1	20.1
I-20 between Exit 61 and Exit 68										
Exit 61 to Exit 63 (Bush River Road)	2.01	05:11	02:02	23.3	59.4	1.98	02:00	03:46	28.0	31.6
Exit 63 to Exit 64 (I-26)	0.73	00:46	00:44	57.7	59.5	0.74	01:11	00:48	47.4	55.8
Exit 64 to Exit 65 (Broad River Road)	0.82	00:55	00:54	53.9	54.2	1.12	01:58	02:19	28.3	29.1
Exit 65 to Exit 68 (Monticello Road)	3.15	03:39	03:09	51.9	60.0	2.93	03:24	05:59	16.4	29.3
Total	6.71	10:30	06:50	38.4	59.0	6.77	08:33	12:51	47.5	31.6
I-126 between I-26 and Greystone Blvd										
Exit 108 to Colonial Life Boulevard	1.22	01:15	01:11	58.4	62.0	1.14	01:11	05:49	47.0	11.8
Colonial Life Boulevard to Greystone Blvd	0.77	00:48	00:58	58.3	47.7	0.98	00:58	04:28	57.9	13.2
Total	1.99	02:03	02:09	58.4	55.6	2.13	02:09	10:17	59.3	12.4

## Arterial Travel Time Analysis

A summary of the Arterial Travel Time Analysis results is shown in **Table 5.135**.

**Table 5.135: Arterial Travel Time TransModeler Results – RA10**

Location	Eastbound					Westbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM		AM	PM	AM	PM
Broad River Road (west of Exit 101 to Greystone Blvd)	7.5	21:39	19:55	20.7	22.5	7.5	20:40	37:29	21.6	11.9
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.8	04:12	05:25	25.7	19.9	1.7	04:57	55:12	20.9	1.9
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	02:52	04:53	23.5	13.8	1.1	02:35	02:59	26.1	22.6
Piney Grove Road (west of Exit 104 to Broad River Road)	1.8	04:40	04:27	22.8	24.0	1.8	06:40	04:39	16.1	23.0
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	04:23	04:41	13.3	12.5	1.0	03:34	05:34	16.4	10.5
Bush River Road (west of Exit 63 to Broad River Road)	2.3	06:51	11:40	20.2	11.9	2.3	10:13	09:27	13.6	14.7
Location	Northbound					Southbound				
	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)		Length (mi)	Travel Time		Average Speed	
		AM	PM	AM	PM		AM	PM	AM	PM
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.5	01:33	01:56	18.5	14.9	0.5	00:46	00:49	37.2	35.0

## Intersection LOS and Delay Analysis

A summary of the Intersection LOS and Delay Analysis results is shown in **Table 5.136**.

Table 5.136: Intersection and LOS TransModeler Results – RA10

Node #	Intersection Name	AM		PM	
		LOS	Delay	LOS	Delay
Exit 101					
100000391	Broad River Road (US 176) at Columbiana Drive / Lordship Lane	C	24.4	B	12.3
100000150	Broad River Road (US 176) at I-26 EB Off-ramp <sup>1</sup>	C	17.7	C	16.3
100000151	Broad River Road (US 176) at I-26 EB On-ramp	A	2.0	A	4.0
100000160	Broad River Road (US 176) at I-26 WB On-ramp <sup>2</sup>	A	1.8	A	1.8
4	Broad River Road (US 176) at Western Lane	A	5.6	A	3.7
Exit 102					
100000395	Lake Murray Boulevard (SC 60) at Columbiana Drive	E	58.5	F	140.1
100000510	Lake Murray Boulevard (SC 60) at I-26 EB On-Ramp <sup>2</sup>	A	3.5	F	54.1
100000169	Lake Murray Boulevard (SC 60) at I-26 WB On-Ramp <sup>2</sup>	A	2.8	F	54.0
100000401	Lake Murray Boulevard (SC 60) at Parkridge Drive / Kinley Road	F	115.5	F	283.1
Exit 103					
100000364	Harbison Boulevard (S-757) at Columbiana Drive	B	14.4	A	9.7
100000365	Harbison Boulevard (S-757) at Park Terrace Drive / Columbiana Circle	A	5.6	C	23.3
100000362	Harbison Boulevard (S-757) at Saturn Parkway	A	1.2	A	2.8
100000173	Harbison Boulevard (S-757) at I-26 EB Ramps	B	10.2	B	10.1
100000165	Harbison Boulevard (S-757) at I-26 WB Ramps / Woodcross Drive	D	37.4	E	56.5
100000398	Harbison Boulevard (S-757) at Parkridge Drive	A	8.7	A	9.9
Exit 104					
100000353	Piney Grove Road at Bower Parkway / Jamil Road	C	34.2	C	31.7
100000175	Piney Grove Road at I-26 EB Ramps	B	15.9	A	4.7
100000177	Piney Grove Road at I-26 WB Ramps	C	27.5	B	10.1
100000399	Piney Grove Road at Fernandina Road	C	31.3	D	36.4
Exit 106					
100000348	St. Andrews Road at Jamil Road	A	5.3	A	8.8
100000178	St. Andrews Road at I-26 EB Ramps / Woodland Hills Road	B	11.0	B	11.9
100000182	St. Andrews Road at I-26 WB Ramps <sup>2</sup>	A	4.1	A	8.9
100000358	St. Andrews Road at Fernandina Road / Burning Tree Drive	B	18.4	C	27.2
100000354	St. Andrews Road at Kay Street / Chartwell Road	D	49.8	F	80.3
Exit 108					
100000256	Bush River Road at Zimalcrest Drive	B	17.7	B	19.8
100000898	Bush River Road at I-26 EB Off-Ramp / Driveway	C	26.5	E	60.1
100000252	Bush River Road at Morninghill Drive	C	30.7	E	63.3
100000184	Bush River Road at Arrowwood Road	B	13.2	D	44.1
Exit 110					
100000186	Sunset Boulevard (US 378) at E. Hospital Drive / Harbor Drive	C	34.8	E	68.8
100000093	Sunset Boulevard (US 378) at I-26 EBR Off-Ramp <sup>1</sup>	F	62.0	F	121.8
100000903	Sunset Boulevard (US 378) at I-26 Ramps	C	27.9	C	29.1
100000902	Sunset Boulevard (US 378) at I-26 WBR Off-Ramp <sup>1</sup>	E	42.0	F	51.1
100000163	Sunset Boulevard (US 378) at Chris Drive / McSwain Drive	A	6.6	C	30.5
Exit 63					
100000455	Bush River Road at Berryhill Drive	A	7.3	C	23.3
100000139	Bush River Road at I-20 WB Ramps	B	10.6	A	7.7
100000142	Bush River Road at I-20 EB Off-Ramp	A	4.6	A	8.8
-	Bush River Road at Rockland Road <sup>1</sup>	-	-	-	-
100000255	Bush River Road at Independence Avenue	D	35.8	B	15.3
Exit 65					
100000187	Broad River Road at Marley Drive / Briargate Circle	D	46.3	C	30.3
100000189	Broad River Road at I-20 WB Ramps	D	47.4	E	65.5
100000190	Broad River Road at I-20 EB Ramps / Garner Lane	B	10.6	C	21.9
100000195	Broad River Road at Longcreek Drive	A	6.0	A	4.8
Additional Intersections					
100000012	Broad River Road (US 176) at Kinley Road	E	65.3	F	110.3
100000037	Broad River Road (US 176) at Harbison Boulevard	B	11.5	E	75.1
100000049	Broad River Road (US 176) at Piney Woods Road / Lost Creek Drive	C	32.9	E	57.1
100000068	Broad River Road (US 176) at Piney Grove Road	A	3.9	A	4.6
100000339	Broad River Road (US 176) at St. Andrews Road	D	45.6	D	55.0
100000349	Broad River Road (US 176) at St. Andrews Parkway	B	10.7	B	16.0
100000344	Broad River Road (US 176) at Seminole Road / Young Drive	E	70.6	D	37.2
41	Broad River Road (US 176) at Dutch Square Boulevard	A	6.4	F	127.2
100000046	Broad River Road (US 176) at Bush River Road	F	86.7	F	162.1
100000266	Broad River Road (US 176) at Greystone Boulevard	B	10.1	B	19.5
100000265	Greystone Boulevard at Stoneridge Drive	C	20.8	B	17.5
100000188	Greystone Boulevard at I-126 WB Ramps <sup>1</sup>	E	38.2	D	25.6
100000185	Greystone Boulevard at I-126 EB Ramps <sup>1</sup>	D	27.7	F	98.5
100000262	Bush River Road at Colonial Life Boulevard	B	13.7	C	20.1
100000897	Colonial Life Boulevard at West Colonial Life Road <sup>1</sup>	A	8.2	C	15.7
100000374	Park Terrance Drive at Bower Parkway	B	10.6	D	48.1
<sup>1</sup> Intersection unsignalized under all scenarios; worst approach LOS and delay reported.					
<sup>2</sup> Delay unable to be processed per HCM 2010 methodology; Average control delay reported.					



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### External to External Speed and Travel Time Analysis

A summary of the External to External Speed and Travel Time Analysis is shown in **Table 5.137**.

