

Appendix G

VISSIM Calibration Memo



1) Background and Purpose

The purpose of this document is to provide calibration and validation results for the existing VISSIM model that will be used as a basis for the traffic modeling to support the Interstate Access Point Approval (IAPA) for the I-495 and I-270 Managed Lane Study. Developing models to accurately depict existing conditions is critical to effectively evaluate future traffic operations along both corridors. Detailed assumptions and methodologies for existing model calibration and validation are outlined below.

2) Data Collection

The study area of this project includes I-270 from MD 85 to I-495 and I-495 from VA 193 to the Woodrow Wilson Bridge. The I-270 Spur between I-270 and I-495 is also included. All interchanges also include their ramp junctions, and adjacent signals are included at specific locations.

a) Peak Period Traffic Volumes

Peak period traffic volumes were developed for the study area. The AM and PM peak periods were determined to be 6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM, respectively. The traffic demand was balanced throughout the network for both periods.

b) Signal Timings

Signal timing data was provided for signalized intersections within the study area to ensure that the VISSIM models included accurate existing signal timings.

c) Travel Times and Speeds

INRIX speed data obtained from the Regional Integrated Transportation Information System (RITIS) data was provided for segments along both I-495 and I-270 for the month of May 2017. Travel time data collected on Tuesdays, Wednesdays, and Thursdays of May 2017 were used to produce the target travel times and speeds.

3) VISSIM Model Development

MDOT SHA Travel Forecasting and Analysis Division (TFAD) provided a previously-calibrated VISSIM model for the study area. Lane geometry was confirmed based on aerial photography. Model calibration required specific updates, which included traffic volume inputs and routing decisions, traffic signal timings, turning speed reduction zones, driver and link behavior types, and lane change distances. These updates enabled the VISSIM model to simulate the typical weekday AM and PM peak periods under existing conditions. Discussed below is a summary of the VISSIM basic inputs, calibration requirements established for this study, and the model results and outputs.

a) Vehicle Inputs and Routing Decisions

The AM and PM models both include a seeding time of 3,600 seconds (1 hour) with four 3,600 second simulation periods for a total 14,400 seconds (4 hours) of actual simulation time, during which data was collected by the VISSIM model. The simulation time is equivalent to the aforementioned peak periods. The initialization time was necessary to populate the network and produce the appropriate congestion on the network prior to data recording.



The entry volume input data was coded for both the seeding period and each of the simulation hours in the peak period. The arrival distribution input data was set to “Exact Volume” rather than the default of “Stochastic Volume” to prevent significant volume variation at the turning movement level. Heavy vehicle and HOV percentages were established within the individual vehicle compositions as a component of the entry volume input data. Vehicle composition included 85% SOV, 12% HOV, and 3% truck volumes for all vehicle inputs.

The static routing decisions were coded in VISSIM such that the beginning of each route is as far upstream of the first decision point as possible; this method allows vehicles to make a routing decision as soon as possible, preventing unnecessary friction and congestion. In instances where routing decisions were close together, route combinations were applied to ensure realistic lane changing behavior.

b) Speeds

Posted speed limits were used as the desired speeds with +/- 5 mph linear distribution due to the severe congestion experienced along the corridor. This was the case for most locations within the study area. However, at select locations, the desired speeds were modified further for calibration purposes.

Turning movement speeds along the arterials were coded as:

- i) Reduced Speed Right Turns: 8 MPH to 12 MPH
- ii) Reduced Speed Left Turns: 11 MPH to 14 MPH
- iii) Accelerated AM Right Turns: 7.5 MPH to 15.5 MPH
- iv) Accelerated AM Left Turns: 12.4 MPH to 18.6 MPH
- v) Accelerated PM Right Turns: 12 MPH to 15.5 MPH
- vi) Accelerated PM Left Turns: 15 MPH to 20 MPH

4) VISSIM Calibration and Validation

Model calibration and validation refers to the process that confirms the model provides a reasonable approximation of existing field conditions and incorporates model refinements to bring it within an accepted range of validation targets. For this study, the model was run five times per peak period.

During the VISSIM model calibration; attention was given to the following parameters:

- i) Modified lane changing distances to ensure smooth yet realistic traffic flow in both peak and off-peak directions.
- ii) Modified driver behavior parameters and link behavior types; driver and link behavior types from the provided files were maintained, where possible.

The existing travel time data along both highways showed high variability between travel times in both the AM and PM peak hours. Travelers experienced a significant drop in speed during the peak periods. May 2017 INRIX speed data is shown in **Figure 1** for I-495 and **Figure 2** for I-270. High variability in travel times can be seen in the differences between the average speeds and the 95% confidence intervals.

INRIX speed data was used to produce additional figures comparing 2017 speed and travel time data to VISSIM model simulation results during the AM and PM peak hours. These figures are provided in Appendices A and B.

Figure 1: I-495 Existing Speed Graph (2017 INRIX Data)

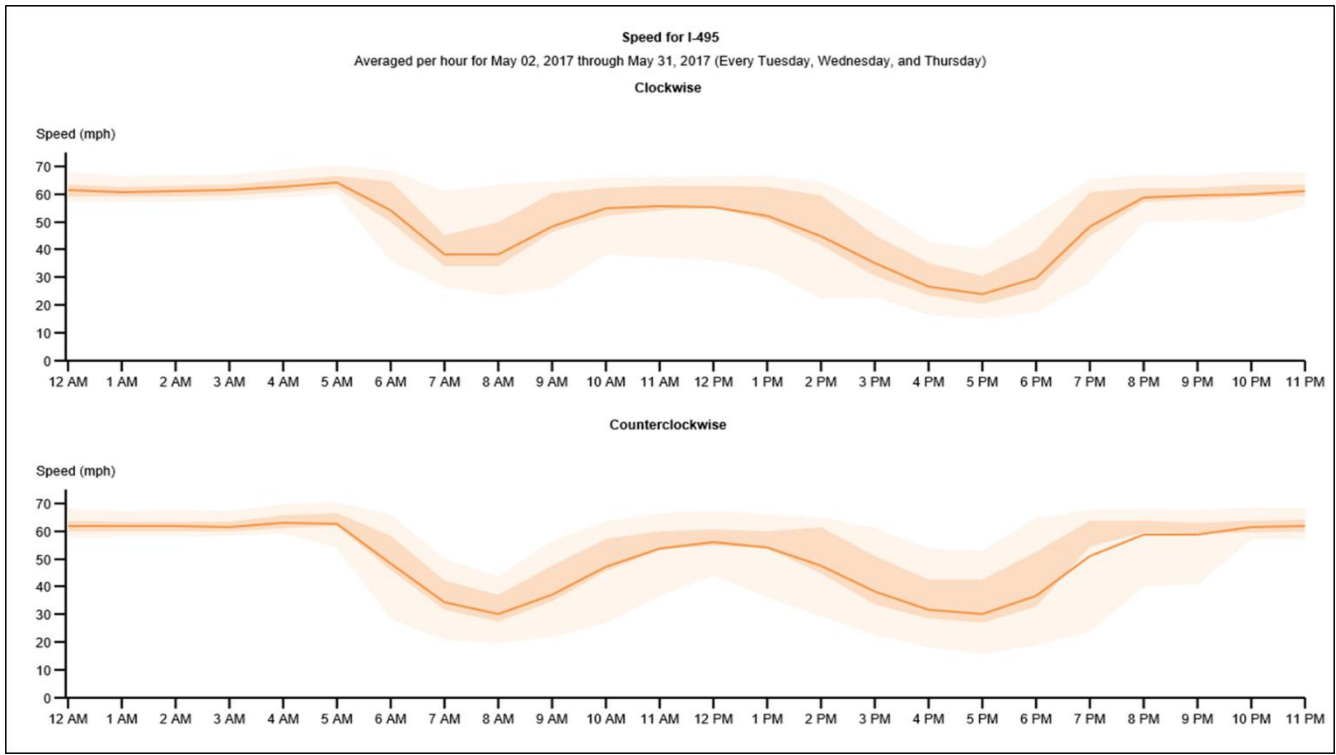
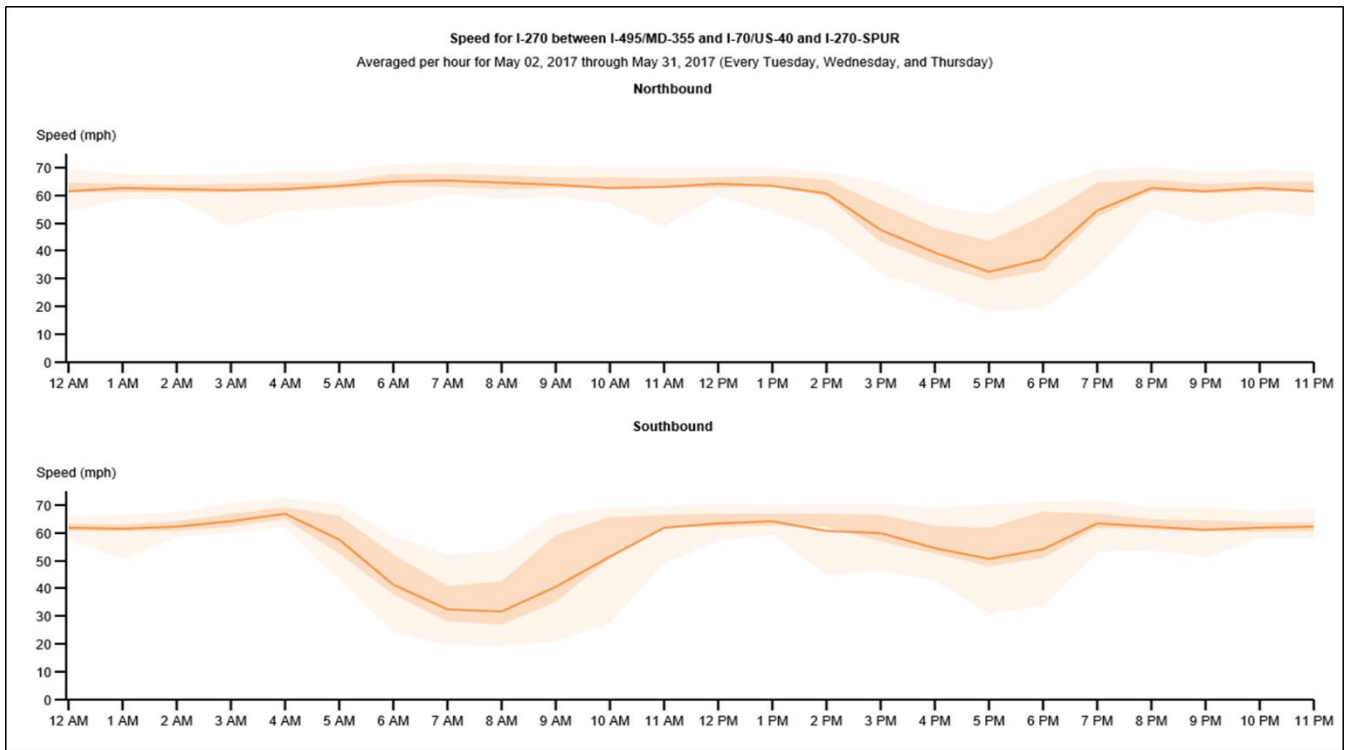


Figure 2: I-270 Existing Speed Graph (2017 INRIX Data)





The goal of calibrating the existing model is to develop a model that is representative of a typical day along the corridor, while also considering the volatility of the corridor and the reliability of each data set. It should be noted that for this project the speeds and travel times are reflective of May 2017 (Tuesdays, Wednesdays, and Thursdays), but the volumes were collected over multiple days, months, and years because there was not a cost-effective method to collect all volume data on the same day given the size of the study area. Both I-495 and I-270 corridors frequently experience oversaturated conditions where the observed volume does not represent the actual demand on each roadway facility. The calibration process was, therefore, pivoted to use travel time as the most reliable validation performance metric while volume was used as secondary benchmark criteria for comparison purposes.

The validation targets for the I-270 and I-495 model were:

1. Travel Time

- VISSIM travel times fall within a 95% confidence level of INRIX travel times. The cumulative upper and lower bounds of the 95% confidence intervals were determined by first calculating the margin of error for each segment along the corridor.

2. Volumes

- VISSIM simulated volumes fall within +/- 10% of balanced traffic count volumes

The AM and PM peak period results along the I-495 and I-270 corridors are summarized in the appendices with tables and graphics as follows:

- **APPENDIX A:** Speed heat maps and speed/travel time tables comparing simulated peak hour results to May 2017 INRIX data for all mainline segments. Speed heat maps have bottleneck segments boxed to correspond with the bottleneck summary list in the subsequent section of the memo.
- **APPENDIX B:** Travel time charts comparing simulated peak hour results to May 2017 INRIX data and confidence intervals for all mainline segments. INRIX travel time data from each Tuesday, Wednesday, and Thursday in May 2017 as well as the average travel time was plotted to illustrate high variability during peak hours. Simulated travel times are shown to typically fall within a 95% confidence level of INRIX data throughout the study corridors, with some exceptions detailed below.
- **APPENDIX C:** Volume tables comparing simulated peak hour results to balanced count volumes for all mainline segments.
- **APPENDIX D:** Volume charts comparing simulated peak hour results to balanced traffic count volumes for all mainline segments. Simulated volumes fall within 10% of balanced count volumes throughout the study corridors.

There are occurrences where the VISSIM travel time falls outside of the confidence intervals, specifically for the PM I-495 outer loop and AM I-270 southbound conditions; however, the existing conditions along these two roadways are highly volatile due to heavy congestion with multiple bottlenecks. As shown on the travel time graphs, there is significant travel time fluctuation between multiple days within the month of May. The VISSIM travel time generally follows the shape of the travel time line and falls within the individual runs along the corridor.



Bottleneck Locations

Bottlenecks can form due to several factors, including increased traffic demand, ramp merges and diverges, weaves, and lane drops. Bottlenecks may meter traffic volumes at downstream locations, resulting in higher downstream travel speeds and lower traffic volumes. A visual audit of the VISSIM simulation models was performed to ensure the models accurately replicate field observations, including the locations of bottlenecks and reduced speeds resulting from these bottlenecks. The bottlenecks were identified by reviewing RITIS travel time speed data and cross referencing the Maryland State Highway Mobility Report's list of most congested freeway sections in 2018. It should be noted that there are multiple bottleneck locations throughout the I-270 and I-495 corridors in the peak travel direction, and queuing from one bottleneck location frequently spills back into other bottleneck locations, making the individual bottlenecks difficult to locate and pinpoint.

The following is a summary of the most notable bottleneck locations identified based on speed data and observation.

I-270 Southbound (AM Peak)

- **I-270 from MD 109 and MD 85:** High traffic volumes entering I-270 from MD 109 and MD 80 onto a congested 2-lane section of I-270 create a bottleneck.
- **I-270 from Father Hurley to MD 124:** High traffic volumes merging onto I-270 from MD 124 westbound and MD 118 create a bottleneck.
- **I-270 from I-370 to Montrose Rd:** A combination of closely spaced interchanges, slip ramps between I-270 Local and Express lanes, and high traffic volumes entering and exiting I-270 from I-370, MD 28, MD 189, and Montrose Rd create heavy weaving conditions and reduce capacity along this stretch of I-270. After Montrose Road, I-270 Local lanes end and merge with I-270 Express lanes, resulting in traffic weaving as vehicles approach the I-270 spurs.
- **I-270 West Spur from I-270 split to I-495 West:** High traffic volume from I-270 southbound merges with heavy traffic volume from I-495 westbound, creating a bottleneck on the I-270 West Spur.

I-270 Northbound (PM Peak)

- **I-270 East/West Spurs at I-270 split:** High traffic volumes entering I-270 from I-495 inner and outer loops, coupled with traffic weaving to I-270 Local or Express lanes, creates a bottleneck at the start of I-270 northbound.
- **I-270 from I-370 to MD 124:** I-270 Local lanes ending after the MD 124 interchange and then merging with I-270 Express lanes' high traffic volumes causes a bottleneck.
- **I-270 between MD 109 and MD 121 interchanges:** A lane drop from 3 to 2 lanes, combined with high traffic volumes result in low speeds along this segment.

I-495 Inner Loop (AM Peak)

- **I-495 from MD 414 to I-295:** High traffic volumes from National Harbor enter a congested I-495 weave section, creating a bottleneck.
- **I-495 from American Legion Bridge to VA 193:** A weaving section occurs on the American Legion Bridge due to high traffic volumes entering from George Washington Memorial Parkway and exiting to Clara Barton Parkway, creating a bottleneck.

I-495 Inner Loop (PM Peak)

- **I-495 from VA193 to I-270 West Spur:** High traffic volumes entering the inner loop from VA 193, George Washington Memorial Parkway, Cabin John Parkway, and MD 190, coupled with a heavy weaving section prior to the I-270 northbound and I-495 westbound split, creates a bottleneck on I-495.
- **I-495 from MD 187 to MD 97:** High traffic volume entering the inner loop from MD 97 creates a bottleneck when merging onto a very high-volume section of I-495.
- **I-495 from I-95 to MD 201:** High traffic volumes entering the inner loop from I-95, US 1, and MD 201, combined with high traffic volumes on I-495, create a bottleneck on I-495.
- **I-495 from US 50 to MD 214:** High traffic volumes entering the congested inner loop from US 50, MD 202, and MD 214, combined with vehicles weaving between Arena Drive and MD 214, create a bottleneck on I-495.



I-495 Outer Loop (AM Peak)

- **I-495 from I-95 and MD 97:** High traffic volume merging onto the outer loop from MD 97, combined with high traffic volume on I-495, creates a bottleneck that is exacerbated by additional heavy volume entering the inner loop from US 29, MD 193, MD 650, and I-95.
- **I-495 from MD 202 and Arena Drive:** I-495 local and express lanes merging and subsequently dropping from 6 to 4 lanes in under one mile creates a bottleneck that is worsened by high traffic volumes from MD 202 and Arena Drive.

I-495 Outer Loop (PM Peak)

- **I-495 from Clara Barton Parkway to I-270 West Spur:** High traffic volumes merging onto the outer loop from MD 190 and Clara Barton Parkway create a bottleneck.
- **I-495 from MD 450 to MD 201:** High traffic volumes entering the outer loop from MD 295, coupled with traffic exiting and entering from MD 201, creates a bottleneck along I-495.
- **I-495 from MD 202 to Arena Drive:** I-495 local and express lanes merging and subsequently dropping from 6 to 4 lanes in under one mile creates a bottleneck that is worsened by high traffic volumes from MD 202 and Arena Drive.

Speed heat maps were developed to confirm bottleneck locations and compare model speeds and trends with RITIS data across the entire study area for each peak period, with bottleneck locations boxed to correspond with the locations summarized above (see **APPENDIX A**). Comparison of the RITIS speed data to the VISSIM simulated travel times, as documented in the speed calibration tables, also indicates the model is generally replicating the speeds based on the location of bottlenecks along the corridor. Additionally, a visual review of model simulation indicates the model is accurately replicating the identified bottleneck locations.

5) Summary of Results

The complexity of the I-495 and I-270 VISSIM study area can be characterized by its large network size, long peak period duration, and high variability of daily speeds and volumes. When evaluating the model travel times and volumes compared to the field-collected data, the model is considered reasonably calibrated based on most segments meeting the aforementioned target criteria during both the AM and PM peaks. VISSIM simulated travel times typically fall within a 95% confidence level of INRIX travel times, with some exceptions attributed to the study area's heavy congestion that causes travel times to fluctuate widely across different days. The simulated volume throughputs fall within 10% of balanced traffic count volumes throughout the I-495 and I-270 corridors. This reasonableness provides the sensitivity necessary to evaluate the future year conditions for alternative analysis.



APPENDIX A

Appendix A.1: Speed Heat Maps

Appendix A.2: Speed and Travel Time Tables

Appendix A.1: Speed Heat Maps







Legend	
	Speed < 10 mph
	10 mph < Speed < 20 mph
	20 mph < Speed < 30 mph
	30 mph < Speed < 40 mph
	40 mph < Speed < 50 mph
	Speed > 50 mph

Figure A.4: I-270 Northbound Heat Map Comparison (PM)

I-270 NB			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
NAME	MILES	MILE POINT	HOURLY				HOURLY			
			3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Merge from I 495 to Democracy Blvd	0.82	0.00	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between Democracy Blvd on and off ramps	0.41	0.82	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between I-270 Spur Merge and Democracy Blvd	0.38	1.23	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Merge I-270 Spur	0.49	1.61	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-355 and Grosvenor Lane	0.19	2.10	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Grosvenor Lane to Exit 1A	1.21	2.29	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between Exit 1A and 1B	0.71	3.50	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-187 to I-270 spur	0.59	4.21	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Tuckerman Lane to I-270 Local	0.89	4.80	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From I-270 Local to Exit 5 for I-270 Local	0.92	5.69	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Exit 5 for I-270 Local to just south of Md-189	0.83	6.61	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-189 on and off ramps	0.36	7.44	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-189 to just south of MD-28	0.51	7.80	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-28 on and off ramps	0.55	8.31	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-28 on ramp to Redland Blvd	1.40	8.86	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between Shady Grove Rd on and off ramps	0.48	10.26	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Shady Grove Rd on ramp to I-370 interchange	0.42	10.74	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From I-370 interchange to Muddy Branch Rd	0.59	11.16	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Muddy Branch Rd to just south of MD-117 interchange	0.94	11.75	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From just south of MD-117 interchange to MD-117	0.29	12.69	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-117 to MD-124 off ramp	0.42	12.98	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-124 on and off ramps	0.71	13.40	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-124 on ramp to just south of Middlebrook Rd	1.78	14.11	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between Middlebrook Rd on and off ramps	0.25	15.89	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Middlebrook Rd on ramp to MD-118 off ramp	0.45	16.14	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-118 on and off ramps	0.61	16.59	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-118 on ramp to MD-27	0.32	17.20	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between Md-27 on and off ramps	0.60	17.52	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From Md-27 on ramp to MD-121 off ramp	2.21	18.12	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-121 on and off ramps	0.18	20.33	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-121 to Md-109	3.90	20.51	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-109 on and off ramps	0.21	24.41	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-109 on ramp to MD-80	3.49	24.62	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-80 on and off ramps	0.19	28.11	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
From MD-80 on ramp to MD-85	4.76	28.30	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			
Between MD-85 on and off ramps	0.50	33.06	[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]				[Heatmap: High speeds (red) at 3:00 PM, decreasing to low speeds (green) by 5:00 PM]			

Figure A.7: I-495 Outer Loop Heat Map Comparison (AM)

