

**I-85 Corridor Study DRAFT
Microsimulation Model Design
Year (2040) Analysis Report**

I-85 from SC 18 (Shelby Highway)
to NC 216 (Battleground Road)
Cherokee County, South
Carolina



Prepared for:
SCDOT

Prepared by:
Stantec Consulting Services Inc.
4969 Centre Pointe Drive
Suite 200
North Charleston, SC 29418-6952

January 18, 2017

Sign-off Sheet

This document entitled I-85 Corridor Study DRAFT Microsimulation Model Design Year (2040) Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of SCDOT (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information Build at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Katie Griffin
(signature)

Katie Griffin

Reviewed by Kellie L Reep
(signature)

Kellie Reep, PE

Approved by _____
(signature)

Stuart Day, PE

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

Introduction
January 18, 2017

Table of Contents

EXECUTIVE SUMMARY	I
1.0 INTRODUCTION	1.1
1.1 OBJECTIVE	1.1
2.0 STUDY METHODOLOGY	2.1
2.1 MODELING APPROACH.....	2.1
2.2 NETWORK ELEMENTS.....	2.2
2.2.1 Geometric Data.....	2.2
2.2.2 Traffic Control Data	2.2
2.2.3 Demand Data	2.2
2.3 MEASURES OF EFFECTIVENESS.....	2.3
3.0 DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS	3.3
3.1 AM PEAK HOUR.....	3.3
3.1.1 Network Performance.....	3.3
3.1.2 Freeway Operations.....	3.3
3.1.3 Intersection Operations	3.7
3.1.4 AM Peak Hour Operations Summary.....	3.8
3.2 PM PEAK HOUR	3.8
3.2.1 Network Performance.....	3.8
3.2.2 Freeway Operations.....	3.9
3.2.3 Intersection Operations	3.12
3.2.4 PM Peak Hour Operations Summary	3.14
4.0 RECOMMENDED ROADWAY IMPROVEMENTS	4.14
5.0 DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS.....	5.16
5.1 AM PEAK HOUR.....	5.16
5.1.1 Network Performance.....	5.16
5.1.2 Freeway Operations.....	5.16
5.1.3 Intersection Operations	5.20
5.1.4 AM Peak Hour Operations Summary.....	5.21
5.2 PM PEAK HOUR	5.21
5.2.1 Network Performance.....	5.21
5.2.2 Freeway Operations.....	5.21
5.2.3 Intersection Operations	5.25
5.2.4 PM Peak Hour Operations Summary	5.26
6.0 CONCLUSION	6.26



I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

Introduction
January 18, 2017

LIST OF TABLES

Table 1 – Measures of Effectiveness	2.3
Table 2 – No Build (2040) AM Peak Hour Network Performance Summary	3.3
Table 3 – No Build (2040) I-85 Northbound AM Peak Hour Freeway Density	3.4
Table 4 – No Build (2040) I-85 Southbound AM Peak Hour Freeway Density	3.5
Table 5 – No Build (2040) I-85 Northbound AM Peak Hour Freeway Travel Times	3.6
Table 6 – No Build (2040) I-85 Southbound AM Peak Hour Freeway Travel Times	3.6
Table 7 – No Build (2040) AM Peak Hour Intersection Delay and LOS	3.7
Table 8 – No Build (2040) PM Peak Hour Network Performance Summary	3.9
Table 9 – No Build (2040) I-85 Northbound PM Peak Hour Freeway Density	3.9
Table 10 – No Build (2040) I-85 Southbound PM Peak Hour Freeway Density	3.10
Table 11 – No Build (2040) I-85 Northbound PM Peak Hour Freeway Travel Times	3.11
Table 12 – No Build (2040) I-85 Southbound PM Peak Hour Freeway Travel Times	3.12
Table 13 – No Build (2040) PM Peak Hour Intersection Delay and LOS	3.12
Table 14 – Build (2040) AM Peak Hour Network Performance Summary	5.16
Table 15 – Build (2040) I-85 Northbound AM Peak Hour Freeway Density	5.17
Table 16 – Build (2040) I-85 Southbound AM Peak Hour Freeway Density	5.18
Table 17 – Build (2040) I-85 Northbound AM Peak Hour Freeway Travel Times	5.19
Table 18 – Build (2040) I-85 Southbound AM Peak Hour Freeway Travel Times	5.19
Table 19 – Build (2040) AM Peak Hour Intersection Delay and LOS	5.20
Table 20 – Build (2040) PM Peak Hour Network Performance Summary	5.21
Table 21 – Build (2040) I-85 Northbound PM Peak Hour Freeway Density	5.22
Table 22 – Build (2040) I-85 Southbound PM Peak Hour Freeway Density	5.23
Table 23 – Build (2040) I-85 Northbound PM Peak Hour Freeway Travel Times	5.24
Table 24 – Build (2040) I-85 Southbound PM Peak Hour Freeway Travel Times	5.24
Table 25 – Build (2040) PM Peak Hour Intersection Delay and LOS	5.25

LIST OF FIGURES

Figure 1 – No Build (2040) I-85 Southbound AM Density and Speed Graphs	6.27
Figure 2 – No Build (2040) I-85 Northbound AM Density and Speed Graphs	6.29
Figure 3 – No Build (2040) I-85 Northbound AM Density and Speed Graphs	6.31
Figure 4 – No Build (2040) I-85 Northbound PM Density and Speed Graphs	6.33
Figure 5 – Build (2040) I-85 Southbound AM Density and Speed Graphs	6.35
Figure 6 – Build (2040) I-85 Northbound AM Density and Speed Graphs	6.37
Figure 7 – Build (2040) I-85 Northbound AM Density and Speed Graphs	6.39
Figure 8 – Build (2040) I-85 Northbound PM Density and Speed Graphs	6.41



Introduction
January 18, 2017

Executive Summary

Stantec conducted a traffic analysis using PTV VISSIM 8.00-11 microsimulation software to evaluate the future no build and build traffic conditions along a nearly 10-mile section of I-85 in Cherokee County, South Carolina. The study area included six (6) interchanges from SC 18 near Gaffney, South Carolina to NC 216 near Grover, North Carolina. This report addresses the future year (2040) no build and build conditions only for the AM and PM peak periods. The No-Build analysis reflects existing conditions and future volumes. The Build analysis reflects widening from 4 to 6-lanes from west of the Blacksburg Hwy interchange to west of the US 29 (Cherokee St) interchange and interchange improvements at each of the interchanges within the project limits. The tables below show a summary of the simulated freeway operations for the build and no build conditions models.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

Introduction
January 18, 2017

I-85 Northbound Freeway Density							
Segment Description	Segment Type	# of Lanes		AM Peak		PM Peak	
		No Build	Build	No Build	Build	No Build	Build
South End to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	2	B	C	E	E
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	2/3	B	C	F	F
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	2	C	C	E	F
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	2/3	B	C	E	E
SC 18 (Shelby Hwy.) On-Ramp to Frontage Rd. Off-Ramp	Basic	2	-	B	-	D	-
Frontage Rd. Off-Ramp	Diverge	2/3	-	B	-	D	-
Frontage Rd. Off-Ramp to Blacksburg Hwy. Off-Ramp	Basic	2	-	B	-	D	-
SC 18 (Shelby Hwy.) On-ramp to Blacksburg Off-Ramp	Basic	-	2/3	-	B	-	D
Blacksburg Off-Ramp	Diverge	2/3	3/4	B	B	D	C
Blacksburg Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	3	B	B	D	C
Blacksburg Hwy. On-Ramp	Merge	2/3	3/4	B	B	D	B
Blacksburg Hwy. On-Ramp to SC 5/SC 198 (Mntn. St.) Off-Ramp	Basic	2	3	B	B	D	C
SC 5/SC 198 (Mntn. St.) Off-Ramp	Diverge	2	3	C	B	F	C
SC 5/SC 198 (Mntn. St.) Off-Ramp to SC 5/SC 198 (Mntn. Rd.)\ On-Ramp	Basic	2	3	C	B	E	C
SC 5/SC 198 (Mntn. St.) On-Ramp	Merge	2/3	3/4	B	B	C	B
SC 5/SC 198 (Mntn. St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	3	C	A	D	C
Tribal Rd. Off-Ramp	Diverge	2/3	3/4	C	A	C	B
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	3	C	A	D	B
Tribal Rd. On-Ramp	Merge	2/3	3/4	B	B	C	B
Tribal Rd. On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	3	C	A	D	C
US 29 (Cherokee St.) Off-Ramp	Diverge	2/3	3	C	B	D	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	2	C	B	D	D
US 29 (Cherokee St.) On-Ramp	Merge	2/3	2/3	B	B	C	C
US 29 (Cherokee St.) On-Ramp to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	2	C	B	D	D
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	2	C	C	D	D
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	2	C	B	D	D
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	2/3	C	B	C	D
NC 216 (Battleground Rd.) On-Ramp to North End	Basic	2	2	C	B	D	D

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

Introduction
January 18, 2017

I-85 Southbound Freeway Density							
Segment Description	Segment Type	# of Lanes		AM Peak		PM Peak	
		No Build	Build	No Build	Build	No Build	Build
North End to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	2	B	B	C	C
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	2	B	B	C	C
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	2	B	B	D	D
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	2/3	B	B	C	C
NC 216 (Battleground Rd.) On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	2	B	B	C	D
US 29 (Cherokee St.) Off-Ramp	Diverge	2	2	B	B	C	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	2	B	B	D	D
US 29 (Cherokee St.) On-Ramp	Merge	2/3	3	B	A	C	B
US 29 (Cherokee St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	3	C	A	E	C
Tribal Rd. Off-Ramp	Diverge	2/3	3/4	D	A	C	B
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	3	B	A	D	B
Tribal Rd. On-Ramp	Merge	2/3	3/4	B	A	C	B
Tribal Rd. On-Ramp to Welcome Center Off-Ramp	Basic	2	3	B	A	D	C
Welcome Center Off-Ramp	Diverge	2	3	B	A	D	B
Welcome Center Off-Ramp to Welcome Center On-Ramp	Basic	2	3	B	A	D	B
Welcome Center On-Ramp	Merge	2/3	3/4	B	A	D	B
SC 5/SC 198 (Mntn. St) Off-Ramp	Diverge	2/3	3/4	B	A	D	C
SC 5/SC 198 (Mntn. St) Off-Ramp to SC 5/SC 198 (Mntn. St) On-Ramp	Basic	2	3	B	A	E	C
SC 5/SC 198 (Mntn. St) On-Ramp	Merge	2/3	3/4	B	B	D	B
SC 5/SC 198 (Mntn. St) On-Ramp to Blacksburg Hwy. Off-Ramp	Basic	2	3	B	B	D	C
Blacksburg Hwy. Off-Ramp	Diverge	2	3	B	B	D	B
Blacksburg Hwy. Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	3	B	A	D	B
Blacksburg Hwy. On-Ramp	Merge	2/3	3/4	B	B	C	B
Blacksburg Hwy. On-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	2/3	C	B	E	D
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	2/3	C	C	E	F
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	2	C	C	E	E
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	2/3	D	D	F	F
SC 18 (Shelby Hwy.) On-Ramp to South End	Basic	2	2	C	C	D	D



Introduction
January 18, 2017

1.0 INTRODUCTION

This report evaluates the future traffic operations along a nearly 10-mile segment of Interstate 85 near Cherokee County, South Carolina. The study area extends from just south of SC 18 (Shelby Highway) northeastward to just north of the NC 216 interchange in North Carolina. This corridor is a moderately-traveled commercial trucking route with local traffic being added during the morning and afternoon peak hours.

There are rural residential land uses to the south of the study area, and a mix of commercial, residential, and industrial throughout the study area. To the north is a mix of mostly rural residential and industrial uses, with the Mill Creek Combustion Station and the Milliken Chemical plant in the area between Blacksburg Highway and US 29.

The analysis presented in this report includes six (6) existing interchanges along I-85:

- 1) SC 18 (Shelby Highway)
- 2) Blacksburg Highway
- 3) SC 5/SC 198 (Mountain Street)
- 4) Tribal Road
- 5) US 29 (Cherokee Street)
- 6) NC 216 (Battleground Road)

1.1 OBJECTIVE

The intent of this study is to evaluate the proposed interchange improvements along I-85 and its intersecting streets. This report includes capacity analyses for the freeway, interchanges, and surface street intersections, along with a summary of the findings.

2.0 STUDY METHODOLOGY

2.1 MODELING APPROACH

The modeling approach detailed in the *I-85 Cherokee Calibration Report* (Stantec, 2016) was also used for the build VISSIM model. Dynamic traffic assignment (DTA) was run with the new network and the 2040 origin-destination matrix.

Study Methodology
January 18, 2017

2.2 NETWORK ELEMENTS

2.2.1 Geometric Data

The existing geometry was assumed for the no build model, as there are no approved interim projects planned in the area. Interchange improvements, developed by the design team, were integrated into the VISSIM build model. An annotated map showing the proposed improvements is provided in the Appendix.

2.2.2 Traffic Control Data

Intersection signal timing and phasing plans were obtained from SCDOT and used in the VISSIM models. For the no build and build models, no signal timing optimization was performed for areas in which the team was provided signal timing plans. All available signal and timing plans can be found in the Appendix.

2.2.3 Demand Data

A growth rate development detailed in the *I-85 Cherokee Growth Factor Justification Memo* was prepared by a Stantec Transportation Analyst on May 17, 2016. This memo concluded that a linear traffic growth rate of 1.5% would be applied along the I-85 corridor. The proposed linear annual traffic growth rate for the individual cross-streets along the corridor range between 1.0% and 2.5%. These proposed growth rates were applied to all mainline, ramp, and arterial turning movement count volumes within the study area to generate the 2040 peak hour volumes used in the 2040 Build and 2040 No Build analyses. The growth rate memo can be found in the Appendix.

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

2.3 MEASURES OF EFFECTIVENESS

Several appropriate Measures of Effectiveness (MOEs) were identified and used in evaluation of the build alternative.

Table 1 – Measures of Effectiveness

<u>Network-Wide MOE's</u>	<u>Freeway MOE's</u>	<u>Intersection MOE's</u>
• Average Delay	• Average Travel Time	• Intersection Delay
• Average Travel Speed	• Average Travel Speed	• Level of Service (LOS)
	• Density / LOS	

3.0 DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

The following sections include the VISSIM simulation results for the No Build (2040) AM and PM peak hours. The level of service of each segment was determined using HCM methodology, based on the densities generated in VISSIM.

3.1 AM PEAK HOUR

3.1.1 Network Performance

Table 2 shows a summary of the network-wide MOE's for the Design Year No Build (2040) conditions. These are to be used primarily as a comparison tool between scenarios.

Table 2 – No Build (2040) AM Peak Hour Network Performance Summary

Average Speed (mph)	57.7
Average Delay Time per Vehicle (sec)	89.2

3.1.2 Freeway Operations

This section summarizes the operations along the I-85 mainline using density and travel times.

Tables 3 and 4 show the No Build (2040) mainline density for I-85 northbound and southbound during the AM peak hour.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

Figures 1 and 2 show graphically the density per-lane in 250 ft. segments along the entire corridor for the northbound and southbound directions during the AM peak hour.

Tables 5 and 6 show the travel times between each interchange for the northbound and southbound directions during the AM peak hour.

Table 3 – No Build (2040) I-85 Northbound AM Peak Hour Freeway Density

I-85 Northbound - AM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
South End to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	20.5	C
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	23.2	C
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	25.2	C
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	23.1	C
SC 18 (Shelby Hwy.) Blacksburg Off-Ramp	Basic	2	20.6	C
Blacksburg Off-Ramp	Diverge	2/3	19.6	B
Blacksburg Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	20.4	C
Blacksburg Hwy. On-Ramp	Merge	2/3	22.0	C
Blacksburg Hwy. On-Ramp to SC 5/SC 198 (Mntn. St.) Off-Ramp	Basic	2	18.3	C
SC 5/SC 198 (Mntn. St.) Off-Ramp	Diverge	2	15.7	B
SC 5/SC 198 (Mntn. St.) Off-Ramp to SC 5/SC 198 (Mntn. Rd.)- On-Ramp	Basic	2	18.4	C
SC 5/SC 198 (Mntn. St.) On-Ramp	Merge	2/3	23.3	C
SC 5/SC 198 (Mntn. St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	21.8	C
Tribal Rd. Off-Ramp	Diverge	2/3	16.3	B
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	19.3	C
Tribal Rd. On-Ramp	Merge	2/3	24.8	C
Tribal Rd. On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	16.6	B
US 29 (Cherokee St.) Off-Ramp	Diverge	2/3	15.7	B
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	17.3	B
US 29 (Cherokee St.) On-Ramp	Merge	2/3	17.0	B
US 29 (Cherokee St.) On-Ramp to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	15.8	B
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	16.0	B
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	15.5	B
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	16.9	B
NC 216 (Battleground Rd.) On-Ramp to North End	Basic	2	18.7	C

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 4 – No Build (2040) I-85 Southbound AM Peak Hour Freeway Density

I-85 Southbound - AM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
North End to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	13.2	B
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	13.9	B
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	14.2	B
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	13.4	B
NC 216 (Battleground Rd.) On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	13.9	B
US 29 (Cherokee St.) Off-Ramp	Diverge	2	14.2	B
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	14.0	B
US 29 (Cherokee St.) On-Ramp	Merge	2/3	13.1	B
US 29 (Cherokee St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	25.1	C
Tribal Rd. Off-Ramp	Diverge	2/3	30.5	D
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	12.2	B
Tribal Rd. On-Ramp	Merge	2/3	11.3	B
Tribal Rd. On-Ramp to Welcome Center Off-Ramp	Basic	2	14.0	B
Welcome Center Off-Ramp	Diverge	2	13.8	B
Welcome Center On-Ramp to Welcome Center On-Ramp	Basic	2	13.1	B
Welcome Center On-Ramp	Merge	2/3	14.0	B
SC 5/SC 198 (Mntn. St) Off-Ramp	Diverge	2/3	13.5	B
SC 5/SC 198 (Mntn. St) Off-Ramp to SC 5/SC 198 (Mntn. St) On-Ramp	Basic	2	15.1	B
SC 5/SC 198 (Mntn. St) On-Ramp	Merge	2/3	18.0	B
SC 5/SC 198 (Mntn. St) On-Ramp to Blacksburg Hwy. Off-Ramp	Basic	2	17.9	B
Blacksburg Hwy. Off-Ramp	Diverge	2	17.7	B
Blacksburg Hwy. Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	16.6	B
Blacksburg Hwy. On-Ramp	Merge	2/3	14.8	B
Blacksburg Hwy. On-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	20.0	C
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	23.1	C
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	22.5	C
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	28.6	D
SC 18 (Shelby Hwy.) On-Ramp to South End	Basic	2	22.4	C

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 5 – No Build (2040) I-85 Northbound AM Peak Hour Freeway Travel Times

Segment	I-85 Northbound Travel Time (min)
South End to SC 18 (Shelby Hwy.) Off-Ramp	1.91
SC 18 (Shelby Hwy.) Off-Ramp to Blacksburg Hwy. Off-Ramp	1.90
Blacksburg Hwy. Off-Ramp to SC 5 (Mountain St.) Off-Ramp	1.80
SC 5 (Mountain St.) Off-Ramp to Tribal St. Off-Ramp	2.60
Tribal St. Off-Ramp to US 29 (Cherokee St.) Off-Ramp	2.14
US 29 (Cherokee St.) Off-Ramp to NC 216 (Battleground Ave.) Off-Ramp	3.12
NC 216 (Battleground Ave.) Off-Ramp to North End	1.11
Total Travel Time	14.58

Table 6 – No Build (2040) I-85 Southbound AM Peak Hour Freeway Travel Times

Segment	I-85 Southbound Travel Time (min)
North End to NC 216 (Battleground Ave.) Off-Ramp	1.31
NC 216 (Battleground Ave.) Off-Ramp to US 29 (Cherokee St.) Off-Ramp	1.93
US 29 (Cherokee St.) Off-Ramp to Tribal St. Off-Ramp	1.74
Tribal St. Off-Ramp to Welcome Center Driveway	0.83
Welcome Center Driveway to SC 5 (Mountain St.) Off-Ramp	0.75
SC 5 (Mountain St.) Off-Ramp to Blacksburg Hwy. Off-Ramp	2.30
Blacksburg Hwy. Off-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	3.07
SC 18 (Shelby Hwy.) Off-Ramp to South End	1.29
Total Travel Time	13.22

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

3.1.3 Intersection Operations

Table 7 summarizes the intersection operations throughout the study area.