**Table 5.137: External to External Speed and Travel Time TransModeler Results – RA10**

Segments	Length (mi)	Travel Time (mm:ss)		Average Speed (mph)	
		AM	PM	AM	PM
I-26 EB from West of Exit 101					
To I-26 EB (east of Exit 110)	13.87	28:25	22:18	29.3	37.3
To I-20 WB (west of Exit 61)	16.10	29:12	19:05	33.1	50.6
To I-20 EB (east of Exit 68)	15.79	29:48	18:42	31.8	50.7
To I-126 EB (Greystone Blvd)	14.77	28:19	17:08	31.3	51.7
I-26 WB from East of Exit 110					
To I-26 WB (west of Exit 101)	13.90	14:25	26:36	57.9	31.4
To I-20 EB (east of Exit 68)	8.48	09:35	18:56	53.1	26.9
I-20 EB from West of Exit 61					
To I-20 EB (east of Exit 68)	11.10	14:57	10:34	44.6	63.1
To I-26 WB (west of Exit 101)	16.69	19:46	20:25	50.6	49.0
To I-126 EB (east of Greystone Blvd)	10.39	15:12	11:39	41.0	53.5
I-20 WB from East of Exit 68					
To I-20 WB (east of Exit 61)	11.11	11:19	17:36	58.9	37.9
To I-26 EB (east of Exit 110)	9.04	13:13	24:43	41.0	22.0
To I-26 WB (west of Exit 101)	15.32	16:53	24:26	54.4	37.6
I-126 WB from East of Greystone Blvd					
To I-26 WB (west of Exit 101)	14.75	14:55	26:53	59.3	32.9
To I-20 WB (west of Exit 61)	10.84	11:18	22:05	57.5	29.5

## 6 Identification of Reasonable Alternatives

The final reasonable alternatives were selected to be moved forward in the selection process. Though traffic operations were a consideration in the evaluation of alternatives, other factors, such as construction costs, business and residential relocations, and environmental impacts were used to identify the reasonable alternatives. RA1 and RA5 were the alternatives which were identified as the reasonable alternatives from the representative alternatives. In addition, RA1A and RA5A were created as reasonable alternatives. The main difference between RA1 and RA1A and between RA5 and RA5A was the interchange type at Exit 63, I-20 at Bush River Road. RA1A included the ParClo design from RA5 and RA5A included the DDI design from RA1.

### 6.1 Create Reasonable Alternative Networks

Revised KMZ files for the reasonable alternatives were used to update the TransModeler simulation networks. In addition, Dynamic Traffic Assignment was run to create the new paths and assign the traffic demand to the

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network. Similar to the representative alternative network development, the network did not converge and therefore manual edits of the paths flows were completed to ensure reasonable path volumes.

### 6.2 Analysis of Reasonable Alternatives

Each of the reasonable alternative TransModeler networks were run for the AM and PM Peak hours for 5 simulations runs which were averaged to develop the outputs for the measures of effectiveness (MOEs). The following MOEs were analyzed for the reasonable alternative analysis:

- Mainline Volumes
- Mainline, Merge, and Diverge Density, v/C, and LOS
- Mainline Travel Times
- Arterial Travel Times
- Total Network Vehicle Mile Traveled, Vehicle Hours Traveled, Completed Trips, Denied Entry Vehicles
- External to External Speeds and Travel Times

Comparisons between the RA's as well as RA10 (No-Build Alternative) were completed for each of the MOEs.

Sections 4.7 and 4.8 of the *Alternatives Development and Screening Report* discusses the evaluation and screening of the Reasonable Alternatives.

#### Mainline Volume Analysis

The Mainline Volume Analysis summary of results are shown in **Table 6.1**, **Table 6.2** and **Table 6.3** for I-26, I-20 and I-126, respectively.

As can be seen in the results below, along the mainline each of the reasonable alternatives carries more volume in the eastbound direction in the morning peak hour and in the westbound direction in the afternoon peak hour. This is reflective of improved operations throughout the study area allowing more vehicles to traverse the interstates without congestion and queuing.

Overall, while RA1, RA1A, RA5, and RA 5A each carry more volume than RA10, RA1 carries more volume than the other alternatives and RA5 carries the least volume of the reasonable alternatives.



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**Table 6.1: I-26 Mainline Volume TransModeler Results – Reasonable Alternatives**

I-26 Mainline	Volume									
	AM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
west of Exit 101 (Broad River Road)	4,387	6,194	6,166	6,162	6,153	2,950	2,990	2,978	2,944	3,032
Exit 101 to Exit 102 (Lake Murray Boulevard)	4,746	7,243	7,544	7,080	7,409	3,560	3,826	3,881	3,838	3,881
Exit 102 to Exit 103 (Harbison Boulevard)	4,552	7,372	7,363	7,163	7,367	4,190	4,083	4,180	4,263	4,175
Exit 103 to Exist 104 (Piney Grove Road)	4,880	7,750	7,877	7,611	7,738	4,772	4,759	4,746	4,813	4,878
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	5,447	8,523	8,567	8,331	8,504	5,148	5,221	5,288	5,279	5,464
Exit 106 to Exit 107	7,405	7,331	7,225	7,298	7,198	6,216	3,335	3,356	3,229	3,439
I-126 Diverge to I-126 Merge	2,765	3,966	4,790	3,923	3,987	2,926	2,227	2,144	2,213	1,580
Exit 108 to Exit 110 (Sunset Boulevard)	3,630	4,629	4,593	4,552	4,718	4,237	4,513	4,502	4,473	4,407
southeast of Exit 110	3,657	3,921	3,950	4,008	3,981	4,262	4,235	4,255	4,249	4,273
I-26 Mainline	Volume									
	PM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
west of Exit 101 (Broad River Road)	3,628	3,583	3,524	3,592	3,546	4,399	5,705	5,677	5,595	5,682
Exit 101 to Exit 102 (Lake Murray Boulevard)	4,355	4,361	4,401	4,347	4,298	5,180	6,947	7,000	6,876	7,103
Exit 102 to Exit 103 (Harbison Boulevard)	4,766	4,866	4,881	4,739	4,704	5,853	7,543	7,591	7,295	7,627
Exit 103 to Exist 104 (Piney Grove Road)	5,163	5,686	5,667	5,565	5,607	6,033	7,981	7,976	7,469	8,006
Exit 104 to Exit 106 (St. Andrews Road/CD Road)	5,350	6,113	6,192	5,966	6,113	6,114	8,371	8,407	8,173	8,470
Exit 106 to Exit 107	6,245	4,566	4,565	4,635	4,493	6,739	5,786	5,754	5,323	5,748
I-126 Diverge to I-126 Merge	2,305	3,579	2,333	3,712	3,321	2,319	2,586	2,580	2,550	1,999
Exit 108 to Exit 110 (Sunset Boulevard)	3,449	4,747	4,825	4,825	4,597	3,729	5,346	5,166	5,564	5,549
southeast of Exit 110	3,962	4,466	4,436	4,399	4,494	4,174	4,773	4,804	4,802	4,785

## Alternatives Traffic Analysis Technical Memo

**Table 6.2: I-20 Mainline Volume TransModeler Results – Reasonable Alternatives**

I-20 Mainline	Volume									
	AM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
west of Exit 61 (Sunset Boulevard)	5,068	5,587	5,426	5,545	5,570	1,934	2,104	2,110	2,059	2,105
Exit 61 to Exit 63 (Bush River Road/CD Road)	5,568	6,397	6,060	6,679	6,627	2,852	3,123	3,170	3,577	3,027
Exit 63 to Exit 64 (I-26)	5,063	-	-	-	-	2,987	-	-	-	-
Exit 63 to Exit 65 (Broad River Road)	5,278	2,732	2,698	2,791	2,779	4,261	1,902	1,412	2,008	2,005
Exit 65 to Exit 68 (Monticello Road)	5,724	6,204	6,230	6,113	5,981	5,566	5,546	5,587	5,631	5,617
east of Exit 68	5,413	5,742	5,774	5,783	5,668	5,599	5,562	5,591	5,616	5,598
I-20 Mainline	Volume									
	PM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
west of Exit 61 (Sunset Boulevard)	2,966	2,979	2,955	2,954	2,981	3,603	3,995	4,080	4,132	4,289
Exit 61 to Exit 63 (Bush River Road/CD Road)	3,774	3,964	3,886	4,339	3,761	4,502	5,592	5,498	5,870	5,822
Exit 63 to Exit 64 (I-26)	3,781	-	-	-	-	4,093	-	-	-	-
Exit 63 to Exit 65 (Broad River Road)	4,200	1,487	1,469	1,504	1,521	4,507	2,471	2,370	2,488	2,409
Exit 65 to Exit 68 (Monticello Road)	4,665	5,385	5,404	5,314	5,392	5,743	6,194	6,216	6,093	6,074
east of Exit 68	4,797	5,383	5,387	5,283	5,375	5,501	5,867	5,865	5,826	5,823



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**Table 6.3: I-126 Mainline Volume TransModeler Results – Reasonable Alternatives**