I-495 OL			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
NAME	MILES	MILE POINT	HOURLY				HOURLY			
			6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	0.43	0.00	Green	Green	Green	Green				
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	0.37	0.43	Green	Green	Green	Green				
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	0.52	0.80	Green	Green	Green	Green				
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	0.15	1.32	Green	Green	Green	Green				
AMERICAN LEGION BRIDGE	0.16	1.47	Green	Green	Green	Green				
BEFORE AMERICAN LEGION BRIDGE	0.10	1.63	Green	Green	Green	Green				
MERGE CLARA BARTON PARKWAY	0.28	1.73	Green	Green	Green	Green				
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	1.20	2.01	Green	Green	Green	Green				
MERGE CABIN JOHN PARKWAY	0.45	3.21	Green	Green	Green	Green				
BETWEEN CABIN JOHN PARKWAY AND MD 190	0.07	3.66	Green	Green	Green	Green				
MERGE MD 190	0.30	3.73	Green	Green	Green	Green				
BETWEEN MD 190 AND I 270	1.06	4.03	Green	Green	Green	Green				
MERGE I 270	0.29	5.09	Green	Green	Green	Green				
BETWEEN I 270 WEST AND MD 187	1.44	5.38	Green	Green	Green	Green				
MERGE MD 187	0.36	6.82	Green	Green	Green	Green				
BETWEEN I 270 EAST AND MD 187	0.58	7.18	Green	Green	Green	Green				
MERGE BEFORE I 270	0.23	7.76	Green	Green	Green	Green				
MERGE AFTER I 270	0.02	7.99	Green	Green	Green	Green				
MD 355 MERGE	0.27	8.01	Green	Green	Green	Green				
BETWEEN MD 355 AND MD 185	1.19	8.28	Green	Green	Green	Green				
MD 185 MERGE	0.62	9.47	Green	Green	Green	Green				
BETWEEN MD 185 AND MD 97	1.67	10.09	Green	Green	Green	Green				
MD 97 MERGE	0.33	11.76	Green	Green	Green	Green				
BETWEEN MD 97 AND US 29	1.12	12.09	Green	Green	Green	Green				
MERGE US 29	0.22	13.21	Green	Green	Green	Green				
BETWEEN MD US 29 AND MD 193	0.50	13.43	Green	Green	Green	Green				
MERGE MD 193	0.26	13.93	Green	Green	Green	Green				
BETWEEN MD 193 AND MD 650	1.20	14.19	Green	Green	Green	Green				
MERGE MD 650	0.48	15.39	Green	Green	Green	Green				
BETWEEN MD 650 AND I 95	0.77	15.87	Green	Green	Green	Green				
I 95 MERGE	0.85	16.64	Green	Green	Green	Green				
BETWEEN US 1 AND I 95	0.58	17.49	Green	Green	Green	Green				
MERGE US 1	0.52	18.07	Green	Green	Green	Green				
BETWEEN GREENBELT STATION AND US 1	0.78	18.59	Green	Green	Green	Green				
BETWEEN GREENBELT STATION AND MD 201	0.88	19.37	Green	Green	Green	Green				
MERGE MD 201	0.58	20.25	Green	Green	Green	Green				
BETWEEN MD 201 AND MD 295 MERGE	0.38	20.83	Green	Green	Green	Green				
MERGE MD 295	0.49	21.21	Green	Green	Green	Green				
BETWEEN MD 295 AND MD 450	2.04	21.70	Green	Green	Green	Green				
MERGE MD 450	0.36	23.74	Green	Green	Green	Green				
BETWEEN MD 450 AND US 50	0.46	24.10	Green	Green	Green	Green				
MERGE US 50	0.70	24.56	Green	Green	Green	Green				
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	1.09	25.26	Green	Green	Green	Green				
END 495 EXPRESS LANE	0.10	26.35	Green	Green	Green	Green				
BEFORE MD 202 MERGE	0.20	26.45	Green	Green	Green	Green				
MERGE MD 202	0.68	26.65	Green	Green	Green	Green				
BETWEEN MD 202 AND ARENA DR	0.23	27.33	Green	Green	Green	Green				
MERGE ARENA DR	0.46	27.56	Green	Green	Green	Green				
BETWEEN ARENA DR AND MD 214	0.53	28.02	Green	Green	Green	Green				
MERGE MD 214	0.50	28.55	Green	Green	Green	Green				
BETWEEN MD 214 AND RITCHIE MARLBORO RD	1.18	29.05	Green	Green	Green	Green				
MERGE RITCHIE MARLBORO RD	0.45	30.23	Green	Green	Green	Green				
BETWEEN RITCHIE MARLBORO AND MD 4	1.87	30.68	Green	Green	Green	Green				
MERGE MD 4	0.58	32.55	Green	Green	Green	Green				
BETWEEN MD 4 AND FORESTVILLE RD	0.61	33.13	Green	Green	Green	Green				
MERGE MD 337	0.17	33.74	Green	Green	Green	Green				
BETWEEN FORESTVILLE AND MD 218	0.90	33.91	Green	Green	Green	Green				
MERGE MD 218	0.05	34.81	Green	Green	Green	Green				
BETWEEN MD 218 AND MD 5	1.09	34.86	Green	Green	Green	Green				
MERGE MD 5	0.72	35.95	Green	Green	Green	Green				
BETWEEN MD 5 AND MD 414	2.32	36.67	Green	Green	Green	Green				
MERGE MD 414	0.57	38.99	Green	Green	Green	Green				
BETWEEN MD 414 AND MD 210	0.83	39.56	Green	Green	Green	Green				
MERGE MD 210	1.64	40.39	Green	Green	Green	Green				
BETWEEN MD 210 AND I 295	0.07	42.03	Green	Green	Green	Green				
MERGE I 295	0.19	42.10	Green	Green	Green	Green				
BEFORE WOODROW WILSON BRIDGE	0.12	42.29	Green	Green	Green	Green				
WOODROW WILSON BRIDGE	1.18	42.41	Green	Green	Green	Green				

Appendix A.2: Speed and Travel Time Tables



Legend	
	Speed Within Acceptable Range
	Speed Outside of Acceptable Range

Figure A.9: I-495 Inner Loop 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	228612	43.3				3945.8	3718.1	227.6	6%
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	25.7	55.4	No	72.3	33.6	38.7	54%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	25.6	28.1	Yes	65.2	59.4	5.8	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	30.7	20.7	Yes	42.9	63.7	-20.8	-48%
AMERICAN LEGION BRIDGE	794	0.2	38.9	26.7	Yes	13.9	20.2	-6.3	-46%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	37.6	36.4	Yes	9.2	9.5	-0.3	-3%
MERGE CLARA BARTON PARKWAY	1055	0.2	43.3	52.1	Yes	16.6	13.8	2.8	17%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	53.0	55.9	Yes	93.7	88.9	4.8	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	60.8	56.8	Yes	23.8	25.5	-1.7	-7%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	63.1	59.7	Yes	2.8	3.0	-0.2	-6%
MERGE MD 190	1235	0.2	63.5	56.5	Yes	13.3	14.9	-1.6	-12%
BETWEEN MD 190 AND I 270	6468	1.2	63.6	56.0	Yes	69.3	78.7	-9.4	-14%
MERGE I 270	867	0.2	59.9	57.4	Yes	9.9	10.3	-0.4	-4%
BETWEEN I 270 AND MD 187	7828	1.5	59.9	55.8	Yes	89.1	95.6	-6.5	-7%
MERGE MD 187	2140	0.4	60.5	54.2	Yes	24.1	26.9	-2.8	-12%
BETWEEN MD 187 AND I 270	2278	0.4	54.0	52.4	Yes	28.7	29.6	-0.9	-3%
MERGE BEFORE I 270	1306	0.2	47.9	50.4	Yes	18.6	17.7	0.9	5%
MERGE AFTER I 270	564	0.1	51.5	59.8	Yes	7.5	6.4	1.0	14%
MD 355 MERGE	1371	0.3	52.0	57.7	Yes	18.0	16.2	1.8	10%
BETWEEN MD 355 AND MD 185	6065	1.1	49.4	41.6	Yes	83.7	99.3	-15.5	-19%
MD 185 MERGE	2074	0.4	55.9	56.7	Yes	25.3	24.9	0.3	1%
BETWEEN MD 185 AND MD 97	9907	1.9	56.0	57.6	Yes	120.7	117.4	3.4	3%
MD 97 MERGE	1461	0.3	59.5	57.3	Yes	16.8	17.4	-0.6	-4%
BETWEEN MD 97 AND US 29	5965	1.1	60.4	58.8	Yes	67.3	69.2	-1.9	-3%
MERGE US 29	1734	0.3	60.9	59.7	Yes	19.4	19.8	-0.4	-2%
BETWEEN MD US 29 AND MD 193	1640	0.3	60.2	60.6	Yes	18.6	18.5	0.1	1%
MERGE MD 193	2099	0.4	61.7	58.4	Yes	23.2	24.5	-1.3	-6%
BETWEEN MD 193 AND MD 650	6046	1.1	62.3	56.9	Yes	66.2	72.4	-6.2	-9%
MERGE MD 650	3008	0.6	61.0	57.4	Yes	33.6	35.7	-2.1	-6%
BETWEEN MD 650 AND I 95	2869	0.5	60.5	59.2	Yes	32.3	33.0	-0.7	-2%
BEFORE I 95 MERGE	5612	1.1	62.5	61.2	Yes	61.2	62.5	-1.3	-2%
AFTER I 95 MERGE	2578	0.5	39.7	56.8	No	44.2	30.9	13.3	30%
MERGE US 1	2873	0.5	37.7	45.4	Yes	52.0	43.2	8.8	17%
BEFORE GREENBELT STATION MERGE	3544	0.7	45.1	38.0	Yes	53.6	63.6	-10.0	-19%
AFTER GREENBELT STATION MERGE	595	0.1	54.4	39.8	Yes	7.5	10.2	-2.7	-37%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	56.9	49.9	Yes	52.9	60.3	-7.4	-14%
MERGE MD 201	3066	0.6	56.8	52.5	Yes	36.8	39.8	-3.0	-8%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	56.2	49.9	Yes	23.0	26.0	-2.9	-13%
MERGE MD 295	2725	0.5	60.2	54.1	Yes	30.8	34.4	-3.5	-11%
BETWEEN MD 295 AND MD 450	10677	2.0	62.0	54.2	Yes	117.3	134.3	-17.0	-14%
MERGE MD 450	1203	0.2	57.3	54.8	Yes	14.3	15.0	-0.7	-5%
BETWEEN MD 450 AND US 50	2809	0.5	54.6	50.5	Yes	35.1	37.9	-2.8	-8%
MERGE US 50	4270	0.8	54.7	56.8	Yes	53.2	51.3	1.9	4%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	54.0	54.7	Yes	69.0	68.1	0.9	1%
END 495 EXPRESS LANE	515	0.1	61.7	55.1	Yes	5.7	6.4	-0.7	-12%
BEFORE MD 202 MERGE	1817	0.3	60.5	56.4	Yes	20.5	22.0	-1.5	-7%
MERGE MD 202	2462	0.5	60.2	57.4	Yes	27.9	29.2	-1.3	-5%
BETWEEN MD 202 AND ARENA DR	1355	0.3	58.3	55.6	Yes	15.9	16.6	-0.8	-5%
MERGE ARENA DR	2059	0.4	56.2	56.0	Yes	25.0	25.1	-0.1	0%
BETWEEN ARENA DR AND MD 214	3333	0.6	54.6	56.7	Yes	41.6	40.0	1.6	4%
MD 214 MERGE	2564	0.5	51.7	55.9	Yes	33.8	31.3	2.6	8%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	55.4	53.0	Yes	119.4	124.9	-5.5	-5%
MERGE MD 4	2628	0.5	60.0	57.1	Yes	29.9	31.4	-1.5	-5%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	61.1	58.7	Yes	37.2	38.8	-1.5	-4%
MERGE FORESTVILLE RD	930	0.2	62.1	60.2	Yes	10.2	10.5	-0.3	-3%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	62.4	62.8	Yes	35.1	34.9	0.2	1%
MERGE MD 218	1660	0.3	63.4	63.1	Yes	17.8	18.0	-0.1	-1%
BETWEEN MD 218 AND MD 5	6410	1.2	60.9	56.2	Yes	71.8	77.8	-6.0	-8%
MERGE MD 5	2751	0.5	32.0	27.5	Yes	58.7	68.2	-9.5	-16%
BETWEEN MD 5 AND MD 414	11958	2.3	18.2	14.2	Yes	447.5	575.5	-127.9	-29%
MERGE MD 414	3478	0.7	14.6	10.4	Yes	162.9	228.0	-65.0	-40%
BETWEEN MD 414 AND MD 210	2470	0.5	15.7	22.6	Yes	107.3	74.4	32.9	31%
MERGE MD 210	5648	1.1	7.7	21.3	Yes	500.4	180.9	319.5	64%
BETWEEN MD 210 AND I 295	2959	0.6	10.1	20.1	Yes	200.4	100.2	100.2	50%
MERGE I 295	3328	0.6	22.6	30.6	Yes	100.3	74.2	26.1	26%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	48.8	56.8	Yes	17.0	14.6	2.4	14%
WOODROW WILSON BRIDGE	6059	1.1	50.2	57.5	Yes	82.4	71.9	10.5	13%

Figure A.10: I-495 Outer Loop 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4173.2	4148.3	24.9	1%
WOODROW WILSON BRIDGE	6160	1.2	49.3	57.4	Yes	85.3	73.1	12.1	14%
BEFORE WOODROW WILSON BRIDGE	644	0.1	53.6	60.2	Yes	8.2	7.3	0.9	11%
MERGE I 295	1023	0.2	59.4	59.0	Yes	11.7	11.8	-0.1	-1%
BETWEEN MD 210 AND I 295	377	0.1	57.3	60.6	Yes	4.5	4.2	0.2	5%
MERGE MD 210	8656	1.6	57.7	58.1	Yes	102.3	101.5	0.8	1%
BETWEEN MD 414 AND MD 210	4452	0.8	61.8	58.5	Yes	49.2	51.9	-2.7	-6%
MERGE MD 414	2984	0.6	62.8	59.0	Yes	32.4	34.5	-2.1	-7%
BETWEEN MD 5 AND MD 414	12214	2.3	60.0	53.0	Yes	138.9	157.2	-18.4	-13%
MERGE MD 5	3740	0.7	62.3	53.4	Yes	40.9	47.7	-6.8	-17%
BETWEEN MD 218 AND MD 5	5897	1.1	60.4	52.5	Yes	66.5	76.6	-10.1	-15%
MERGE MD 218	238	0.0	59.0	54.4	Yes	2.7	3.0	-0.2	-9%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	57.0	54.4	Yes	58.7	61.6	-2.9	-5%
MERGE MD 337	912	0.2	55.2	54.7	Yes	11.3	11.4	-0.1	-1%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	52.0	52.4	Yes	41.2	40.9	0.3	1%
MERGE MD 4	3108	0.6	48.1	54.1	Yes	44.0	39.2	4.9	11%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	43.2	52.8	Yes	99.4	81.4	18.0	18%
MERGE MD 214	2618	0.5	41.8	55.4	Yes	42.7	32.2	10.5	25%
BETWEEN ARENA DR AND MD 214	2789	0.5	41.4	51.3	Yes	46.0	37.1	8.9	19%
MERGE ARENA DR	2437	0.5	39.8	47.1	Yes	41.7	35.3	6.5	15%
BETWEEN MD 202 AND ARENA DR	1179	0.2	33.3	35.2	Yes	24.1	22.9	1.3	5%
MERGE MD 202	3055	0.6	27.7	22.4	Yes	75.2	93.1	-17.9	-24%
BEFORE MD 202 MERGE	908	0.2	28.2	11.3	No	22.0	54.6	-32.6	-148%
END 495 EXPRESS LANE	594	0.1	24.5	14.5	Yes	16.5	27.9	-11.4	-69%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	33.3	40.0	Yes	124.9	104.1	20.8	17%
MERGE US 50	3680	0.7	37.7	54.8	No	66.5	45.8	20.7	31%
BETWEEN MD 450 AND US 50	2561	0.5	32.2	28.8	Yes	54.2	60.6	-6.4	-12%
MERGE MD 450	2100	0.4	37.4	27.4	Yes	38.3	52.3	-14.0	-36%
BETWEEN MD 295 AND MD 450	10674	2.0	51.0	46.2	Yes	142.7	157.6	-14.9	-10%
MERGE MD 295	2479	0.5	54.1	52.4	Yes	31.2	32.2	-1.0	-3%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	56.1	51.5	Yes	24.2	26.4	-2.2	-9%
MERGE MD 201	3054	0.6	59.2	51.8	Yes	35.2	40.2	-5.1	-14%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	59.2	52.7	Yes	53.4	60.0	-6.6	-12%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	58.3	56.9	Yes	48.0	49.2	-1.2	-2%
MERGE US 1	2739	0.5	51.8	57.8	Yes	36.1	32.3	3.8	11%
BETWEEN US 1 AND I 95	3225	0.6	42.2	56.7	No	52.1	38.8	13.3	26%
I 95 MERGE	4389	0.8	11.3	54.9	No	265.4	54.5	210.9	79%
BETWEEN MD 650 AND I 95	4048	0.8	9.8	11.0	Yes	283.0	251.1	31.9	11%
MERGE MD 650	2547	0.5	9.6	9.6	Yes	181.2	181.1	0.1	0%
BETWEEN MD 193 AND MD 650	6315	1.2	11.1	11.0	Yes	387.9	390.5	-2.6	-1%
MERGE MD 193	1353	0.3	13.5	11.8	Yes	68.2	78.0	-9.8	-14%
BETWEEN MD US 29 AND MD 193	2722	0.5	14.3	15.2	Yes	129.6	121.8	7.8	6%
MERGE US 29	1127	0.2	15.3	13.9	Yes	50.3	55.4	-5.1	-10%
BETWEEN MD 97 AND US 29	5926	1.1	21.1	19.1	Yes	191.4	211.4	-20.0	-10%
MD 97 MERGE	1734	0.3	24.9	16.3	Yes	47.5	72.4	-24.9	-52%
BETWEEN MD 185 AND MD 97	8746	1.7	41.0	31.7	Yes	145.4	188.2	-42.8	-29%
MD 185 MERGE	3315	0.6	45.4	53.0	Yes	49.8	42.6	7.1	14%
BETWEEN MD 355 AND MD 185	6287	1.2	52.7	51.5	Yes	81.3	83.3	-1.9	-2%
MD 355 MERGE	1401	0.3	56.8	53.2	Yes	16.8	17.9	-1.1	-7%
MERGE AFTER I 270	61	0.0	56.4	54.1	Yes	0.7	0.8	0.0	-4%
MERGE BEFORE I 270	1298	0.2	55.1	49.2	Yes	16.1	18.0	-1.9	-12%
BETWEEN I 270 EAST AND MD 187	3092	0.6	56.7	53.3	Yes	37.2	39.6	-2.4	-7%
MERGE MD 187	1936	0.4	59.2	52.6	Yes	22.3	25.1	-2.8	-13%
BETWEEN I 270 WEST AND MD 187	7643	1.4	60.2	52.8	Yes	86.5	98.7	-12.1	-14%
MERGE I 270	1490	0.3	54.1	50.8	Yes	18.8	20.0	-1.2	-7%
BETWEEN MD 190 AND I 270	5753	1.1	54.3	42.1	Yes	72.2	93.2	-21.0	-29%
MERGE MD 190	1537	0.3	57.5	51.9	Yes	18.2	20.2	-2.0	-11%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	57.2	51.4	Yes	2.6	2.8	-0.3	-11%
MERGE CABIN JOHN PARKWAY	2397	0.5	55.8	44.3	Yes	29.3	36.9	-7.6	-26%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	56.2	42.5	Yes	76.8	101.5	-24.7	-32%
MERGE CLARA BARTON PARKWAY	1463	0.3	57.9	49.6	Yes	17.2	20.1	-2.9	-17%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	57.8	52.0	Yes	8.8	9.8	-1.0	-11%
AMERICAN LEGION BRIDGE	790	0.1	57.2	53.0	Yes	9.4	10.2	-0.7	-8%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	56.5	52.1	Yes	10.2	11.0	-0.8	-8%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	58.6	52.4	Yes	49.9	55.8	-5.9	-12%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	59.6	52.8	Yes	7.8	8.8	-1.0	-13%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	59.4	52.6	Yes	19.2	21.6	-2.5	-13%



Figure A.11: I-270 Southbound 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				3945.8	4280.1	-334.3	-8%
BETWEEN MD-85 ON AND OFF RAMP	2549	0.5	55.3	57.5	Yes	31.4	30.2	1.2	4%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	34.8	44.4	Yes	499.7	391.9	107.8	22%
BETWEEN MD-80 ON AND OFF RAMP	845	0.2	24.4	19.2	Yes	23.6	30.1	-6.4	-27%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	33.4	24.5	Yes	382.6	522.7	-140.1	-37%
BETWEEN MD-109 ON AND OFF RAMP	922	0.2	31.0	22.7	Yes	20.3	27.7	-7.4	-37%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	45.8	45.2	Yes	273.1	276.3	-3.2	-1%
BETWEEN MD-121 ON AND OFF RAMP	2354	0.4	39.8	52.7	Yes	40.4	30.5	9.9	24%
FROM MD-121 TO MD-27	10608	2.0	29.9	32.9	Yes	242.1	220.1	22.0	9%
BETWEEN MD-27 ON AND OFF RAMP	3802	0.7	15.8	12.5	Yes	163.7	206.6	-42.9	-26%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	16.6	12.3	Yes	76.0	102.8	-26.8	-35%
BETWEEN MD-118 ON AND OFF RAMP	3278	0.6	17.8	14.6	Yes	125.7	153.0	-27.3	-22%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	23.1	26.0	Yes	76.2	67.7	8.5	11%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1460	0.3	26.3	31.7	Yes	37.9	31.4	6.5	17%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	27.5	26.0	Yes	253.0	267.8	-14.8	-6%
BETWEEN MD-124 ON AND OFF RAMP	1613	0.3	25.2	17.3	Yes	43.6	63.5	-19.9	-46%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	29.6	22.0	Yes	70.0	94.4	-24.3	-35%
BETWEEN MD-117 ON AND OFF RAMP	1463	0.3	34.6	30.4	Yes	28.9	32.8	-4.0	-14%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	38.0	33.0	Yes	66.9	77.0	-10.1	-15%
BETWEEN I-370 ON AND OFF RAMP	3154	0.6	29.6	27.1	Yes	72.5	79.3	-6.8	-9%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	18.4	15.1	Yes	174.8	213.2	-38.3	-22%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	77	0.0	21.0	28.3	Yes	2.5	1.9	0.6	26%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	19.6	26.4	Yes	344.3	255.8	88.5	26%
BETWEEN MD-28 ON AND OFF RAMP	52	0.0	27.7	29.6	Yes	1.3	1.2	0.1	7%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	29.6	22.6	Yes	95.1	124.5	-29.4	-31%
BETWEEN MD-189 ON AND OFF RAMP	3083	0.6	26.0	18.2	Yes	80.9	115.6	-34.7	-43%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	22.5	17.5	Yes	102.7	131.9	-29.3	-29%
BETWEEN MONTROSE RD ON AND OFF RAMP	4822	0.9	28.1	20.3	Yes	116.9	162.3	-45.4	-39%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	40.6	28.0	Yes	103.4	149.8	-46.4	-45%
FROM I-270 SPUR MD-187	1248	0.2	56.5	57.4	Yes	15.1	14.8	0.2	2%
BETWEEN MD-187 SPUR ON AND OFF RAMP	4256	0.8	60.6	62.6	Yes	47.9	46.3	1.6	3%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	58.7	61.6	Yes	71.9	68.6	3.4	5%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMP	1395	0.3	52.4	62.7	Yes	18.2	15.2	3.0	16%
I-270 SPUR MERGE	1150	0.2	25.2	21.9	Yes	31.1	35.8	-4.6	-15%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	29.9	22.5	Yes	65.8	87.2	-21.4	-33%
MERGE US-1	2749	0.5	32.9	28.4	Yes	57.0	66.0	-9.0	-16%
MERGE I-495	4180	0.8	31.9	33.8	Yes	89.3	84.3	5.0	6%

Figure A.12: I-270 Northbound 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				1854.7	1919.5	-64.8	-3%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	53.9	60.9	No	13.2	11.7	1.5	12%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	58.4	62.8	Yes	72.5	67.5	5.1	7%
BETWEEN EXIT 1A AND 1B	4042	0.8	60.6	63.9	Yes	45.5	43.1	2.4	5%
FROM MD-187 TO I-270 SPUR	341	0.1	60.7	63.0	Yes	3.8	3.7	0.1	4%
FROM TUCKERMAN LANE TO I-270 LOCAL	7076	1.3	63.0	63.2	Yes	76.6	76.3	0.3	0%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	66.6	62.7	Yes	52.0	55.3	-3.3	-6%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	65.8	63.2	Yes	33.4	34.8	-1.4	-4%
BETWEEN MD-189 ON AND OFF RAMPS	3080	0.6	66.4	63.4	Yes	31.6	33.1	-1.5	-5%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	66.4	63.3	Yes	41.9	43.9	-2.1	-5%
BETWEEN MD-28 ON AND OFF RAMPS	49	0.0	66.3	62.9	Yes	0.5	0.5	0.0	-5%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	65.8	64.0	Yes	103.7	106.7	-3.0	-3%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	74	0.0	66.9	63.6	Yes	0.8	0.8	0.0	-5%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	67.4	63.8	Yes	48.8	51.6	-2.8	-6%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	67.6	64.0	Yes	1.7	1.8	-0.1	-6%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	66.7	63.0	Yes	81.2	85.9	-4.7	-6%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	66.6	63.2	Yes	0.3	0.3	0.0	-5%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	66.9	63.2	Yes	33.1	35.1	-1.9	-6%
BETWEEN MD-124 ON AND OFF RAMPS	27	0.0	66.8	64.0	Yes	0.3	0.3	0.0	-4%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	66.2	63.5	Yes	124.0	129.3	-5.3	-4%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1221	0.2	65.0	63.8	Yes	12.8	13.0	-0.2	-2%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	64.4	63.5	Yes	25.7	26.0	-0.3	-1%
BETWEEN MD-118 ON AND OFF RAMPS	3423	0.6	64.7	63.2	Yes	36.1	36.9	-0.8	-2%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	64.5	63.2	Yes	15.7	16.1	-0.3	-2%
BETWEEN MD-27 ON AND OFF RAMPS	3356	0.6	65.9	63.6	Yes	34.7	36.0	-1.3	-4%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	64.8	63.5	Yes	121.3	123.8	-2.5	-2%
BETWEEN MD-121 ON AND OFF RAMPS	959	0.2	64.9	62.9	Yes	10.1	10.4	-0.3	-3%
FROM MD-121 TO MD-109	20431	3.9	66.8	63.2	Yes	208.7	220.4	-11.8	-6%
BETWEEN MD-109 ON AND OFF RAMPS	920	0.2	65.2	64.6	Yes	9.6	9.7	-0.1	-1%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	66.6	62.5	Yes	191.4	203.8	-12.4	-6%
BETWEEN MD-80 ON AND OFF RAMPS	946	0.2	66.0	60.9	Yes	9.8	10.6	-0.8	-8%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	66.3	62.8	Yes	255.9	270.3	-14.4	-6%
BETWEEN MD-85 ON AND OFF RAMPS	2482	0.5	61.5	63.1	Yes	27.5	26.8	0.7	2%
MERGE FROM I 495	4953	0.9	62.7	59.6	Yes	53.9	56.6	-2.8	-5%
MERGE US-1	2620	0.5	63.8	63.4	Yes	28.0	28.2	-0.2	-1%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	64.2	63.7	Yes	31.6	31.8	-0.2	-1%
MERGE I-270 SPUR	1612	0.3	64.8	63.3	Yes	17.0	17.4	-0.4	-2%