Table 7 – No Build (2040) AM Peak Hour Intersection Delay and LOS

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
NC 216 @ US 29	U	0.2	A	SC 5 @ Flying J Driveway 1	U	0.6	A
US 29 @ Frontage Rd.	U	0.7	A	SC 5 @ Flying J Driveway 2	U	0.6	A
NC 216 @ AGI Driveway	U	0.4	A	SC 5 @ Waffle House Driveway 1	U	1.3	A
NC 216 @ Misc. Driveway (N. of Pioneer Driveway)	U	0.3	A	SC 5 @ @ I-85 SB Ramps	S	21.8	C
NC 216 @ Pioneer Driveway	U	0.2	A	SC 5 @ I-85 NB Ramps	S	14.0	B
NC 216 @ I-85 SB Ramps	U	1.0	A	SC 5 @ Driveway	U	1.1	A
NC 216 @ I-85 NB Ramps	U	1.1	A	SC 5 @ Gas Station Driveway	U	1.0	A
NC 216 @ Driveway	U	0.2	A	I-85 SB SC 5 Off-Ramp @ Waffle House Driveway 2	U	2.1	A
I-85 NB NC 216 Off-Ramp @ Banks Rd.	U	1.6	A	I-85 SB SC 5 Off-Ramp @ Truck Pull-Out 2	U	0.5	A
NC 216 @ Dixon School Rd.	U	2.0	A	I-85 SB SC 5 Off-Ramp @ Truck Pull-Out 1	U	1.9	A
US 29 @ Wilco Hess Driveway 3	U	2.3	A	I-85 NB SC 5 On-Ramp @ Misc. Driveway	U	0.3	A
US 29 @ Misc. Driveway	U	0.5	A	I-85 SB SC 5 Off-Ramp @ Gas Station Driveway	U	0.3	A
US 29 @ Wilco Hess Driveway 2	U	1.7	A	I-85 NB SC 5 Off-Ramp @ Rock Springs Rd.	U	0.6	A
US 29 @ Wilco Hess Driveway 1	U	0.6	A	I-85 NB SC 5 Off-Ramp @ Misc. Driveway	U	1.3	A
US 29 @ SB On-Ramp	U	0.4	A	I-85 NB Off-Ramp @ Henson Rd.	U	1.4	A
US 29 @ ABC Store Driveway	U	0.5	A	Blacksburg Hwy. @ Sunoco Driveway 4	U	0.3	A
US 29 @ Exxon Driveway 1	U	0.8	A	Blacksburg Hwy. @ Sunoco Driveway 3	U	0.3	A
US 29 @ I-85 SB Off-Ramp	U	1.1	A	Blacksburg Hwy. @ SB Ramps	U	2.8	A
US 29 @ NB Off-Ramp	U	2.1	A	Blacksburg Hwy. @ NB Ramps	U	4.2	A
US 29 @ I-85 NB On-Ramp	U	1.2	A	I-85 SB Blacksburg Hwy. Off-Ramp @ Sunoco Driveway 2	U	1.4	A
US 29 @ Lakeview Dr.	U	0.1	A	I-85 SB Blacksburg Hwy. Off-Ramp @ Sunoco Driveway 1	U	0.8	A
US 29 @ I-85 NB On-Ramp	U	1.7	A	I-85 Blacksburg Hwy. Off-Ramp @ Misc. Driveway	U	0.4	A
I-85 NB US 29 On-Ramp @ Frontage Rd.	U	4.1	A	I-85 NB Blacksburg Hwy. Off-Ramp @ Milliken Rd.	U	20.0	C

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
I-85 SB US 29 Off-Ramp @ Exxon Driveway 2	U	2.9	A	Frontage Rd. @ Frontage Rd.	U	0.1	A
I-85 SB US 29 On-Ramp @ Misc. Driveway	U	0.4	A	I-85 SB Blacksburg Hwy. On-Ramp @ Crawford Rd.	U	0.1	A
Tribal Rd. @ I-85 SB Ramps	U	11.8	B	SC 18 @ I-85 SB Ramps	U	3.1	A
Tribal Rd. @ I-85 NB Ramps	U	6.4	A	SC 18 @ I-85 NB Ramps	U	3.2	A
Tribal Rd. @ Driveway 1	U	3.3	A	Shelby Hwy. @ SC 18	U	4.9	A
Tribal Rd. @ Driveway 2	U	0.6	A	Shelby Hwy. @ Kangaroo Driveway 3	U	0.8	A
I-85 NB Tribal Rd. Off-Ramp @ Gas Station Driveway	U	2.1	A	Shelby Hwy. @ Kangaroo Driveway 2	U	1.4	A
I-85 NB Tribal Rd. On-Ramp @ Priester Rd.	U	2.8	A	Shelby Hwy. @ Kangaroo Driveway 1	U	0.9	A
I-85 SB Tribal Rd. On-Ramp @ SR 11-52	U	2.4	A	Shelby Hwy. @ Wind Hill Rd.	U	1.2	A
State Rd 11-52 @ White Farm Rd.	U	0.3	A	I-85 SB SC 18 On-Ramp @ Lemeul Rd.	U	0.6	A
SC 5 @ White Farm Rd.	U	0.6	A	I-85 SB SC 18 On-Ramp @ Wilcox Ave.	U	2.3	A
SC 5 @ State Rd. 11-52	U	0.5	A				

Legend: U = Unsignalized Intersection, S = Signalized Intersection

3.1.4 AM Peak Hour Operations Summary

The tables in the preceding sections show that vehicles on I-85 during the AM Peak hour experience very little delay. In the model, vehicles are unimpeded in their ability to travel through this stretch of I-85. All intersections within the study area operate at LOS C or better, with all but four operating at LOS A. All freeway segments within the study operate at LOS D or better in the AM peak hour, with the majority at a LOS B.

3.2 PM PEAK HOUR

3.2.1 Network Performance

Table 8 shows a summary of the network-wide MOE's for the Design Year No Build (2040) conditions.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

Table 8 – No Build (2040) PM Peak Hour Network Performance Summary

Average Speed (mph)	56.7
Average Delay Time per Vehicle (sec)	129.4

3.2.2 Freeway Operations

This section summarizes the operations along the I-85 mainline using density, LOS, and travel times.

Tables 9 and 10 show the No Build (2040) mainline density for I-85 Northbound and Southbound, respectively, during the PM peak hour.

Table 9 – No Build (2040) I-85 Northbound PM Peak Hour Freeway Density

I-85 Northbound - PM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
South End to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	37.0	E
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	46.0	F
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	44.4	E
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	39.4	E
SC 18 (Shelby Hwy.) Blacksburg Off-Ramp	Basic	2	32.7	D
Blacksburg Off-Ramp	Diverge	2/3	30.7	D
Blacksburg Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	32.5	D
Blacksburg Hwy. On-Ramp	Merge	2/3	34.2	D
Blacksburg Hwy. On-Ramp to SC 5/SC 198 (Mntn. St.) Off-Ramp	Basic	2	32.1	D
SC 5/SC 198 (Mntn. St.) Off-Ramp	Diverge	2	28.7	D
SC 5/SC 198 (Mntn. St.) Off-Ramp to SC 5/SC 198 (Mntn. Rd.)- On-Ramp	Basic	2	33.4	D
SC 5/SC 198 (Mntn. St.) On-Ramp	Merge	2/3	45.2	F
SC 5/SC 198 (Mntn. St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	41.2	E
Tribal Rd. Off-Ramp	Diverge	2/3	26.5	C
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	31.8	D
Tribal Rd. On-Ramp	Merge	2/3	23.7	C
Tribal Rd. On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	30.5	D
US 29 (Cherokee St.) Off-Ramp	Diverge	2/3	27.9	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	30.5	D
US 29 (Cherokee St.) On-Ramp	Merge	2/3	29.4	D
US 29 (Cherokee St.) On-Ramp to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	28.2	D
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	27.7	C
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	26.3	D
NC 216 (Battleground Rd.) On-Ramp to North End	Basic	2	29.9	D

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 10 – No Build (2040) I-85 Southbound PM Peak Hour Freeway Density

I-85 Southbound - PM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
North End to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	24.0	C
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	26.5	C
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	27.9	D
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	25.8	C
NC 216 (Battleground Rd.) On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	25.9	C
US 29 (Cherokee St.) Off-Ramp	Diverge	2	26.9	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	27.4	D
US 29 (Cherokee St.) On-Ramp	Merge	2/3	22.8	C
US 29 (Cherokee St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	2	35.1	E
Tribal Rd. Off-Ramp	Diverge	2/3	26.4	C
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	2	27.5	D
Tribal Rd. On-Ramp	Merge	2/3	24.8	C
Tribal Rd. On-Ramp to Welcome Center Off-Ramp	Basic	2	33.9	D
Welcome Center Off-Ramp	Diverge	2	32.7	D
Welcome Center On-Ramp to Welcome Center On-Ramp	Basic	2	30.1	D
Welcome Center On-Ramp	Merge	2/3	31.9	D
SC 5/SC 198 (Mntn. St) Off-Ramp	Diverge	2/3	32.4	D
SC 5/SC 198 (Mntn. St) Off-Ramp to SC 5/SC 198 (Mntn. St) On-Ramp	Basic	2	36.5	E
SC 5/SC 198 (Mntn. St) On-Ramp	Merge	2/3	30.3	D
SC 5/SC 198 (Mntn. St) On-Ramp to Blacksburg Hwy. Off-Ramp	Basic	2	29.5	D
Blacksburg Hwy. Off-Ramp	Diverge	2	30.1	D
Blacksburg Hwy. Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	2	28.6	D
Blacksburg Hwy. On-Ramp	Merge	2/3	28.0	C
Blacksburg Hwy. On-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	35.5	E
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	42.5	E
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	39.8	E
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	43.9	F
SC 18 (Shelby Hwy.) On-Ramp to South End	Basic	2	33.4	D

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Figures 3 and 4 show graphically the density per-lane in 250 ft. segments along the entire corridor for the northbound and southbound directions during the PM peak hour.

Tables 11 and 12 show the travel times between each interchange for the northbound and southbound directions, respectively, during the PM peak hour.

Table 11 – No Build (2040) I-85 Northbound PM Peak Hour Freeway Travel Times

Segment	I-85 Northbound Travel Time (min)
South End to SC 18 (Shelby Hwy.) Off-Ramp	2.00
SC 18 (Shelby Hwy.) Off-Ramp to Blacksburg Hwy. Off-Ramp	2.96
Blacksburg Hwy. Off-Ramp to SC 5 (Mountain St.) Off-Ramp	1.94
SC 5 (Mountain St.) Off-Ramp to Tribal St. Off-Ramp	2.63
Tribal St. Off-Ramp to US 29 (Cherokee St.) Off-Ramp	2.63
US 29 (Cherokee St.) Off-Ramp to NC 216 (Battleground Ave.) Off-Ramp	3.36
NC 216 (Battleground Ave.) Off-Ramp to North End	1.42
Total Travel Time	16.94

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 12 – No Build (2040) I-85 Southbound PM Peak Hour Freeway Travel Times

Segment	I-85 Southbound Travel Time (min)
North End to NC 216 (Battleground Ave.) Off-Ramp	1.38
NC 216 (Battleground Ave.) Off-Ramp to US 29 (Cherokee St.) Off-Ramp	2.07
US 29 (Cherokee St.) Off-Ramp to Tribal St. Off-Ramp	1.84
Tribal St. Off-Ramp to Welcome Center Driveway	0.98
Welcome Center Driveway to SC 5 (Mountain St.) Off-Ramp	0.91
SC 5 (Mountain St.) Off-Ramp to Blacksburg Hwy. Off-Ramp	2.54
Blacksburg Hwy. Off-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	3.53
SC 18 (Shelby Hwy.) Off-Ramp to South End	1.43
Total Travel Time	14.68

3.2.3 Intersection Operations

Table 13 summarizes the intersection operations throughout the study area.

Table 13 – No Build (2040) PM Peak Hour Intersection Delay and LOS

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
NC 216 @ US 29	U	0.2	A	SC 5 @ Flying J Driveway 1	U	0.8	A
US 29 @ Frontage Rd.	U	1.1	A	SC 5 @ Flying J Driveway 2	U	0.8	A
NC 216 @ AGI Driveway	U	0.1	A	SC 5 @ Waffle House Driveway 1	U	1.5	A
NC 216 @ Misc. Driveway (N. of Pioneer Driveway)	U	0.2	A	SC 5 @ I-85 SB Ramps	S	13.6	B
NC 216 @ Pioneer Driveway	U	0.7	A	SC 5 @ I-85 NB Ramps	S	9.9	A
NC 216 @ I-85 SB Ramps	U	0.6	A	SC 5 @ Driveway	U	0.6	A
NC 216 @ I-85 NB Ramps	U	1.5	A	SC 5 @ Gas Station Driveway	U	0.4	A
NC 216 @ Driveway	U	0.7	A	I-85 SB SC 5 Off-Ramp @ Waffle House Driveway 2	U	6.6	A
I-85 NB NC 216 Off-Ramp @ Banks Rd.	U	1.8	A	I-85 SB SC 5 Off-Ramp @ Truck Pull-Out 2	U	0.8	A
NC 216 @ Dixon School Rd.	U	1.9	A	I-85 SB SC 5 Off-Ramp @ Truck Pull-Out 1	U	2.2	A



I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR NO BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
US 29 @ Wilco Hess Driveway 3	U	2.2	A	I-85 NB SC 5 On-Ramp @ Misc. Driveway	U	0.3	A
US 29 @ Misc. Driveway	U	0.6	A	I-85 SB SC 5 Off-Ramp @ Gas Station Driveway	U	0.3	A
US 29 @ Wilco Hess Driveway 2	U	2.7	A	I-85 NB SC 5 Off-Ramp @ Rock Springs Rd.	U	0.3	A
US 29 @ Wilco Hess Driveway 1	U	0.5	A	I-85 NB SC 5 Off-Ramp @ Misc. Driveway	U	1.6	A
US 29 @ I-85 SB On-Ramp	U	0.6	A	I-85 NB Off-Ramp @ Henson Rd.	U	1.2	A
US 29 @ ABC Store Driveway	U	0.5	A	Blacksburg Hwy. @ Sunoco Driveway 4	U	0.3	A
US 29 @ Exxon Driveway 1	U	0.8	A	Blacksburg Hwy. @ Sunoco Driveway 3	U	0.4	A
US 29 @ I-85 SB Off-Ramp	U	0.7	A	Blacksburg Hwy. @ SB Ramps	U	3.9	A
US 29 @ NB Off-Ramp	U	2.5	A	Blacksburg Hwy. @ NB Ramps	U	3.1	A
US 29 @ I-85 NB On-Ramp	U	1.3	A	I-85 SB Blacksburg Hwy. Off-Ramp @ Sunoco Driveway 2	U	1.5	A
US 29 @ Lakeview Dr.	U	0.1	A	I-85 SB Blacksburg Hwy. Off-Ramp @ Sunoco Driveway 1	U	1.4	A
US 29 @ I-85 NB On-Ramp	U	0.7	A	I-85 Blacksburg Hwy. Off-Ramp @ Misc. Driveway	U	1.6	A
I-85 NB US 29 On-Ramp @ Frontage Rd.	U	4.2	A	I-85 NB Blacksburg Hwy. Off-Ramp @ Milliken Rd.	U	9.4	A
I-85 SB US 29 Off-Ramp @ Exxon Driveway 2	U	2.5	A	Frontage Rd. @ Frontage Rd.	U	1.8	A
I-85 SB US 29 On-Ramp @ Misc. Driveway	U	0.2	A	I-85 SB Blacksburg Hwy. On-Ramp @ Crawford Rd.	U	0.1	A
Tribal Rd. @ I-85 SB Ramps	U	4.5	A	SC 18 @ I-85 SB Ramps	U	3.1	A
Tribal Rd. @ I-85 NB Ramps	U	6.8	A	SC 18 @ I-85 NB Ramps	U	4.8	A
Tribal Rd. @ Driveway 1	U	0.5	A	Shelby Hwy. @ SC 18	U	4.8	A
Tribal Rd. @ Driveway 2	U	6.5	A	Shelby Hwy. @ Kangaroo Driveway 3	U	1.2	A
I-85 NB Tribal Rd. Off-Ramp @ Gas Station Driveway	U	1.3	A	Shelby Hwy. @ Kangaroo Driveway 2	U	1.7	A
I-85 NB Tribal Rd. On-Ramp @ Priestor Rd.	U	3.1	A	Shelby Hwy. @ Kangaroo Driveway 1	U	1.2	A
I-85 SB Tribal Rd. On-Ramp @ SR 11-52	U	1.9	A	Shelby Hwy. @ Wind Hill Rd.	U	1.6	A
State Rd 11-52 @ White Farm Rd.	U	0.8	A	I-85 SB SC 18 On-Ramp @ Lemeul Rd.	U	0.6	A
SC 5 @ White Farm Rd.	U	0.6	A	I-85 SB SC 18 On-Ramp @ Wilcox Ave.	U	2.3	A
SC 5 @ State Rd. 11-52	U	0.7	A				

Legend: U = Unsignalized Intersection, S = Signalized Intersection



3.2.4 PM Peak Hour Operations Summary

Vehicles on I-85 during the PM peak hour experience some delay as a result of the increased traffic demand in 2040. All signalized intersections in the network operate at an overall LOS A, with the exception of one: SC 5 at I-85 Southbound Ramps, which operates at LOS B. Most freeway segments in the network operate at an overall LOS D or better during the PM peak hour, but there are a few areas that operate at LOS E or F.

The traffic demand along I-85 in the year 2040 is expected to approach or exceed capacity in several areas during the PM peak hour. Six segments in both the northbound and southbound directions are expected to operate at LOS E or F. This is mainly due to friction caused by merging and diverging with high volumes of traffic, and limited capacity due to the existing four-lane cross section of I-85

4.0 RECOMMENDED ROADWAY IMPROVEMENTS

The VISSIM Build model includes future year widening of I-85 to 6 lanes and the interchange improvements developed by the design team. Improvements were only recommended for the interchanges within the project limits, which extend from Blacksburg Highway interchange to US 29/Cherokee Street interchange. An annotated map showing the proposed improvements is provided in the Appendix. These improvements include the following:

- Blacksburg Highway (Exit 100)
 - Removed Frontage Road south of the interchange.
 - Removed driveway access along the southbound on and off-ramps.
 - Removed south Sunoco driveway along Blacksburg Highway.
 - Relocated Crawford Road and Simper Road north of the interchange.
- SC 5/Mountain Street (Exit 102)
 - Removed driveway access along the northbound on and off-ramps, southbound on and off-ramps.
 - Relocated Henson Road south of the interchange.
 - Removed the southernmost Flying J driveway and the Waffle House driveway along SC 5/Mountain Street.
 - Relocated Shaman Road to intersect with White Farm Road along SC 5/Mountain Street.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

Recommended Roadway Improvements
January 18, 2017

- Tribal Road (Exit 104)
 - Removed driveway access along the northbound and the south-bound on-ramps.
 - Relocated Priester Road and aligned to intersect with relocated Gibbons Road.
 - Relocated White Farm Road and aligned to intersect with relocated State Road 11-52.
 - Relocated north Atlas Industrial Park driveway along Gibbons Road.
- US 29/Cherokee Street (Exit 106)
 - Removed northbound off-ramp loop and constructed new northbound off-ramp to complete the diamond interchange configuration.
 - Removed driveway access along the north-bound on-ramp, and the south-bound on and off-ramps.
 - Realigned northbound and southbound on-ramps.
 - Extended Lakeview Drive to intersect with Frontage Road.
 - Removed Gas Station Driveway along US 29/Cherokee Street.
 - Removed Mike's Driveway, Exxon, and ABC Store driveways along US 29/Cherokee Street.
 - Relocated Crossover Road.

5.0 DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS

The following sections include the VISSIM simulation results for the Build (2040) AM and PM peak hours. The level of service of each segment was determined using HCM methodology, based on the densities generated in VISSIM.

5.1 AM PEAK HOUR

5.1.1 Network Performance

Table 14 shows a summary of the network-wide MOE's for the Build (2040) conditions.

Table 14 – Build (2040) AM Peak Hour Network Performance Summary

Average Speed (mph)	63.4
Average Delay Time per Vehicle (sec)	52.3

5.1.2 Freeway Operations

This section summarizes the operations along the I-85 mainline using density, level of service, and travel times.

Tables 15 and 16 show the mainline density for I-85 northbound and southbound during the AM peak hour.

Figures 5 and 6 show graphically the density per-lane in 250 ft. segments along the entire corridor for the northbound and southbound directions during the AM peak hour.