I-126 Mainline	Volume									
	AM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
I-126 to I-26 WB	4,676	-	-	-	-	2,096	2,774	2,129	2,025	2,096
I-26 to Colonial Life Blvd	5,384	6,918	6,733	6,768	6,605	2,561	2,057	2,962	2,659	2,814
I-126 from Colonial Life Blvd to Greystone Blvd	5,913	7,588	7,589	7,333	7,257	3,361	3,488	3,659	3,370	3,480
I-126 from Greystone Blvd to Huger St	5,897	6,940	6,875	6,898	6,908	3,566	3,542	3,583	3,473	3,538
I-126 Mainline	Volume									
	PM									
	EB					WB				
Location	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
I-126 to I-26 WB	2,656	-	-	-	-	3,044	4,452	4,325	3,831	4,325
I-26 to Colonial Life Blvd	2,944	3,458	3,432	3,479	3,213	3,585	6,160	6,187	5,414	6,144
I-126 from Colonial Life Blvd to Greystone Blvd	3,313	4,092	4,059	3,963	3,784	5,464	7,391	7,524	6,345	7,117
I-126 from Greystone Blvd to Huger St	3,384	3,707	3,721	3,727	3,686	5,972	6,920	6,978	7,037	7,018

## Alternatives Traffic Analysis Technical Memo

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### Basic Freeway Segment Analysis

The Basic Freeway Segment Analysis summary of results is shown in **Table 6.4**, **Table 6.5** and **Table 6.6** for I-26, I-20 and I-126, respectively.

As can be seen in the tables below, overall, all of the reasonable alternatives show improvement over the no-build alternative. However, one location that showed a consistent degradation is I-126 eastbound in the morning peak hour. This is due to the increased volume moving through the network backing up at Huger Street outside of the project improvement limits. RA1A shows the best improvement in overall LOS throughout the study area with RA5A showing the least improvement over the no-build alternative.



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Table 6.4: I-26 Basic Freeway Segment TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>															
Exit 101 to Exit 102	F	126.8	0.49	D	31.4	0.60	D	35.0	0.63	D	28.9	0.59	D	31.9	0.62
Exit 102 to Exit 103	F	118.2	0.63	E	35.4	0.77	D	34.8	0.77	E	35.6	0.75	E	35.8	0.77
Exit 103 to Exit 104	F	123.0	0.65	D	32.5	0.65	D	33.1	0.66	F	46.9	0.63	D	32.7	0.64
Exit 104 to Exit 106	F	80.2	0.81	E	37.4	0.71	D	34.3	0.71	F	61.9	0.69	F	48.1	0.71
Exit 106 to Exit 107	F	104.1	0.66	E	38.2	0.54	D	34.6	0.54	D	32.9	0.54	D	33.1	0.53
I-126 Diverge to I-126 Merge	E	37.2	0.71	E	36.3	0.72	E	35.3	0.71	C	25.6	0.58	D	28.2	0.59
Exit 108 to Exit 110	F	82.5	0.50	C	23.1	0.48	C	21.7	0.48	C	23.3	0.47	C	24.8	0.49
<b>I-26 Westbound</b>															
Exit 110 to Exit 108	D	29.8	0.59	B	16.8	0.38	B	16.6	0.38	C	20.1	0.47	C	21.5	0.46
I-126 Diverge to I-126 Merge	E	41.4	0.73	B	14.1	0.31	B	13.8	0.30	B	14.0	0.39	B	14.1	0.28
Exit 107 to Exit 106	D	33.2	0.55	B	13.5	0.30	B	13.4	0.30	C	19.6	0.36	C	20.1	0.38
Exit 106 to Exit 104	E	40.5	0.76	C	24.9	0.46	C	25.6	0.47	C	21.2	0.44	C	21.1	0.46
Exit 104 to Exit 103	D	31.7	0.66	C	18.0	0.40	C	22.0	0.40	D	27.8	0.40	C	24.0	0.41
Exit 103 to Exit 102	D	26.7	0.58	C	18.9	0.43	C	18.1	0.44	C	20.7	0.44	C	20.4	0.43
Exit 102 to Exit 101	B	17.6	0.37	B	15.8	0.32	B	15.3	0.32	B	14.2	0.32	B	15.6	0.32
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-26 Eastbound</b>															
Exit 101 to Exit 102	C	22.8	0.45	C	18.1	0.36	B	17.4	0.37	B	17.4	0.36	B	17.2	0.36
Exit 102 to Exit 103	D	30.1	0.66	C	22.6	0.51	C	23.0	0.51	C	22.6	0.49	C	22.6	0.49
Exit 103 to Exit 104	D	29.4	0.66	C	22.5	0.47	C	22.5	0.47	C	22.7	0.46	C	21.8	0.47
Exit 104 to Exit 106	F	74.7	0.79	C	24.1	0.51	C	19.9	0.52	C	25.9	0.50	C	24.1	0.51
Exit 106 to Exit 107	F	84.9	0.56	C	19.0	0.34	B	12.6	0.34	B	13.0	0.34	B	11.5	0.33
I-126 Diverge to I-126 Merge	F	130.1	0.60	B	16.4	0.35	B	16.3	0.35	C	24.7	0.55	C	24.0	0.49
Exit 108 to Exit 110	F	130.8	0.48	C	20.8	0.49	C	22.0	0.50	C	23.6	0.50	C	22.8	0.48
<b>I-26 Westbound</b>															
Exit 110 to Exit 108	F	76.5	0.58	C	19.5	0.45	C	19.1	0.43	D	29.6	0.58	D	30.8	0.58
I-126 Diverge to I-126 Merge	F	157.3	0.58	B	15.1	0.36	B	15.5	0.36	B	16.5	0.45	B	16.6	0.35
Exit 107 to Exit 106	F	123.2	0.60	C	22.0	0.49	C	22.0	0.48	D	32.9	0.59	D	32.2	0.64
Exit 106 to Exit 104	F	47.4	0.91	E	41.6	0.74	E	41.5	0.75	E	35.2	0.68	D	33.3	0.71
Exit 104 to Exit 103	E	39.5	0.84	D	31.8	0.67	E	35.0	0.66	E	40.5	0.62	E	37.6	0.67
Exit 103 to Exit 102	E	38.5	0.81	E	42.8	0.79	E	41.4	0.79	E	39.0	0.76	F	49.6	0.79
Exit 102 to Exit 101	C	23.6	0.54	D	26.2	0.58	D	26.9	0.58	D	26.7	0.57	D	26.9	0.59

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Table 6.5: I-20 Basic Freeway Segment TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>															
west of Exit 61	F	52.4	0.70	E	39.8	0.70	E	37.9	0.75	E	35.8	0.77	E	35.9	0.77
Exit 61 to Exit 63	F	69.9	0.77	D	29.1	0.61	F	58.1	0.63	E	38.4	0.56	D	33.8	0.55
Exit 63 to Exit 64	C	19.7	0.53	B	15.8	0.35	B	13.4	0.28	B	16.0	0.39	B	16.1	0.39
Exit 64 to Exit 65	D	26.7	0.73												
Exit 65 to Exit 68	E	39.9	0.80	E	42.8	0.79	F	54.3	0.85	F	57.1	0.85	F	61.6	0.83
<b>I-20 Westbound</b>															
Exit 68 to Exit 65	E	41.5	0.77	E	38.7	0.77	D	31.0	0.78	E	38.1	0.78	E	37.6	0.78
Exit 65 to Exit 64	F	70.7	0.59	A	8.1	0.16	A	2.6	0.12	E	35.1	0.78	E	36.9	0.78
Exit 64 to Exit 63	E	43.0	0.31												
Exit 63 to Exit 61	B	17.0	0.40	B	14.3	0.33	B	14.5	0.33	A	8.9	0.21	A	9.8	0.21
west of Exit 61	B	12.1	0.27	B	12.8	0.29	B	13.3	0.29	B	14.2	0.37	B	14.1	0.32
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
<b>I-20 Eastbound</b>															
west of Exit 61	B	17.7	0.41	C	18.5	0.41	B	17.5	0.41	B	17.8	0.41	B	17.7	0.41
Exit 61 to Exit 63	C	22.6	0.52	C	18.2	0.41	C	21.9	0.40	B	17.8	0.36	C	18.1	0.31
Exit 63 to Exit 64	B	15.6	0.39	A	8.9	0.21	A	7.4	0.15	A	9.7	0.21	A	9.3	0.21
Exit 64 to Exit 65	C	22.7	0.58												
Exit 65 to Exit 68	D	29.2	0.65	E	35.0	0.75	D	34.2	0.75	D	32.7	0.74	D	32.8	0.75
<b>I-20 Westbound</b>															
Exit 68 to Exit 65	F	69.9	0.80	F	54.1	0.86	E	39.4	0.86	F	66.0	0.81	F	65.2	0.81
Exit 65 to Exit 64	F	90.5	0.63	A	10.6	0.21	A	6.4	0.20	F	49.6	0.85	F	48.7	0.84
Exit 64 to Exit 63	C	19.5	0.43												
Exit 63 to Exit 61	E	40.9	0.63	E	36.3	0.58	C	25.3	0.57	A	10.4	0.26	A	10.4	0.25
west of Exit 61	C	21.3	0.50	C	24.0	0.55	C	24.1	0.57	D	28.9	0.61	E	38.0	0.61