Figure A.13: I-495 Inner Loop 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	228612	43.3				3969.6	3711.1	258.4	7%
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	17.1	20.3	Yes	108.9	91.8	17.0	16%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	18.3	10.2	Yes	91.5	163.9	-72.4	-79%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	25.8	16.4	Yes	51.1	80.2	-29.1	-57%
AMERICAN LEGION BRIDGE	794	0.2	35.9	26.0	Yes	15.1	20.8	-5.8	-38%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	35.5	36.1	Yes	9.7	9.6	0.2	2%
MERGE CLARA BARTON PARKWAY	1055	0.2	42.7	52.0	Yes	16.9	13.8	3.0	18%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	52.6	55.6	Yes	94.5	89.3	5.2	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	58.4	56.6	Yes	24.8	25.6	-0.8	-3%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	59.9	59.6	Yes	2.9	3.0	0.0	-1%
MERGE MD 190	1235	0.2	60.0	56.4	Yes	14.0	14.9	-0.9	-6%
BETWEEN MD 190 AND I 270	6468	1.2	59.8	54.5	Yes	73.8	80.9	-7.2	-10%
MERGE I 270	867	0.2	58.6	57.8	Yes	10.1	10.2	-0.1	-1%
BETWEEN I 270 AND MD 187	7828	1.5	59.0	56.3	Yes	90.4	94.7	-4.3	-5%
MERGE MD 187	2140	0.4	58.2	56.0	Yes	25.1	26.1	-1.0	-4%
BETWEEN MD 187 AND I 270	2278	0.4	49.4	55.6	Yes	31.5	27.9	3.5	11%
MERGE BEFORE I 270	1306	0.2	48.3	51.7	Yes	18.4	17.2	1.2	7%
MERGE AFTER I 270	564	0.1	47.0	60.8	Yes	8.2	6.3	1.9	23%
MD 355 MERGE	1371	0.3	45.4	55.6	Yes	20.6	16.8	3.8	18%
BETWEEN MD 355 AND MD 185	6065	1.1	38.6	44.8	Yes	107.2	92.2	15.0	14%
MD 185 MERGE	2074	0.4	48.5	57.7	Yes	29.2	24.5	4.7	16%
BETWEEN MD 185 AND MD 97	9907	1.9	47.5	57.7	Yes	142.1	117.0	25.1	18%
MD 97 MERGE	1461	0.3	56.1	58.0	Yes	17.8	17.2	0.6	3%
BETWEEN MD 97 AND US 29	5965	1.1	58.0	59.2	Yes	70.1	68.7	1.4	2%
MERGE US 29	1734	0.3	60.0	59.6	Yes	19.7	19.8	-0.1	-1%
BETWEEN MD US 29 AND MD 193	1640	0.3	59.3	60.7	Yes	18.9	18.4	0.4	2%
MERGE MD 193	2099	0.4	60.3	58.3	Yes	23.7	24.5	-0.8	-3%
BETWEEN MD 193 AND MD 650	6046	1.1	60.2	54.5	Yes	68.5	75.6	-7.1	-10%
MERGE MD 650	3008	0.6	59.5	57.6	Yes	34.5	35.6	-1.1	-3%
BETWEEN MD 650 AND I 95	2869	0.5	59.9	60.0	Yes	32.6	32.6	0.0	0%
BEFORE I 95 MERGE	5612	1.1	58.1	61.6	Yes	65.8	62.1	3.7	6%
AFTER I 95 MERGE	2578	0.5	26.2	40.0	Yes	67.0	43.9	23.1	34%
MERGE US 1	2873	0.5	25.9	32.9	Yes	75.7	59.5	16.3	21%
BEFORE GREENBELT STATION MERGE	3544	0.7	34.4	35.0	Yes	70.2	69.1	1.1	2%
AFTER GREENBELT STATION MERGE	595	0.1	49.6	38.1	Yes	8.2	10.7	-2.5	-30%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	54.4	49.5	Yes	55.3	60.8	-5.5	-10%
MERGE MD 201	3066	0.6	54.8	51.1	Yes	38.2	40.9	-2.7	-7%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	54.2	44.5	Yes	23.9	29.1	-5.2	-22%
MERGE MD 295	2725	0.5	58.1	53.0	Yes	32.0	35.1	-3.1	-10%
BETWEEN MD 295 AND MD 450	10677	2.0	59.3	53.5	Yes	122.8	136.2	-13.4	-11%
MERGE MD 450	1203	0.2	53.7	51.5	Yes	15.3	15.9	-0.6	-4%
BETWEEN MD 450 AND US 50	2809	0.5	52.9	43.5	Yes	36.2	44.0	-7.8	-22%
MERGE US 50	4270	0.8	53.5	56.2	Yes	54.4	51.8	2.6	5%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	50.6	52.4	Yes	73.5	71.0	2.5	3%
END 495 EXPRESS LANE	515	0.1	61.8	54.2	Yes	5.7	6.5	-0.8	-14%
BEFORE MD 202 MERGE	1817	0.3	60.7	55.4	Yes	20.4	22.4	-1.9	-10%
MERGE MD 202	2462	0.5	60.7	56.7	Yes	27.6	29.6	-2.0	-7%
BETWEEN MD 202 AND ARENA DR	1355	0.3	59.5	54.7	Yes	15.5	16.9	-1.4	-9%
MERGE ARENA DR	2059	0.4	56.2	55.2	Yes	25.0	25.4	-0.4	-2%
BETWEEN ARENA DR AND MD 214	3333	0.6	50.9	56.2	Yes	44.7	40.4	4.2	9%
MD 214 MERGE	2564	0.5	44.0	55.4	Yes	39.8	31.6	8.2	21%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.6	55.7	Yes	155.3	118.7	36.6	24%
MERGE MD 4	2628	0.5	49.3	56.8	Yes	36.3	31.5	4.8	13%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	53.1	57.6	Yes	42.9	39.5	3.3	8%
MERGE FORESTVILLE RD	930	0.2	59.7	59.4	Yes	10.6	10.7	-0.1	-1%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	60.7	62.5	Yes	36.1	35.0	1.1	3%
MERGE MD 218	1660	0.3	61.9	62.9	Yes	18.3	18.0	0.3	2%
BETWEEN MD 218 AND MD 5	6410	1.2	61.0	43.5	No	71.7	100.4	-28.8	-40%
MERGE MD 5	2751	0.5	37.2	19.0	No	50.5	98.8	-48.3	-96%
BETWEEN MD 5 AND MD 414	11958	2.3	20.0	18.3	Yes	407.2	446.3	-39.1	-10%
MERGE MD 414	3478	0.7	15.6	18.1	Yes	151.7	131.0	20.7	14%
BETWEEN MD 414 AND MD 210	2470	0.5	18.6	29.9	Yes	90.3	56.3	34.1	38%
MERGE MD 210	5648	1.1	11.3	28.3	No	339.8	135.9	203.9	60%
BETWEEN MD 210 AND I 295	2959	0.6	12.9	19.7	Yes	156.3	102.5	53.7	34%
MERGE I 295	3328	0.6	23.0	29.3	Yes	98.6	77.4	21.2	22%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	41.4	56.4	No	20.0	14.7	5.3	27%
WOODROW WILSON BRIDGE	6059	1.1	43.5	57.4	Yes	95.0	71.9	23.1	24%

Figure A.14: I-495 Outer Loop 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4792.2	4275.8	516.4	11%
WOODROW WILSON BRIDGE	6160	1.2	56.7	56.9	Yes	74.1	73.8	0.3	0%
BEFORE WOODROW WILSON BRIDGE	644	0.1	57.1	60.1	Yes	7.7	7.3	0.4	5%
MERGE I 295	1023	0.2	59.9	59.0	Yes	11.6	11.8	-0.2	-2%
BETWEEN MD 210 AND I 295	377	0.1	57.9	60.6	Yes	4.4	4.2	0.2	4%
MERGE MD 210	8656	1.6	59.5	58.2	Yes	99.2	101.5	-2.2	-2%
BETWEEN MD 414 AND MD 210	4452	0.8	61.7	58.6	Yes	49.2	51.8	-2.7	-5%
MERGE MD 414	2984	0.6	63.8	59.2	Yes	31.9	34.4	-2.5	-8%
BETWEEN MD 5 AND MD 414	12214	2.3	64.5	53.0	Yes	129.2	157.0	-27.9	-22%
MERGE MD 5	3740	0.7	60.2	52.9	Yes	42.3	48.3	-5.9	-14%
BETWEEN MD 218 AND MD 5	5897	1.1	48.0	53.0	Yes	83.8	75.9	7.9	9%
MERGE MD 218	238	0.0	44.7	55.2	Yes	3.6	2.9	0.7	19%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	41.3	54.6	Yes	81.1	61.3	19.9	25%
MERGE MD 337	912	0.2	38.9	54.9	No	16.0	11.3	4.7	29%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	40.6	53.3	Yes	52.8	40.2	12.6	24%
MERGE MD 4	3108	0.6	39.5	54.6	No	53.6	38.8	14.8	28%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	40.5	45.3	Yes	106.0	94.9	11.2	11%
MERGE MD 214	2618	0.5	39.5	33.1	Yes	45.2	53.9	-8.8	-19%
BETWEEN ARENA DR AND MD 214	2789	0.5	39.0	25.3	Yes	48.7	75.2	-26.5	-54%
MERGE ARENA DR	2437	0.5	35.0	27.6	Yes	47.4	60.2	-12.8	-27%
BETWEEN MD 202 AND ARENA DR	1179	0.2	26.1	25.7	Yes	30.8	31.3	-0.5	-2%
MERGE MD 202	3055	0.6	22.1	21.0	Yes	94.0	99.1	-5.1	-5%
BEFORE MD 202 MERGE	908	0.2	23.8	10.7	Yes	26.0	57.8	-31.8	-123%
END 495 EXPRESS LANE	594	0.1	20.0	14.4	Yes	20.2	28.2	-8.0	-39%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	30.4	39.7	Yes	136.9	104.7	32.2	24%
MERGE US 50	3680	0.7	34.8	56.7	No	72.2	44.3	27.9	39%
BETWEEN MD 450 AND US 50	2561	0.5	29.2	28.8	Yes	59.7	60.6	-0.9	-2%
MERGE MD 450	2100	0.4	33.4	28.2	Yes	42.9	50.8	-7.9	-18%
BETWEEN MD 295 AND MD 450	10674	2.0	47.9	45.8	Yes	151.9	158.8	-6.9	-5%
MERGE MD 295	2479	0.5	54.8	52.8	Yes	30.9	32.0	-1.2	-4%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	57.5	51.9	Yes	23.7	26.2	-2.6	-11%
MERGE MD 201	3054	0.6	61.7	52.5	Yes	33.8	39.7	-5.9	-18%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	61.9	52.9	Yes	51.1	59.8	-8.7	-17%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	57.2	57.2	Yes	48.9	48.9	0.0	0%
MERGE US 1	2739	0.5	52.2	57.9	Yes	35.8	32.3	3.5	10%
BETWEEN US 1 AND I 95	3225	0.6	45.8	56.8	Yes	48.0	38.7	9.3	19%
I 95 MERGE	4389	0.8	10.5	58.1	No	285.7	51.5	234.2	82%
BETWEEN MD 650 AND I 95	4048	0.8	8.3	12.5	Yes	334.3	221.5	112.8	34%
MERGE MD 650	2547	0.5	7.7	9.7	Yes	226.8	179.7	47.1	21%
BETWEEN MD 193 AND MD 650	6315	1.2	8.5	10.5	Yes	507.0	410.5	96.5	19%
MERGE MD 193	1353	0.3	10.4	11.4	Yes	88.3	81.1	7.3	8%
BETWEEN MD US 29 AND MD 193	2722	0.5	11.5	14.4	Yes	161.9	129.0	32.9	20%
MERGE US 29	1127	0.2	12.7	13.1	Yes	60.6	58.8	1.9	3%
BETWEEN MD 97 AND US 29	5926	1.1	17.9	17.9	Yes	226.3	226.4	-0.1	0%
MD 97 MERGE	1734	0.3	21.3	15.6	Yes	55.4	75.6	-20.2	-36%
BETWEEN MD 185 AND MD 97	8746	1.7	40.2	32.4	Yes	148.3	184.2	-35.9	-24%
MD 185 MERGE	3315	0.6	46.2	52.8	Yes	48.9	42.8	6.2	13%
BETWEEN MD 355 AND MD 185	6287	1.2	49.9	44.4	Yes	85.9	96.6	-10.7	-12%
MD 355 MERGE	1401	0.3	53.4	52.9	Yes	17.9	18.1	-0.2	-1%
MERGE AFTER I 270	61	0.0	53.1	54.1	Yes	0.8	0.8	0.0	2%
MERGE BEFORE I 270	1298	0.2	52.1	49.5	Yes	17.0	17.9	-0.9	-5%
BETWEEN I 270 EAST AND MD 187	3092	0.6	52.8	53.5	Yes	39.9	39.4	0.5	1%
MERGE MD 187	1936	0.4	50.5	52.8	Yes	26.1	25.0	1.1	4%
BETWEEN I 270 WEST AND MD 187	7643	1.4	48.1	53.0	Yes	108.4	98.3	10.1	9%
MERGE I 270	1490	0.3	39.2	51.6	Yes	25.9	19.7	6.2	24%
BETWEEN MD 190 AND I 270	5753	1.1	40.2	44.2	Yes	97.6	88.7	8.9	9%
MERGE MD 190	1537	0.3	39.6	52.1	Yes	26.4	20.1	6.3	24%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	39.4	51.4	Yes	3.7	2.8	0.9	23%
MERGE CABIN JOHN PARKWAY	2397	0.5	36.8	50.8	Yes	44.4	32.2	12.2	28%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	43.0	44.0	Yes	100.5	98.3	2.3	2%
MERGE CLARA BARTON PARKWAY	1463	0.3	48.1	48.6	Yes	20.7	20.5	0.2	1%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	50.3	51.1	Yes	10.1	9.9	0.2	2%
AMERICAN LEGION BRIDGE	790	0.1	47.5	52.4	Yes	11.3	10.3	1.1	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	47.1	51.9	Yes	12.2	11.1	1.1	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	42.9	52.3	Yes	68.2	55.9	12.2	18%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	40.3	52.8	Yes	11.5	8.8	2.7	24%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	45.2	50.6	Yes	25.2	22.5	2.7	11%



Figure A.15: I-270 Southbound 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				3704.4	3645.4	59.0	2%
BETWEEN MD-85 ON AND OFF RAMPS	2549	0.5	58.6	57.5	Yes	29.7	30.2	-0.6	-2%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	50.6	34.6	Yes	344.3	503.6	-159.3	-46%
BETWEEN MD-80 ON AND OFF RAMPS	845	0.2	36.3	16.3	No	15.9	35.3	-19.5	-123%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	40.9	24.4	Yes	313.1	524.0	-210.8	-67%
BETWEEN MD-109 ON AND OFF RAMPS	922	0.2	36.2	23.0	Yes	17.3	27.4	-10.0	-58%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	46.0	44.9	Yes	271.5	278.4	-6.9	-3%
BETWEEN MD-121 ON AND OFF RAMPS	2354	0.4	39.7	48.7	Yes	40.5	32.9	7.6	19%
FROM MD-121 TO MD-27	10608	2.0	29.4	35.9	Yes	245.9	201.3	44.6	18%
BETWEEN MD-27 ON AND OFF RAMPS	3802	0.7	18.3	27.3	Yes	141.9	94.8	47.1	33%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	19.9	26.4	Yes	63.6	47.8	15.8	25%
BETWEEN MD-118 ON AND OFF RAMPS	3278	0.6	21.2	25.6	Yes	105.5	87.3	18.2	17%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	28.3	38.1	Yes	62.3	46.3	16.0	26%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1460	0.3	33.2	46.0	Yes	30.0	21.6	8.4	28%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	32.1	34.0	Yes	217.1	204.7	12.4	6%
BETWEEN MD-124 ON AND OFF RAMPS	1613	0.3	27.8	17.8	Yes	39.6	61.8	-22.2	-56%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	32.0	20.9	Yes	64.7	99.4	-34.6	-54%
BETWEEN MD-117 ON AND OFF RAMPS	1463	0.3	38.0	30.7	Yes	26.3	32.4	-6.2	-23%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	43.4	34.3	Yes	58.6	74.0	-15.4	-26%
BETWEEN I-370 ON AND OFF RAMPS	3154	0.6	37.1	38.4	Yes	57.9	56.0	1.9	3%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	19.3	23.1	Yes	167.4	139.5	28.0	17%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	77	0.0	19.4	28.3	Yes	2.7	1.8	0.8	31%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	17.6	46.7	No	383.5	144.3	239.1	62%
BETWEEN MD-28 ON AND OFF RAMPS	52	0.0	25.0	42.4	No	1.4	0.8	0.6	41%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	25.6	35.9	Yes	110.2	78.4	31.8	29%
BETWEEN MD-189 ON AND OFF RAMPS	3083	0.6	22.0	29.2	Yes	95.8	72.1	23.7	25%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	19.8	25.3	Yes	116.4	91.2	25.2	22%
BETWEEN MONTROSE RD ON AND OFF RAMPS	4822	0.9	26.8	26.0	Yes	122.8	126.3	-3.5	-3%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	39.4	31.7	Yes	106.5	132.5	-26.0	-24%
FROM I-270 SPUR MD-187	1248	0.2	55.2	57.6	Yes	15.4	14.8	0.6	4%
BETWEEN MD-187 SPUR ON AND OFF RAMPS	4256	0.8	59.0	62.8	Yes	49.2	46.2	2.9	6%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	54.1	61.8	Yes	78.1	68.4	9.8	13%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMPS	1395	0.3	47.6	62.8	Yes	20.0	15.1	4.8	24%
I-270 SPUR MERGE	1150	0.2	23.3	24.0	Yes	33.7	32.7	1.0	3%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	26.4	24.9	Yes	74.4	78.9	-4.5	-6%
MERGE US-1	2749	0.5	27.4	27.8	Yes	68.4	67.4	1.0	1%
MERGE I-495	4180	0.8	25.2	37.6	Yes	113.0	75.7	37.3	33%

Figure A.16: I-270 Northbound 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				1872.8	1932.7	-59.9	-3%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	51.5	60.4	No	13.8	11.8	2.0	15%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	57.7	61.9	Yes	73.4	68.5	4.9	7%
BETWEEN EXIT 1A AND 1B	4042	0.8	61.0	63.4	Yes	45.2	43.5	1.7	4%
FROM MD-187 TO I-270 SPUR	341	0.1	60.5	61.9	Yes	3.8	3.8	0.1	2%
FROM TUCKERMAN LANE TO I-270 LOCAL	7076	1.3	61.5	62.2	Yes	78.4	77.5	0.9	1%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	65.4	62.5	Yes	52.9	55.4	-2.5	-5%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	65.0	62.9	Yes	33.9	35.0	-1.1	-3%
BETWEEN MD-189 ON AND OFF RAMP	3080	0.6	65.2	63.1	Yes	32.2	33.3	-1.1	-3%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	65.4	62.8	Yes	42.5	44.3	-1.8	-4%
BETWEEN MD-28 ON AND OFF RAMP	49	0.0	65.4	61.3	Yes	0.5	0.5	0.0	-7%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	64.0	63.8	Yes	106.8	107.0	-0.2	0%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	74	0.0	66.4	63.3	Yes	0.8	0.8	0.0	-5%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	66.9	63.6	Yes	49.2	51.7	-2.5	-5%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	67.2	63.7	Yes	1.7	1.8	-0.1	-5%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	66.2	62.8	Yes	81.8	86.2	-4.4	-5%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	66.3	62.9	Yes	0.3	0.3	0.0	-5%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	66.7	63.1	Yes	33.2	35.1	-1.9	-6%
BETWEEN MD-124 ON AND OFF RAMP	27	0.0	66.8	63.9	Yes	0.3	0.3	0.0	-4%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	66.0	63.3	Yes	124.5	129.8	-5.3	-4%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1221	0.2	63.9	63.6	Yes	13.0	13.1	-0.1	-1%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	63.3	63.3	Yes	26.1	26.1	0.0	0%
BETWEEN MD-118 ON AND OFF RAMP	3423	0.6	63.6	63.2	Yes	36.7	36.9	-0.2	-1%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	63.8	63.2	Yes	15.9	16.0	-0.1	-1%
BETWEEN MD-27 ON AND OFF RAMP	3356	0.6	65.5	63.5	Yes	34.9	36.0	-1.1	-3%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	65.1	63.5	Yes	120.8	123.8	-3.0	-2%
BETWEEN MD-121 ON AND OFF RAMP	959	0.2	64.6	62.9	Yes	10.1	10.4	-0.3	-3%
FROM MD-121 TO MD-109	20431	3.9	66.5	63.2	Yes	209.4	220.6	-11.1	-5%
BETWEEN MD-109 ON AND OFF RAMP	920	0.2	65.0	64.5	Yes	9.7	9.7	-0.1	-1%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	66.1	62.4	Yes	192.7	204.3	-11.5	-6%
BETWEEN MD-80 ON AND OFF RAMP	946	0.2	65.7	60.7	Yes	9.8	10.6	-0.8	-8%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	66.3	62.7	Yes	255.9	270.6	-14.7	-6%
BETWEEN MD-85 ON AND OFF RAMP	2482	0.5	61.7	63.1	Yes	27.4	26.8	0.6	2%
MERGE FROM I 495	4953	0.9	60.6	53.4	No	55.7	63.3	-7.5	-13%
MERGE US-1	2620	0.5	61.9	62.9	Yes	28.9	28.4	0.5	2%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	61.8	63.3	Yes	32.9	32.1	0.8	2%
MERGE I-270 SPUR	1612	0.3	62.5	63.0	Yes	17.6	17.4	0.1	1%