Tables 17 and 18 show the travel times between each interchange for the northbound and southbound directions during the AM peak hour.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

Table 15 – Build (2040) I-85 Northbound AM Peak Hour Freeway Density

I-85 Northbound - AM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
South End to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	20.7	C
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	26.2	C
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	25.2	C
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	24.2	C
SC 18 (Shelby Hwy.) On-Ramp to Blacksburg Off-Ramp	Basic	2/3	17.1	B
Blacksburg Off-Ramp	Diverge	3/4	14.2	B
Blacksburg Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	3	11.2	B
Blacksburg Hwy. On-Ramp	Merge	3/4	10.9	B
Blacksburg Hwy. On-Ramp to SC 5/SC 198 (Mntn. St.) Off-Ramp	Basic	3	11.2	B
SC 5/SC 198 (Mntn. St.) Off-Ramp	Diverge	3	13.2	B
SC 5/SC 198 (Mntn. St.) Off-Ramp to SC 5/SC 198 (Mntn. St.) On-Ramp	Basic	3	11.7	B
SC 5/SC 198 (Mntn. St.) On-Ramp	Merge	3/4	11.2	B
SC 5/SC 198 (Mntn. St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	3	10.9	A
Tribal Rd. Off-Ramp	Diverge	3/4	10.0	A
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	3	9.4	A
Tribal Rd. On-Ramp	Merge	3/4	10.5	B
Tribal Rd. On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	3	10.9	A
US 29 (Cherokee St.) Off-Ramp	Diverge	3	14.3	B
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	15.2	B
US 29 (Cherokee St.) On-Ramp	Merge	2/3	14.7	B
US 29 (Cherokee St.) On-Ramp to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	15.3	B
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	16.6	B
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	18.2	C
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	17.4	B
NC 216 (Battleground Rd.) On-Ramp to North End	Basic	2	17.8	B

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

Table 16 – Build (2040) I-85 Southbound AM Peak Hour Freeway Density

I-85 Southbound - AM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
North End to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	13.2	B
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	13.9	B
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	14.1	B
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	14.1	B
NC 216 (Battleground Rd.) On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	13.9	B
US 29 (Cherokee St.) Off-Ramp	Diverge	2	14.2	B
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	14.0	B
US 29 (Cherokee St.) On-Ramp	Merge	3	9.2	A
US 29 (Cherokee St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	3	10.3	A
Tribal Rd. Off-Ramp	Diverge	3/4	9.9	A
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	3	8.2	A
Tribal Rd. On-Ramp	Merge	3/4	8.7	A
Tribal Rd. On-Ramp to Welcome Center Off-Ramp	Basic	3	9.3	A
Welcome Center Off-Ramp	Diverge	3	9.2	A
Welcome Center Off-Ramp to Welcome Center On-Ramp	Basic	3	8.8	A
Welcome Center On-Ramp	Merge	3/4	9.4	A
SC 5/SC 198 (Mntn. St) Off-Ramp	Diverge	3/4	9.6	A
SC 5/SC 198 (Mntn. St) Off-Ramp to SC 5/SC 198 (Mntn. St) On-Ramp	Basic	3	9.5	A
SC 5/SC 198 (Mntn. St) On-Ramp	Merge	3/4	12.6	B
SC 5/SC 198 (Mntn. St) On-Ramp to Blacksburg Hwy. Off-Ramp	Basic	3	11.7	B
Blacksburg Hwy. Off-Ramp	Diverge	3	11.8	B
Blacksburg Hwy. Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	3	10.9	A
Blacksburg Hwy. On-Ramp	Merge	3/4	11.3	B
Blacksburg Hwy. On-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2/3	17.5	B
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	23.8	C
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	22.6	C
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	28.9	D
SC 18 (Shelby Hwy.) On-Ramp to South End	Basic	2	23.0	C

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 17 – Build (2040) I-85 Northbound AM Peak Hour Freeway Travel Times

Segment	I-85 Northbound Travel Time (min)
South End to SC 18 (Shelby Hwy.) Off-Ramp	1.85
SC 18 (Shelby Hwy.) Off-Ramp to Blacksburg Hwy. Off-Ramp	1.82
Blacksburg Hwy. Off-Ramp to SC 5 (Mountain St.) Off-Ramp	1.62
SC 5 (Mountain St.) Off-Ramp to Tribal St. Off-Ramp	2.06
Tribal St. Off-Ramp to US 29 (Cherokee St.) Off-Ramp	1.91
US 29 (Cherokee St.) Off-Ramp to NC 216 (Battleground Ave.) Off-Ramp	3.05
NC 216 (Battleground Ave.) Off-Ramp to North End	1.12
Total Travel Time	13.43

Table 18 – Build (2040) I-85 Southbound AM Peak Hour Freeway Travel Times

Segment	I-85 Southbound Travel Time (min)
North End to NC 216 (Battleground Ave.) Off-Ramp	1.31
NC 216 (Battleground Ave.) Off-Ramp to US 29 (Cherokee St.) Off-Ramp	1.92
US 29 (Cherokee St.) Off-Ramp to Tribal St. Off-Ramp	1.47
Tribal St. Off-Ramp to Welcome Center Driveway	0.78
Welcome Center Driveway to SC 5 (Mountain St.) Off-Ramp	0.70
SC 5 (Mountain St.) Off-Ramp to Blacksburg Hwy. Off-Ramp	2.11
Blacksburg Hwy. Off-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	2.88
SC 18 (Shelby Hwy.) Off-Ramp to South End	1.27
Total Travel Time	12.44

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

5.1.3 Intersection Operations

Table 19 summarizes the intersection operations throughout the study area.

Table 19 – Build (2040) AM Peak Hour Intersection Delay and LOS

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
NC 216 @ US 29	U	0.2	A	Gibbons Rd @ Driveway	U	1.1	A
NC 216 @ Frontage Rd.	U	0.6	A	Tribal Rd. @ Driveway	U	0.3	A
NC 216 @ AGI Driveway	U	0.3	A	SC 5 @ State Rd. 11-52	U	0.6	A
NC 216 @ Misc. Driveway (N. of Pioneer Driveway)	U	0.3	A	SC 5 @ Shaman Rd. & White Farm Rd.	U	1.8	A
NC 216 @ Pioneer Driveway	U	0.2	A	SC 5 @ Flying J Driveway 1	U	0.8	A
NC 216 @ I-85 SB Ramps	U	0.9	A	SC 5 @ Flying J Driveway 2	U	1.3	A
NC 216 @ I-85 NB Ramps	U	1.1	A	SC 5 @ I-85 SB Ramps	S	9.9	A
NC 216 @ Driveway	U	0.1	A	SC 5 @ I-85 NB Ramps	S	6.9	A
I-85 NB NC 216 Off-Ramp @ Banks Rd.	U	1.6	A	SC 5 @ Driveway	U	0.8	A
NC 216 @ Dixon School Rd.	U	1.9	A	SC 5 @ Gas Station Driveway	U	0.8	A
US 29 @ Wilco Hess Driveway 3	U	1.9	A	SC 5 @ Henson Rd.	U	0.2	A
US 29 @ Misc. Driveway	U	0.1	A	Henson Rd. @ Driveway	U	0.0	A
US 29 @ Wilco Hess Driveway 2	U	0.7	A	Blacksburg Hwy. @ Crawford Rd. & Simper Rd.	U	0.5	A
US 29 @ Crossover Rd.	U	1.6	A	Blacksburg Hwy. @ Sunoco Driveway 4	U	0.3	A
US 29 @ I-85 SB Ramps	U	1.7	A	Blacksburg Hwy. @ SB Ramps	U	2.3	A
US 29 @ I-85 NB Ramps	U	2.0	A	Blacksburg Hwy. @ NB Ramps	U	11.0	B
US 29 @ Lakeview Dr.	U	1.5	A	SC 18 @ I-85 SB Ramps	U	3.0	A
Lakeview Dr. @ Driveway 1	U	0.0	A	SC 18 @ I-85 NB Ramps	U	3.3	A
Lakeview Dr. @ Driveway 2	U	0.4	A	Shelby Hwy. @ SC 18	U	3.8	A
Lakeview Dr. @ Frontage Rd.	U	0.0	A	Shelby Hwy. @ Kangaroo Driveway 3	U	0.8	A
Tribal Rd. @ White Farm Rd.	U	0.7	A	Shelby Hwy. @ Kangaroo Driveway 2	U	1.3	A
State Rd 11-52 @ White Farm Rd.	U	1.3	A	Shelby Hwy. @ Kangaroo Driveway 1	U	0.6	A
Tribal Rd. @ I-85 SB Ramps	U	9.5	A	Shelby Hwy. @ Wind Hill Rd.	U	0.2	A
Tribal Rd. @ I-85 NB Ramps	U	3.1	A	I-85 SB SC 18 On-Ramp @ Lemeul Rd.	U	0.6	A
Tribal Rd. @ Gibbons Rd. & Priester Rd.	U	5.9	A	I-85 SB SC 18 On-Ramp @ Wilcox Ave.	U	2.2	A

Legend: U = Unsignalized Intersection, S = Signalized Intersection

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

5.1.4 AM Peak Hour Operations Summary

The tables in the preceding sections show that vehicles on I-85 during the AM Peak hour experience shorter delay than in the No Build scenario. All intersections within the study area operate at LOS A. All freeway segments within the study operate at LOS D or better in the AM peak hour, with the majority at a LOS A or B. In comparison to the No Build, the proposed interchange designs improve the LOS at the intersections of SC 5 @ I-85 southbound and northbound ramps from a C to an A and a B to an A.

5.2 PM PEAK HOUR

5.2.1 Network Performance

Table 20 shows a summary of the network-wide MOE's for the Design Year Build (2040) conditions.

Table 20 – Build (2040) PM Peak Hour Network Performance Summary

Average Speed (mph)	60.1
Average Delay Time per Vehicle (sec)	99.3

5.2.2 Freeway Operations

This section summarizes the operations along the I-85 mainline using density, LOS, and travel times.

Tables 21 and 22 show the Build (2040) mainline density for I-85 northbound and southbound during the PM peak hour.

Figures 7 and 8 show graphically the density per-lane in 250 ft. segments along the entire corridor for the northbound and southbound directions during the AM peak hour.

Tables 23 and 24 show the travel times between each interchange for the northbound and southbound directions, respectively, during the PM peak hour.

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

Table 21 – Build (2040) I-85 Northbound PM Peak Hour Freeway Density

I-85 Northbound - PM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
South End to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2	38.6	E
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	56.3	F
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	45.1	F
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	41.5	E
SC 18 (Shelby Hwy.) On-Ramp to Blacksburg Off-Ramp	Basic	2/3	28.8	D
Blacksburg Off-Ramp	Diverge	3/4	21.4	C
Blacksburg Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	3	19.0	C
Blacksburg Hwy. On-Ramp	Merge	3/4	18.4	B
Blacksburg Hwy. On-Ramp to SC 5/SC 198 (Mntn. St.) Off-Ramp	Basic	3	19.2	C
SC 5/SC 198 (Mntn. St.) Off-Ramp	Diverge	3	23.4	C
SC 5/SC 198 (Mntn. St.) Off-Ramp to SC 5/SC 198 (Mntn. St.) On-Ramp	Basic	3	23.5	C
SC 5/SC 198 (Mntn. St.) On-Ramp	Merge	3/4	19.1	B
SC 5/SC 198 (Mntn. St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	3	18.7	C
Tribal Rd. Off-Ramp	Diverge	3/4	17.0	B
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	3	16.4	B
Tribal Rd. On-Ramp	Merge	3/4	17.8	B
Tribal Rd. On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	3	19.3	C
US 29 (Cherokee St.) Off-Ramp	Diverge	3	26.1	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	28.4	D
US 29 (Cherokee St.) On-Ramp	Merge	2/3	25.9	C
US 29 (Cherokee St.) On-Ramp to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	26.2	D
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	29.5	D
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	33.0	D
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	32.1	D

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 22 – Build (2040) I-85 Southbound PM Peak Hour Freeway Density

I-85 Southbound - PM Peak Hour				
Segment Description	Segment Type	# of Lanes	Density (pcpmpl)	LOS
North End to NC 216 (Battleground Rd.) Off-Ramp	Basic	2	24.7	C
NC 216 (Battleground Rd.) Off-Ramp	Diverge	2	27.1	C
NC 216 (Battleground Rd.) Off-Ramp to NC 216 (Battleground Rd.) On-Ramp	Basic	2	28.6	D
NC 216 (Battleground Rd.) On-Ramp	Merge	2/3	27.7	C
NC 216 (Battleground Rd.) On-Ramp to US 29 (Cherokee St.) Off-Ramp	Basic	2	26.6	D
US 29 (Cherokee St.) Off-Ramp	Diverge	2	27.8	C
US 29 (Cherokee St.) Off-Ramp to US 29 (Cherokee St.) On-Ramp	Basic	2	27.6	D
US 29 (Cherokee St.) On-Ramp	Merge	3	15.8	B
US 29 (Cherokee St.) On-Ramp to Tribal Rd. Off-Ramp	Basic	3	18.4	C
Tribal Rd. Off-Ramp	Diverge	3/4	18.1	B
Tribal Rd. Off-Ramp to Tribal Rd. On-Ramp	Basic	3	17.0	B
Tribal Rd. On-Ramp	Merge	3/4	17.0	B
Tribal Rd. On-Ramp to Welcome Center Off-Ramp	Basic	3	18.3	C
Welcome Center Off-Ramp	Diverge	3	18.7	B
Welcome Center Off-Ramp to Welcome Center On-Ramp	Basic	3	17.9	B
Welcome Center On-Ramp	Merge	3/4	18.6	B
SC 5/SC 198 (Mntn. St) Off-Ramp	Diverge	3/4	20.3	C
SC 5/SC 198 (Mntn. St) Off-Ramp to SC 5/SC 198 (Mntn. St) On-Ramp	Basic	3	20.4	C
SC 5/SC 198 (Mntn. St) On-Ramp	Merge	3/4	19.8	B
SC 5/SC 198 (Mntn. St) On-Ramp to Blacksburg Hwy. Off-Ramp	Basic	3	18.2	C
Blacksburg Hwy. Off-Ramp	Diverge	3	18.9	B
Blacksburg Hwy. Off-Ramp to Blacksburg Hwy. On-Ramp	Basic	3	17.6	B
Blacksburg Hwy. On-Ramp	Merge	3/4	17.8	B
Blacksburg Hwy. On-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	Basic	2/3	31.3	D
SC 18 (Shelby Hwy.) Off-Ramp	Diverge	2/3	47.7	F
SC 18 (Shelby Hwy.) Off-Ramp to SC 18 (Shelby Hwy.) On-Ramp	Basic	2	42.2	E
SC 18 (Shelby Hwy.) On-Ramp	Merge	2/3	46.3	F
SC 18 (Shelby Hwy.) On-Ramp to South End	Basic	2	33.9	D

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS

January 18, 2017

Table 23 – Build (2040) I-85 Northbound PM Peak Hour Freeway Travel Times

Segment	I-85 Northbound Travel Time (min)
South End to SC 18 (Shelby Hwy.) Off-Ramp	2.03
SC 18 (Shelby Hwy.) Off-Ramp to Blacksburg Hwy. Off-Ramp	1.96
Blacksburg Hwy. Off-Ramp to SC 5 (Mountain St.) Off-Ramp	1.78
SC 5 (Mountain St.) Off-Ramp to Tribal St. Off-Ramp	2.26
Tribal St. Off-Ramp to US 29 (Cherokee St.) Off-Ramp	2.02
US 29 (Cherokee St.) Off-Ramp to NC 216 (Battleground Ave.) Off-Ramp	3.23
NC 216 (Battleground Ave.) Off-Ramp to North End	1.45
Total Travel Time	14.73

Table 24 – Build (2040) I-85 Southbound PM Peak Hour Freeway Travel Times

Segment	I-85 Southbound Travel Time (min)
North End to NC 216 (Battleground Ave.) Off-Ramp	1.41
NC 216 (Battleground Ave.) Off-Ramp to US 29 (Cherokee St.) Off-Ramp	2.10
US 29 (Cherokee St.) Off-Ramp to Tribal St. Off-Ramp	1.59
Tribal St. Off-Ramp to Welcome Center Driveway	0.84
Welcome Center Driveway to SC 5 (Mountain St.) Off-Ramp	0.77
SC 5 (Mountain St.) Off-Ramp to Blacksburg Hwy. Off-Ramp	2.26
Blacksburg Hwy. Off-Ramp to SC 18 (Shelby Hwy.) Off-Ramp	3.37
SC 18 (Shelby Hwy.) Off-Ramp to South End	1.44
Total Travel Time	14.73

I-85 CORRIDOR STUDY DRAFT MICROSIMULATION MODEL DESIGN YEAR (2040) ANALYSIS REPORT

DESIGN YEAR BUILD (2040) TRAFFIC CONDITIONS
January 18, 2017

5.2.3 Intersection Operations

Table 25 summarizes the intersection operations throughout the study area.

Table 25 – Build (2040) PM Peak Hour Intersection Delay and LOS

Intersection	Control	Avg. Delay	LOS	Intersection	Control	Avg. Delay	LOS
NC 216 @ US 29	U	0.2	A	Gibbons Rd @ Driveway	U	8.4	A
NC 216 @ Frontage Rd.	U	1.0	A	Tribal Rd. @ Driveway	U	0.4	A
NC 216 @ AGI Driveway	U	0.1	A	SC 5 @ State Rd. 11-52	U	0.4	A
NC 216 @ Misc. Driveway (N. of Pioneer Driveway)	U	0.2	A	SC 5 @ Rock Shaman Rd. & White Farm Rd.	U	0.9	A
NC 216 @ Pioneer Driveway	U	0.6	A	SC 5 @ Flying J Driveway 1	U	1.0	A
NC 216 @ I-85 SB Ramps	U	0.6	A	SC 5 @ Flying J Driveway 2	U	1.9	A
NC 216 @ I-85 NB Ramps	U	1.4	A	SC 5 @ I-85 SB Ramps	S	12.4	B
NC 216 @ Driveway	U	0.7	A	SC 5 @ I-85 NB Ramps	S	7.9	A
I-85 NB NC 216 Off-Ramp @ Banks Rd.	U	1.7	A	SC 5 @ Driveway	U	0.5	A
NC 216 @ Dixon School Rd.	U	2.0	A	SC 5 @ Gas Station Driveway	U	0.6	A
US 29 @ Wilco Hess Driveway 3	U	1.7	A	SC 5 @ Henson Rd.	U	0.2	A
US 29 @ Misc. Driveway	U	0.2	A	Henson Rd. @ Driveway	U	0.0	A
US 29 @ Wilco Hess Driveway 2	U	1.8	A	Blacksburg Hwy. @ Crawford Rd. & Simper Rd.	U	1.2	A
US 29 @ Crossover Rd.	U	1.6	A	Blacksburg Hwy. @ Sunoco Driveway 4	U	0.4	A
US 29 @ I-85 SB Ramps	U	2.8	A	Blacksburg Hwy. @ SB Ramps	U	2.5	A
US 29 @ I-85 NB Ramps	U	2.9	A	Blacksburg Hwy. @ NB Ramps	U	4.6	A
US 29 @ Lakeview Dr.	U	0.3	A	SC 18 @ I-85 SB Ramps	U	2.8	A
Lakeview Dr. @ Driveway 1	U	0.0	A	SC 18 @ I-85 NB Ramps	U	4.8	A
Lakeview Dr. @ Driveway 2	U	0.6	A	Shelby Hwy. @ SC 18	U	3.4	A
Lakeview Dr. @ Frontage Rd.	U	0.0	A	Shelby Hwy. @ Kangaroo Driveway 3	U	1.2	A
Tribal Rd. @ White Farm Rd.	U	0.7	A	Shelby Hwy. @ Kangaroo Driveway 2	U	1.5	A
State Rd 11-52 @ White Farm Rd.	U	1.2	A	Shelby Hwy. @ Kangaroo Driveway 1	U	0.6	A
Tribal Rd. @ I-85 SB Ramps	U	4.0	A	Shelby Hwy. @ Wind Hill Rd.	U	0.2	A
Tribal Rd. @ I-85 NB Ramps	U	3.0	A	I-85 SB SC 18 On-Ramp @ Lemeul Rd.	U	0.7	A
Tribal Rd. @ Gibbons Rd. & Priester Rd.	U	5.0	A	I-85 SB SC 18 On-Ramp @ Wilcox Ave.	U	2.3	A

Legend: U = Unsignalized Intersection, S = Signalized Intersection



Conclusion
January 18, 2017

5.2.4 PM Peak Hour Operations Summary

The tables in the preceding sections show that vehicles on I-85 during the PM Peak hour experience shorter delay than in the No Build scenario. All signalized intersections in the network operate at an overall LOS B or better, with all but one operating at LOS A. All freeway segments in the network operate at an overall LOS D or better during the PM peak hour, with the exception of the SC 18 (Shelby Highway) interchange. The failing freeway segments at this interchange occur at the north and southbound on and off-ramps, which is consistent with the results from the No-Build VISSIM model. This interchange is south of where the widening begins, is not within the limits of construction, and therefore does not improve in level of service. The overall network operations for the build scenario show an overall increase in network speed of nearly 3.5 mph and a 23% reduction in average delay, as compared to the 2040 No Build scenario.

6.0 CONCLUSION

The microsimulation model analyses of future traffic conditions in the year 2040 show that the widening of I-85 to six lanes and the proposed interchange improvements result in an overall improvement in delay and level of service throughout the corridor.

The No Build conditions model reflects high freeway densities at several merge and diverge locations along the corridor. This is mainly due to the high vehicular demand along this 4-lane section.

The Build conditions model reflects improved network operations during the AM and PM peak hours on I-85 northbound and southbound. All intersections in the build model operate at LOS B or better. The proposed widening improves the overall network delay in the AM peak hour by 41 percent and PM peak by 23 percent. Comparing freeway segment LOS throughout the network, almost all the northbound and southbound freeway segments in the AM and PM peak hours improved with the addition of the third lane and the proposed interchange improvements in place.