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Table 6.6: I-126 Basic Freeway Segment TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
I-26 to Colonial Life Blvd	D	30.0	0.75	E	36.9	0.77	D	34.5	0.75	D	32.8	0.75	D	33.8	0.73
Colonial Life Blvd to Greystone Blvd	B	16.4	0.62	E	44.0	0.79	E	39.0	0.79	E	43.7	0.76	F	48.8	0.76
Greystone Blvd to Huger St	D	27.8	0.61	F	51.5	0.72	F	50.4	0.72	F	47.9	0.72	F	48.7	0.72
I-126 Westbound															
Huger St to Greystone Blvd	B	15.2	0.37	B	16.3	0.37	B	16.3	0.37	B	15.5	0.36	B	15.5	0.37
Greystone Blvd to Colonial Life Blvd	B	15.5	0.35	B	16.9	0.36	C	18.9	0.38	B	15.8	0.35	B	16.7	0.36
Colonial Life Blvd to I-26	C	22.8	0.47	A	11.0	0.29	B	12.6	0.30	A	9.2	0.28	A	9.7	0.29
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
I-26 to Colonial Life Blvd	B	16.2	0.41	B	17.2	0.38	B	12.9	0.38	B	15.4	0.39	B	14.6	0.36
Colonial Life Blvd to Greystone Blvd	A	10.5	0.35	C	19.4	0.43	C	24.2	0.42	B	17.1	0.41	C	19.2	0.39
Greystone Blvd to Huger St	B	14.4	0.35	B	15.8	0.39	B	15.9	0.39	B	15.8	0.39	B	15.8	0.38
I-126 Westbound															
Huger St to Greystone Blvd	F	73.1	0.62	D	30.3	0.72	D	31.1	0.73	D	31.0	0.73	D	30.8	0.73
Greystone Blvd to Colonial Life Blvd	F	106.5	0.57	E	44.3	0.77	F	54.2	0.78	F	61.1	0.66	F	66.8	0.74
Colonial Life Blvd to I-26	F	125.1	0.68	D	30.1	0.62	D	27.7	0.60	D	33.2	0.56	D	31.8	0.64

## Alternatives Traffic Analysis Technical Memo

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### Ramp Merge Analysis

The Ramp Merge Analysis summary of results is shown in **Table 6.7**, **Table 6.8** and **Table 6.9** for I-26, I-20 and I-126, respectively.

As can be seen in the results below, each of the reasonable alternatives show significant improvement over the operations of the no-build alternative. Two areas of note where there is a significant decrease in operations are at the eastbound Exit 65 merge on I-20 and the eastbound I-126 merge areas. The I-20 degradation is due to increased volume where the road narrows to 3 lanes at the river crossing between Exit 65 and Exit 68. The increased volume causes extensive queuing not seen in the no-build alternative which impacts the operations at Exit 65. Along I-126, the degradation in operations is due to increased queuing from Huger Street due to more volume getting to the outer limits of the study area.



Table 6.7: I-26 Ramp Merge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-26 Eastbound															
Exit 101	F	126.8	0.49	D	31.4	0.60	D	35.0	0.63	D	28.9	0.59	D	31.9	0.62
Exit 102	F	123.0	0.49	E	38.4	0.61	D	31.6	0.61	D	32.9	0.60	D	32.9	0.62
Exit 103	F	109.3	0.69	D	31.7	0.65	D	33.1	0.66	F	46.9	0.63	D	32.7	0.64
Exit 104	F	87.0	0.59	D	29.9	0.59	D	34.3	0.60	F	52.2	0.59	E	38.4	0.60
Exit CD Road				E	38.2	0.54	D	34.6	0.54	D	32.9	0.54			
Exit 106 Loop	F	58.2	0.70										D33.10.53		
Exit 106	F	104.1	0.66												
Exit 107 Loop	F	58.2	0.70												
Exit 107 (from I-20)				B	12.5	0.28	B	12.6	0.27	C	25.0	0.44	C	27.7	0.44
Exit 107	F	92.1	0.69												
Exit 108	E	40.3	0.47												
Exit 108 (I-126)	F	46.4	0.52	B	18.6	0.39	C	21.7	0.38	C	23.3	0.47	C	24.8	0.49
Exit 110	B	16.3	0.38	B	19.6	0.41	C	20.5	0.41	B	19.5	0.42	B	19.8	0.42
I-26 Westbound															
Exit 110	B	15.6	0.35	B	17.4	0.38	B	16.7	0.38	B	18.9	0.37	C	20.5	0.37
Exit 108 (I-126)	F	47.7	0.56	B	15.9	0.30	B	13.2	0.30	B	17.2	0.38	B	17.5	0.31
Exit 108	D	29.5	0.51												
Exit 107 Loop	D	32.2	0.50												
Exit 107	D	33.2	0.55												
Exit 107 (from I-20)				C	20.3	0.38	C	23.2	0.38	C	25.2	0.38	C	24.7	0.39
Exit 106	D	28.7	0.57	C	24.7	0.46	C	27.5	0.47	C	25.8	0.37	C	24.2	0.38
Exit 104	C	22.8	0.50	B	18.5	0.40	B	16.2	0.40	B	19.7	0.40	B	16.2	0.41
Exit 103	C	24.8	0.44	B	15.7	0.34	B	18.1	0.35	B	18.4	0.36	B	17.9	0.35
Exit 102	B	17.6	0.37	B	15.8	0.32	B	15.3	0.32	B	14.2	0.32	B	15.6	0.32
Exit 101	A	7.2	0.31	B	12.3	0.25	A	9.0	0.25	A	8.8	0.25	A	9.0	0.25
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-26 Eastbound															
Exit 101	C	22.8	0.45	B	18.1	0.36	B	17.4	0.37	B	17.4	0.36	B	17.2	0.36
Exit 102	D	29.4	0.50	C	22.3	0.41	C	21.6	0.41	C	21.0	0.40	C	20.5	0.39
Exit 103	F	48.1	0.73	C	22.1	0.47	C	22.5	0.47	C	22.7	0.47	C	21.8	0.47
Exit 104	F	66.6	0.60	B	19.6	0.42	B	19.9	0.43	C	24.6	0.42	C	22.7	0.42
Exit CD Road				B	19.0	0.34	B	12.6	0.34	B	13.0	0.34			
Exit 106 Loop	F	81.4	0.54										B11.50.33		
Exit 106	F	84.9	0.56												
Exit 107 Loop	F	81.4	0.54												
Exit 107 (from I-20)				B	11.3	0.25	B	12.6	0.25	C	24.3	0.41	C	23.6	0.37
Exit 107	F	87.4	0.49												
Exit 108	F	132.8	0.42												
Exit 108 (I-126)	F	150.5	0.49	B	19.8	0.40	C	22.0	0.40	C	23.6	0.50	C	22.8	0.48
Exit 110	B	17.7	0.41	C	22.7	0.46	C	22.6	0.46	C	22.8	0.46	C	23.0	0.47
I-26 Westbound															
Exit 110	F	67.8	0.33	C	20.6	0.45	B	18.8	0.43	D	29.5	0.46	D	31.5	0.46
Exit 108 (I-126)	F	185.1	0.60	C	27.2	0.49	C	21.3	0.48	C	23.9	0.57	C	22.7	0.51
Exit 108	F	135.9	0.57												
Exit 107 Loop	F	124.7	0.57												
Exit 107	F	123.2	0.60												
Exit 107 (from I-20)				D	33.5	0.60	E	36.6	0.61	D	34.7	0.57	D	34.5	0.60
Exit 106	D	34.8	0.68	E	39.8	0.74	E	40.3	0.75	D	34.9	0.57	D	33.1	0.59
Exit 104	D	31.3	0.63	D	29.6	0.67	C	24.6	0.66	C	25.2	0.62	C	24.8	0.67
Exit 103	E	36.4	0.61	D	34.3	0.63	E	41.4	0.63	E	37.0	0.61	F	51.0	0.64
Exit 102	C	23.6	0.54	C	26.2	0.58	C	26.9	0.58	C	26.7	0.57	C	26.9	0.59
Exit 101	A	9.0	0.46	C	22.1	0.48	B	15.9	0.47	B	15.7	0.47	B	16.0	0.47