Figure A.17: I-495 Inner Loop 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	228612	43.3				5846.4	5433.0	413.5	7%
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	8.2	18.2	Yes	227.9	102.2	125.7	55%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	8.9	9.6	Yes	187.8	174.3	13.5	7%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	12.2	12.5	Yes	108.4	105.9	2.4	2%
AMERICAN LEGION BRIDGE	794	0.2	14.4	17.1	Yes	37.6	31.7	6.0	16%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	14.5	16.4	Yes	23.8	21.1	2.7	12%
MERGE CLARA BARTON PARKWAY	1055	0.2	14.7	16.0	Yes	49.1	45.1	4.0	8%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	13.8	15.1	Yes	360.9	329.4	31.5	9%
MERGE CABIN JOHN PARKWAY	2126	0.4	11.9	13.2	Yes	122.1	109.7	12.4	10%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	13.4	14.9	Yes	13.1	11.8	1.3	10%
MERGE MD 190	1235	0.2	13.5	14.4	Yes	62.4	58.6	3.9	6%
BETWEEN MD 190 AND I 270	6468	1.2	18.6	23.5	Yes	236.6	187.8	48.8	21%
MERGE I 270	867	0.2	51.3	55.0	Yes	11.5	10.7	0.8	7%
BETWEEN I 270 AND MD 187	7828	1.5	60.9	49.1	Yes	87.7	108.6	-20.9	-24%
MERGE MD 187	2140	0.4	47.4	13.7	No	30.8	106.8	-76.0	-247%
BETWEEN MD 187 AND I 270	2278	0.4	20.7	12.1	Yes	74.9	128.7	-53.8	-72%
MERGE BEFORE I 270	1306	0.2	10.9	15.4	Yes	81.7	57.8	23.9	29%
MERGE AFTER I 270	564	0.1	14.0	14.6	Yes	27.5	26.4	1.1	4%
MD 355 MERGE	1371	0.3	13.8	12.7	Yes	68.0	73.6	-5.7	-8%
BETWEEN MD 355 AND MD 185	6065	1.1	14.0	16.0	Yes	294.6	257.8	36.8	12%
MD 185 MERGE	2074	0.4	14.1	14.5	Yes	100.1	97.4	2.6	3%
BETWEEN MD 185 AND MD 97	9907	1.9	21.6	24.8	Yes	312.4	272.5	39.9	13%
MD 97 MERGE	1461	0.3	23.9	21.5	Yes	41.6	46.4	-4.8	-11%
BETWEEN MD 97 AND US 29	5965	1.1	29.2	35.9	Yes	139.3	113.2	26.0	19%
MERGE US 29	1734	0.3	30.1	29.4	Yes	39.3	40.2	-0.9	-2%
BETWEEN MD US 29 AND MD 193	1640	0.3	26.2	18.2	Yes	42.7	61.4	-18.8	-44%
MERGE MD 193	2099	0.4	26.3	20.2	Yes	54.4	70.8	-16.4	-30%
BETWEEN MD 193 AND MD 650	6046	1.1	37.1	32.8	Yes	111.1	125.7	-14.6	-13%
MERGE MD 650	3008	0.6	42.4	39.8	Yes	48.3	51.5	-3.2	-7%
BETWEEN MD 650 AND I 95	2869	0.5	41.1	51.3	Yes	47.5	38.2	9.4	20%
BEFORE I 95 MERGE	5612	1.1	36.3	30.1	Yes	105.6	127.2	-21.6	-20%
AFTER I 95 MERGE	2578	0.5	14.9	19.5	Yes	117.8	90.0	27.8	24%
MERGE US 1	2873	0.5	15.3	15.9	Yes	128.2	123.4	4.8	4%
BEFORE GREENBELT STATION MERGE	3544	0.7	18.5	33.0	Yes	130.8	73.1	57.6	44%
AFTER GREENBELT STATION MERGE	595	0.1	22.4	47.4	No	18.1	8.6	9.5	53%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	22.8	47.8	No	131.9	62.9	69.0	52%
MERGE MD 201	3066	0.6	21.2	34.4	Yes	98.6	60.8	37.8	38%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	25.5	34.1	Yes	50.8	38.0	12.7	25%
MERGE MD 295	2725	0.5	26.4	42.7	No	70.4	43.6	26.8	38%
BETWEEN MD 295 AND MD 450	10677	2.0	27.9	33.8	Yes	260.6	215.4	45.1	17%
MERGE MD 450	1203	0.2	27.1	23.3	Yes	30.3	35.2	-4.9	-16%
BETWEEN MD 450 AND US 50	2809	0.5	32.9	23.7	Yes	58.2	80.7	-22.4	-38%
MERGE US 50	4270	0.8	24.7	12.9	Yes	117.7	225.8	-108.1	-92%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	27.3	23.5	Yes	136.3	158.7	-22.4	-16%
END 495 EXPRESS LANE	515	0.1	24.2	25.4	Yes	14.5	13.8	0.7	5%
BEFORE MD 202 MERGE	1817	0.3	25.0	20.4	Yes	49.6	60.7	-11.1	-22%
MERGE MD 202	2462	0.5	21.3	20.4	Yes	78.9	82.4	-3.5	-4%
BETWEEN MD 202 AND ARENA DR	1355	0.3	18.5	20.0	Yes	49.9	46.1	3.8	8%
MERGE ARENA DR	2059	0.4	19.1	24.8	Yes	73.6	56.6	17.0	23%
BETWEEN ARENA DR AND MD 214	3333	0.6	21.8	45.3	No	104.3	50.1	54.2	52%
MD 214 MERGE	2564	0.5	22.9	42.9	No	76.3	40.8	35.5	47%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.9	51.1	Yes	154.0	129.5	24.5	16%
MERGE MD 4	2628	0.5	53.7	51.7	Yes	33.3	34.7	-1.3	-4%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	53.4	51.5	Yes	42.6	44.2	-1.6	-4%
MERGE FORESTVILLE RD	930	0.2	54.2	52.5	Yes	11.7	12.1	-0.4	-3%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	54.8	61.7	Yes	40.0	35.5	4.5	11%
MERGE MD 218	1660	0.3	55.0	63.0	Yes	20.6	18.0	2.6	13%
BETWEEN MD 218 AND MD 5	6410	1.2	59.8	59.6	Yes	73.1	73.3	-0.2	0%
MERGE MD 5	2751	0.5	63.0	62.7	Yes	29.8	29.9	-0.1	0%
BETWEEN MD 5 AND MD 414	11958	2.3	64.4	62.9	Yes	126.6	129.5	-2.9	-2%
MERGE MD 414	3478	0.7	63.6	63.2	Yes	37.3	37.5	-0.3	-1%
BETWEEN MD 414 AND MD 210	2470	0.5	61.4	60.4	Yes	27.4	27.9	-0.4	-2%
MERGE MD 210	5648	1.1	48.9	60.9	Yes	78.7	63.2	15.5	20%
BETWEEN MD 210 AND I 295	2959	0.6	34.5	36.5	Yes	58.4	55.3	3.1	5%
MERGE I 295	3328	0.6	34.5	26.2	Yes	65.7	86.5	-20.8	-32%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	44.7	46.8	Yes	18.6	17.7	0.8	5%
WOODROW WILSON BRIDGE	6059	1.1	49.7	52.5	Yes	83.2	78.6	4.6	5%

Figure A.18: I-495 Outer Loop 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4639.4	4785.1	-145.8	-3%
WOODROW WILSON BRIDGE	6160	1.2	48.4	55.4	Yes	86.8	75.8	11.0	13%
BEFORE WOODROW WILSON BRIDGE	644	0.1	52.6	59.7	Yes	8.3	7.4	1.0	12%
MERGE I 295	1023	0.2	57.7	58.8	Yes	12.1	11.9	0.2	2%
BETWEEN MD 210 AND I 295	377	0.1	54.6	60.3	Yes	4.7	4.3	0.4	9%
MERGE MD 210	8656	1.6	53.5	57.9	Yes	110.4	102.0	8.4	8%
BETWEEN MD 414 AND MD 210	4452	0.8	53.4	55.9	Yes	56.8	54.3	2.5	4%
MERGE MD 414	2984	0.6	45.3	57.8	Yes	44.9	35.2	9.8	22%
BETWEEN MD 5 AND MD 414	12214	2.3	30.9	52.5	No	269.6	158.6	110.9	41%
MERGE MD 5	3740	0.7	21.0	53.1	No	121.7	48.1	73.6	61%
BETWEEN MD 218 AND MD 5	5897	1.1	21.5	44.7	No	186.6	89.9	96.7	52%
MERGE MD 218	238	0.0	21.2	30.1	Yes	7.7	5.4	2.3	30%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	19.5	21.1	Yes	171.7	158.9	12.8	7%
MERGE MD 337	912	0.2	19.6	19.1	Yes	31.8	32.5	-0.8	-2%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	24.9	37.1	Yes	86.3	57.8	28.4	33%
MERGE MD 4	3108	0.6	26.9	52.6	No	78.7	40.3	38.4	49%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	39.6	22.3	Yes	108.5	192.9	-84.4	-78%
MERGE MD 214	2618	0.5	41.0	11.9	No	43.6	149.7	-106.1	-244%
BETWEEN ARENA DR AND MD 214	2789	0.5	36.6	14.1	No	51.9	135.2	-83.3	-160%
MERGE ARENA DR	2437	0.5	31.1	13.8	Yes	53.4	120.5	-67.1	-126%
BETWEEN MD 202 AND ARENA DR	1179	0.2	24.1	12.8	Yes	33.4	62.9	-29.5	-88%
MERGE MD 202	3055	0.6	21.2	13.1	Yes	98.4	159.4	-61.1	-62%
BEFORE MD 202 MERGE	908	0.2	21.8	10.1	Yes	28.3	61.4	-33.1	-117%
END 495 EXPRESS LANE	594	0.1	19.4	15.5	Yes	20.9	26.2	-5.3	-26%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	31.2	30.7	Yes	133.5	135.3	-1.9	-1%
MERGE US 50	3680	0.7	50.7	58.6	Yes	49.5	42.8	6.7	14%
BETWEEN MD 450 AND US 50	2561	0.5	41.3	53.2	Yes	42.3	32.8	9.4	22%
MERGE MD 450	2100	0.4	40.0	44.8	Yes	35.8	32.0	3.8	11%
BETWEEN MD 295 AND MD 450	10674	2.0	40.2	26.3	Yes	181.1	277.2	-96.1	-53%
MERGE MD 295	2479	0.5	32.0	13.1	Yes	52.8	128.8	-76.0	-144%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	31.3	14.0	Yes	43.5	97.5	-53.9	-124%
MERGE MD 201	3054	0.6	33.6	17.0	Yes	62.0	122.3	-60.3	-97%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	42.5	23.5	No	74.4	134.6	-60.2	-81%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	56.1	31.6	No	49.8	88.4	-38.6	-77%
MERGE US 1	2739	0.5	57.4	57.2	Yes	32.5	32.7	-0.1	0%
BETWEEN US 1 AND I 95	3225	0.6	58.0	57.2	Yes	37.9	38.4	-0.5	-1%
I 95 MERGE	4389	0.8	63.1	58.6	Yes	47.4	51.1	-3.7	-8%
BETWEEN MD 650 AND I 95	4048	0.8	51.1	53.3	Yes	54.0	51.8	2.2	4%
MERGE MD 650	2547	0.5	41.7	53.5	Yes	41.7	32.5	9.2	22%
BETWEEN MD 193 AND MD 650	6315	1.2	31.6	52.0	No	136.4	82.7	53.7	39%
MERGE MD 193	1353	0.3	34.6	54.0	No	26.7	17.1	9.6	36%
BETWEEN MD US 29 AND MD 193	2722	0.5	31.3	52.6	No	59.2	35.3	24.0	40%
MERGE US 29	1127	0.2	28.9	51.4	No	26.6	15.0	11.6	44%
BETWEEN MD 97 AND US 29	5926	1.1	29.8	51.2	No	135.5	78.9	56.7	42%
MD 97 MERGE	1734	0.3	33.0	53.1	No	35.9	22.3	13.6	38%
BETWEEN MD 185 AND MD 97	8746	1.7	39.6	50.4	Yes	150.6	118.3	32.3	21%
MD 185 MERGE	3315	0.6	47.8	46.1	Yes	47.3	49.0	-1.7	-4%
BETWEEN MD 355 AND MD 185	6287	1.2	48.1	47.1	Yes	89.1	90.9	-1.8	-2%
MD 355 MERGE	1401	0.3	45.9	53.2	Yes	20.8	17.9	2.9	14%
MERGE AFTER I 270	61	0.0	45.2	54.1	Yes	0.9	0.8	0.2	16%
MERGE BEFORE I 270	1298	0.2	44.2	49.4	Yes	20.0	17.9	2.1	10%
BETWEEN I 270 EAST AND MD 187	3092	0.6	40.8	53.3	Yes	51.6	39.6	12.1	23%
MERGE MD 187	1936	0.4	30.4	52.6	No	43.5	25.1	18.4	42%
BETWEEN I 270 WEST AND MD 187	7643	1.4	21.1	43.1	No	246.5	121.0	125.5	51%
MERGE I 270	1490	0.3	16.5	20.3	Yes	61.7	50.1	11.6	19%
BETWEEN MD 190 AND I 270	5753	1.1	17.3	19.2	Yes	226.5	204.1	22.4	10%
MERGE MD 190	1537	0.3	17.8	14.9	Yes	58.9	70.2	-11.3	-19%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	17.8	13.2	Yes	8.2	11.0	-2.8	-34%
MERGE CABIN JOHN PARKWAY	2397	0.5	17.7	14.4	Yes	92.6	113.8	-21.2	-23%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	23.8	22.2	Yes	181.6	194.2	-12.6	-7%
MERGE CLARA BARTON PARKWAY	1463	0.3	27.3	37.4	Yes	36.6	26.6	9.9	27%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	33.1	44.3	Yes	15.3	11.5	3.9	25%
AMERICAN LEGION BRIDGE	790	0.1	28.5	35.9	Yes	18.9	15.0	3.9	21%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	32.3	27.6	Yes	17.8	20.8	-3.0	-17%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	25.3	21.3	Yes	115.5	137.1	-21.6	-19%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	22.9	13.7	Yes	20.2	33.9	-13.7	-67%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	28.4	14.9	Yes	40.1	76.2	-36.1	-90%

Figure A.19: I-270 Southbound 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				2388.9	2112.8	276.1	12%
BETWEEN MD-85 ON AND OFF RAMP	2549	0.5	60.0	58.3	Yes	29.0	29.8	-0.9	-3%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	49.4	61.5	No	352.3	283.1	69.2	20%
BETWEEN MD-80 ON AND OFF RAMP	845	0.2	64.1	61.1	Yes	9.0	9.4	-0.4	-5%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	64.9	58.4	Yes	197.3	219.0	-21.7	-11%
BETWEEN MD-109 ON AND OFF RAMP	922	0.2	65.1	59.3	Yes	9.6	10.6	-1.0	-10%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	64.2	57.7	Yes	194.7	216.6	-21.9	-11%
BETWEEN MD-121 ON AND OFF RAMP	2354	0.4	66.1	62.7	Yes	24.3	25.6	-1.3	-5%
FROM MD-121 TO MD-27	10608	2.0	67.6	63.5	Yes	106.9	114.0	-7.1	-7%
BETWEEN MD-27 ON AND OFF RAMP	3802	0.7	65.2	63.5	Yes	39.8	40.8	-1.0	-3%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	64.3	63.3	Yes	19.6	19.9	-0.3	-2%
BETWEEN MD-118 ON AND OFF RAMP	3278	0.6	65.3	63.5	Yes	34.2	35.2	-1.0	-3%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	65.2	61.6	Yes	27.0	28.6	-1.6	-6%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1460	0.3	66.7	62.9	Yes	14.9	15.8	-0.9	-6%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	66.5	63.2	Yes	104.7	110.1	-5.4	-5%
BETWEEN MD-124 ON AND OFF RAMP	1613	0.3	64.7	62.7	Yes	17.0	17.5	-0.6	-3%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	62.6	61.6	Yes	33.1	33.6	-0.5	-1%
BETWEEN MD-117 ON AND OFF RAMP	1463	0.3	63.2	61.1	Yes	15.8	16.3	-0.5	-3%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	62.6	61.3	Yes	40.6	41.5	-0.9	-2%
BETWEEN I-370 ON AND OFF RAMP	3154	0.6	65.3	63.5	Yes	32.9	33.9	-0.9	-3%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	65.3	63.9	Yes	49.4	50.5	-1.1	-2%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	77	0.0	65.6	59.9	Yes	0.8	0.9	-0.1	-10%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	66.2	59.7	Yes	101.8	112.9	-11.1	-11%
BETWEEN MD-28 ON AND OFF RAMP	52	0.0	65.4	60.0	Yes	0.5	0.6	0.0	-9%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	64.8	60.1	Yes	43.5	46.9	-3.4	-8%
BETWEEN MD-189 ON AND OFF RAMP	3083	0.6	65.4	60.1	Yes	32.1	35.0	-2.9	-9%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	66.9	60.2	Yes	34.5	38.3	-3.8	-11%
BETWEEN MONTROSE RD ON AND OFF RAMP	4822	0.9	67.1	60.3	Yes	49.0	54.5	-5.6	-11%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	64.3	59.4	Yes	65.2	70.7	-5.4	-8%
FROM I-270 SPUR MD-187	1248	0.2	61.4	59.2	Yes	13.9	14.4	-0.5	-4%
BETWEEN MD-187 SPUR ON AND OFF RAMP	4256	0.8	62.3	58.8	Yes	46.6	49.3	-2.7	-6%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	46.5	37.2	Yes	90.8	113.5	-22.7	-25%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMP	1395	0.3	18.7	15.3	Yes	50.9	62.1	-11.2	-22%
I-270 SPUR MERGE	1150	0.2	57.2	58.9	Yes	13.7	13.3	0.4	3%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	46.3	59.8	No	42.4	32.9	9.6	23%
MERGE US-1	2749	0.5	14.6	58.7	No	128.5	31.9	96.6	75%
MERGE I-495	4180	0.8	8.8	34.1	No	322.3	83.7	238.7	74%

Figure A.20: I-270 Northbound 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				3194.1	3082.7	111.4	3%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	34.0	57.7	No	20.9	12.3	8.6	41%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	37.4	51.5	Yes	113.3	82.4	31.0	27%
BETWEEN EXIT 1A AND 1B	4042	0.8	24.4	27.7	Yes	113.0	99.4	13.5	12%
FROM MD-187 TO I-270 SPUR	341	0.1	19.8	24.2	Yes	11.8	9.6	2.2	18%
FROM TUCKERMAN LANE TO I-270 LOCAL	7076	1.3	29.8	47.0	No	161.8	102.7	59.0	36%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	44.3	48.5	Yes	78.3	71.5	6.8	9%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	55.0	51.3	Yes	40.0	42.8	-2.8	-7%
BETWEEN MD-189 ON AND OFF RAMP	3080	0.6	57.4	52.5	Yes	36.6	40.0	-3.4	-9%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	56.8	51.9	Yes	48.9	53.5	-4.6	-9%
BETWEEN MD-28 ON AND OFF RAMP	49	0.0	57.7	50.0	Yes	0.6	0.7	-0.1	-16%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	52.5	50.9	Yes	130.0	134.2	-4.1	-3%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	74	0.0	51.8	40.0	Yes	1.0	1.3	-0.3	-30%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	46.5	29.3	No	70.8	112.2	-41.3	-58%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	42.2	26.5	Yes	2.8	4.4	-1.7	-59%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	33.8	21.3	Yes	160.0	253.7	-93.6	-59%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	28.4	19.1	Yes	0.7	1.0	-0.3	-48%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	25.7	20.2	Yes	86.3	109.8	-23.5	-27%
BETWEEN MD-124 ON AND OFF RAMP	27	0.0	24.5	20.6	Yes	0.8	0.9	-0.1	-19%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	32.5	37.3	Yes	252.9	220.5	32.4	13%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1221	0.2	42.7	19.8	No	19.5	42.1	-22.6	-116%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	40.0	25.3	Yes	41.3	65.2	-23.9	-58%
BETWEEN MD-118 ON AND OFF RAMP	3423	0.6	38.7	39.2	Yes	60.3	59.6	0.7	1%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	34.3	48.2	Yes	29.5	21.0	8.5	29%
BETWEEN MD-27 ON AND OFF RAMP	3356	0.6	27.7	47.7	No	82.6	47.9	34.6	42%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	29.6	39.3	Yes	265.4	200.2	65.2	25%
BETWEEN MD-121 ON AND OFF RAMP	959	0.2	19.9	26.0	Yes	32.9	25.1	7.8	24%
FROM MD-121 TO MD-109	20431	3.9	39.7	45.6	Yes	350.7	305.4	45.2	13%
BETWEEN MD-109 ON AND OFF RAMP	920	0.2	49.4	54.5	Yes	12.7	11.5	1.2	9%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	45.5	52.1	Yes	280.0	244.4	35.5	13%
BETWEEN MD-80 ON AND OFF RAMP	946	0.2	46.3	50.7	Yes	13.9	12.7	1.2	9%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	55.2	51.8	Yes	307.6	327.5	-19.9	-6%
BETWEEN MD-85 ON AND OFF RAMP	2482	0.5	52.2	53.1	Yes	32.4	31.9	0.5	2%
MERGE FROM I 495	4953	0.9	22.3	29.5	Yes	151.6	114.6	37.0	24%
MERGE US-1	2620	0.5	22.3	16.0	Yes	80.0	111.7	-31.8	-40%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	28.7	26.5	Yes	70.6	76.5	-5.9	-8%
MERGE I-270 SPUR	1612	0.3	33.6	34.1	Yes	32.7	32.2	0.5	2%

Figure A.21: I-495 Inner Loop 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	228612	43.3				6551.1	6631.9	-80.7	-1%
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	7.8	7.0	Yes	237.6	266.9	-29.3	-12%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	8.8	6.9	Yes	190.7	243.0	-52.3	-27%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	12.0	11.3	Yes	110.1	116.4	-6.3	-6%
AMERICAN LEGION BRIDGE	794	0.2	13.7	15.3	Yes	39.6	35.4	4.2	11%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	13.8	14.2	Yes	25.0	24.3	0.7	3%
MERGE CLARA BARTON PARKWAY	1055	0.2	13.5	13.9	Yes	53.1	51.7	1.4	3%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	12.5	13.1	Yes	397.3	378.7	18.6	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	10.5	11.8	Yes	137.8	122.5	15.3	11%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	11.5	13.3	Yes	15.4	13.2	2.1	14%
MERGE MD 190	1235	0.2	11.6	12.9	Yes	72.8	65.5	7.2	10%
BETWEEN MD 190 AND I 270	6468	1.2	16.4	20.1	Yes	268.2	219.7	48.5	18%
MERGE I 270	867	0.2	49.5	54.9	Yes	11.9	10.8	1.2	10%
BETWEEN I 270 AND MD 187	7828	1.5	58.8	20.3	No	90.8	262.5	-171.7	-189%
MERGE MD 187	2140	0.4	28.7	6.5	No	50.9	225.0	-174.1	-342%
BETWEEN MD 187 AND I 270	2278	0.4	10.9	9.0	Yes	142.5	173.5	-31.0	-22%
MERGE BEFORE I 270	1306	0.2	9.5	12.6	Yes	93.9	70.5	23.3	25%
MERGE AFTER I 270	564	0.1	10.4	13.2	Yes	37.2	29.2	8.0	21%
MD 355 MERGE	1371	0.3	10.4	11.5	Yes	89.9	81.1	8.8	10%
BETWEEN MD 355 AND MD 185	6065	1.1	12.6	15.2	Yes	327.8	271.7	56.0	17%
MD 185 MERGE	2074	0.4	13.3	13.3	Yes	106.5	106.2	0.3	0%
BETWEEN MD 185 AND MD 97	9907	1.9	21.4	22.8	Yes	316.0	296.4	19.5	6%
MD 97 MERGE	1461	0.3	24.1	19.2	Yes	41.3	51.8	-10.5	-25%
BETWEEN MD 97 AND US 29	5965	1.1	28.5	29.8	Yes	142.6	136.5	6.2	4%
MERGE US 29	1734	0.3	28.5	21.5	Yes	41.5	54.9	-13.4	-32%
BETWEEN MD US 29 AND MD 193	1640	0.3	23.4	16.5	Yes	47.8	67.6	-19.8	-41%
MERGE MD 193	2099	0.4	23.5	18.7	Yes	60.8	76.7	-15.9	-26%
BETWEEN MD 193 AND MD 650	6046	1.1	32.1	31.3	Yes	128.3	131.5	-3.3	-3%
MERGE MD 650	3008	0.6	33.8	37.3	Yes	60.7	55.0	5.7	9%
BETWEEN MD 650 AND I 95	2869	0.5	32.2	50.6	No	60.8	38.7	22.1	36%
BEFORE I 95 MERGE	5612	1.1	25.7	38.9	Yes	149.1	98.5	50.6	34%
AFTER I 95 MERGE	2578	0.5	12.6	19.0	Yes	139.9	92.6	47.3	34%
MERGE US 1	2873	0.5	13.7	14.9	Yes	142.7	131.6	11.1	8%
BEFORE GREENBELT STATION MERGE	3544	0.7	17.1	29.3	Yes	140.9	82.4	58.5	42%
AFTER GREENBELT STATION MERGE	595	0.1	21.0	36.3	Yes	19.3	11.2	8.1	42%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	21.5	32.7	Yes	140.0	92.0	48.0	34%
MERGE MD 201	3066	0.6	20.2	18.0	Yes	103.3	116.4	-13.2	-13%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	25.6	26.8	Yes	50.6	48.2	2.3	5%
MERGE MD 295	2725	0.5	26.2	22.8	Yes	70.8	81.6	-10.8	-15%
BETWEEN MD 295 AND MD 450	10677	2.0	28.3	22.7	Yes	257.1	320.1	-63.0	-25%
MERGE MD 450	1203	0.2	27.2	19.4	Yes	30.2	42.4	-12.2	-40%
BETWEEN MD 450 AND US 50	2809	0.5	31.2	18.9	Yes	61.4	101.4	-39.9	-65%
MERGE US 50	4270	0.8	21.8	12.0	Yes	133.8	241.8	-108.1	-81%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	26.4	27.2	Yes	141.1	136.8	4.2	3%
END 495 EXPRESS LANE	515	0.1	24.7	44.3	No	14.2	7.9	6.3	44%
BEFORE MD 202 MERGE	1817	0.3	24.0	32.4	Yes	51.7	38.3	13.4	26%
MERGE MD 202	2462	0.5	21.0	24.4	Yes	80.0	68.8	11.2	14%
BETWEEN MD 202 AND ARENA DR	1355	0.3	18.9	21.7	Yes	49.0	42.5	6.4	13%
MERGE ARENA DR	2059	0.4	19.6	25.2	Yes	71.7	55.7	16.0	22%
BETWEEN ARENA DR AND MD 214	3333	0.6	22.9	34.1	Yes	99.1	66.7	32.4	33%
MD 214 MERGE	2564	0.5	25.1	30.2	Yes	69.5	57.8	11.7	17%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.2	51.0	Yes	156.6	129.7	26.9	17%
MERGE MD 4	2628	0.5	49.0	51.9	Yes	36.6	34.5	2.1	6%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	47.9	51.8	Yes	47.5	43.9	3.6	8%
MERGE FORESTVILLE RD	930	0.2	50.4	52.7	Yes	12.6	12.0	0.6	4%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	52.0	61.7	Yes	42.1	35.5	6.6	16%
MERGE MD 218	1660	0.3	52.6	62.9	Yes	21.5	18.0	3.6	17%
BETWEEN MD 218 AND MD 5	6410	1.2	56.3	60.0	Yes	77.7	72.8	4.9	6%
MERGE MD 5	2751	0.5	61.4	62.8	Yes	30.6	29.9	0.7	2%
BETWEEN MD 5 AND MD 414	11958	2.3	63.6	62.9	Yes	128.2	129.6	-1.4	-1%
MERGE MD 414	3478	0.7	62.6	63.3	Yes	37.9	37.5	0.4	1%
BETWEEN MD 414 AND MD 210	2470	0.5	55.7	60.4	Yes	30.2	27.9	2.3	8%
MERGE MD 210	5648	1.1	21.9	33.4	Yes	175.5	115.3	60.3	34%
BETWEEN MD 210 AND I 295	2959	0.6	16.7	15.5	Yes	120.9	129.9	-9.1	-7%
MERGE I 295	3328	0.6	22.8	21.2	Yes	99.4	107.3	-7.8	-8%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	38.4	46.9	Yes	21.6	17.7	4.0	18%
WOODROW WILSON BRIDGE	6059	1.1	42.1	52.7	Yes	98.2	78.5	19.8	20%