Figure 1
NO BUILD (2040)
I-85
SOUTHBOUND
AM PEAK HOUR

Density Legend		
Color	Low	High
	0	11
	11	18
	18	26
	26	35
	35	45

Scale		
	1.0	

Speed Legend		
Color	Low	High
	0	6
	6	12
	12	19
	19	25
	25	31
	31	37
	37	50
	50	62
	62	75

Scale		
	1.0	

Density

Speed

Density

Speed

Blacksburg Hwy

Off-Ramp

SC 18 (Shelby Hwy)
On-Ramp

SC 18 (Shelby Hwy)
Off-Ramp

SC 5 / SC 198
(Mountain St.) On-
Ramp

SC 5 / SC 198
(Mountain St.) Off-
Ramp

Welcome Center
On-Ramp

Welcome Center
Off-Ramp

Tribal Road On-Ramp

Tribal Rd. Off-Ramp

Blacksburg Hwy
On-Ramp

Direction of
Travel

NO BUILD (2040)

I-85

SOUTHBOUND

AM PEAK HOUR

Density

Speed

175	17.1		645	62.5	
15.4	18.3		65.6	62.6	
16.2	16.4		66.0	62.6	
12.7	12.9		68.2	60.5	0.0
145	15.5	1.9	69.9	65.6	27.5
125	11.9	2.6	72.7	70.4	60.6
115	8.4	5.4	74.7	74.2	70.2
111	9.3	4.9	74.2	74.6	70.5
115	10.7	3.4	73.6	73.8	67.1
115	11.4		73.3	73.1	
116	11.6		73.1	72.9	
116	11.6		72.8	72.8	
11.7	11.6		72.4	72.6	
11.7	11.7		72.1	72.2	
11.7	11.8		71.8	71.8	
11.7	11.8		71.6	71.6	
11.8	11.8		71.6	71.5	
11.8	11.8		71.4	71.5	
11.8	11.8		71.3	71.5	
11.8	11.8		71.2	71.5	
11.9	11.8		71.3	71.4	
11.9	11.8		71.3	71.3	
120	12.1		70.3	70.8	
11.9	12.7		70.7	71.8	
11.8	12.3		72.6	73.1	
11.8	12.1		73.5	73.8	
11.7	11.9		74.2	74.4	
11.6	11.9		74.7	74.9	
11.6	11.8		75.2	75.4	
11.4	11.6		75.4	75.6	
11.6	11.7		75.4	75.5	
11.6	11.7		75.4	75.5	
11.6	11.7		75.4	75.5	
11.6	11.7		75.5	75.6	
11.6	11.7		75.5	75.6	
11.6	11.7		75.5	75.6	
11.6	11.7		75.5	75.6	
11.6	11.7		75.4	75.5	
11.6	11.7		75.4	75.4	
11.6	11.7		75.4	75.4	
11.6	11.7		75.3	75.5	
11.6	11.7		75.3	75.5	
11.6	11.7		75.4	75.5	
11.7	11.7		75.3	75.5	
11.7	11.7		75.4	75.3	
11.7	11.7		75.3	75.3	
11.6	11.8		75.3	75.3	
11.6	11.8		75.2	75.3	
11.6	11.8		75.1	75.3	
11.7	11.7		75.0	75.3	
11.7	11.8		75.0	75.2	
11.6	11.8		75.0	75.0	
11.6	11.9		75.0	74.9	
11.6	11.9		74.9	74.8	
11.7	11.8		74.8	74.8	
11.7	11.9		74.7	74.8	
11.7	11.9		74.6	74.7	
11.7	11.9		74.5	74.7	
11.8	11.8		74.5	74.7	
11.7	11.8		74.5	74.5	
11.9	11.8		74.3	74.3	
11.9	11.8		74.1	74.1	
120	11.8		73.9	73.8	
120	11.9		73.7	73.5	
120	11.9		73.6	72.9	
11.7	11.7	0.3	73.8	72.5	16.0
11.8	11.9	0.4	73.7	73.2	41.5
11.7	11.7		73.5	73.4	
11.9	11.8		73.2	73.1	
11.9	11.9		73.0	72.9	
11.9	11.9		72.8	72.6	
11.9	12.0		72.5	72.1	
11.9	12.1		72.2	71.9	
11.9	12.1		72.2	72.0	
11.9	12.0		72.4	72.4	
11.9	11.9		72.7	72.9	
11.9	11.8		73.0	73.2	
11.8	11.8		73.3	73.4	
11.8	11.9		73.6	73.7	
11.7	12.0		74.0	74.1	
11.6	11.9		74.5	74.5	
11.6	11.8		75.0	74.9	
11.6	11.6		75.4	75.3	
11.5	11.6		75.8	75.7	
11.4	11.6		76.3	76.1	
11.3	11.5		76.8	76.6	
11.3	11.5		77.2	77.1	
11.1	11.4		77.7	77.6	
11.0	11.4		78.2	78.1	
11.0	11.3		78.5	78.6	
11.0	11.3		78.7	78.8	
11.0	11.2		78.7	78.9	
11.0	11.2		78.8	78.9	
10.9	11.2		78.8	79.0	
10.9	11.2		78.9	79.0	
10.9	11.3		78.9	79.0	
10.9	11.3		79.0	79.1	
10.9	11.2		79.0	79.1	
10.9	11.2		78.9	79.2	
11.0	11.2		78.9	79.2	
10.9	11.2		79.0	79.3	
10.9	11.2		79.1	79.3	
10.9	11.2		79.2	79.3	
10.9	11.2		79.2	79.4	
10.8	11.2		79.3	79.4	
10.8	11.2		79.3	79.4	
10.9	11.2		79.4	79.5	
10.8	11.2		79.4	79.5	
10.8	11.2		79.5	79.6	
10.7	11.3		79.6	79.6	
10.7	11.2		79.6	79.7	
10.7	11.2		79.7	79.8	
10.7	11.2		79.8	79.9	
10.7	11.2		79.9	80.0	
10.7	11.2		79.9	80.0	
10.7	11.2		79.9	80.0	
10.7	11.2		79.8	80.0	
10.8	11.2		79.7	79.9	
10.8	11.2		79.7	79.9	
10.8	11.2		79.7	79.9	
10.0	10.4		79.6	79.7	

US 29 (Cherokee St.)

On-Ramp

US 29 (Cherokee St.)

Off-Ramp

NC 216 (Battleground Rd.)

On-Ramp

NC 216 (Battleground Rd.)

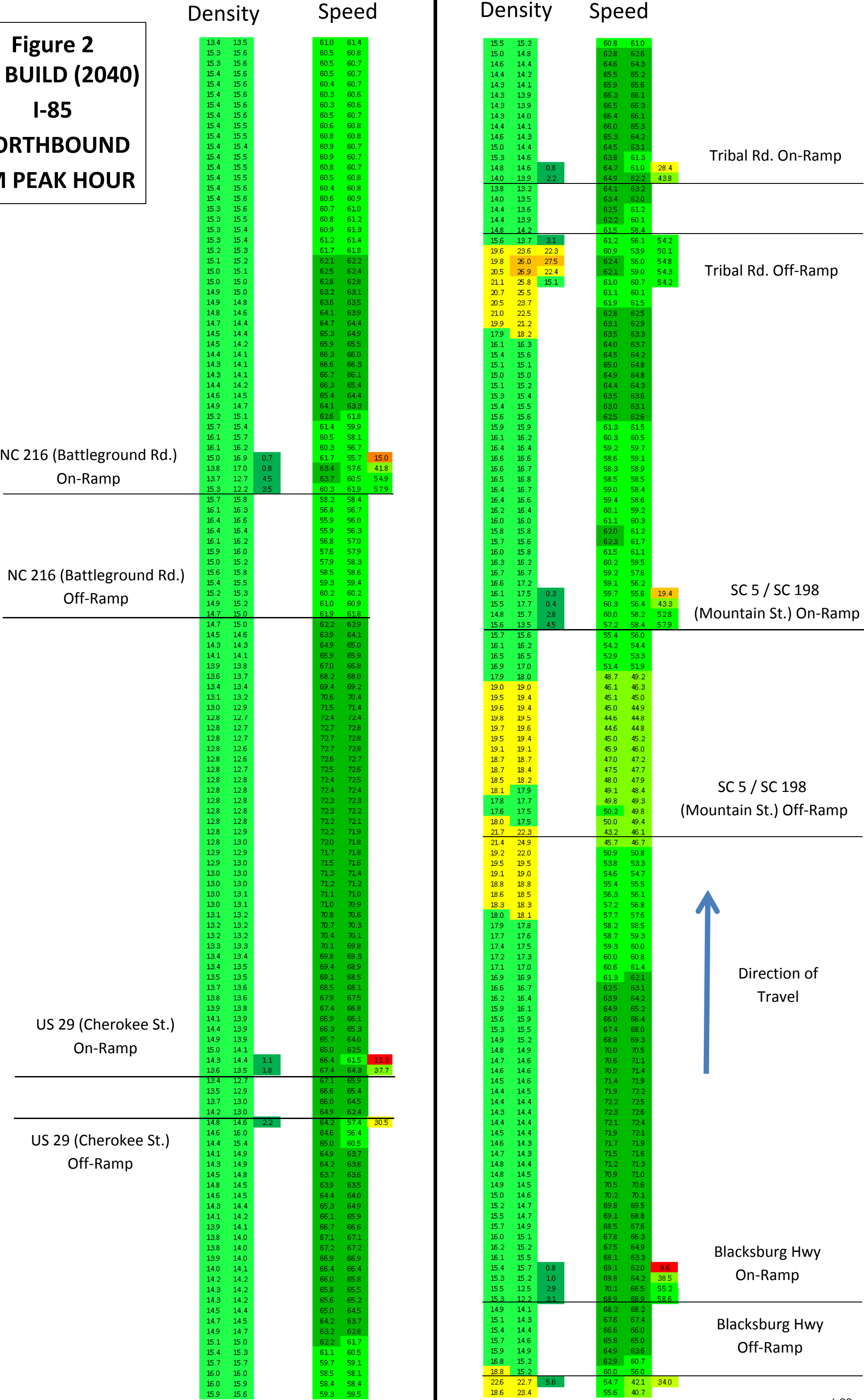
Off-Ramp



Direction of

Travel

Figure 2
NO BUILD (2040)
I-85
NORTHBOUND
AM PEAK HOUR



NO BUILD (2040)

I-85

NORTHBOUND

AM PEAK HOUR

Density

Speed

20.1	24.2		60.3	49.2	
16.8	20.0		66.4	63.1	
16.1	19.1		67.6	67.3	
16.4	18.8		67.4	67.8	
17.5	17.6		67.5	67.7	
17.4	17.5		67.7	68.1	
17.2	17.5		68.2	68.5	
17.1	17.4		68.7	69.0	
16.9	17.2		69.4	69.9	
16.7	17.1		69.9	70.4	
16.7	17.1		70.0	70.6	
16.7	17.0		70.3	70.8	
16.7	16.9		70.4	70.8	
16.7	17.0		70.3	70.7	
16.8	17.1		70.0	70.5	
16.9	17.2		69.5	70.0	
17.0	17.4		68.8	69.4	
17.2	17.4		68.2	68.9	
17.4	17.5		67.8	68.4	
17.5	17.6		67.4	67.9	
17.6	17.6		67.3	67.7	
17.5	17.6		67.6	67.9	
17.3	17.4		68.5	68.7	
17.0	17.2		69.5	69.8	
16.8	16.9		70.4	70.7	
16.6	16.8		71.1	71.5	
16.6	16.5		71.5	71.9	
15.6	15.5	0.0	71.6	72.0	57.3
16.6	16.6	0.0	71.6	71.9	54.8
16.0	15.9		71.7	71.9	
16.6	16.6		71.7	71.8	
16.6	16.7		71.7	71.6	
16.6	16.7		71.5	71.4	
16.7	16.8		71.3	71.1	
16.7	16.8		71.0	70.9	
16.7	16.9		70.9	70.9	
16.7	16.9		70.9	71.0	
16.7	16.8		71.1	71.2	
16.7	16.8		71.2	71.4	
16.7	16.7		71.2	71.4	
16.7	16.7		71.2	71.3	
16.7	16.8		71.2	71.1	
16.7	16.9		71.2	70.9	
16.7	16.9		71.0	70.8	
16.7	17.0		70.7	70.7	
16.8	16.9		70.6	70.7	
16.8	17.0		70.5	70.6	
17.0	17.0		70.2	70.3	
17.1	17.1		69.9	69.9	
17.0	17.1		69.8	69.4	
17.0	17.1		69.6	69.5	
17.0	17.2		69.5	69.3	
17.1	17.2		69.2	69.0	
17.2	17.2		68.8	68.6	
17.3	17.4		68.5	68.2	
17.4	17.5		68.0	67.9	
17.4	17.7		67.5	67.5	
17.7	17.7		66.9	67.1	
17.9	17.7		66.4	66.6	
18.0	17.9		65.8	66.1	
18.1	18.1		65.2	65.5	
18.3	18.3		64.5	64.8	
18.5	18.6		63.7	64.0	
18.8	18.8		62.8	63.1	
19.2	19.1		61.9	62.0	
19.5	19.5		60.7	60.7	
20.0	19.8		59.4	59.5	
20.5	20.2		58.2	58.1	
21.3	20.8		56.5	56.1	
21.4	21.8		55.2	54.4	
20.7	22.8	1.1	55.2	53.2	12.1
20.3	21.1	2.6	54.5	54.2	43.9
20.1	20.0		53.8	54.2	
20.2	20.3		53.5	53.7	
20.4	20.5		53.0	53.2	
20.8	20.7		52.2	52.4	
21.1	21.0		51.5	51.7	
21.6	21.4		50.5	50.6	
22.4	22.3		48.6	48.6	
23.2	23.1		47.1	46.7	
22.2	22.6	4.4	46.6	45.4	51.7
23.5	24.4	3.7	46.7	45.8	53.8
23.6	24.5	1.4	48.5	48.6	48.8
24.0	24.3		50.1	49.4	
23.1	23.2		52.1	51.8	
21.8	21.9		55.1	55.0	
20.9	20.8		57.8	57.7	
20.4	20.3		59.2	58.9	
20.3	20.2		59.7	59.3	
20.0	19.9		60.4	60.0	
19.8	19.9		60.7	60.4	
19.7	19.8		61.0	60.8	
19.6	19.5		61.6	61.5	
19.5	19.1		62.1	62.2	
19.2	19.0		62.7	62.9	
18.9	18.9		63.4	63.6	
18.7	18.7		64.0	64.2	
18.6	18.5		64.8	64.8	
18.4	18.3		65.5	65.3	
18.4	18.1		66.2	65.8	
18.2	17.9		66.8	66.4	
18.0	17.7		67.4	67.0	
17.8	17.5		68.1	67.7	
17.6	17.4		68.7	68.4	
17.5	17.2		69.3	69.0	
17.3	17.1		69.8	69.6	
17.3	16.9		70.4	70.2	
17.1	16.8		71.0	70.8	
17.0	16.6		71.5	71.4	
16.8	16.5		72.1	72.0	
16.6	16.4		72.7	72.6	
16.4	16.4		73.3	73.1	
16.1	16.4		74.0	73.7	
16.1	16.2		74.5	74.3	
16.0	16.1		75.1	74.9	
15.8	15.9		75.7	75.6	
15.6	15.9		76.3	76.2	
15.5	15.7		76.8	76.8	
15.5	15.6		77.3	77.3	
15.4	15.5		77.6	77.7	
15.3	15.5		78.0	78.0	
15.3	15.4		78.3	78.2	
14.1	14.3		78.4	78.3	

Frontage Rd. Off-Ramp

SC 18 (Shelby Hwy)
On-Ramp

SC 18 (Shelby Hwy) Off-Ramp

Direction of
Travel



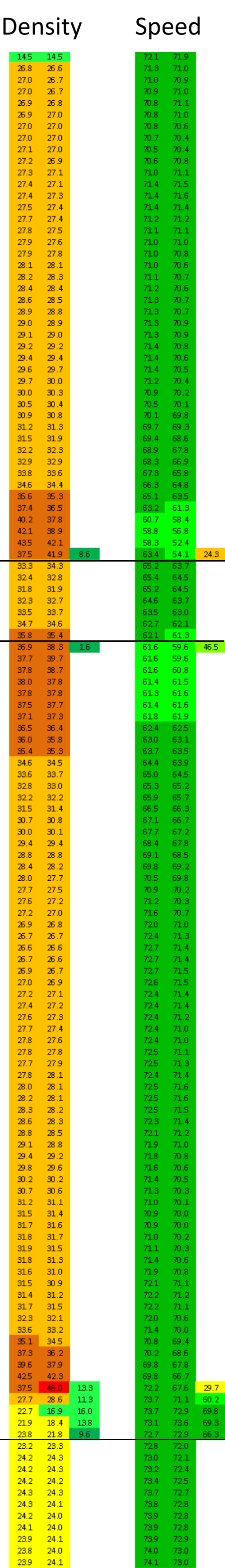
Figure 3
NO BUILD (2040)
I-85
SOUTHBOUND
PM PEAK HOUR

Density Legend		
Color	Low	High
	0	11
	11	18
	18	26
	26	35
	35	45

Scale	
	1.0

Speed Legend		
Color	Low	High
	0	6
	6	12
	12	19
	19	25
	25	31
	31	37
	37	50
	50	62
	62	75

Scale	
	1.0



NO BUILD (2040)