Table 6.8: I-20 Ramp Merge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour																			
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions							
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C					
I-20 Eastbound																				
Exit 61 Loop	F	103.6	0.53	D	30.2	0.61	C	21.9	0.57	C	24.0	0.62	C	24.1	0.62					
Exit 61	F	71.2	0.59	C	25.3	0.53	F	58.1	0.51	E	40.5	0.56	D	33.2	0.56					
Exit 63 Loop	C	20.7	0.52																	
Exit 63	B	19.5	0.42																	
Exit 64 Loop	D	33.2	0.54																	
Exit 64	C	25.8	0.55																	
Exit 65	E	37.1	0.60	F	112.8	0.52	F	84.7	0.53	F	106.8	0.53	F	119.7	0.53					
Exit 65 (from CD)				F	79.4	0.47	F	76.3	0.47	F	75.9	0.39	F	81.5	0.39					
Exit 68	D	28.2	0.56	D	33.4	0.60	D	32.4	0.60	D	32.7	0.60	D	31.3	0.59					
I-20 Westbound																				
Exit 68	C	27.6	0.78	D	31.3	0.58	D	31.0	0.58	D	29.8	0.59	D	30.4	0.59					
Exit 65	F	70.7	0.44							A	6.8	0.17	A	7.3	0.17					
Exit 65 (from CD)										A	8.1	0.16	A	2.6	0.12					
Exit 64 Loop	C	24.8	0.37																	
Exit 64	E	43.0	0.31																	
Exit 64 (from CD)				B	12.2	0.22	B	12.4	0.23	A	8.9	0.20	A	8.5	0.19					
Exit 63 (from CD)										B	11.2	0.26	A	10.0	0.22					
Exit 63	B	13.2	0.30	B	12.5	0.26	B	12.3	0.29	B	16.5	0.30	B	15.1	0.25					
Exit 61 Loop				A	9.9	0.20	B	10.0	0.20	B	10.4	0.20	A	9.8	0.20					
Exit 61	B	10.1	0.20	B	11.5	0.22	B	12.3	0.22	B	11.8	0.22	B	12.1	0.22					
Segment	PM Peak Hour																			
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions							
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C					
I-20 Eastbound																				
Exit 61 Loop	B	16.9	0.35	B	17.5	0.37	B	15.7	0.37	B	13.5	0.39	B	11.8	0.35					
Exit 61	B	19.5	0.39	B	16.8	0.33	C	21.9	0.32	B	16.7	0.36	B	16.9	0.31					
Exit 63 Loop	B	17.0	0.37																	
Exit 63	B	15.4	0.31																	
Exit 64 Loop	D	29.9	0.44																	
Exit 64	C	22.3	0.44																	
Exit 65	C	25.5	0.49	C	23.9	0.45	D	31.9	0.45	C	27.9	0.44	D	29.1	0.45					
Exit 65 (from CD)				C	21.4	0.36	B	19.3	0.36	C	20.5	0.28	B	19.7	0.31					
Exit 68	C	26.2	0.50	D	31.4	0.56	D	30.7	0.56	D	31.2	0.55	D	30.9	0.56					
I-20 Westbound																				
Exit 68	F	58.1	0.82	F	72.5	0.65	E	39.4	0.65	E	42.7	0.65	E	41.8	0.64					
Exit 65	F	90.5	0.47							A	6.5	0.21	A	6.8	0.20					
Exit 65 (from CD)										B	10.6	0.21	A	6.4	0.20					
Exit 64 Loop	C	27.5	0.42																	
Exit 64	B	19.5	0.43																	
Exit 64 (from CD)				C	21.5	0.37	C	20.6	0.36	B	11.6	0.27	B	11.8	0.26					
Exit 63 (from CD)										C	22.6	0.42	C	22.4	0.39					
Exit 63	C	22.8	0.47	C	24.2	0.48	C	20.4	0.45	D	31.9	0.50	E	37.9	0.49					
Exit 61 Loop				B	17.6	0.39	B	15.6	0.40	B	17.4	0.41	B	17.0	0.42					
Exit 61	B	16.7	0.38	B	19.6	0.42	B	19.7	0.42	C	21.8	0.43	C	21.4	0.45					

Table 6.9: I-126 Ramp Merge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
Colonial Life Blvd	B	16.4	0.62	F	49.5	0.64	D	34.9	0.64	E	37.5	0.62	E	42.8	0.61
Greystone Blvd	C	20.2	0.61	F	50.2	0.73	E	43.8	0.73	F	59.8	0.73	F	63.6	0.73
I-126 Westbound															
Colonial Life Blvd				B	11.5	0.29	A	9.3	0.31	B	14.5	0.28	B	15.3	0.29
Greystone Blvd	B	13.4	0.28	B	16.9	0.36	B	18.9	0.38	A	9.2	0.28	A	9.7	0.29
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
Colonial Life Blvd	B	10.5	0.35	B	13.9	0.34	C	27.4	0.34	C	20.2	0.33	C	21.6	0.32
Greystone Blvd	B	10.3	0.35	B	16.1	0.39	B	13.2	0.39	B	13.5	0.39	B	13.0	0.38
I-126 Westbound															
Colonial Life Blvd				D	30.7	0.64	B	19.8	0.64	F	53.0	0.54	F	60.1	0.60
Greystone Blvd	F	73.2	0.47	E	44.3	0.77	F	54.2	0.78	D	33.2	0.56	D	31.8	0.64



## Alternatives Traffic Analysis Technical Memo

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### Ramp Diverge Analysis

The Ramp Diverge Analysis summary of results is shown in **Table 6.10**, **Table 6.11** and **Table 6.12** for I-26, I-20 and I-126, respectively.

As can be seen in the tables below, overall, all of the reasonable alternatives show improvement over the no-build alternative. However, one location that showed a consistent degradation is I-126 eastbound in the morning peak hour. This is due to the increased volume moving through the network backing up at Huger Street outside of the project improvement limits.

Table 6.10: I-26 Ramp Diverge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-26 Eastbound															
Exit 101	F	94.5	0.45	D	30.8	0.58	D	28.9	0.64	C	25.7	0.64	C	24.6	0.64
Exit 101 Loop	F	109.7	0.42	C	24.1	0.45	C	21.8	0.50	C	22.1	0.50	C	21.0	0.50
Exit 102	F	126.8	0.49	D	32.0	0.55	D	35.0	0.63	D	28.9	0.59	D	31.9	0.62
Exit 102 Loop	F	111.1	0.45	C	27.2	0.51	C	27.3	0.57	C	25.6	0.55	C	27.3	0.57
Exit 103	F	118.2	0.63	E	35.6	0.69	D	31.6	0.77	D	33.1	0.74	D	33.0	0.77
Exit 104	F	107.0	0.68	D	32.1	0.58	D	33.1	0.66	F	46.9	0.63	D	32.7	0.64
Exit 106 (CD Road to I-20)				F	53.0	0.71	F	46.1	0.70	F	55.4	0.69	E	40.6	0.71
Exit 106	F	68.7	0.60	F	74.3	0.70	F	56.9	0.73	D	31.5	0.61	E	36.6	0.60
Exit 107	F	104.1	0.66												
Exit 107 Loop	F	58.2	0.70												
Exit 107 (CD Road to I-126)															
Exit 108	F	92.1	0.69												
I-26 to I-26	F	55.9	0.83												
Exit 110	F	101.3	0.35	C	23.4	0.43	C	22.5	0.48	C	23.3	0.47	C	24.8	0.49
I-26 Westbound															
Exit 110	F	52.1	0.44	E	44.0	0.44	D	34.7	0.44	F	56.1	0.44	E	44.7	0.44
Exit 108	D	29.5	0.51												
Exit 107/I-126															
Exit 107	D	29.5	0.51												
Exit 107 Loop	D	32.2	0.50												
Exit 106	D	33.2	0.55												
Exit 106/CD Road										B	17.2	0.38	B	17.5	0.31
Exit 106 Loop	D	30.0	0.60												
Exit 104	D	34.4	0.71												
Exit 103	C	22.0	0.50												
Exit 102	C	25.3	0.58										C	20.1	0.43
Exit 102 Loop	B	19.0	0.40	B	17.5	0.33	B	16.9	0.33	B	16.4	0.33	B	17.7	0.33
Exit 101	B	17.6	0.37	B	15.8	0.32	B	15.3	0.32	B	14.2	0.32	B	15.6	0.32
Exit 101 Loop	B	14.9	0.34	B	16.7	0.29	B	12.8	0.29	B	11.8	0.28	B	13.4	0.29
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-26 Eastbound															
Exit 101	B	15.2	0.38	B	18.9	0.37	B	15.8	0.37	B	14.4	0.37	B	14.7	0.37
Exit 101 Loop	B	19.1	0.37	B	14.5	0.29	B	12.0	0.28	B	12.6	0.29	B	11.9	0.28
Exit 102	C	22.8	0.45	B	18.1	0.36	B	17.4	0.37	B	17.4	0.36	B	17.2	0.36
Exit 102 Loop	C	22.2	0.43	B	16.5	0.35	B	16.9	0.35	B	16.8	0.34	B	16.1	0.34
Exit 103	D	30.1	0.66	C	23.5	0.51	C	22.1	0.51	C	21.2	0.49	C	20.7	0.49
Exit 104	F	50.8	0.72	C	23.0	0.47	C	22.5	0.47	C	22.7	0.46	C	21.8	0.47
Exit 106 (CD Road to I-20)										C	26.9	0.50	C	24.6	0.51
Exit 106	F	63.4	0.59	D	28.1	0.51	D	34.0	0.52	B	19.7	0.41	B	18.9	0.40
Exit 107	F	84.9	0.56	E	35.7	0.51	C	22.7	0.51						
Exit 107 Loop	F	81.4	0.54												
Exit 107 (CD Road to I-126)															
Exit 108	F	87.4	0.49												
I-26 to I-26	F	135.5	0.54												
Exit 110	F	146.0	0.30	C	22.9	0.49	C	22.6	0.50	C	23.6	0.50	C	22.8	0.48
I-26 Westbound															
Exit 110	F	81.3	0.43	D	28.3	0.50	D	32.8	0.50	D	31.2	0.50	D	31.5	0.50
Exit 108	F	135.9	0.57												
Exit 107/I-126															
Exit 107	F	135.9	0.57												
Exit 107 Loop	F	124.7	0.57												
Exit 106	F	123.2	0.60												
Exit 106/CD Road										C	23.9	0.57	C	22.7	0.51
Exit 106 Loop	F	94.5	0.71												
Exit 104	E	40.1	0.85												
Exit 103	D	28.9	0.63												
Exit 102	E	37.3	0.81										E	40.8	0.78
Exit 102 Loop	C	26.9	0.57	D	30.8	0.61	D	30.5	0.61	D	29.7	0.58	D	31.1	0.61
Exit 101	C	23.6	0.54	C	26.2	0.58	C	26.9	0.58	C	26.7	0.57	C	26.9	0.59
Exit 101 Loop	C	20.2	0.50	D	28.2	0.53	C	22.0	0.53	C	22.0	0.52	C	21.7	0.53