Figure A.22: I-495 Outer Loop 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4888.5	5334.6	-446.1	-9%
WOODROW WILSON BRIDGE	6160	1.2	47.8	55.1	Yes	87.8	76.3	11.5	13%
BEFORE WOODROW WILSON BRIDGE	644	0.1	52.4	59.7	Yes	8.4	7.4	1.0	12%
MERGE I 295	1023	0.2	56.7	58.9	Yes	12.3	11.9	0.4	4%
BETWEEN MD 210 AND I 295	377	0.1	51.5	60.3	Yes	5.0	4.3	0.7	15%
MERGE MD 210	8656	1.6	48.6	57.9	Yes	121.4	102.0	19.4	16%
BETWEEN MD 414 AND MD 210	4452	0.8	50.9	56.1	Yes	59.6	54.1	5.5	9%
MERGE MD 414	2984	0.6	48.0	57.9	Yes	42.4	35.2	7.2	17%
BETWEEN MD 5 AND MD 414	12214	2.3	35.6	52.5	Yes	234.0	158.5	75.5	32%
MERGE MD 5	3740	0.7	24.6	53.1	No	103.6	48.0	55.6	54%
BETWEEN MD 218 AND MD 5	5897	1.1	24.4	41.5	Yes	164.7	96.9	67.9	41%
MERGE MD 218	238	0.0	24.3	25.6	Yes	6.7	6.3	0.3	5%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	22.2	18.9	Yes	151.0	177.3	-26.3	-17%
MERGE MD 337	912	0.2	22.3	18.9	Yes	27.9	32.8	-4.9	-18%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	28.2	35.7	Yes	76.1	60.1	16.1	21%
MERGE MD 4	3108	0.6	31.9	45.0	Yes	66.5	47.1	19.4	29%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	42.8	28.9	Yes	100.5	148.9	-48.4	-48%
MERGE MD 214	2618	0.5	41.2	14.1	No	43.3	126.9	-83.6	-193%
BETWEEN ARENA DR AND MD 214	2789	0.5	34.9	14.9	No	54.5	127.9	-73.4	-135%
MERGE ARENA DR	2437	0.5	27.7	13.5	Yes	60.0	123.0	-63.0	-105%
BETWEEN MD 202 AND ARENA DR	1179	0.2	19.9	11.9	Yes	40.4	67.7	-27.2	-67%
MERGE MD 202	3055	0.6	16.7	12.2	Yes	124.4	170.7	-46.4	-37%
BEFORE MD 202 MERGE	908	0.2	18.0	9.5	Yes	34.4	65.0	-30.6	-89%
END 495 EXPRESS LANE	594	0.1	15.7	14.7	Yes	25.8	27.5	-1.7	-6%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	24.5	29.9	Yes	169.5	139.2	30.3	18%
MERGE US 50	3680	0.7	26.1	47.0	No	96.3	53.4	42.9	45%
BETWEEN MD 450 AND US 50	2561	0.5	21.5	26.9	Yes	81.1	65.0	16.1	20%
MERGE MD 450	2100	0.4	23.0	17.2	Yes	62.3	83.2	-20.9	-33%
BETWEEN MD 295 AND MD 450	10674	2.0	28.5	16.2	Yes	255.0	449.1	-194.2	-76%
MERGE MD 295	2479	0.5	23.4	11.7	Yes	72.4	145.1	-72.7	-100%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	23.6	13.2	Yes	57.6	103.2	-45.5	-79%
MERGE MD 201	3054	0.6	26.5	16.0	Yes	78.6	130.6	-51.9	-66%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	37.3	22.4	Yes	85.0	141.6	-56.7	-67%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	54.3	30.9	No	51.5	90.5	-39.0	-76%
MERGE US 1	2739	0.5	56.1	57.0	Yes	33.3	32.8	0.5	1%
BETWEEN US 1 AND I 95	3225	0.6	54.7	57.2	Yes	40.2	38.5	1.8	4%
I 95 MERGE	4389	0.8	62.2	58.6	Yes	48.1	51.1	-3.0	-6%
BETWEEN MD 650 AND I 95	4048	0.8	48.9	53.2	Yes	56.4	51.9	4.6	8%
MERGE MD 650	2547	0.5	42.7	53.3	Yes	40.7	32.6	8.1	20%
BETWEEN MD 193 AND MD 650	6315	1.2	42.4	50.0	Yes	101.6	86.2	15.5	15%
MERGE MD 193	1353	0.3	42.2	54.0	Yes	21.9	17.1	4.8	22%
BETWEEN MD US 29 AND MD 193	2722	0.5	40.0	52.6	Yes	46.4	35.3	11.2	24%
MERGE US 29	1127	0.2	38.3	49.6	Yes	20.1	15.5	4.6	23%
BETWEEN MD 97 AND US 29	5926	1.1	37.6	49.7	Yes	107.3	81.3	26.0	24%
MD 97 MERGE	1734	0.3	35.2	52.9	Yes	33.6	22.4	11.2	33%
BETWEEN MD 185 AND MD 97	8746	1.7	39.8	51.0	Yes	149.7	116.9	32.8	22%
MD 185 MERGE	3315	0.6	43.5	45.9	Yes	51.9	49.3	2.6	5%
BETWEEN MD 355 AND MD 185	6287	1.2	38.0	44.0	Yes	112.7	97.4	15.3	14%
MD 355 MERGE	1401	0.3	36.5	41.2	Yes	26.1	23.2	2.9	11%
MERGE AFTER I 270	61	0.0	39.1	50.3	Yes	1.1	0.8	0.2	22%
MERGE BEFORE I 270	1298	0.2	36.2	49.1	Yes	24.4	18.0	6.4	26%
BETWEEN I 270 EAST AND MD 187	3092	0.6	35.6	53.0	Yes	59.1	39.8	19.4	33%
MERGE MD 187	1936	0.4	24.5	45.2	No	54.0	29.2	24.8	46%
BETWEEN I 270 WEST AND MD 187	7643	1.4	20.0	20.5	Yes	260.9	254.3	6.6	3%
MERGE I 270	1490	0.3	14.6	9.0	Yes	69.8	113.3	-43.5	-62%
BETWEEN MD 190 AND I 270	5753	1.1	16.2	13.7	Yes	242.5	286.5	-44.0	-18%
MERGE MD 190	1537	0.3	16.5	12.9	Yes	63.4	81.5	-18.2	-29%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	16.5	11.6	Yes	8.9	12.6	-3.7	-42%
MERGE CABIN JOHN PARKWAY	2397	0.5	16.4	13.1	Yes	99.6	125.1	-25.4	-26%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN P	6336	1.2	21.8	21.2	Yes	198.2	203.4	-5.2	-3%
MERGE CLARA BARTON PARKWAY	1463	0.3	24.8	38.8	Yes	40.2	25.7	14.5	36%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	31.2	48.7	Yes	16.3	10.4	5.8	36%
AMERICAN LEGION BRIDGE	790	0.1	32.1	51.8	No	16.8	10.4	6.4	38%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	34.3	50.2	Yes	16.8	11.4	5.3	32%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	26.9	30.6	Yes	108.6	95.6	13.0	12%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	24.2	20.5	Yes	19.1	22.6	-3.5	-18%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	29.3	17.2	Yes	38.8	66.2	-27.4	-71%

Figure A.23: I-270 Southbound 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				2500.4	2360.4	139.9	6%
BETWEEN MD-85 ON AND OFF RAMP	2549	0.5	54.2	58.1	Yes	32.1	29.9	2.2	7%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	50.9	61.0	Yes	342.1	285.5	56.6	17%
BETWEEN MD-80 ON AND OFF RAMP	845	0.2	62.7	60.3	Yes	9.2	9.6	-0.4	-4%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	64.3	57.3	Yes	198.9	223.4	-24.6	-12%
BETWEEN MD-109 ON AND OFF RAMP	922	0.2	64.1	57.6	Yes	9.8	10.9	-1.1	-11%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	63.6	55.8	Yes	196.4	223.9	-27.4	-14%
BETWEEN MD-121 ON AND OFF RAMP	2354	0.4	66.4	62.5	Yes	24.2	25.7	-1.5	-6%
FROM MD-121 TO MD-27	10608	2.0	68.1	63.3	Yes	106.1	114.3	-8.1	-8%
BETWEEN MD-27 ON AND OFF RAMP	3802	0.7	65.4	63.5	Yes	39.6	40.8	-1.2	-3%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	64.5	63.0	Yes	19.6	20.1	-0.5	-2%
BETWEEN MD-118 ON AND OFF RAMP	3278	0.6	65.0	63.3	Yes	34.4	35.3	-0.9	-3%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	64.7	61.2	Yes	27.3	28.8	-1.5	-6%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1460	0.3	66.6	62.8	Yes	14.9	15.9	-0.9	-6%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	66.6	63.0	Yes	104.6	110.5	-5.9	-6%
BETWEEN MD-124 ON AND OFF RAMP	1613	0.3	64.5	62.6	Yes	17.0	17.6	-0.5	-3%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	62.6	61.2	Yes	33.1	33.9	-0.8	-2%
BETWEEN MD-117 ON AND OFF RAMP	1463	0.3	62.9	60.6	Yes	15.9	16.5	-0.6	-4%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	62.3	60.7	Yes	40.8	41.8	-1.0	-3%
BETWEEN I-370 ON AND OFF RAMP	3154	0.6	65.8	63.4	Yes	32.7	33.9	-1.2	-4%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	65.8	63.7	Yes	49.0	50.6	-1.6	-3%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	77	0.0	65.8	59.3	Yes	0.8	0.9	-0.1	-11%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	66.2	59.1	Yes	101.8	114.1	-12.3	-12%
BETWEEN MD-28 ON AND OFF RAMP	52	0.0	63.6	59.0	Yes	0.6	0.6	0.0	-8%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	64.0	59.5	Yes	44.0	47.3	-3.3	-7%
BETWEEN MD-189 ON AND OFF RAMP	3083	0.6	64.9	59.5	Yes	32.4	35.4	-2.9	-9%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	64.5	59.6	Yes	35.8	38.7	-2.9	-8%
BETWEEN MONTROSE RD ON AND OFF RAMP	4822	0.9	63.8	59.6	Yes	51.5	55.1	-3.7	-7%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	62.6	59.1	Yes	67.0	70.9	-3.9	-6%
FROM I-270 SPUR MD-187	1248	0.2	60.5	59.1	Yes	14.1	14.4	-0.3	-2%
BETWEEN MD-187 SPUR ON AND OFF RAMP	4256	0.8	59.4	58.9	Yes	48.8	49.3	-0.4	-1%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	25.9	22.6	Yes	163.1	186.8	-23.7	-15%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMP	1395	0.3	14.5	14.5	Yes	65.8	65.4	0.3	1%
I-270 SPUR MERGE	1150	0.2	52.4	58.6	Yes	15.0	13.4	1.6	11%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	41.5	59.7	No	47.4	32.9	14.5	31%
MERGE US-1	2749	0.5	12.4	42.6	No	151.6	44.0	107.6	71%
MERGE I-495	4180	0.8	9.1	12.8	Yes	313.1	222.5	90.6	29%

Figure A.24: I-270 Northbound 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				3773.2	3540.8	232.4	6%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	24.2	30.4	Yes	29.4	23.4	5.9	20%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	28.1	26.0	Yes	151.0	163.2	-12.2	-8%
BETWEEN EXIT 1A AND 1B	4042	0.8	20.6	16.5	Yes	134.1	166.6	-32.5	-24%
FROM MD-187 TO I-270 SPUR	341	0.1	17.5	19.2	Yes	13.3	12.1	1.2	9%
FROM TUCKERMAN LANE TO I-270 LOCAL	7076	1.3	27.9	47.0	No	172.7	102.5	70.2	41%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	43.2	48.8	Yes	80.2	71.0	9.1	11%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	50.9	51.3	Yes	43.2	42.8	0.4	1%
BETWEEN MD-189 ON AND OFF RAMP	3080	0.6	50.7	52.5	Yes	41.4	40.0	1.4	3%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	45.0	52.1	Yes	61.8	53.3	8.4	14%
BETWEEN MD-28 ON AND OFF RAMP	49	0.0	45.7	50.4	Yes	0.7	0.7	0.1	9%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	33.0	36.7	Yes	206.7	186.0	20.7	10%
BETWEEN SHADY GROVE RD ON AND OFF RAMP	74	0.0	38.0	25.2	Yes	1.3	2.0	-0.7	-51%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	28.6	23.2	Yes	115.2	141.7	-26.4	-23%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	23.3	22.9	Yes	5.0	5.1	-0.1	-2%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	22.7	21.2	Yes	238.9	255.6	-16.7	-7%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	23.4	18.2	Yes	0.8	1.1	-0.2	-29%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	22.0	18.8	Yes	100.6	117.8	-17.2	-17%
BETWEEN MD-124 ON AND OFF RAMP	27	0.0	21.3	19.2	Yes	0.9	1.0	-0.1	-11%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	29.7	33.3	Yes	276.9	246.5	30.4	11%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMP	1221	0.2	38.5	19.8	No	21.6	42.0	-20.4	-94%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	34.7	25.4	Yes	47.6	65.0	-17.4	-37%
BETWEEN MD-118 ON AND OFF RAMP	3423	0.6	32.6	39.5	Yes	71.5	59.0	12.5	17%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	29.6	48.3	No	34.2	21.0	13.2	39%
BETWEEN MD-27 ON AND OFF RAMP	3356	0.6	25.0	40.2	Yes	91.5	56.9	34.6	38%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	27.6	26.6	Yes	285.2	295.5	-10.3	-4%
BETWEEN MD-121 ON AND OFF RAMP	959	0.2	18.4	19.0	Yes	35.6	34.5	1.1	3%
FROM MD-121 TO MD-109	20431	3.9	31.8	42.4	Yes	437.8	328.2	109.6	25%
BETWEEN MD-109 ON AND OFF RAMP	920	0.2	42.9	54.5	Yes	14.6	11.5	3.1	21%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	40.9	52.1	Yes	311.6	244.8	66.8	21%
BETWEEN MD-80 ON AND OFF RAMP	946	0.2	44.8	50.7	Yes	14.4	12.7	1.7	12%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	52.8	51.8	Yes	321.3	327.6	-6.3	-2%
BETWEEN MD-85 ON AND OFF RAMP	2482	0.5	47.8	53.1	Yes	35.4	31.8	3.6	10%
MERGE FROM I 495	4953	0.9	20.2	25.1	Yes	167.3	134.3	33.0	20%
MERGE US-1	2620	0.5	19.2	13.9	Yes	92.9	128.4	-35.4	-38%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	25.3	24.8	Yes	80.2	81.7	-1.5	-2%
MERGE I-270 SPUR	1612	0.3	30.4	33.0	Yes	36.1	33.4	2.8	8%



APPENDIX B

Travel Time Charts

Figure B.1: I-495 Inner Loop – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

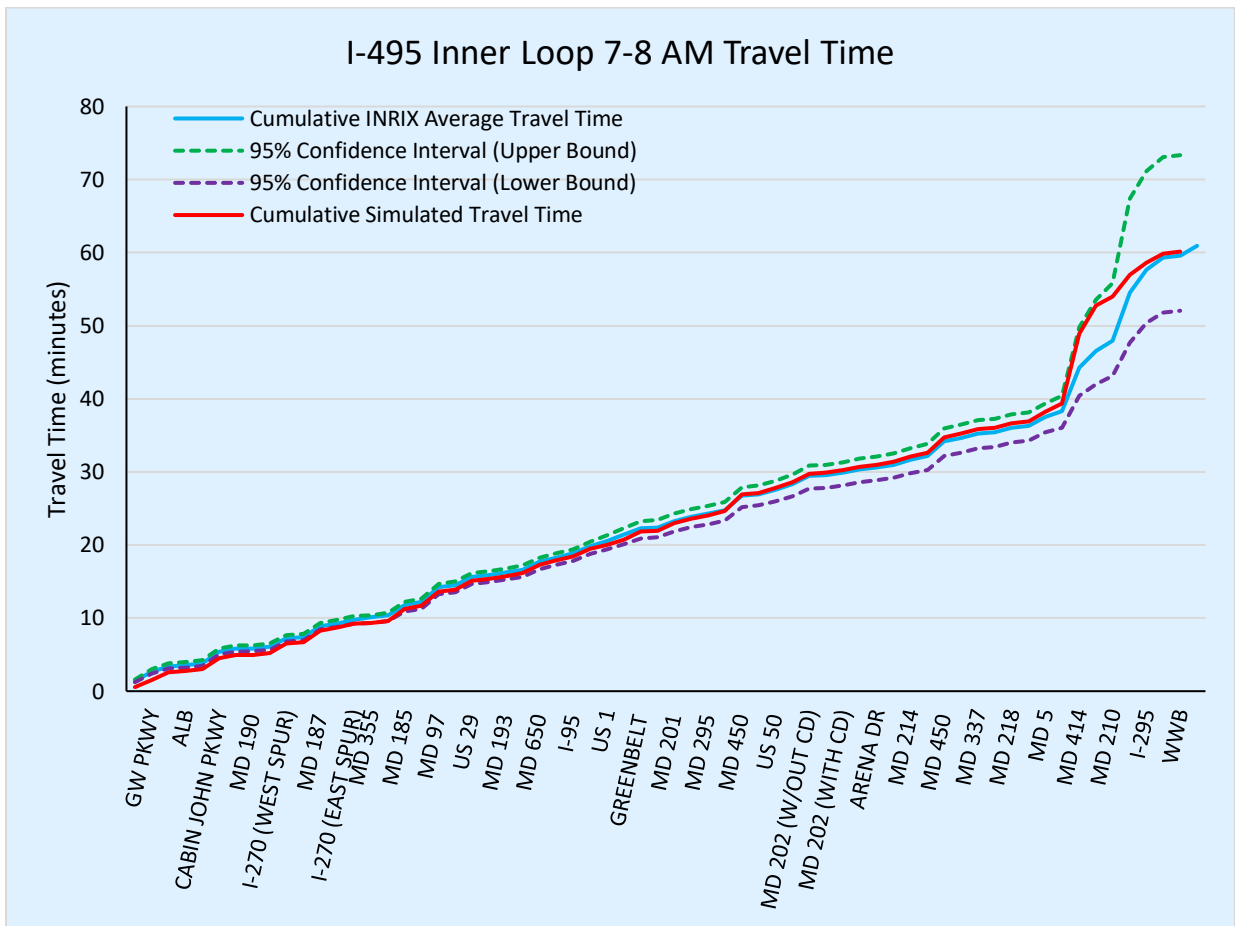


Figure B.2: I-495 Inner Loop – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

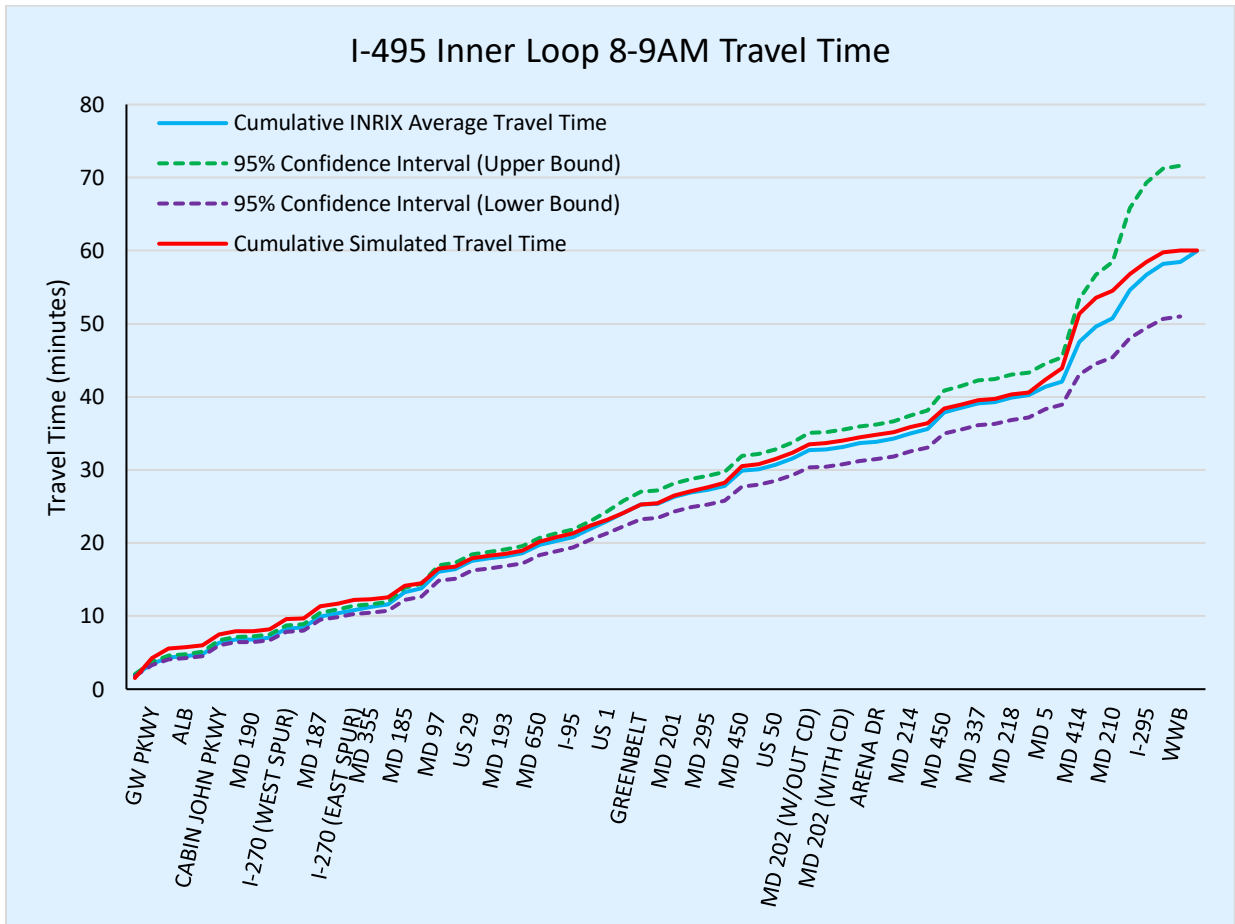


Figure B.3: I-495 Inner Loop – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