I-85

SOUTHBOUND

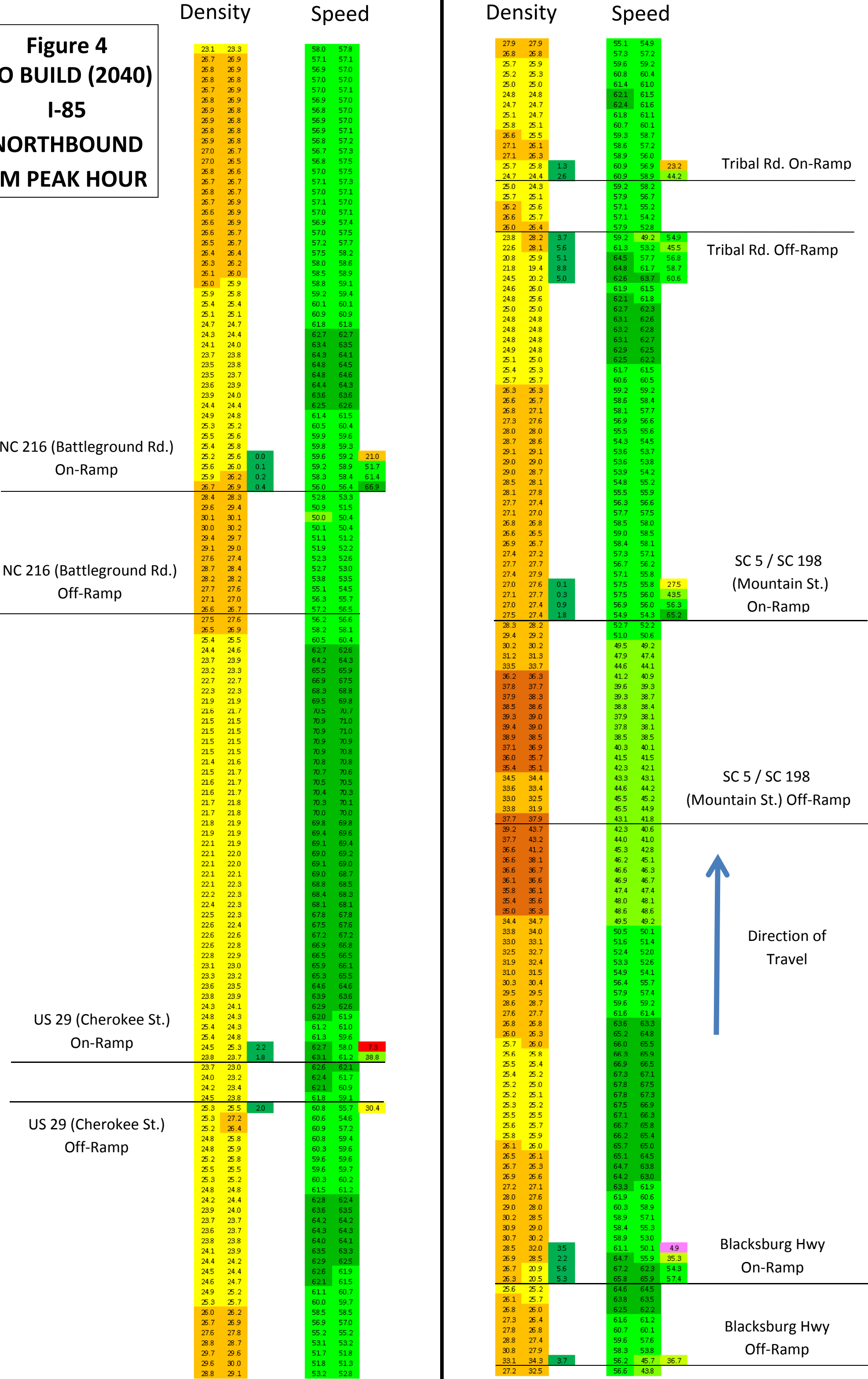
PM PEAK HOUR

Density			Speed			
31.4	29.7		72.6	71.3		US 29 (Cherokee St.) On-Ramp
31.5	29.5		72.9	71.6		
30.9	30.5		73.4	71.5		
22.2	27.9		74.5	70.6		
24.7	29.6	6.0	75.3	72.4	34.7	
19.7	19.6	7.4	76.3	74.4	62.3	
18.2	12.8	12.6	76.5	76.0	70.5	
18.3	14.3	10.9	76.3	76.1	70.2	US 29 (Cherokee St.) Off-Ramp
21.0	18.4	5.1	75.7	75.7	67.0	
21.5	21.8		75.6	75.4		
22.0	22.1		75.5	75.2		
22.3	22.3		75.3	75.0		
22.5	22.6		75.1	74.8		
22.7	22.8		74.8	74.6		
23.0	23.0		74.5	74.3		US 29 (Cherokee St.) Off-Ramp
23.1	23.2		74.4	74.1		
23.2	23.3		74.3	74.0		
23.4	23.4		74.3	73.9		
23.5	23.4		74.2	73.9		
23.5	23.3		74.2	73.9		
23.6	23.2		74.1	73.9		
23.7	23.1		74.1	74.0		US 29 (Cherokee St.) Off-Ramp
24.5	24.4		73.6	73.8		
24.5	25.8		73.9	74.5		
22.6	23.7		75.0	75.2		
22.4	22.5		75.9	75.6		
22.0	22.0		76.4	76.0		
21.8	21.7		76.8	76.5		US 29 (Cherokee St.) Off-Ramp
21.6	21.6		77.3	76.8		
21.3	21.5		77.4	77.0		
21.5	21.7		77.4	77.0		
21.5	21.6		77.4	76.9		
21.5	21.6		77.4	76.9		
21.5	21.6		77.4	76.9		
21.6	21.5		77.4	76.9		US 29 (Cherokee St.) Off-Ramp
21.7	21.5		77.4	76.9		
21.7	21.5		77.3	76.8		
21.7	21.5		77.3	76.8		
21.6	21.6		77.3	76.8		
21.5	21.7		77.3	76.8		
21.5	21.7		77.3	76.8		
21.5	21.7		77.3	76.7		US 29 (Cherokee St.) Off-Ramp
21.6	21.7		77.2	76.7		
21.6	21.7		77.2	76.6		
21.6	21.8		77.2	76.6		
21.7	21.7		77.2	76.7		
21.7	21.8		77.1	76.6		
21.7	21.9		77.1	76.7		
21.7	21.9		77.1	76.6		US 29 (Cherokee St.) Off-Ramp
21.8	22.0		77.1	76.5		
21.9	22.0		77.0	76.4		
22.0	22.0		77.0	76.4		
22.0	22.0		77.0	76.5		
22.1	22.1		76.9	76.5		
22.1	22.2		76.8	76.5		
22.1	22.3		76.8	76.4		US 29 (Cherokee St.) Off-Ramp
22.1	22.4		76.7	76.3		
22.3	22.4		76.7	76.2		
22.5	22.5		76.6	76.1		
22.7	22.7		76.4	76.0		
22.9	22.8		76.2	75.7		
23.1	22.9		76.0	75.5		US 29 (Cherokee St.) Off-Ramp
23.1	22.9		75.8	75.2		
22.9	22.8		75.7	74.6		
22.4	22.4	0.6	75.9	74.3	16.7	
22.9	22.6	0.4	75.9	75.0	44.2	
22.9	22.7		75.8	75.4		
23.2	23.1		75.6	75.2		US 29 (Cherokee St.) Off-Ramp
23.3	23.3		75.5	75.1		
23.5	23.5		75.3	75.0		
23.8	23.7		75.0	74.8		
24.0	23.9		74.6	74.5		
23.9	23.9		74.5	74.4		
23.7	23.7		74.7	74.7		US 29 (Cherokee St.) Off-Ramp
23.3	23.4		75.0	75.1		
23.2	23.1		75.2	75.3		
22.9	23.0		75.4	75.6		
22.8	22.8		75.6	75.8		
22.6	22.6		76.0	76.2		
22.5	22.4		76.4	76.6		US 29 (Cherokee St.) Off-Ramp
22.3	22.2		76.8	76.9		
22.0	22.1		77.2	77.2		
21.7	21.8		77.5	77.6		
21.5	21.7		77.9	77.9		
21.3	21.5		78.3	78.2		
21.1	21.2		78.6	78.6		US 29 (Cherokee St.) Off-Ramp
20.9	21.0		79.0	79.0		
20.7	20.7		79.4	79.4		
20.5	20.6		79.8	79.8		
20.5	20.6		79.9	80.0		
20.5	20.6		79.9	80.0		
20.4	20.6		79.9	80.1		US 29 (Cherokee St.) Off-Ramp
20.3	20.6		80.0	80.1		
20.3	20.6		80.0	80.1		
20.3	20.6		80.1	80.1		
20.3	20.5		80.1	80.1		
20.3	20.5		80.1	80.2		
20.2	20.5		80.1	80.2		
20.2	20.4		80.2	80.3		US 29 (Cherokee St.) Off-Ramp
20.2	20.3		80.2	80.3		
20.2	20.3		80.2	80.3		
20.2	20.2		80.2	80.3		
20.1	20.3		80.2	80.3		
20.0	20.3		80.2	80.3		
19.9	20.2		80.2	80.4		US 29 (Cherokee St.) Off-Ramp
19.9	20.2		80.2	80.4		
19.9	20.1		80.2	80.4		
19.9	20.0		80.3	80.4		
19.9	19.9		80.3	80.5		
19.8	19.9		80.3	80.5		
19.7	19.8		80.3	80.5		US 29 (Cherokee St.) Off-Ramp
19.7	19.8		80.4	80.6		
19.6	19.7		80.4	80.6		
19.6	19.6		80.5	80.6		
19.6	19.6		80.5	80.6		
19.6	19.6		80.4	80.6		
19.6	19.6		80.3	80.6		
19.6	19.6		80.3	80.5		US 29 (Cherokee St.) Off-Ramp
19.6	19.5		80.3	80.5		
18.2	18.3		80.1	80.3		



Direction of
Travel

Figure 4
NO BUILD (2040)
I-85
NORTHBOUND
PM PEAK HOUR



NO BUILD (2040)

I-85

NORTHBOUND

PM PEAK HOUR

Density

Speed

30.8	35.3		59.6	50.0
28.0	30.8		63.1	59.7
27.3	29.8		63.6	62.4
27.5	29.3		63.3	63.1
28.2	28.4		63.3	63.5
28.2	28.2		63.4	63.9
27.9	28.0		64.0	64.4
27.6	27.8		64.7	64.9
27.2	27.4		65.7	65.9
26.9	27.0		66.3	66.7
26.9	26.9		66.6	66.9
26.8	26.7		66.8	67.1
26.7	26.8		67.1	67.1
26.8	26.9		67.0	66.7
26.9	27.2		66.5	66.2
27.1	27.4		65.9	65.6
27.5	27.8		65.0	64.9
27.8	28.0		64.1	64.4
28.2	28.1		63.4	64.0
28.4	28.3		62.9	63.6
28.4	28.3		62.8	63.5
28.2	28.1		63.4	64.0
27.7	27.7		64.3	65.0
27.2	27.2		65.6	66.3
26.6	26.7		67.0	67.5
26.2	26.2		68.3	68.6
25.8	25.9		69.1	69.2
24.3	24.2	0.2	69.2	69.2
26.0	26.0	0.1	69.0	68.8
25.1	25.2		68.8	68.5
26.1	26.2		68.8	68.7
26.2	26.1		68.7	68.9
26.3	26.1		68.4	68.8
26.3	26.3		68.2	68.6
26.4	26.4		68.1	68.3
26.5	26.4		68.0	68.1
26.5	26.4		67.9	68.1
26.4	26.4		67.9	68.2
26.5	26.4		67.9	68.2
26.5	26.3		67.9	68.2
26.5	26.4		67.9	68.0
26.5	26.5		67.8	67.8
26.5	26.5		67.8	67.7
26.4	26.5		68.0	67.9
26.2	26.4		68.2	68.4
26.2	26.3		68.2	68.6
26.3	26.3		68.1	68.5
26.4	26.3		67.9	68.1
26.6	26.5		67.6	67.6
26.7	26.8		67.0	66.8
26.9	26.9		66.4	66.5
27.0	27.0		66.1	66.3
27.2	27.2		65.5	66.0
27.4	27.4		65.1	65.4
27.7	27.7		64.6	64.8
27.9	27.9		64.1	64.2
28.2	28.1		63.4	63.8
28.5	28.3		62.7	63.2
28.9	28.6		62.0	62.4
29.2	29.0		61.4	61.5
29.5	29.4		60.7	60.6
29.9	29.9		59.9	59.8
30.3	30.4		58.9	58.8
30.9	30.9		58.0	57.8
31.6	31.6		56.7	56.5
32.7	32.7		54.7	54.6
33.8	33.7		53.0	53.0
34.9	34.8		51.5	51.1
36.2	36.0		50.0	48.9
36.5	37.6		49.2	47.3
35.7	39.1	2.1	49.3	46.1
34.9	36.4	3.5	48.9	47.4
34.9	35.3		47.8	47.6
35.1	35.1		47.6	47.9
35.1	35.1		47.5	47.8
35.8	35.7		46.7	47.0
36.6	36.5		45.7	45.9
37.9	37.9		44.1	44.3
41.3	40.7		40.7	41.0
44.6	43.9		37.9	37.9
43.3	43.6	6.5	37.2	36.4
46.8	47.8	5.8	36.6	35.8
47.5	48.8	3.0	37.3	36.8
51.7	53.1		36.0	35.2
50.6	50.3		37.2	37.1
45.8	46.0		41.0	40.7
41.9	42.5		44.6	44.0
40.2	40.4		46.4	46.2
39.4	39.6		47.3	47.1
38.6	38.4		48.2	48.4
38.3	38.0		48.5	49.0
38.2	37.8		48.8	49.2
37.8	37.6		49.5	49.4
37.2	37.2		50.3	50.1
36.7	36.7		50.9	50.8
36.2	36.3		51.5	51.5
35.7	35.9		52.2	52.2
35.3	35.5		52.8	52.7
34.8	35.3		53.4	53.1
34.7	34.6		53.8	53.8
34.3	34.3		54.4	54.3
34.0	33.9		55.0	55.0
33.8	33.7		55.4	55.4
33.7	33.4		56.0	55.8
33.3	33.3		56.7	56.4
32.5	32.4		57.9	57.7
31.8	31.5		59.1	58.9
31.3	31.1		59.7	59.8
30.9	30.6		60.6	60.8
30.6	29.9		61.6	61.8
30.0	29.4		62.9	62.9
29.4	28.8		64.2	64.2
28.7	28.2		65.7	65.5
28.1	28.0		66.7	66.5
27.7	27.5		67.8	67.6
27.4	27.1		68.8	68.7
26.9	26.6		69.9	69.9
26.2	25.9		71.3	71.5
25.5	25.3		72.9	73.1
25.0	25.0		74.2	74.1
24.7	24.7		74.9	75.0
24.5	24.5		75.4	75.7
22.6	22.7		76.3	76.3

Frontage Rd. Off-Ramp

SC 18 (Shelby Hwy)
On-Ramp

SC 18 (Shelby Hwy)
Off-Ramp



Direction of
Travel

BUILD (2040)

I-85

SOUTHBOUND

AM PEAK

HOUR

Density

Speed

9.7	9.4	6.4	73.0	73.0	72.1	US 29 (Cherokee St.) On-Ramp
9.7	9.3	6.1	73.7	73.8	72.7	
9.1	8.7	5.6	74.1	74.1	73.1	
9.7	9.4	5.8	74.4	74.4	73.2	
6.5	6.2	3.8	74.7	74.6	73.2	
9.8	9.4	5.7	74.9	74.9	73.2	
9.9	9.4	5.5	75.3	75.2	73.0	
9.9	9.5	5.4	75.3	75.2	72.3	
10.2	9.4	5.4	74.9	74.8	70.7	US 29 (Cherokee St.) Off-Ramp
10.7	9.7	5.0	74.2	74.2	67.8	
11.5	11.3		72.9	72.8		
11.7	11.6		72.7	72.5		
11.7	11.8		72.3	72.1		
11.7	11.9		71.9	71.7		
11.8	11.9		71.5	71.4		
11.9	11.9		71.2	71.3		
11.9	11.9		71.1	71.4		US 29 (Cherokee St.) Off-Ramp
11.9	11.8		71.1	71.5		
11.9	11.8		71.2	71.4		
12.0	11.7		71.3	71.4		
12.0	11.7		71.3	71.4		
12.0	11.6		71.4	71.5		
12.0	11.6		71.6	71.6		
12.0	11.7		71.6	71.4		
12.2	12.6		70.0	71.2		NC 216 (Battleground Rd.) On-Ramp
11.7	12.5		72.9	73.3		
11.8	12.0		74.2	74.2		
11.8	11.7		74.9	74.8		
11.8	11.7		75.4	75.2		
11.6	11.6		75.7	75.4		
11.7	11.6		75.6	75.4		
11.8	11.6		75.5	75.5		
11.8	11.6		75.5	75.5		
11.8	11.6		75.6	75.5		
11.8	11.6		75.6	75.5		
11.8	11.6		75.6	75.6		
11.8	11.6		75.6	75.6		
11.7	11.6		75.5	75.6		
11.7	11.7		75.5	75.6		
11.7	11.7		75.5	75.6		
11.7	11.7		75.5	75.5		
11.7	11.7		75.6	75.5		
11.7	11.7		75.6	75.4		
11.7	11.7		75.5	75.4		
11.7	11.7		75.5	75.3		
11.7	11.8		75.4	75.3		
11.7	11.7		75.3	75.3		
11.7	11.7		75.3	75.3		
11.7	11.7		75.2	75.3		
11.7	11.7		75.1	75.3		
11.7	11.7		75.1	75.3		
11.8	11.7		75.1	75.2		
11.8	11.7		75.1	75.1		
11.7	11.7		75.0	75.1		
11.7	11.7		75.0	75.0		
11.7	11.8		75.0	74.9		
11.7	11.8		75.0	74.8		
11.8	11.7		74.9	74.7		
11.8	11.8		74.8	74.5		
11.9	11.7		74.5	74.3		
12.0	11.7		74.3	74.1		
12.1	11.7		74.2	73.8		
12.3	11.6		73.9	73.5		
12.2	11.7		73.9	72.9		
11.9	11.6	0.3	74.1	72.6	15.4	
12.0	11.7	0.3	74.0	73.2	43.8	
11.9	11.6		73.8	73.5		NC 216 (Battleground Rd.) Off-Ramp
12.0	11.7		73.5	73.2		
11.9	11.8		73.3	73.0		
12.0	11.8		73.1	72.7		
12.0	11.9		72.8	72.3		
12.0	12.0		72.4	72.1		
12.0	12.0		72.4	72.1		
12.0	12.0		72.6	72.5		
11.9	11.9		72.9	72.8		Direction of Travel
11.8	11.9		73.2	73.1		
11.8	11.8		73.4	73.3		
11.8	11.9		73.8	73.7		
11.7	12.0		74.2	74.2		
11.7	11.8		74.6	74.6		
11.7	11.7		75.1	75.0		
11.7	11.6		75.5	75.3		
11.7	11.5		75.8	75.8		
11.6	11.4		76.2	76.2		
11.5	11.4		76.6	76.6		
11.4	11.4		77.1	77.1		
11.3	11.3		77.6	77.5		
11.2	11.3		78.1	78.0		
11.2	11.2		78.5	78.4		
11.1	11.2		78.7	78.5		
11.1	11.2		78.7	78.6		
11.1	11.1		78.8	78.6		
11.1	11.2		78.8	78.7		
11.1	11.2		78.9	78.7		
11.1	11.1		78.9	78.8		
11.1	11.1		79.0	78.9		
11.1	11.1		79.0	78.9		
11.1	11.1		79.1	78.9		
11.1	11.0		79.1	79.1		
11.1	11.0		79.2	79.1		
11.1	11.0		79.3	79.2		
11.1	11.0		79.3	79.2		
11.0	11.1		79.4	79.3		
11.0	11.1		79.4	79.4		
11.0	11.1		79.5	79.4		
11.0	11.1		79.5	79.4		
10.9	11.1		79.6	79.5		
10.9	11.1		79.6	79.5		
10.9	11.1		79.7	79.6		
10.9	11.1		79.7	79.7		
10.9	11.1		79.8	79.8		
10.9	11.1		79.8	79.9		
10.9	11.1		79.9	80.0		
10.8	11.1		80.0	80.0		
10.8	11.1		80.0	80.0		
10.8	11.2		80.0	80.0		
10.8	11.2		79.9	79.9		
10.8	11.2		79.8	79.9		
10.8	11.2		79.8	79.8		
10.8	11.2		79.8	79.8		
10.1	10.4		79.6	79.6		

Figure 6
BUILD (2040)
I-85
NORTHBOUND
AM PEAK HOUR

Density			Speed		
13.4	13.4		62.0	62.3	
15.4	15.4		61.5	61.5	
15.3	15.5		61.5	61.4	
15.3	15.4		61.5	61.6	
15.3	15.5		61.6	61.6	
15.3	15.5		61.5	61.7	
15.3	15.5		61.5	61.6	
15.4	15.4		61.5	61.7	
15.5	15.3		61.4	61.7	
15.4	15.4		61.5	61.6	
15.4	15.4		61.7	61.7	
15.3	15.4		61.8	61.7	
15.3	15.3		61.9	61.9	
15.3	15.3		61.9	62.0	
15.3	15.3		62.0	62.0	
15.3	15.2		62.1	61.9	
15.3	15.2		62.0	61.9	
15.4	15.2		61.9	61.9	
15.4	15.2		61.9	61.9	
15.2	15.2		62.1	62.1	
15.1	15.2		62.4	62.5	
15.1	15.0		62.8	62.9	
14.9	15.0		63.3	63.3	
14.8	14.8		63.9	63.6	
14.7	14.7		64.4	64.1	
14.7	14.5		64.6	64.5	
14.6	14.5		65.0	64.9	
14.5	14.4		65.5	65.3	
14.4	14.3		66.1	65.8	
14.3	14.1		66.8	66.3	
14.2	14.0		67.4	66.7	
14.1	14.0		67.7	66.9	
14.2	14.0		67.5	66.8	
14.4	14.1		66.9	66.3	
14.7	14.2		66.0	65.4	
14.9	14.4		65.1	64.3	
15.3	14.6		64.0	62.8	
15.6	15.0		62.9	61.1	
15.9	15.3		62.1	59.4	
15.9	15.8		61.7	57.6	
15.0	16.7	0.8	62.7	56.0	10.6
13.9	16.6	0.9	64.9	58.0	42.3
13.9	12.2	4.3	65.3	61.4	55.7
15.2	12.0	3.2	62.1	62.7	59.0
15.4	15.4		60.2	59.6	
15.8	15.8		58.8	58.3	
16.1	16.1		58.0	57.4	
16.0	16.0		58.1	57.7	
15.6	15.9		59.1	58.6	
15.3	15.6		60.1	59.8	
14.6	14.7		60.5	60.5	
15.1	15.3		60.9	61.0	
14.9	15.1		61.8	62.0	
14.8	14.8		62.6	62.8	
14.6	14.7		63.4	63.6	
14.4	14.6		64.1	64.3	
14.4	14.6		64.6	65.2	
14.1	14.3		66.0	66.2	
14.0	14.0		67.1	67.0	
13.8	13.9		68.0	67.8	
13.6	13.8		68.8	68.6	
13.3	13.6		69.6	69.6	
13.2	13.3		70.7	70.7	
13.0	13.1		71.8	71.7	
12.8	12.9		72.8	72.7	
12.6	12.8		73.7	73.6	
12.6	12.7		74.1	73.9	
12.6	12.7		74.0	73.9	
12.6	12.7		74.0	73.8	
12.6	12.7		74.0	73.8	
12.6	12.8		73.9	73.7	
12.7	12.7		73.9	73.7	
12.7	12.7		73.9	73.6	
12.7	12.8		73.9	73.5	
12.7	12.8		73.8	73.4	
12.7	12.8		73.7	73.4	
12.8	12.8		73.7	73.4	
12.8	12.8		73.8	73.4	
12.8	12.8		73.7	73.2	
12.9	12.8		73.6	73.1	
12.9	12.8		73.5	73.0	
12.9	12.8		73.3	72.9	
13.0	12.8		73.1	72.9	
13.1	12.8		73.1	72.7	
13.0	12.8		73.0	72.5	
13.0	12.9		72.9	72.2	
13.0	13.0		72.8	71.9	
13.0	13.1		72.6	71.7	
13.2	13.0		72.2	71.6	
13.2	13.0		71.9	71.3	
13.4	13.1		71.5	70.9	
13.4	13.2		71.0	70.2	
12.7	14.1	0.5	71.3	67.4	27.2
12.0	13.9	1.0	72.7	68.6	56.1
12.4	10.1	3.9	72.6	71.8	64.8
12.2	11.8	2.3	71.8	72.0	58.9
12.3	12.6		71.5	71.3	
12.4	12.6		71.3	71.1	
12.4	12.7		71.0	70.8	
12.5	12.7		70.8	70.6	
12.4	12.8		70.5	70.2	
12.5	12.9		70.1	69.8	
12.5	12.8		69.8	69.6	
12.7	12.9		69.6	69.4	
12.7	13.0		69.3	69.2	
12.8	13.2		68.9	68.8	
12.8	13.3		68.6	68.3	
12.7	13.5		68.4	68.0	
12.4	13.6	1.1	68.7	68.1	70.5
11.9	13.4	1.2	69.9	69.5	71.9
11.6	13.3	1.3	70.6	70.6	72.8
11.1	13.1	1.5	71.4	71.4	74.2
10.6	12.8	1.5	71.8	71.7	74.4
10.7	13.3	1.7	72.0	71.8	74.0
10.0	13.3	2.2	72.1	72.2	72.2
8.9	12.7	2.4	72.0	72.5	71.2
9.1	13.5	3.1	72.2	72.7	70.6
9.0	13.0	3.7	72.1	73.1	70.2
9.0	9.5	7.1	72.2	72.6	72.1
8.9	9.0	7.8	72.0	72.6	71.4
8.9	9.3	7.7	71.7	71.9	71.0
9.1	9.3	7.7	71.2	71.2	70.6
9.2	9.4	7.8	70.6	70.6	69.9
9.3	9.5	7.9	70.0	70.1	69.1
9.4	9.6	8.0	69.2	69.4	68.2
9.6	9.7	8.0	68.4	68.7	67.1
9.7	9.7	8.0	68.2	68.4	66.6
9.5	9.8	8.0	68.7	68.7	66.8
9.3	9.8	7.8	69.3	69.3	67.7
9.2	9.7	7.7	70.4	70.5	68.8
9.1	9.5	7.5	71.5	71.7	70.2