Table 6.11: I-20 Ramp Diverge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-20 Eastbound															
Exit 61	F	65.4	0.53	E	35.7	0.58	F	48.0	0.56	E	36.3	0.58	E	36.7	0.58
Exit 63/64/65				C	24.3	0.53	F	51.6	0.49						
Exit 63/64										E	40.9	0.55	C	26.4	0.55
Exit 63	F	67.7	0.77												
Exit 64	B	19.7	0.53												
Exit 64 Loop	D	33.2	0.54												
Exit 65	C	26.7	0.55												
Exit 68	F	46.8	0.79	E	44.1	0.84	F	45.7	0.84	E	44.2	0.85	F	51.5	0.83
I-20 Westbound															
Exit 68	E	37.7	0.78	E	40.1	0.77	E	38.8	0.78	E	38.1	0.78	E	37.6	0.78
Exit 65	C	24.5	0.58	C	22.1	0.38	E	35.9	0.38	D	31.9	0.39	D	32.3	0.39
Exit 65 (CD Road to I-26)				B	18.5	0.34	E	36.6	0.33						
Exit 64 (CD Road to I-26)										C	26.5	0.35	C	25.3	0.35
Exit 64	F	71.4	0.59												
Exit 64 Loop	C	24.8	0.37												
Exit 63 (CD Road)										A	7.5	0.21	A	7.8	0.21
Exit 63	E	43.0	0.31	A	9.5	0.16	A	2.8	0.12						
Exit 61	C	22.1	0.40	F	46.1	0.32	C	24.1	0.33	C	25.9	0.37	E	41.3	0.31
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-20 Eastbound															
Exit 61	B	17.1	0.31	B	18.1	0.31	B	17.4	0.31	B	16.3	0.31	B	16.4	0.31
Exit 63/64/65				B	15.1	0.33	C	20.3	0.32						
Exit 63/64										B	15.4	0.36	B	15.0	0.31
Exit 63	C	26.8	0.52												
Exit 64	B	15.6	0.39												
Exit 64 Loop	D	29.9	0.44												
Exit 65	C	22.7	0.44												
Exit 68	C	27.9	0.65	E	37.2	0.74	E	35.6	0.75	D	34.7	0.74	D	35.0	0.75
I-20 Westbound															
Exit 68	F	75.1	0.76	F	69.1	0.81	F	65.5	0.81	F	66.0	0.81	F	65.2	0.81
Exit 65	C	25.6	0.60	C	24.6	0.43	E	43.8	0.43	E	41.4	0.42	E	41.3	0.42
Exit 65 (CD Road to I-26)				C	21.5	0.41	D	34.6	0.41						
Exit 64 (CD Road to I-26)										C	24.7	0.40	C	26.1	0.39
Exit 64	F	91.4	0.61												
Exit 64 Loop	C	27.5	0.42												
Exit 63 (CD Road)										A	6.6	0.26	A	7.4	0.25
Exit 63	B	19.5	0.43	B	11.1	0.21	A	6.4	0.20						
Exit 61	F	92.4	0.60	F	110.6	0.54	F	62.3	0.55	F	98.8	0.56	F	102.3	0.55

Table 6.12: I-126 Ramp Diverge TransModeler Results – Reasonable Alternatives

Segment	AM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
Colonial Life Boulevard				E	36.9	0.77	D	34.5	0.75	D	32.8	0.75	D	33.8	0.73
Greystone Blvd	B	15.9	0.49	F	47.5	0.63	E	35.4	0.63	E	38.9	0.61	E	44.2	0.60
I-126 Westbound															
Greystone Boulevard	B	19.3	0.37	B	16.3	0.37	C	20.2	0.37	C	22.6	0.36	B	18.0	0.37
Colonial Life Boulevard	B	13.4	0.35	B	17.3	0.29	B	17.9	0.31	B	14.9	0.28	B	15.7	0.29
Colonial Life Boulevard to I-26 EB				B	15.1	0.32	B	14.8	0.34	B	14.1	0.30	B	14.8	0.32
Exit 107 (I-20)				B	14.0	0.29	B	13.1	0.31	A	9.2	0.28	A	9.7	0.29
Segment	PM Peak Hour														
	RA10 (No Build) Conditions			RA1 Conditions			RA1A Conditions			RA5 Conditions			RA5A Conditions		
	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C	LOS <sup>1</sup>	Density <sup>2</sup>	v/C
I-126 Eastbound															
Colonial Life Boulevard				B	17.2	0.38	B	12.9	0.38	B	15.4	0.39	B	14.6	0.36
Greystone Blvd	D	32.7	0.27	C	24.2	0.34	D	29.6	0.33	C	20.8	0.33	C	23.0	0.31
I-126 Westbound															
Greystone Boulevard	F	85.3	0.60	D	32.2	0.72	D	30.9	0.73	D	32.5	0.73	D	32.3	0.73
Colonial Life Boulevard	F	72.1	0.57	F	48.6	0.61	F	53.2	0.62	F	54.3	0.52	F	61.5	0.59
Colonial Life Boulevard to I-26 EB				E	44.4	0.69	E	40.2	0.69	E	35.8	0.59	E	39.2	0.68
Exit 107 (I-20)				E	36.0	0.64	D	30.7	0.64	D	33.2	0.56	D	31.8	0.64

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### Mainline Travel Time Analysis

The Mainline Travel Time Analysis summary of results is shown in **Table 6.13**, **Table 6.14**, and **Table 6.15**.

As shown in the tables below, mainline travel times and speeds are significantly increased throughout the study area in the eastbound direction in the morning peak hour and in the westbound direction in the afternoon peak hour. This reinforces the reduced congestion and queuing that was observed in the observations of the mainline operations in the peak directions for each of the peak hours. Overall, across I-26, I-20 and I-126, RA1 had the lowest travel times and highest speeds of the reasonable alternatives followed by RA1. RA5A had the highest travel times and lowest speeds of the reasonable alternatives.

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Table 6.13: I-26 Mainline Travel Time TransModeler Results – Reasonable Alternatives

Segments	AM													AM												
	Eastbound													Westbound												
	Travel Time (mm:ss)								Average Speed (mph)					Travel Time (mm:ss)								Average Speed (mph)				
I-26 between Exit 101 and Exit 110	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.93	04:18	0.76	00:50	00:51	0.76	00:49	00:50	13.0	54.7	53.2	55.6	54.3	0.91	00:55	0.90	00:55	00:54	1.00	01:00	01:01	60.2	59.3	59.8	59.7	59.1
Exit 102 to Exit 103 (Harbison Boulevard)	1.29	06:22	1.21	01:22	01:21	1.21	01:22	01:21	12.1	53.2	53.9	53.0	53.9	0.76	00:45	1.04	01:00	01:01	0.86	00:51	00:51	60.2	61.8	61.4	60.3	60.8
Exit 103 to Exist 104 (Piney Grove Road)	0.83	03:40	0.89	00:59	01:00	0.89	01:21	01:00	13.5	53.9	53.1	39.7	53.4	1.23	01:15	0.95	00:57	00:57	0.96	01:07	00:57	59.3	60.0	60.1	51.5	60.4
Exit 104 to Exit 106 (St. Andrews Road)	2.20	06:42	-	-	-	-	-	-	19.7	-	-	-	-	1.98	02:21	-	-	-	-	-	-	50.5	-	-	-	-
Exit 104 to Exit 107 (I-20)/ Exit106 (St. Andrews Road)	0.53	01:57	1.74	02:33	02:31	1.77	03:09	02:28	16.2	40.9	41.5	33.8	43.2	0.72	00:59	2.45	03:03	03:04	1.98	02:08	02:06	44.3	48.1	47.9	55.6	56.7
Exit 106 to I-26/I-126 Split	0.60	01:36	1.22	02:27	02:22	1.19	01:56	02:00	22.3	30.0	31.0	37.1	35.8	0.20	00:16	0.66	00:40	00:40	1.12	01:23	01:23	44.8	59.8	59.7	48.7	48.6
I-26 to I-126	0.42	00:42	0.94	00:58	00:58	1.24	01:27	01:28	36.5	58.6	58.6	51.3	50.8	0.02	00:02	0.73	00:40	00:40	0.73	00:54	00:54	39.6	64.9	65.1	48.2	48.4
I-26/I-126 Split to Exit 110 (Sunset Boulevard)	1.56	03:23	1.63	01:38	01:37	1.60	01:35	01:35	27.6	60.3	60.6	60.8	60.3	2.37	02:43	1.47	01:27	01:27	1.46	01:30	01:30	52.3	61.1	60.9	58.6	58.0
Total	8.35	28:41	8.39	10:46	10:40	8.67	11:39	10:43	17.5	46.7	47.2	44.6	48.6	8.20	09:16	8.19	08:42	08:43	8.10	08:53	08:42	53.1	56.5	56.4	54.7	55.9