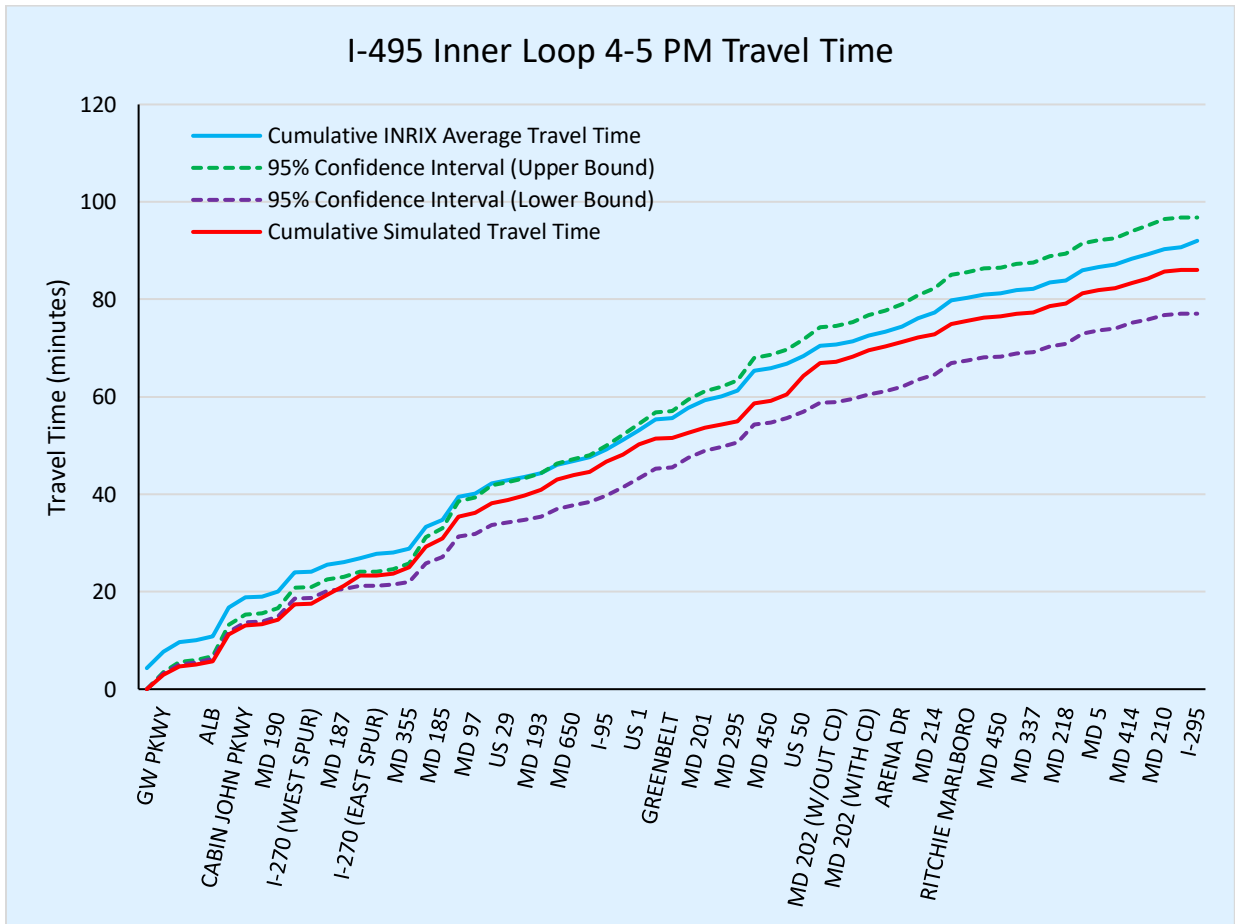


Figure B.4: I-495 Inner Loop – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

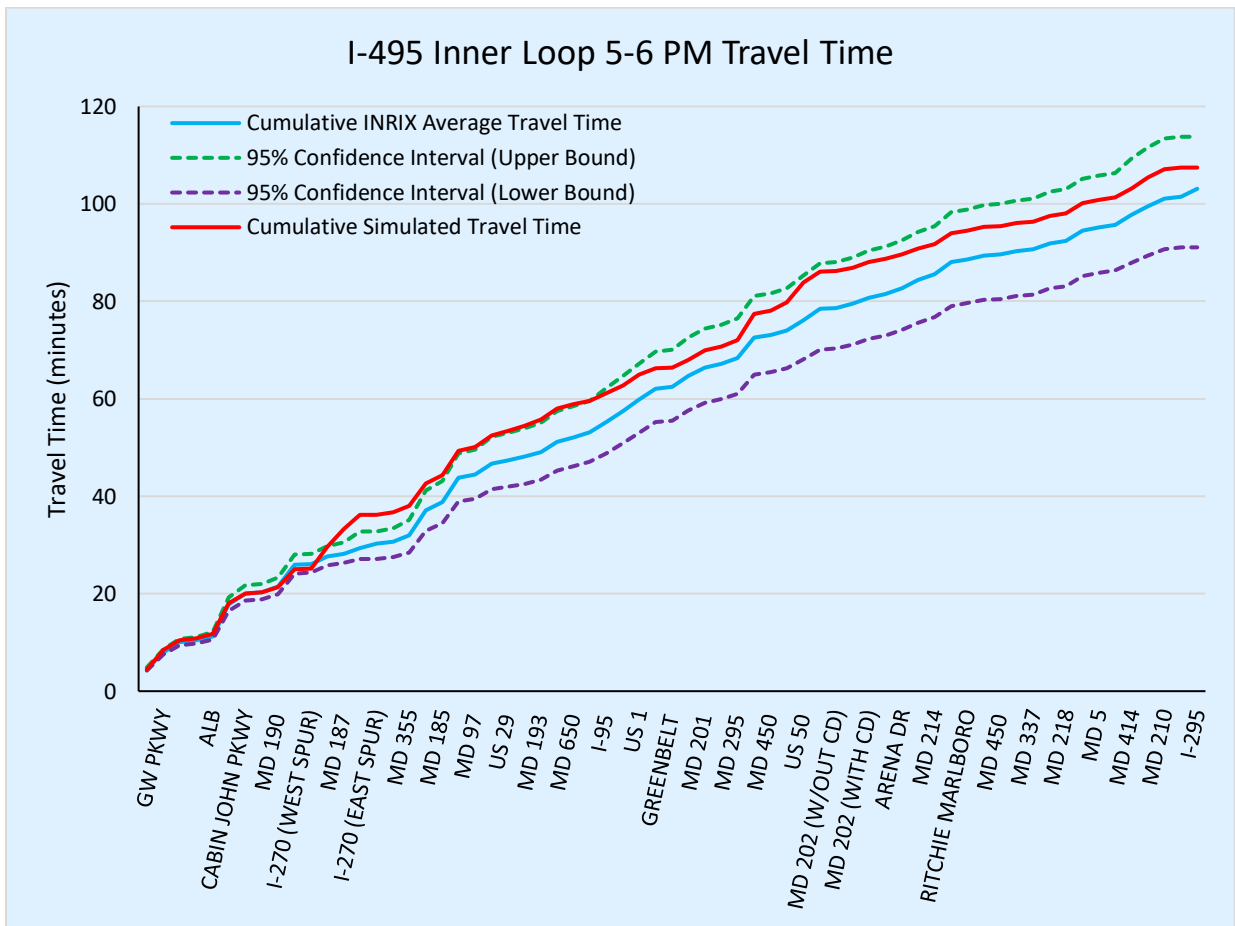


Figure B.5: I-495 Outer Loop – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

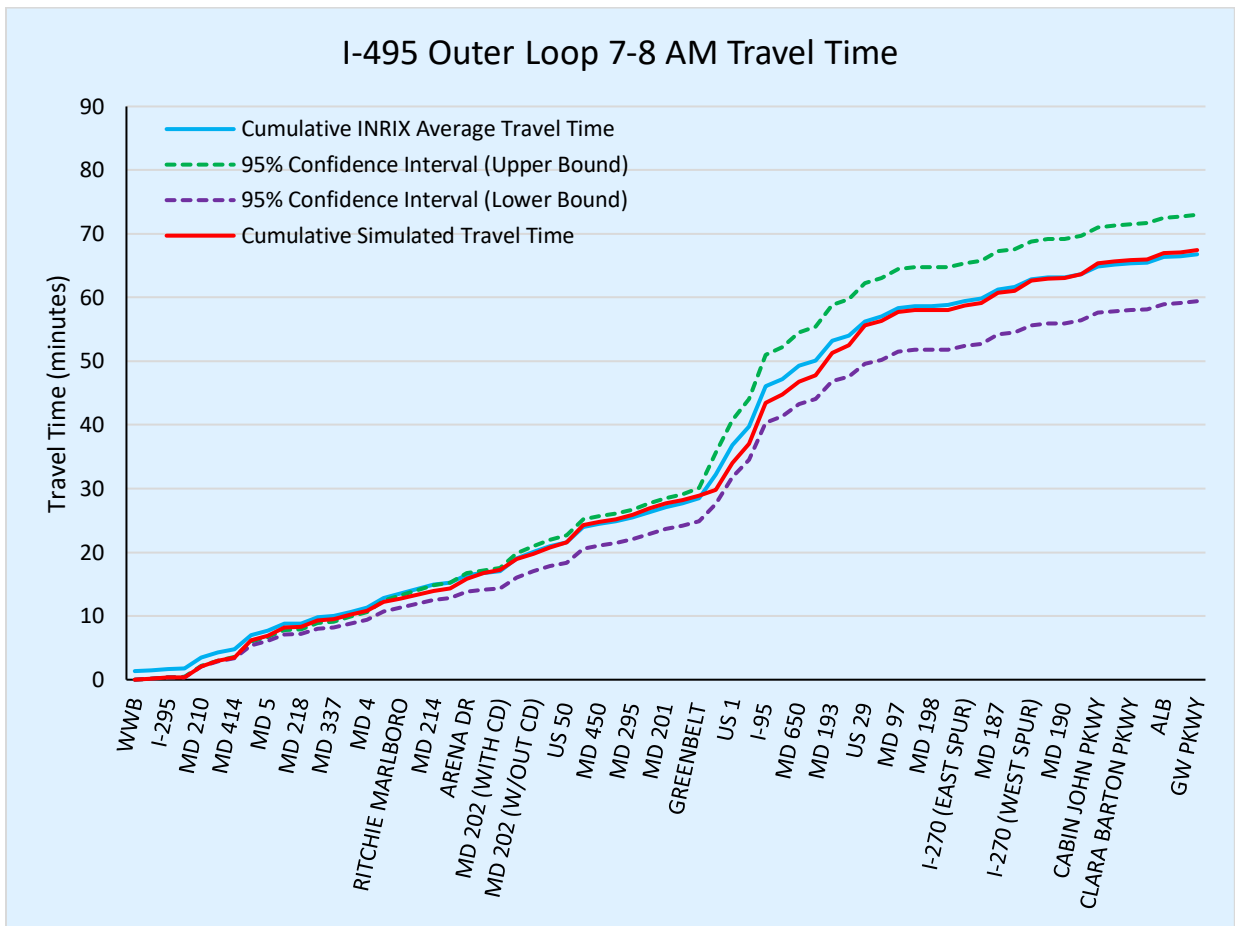


Figure B.6: I-495 Outer Loop – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

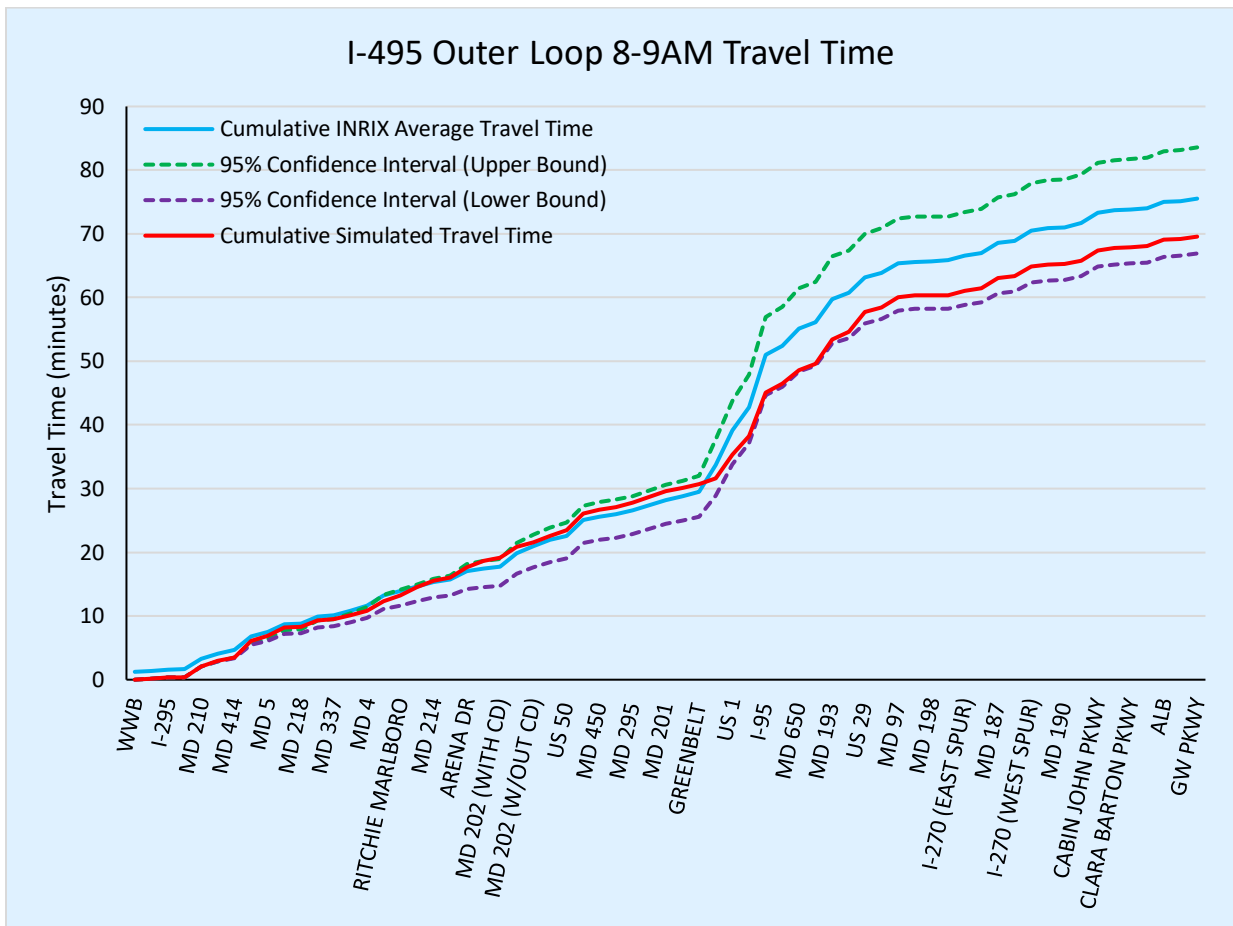


Figure B.7: I-495 Outer Loop – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

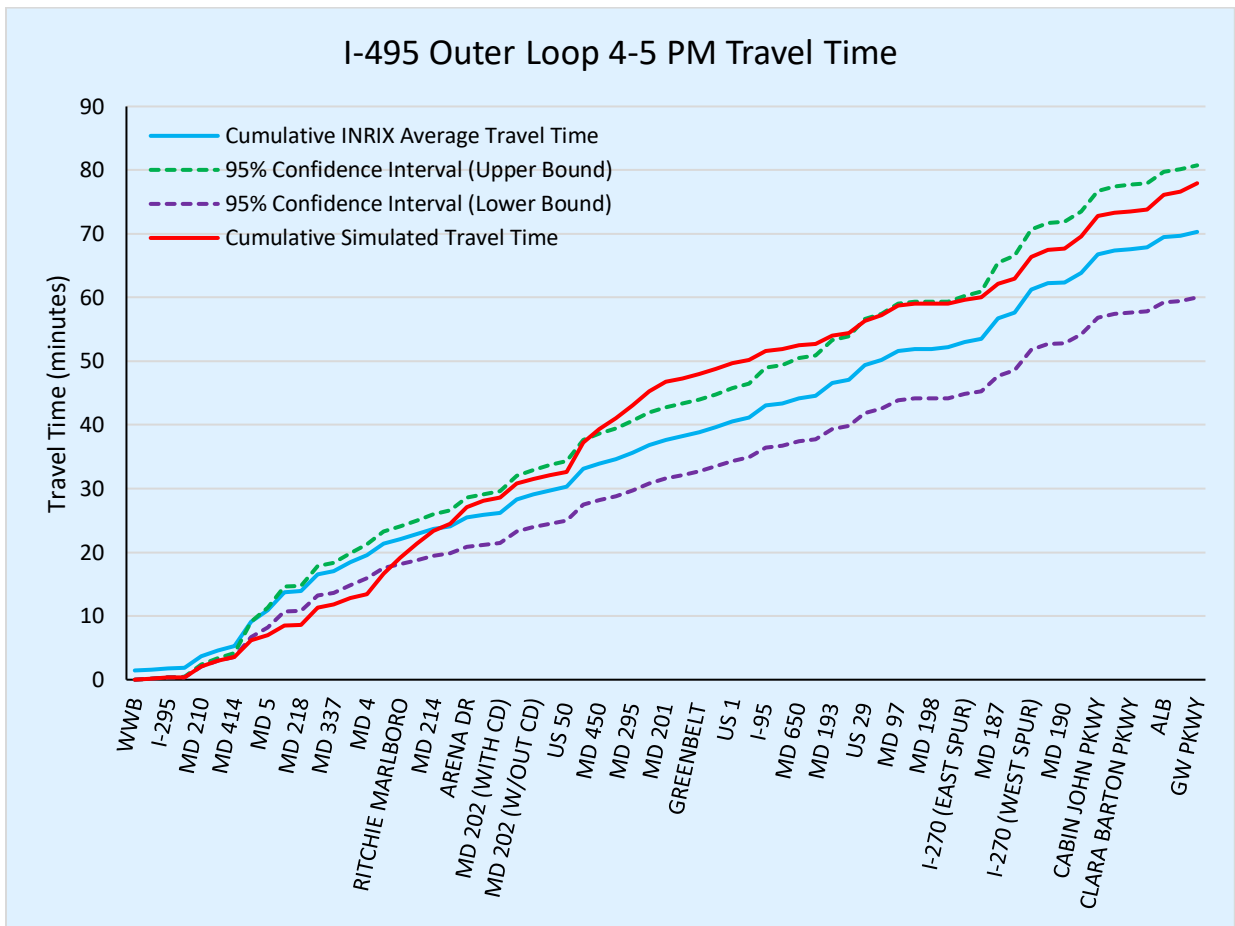


Figure B.8: I-495 Outer Loop – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

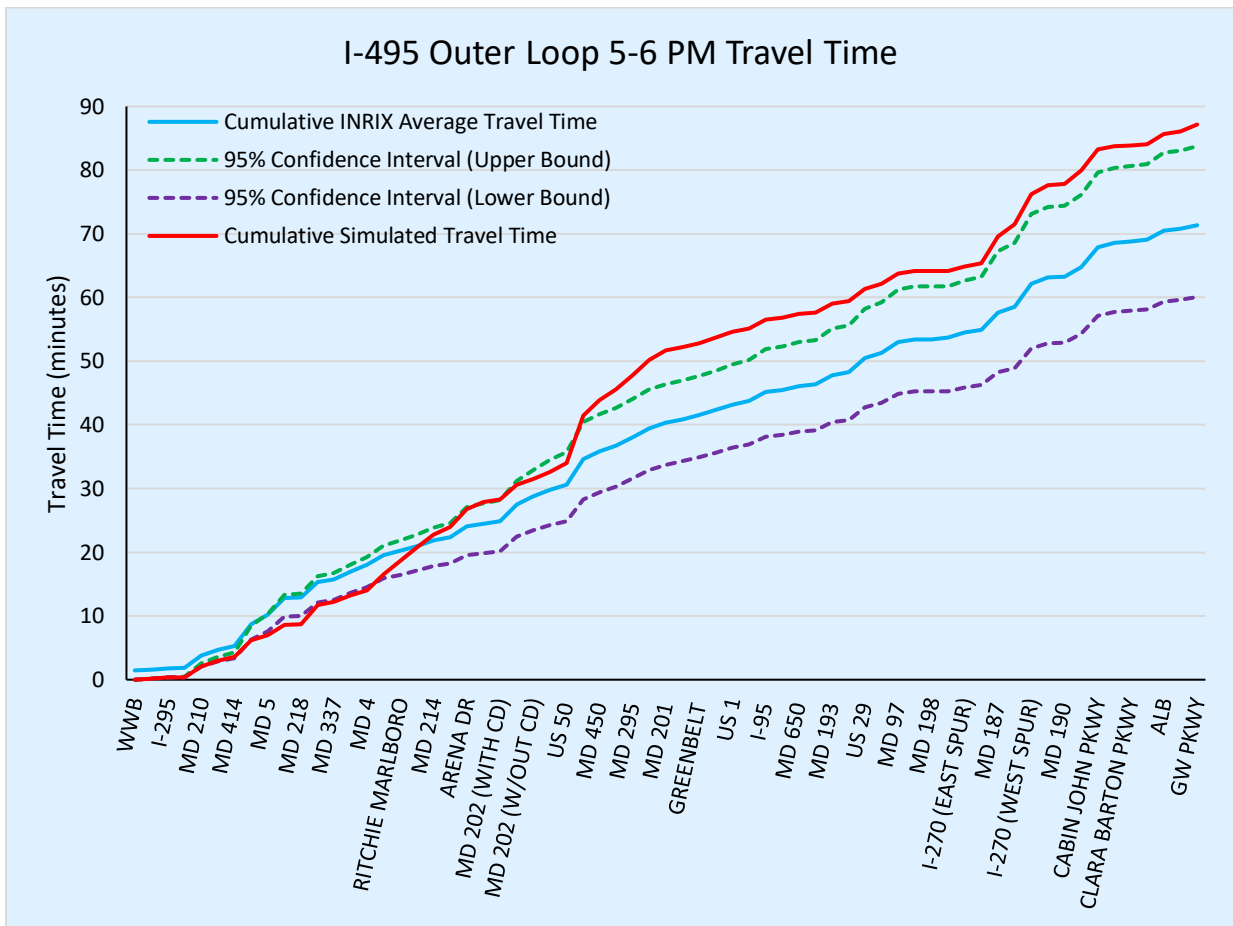


Figure B.9: I-270 Southbound – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

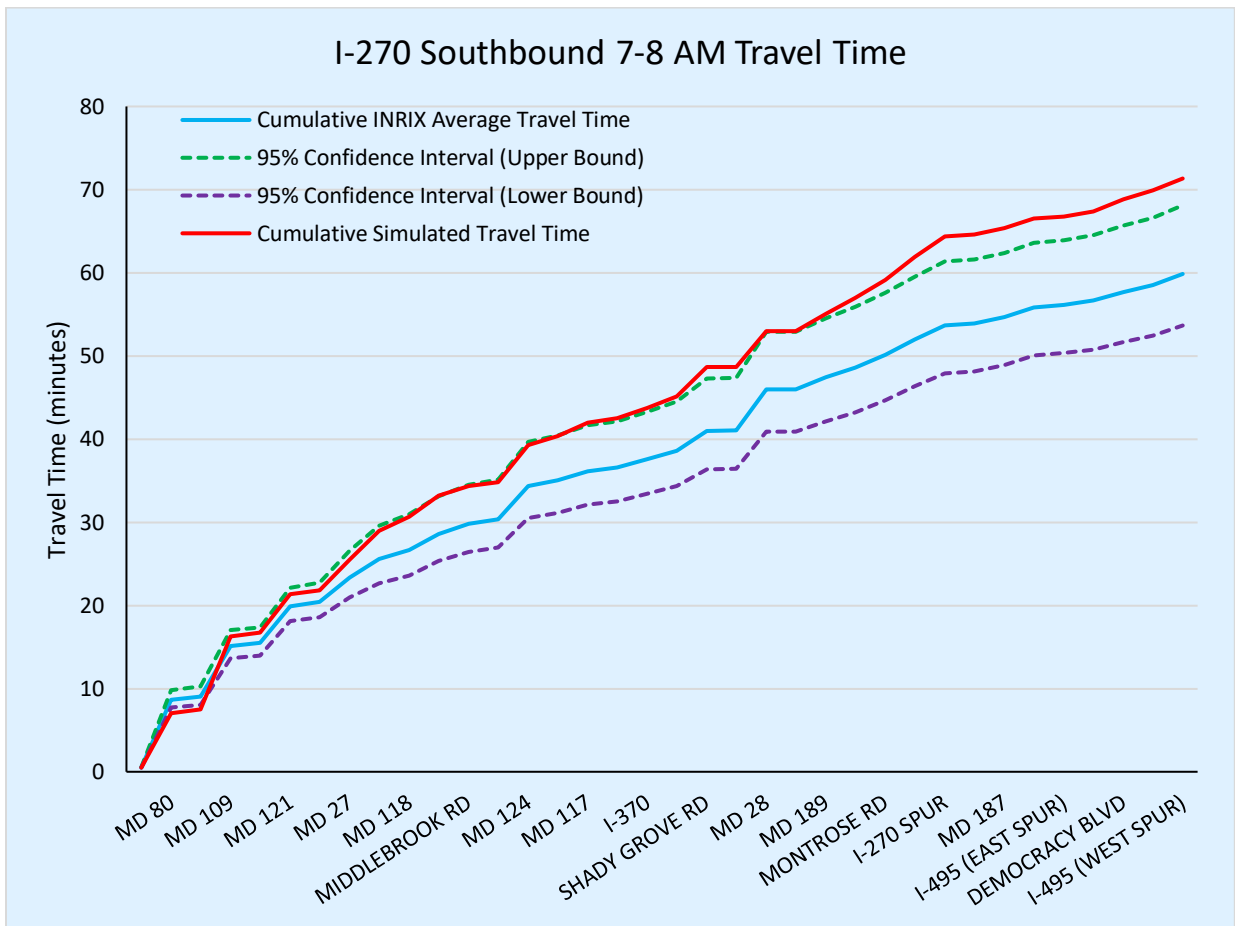


Figure B.10: I-270 Southbound – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