Density				Speed			
8.9	9.3	7.3		72.0	72.4	70.7	
9.0	9.5	7.4		72.2	72.6	70.7	
9.0	9.6	7.3		72.4	72.8	70.5	
8.9	9.5	7.4		72.8	73.1	70.1	
8.8	9.4	7.3		72.7	72.9	69.5	
9.0	9.7	7.5		72.1	72.3	68.5	
9.3	9.8	7.6		71.3	71.4	66.9	
9.4	10.1	7.6		70.2	70.1	65.2	
8.9	10.3	8.9		71.5	68.7	58.7	
8.2	8.8	8.6	5.1	73.5	73.7	59.3	15.9
8.1	8.8	6.5		73.8	74.3	72.6	
7.9	8.7	6.7		73.7	74.4	73.1	
7.9	8.6	6.8		73.5	74.2	72.9	
8.0	8.7	6.9		73.3	74.0	72.6	
8.0	8.7	6.8		73.1	73.9	72.4	
8.0	8.8	6.9		72.8	73.6	72.2	
8.0	8.7	6.9		72.6	73.4	71.8	
8.0	8.7	7.1		72.5	72.4	69.9	72.1
8.1	8.7	7.2	2.7	72.6	72.7	70.7	73.2
8.1	8.7	7.2	2.6	72.6	72.8	71.0	73.6
8.1	8.8	8.8	0.9	72.6	72.8	72.0	71.3
8.0	8.9	9.5		72.6	73.0	72.2	
8.1	9.0	9.4		72.5	73.2	72.5	
8.1	9.8	8.6		72.4	73.6	72.3	
8.1	10.1	8.2		72.5	73.7	72.4	
8.3	9.9	8.1		72.7	73.8	72.6	
8.8	9.4	8.1		73.0	73.6	72.7	
8.8	9.4	8.1		73.1	73.6	72.6	
8.9	9.4	8.2		72.9	73.3	72.4	
8.9	9.4	8.2		72.4	72.9	71.9	
9.0	9.5	8.2		71.9	72.4	71.5	
9.1	9.5	8.3		71.5	71.7	71.0	
9.0	9.6	8.4		71.4	71.3	70.7	
9.1	9.6	8.5		71.1	71.0	70.4	
9.1	9.7	8.6		70.5	70.4	69.7	
9.2	9.8	8.7		69.8	69.9	68.9	
9.2	10.0	8.8		68.9	69.3	68.1	
9.3	9.9	9.0		68.3	68.8	67.7	
9.4	9.8	9.0		68.0	68.7	67.9	
9.5	9.8	9.0		67.9	68.5	68.1	
9.4	9.9	9.0		68.0	68.3	68.0	
9.3	9.9	9.0		68.2	68.4	68.0	
9.3	9.8	9.1		68.4	68.8	68.3	
9.2	9.7	9.0		69.0	69.3	69.0	
9.1	9.6	9.0		69.6	69.9	69.6	
9.0	9.5	8.9		70.1	70.4	70.1	
9.1	9.6	8.8		69.9	70.1	69.9	
9.3	9.6	8.9		69.1	69.3	69.1	
9.3	9.7	9.2		68.5	68.5	68.0	
9.1	10.0	9.5		68.3	67.7	66.6	
8.9	9.9	9.9	0.1	68.0	67.6	65.7	13.2
8.7	9.8	10.2	0.2	67.5	67.5	65.4	45.5
8.7	9.6	9.8	1.3	66.3	67.0	65.5	56.2
8.9	9.4	8.4	2.9	64.7	65.3	65.5	62.4
9.0	9.3	8.6		63.8	64.0	64.3	
9.2	9.5	8.8		62.8	62.9	63.0	
9.4	9.5	9.1		62.0	62.1	62.0	
9.5	9.7	9.2		61.1	61.0	61.2	
9.8	10.0	9.5		59.3	59.2	59.1	
10.1	10.5	9.7		57.1	57.2	57.0	
10.4	10.7	9.9		55.8	56.4	55.9	
10.4	10.7	9.9		56.1	56.5	55.6	
10.4	10.8	9.7		56.2	56.4	56.0	
10.4	10.7	9.7		56.3	56.7	56.1	
10.4	10.6	9.7		56.8	57.0	56.0	
10.2	10.5	9.5		57.5	57.5	56.7	
10.1	10.4	9.2		58.5	58.3	57.9	
10.0	10.4	9.1		58.9	58.8	58.4	
10.0	10.3	9.0		59.1	59.4	58.8	
9.9	10.2	8.8		59.9	60.2	59.1	
9.8	10.1	8.7		60.8	60.7	59.8	
10.0	9.9	8.4		61.1	61.3	60.5	
10.1	9.9	8.1		61.4	61.5	61.0	
10.5	10.8	11.0		60.3	57.4	59.8	
10.2	10.4	13.2		62.4	60.4	61.5	
10.0	10.5	12.3		63.6	62.5	63.2	
9.7	12.1	10.4		64.3	64.8	63.7	
9.7	12.2	10.0		64.5	65.8	64.4	
10.2	11.7	9.8		65.1	66.0	65.3	
10.7	11.1	9.7		65.7	66.2	65.9	
10.6	11.0	9.6		66.2	66.8	66.4	
10.6	10.9	9.4		66.3	67.4	67.0	
10.5	10.9	9.3		66.8	68.1	67.5	
10.2	10.9	9.3		67.4	68.5	67.9	
10.1	10.9	9.3		67.9	69.1	68.3	
10.0	10.8	9.2		68.2	69.7	68.9	
9.9	10.8	9.1		68.4	69.8	69.3	
9.8	10.8	9.0		68.8	70.2	69.7	
9.8	10.7	8.9		69.4	71.0	70.4	
9.7	10.7	8.7		70.2	71.6	71.0	
9.5	10.7	8.6		70.9	72.2	71.5	
9.5	10.6	8.5		71.5	73.0	72.2	
9.3	10.5	8.3		72.5	73.9	73.2	
9.2	10.4	8.2		73.4	74.8	74.3	
9.1	10.3	8.1		74.3	75.7	75.3	
8.6	9.8	7.7		74.7	76.2	75.7	
8.9	10.2	8.1		74.9	76.4	75.9	
8.9	10.1	8.0		75.2	76.7	76.2	
8.8	10.2	7.9		75.5	76.9	76.5	
8.8	10.1	7.9		75.8	77.1	76.8	
8.9	10.0	7.9		75.9	77.2	76.8	
8.9	10.1	7.9		75.8	77.1	76.8	
8.9	10.1	7.9		75.8	77.0	76.7	
8.9	10.1	7.9		75.7	76.9	76.6	
9.0	10.1	7.8		75.6	76.8	76.5	
9.1	10.1	7.8		75.5	76.7	76.4	
9.2	10.1	7.8		75.4	76.6	76.3	
9.2	10.1	7.8		75.3	76.4	76.2	
9.2	10.2	7.8		75.2	76.3	76.0	
9.2	10.2	7.8		75.0	76.1	75.7	
9.3	10.3	7.8		74.8	75.9	75.4	
9.4	10.3	7.7		74.6	75.6	75.0	
9.5	10.4	7.7		74.3	75.3	74.6	
9.5	10.5	7.8		74.1	75.0	73.6	
9.3	10.7	7.9		74.3	74.8	72.1	
9.0	10.4	8.1	0.2	74.4	75.2	70.6	11.8
9.1	10.5	8.1	0.4	74.2	75.3	71.3	41.4
9.2	10.4	7.3	1.2	74.0	75.2	72.2	56.9
9.2	10.2	6.9	1.7	73.7	74.7	73.8	61.0
9.2	10.1	7.1		73.4	74.3	73.8	
9.3	10.2	7.2		72.9	74.0	73.2	
9.4	10.4	7.2		72.2	73.4	72.1	
9.5	10.5	7.1		71.7	72.9	71.3	
9.8	10.6	7.0		71.1	72.4	70.4	
10.4	10.7	6.8		70.0	71.3	68.6	
11.0	11.3	6.4		68.6	69.3	65.6	
10.7	13.0	12.8	4.9	68.4	64.1	45.8	35.8
8.5	10.6	14.4		69.7	66.2	44.0	
9.9	12.1	14.7		71.0	69.3	54.7	
9.4	10.9	12.7		71.7	71.9	69.5	
9.3	10.8	12.3		71.6	72.5	73.4	
Tribal Rd. On-Ramp							
Tribal Rd. Off-Ramp							
SC 5 / SC 198 (Mountain St.) On-Ramp							
SC 5 / SC 198 (Mountain St.) Off-Ramp							
Direction of Travel							
Blacksburg Hwy On-Ramp							
Blacksburg Hwy Off-Ramp							
6.37							

BUILD (2040)

I-85

NORTHBOUND

AM PEAK

HOUR

Density

Speed

9.4	11.1	11.9	71.2	72.3	73.6
9.5	12.7	10.2	71.0	72.9	73.2
9.6	12.6	10.1	71.0	73.0	73.4
9.8	12.6	9.8	71.1	73.3	73.7
10.7	11.8	9.7	71.7	73.4	73.9
10.7	11.6	9.5	72.4	73.9	74.5
10.7	11.5	9.5	72.9	74.4	74.9
10.7	11.5	9.4	73.1	74.4	74.9
10.8	11.5	9.3	73.2	74.5	75.0
10.8	11.5	9.2	73.2	74.5	75.1
10.8	11.5	9.2	73.2	74.4	75.0
10.9	11.6	9.1	73.0	74.2	74.8
11.0	11.7	9.1	72.7	73.9	74.4
11.2	11.7	9.1	72.3	73.5	74.0
11.3	11.6	9.1	72.0	73.1	73.6
11.4	11.8	9.0	71.7	72.8	73.2
11.6	12.0	8.8	71.4	72.5	72.8
11.7	12.2	8.6	71.2	72.3	72.5
11.7	12.0	8.4	71.6	72.5	72.7
11.9	12.0	8.2	72.5	73.2	73.3
11.9	11.9	7.8	73.4	74.0	74.1
12.0	11.9	7.5	74.1	74.7	74.7
11.9	12.0	7.2	74.7	75.2	75.0
12.0	12.0	7.1	74.8	75.3	74.7
11.0	10.7	6.3	74.6	75.2	74.3
12.6	11.7	6.7	74.2	75.0	73.6
13.3	12.0	6.3	73.6	74.7	72.8
14.3	12.0	5.6	72.8	74.5	71.6
16.1	14.3	1.9	71.6	73.2	69.0
16.2	16.3		71.2	71.7	
16.4	16.4		71.0	71.5	
16.4	16.5		70.9	71.3	
16.5	16.5		70.8	71.1	
16.5	16.6		70.9	70.9	
16.5	16.6		71.0	70.9	
16.5	16.6		71.0	71.0	
16.4	16.6		71.1	71.1	
16.4	16.6		71.1	71.1	
16.4	16.5		71.0	71.1	
16.5	16.5		70.9	71.2	
16.5	16.5		71.0	71.1	
16.5	16.5		71.0	71.0	
16.6	16.5		70.9	70.8	
16.6	16.6		70.8	70.6	
16.8	16.6		70.5	70.3	
16.9	16.7		70.1	69.8	
16.9	16.7		70.0	69.4	
16.9	16.7		69.8	69.5	
16.9	16.8		69.5	69.3	
17.0	16.9		69.1	69.0	
17.1	17.0		68.7	68.5	
17.1	17.2		68.4	68.1	
17.3	17.2		67.9	67.7	
17.4	17.3		67.4	67.3	
17.5	17.4		66.9	66.7	
17.7	17.6		66.3	66.2	
17.9	17.7		65.7	65.6	
18.0	17.9		65.1	64.9	
18.2	18.2		64.3	64.2	
18.5	18.3		63.6	63.4	
18.8	18.6		62.6	62.5	
19.0	19.0		61.5	61.5	
19.4	19.4		60.3	60.4	
19.8	19.6		59.4	59.2	
20.3	19.9		58.4	57.9	
21.0	20.4		57.0	55.9	
21.3	21.4		55.6	53.9	
20.9	22.5	1.0	55.0	52.8	11.6
20.3	21.0	2.4	54.4	53.5	44.9
20.3	19.8		53.5	53.5	
20.4	20.0		53.2	53.2	
20.5	20.3		52.8	52.6	
20.7	20.8		52.0	51.7	
21.1	20.9		51.3	50.9	
21.5	21.3		50.3	50.0	
22.5	22.1		48.2	48.1	
23.5	22.9		46.2	46.2	
22.7	22.5	4.5	45.3	44.7	50.5
23.9	24.5	3.7	45.7	44.7	53.9
23.6	24.2	1.4	48.4	48.4	49.2
24.0	24.0		50.1	49.5	
23.0	22.9		52.2	51.8	
21.7	21.6		55.1	55.1	
20.5	20.7		57.9	58.0	
20.0	20.2		59.2	59.4	
19.9	20.0		59.7	59.9	
19.8	19.8		60.3	60.4	
19.8	19.5		60.6	60.6	
19.7	19.6		60.9	60.8	
19.4	19.5		61.3	61.3	
19.2	19.4		61.8	61.9	
19.0	19.2		62.4	62.6	
18.8	19.0		63.2	63.1	
18.7	18.7		63.8	63.8	
18.6	18.4		64.5	64.4	
18.5	18.2		65.2	65.0	
18.2	18.2		65.9	65.5	
18.0	18.0		66.4	66.3	
17.8	17.9		66.9	66.9	
17.6	17.7		67.6	67.5	
17.3	17.7		68.2	68.1	
17.3	17.4		68.7	68.8	
17.3	17.2		69.2	69.4	
17.2	17.0		69.8	70.0	
17.0	16.9		70.4	70.6	
16.8	16.8		71.0	71.2	
16.6	16.7		71.7	71.7	
16.5	16.5		72.3	72.2	
16.4	16.3		72.9	72.8	
16.3	16.1		73.5	73.5	
16.2	16.0		74.2	74.2	
16.0	15.9		74.8	74.8	
15.8	15.8		75.5	75.4	
15.7	15.7		76.0	76.1	
15.6	15.6		76.6	76.6	
15.4	15.5		77.1	77.0	
15.4	15.4		77.5	77.4	
15.3	15.4		77.9	77.8	
15.2	15.3		78.2	78.0	

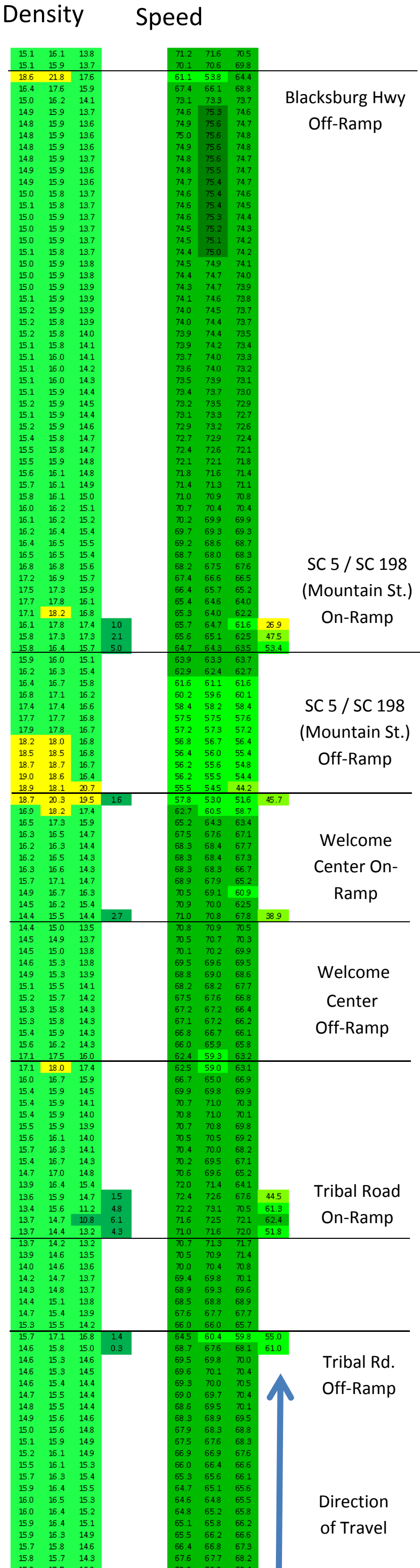
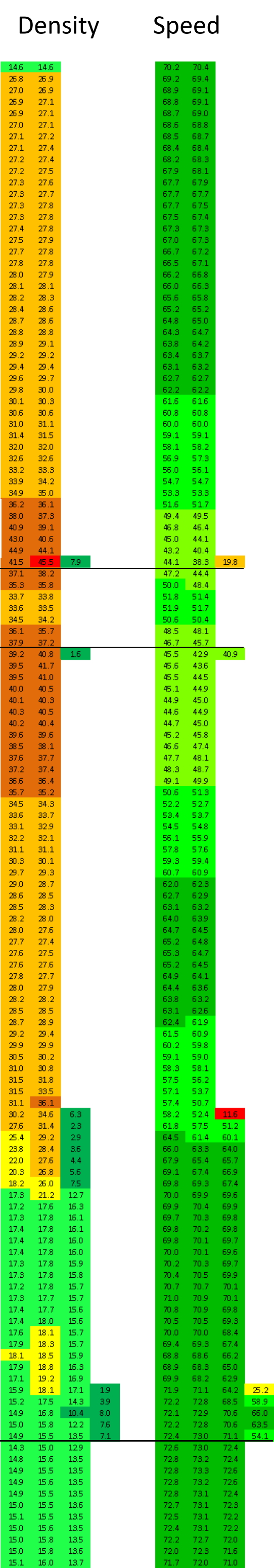
SC 18 (Shelby Hwy)
On-Ramp

SC 18 (Shelby Hwy)
Off-Ramp



Direction of
Travel

Figure 7
BUILD (2040)
I-85
SOUTHBOUND
PM PEAK HOUR



BUILD (2040)