Segments	PM													PM												
	Eastbound													Westbound												
	Travel Time (mm:ss)								Average Speed (mph)					Travel Time (mm:ss)								Average Speed (mph)				
I-26 between Exit 101 and Exit 110	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 101 to Exit 102 (Lake Murray Boulevard)	0.93	00:56	0.76	00:46	00:46	0.76	00:46	00:45	59.4	59.6	59.6	59.3	59.9	0.91	00:57	0.90	00:58	00:58	1.00	01:05	01:05	57.4	55.8	55.7	55.2	55.1
Exit 102 to Exit 103 (Harbison Boulevard)	1.29	01:20	1.21	01:13	01:13	1.21	01:13	01:13	58.0	59.6	59.4	59.5	59.9	0.76	00:51	1.04	01:13	01:16	0.86	00:59	01:13	53.4	50.8	49.1	52.7	42.5
Exit 103 to Exist 104 (Piney Grove Road)	0.83	01:11	0.89	00:54	00:54	0.89	00:54	00:54	42.3	59.1	59.2	59.2	59.7	1.23	01:23	0.95	01:02	01:01	0.96	01:04	01:02	53.1	55.5	55.5	53.7	55.4
Exit 104 to Exit 106 (St. Andrews Road)	2.20	04:32	-	-	-	-	-	-	29.0	-	-	-	-	1.98	03:00	-	-	-	-	-	-	39.7	-	-	-	-
Exit 104 to Exit 107 (I-20)/ Exit106 (St. Andrews Road)	0.53	01:41	1.74	01:49	01:49	1.77	01:53	01:51	18.8	57.5	57.3	56.3	57.5	0.72	03:55	2.45	03:19	03:20	1.98	02:23	02:19	11.1	44.3	44.1	50.0	51.5
Exit 106 to I-26/I-126 Split	0.60	02:09	1.22	01:33	01:33	1.19	01:24	01:23	16.6	47.3	47.5	51.3	51.7	0.20	01:12	0.66	00:43	00:43	1.12	01:32	01:30	10.2	55.4	55.6	43.8	44.7
I-26 to I-126	0.42	01:55	0.94	00:58	00:58	1.24	01:27	01:27	13.3	58.4	58.6	51.3	51.3	0.02	00:08	0.73	00:41	00:41	0.73	00:55	00:55	8.7	64.6	64.6	47.4	47.6
I-26/I-126 Split to Exit 110 (Sunset Boulevard)	1.56	07:42	1.63	01:36	01:36	1.60	01:35	01:34	12.1	61.0	61.0	60.5	60.9	2.37	13:05	1.47	01:28	01:27	1.46	01:41	01:43	10.9	60.1	60.7	51.9	51.2
Total	8.35	21:26	8.39	08:49	08:49	8.67	09:13	09:08	23.4	57.1	57.1	56.4	57.0	8.20	24:32	8.19	09:24	09:26	8.10	09:39	09:46	20.1	52.3	52.1	50.4	49.7

Table 6.14: I-20 Mainline Travel Time TransModeler Results – Reasonable Alternatives

Segments	AM													AM												
	Eastbound													Westbound												
	Travel Time (mm:ss)								Average Speed (mph)					Travel Time (mm:ss)								Average Speed (mph)				
I-20 between Exit 61 and Exit 68	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 61 to Exit 63 (Bush River Road)	2.01	05:11	-	-	-	-	-	-	23.3	-	-	-	-	1.98	02:00	-	-	-	-	-	-	28.0	-	-	-	-
Exit 61 to Exit 63/64	-	-	1.83	01:58	03:17	1.81	02:36	02:11	-	55.5	33.4	41.9	49.9	-	-	2.31	02:23	02:21	2.35	02:23	02:44	-	58.2	58.6	59.1	51.5
Exit 63 to Exit 64 (I-26)	0.73	00:46	-	-	-	-	-	-	57.7	-	-	-	-	0.74	01:11	-	-	-	-	-	-	47.4	-	-	-	-
Exit 63/64 to Exit 65	-	-	2.54	04:03	03:55	2.54	03:57	04:06	-	37.5	38.8	38.6	37.1	-	-	1.39	01:21	01:22	1.36	01:18	01:17	-	61.3	61.2	63.1	63.2
Exit 64 to Exit 65 (Broad River Road)	0.82	00:55	-	-	-	-	-	-	53.9	-	-	-	-	1.12	01:58	-	-	-	-	-	-	28.3	-	-	-	-
Exit 65 to Exit 68 (Monticello Road)	3.15	03:39	2.51	04:23	04:22	2.52	04:13	04:35	51.9	34.3	34.5	35.8	32.9	2.93	03:24	2.99	03:15	03:23	3.00	03:18	03:25	16.4	55.1	52.9	54.5	52.7
Total	6.71	10:30	6.87	10:25	11:34	6.87	10:46	10:52	38.4	39.6	35.6	38.3	37.9	6.77	08:33	6.68	07:00	07:06	6.70	06:59	07:27	47.5	57.3	56.4	57.7	54.0
Segments	PM													PM												
	Eastbound													Westbound												
	Travel Time (mm:ss)								Average Speed (mph)					Travel Time (mm:ss)								Average Speed (mph)				
I-20 between Exit 61 and Exit 68	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 61 to Exit 63 (Bush River Road)	2.01	02:02	-	-	-	-	-	-	59.4	-	-	-	-	1.98	03:46	-	-	-	-	-	-	31.6	-	-	-	-
Exit 61 to Exit 63/64	-	-	1.83	01:49	01:57	1.81	01:50	01:49	-	60.2	56.1	59.4	59.7	-	-	2.31	03:44	02:59	2.35	03:43	04:01	-	37.2	46.4	37.9	35.1
Exit 63 to Exit 64 (I-26)	0.73	00:44	-	-	-	-	-	-	59.5	-	-	-	-	0.74	00:48	-	-	-	-	-	-	55.8	-	-	-	-
Exit 63/64 to Exit 65	-	-	2.54	02:23	02:24	2.54	02:25	02:25	-	63.9	63.3	62.9	63.0	-	-	1.39	01:21	01:21	1.36	01:17	01:17	-	61.3	61.3	63.3	63.1
Exit 64 to Exit 65 (Broad River Road)	0.82	00:54	-	-	-	-	-	-	54.2	-	-	-	-	1.12	02:19	-	-	-	-	-	-	29.1	-	-	-	-
Exit 65 to Exit 68 (Monticello Road)	3.15	03:09	2.51	02:41	02:42	2.52	02:40	02:41	60.0	55.9	55.7	56.5	56.3	2.93	05:59	2.99	04:07	04:10	3.00	04:46	04:41	29.3	43.5	42.9	37.7	38.3
Total	6.71	06:50	6.87	06:53	07:03	6.87	06:55	06:55	59.0	59.8	58.4	59.5	59.6	6.77	12:51	6.68	09:12	08:31	6.70	09:47	10:00	31.6	43.6	47.1	41.1	40.2



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Table 6.15: I-126 Mainline Travel Time TransModeler Results – Reasonable Alternatives