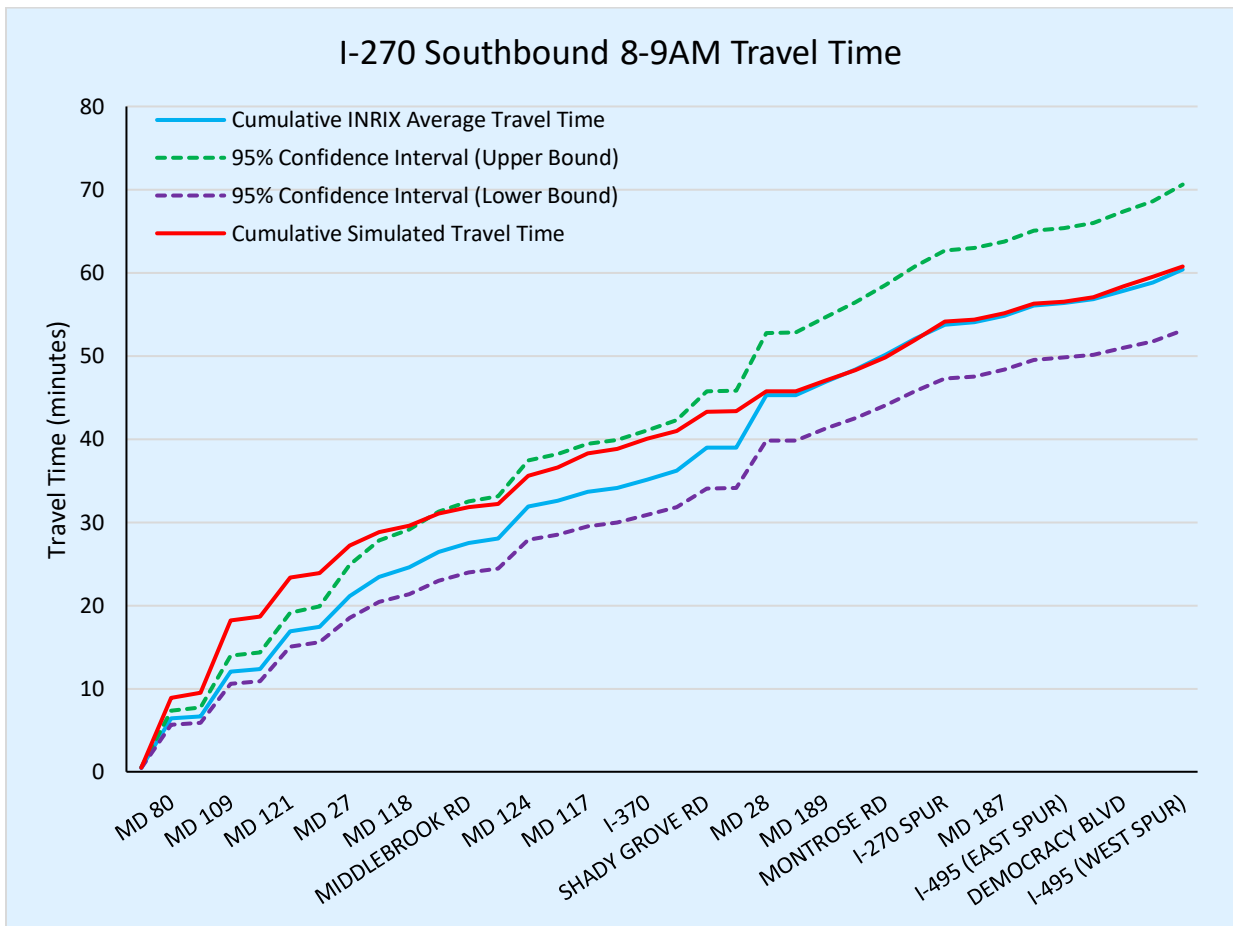


Figure B.11: I-270 Southbound – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

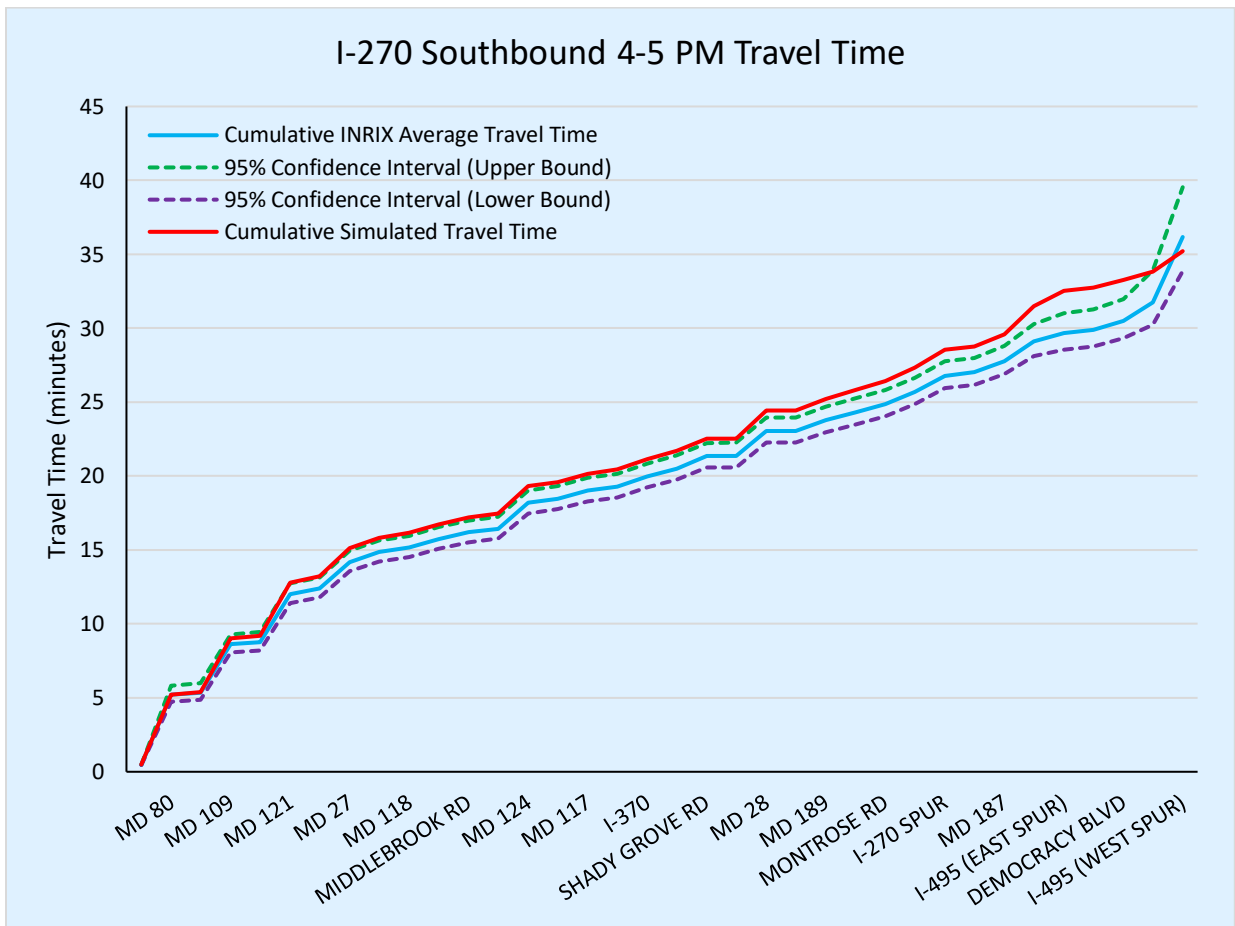


Figure B.12: I-270 Southbound – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

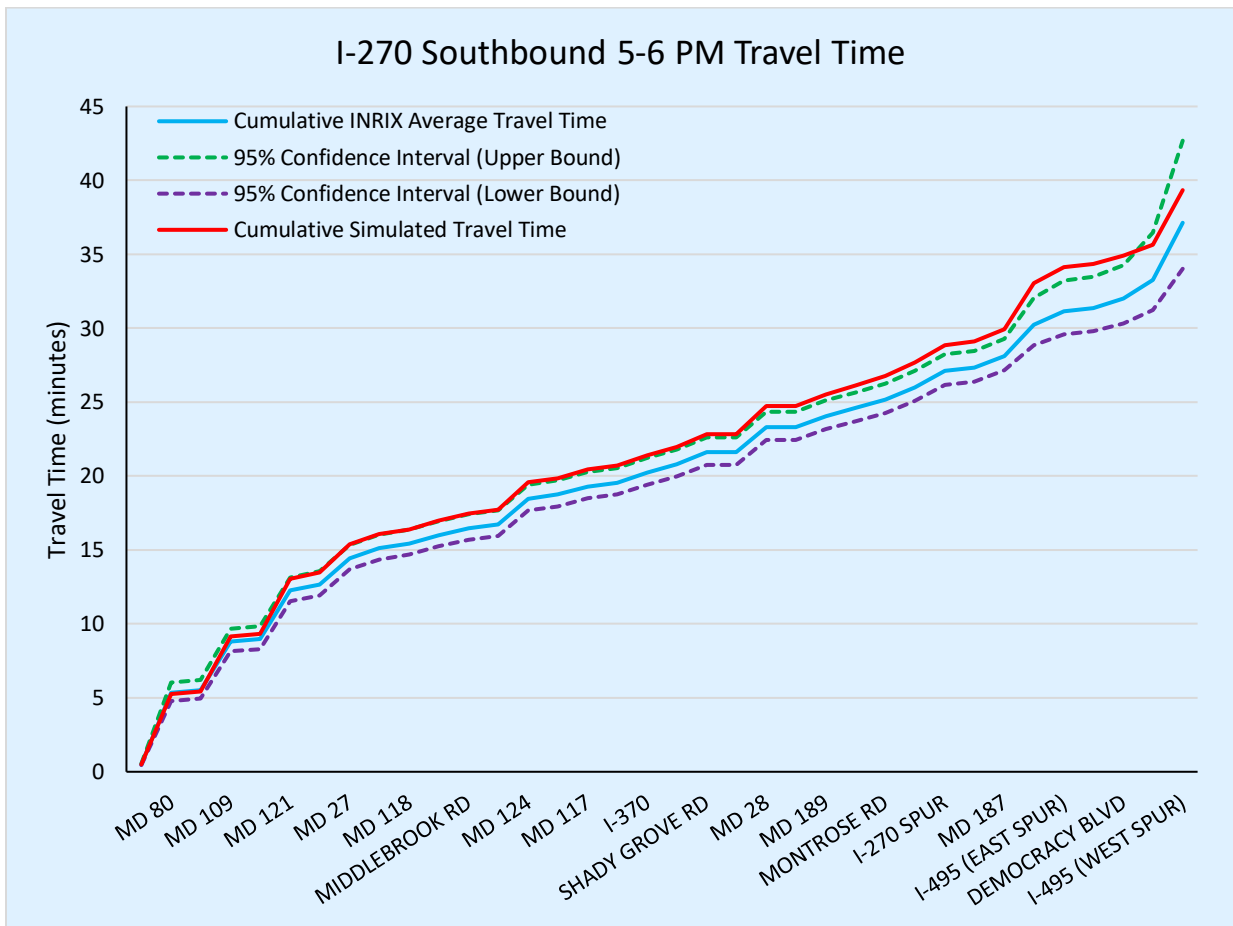


Figure B.13: I-270 Northbound – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

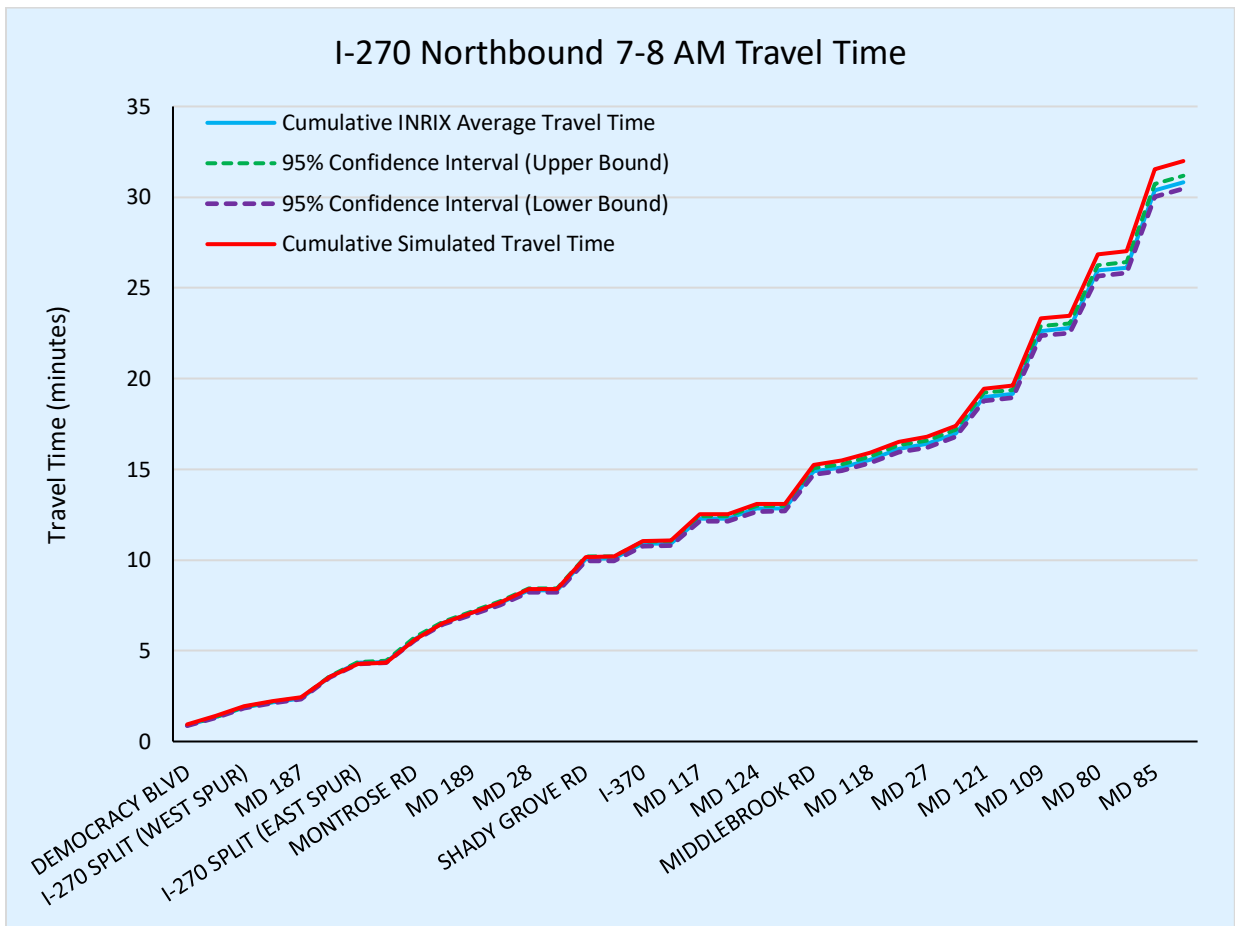


Figure B.14: I-270 Northbound – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

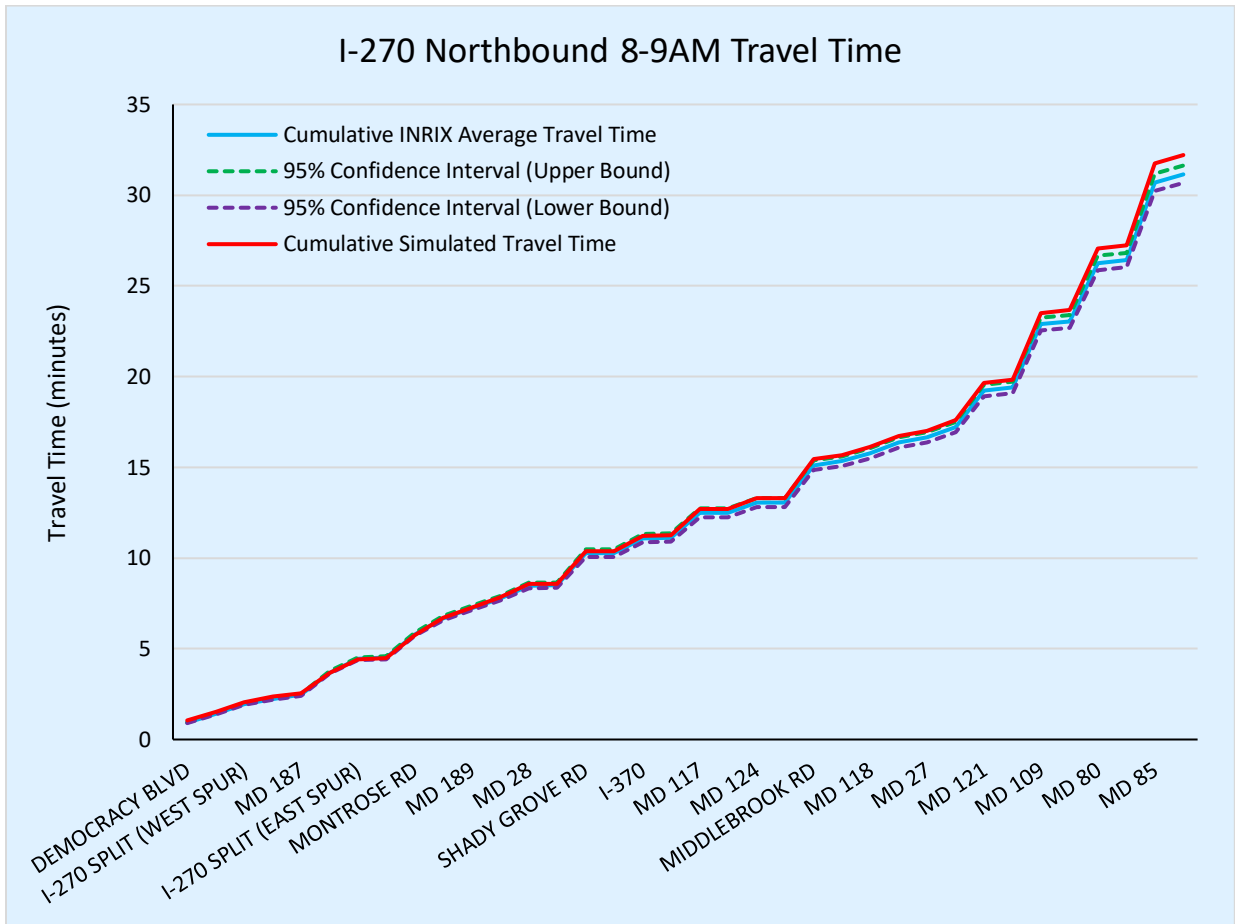


Figure B.15: I-270 Northbound – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

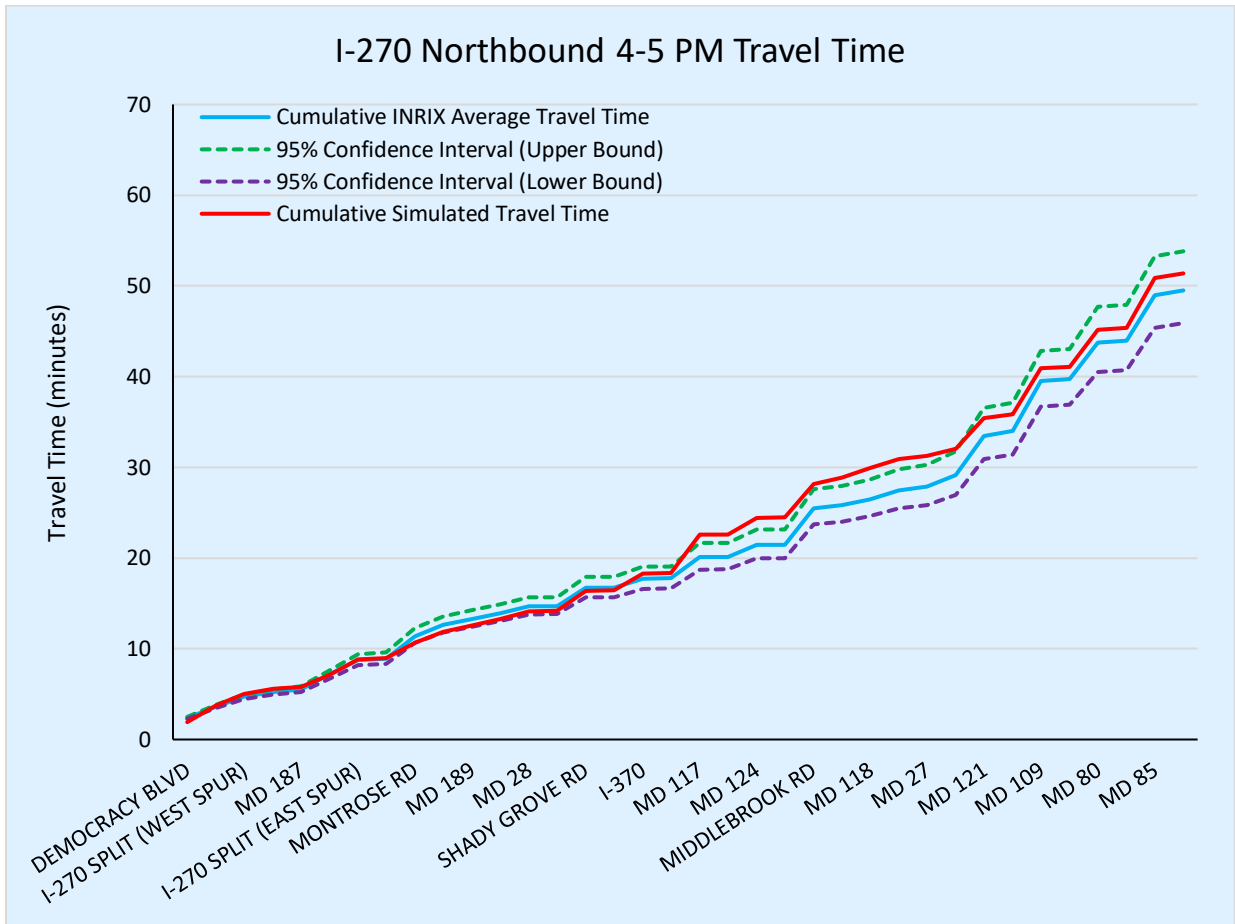


Figure B.16: I-270 Northbound – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