I-85

SOUTHBOUND

PM PEAK

HOUR

Density

Speed

15.7	15.3	13.3	70.1	70.0	70.6	US 29 (Cherokee St.) On-Ramp
10.2	10.0	8.5	70.8	70.7	71.0	
15.5	15.1	12.7	71.3	71.1	71.3	
120	11.8	9.7	71.8	71.5	71.6	
15.4	15.3	12.5	72.2	71.7	71.7	
15.2	15.4	12.4	72.5	72.0	71.6	
15.3	15.5	12.5	72.3	71.9	71.0	
15.9	15.3	12.5	71.4	71.3	69.7	
17.7	15.4	11.6	69.7	70.2	67.4	
21.8	22.1		66.1	65.9		US 29 (Cherokee St.) Off-Ramp
22.4	22.6		65.5	65.4		
22.6	22.9		64.9	64.8		
23.0	23.0		64.2	64.2		
23.2	23.2		63.6	63.6		
23.3	23.4		63.3	63.1		
23.3	23.5		63.2	62.8		
23.4	23.6		62.9	62.6		
23.6	23.6		62.5	62.6		
23.5	23.6		62.6	62.7		
23.4	23.6		62.8	62.7		
23.4	23.5		63.0	62.7		
23.5	23.4		63.1	62.9		NC 216 (Battleground Rd.) On-Ramp
23.8	23.4		62.4	62.5		
25.9	26.7		57.8	60.7		
23.5	25.0		64.2	65.3		
22.6	23.1		68.4	68.6		
22.3	22.5		70.0	70.0		
22.1	22.3		70.7	70.8		
21.8	22.0		70.9	71.0		
22.0	22.2		70.9	71.1		
22.0	22.3		70.8	71.0		
22.0	22.3		70.8	70.9		
22.0	22.3		70.8	70.8		
22.0	22.3		70.7	70.7		
22.0	22.3		70.6	70.7		
22.1	22.3		70.4	70.7		
22.2	22.4		70.3	70.6		
22.2	22.3		70.4	70.6		
22.1	22.3		70.6	70.6		
22.1	22.3		70.7	70.6		
22.0	22.3		70.7	70.6		
22.1	22.3		70.7	70.6		
22.2	22.2		70.6	70.6		
22.2	22.2		70.6	70.6		
22.3	22.2		70.5	70.4		
22.4	22.2		70.4	70.4		
22.4	22.2		70.3	70.3		
22.3	22.3		70.3	70.2		
22.4	22.4		70.2	70.0		
22.4	22.4		70.0	70.0		
22.5	22.4		69.9	69.9		
22.4	22.6		69.8	69.7		
22.4	22.7		69.6	69.6		
22.4	22.8		69.4	69.4		
22.5	22.8		69.2	69.3		
22.6	22.9		69.0	69.1		
22.8	22.9		68.6	68.9		
22.9	23.0		68.3	68.5		
23.1	23.1		67.9	68.1		
23.2	23.3		67.5	67.6		
23.3	23.5		67.2	67.0		
23.4	23.6		67.0	66.6		
23.5	23.7		66.6	66.0		
23.1	23.3		66.7	65.8		
23.5	23.5	0.4	65.5	66.3	42.6	
23.5	23.4		66.0	65.9		NC 216 (Battleground Rd.) Off-Ramp
23.8	23.9		65.5	65.2		
23.9	24.2		65.0	64.6		
24.0	24.5		64.5	64.1		
24.3	24.7		63.9	63.5		
24.4	24.7		63.4	63.3		
24.5	24.5		63.3	63.6		
24.4	24.3		63.8	64.1		
24.2	24.0		64.5	64.8		
23.9	23.8		65.1	65.3		
23.7	23.6		65.5	65.7		
23.5	23.5		66.1	66.2		
23.3	23.4		66.7	66.8		Direction of Travel
23.1	23.2		67.4	67.4		
23.0	22.8		68.1	68.1		
22.8	22.6		68.7	68.8		
22.6	22.4		69.3	69.5		
22.3	22.2		69.9	70.0		
22.1	22.0		70.6	70.6		
21.8	21.8		71.4	71.4		
21.6	21.5		72.3	72.2		
21.4	21.3		73.0	72.9		
21.2	21.2		73.5	73.4		
21.1	21.2		73.8	73.6		
21.1	21.1		73.8	73.7		
21.1	21.1		73.9	73.7		
21.0	21.1		74.0	73.9		
21.1	21.0		74.1	74.1		
21.0	21.0		74.2	74.2		
21.1	20.9		74.2	74.2		
21.0	20.9		74.4	74.3		
21.0	20.9		74.5	74.3		
20.9	21.0		74.6	74.4		
20.8	21.0		74.7	74.5		
20.8	21.0		74.8	74.7		
20.8	20.9		74.9	74.8		
20.8	20.8		74.9	74.9		
20.8	20.8		75.1	75.1		
20.7	20.8		75.2	75.2		
20.7	20.7		75.3	75.4		
20.7	20.7		75.4	75.5		
20.7	20.5		75.6	75.7		
20.6	20.5		75.7	75.7		
20.6	20.5		75.9	75.8		
20.5	20.5		76.2	75.9		
20.4	20.4		76.4	76.1		
20.3	20.5		76.6	76.4		
20.2	20.4		76.8	76.6		
20.2	20.4		76.9	76.8		
20.2	20.4		76.9	76.8		
20.2	20.4		76.9	76.9		
20.2	20.4		77.0	76.9		
20.1	20.4		76.9	76.8		
18.9	19.0		77.0	76.9		



Direction of
Travel

Figure 8
BUILD (2040)
I-85
NORTHBOUND
PM PEAK HOUR

Density			Speed			Density			Speed			
Figure 8 BUILD (2040) I-85 NORTHBOUND M PEAK HOUR	23.0	23.0	58.0	58.0		15.4	15.7	135	69.2	68.9	67.6	Tribal Rd. On-Ramp
	26.6	26.6	57.1	57.0		15.5	15.7	135	69.2	69.0	67.4	
	26.7	26.9	56.8	56.7		15.5	15.5	132	69.0	68.7	66.8	
	26.7	26.9	56.7	56.8		16.1	15.8	135	68.3	68.1	65.8	
	26.7	26.7	56.9	57.0		16.5	16.2	134	67.6	67.1	64.5	
	26.8	26.6	57.0	57.0		16.5	17.0	133	67.0	65.8	63.0	
	26.8	26.6	57.0	57.0		15.6	17.2	15.2	68.3	64.8	57.3	
	26.7	26.6	57.3	56.9		14.0	14.2	15.1	70.1	68.7	57.4	
	26.6	26.7	57.4	56.9		14.1	14.5	126	70.8	70.3	68.9	
	26.6	26.7	57.3	57.0		13.8	14.4	128	70.8	70.7	69.9	
	26.5	26.7	57.2	57.1		13.9	14.3	130	70.3	70.4	69.8	
	26.6	26.6	57.1	57.2		14.0	14.3	130	70.0	70.1	69.4	
	26.6	26.6	57.0	57.2		14.1	14.4	130	69.8	69.9	69.2	
	26.7	26.6	57.1	56.9		14.1	14.5	129	69.5	69.6	69.1	
	26.7	26.7	57.2	56.6		14.2	14.6	129	69.3	69.3	68.7	
	26.8	26.8	57.0	56.4		14.2	14.7	130	68.9	68.3	67.2	
	26.9	26.9	56.9	56.3		14.4	14.9	132	69.1	68.5	67.2	
	26.8	27.0	56.9	56.3		14.4	14.8	131	69.2	69.1	68.0	
	26.8	26.9	57.0	56.4		14.4	15.1	145	69.1	69.1	68.5	
	26.7	26.8	57.2	56.6		14.4	15.1	15.5	69.1	69.0	68.4	
	26.5	26.7	57.5	57.0		14.4	15.0	15.5	69.2	69.2	68.6	
	26.3	26.6	57.8	57.3		14.4	15.0	15.5	69.4	69.2	68.9	
	26.4	26.3	58.1	57.6		14.4	15.1	15.2	69.5	69.4	69.2	
	26.4	26.1	58.4	57.9		14.5	15.4	14.8	69.5	69.5	69.4	
26.1	26.0	58.7	58.3		14.9	15.5	14.2	69.8	69.7	69.1		
25.8	26.0	59.2	58.5		14.9	15.5	14.2	69.8	69.6	69.1		
25.5	25.9	59.7	58.9		15.1	15.4	14.3	69.5	69.3	68.8		
25.3	25.5	60.4	59.6		15.2	15.5	14.4	68.9	68.7	68.3		
25.1	25.0	61.2	60.4		15.5	15.6	14.6	68.0	68.1	67.5		
24.8	24.6	61.9	61.3		15.6	15.7	14.9	67.3	67.1	66.6		
24.6	24.3	62.6	61.8		15.7	15.8	15.0	67.0	66.7	66.1		
24.5	24.2	63.0	61.9		15.9	15.9	15.1	66.6	66.2	65.6		
24.6	24.3	62.9	61.6		16.1	16.2	15.3	65.8	65.3	64.7		
24.9	24.6	62.2	61.0		16.2	16.5	15.5	65.1	64.2	63.7		
25.4	25.1	60.9	59.8		16.4	16.7	15.9	64.2	63.3	62.8		
26.2	25.6	59.3	58.2		16.5	16.9	16.0	63.5	62.6	62.4		
27.2	26.4	57.5	56.2		16.6	17.0	16.0	63.1	62.5	62.4		
28.3	27.4	55.7	53.7		16.6	16.9	16.1	62.9	62.5	62.5		
29.3	28.6	54.2	51.2		16.6	16.6	16.1	63.2	63.0	62.7		
30.0	30.7	53.0	48.1		16.5	16.5	15.9	63.5	63.3	63.0		
28.5	34.0	53.5	44.8	9.8	16.4	16.4	15.8	64.0	63.7	63.6		
25.5	32.6	56.3	48.0	37.0	16.2	16.3	15.4	65.0	64.4	64.6		
23.3	21.6	60.0	55.2	52.9	16.1	16.2	15.2	65.7	65.2	65.1		
26.8	19.9	56.9	57.8	55.4	16.1	16.0	15.2	66.0	65.5	65.4		
NC 216 (Battleground Rd.) On-Ramp	27.9	27.6	54.3	54.0		16.2	16.0	15.3	65.7	64.9	64.8	
	28.7	28.9	52.7	52.0		16.4	16.4	15.6	64.9	64.0	63.2	
	29.1	29.5	51.9	51.2		16.5	16.7	16.1	64.3	62.9	61.4	
	29.1	29.3	51.9	51.5		16.0	17.0	16.9	64.2	62.4	59.7	
	28.8	28.8	52.5	52.5		15.5	17.0	17.7	64.4	62.4	58.5	
	28.5	28.2	53.2	53.6	0.4	15.5	16.5	17.9	63.9	62.6	59.4	
	26.9	26.7	53.7	54.1	0.6	15.7	16.1	15.8	62.4	62.4	61.0	
	28.0	27.5	54.4	54.7	2.9	16.3	16.6	14.3	60.6	59.6	61.4	
	27.4	27.0	55.6	55.7	4.0	16.7	16.7	16.3	59.3	57.7	59.2	
	27.0	26.3	56.6	56.8		17.3	17.2	16.7	58.0	56.6	57.9	
	26.6	26.1	57.5	57.5		17.6	17.5	17.1	56.9	55.6	56.8	
26.0	26.0	58.2	58.1		18.0	17.9	17.4	55.6	54.4	55.7		
NC 216 (Battleground Rd.) Off-Ramp	26.7	26.6	57.1	58.1		18.7	18.9	18.3	53.1	51.9	53.1	
	25.9	26.0	59.3	59.2		19.6	19.8	19.4	50.3	49.7	50.5	
	25.4	25.1	60.7	61.1		20.1	20.4	19.8	49.1	48.4	49.2	
	24.4	24.1	62.8	63.2		20.1	20.5	19.8	49.0	48.2	49.0	
	23.6	23.5	64.7	64.9		20.2	20.5	19.7	48.9	48.4	49.0	
	23.0	23.0	66.2	66.2		20.2	20.4	19.6	49.1	48.7	49.1	
	22.5	22.5	67.7	67.6		20.2	20.1	19.7	49.4	48.8	49.3	
	22.0	22.1	69.0	68.8		19.9	20.0	19.4	50.0	49.3	50.0	
	21.7	21.8	70.1	70.0		19.6	19.8	18.8	50.7	50.2	51.3	
	21.4	21.4	71.0	71.0		19.4	19.5	18.7	51.2	50.6	51.7	
	21.4	21.3	71.3	71.3		19.2	19.4	18.7	51.6	51.1	51.7	
	21.3	21.4	71.2	71.2		19.0	19.4	18.6	52.2	51.4	51.9	
	21.4	21.4	71.2	71.1		18.9	19.2	18.5	52.6	51.5	52.2	
	21.3	21.5	71.2	71.0		19.1	19.4	18.4	52.5	51.3	52.0	
	21.3	21.6	71.1	70.8		20.1	20.0	17.9	51.4	50.3	51.2	
	21.5	21.6	70.9	70.6		24.8	25.8	24.9	44.9	37.9	45.6	
	21.5	21.6	70.7	70.4		24.2	25.3	28.8	45.9	41.6	45.9	
	21.6	21.7	70.5	70.2		20.5	21.4	24.8	52.9	50.6	51.5	
	21.6	21.8	70.3	69.9		18.6	20.8	20.3	57.5	57.3	56.8	
	21.7	21.8	70.1	69.8		18.1	20.7	19.2	59.1	58.8	58.6	
	21.8	21.8	69.9	69.7		18.4	20.0	18.7	59.9	59.6	59.7	
	22.0	21.7	69.5	69.6		18.8	19.1	18.3	60.8	60.4	60.6	
	22.2	21.8	69.4	69.3		18.6	18.9	18.0	61.5	61.3	61.5	
	22.2	21.9	69.2	68.9		18.3	18.7	17.8	62.1	62.0	62.2	
22.3	22.0	68.9	68.6		18.1	18.6	17.6	62.8	62.8	62.7		
22.4	22.1	68.6	68.3		17.9	18.3	17.4	63.5	63.5	63.3		
22.5	22.2	68.2	67.9		17.7	18.3	17.1	64.3	64.3	64.1		
22.6	22.3	67.9	67.4		17.5	18.1	16.9	64.9	65.2	64.8		
22.6	22.5	67.7	66.9		17.4	17.9	16.8	65.2	65.9	65.2		
22.7	22.7	67.4	66.6		17.2	17.8	16.6	65.8	66.5	65.8		
22.7	22.9											

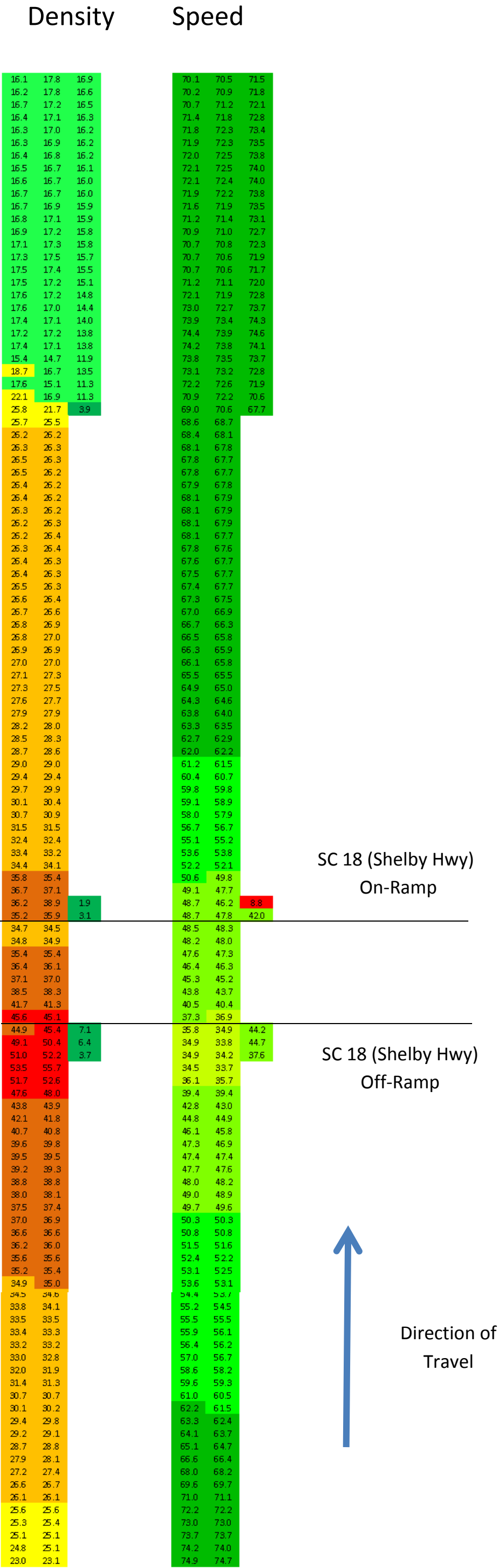
BUILD (2040)

I-85

NORTHBOUND

PM PEAK

HOUR



APPENDIX

ONE (1) 8 PHASE FULLY ACTUATED STANDARD
170 CONTROLLER WITH FLASHER,
SIGNAL MONITOR UNIT, AND CABINET.
4 VEHICLE DETECTOR UNITS

HEAD NUMBER	1	2	3	4	5	6	7	8
LENS		R Y G		R Y G		R Y G		R Y G
PHASE		2		4		6		8
SIZE		12"		12"		12"		12"
QUANTITY		2		2		2		2

This engineering plan view illustrates the proposed interchange between Interstate 85 (I-85) and South Carolina Highway 198 (SC 198). The diagram shows the I-85 corridor running horizontally, with an 'I-85 N.B. EXIT RAMP' on the south side and an 'I-85 NB ENTRANCE RAMP' on the north side. SC 198 runs diagonally from the bottom left towards the top right. A 'HARDEES' commercial site is located along SC 198, south of the interchange. The plan includes various right-of-way (R/W) lines: '100' R/W' for the main corridors and '50' R/W' for the interchange area. Stationing markers are present, such as 'SC 198 3+00' and 'SC 198 4+00'. A north arrow is located in the upper left corner. The diagram also shows existing and proposed road alignments, including a '1/4 30' 4A' section, and various survey points and markers.

FUNCTIONS	SECONDS							
	01	02	03	04	05	06	07	08
MIN GREEN		15		8		15		8
ADDED INIT (SEC/ACT)								
MAX INITIAL								
PASSAGE		4.0		2.5		4.0		2.5
TIME BEFORE REDUCE								
TIME TO REDUCE								
MIN GAP								
MAXIMUM I	40	30		30		40		30
MAXIMUM II				20		30		20
YELLOW CHANGE		4.3		3.4		4.3		3.4
RED CLEAR		1.7		1.7		1.7		1.7
RECALL		MIN		OFF		MIN		OFF
DET. MEMORY		-		N		-		N
L-LOCK, N-NON-LOCK								
DET. DELAY		-		-		-		-
DET. MODE		PR		PR		PR		PR
P-PULSE PR-PRESENCE								
WALK								
PEDESTRIAN CLEAR								

OLA _____	OLC _____
OLB _____	OLD _____

FLASH	SIGNAL HEAD NUMBER	01 CLEAR TO 05				02 CLEAR TO 06				03 CLEAR TO 07				04 CLEAR TO 08													
		R	W	02-06	01-06	02-05	BARR.	R	W	01-05				BARR.	R	W	04-08	03-08	04-07	BARR.	R	W	03-07				
Y	2							G						Y	R							R					
R	4							R						R	R							G					
Y	6							G						Y	R							R					
R	8							R						R	R							G					

[illegible]

ROUTE NUMBER	SC 198		I-85 NB. RAMP EXIT		ENTRANCE
APPROACH DIRECTION	NB	SB	EB	WB	
SIGNAL DESIGN SPEED	45	45	35	35	
GRADE (%)	0	0	+3.0	+2.0	

DKT. NO. —	SHEET NO. —
------------	-------------

DATE	REVISIONS		
		SOUTH COAST DEPARTMENT OF ENGINEERING COLUMBIA SUBJECT TITLE TRAFFIC SIGNAL INS	
		SPECIFIC LOCATION INTERSECTION OF I 85 N.B. EXIT & ENTRANCE RAMP WITH	
		CITY	COUNTY CHESAPEAKE
DESIGNED MTJ		APPROVED BY 	APPROVED BY
DRAWN MTJ		DIR. OF TRAFFIC ENGINEERING	
CHECKED 		SCALE	DATE
REVIEWED 	ELM	1"=50'	3-11-96
RECOMMENDED 			SHEET NO. 1 OF 1

#4076

SIGNAL EQUIPMENT

- 8 PHASE FULLY ACTUATED STANDARD
- 170 CONTROLLER WITH FLASHER, SIGNAL MONITOR UNIT, AND CABINET.
- VEHICLE DETECTOR UNITS

SIGNAL HEADS

NUMBER	1	2	3	4	5	6	7	8
LENS		R		R		R		R
		Y		Y		Y		Y
		G		G		G		G
ASE		2		4		6		8
E		12"		12"		12"		12"
ANTITY		2		3		2		3

DOLES AS NECESSARY

SIGNAL DISPLAY SEQUENCE (PREFERENTIAL PHASING)

F L O O H	SIGNAL HEAD NUMBER	Ø1 CLEAR TO Ø5				Ø2 CLEAR TO Ø6				Ø3 CLEAR TO Ø7				Ø4 CLEAR TO Ø8						
		R W	Ø2-Ø6	Ø1-Ø6	Ø2-Ø5	BARR.	R W	Ø1-Ø5		BARR.	R W	Ø4-Ø8	Ø3-Ø8	Ø4-Ø7	BARR.	R W	Ø3-Ø7		BARR.	
Y	2						G			Y	R					R			R	R
R	4						R			R	R					G			Y	R
Y	6						G			Y	R					R			R	R
R	8						R			R	R					G			Y	R