Segments	AM													AM												
	Eastbound													Westbound												
	Travel Time (mm:ss)							Average Speed (mph)						Travel Time (mm:ss)							Average Speed (mph)					
I-126 between I-26 and Greystone Blvd	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 108 to Colonial Life Boulevard	1.22	01:15	-	-	-	-	-	-	58.4	-	-	-	-	1.14	01:11	-	-	-	-	-	-	47.0	-	-	-	-
I-26 to Colonial Life Blvd	-	-	0.81	01:04	01:03	1.13	01:24	01:24	-	45.1	46.4	48.6	48.6	-	-	0.96	00:57	00:57	0.97	01:01	01:02	-	60.9	60.8	44.4	44.1
Colonial Life Blvd to Greystone Blvd	0.77	00:48	1.51	02:04	01:46	1.49	01:58	02:08	58.3	43.7	51.1	45.6	41.9	0.98	00:58	1.13	01:06	01:07	1.12	01:06	01:06	57.9	61.5	61.2	41.2	41.0
Total	1.99	02:03	2.31	03:09	02:49	2.62	03:22	03:32	58.4	44.1	49.3	46.8	44.5	2.13	02:09	2.09	02:03	02:03	2.09	02:07	02:08	59.3	61.2	61.0	59.2	58.8
Segments	PM													PM												
	Eastbound													Westbound												
	Travel Time (mm:ss)							Average Speed (mph)						Travel Time (mm:ss)							Average Speed (mph)					
I-126 between I-26 and Greystone Blvd	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Exit 108 to Colonial Life Boulevard	1.22	01:11	-	-	-	-	-	-	62.0	-	-	-	-	1.14	05:49	-	-	-	-	-	-	11.8	-	-	-	-
I-26 to Colonial Life Blvd	-	-	0.81	00:57	00:58	1.13	01:19	01:19	-	50.6	50.5	51.6	51.8	-	-	0.96	01:17	01:16	0.97	01:24	01:23	-	45.2	45.6	41.8	42.5
Colonial Life Blvd to Greystone Blvd	0.77	00:58	1.51	01:35	01:49	1.49	01:35	01:41	47.7	57.0	49.9	56.6	52.9	0.98	04:28	1.13	01:36	01:50	1.12	02:06	02:18	13.2	42.3	36.9	32.0	29.2
Total	1.99	02:09	2.31	02:33	02:46	2.62	02:54	03:00	55.6	54.6	50.1	54.3	52.5	2.13	10:17	2.09	02:53	03:06	2.09	03:30	03:41	12.4	43.6	40.4	35.9	34.1

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### Arterial Travel Time Analysis

The Arterial Travel Time Analysis summary of results is shown in **Table 6.16**.

Overall, there is not a clear pattern of change from the RA10 No-Build alternative to the Reasonable Alternatives for Arterial Travel Times and Speeds. This is due in part to the Dynamic Traffic Assignment redistributing trips along the arterials. Some arterials showed significant improvements in operations while others showed a degradation. RA1A showed the best overall Arterial Travel Speeds while RA5 had the worst overall Arterial Travel Speeds.

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Table 6.16: Arterial Travel Time TransModeler Results – Reasonable Alternatives

Location	Eastbound								Eastbound								Eastbound									
	Travel Time (mm:ss)								Travel Time (mm:ss)								Average Speed (mph)									
	AM								PM								AM					PM				
	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Broad River Road (west of Exit 101 to Greystone Blvd)	7.5	21:39	6.7	26:31	20:21	8.5	23:53	23:25	7.5	19:55	6.7	22:25	21:57	8.5	25:55	21:04	20.7	16.6	21.6	21.4	21.9	22.5	19.6	20.0	19.8	24.3
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.8	04:12	1.5	05:27	06:16	2.2	05:49	06:40	1.8	05:25	1.5	08:30	06:53	2.2	10:14	12:02	25.7	23.8	20.8	22.4	19.6	19.9	15.3	18.9	12.7	10.8
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	02:52	1.1	03:49	03:52	1.2	03:52	03:53	1.1	04:53	1.1	05:03	05:09	1.2	05:26	05:11	23.5	18.1	17.9	19.0	18.9	13.8	13.7	13.5	13.5	14.2
Piney Grove Road (west of Exit 104 to Broad River Road)	1.8	04:40	1.5	05:27	05:54	1.7	06:26	05:23	1.8	04:27	1.5	05:20	05:16	1.7	05:27	05:19	22.8	19.3	17.9	16.2	19.3	24.0	19.7	20.0	19.1	19.5
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	04:23	1.0	05:28	05:46	1.1	05:05	04:32	1.0	04:41	1.0	05:11	05:08	1.1	04:38	04:41	13.3	14.4	13.6	13.0	14.4	12.5	15.2	15.3	14.3	13.9
Bush River Road (west of Exit 63 to Broad River Road)	2.3	06:51	2.0	07:46	07:42	2.3	07:07	06:56	2.3	11:40	2.0	07:06	07:28	2.3	07:32	07:07	20.2	16.8	17.7	19.4	18.9	11.9	18.4	18.3	18.3	18.4
Location	Northbound								Northbound								Northbound									
	Travel Time (mm:ss)								Travel Time (mm:ss)								Average Speed (mph)									
	AM								PM								AM					PM				
	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.5	01:33	0.6	01:48	01:52	0.6	01:49	01:46	0.5	01:56	0.6	02:28	02:50	0.6	02:33	02:23	18.5	20.9	20.2	21.1	21.7	14.9	15.3	13.3	15.1	16.1
Location	Westbound								Westbound								Westbound									
	Travel Time (mm:ss)								Travel Time (mm:ss)								Average Speed (mph)									
	AM								PM								AM					PM				
	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Broad River Road (west of Exit 101 to Greystone Blvd)	7.5	20:40	7.3	17:41	18:18	8.5	25:05	19:29	7.5	37:29	7.3	27:04	26:54	8.5	26:32	23:33	21.6	26.7	25.9	20.4	26.3	11.9	17.5	17.6	19.3	21.7
Lake Murray Boulevard (west of Exit 102 to Broad River Road)	1.7	04:57	1.5	04:46	04:51	2.1	05:30	04:50	1.7	55:12	1.5	05:14	05:08	2.2	05:50	05:52	20.9	26.3	25.9	22.9	26.1	1.9	24.0	24.5	21.6	21.5
Harbison Boulevard (west of Exit 103 to Broad River Road)	1.1	02:35	1.1	03:36	03:39	1.2	04:18	03:33	1.1	02:59	1.1	04:07	04:06	1.2	08:58	03:55	26.1	19.2	18.9	17.1	20.8	22.6	16.8	16.9	8.2	18.8
Piney Grove Road (west of Exit 104 to Broad River Road)	1.8	06:40	1.5	05:04	05:03	1.7	06:38	05:14	1.8	04:39	1.5	05:15	05:19	1.7	05:44	05:30	16.1	20.7	20.9	15.7	20.0	23.0	20.0	19.8	18.2	19.0
St. Andrews Road (west of Exit 106 to Broad River Road)	1.0	03:34	1.0	05:14	06:55	1.1	11:21	05:56	1.0	05:34	1.0	05:27	05:51	1.1	05:43	05:35	16.4	15.1	11.4	5.8	11.0	10.5	14.5	13.4	11.6	11.7
Bush River Road (west of Exit 63 to Broad River Road)	2.3	10:13	2.0	07:10	06:39	2.3	07:43	07:05	2.3	09:27	2.0	07:08	07:01	2.3	07:26	07:09	13.6	18.5	20.5	17.9	18.5	14.7	18.6	19.4	18.6	18.3
Location	Southbound								Southbound								Southbound									
	Travel Time (mm:ss)								Travel Time (mm:ss)								Average Speed (mph)									
	AM								PM								AM					PM				
	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	Length (mi)	RA10	Length (mi)	RA1	RA1A	Length (mi)	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A	RA10	RA1	RA1A	RA5	RA5A
Colonial Life Boulevard (I-126 Ramps to Bush River Road)	0.5	00:46	0.6	02:31	02:51	0.6	02:22	02:26	0.5	00:49	0.6	02:55	02:57	0.6	02:51	02:38	37.2	15.0	13.3	16.3	15.8	35.0	13.0	12.8	13.5	14.6



## Alternatives Traffic Analysis Technical Memo

### Trip Statistics Summary

The Trip Statistics Summary Analysis summary of results is shown in **Table 6.17**.

**Table 6.17: External to External Speed and Travel Time TransModeler Results – Reasonable Alternatives**

Vehicle Miles Traveled (VMT)					
	RA10	RA1	RA1A	RA5	RA5A
AM	245,498	308,362	306,576	296,826	302,858
PM	230,931	326,410	325,872	318,291	319,204
Vehicle Hours Traveled (VHT)					
	RA10	RA1	RA1A	RA5	RA5A
AM	7,869	8,276	8,260	8,210	8,169
PM	8,996	8,988	9,172	9,116	8,965
Total Completed Trips (vehicles)					
	RA10	RA1	RA1A	RA5	RA5A
AM	50,102	54,377	54,026	53,670	54,656
PM	49,028	58,749	58,425	58,574	59,389
Total Denied Entry (vehicles)					
	RA10	RA1	RA1A	RA5	RA5A
AM	2,499	828	950	1,411	923
PM	5,432	1,355	1,281	1,659	1,386
Denied Entry (%)					
	RA10	RA1	RA1A	RA5	RA5A
AM	5.0	1.5	1.8	2.6	1.7
PM	11.1	2.3	2.2	2.8	2.3

The Trip Statistics Summary Analysis shows that there is a significant increase in Vehicle Miles Traveled in each of the reasonable alternatives as compared to RA10. RA1 showed the biggest improvement in both the morning and evening peak hours. There were also, significantly more Completed Trips and fewer Denied Entry vehicles in the reasonable alternatives than in RA10. RA1 showed the most significant improvement while RA5 showed the least significant improvement.

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### 7 References

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