ALTERNATE PHASES

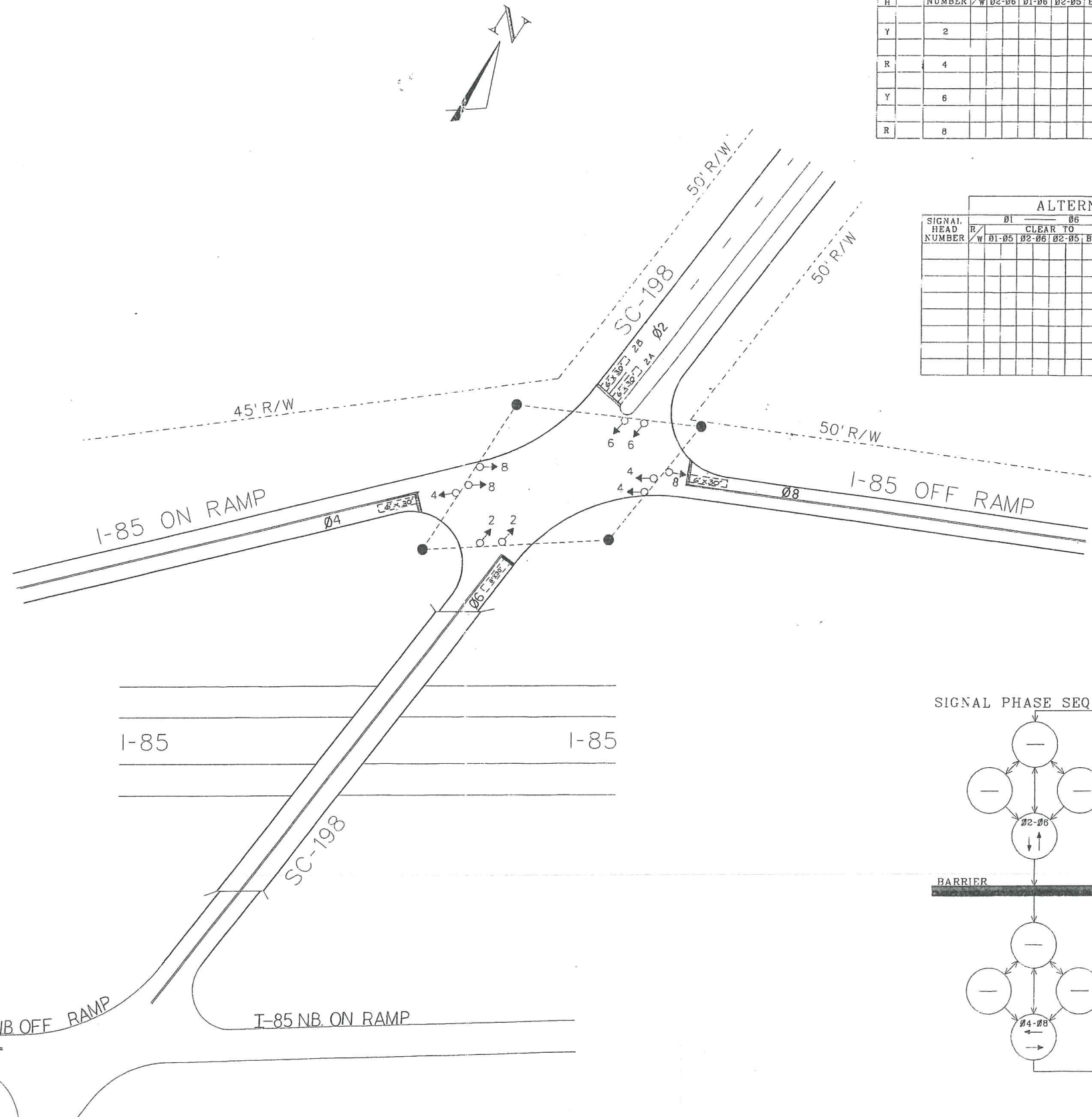
SIGNAL HEAD NUMBER	Ø1 CLEAR TO Ø6						Ø2 CLEAR TO Ø5						BARRIER	Ø3 CLEAR TO Ø8						Ø4 CLEAR TO Ø7					
	R	W	Ø1-Ø5	Ø2-Ø6	Ø2-Ø5	BARR.	R	W	Ø1-Ø5	Ø2-Ø6	Ø1-Ø6	BARR.		R	W	Ø3-Ø7	Ø4-Ø8	Ø4-Ø7	BARR.	R	W	Ø3-Ø7	Ø4-Ø8	Ø3-Ø8	BARR.
										</															

TRAFFIC SIGNAL SETTINGS

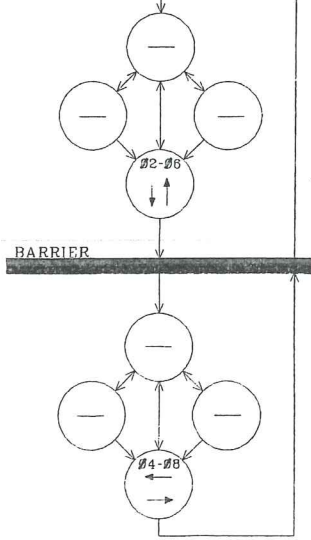
ACTIONS	SECONDS							
	Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
EN		15		15		15		15
INIT (SEC/ACT)								
RTIAL		4.0		2.5		4.0		2.5
FORE REDUCE								
REDUCE								
I		30		30		30		30
II								
CHANGE		4.3		3.8		4.3		3.8
AR		1.8		3.1		1.8		3.1
ORY		MIN		OFF		MIN		OFF
		-		N		-		N
L-LOCK, N-NON-LOCK								
AY				10				
3		PR		PR		PR		PR
P-PULSE PR-PRESENCE								
AN CLEAR								

OVERLAP SETTINGS

OLA	OLC
OLB	OLD



SIGNAL PHASE SEQUENCE



ROUTE NUMBER	SC-198	I-85 SB RAMP
APPROACH DIRECTION	NB SB	EB WB
SIGNAL DESIGN SPEED	45 45	35 35
GRADE (%)	0 0	-1.65 -1.66

DKT. NO. 11.347 SHEET NO. 51

DATE	REVISIONS	SCDOT SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION ENGINEERING DIVISION COLUMBIA, S.C.	
		SUBJECT TITLE TRAFFIC SIGNAL INSTALLATION	
		SPECIFIC LOCATION INTERSECTION OF SC-198 & I-85 SB RAMP	
		CITY	COUNTY CHEROKEE
DESIGNED	APPROVED BY	APPROVED BY	
DRAWN JLB	Richard B. West		
CHECKED	DIR. OF TRAFFIC ENGINEERING	ENGINEER	
REVIEWED	SCALE	DATE	SHEET NO.
RECOMMENDED	1"=50'	7/24/96	1 of 1
		INDEX NO. 1092-3	

To: Tom Miller, PE
Greg Schuch, PE
HDR | ICA

From: Stuart Day, PE

Stantec Consulting Services Inc.

File: 171001605

Date: May 17, 2016

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Traffic Growth Rate Percentage

Traffic Projections

The growth rate of traffic within the corridor was estimated using three procedures.

The first procedure evaluated the annual rate of change for the AADT between 1990 and 2015 for each freeway segment based on the SCDOT AADT count station data. The second procedure evaluated the traffic assignments of the freeway segments in the South Carolina Statewide Travel Demand Model (SCSWM) 2010 and 2040 base networks. The third procedure reviewed approved growth rates on a recent study by STV Incorporated titled *I-85 Widening Project MM80-MM96: Spartanburg and Cherokee Counties* (2015).

These three procedures led to the selection of **1.5%** as the proposed linear traffic growth rate along the I-85 corridor. This proposed growth rate would be applied to all mainline and ramp volumes within the study area to generate the design year peak hour volumes for use in the alternatives analysis.

The growth rates of traffic for individual cross-streets along the corridor were also estimated using the first procedure. The proposed linear annual traffic growth rate for these streets ranged between **1.0%** and **2.5%**. These respective proposed growth rates would be applied to all arterial turning movement count volumes within the study area to generate the design year peak hour volumes for use in the alternatives analysis.

The following sections detail the processes employed to reach the aforementioned proposed linear annual growth rates for the I-85 corridor and cross-street volumes.

I-85 Corridor Growth Rate Analysis

AADT Evaluation

An evaluation of the historic AADT volumes for each of the segments within the study area was performed. The average annual rate of change in AADT on each of the segments was calculated for:

- The last five years of data available (2010-2015)
- The last ten years of data available (2005-2015)
- The last 25 years of data available (1990-2015)

The 2015, 2010, 2005 and 1990 AADT for each of the segments are shown in Table 1.

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

Table 1 – Historic Freeway Segment AADT

I-85 Segment Number	Count Station #	I-85 Segment Description	2015 AADT	2010 AADT	2005 AADT	1990 AADT
Segment 1	2343	I-85 (Exit 96 to Exit 100) SC 18 TO S-83	45,800	47,800	45,800	29,500
Segment 2	2345	I-85 (Exit 100 to Exit 102) SC 83 TO SC 5	43,500	46,200	44,700	29,500
Segment 3	2347	I-85 (Exit 102 to Exit 104) SC 5 TO S-99	37,000	41,900	41,900	27,600
Segment 4	2349	I-85 (Exit 104 to Exit 106) S-99 TO US 29	36,500	41,600	41,400	27,500
Segment 5	2351	I-85 (Exit 106 to NC LINE) US 29 TO STATE LINE	37,300	41,800	42,000	26,000

The linear annual rate of change in the AADT is shown in Table 2.

Table 2 – Freeway Linear Annual Percentage Change in AADT

I-85 Segment Number	Count Station #	I-85 Segment Description	2010-2015 Annual Rate (%)	2005-2015 Annual Rate (%)	1990-2015 Annual Rate (%)
Segment 1	2343	I-85 (Exit 96 to Exit 100) SC 18 TO S-83	-0.84	0.00	2.21
Segment 2	2345	I-85 (Exit 100 to Exit 102) SC 83 TO SC 5	-1.17	-0.27	1.90
Segment 3	2347	I-85 (Exit 102 to Exit 104) SC 5 TO S-99	-2.34	-1.17	1.36
Segment 4	2349	I-85 (Exit 104 to Exit 106) S-99 TO US 29	-2.45	-1.18	1.31
Segment 5	2351	I-85 (Exit 106 to NC LINE) US 29 TO STATE LINE	-2.15	-1.12	1.74
AVERAGE			-1.79	-0.75	1.70

The linear annual five-year rate of change in the segment volumes based on the AADT ranged from -2.45 to -1.17 percent per year. The linear annual ten-year rate of change in the segment columns ranged from -1.18 to 0 percent per year. The linear annual growth rate between 1990 and 2015 was assessed. The linear rate of growth was positive throughout the corridor, ranging from 1.31 to 2.21 percent per year. The average linear five-, ten-, and twenty year rates of change were -1.79%, -0.75%, and 1.70% respectively.

South Carolina Statewide Model Projection Evaluation

Traffic Assignments for the 2010 and 2040 base South Carolina Statewide Model (SCSWM) networks were obtained from the model. The average annual growth rate for each segment was calculated as shown in Table 3.

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes**Table 3 – Statewide Model Projection Growth Rates**

I-85 Segment Number	I-85 Segment Description	2010 SCSWM Projection	2040 SCSWM Projection	2010-2040 Annual Rate (%)
Segment 1	I-85 (Exit 96 to Exit 100) SC 18 TO S-83	61,800	70,500	0.47
Segment 2	I-85 (Exit 100 to Exit 102) SC 83 TO SC 5	60,900	66,400	0.30
Segment 3	I-85 (Exit 102 to Exit 104) SC 5 TO S-99	47,200	55,800	0.61
Segment 4	I-85 (Exit 104 to Exit 106) S-99 TO US 29	45,700	55,400	0.71
Segment 5	I-85 (Exit 106 to NC LINE) US 29 TO STATE LINE	41,400	52,200	0.87
			AVERAGE	0.59

The projected SCSWM growth rates on the individual segments ranged from between 0.30 and 0.87 percent per year.

STV, Incorporated Adjacent I-85 Corridor Analysis Review

An adjacent project previously completed by STV, Inc. on I-85 (MM 80-MM 96) utilized a similar methodology that produced comparable results.

The study noted that positive trends in AADT can be seen on both corridors between 1997 and 2007, immediately followed by fluctuating AADT values that reflected changes in the stability of the national economy. A decline in traffic can be noted through the corridors between 2008 and 2014. An annual growth rate of **1.5%** was recommended for the segment between MM80 and MM96 in the study.

Proposed I-85 Corridor Growth Rate

A comparison of the growth rates derived from the historic AADT data, the SCSWM projections, and the reviewed adjacent study is shown in Table 4. Only the growth rate for the two southernmost segments (between Exits 96 and 100) exceeded 1.5 percent per year based on the historic AADT, while the SCSWM projected rate for these segments were approximately 0.5 and 0.3 percent per year respectively. The adjacent 2015 STV I-85 MM80-MM96 study produced similar historical growth patterns over a 18-year period.

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

Table 4 – Comparison of Freeway Linear Growth Rate Projections

I-85 Segment Number	I-85 Segment Description	5-Year (10-15) Annual Rate (%)	10-Year (05-15) Annual Rate (%)	25-Year (90-15) Annual Rate (%)	2010-2040 SCSWM Annual Rate (%)	Adjacent STV Study Growth Rate (%)	Proposed Corridor Growth Rate (%)
Segment 1	I-85 (Exit 96 to Exit 100) SC 18 TO S-83	-0.84	0.00	2.21	0.47	1.50	1.50
Segment 2	I-85 (Exit 100 to Exit 102) SC 83 TO SC 5	-1.17	-0.27	1.90	0.30	1.50	1.50
Segment 3	I-85 (Exit 102 to Exit 104) SC 5 TO S-99	-2.34	-1.17	1.36	0.61	1.50	1.50
Segment 4	I-85 (Exit 104 to Exit 106) S-99 TO US 29	-2.45	-1.18	1.31	0.71	1.50	1.50
Segment 5	I-85 (Exit 106 to NC LINE) US 29 TO STATE LINE	-2.15	-1.12	1.74	0.87	1.50	1.50
AVERAGE		-1.79	-1.03	1.70	0.59	1.50	1.50

Based on these estimates and the review of the adjacent I-85 Widening Project (MM80-96), an average annual growth rate of **1.5%** per year was selected to be applied to develop the design year volumes throughout the study area. An annual growth rate of 1.5 percent per year would provide a conservative estimate of future traffic volumes on all freeway segments in the study area.

I-85 Traffic Volume Data – 2040 Design Hour Adjusted Volumes

The 1.5 percent per year growth rate will be applied to the freeway and ramp traffic to develop projections of the 2040 Design Hour Traffic Volumes. The estimated freeway segment AADT for the 2040 Design Year using this growth rate is summarized in Table 5.

Table 5 – Estimated 2040 Freeway Segment AADT

I-85 Segment Number	Count Station #	I-85 Segment Description	2015 AADT	Projected Annual Growth Rate	Estimated 2040 AADT
Segment 1	2343	I-85 (Exit 96 to Exit 100) SC 18 TO S-83	45,800	1.5%	63,000
Segment 2	2345	I-85 (Exit 100 to Exit 102) SC 83 TO SC 5	43,500	1.5%	59,800
Segment 3	2347	I-85 (Exit 102 to Exit 104) SC 5 TO S-99	37,000	1.5%	50,900
Segment 4	2349	I-85 (Exit 104 to Exit 106) S-99 TO US 29	36,500	1.5%	50,200
Segment 5	2351	I-85 (Exit 106 to NC LINE) US 29 TO STATE LINE	37,300	1.5%	51,300

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

I-85 Cross-Street Growth Rate Analysis

AADT Evaluation

An evaluation of the historic AADT volumes for each of the cross-streets within the study area was performed. Data values ranged in availability from 1987-2015 for each interchange. The average annual rate of change in AADT on each of the cross-streets was calculated for:

- The last five years of data available (2010-2015)
- The last ten years of data available (2005-2015)
- The last 25 years of data available (1990-2015)

The 2015, 2010, 2005 and 1990 AADT for each of the cross-streets are shown in Table 6.

Table 6 – Historic Cross-Street AADT

State ID #	Road Name	Road Description	2015 AADT	2010 AADT	2005 AADT	1990 AADT
SC 18	Shelby Highway	(Exit 96) SC 329 TO S-800	9,400	9,000	7,500	7,600
S-83	Blacksburg Highway	(Exit 100) S-351 TO S-214	4,300	4,000	3,200	2,900
SC 5/SC 198	N Mountain Street ¹	(Exit 102) S-351 TO S-245	7,200	5,600	N/A	N/A
S-99	Tribal Road ²	(Exit 104) S-65 TO S-66	650	475	425	350
US 29	E Cherokee Street	(Exit 106) S-21 TO STATE LINE	2,300	2,200	3,000	2,100

The historical annual linear growth rates are summarized in Table 7.

Table 7 – Cross-Street Linear Annual Percentage Change in AADT

State ID #	Road Name	Road Description	5 Year Growth Rate (%)	10 Year Growth Rate (%)	15 Year Growth Rate (%)	25 Year Growth Rate (%)
SC 18	Shelby Highway	(Exit 96) SC 329 TO S-800	0.89	2.53	1.17	0.95
S-83	Blacksburg Highway	(Exit 100) S-351 TO S-214	5.29	3.44	0.33	1.93
SC 5/SC 198	N Mountain Street ¹	(Exit 102) S-351 TO S-245	5.71	N/A	N/A	N/A
S-99	Tribal Road ²	(Exit 104) S-65 TO S-66	7.37	5.29	1.21	3.43
US 29	E Cherokee Street	(Exit 106) S-21 TO STATE LINE	0.91	-2.33	-1.56	0.38

1. N Mountain Street only has data recorded from 2006-2014
2. Tribal Road only has data recorded from 1990-2014

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

The linear annual five-year rates of change in the cross-street volumes based on the AADT ranged from 0.89 to 7.37 percent per year, the linear annual ten-year rates of change in the segment volumes ranged from -2.33 to 5.29 percent per year, and the linear annual twenty five-year rates of change ranged from 0.38 to 3.43 percent per year.

South Carolina Statewide Model (SCSWM) Projection Evaluation

Traffic assignments for the 2010 and 2040 base SCSWM networks were obtained from the model. The linear growth rate for each cross street was calculated as shown in Table 8.

Table 8 – Statewide Model Projection Cross-Street Growth Rates

State ID #	Road Name	2010 SCSWM Projection	2040 SCSWM Projection	30-Year (2010-2040) Linear Growth Rate (%)
SC 18	Shelby Highway	30,123	32,230	0.23%
S-83	Blacksburg Highway	15,708	29,151	2.85%
SC 5/SC 198	N Mountain Street	26,122	28,361	0.29%
S-99	Tribal Road	2,509	2,330	-0.24%
US 29	E Cherokee Street	3,829	2,670	-1.01%

The projected cross-street growth rates on the individual segments range between -1.01 and 2.85 percent per year.

STV, Incorporated Adjacent I-85 Corridor Analysis Review

A review of approved growth rates from a recent study titled *I-85 Widening Project MM80-MM96: Spartanburg and Cherokee Counties* (2015) by STV, Inc. was conducted.

The study compared growth rates derived from historical AADT to determine recommended growth rates for I-85. An annual growth rate of **1.5%** was recommended for all freeway segments and applied to all cross-streets in the study area. An exclusive review of the cross-street data was not performed as part of the STV, Inc. study.

Proposed I-85 Corridor Growth Rate

A comparison of the growth rates derived from the historic AADT data (from 1990 to 2015), the SCSWM projections, and the resulting proposed growth rate for use in this project is shown in Table 9.

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

Table 9 – Comparison of Cross Street Linear Growth Rate Projections

State ID #	Road Name	1990-2015 Historical Linear Growth Rate (%)	2010-2040 SCSWM Linear Growth Rate (%)	Recommended Linear Growth Rate (%)
SC 18	Shelby Highway	0.95	0.23	1.0%
S-83	Blacksburg Highway	1.93	2.85	2.5%
SC 5/SC 198	N Mountain Street	N/A	0.29	1.0%
S-99	Tribal Road	3.43	-0.24	1.5%
US 29	E Cherokee Street	0.38	-1.01	1.0%

To develop growth rates for the cross-streets along the corridor, a combination of historical growth and model growth data was considered. Each cross street was reviewed as an independent segment, returning annual linear growth rates ranging from 0.95 to 3.43 percent historically, and linear growth rates of -1.01 to 2.85 percent in the SCSWM. Proposed growth rates ranging from **1.0% to 2.5%** per year would provide a conservative estimate of future traffic volumes on all cross-streets in the study area.

I-85 Cross Street Traffic Volume Data – 2040 Design Hour Volumes

The 1.0 and 2.5 percent per year growth rates would be applied to the respective arterial turning movements to develop projections of the 2040 Design Hour Traffic Volumes. The estimated cross-street AADT for the 2040 Design Year using these growth rates are summarized in Table 10.

Table 10 – Estimated 2040 Cross-Street AADT

State ID #	Road Name	2015 AADT	Estimated 2040 AADT
SC 18	Shelby Highway ³	9,400	11,800
S-83	Blacksburg Highway ⁵	4,300	7,000
SC 5/SC 198	N Mountain Street ³	7,200	9,000
S-99	Tribal Road ⁴	650	900
US 29	E Cherokee Street ³	2,300	2,900

3. Based on the 1.0% proposed growth rate

4. Based on the 1.5% proposed growth rate

5. Based on the 2.5% proposed growth rate



May 17, 2016

Tom Miller, PE & Greg Schuch, PE

Page 8 of 8

Reference: I-85 Widening MM 96-MM 106, Cherokee County – Suggested Methodology for Selecting Proposed Design Hour Traffic Volumes

Please find attached historical AADT volumes and growth rates for I-85 freeway and cross-streets, as well as South Carolina Statewide Model 2010 and 2040 project volume outputs and growth rate calculations.

Let me know if you have any questions or comments.

STANTEC CONSULTING SERVICES INC.

Stuart Day, PE

Phone: (843) 740-6335

Fax: (873) 740-7707

Stuart.Day@Stantec.com

Attachments: I-85 Widening Historical Growth Data.pdf

I-85 SCSWM Growth Output.pdf

I-85 SCSWM Volume Exhibits.pdf