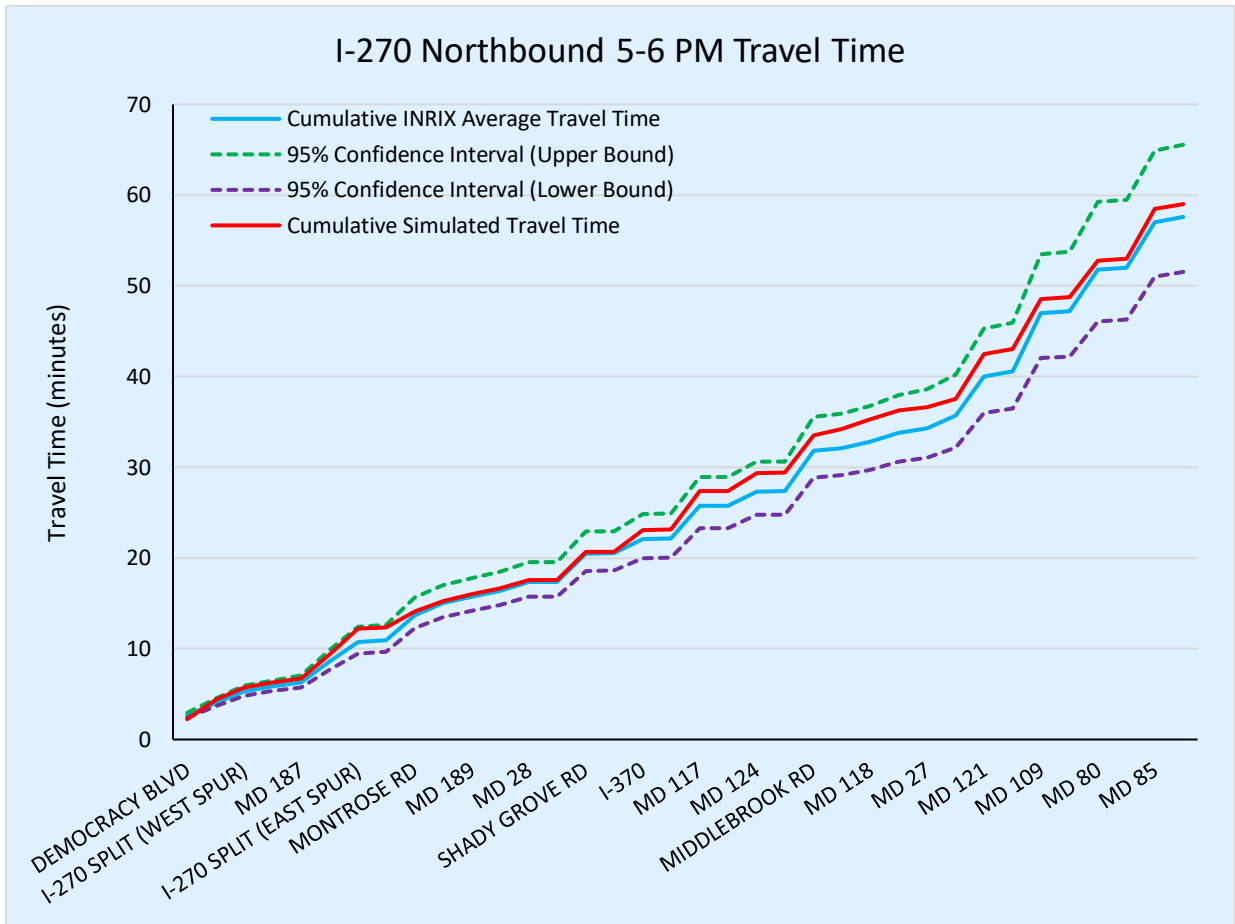


Figure B.27: I-270 Southbound – 4-5 PM VISSIM Model and May 2017 Travel Time Comparison

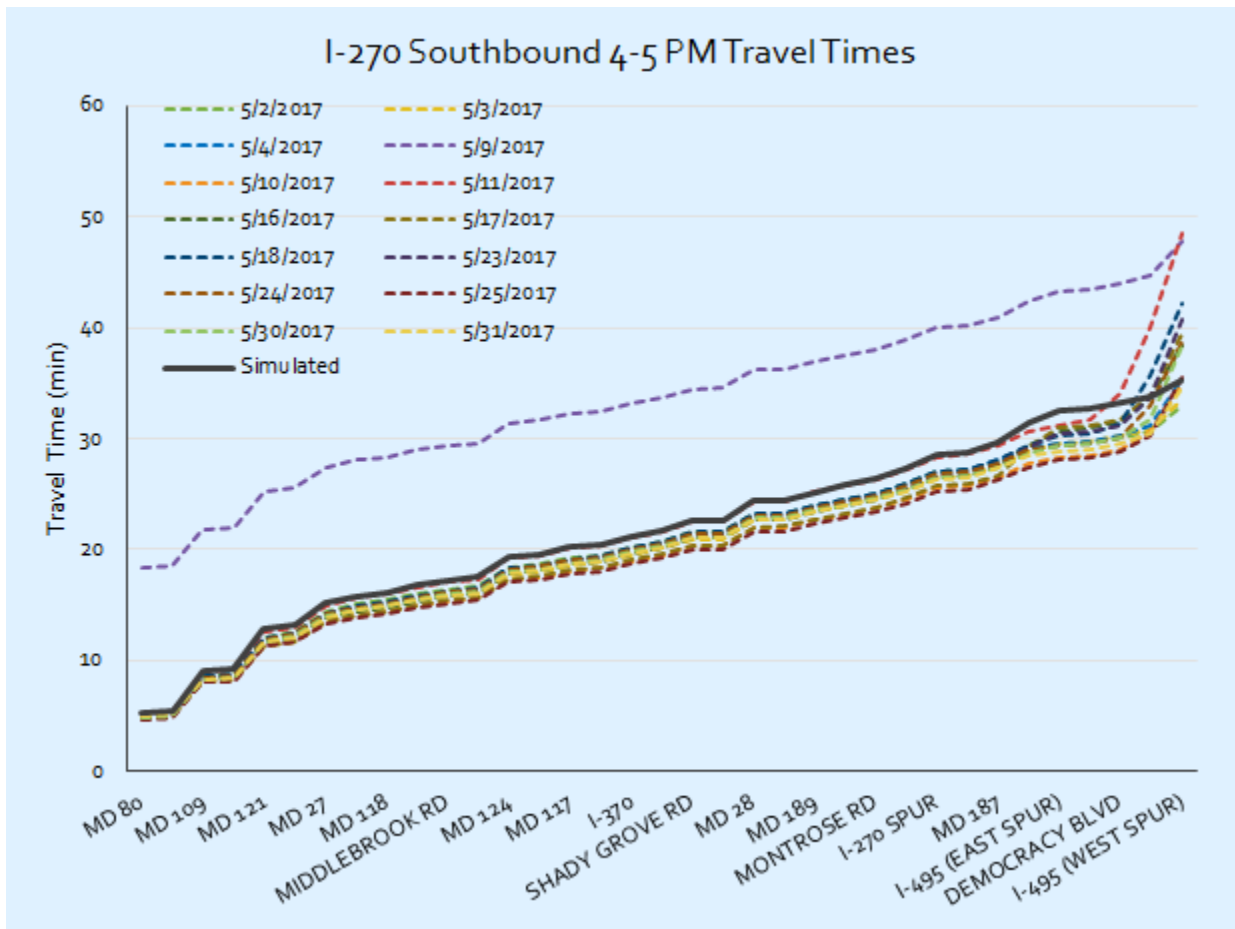


Figure B.28: I-270 Southbound – 5-6 PM VISSIM Model and May 2017 Travel Time Comparison

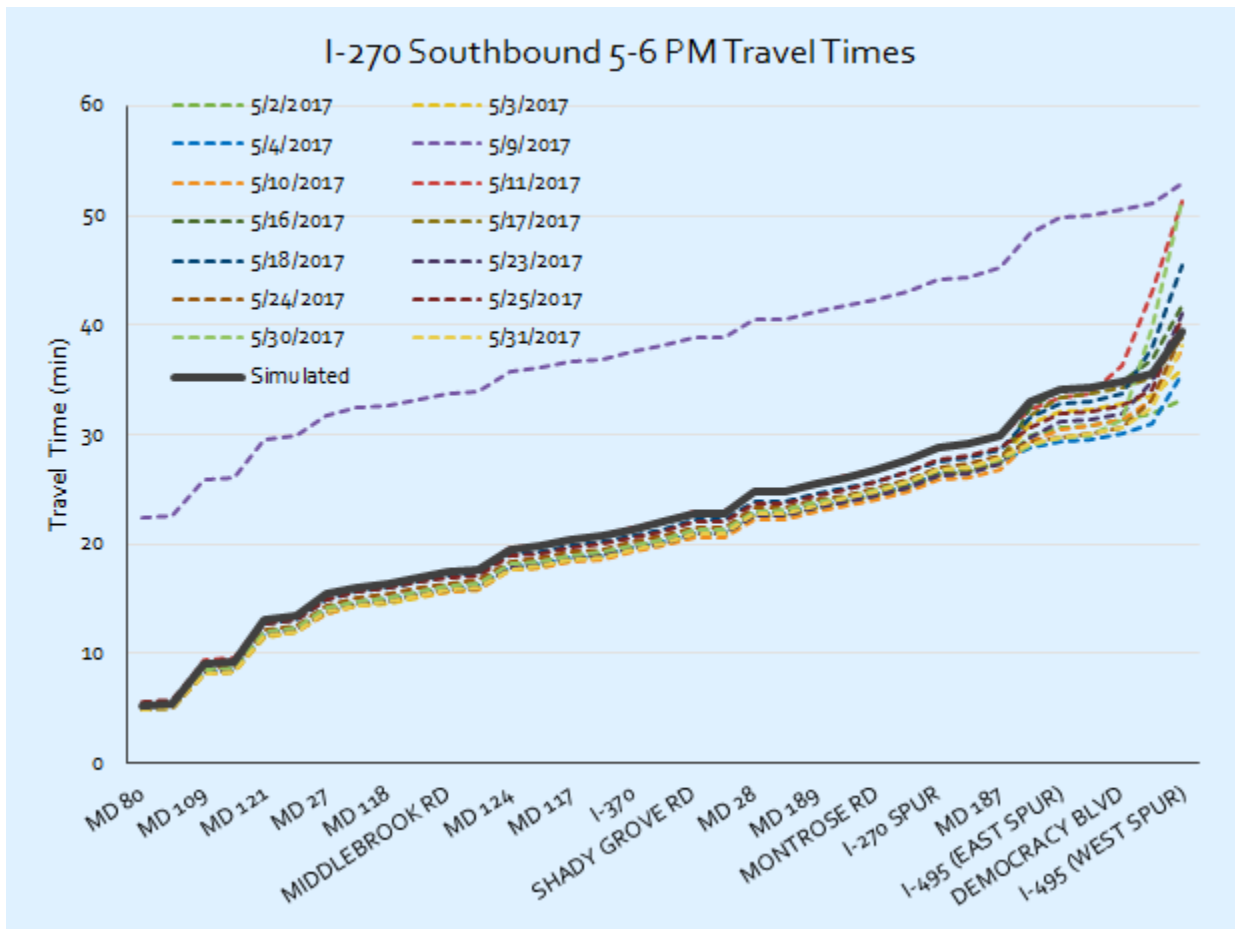
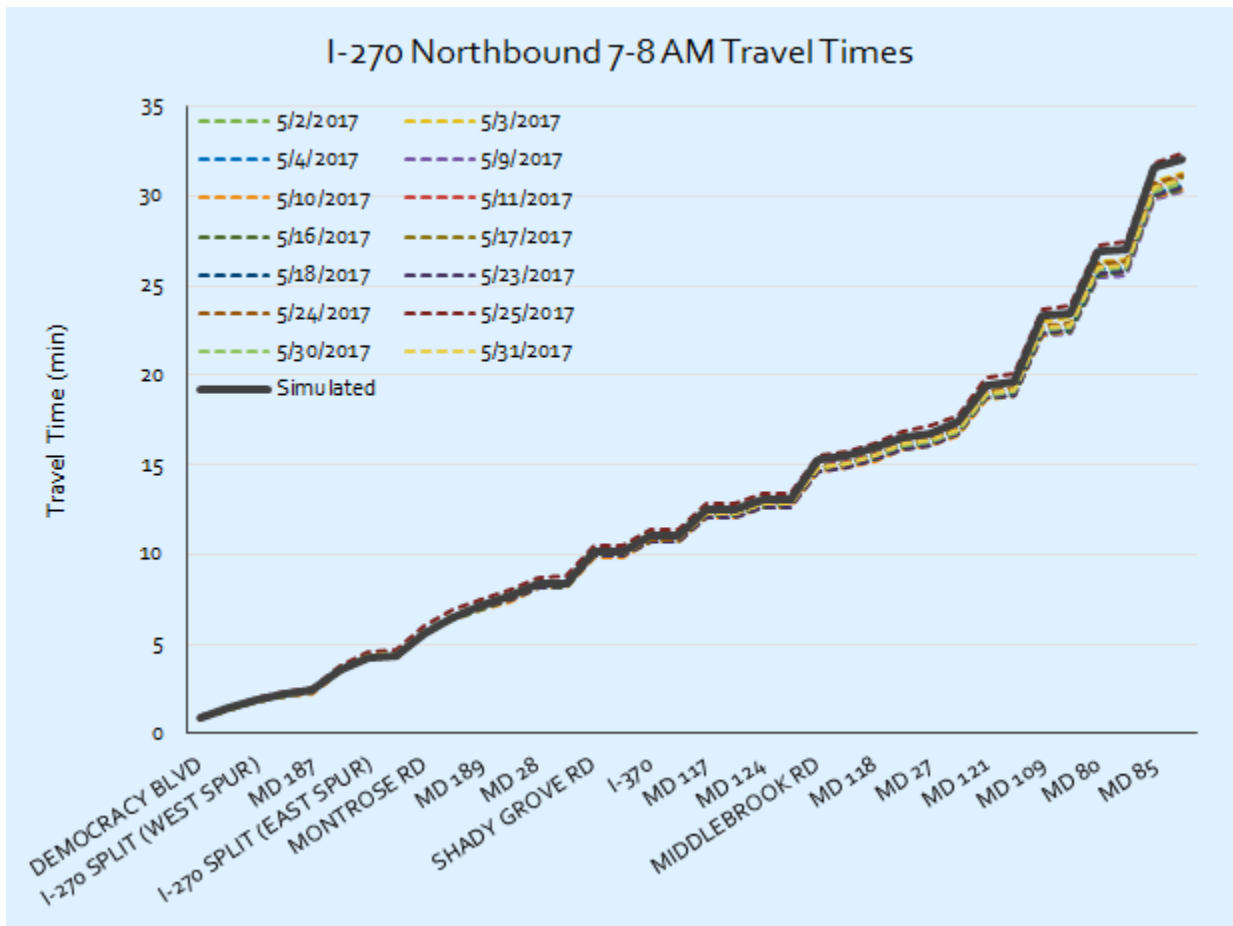


Figure B.29: I-270 Northbound – 7-8 AM VISSIM Model and May 2017 Travel Time Comparison



APPENDIX C

Volume Tables




Legend	
	Model throughput within 10% of balanced count volume
	Model throughput NOT within 10% of balanced count volume
	Criteria Not Met

Figure C.1: I-495 Inner Loop 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop				Calibration not met		
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9190	8390	9%	Yes	8.53288	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8390	7819	7%	Yes	6.34268	No
BETWEEN MD 190 AND I-270	8540	8022	6%	Yes	5.69231	No
BETWEEN I-270 WEST AND MD 187	4455	4509	-1%	Yes	0.8066	Yes
BETWEEN I-270 EAST AND MD 187	4145	4296	-4%	Yes	2.32432	Yes
BETWEEN MD 355 AND MD 185	8120	7780	4%	Yes	3.81325	Yes
BETWEEN MD 185 AND MD 97	7780	7335	6%	Yes	5.11883	No
BETWEEN MD 97 AND US 29	7445	7246	3%	Yes	2.32189	Yes
BETWEEN MD US 29 AND MD 193	7060	6867	3%	Yes	2.31283	Yes
BETWEEN MD 193 AND MD 650	7475	7250	3%	Yes	2.62222	Yes
BETWEEN MD 650 AND I-95	8495	8297	2%	Yes	2.16087	Yes
BETWEEN US 1 AND I-95	7590	6846	10%	Yes	8.75718	No
BETWEEN GREENBELT STATION AND US 1	8720	8215	6%	Yes	5.488	No
BETWEEN GREENBELT STATION AND MD 201	8240	7733	6%	Yes	5.67322	No
BETWEEN MD 201 AND MD 295	7590	7126	6%	Yes	5.40926	No
BETWEEN MD 295 AND MD 450	6830	6407	6%	Yes	5.19949	No
BETWEEN MD 450 AND US 50	7190	6786	6%	Yes	4.83287	Yes
BETWEEN US 50 AND MD 202	7975	7661	4%	Yes	3.55125	Yes
BETWEEN MD 202 AND ARENA DR	7620	7308	4%	Yes	3.61134	Yes
BETWEEN ARENA DR AND MD 214	7665	7382	4%	Yes	3.26269	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7515	7266	3%	Yes	2.89643	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7610	7403	3%	Yes	2.3892	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6695	6559	2%	Yes	1.67063	Yes
BETWEEN FORESTVILLE AND MD 218	6080	5965	2%	Yes	1.48187	Yes
BETWEEN MD 218 AND MD 5	6290	6177	2%	Yes	1.43124	Yes
BETWEEN MD 5 AND MD 414	5345	4998	6%	Yes	4.82527	Yes
BETWEEN MD 414 AND MD 210	5465	4916	10%	No	7.62022	No
BETWEEN MD 210 AND I-295	6405	7369	-15%	No	11.6161	No
WOODROW WILSON BRIDGE	9445	9473	0%	Yes	0.2879	Yes

Figure C.2: I-495 Inner Loop 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop					Calibrated	
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9175	8317	9%	Yes	9.1745	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8430	7716	8%	Yes	7.94659	No
BETWEEN MD 190 AND I-270	8990	8306	8%	Yes	7.35526	No
BETWEEN I-270 WEST AND MD 187	4090	3930	4%	Yes	2.52667	Yes
BETWEEN I-270 EAST AND MD 187	3805	3695	3%	Yes	1.79629	Yes
BETWEEN MD 355 AND MD 185	7435	7271	2%	Yes	1.91254	Yes
BETWEEN MD 185 AND MD 97	7550	7475	1%	Yes	0.8653	Yes
BETWEEN MD 97 AND US 29	7250	7250	0%	Yes	0	Yes
BETWEEN MD US 29 AND MD 193	6965	6972	0%	Yes	0.08385	Yes
BETWEEN MD 193 AND MD 650	7465	7467	0%	Yes	0.02315	Yes
BETWEEN MD 650 AND I-95	7905	7881	0%	Yes	0.27014	Yes
BETWEEN US 1 AND I-95	7215	7455	-3%	Yes	2.80228	Yes
BETWEEN GREENBELT STATION AND US 1	8460	8532	-1%	Yes	0.78113	Yes
BETWEEN GREENBELT STATION AND MD 201	8085	8094	0%	Yes	0.10006	Yes
BETWEEN MD 201 AND MD 295	7860	7876	0%	Yes	0.18038	Yes
BETWEEN MD 295 AND MD 450	7245	7230	0%	Yes	0.17632	Yes
BETWEEN MD 450 AND US 50	7890	7629	3%	Yes	2.96295	Yes
BETWEEN US 50 AND MD 202	8610	8378	3%	Yes	2.51728	Yes
BETWEEN MD 202 AND ARENA DR	8205	7977	3%	Yes	2.53474	Yes
BETWEEN ARENA DR AND MD 214	8045	7800	3%	Yes	2.75255	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7560	7358	3%	Yes	2.3389	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7540	7221	4%	Yes	3.7132	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7290	7003	4%	Yes	3.39496	Yes
BETWEEN FORESTVILLE AND MD 218	6635	6373	4%	Yes	3.24871	Yes
BETWEEN MD 218 AND MD 5	6885	6613	4%	Yes	3.31092	Yes
BETWEEN MD 5 AND MD 414	6050	6072	0%	Yes	0.28259	Yes
BETWEEN MD 414 AND MD 210	6035	6079	-1%	Yes	0.56536	Yes
BETWEEN MD 210 AND I-295	6715	7973	-19%	No	14.6796	No
WOODROW WILSON BRIDGE	9280	9637	-4%	Yes	3.67077	Yes



Figure C.3: I-495 Inner Loop 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop					Calibrated	
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	7810	7938	-2%	Yes	1.44249	Yes
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	6845	6969	-2%	Yes	1.49203	Yes
BETWEEN MD 190 AND I-270	8905	8744	2%	Yes	1.71388	Yes
BETWEEN I-270 WEST AND MD 187	3770	3892	-3%	Yes	1.97108	Yes
BETWEEN I-270 EAST AND MD 187	3645	3541	3%	Yes	1.73502	Yes
BETWEEN MD 355 AND MD 185	7440	7024	6%	Yes	4.89175	Yes
BETWEEN MD 185 AND MD 97	8355	8096	3%	Yes	2.85574	Yes
BETWEEN MD 97 AND US 29	8665	8394	3%	Yes	2.93432	Yes
BETWEEN MD US 29 AND MD 193	8385	8027	4%	Yes	3.952	Yes
BETWEEN MD 193 AND MD 650	8505	8231	3%	Yes	2.9953	Yes
BETWEEN MD 650 AND I-95	9115	8909	2%	Yes	2.16998	Yes
BETWEEN US 1 AND I-95	7170	6851	4%	Yes	3.80992	Yes
BETWEEN GREENBELT STATION AND US 1	8115	8272	-2%	Yes	1.73446	Yes
BETWEEN GREENBELT STATION AND MD 201	7990	8163	-2%	Yes	1.92502	Yes
BETWEEN MD 201 AND MD 295	8020	8028	0%	Yes	0.08931	Yes
BETWEEN MD 295 AND MD 450	7850	7641	3%	Yes	2.37477	Yes
BETWEEN MD 450 AND US 50	8240	8118	1%	Yes	1.34899	Yes
BETWEEN US 50 AND MD 202	8095	7971	2%	Yes	1.38351	Yes
BETWEEN MD 202 AND ARENA DR	7490	7741	-3%	Yes	2.87624	Yes
BETWEEN ARENA DR AND MD 214	7265	7617	-5%	Yes	4.08063	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7195	7498	-4%	Yes	3.53511	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	6885	7008	-2%	Yes	1.47578	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6680	6919	-4%	Yes	2.89841	Yes
BETWEEN FORESTVILLE AND MD 218	6185	6446	-4%	Yes	3.28425	Yes
BETWEEN MD 218 AND MD 5	6830	7104	-4%	Yes	3.28267	Yes
BETWEEN MD 5 AND MD 414	5710	5831	-2%	Yes	1.59286	Yes
BETWEEN MD 414 AND MD 210	5455	5558	-2%	Yes	1.38803	Yes
BETWEEN MD 210 AND I-295	5740	6024	-5%	Yes	3.70302	Yes
WOODROW WILSON BRIDGE	8415	8661	-3%	Yes	2.6623	Yes



Figure C.4: I-495 Inner Loop 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop					Calibrated	
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8085	7612	6%	Yes	5.3391	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	6820	6608	3%	Yes	2.58729	Yes
BETWEEN MD 190 AND I-270	8515	8308	2%	Yes	2.25701	Yes
BETWEEN I-270 WEST AND MD 187	3575	3449	4%	Yes	2.12615	Yes
BETWEEN I-270 EAST AND MD 187	3445	3274	5%	Yes	2.95025	Yes
BETWEEN MD 355 AND MD 185	7055	6945	2%	Yes	1.31475	Yes
BETWEEN MD 185 AND MD 97	7820	7896	-1%	Yes	0.85735	Yes
BETWEEN MD 97 AND US 29	7975	8084	-1%	Yes	1.21642	Yes
BETWEEN MD US 29 AND MD 193	7695	7765	-1%	Yes	0.79617	Yes
BETWEEN MD 193 AND MD 650	7765	8000	-3%	Yes	2.64689	Yes
BETWEEN MD 650 AND I-95	8500	8504	0%	Yes	0.04338	Yes
BETWEEN US 1 AND I-95	6745	6658	1%	Yes	1.06276	Yes
BETWEEN GREENBELT STATION AND US 1	7745	7976	-3%	Yes	2.60547	Yes
BETWEEN GREENBELT STATION AND MD 201	7640	7713	-1%	Yes	0.83318	Yes
BETWEEN MD 201 AND MD 295	7630	7631	0%	Yes	0.01145	Yes
BETWEEN MD 295 AND MD 450	7360	7139	3%	Yes	2.5956	Yes
BETWEEN MD 450 AND US 50	7810	7778	0%	Yes	0.36247	Yes
BETWEEN US 50 AND MD 202	8245	8102	2%	Yes	1.58173	Yes
BETWEEN MD 202 AND ARENA DR	7845	7966	-2%	Yes	1.36088	Yes
BETWEEN ARENA DR AND MD 214	7510	7717	-3%	Yes	2.37235	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7410	7679	-4%	Yes	3.09697	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7300	7376	-1%	Yes	0.88721	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6870	7057	-3%	Yes	2.24093	Yes
BETWEEN FORESTVILLE AND MD 218	6405	6646	-4%	Yes	2.98339	Yes
BETWEEN MD 218 AND MD 5	6965	7213	-4%	Yes	2.9455	Yes
BETWEEN MD 5 AND MD 414	5880	6034	-3%	Yes	1.99529	Yes
BETWEEN MD 414 AND MD 210	5635	5758	-2%	Yes	1.62968	Yes
BETWEEN MD 210 AND I-295	5785	6123	-6%	Yes	4.38039	Yes
WOODROW WILSON BRIDGE	8315	8861	-7%	Yes	5.89178	No

Figure C.5: I-495 Outer Loop 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop					Calibrated	
WOODROW WILSON BRIDGE	8625	8105	6%	Yes	5.68552	No
BETWEEN MD 210 AND I-295	5170	4844	6%	Yes	4.60711	Yes
BETWEEN MD 414 AND MD 210	5290	5005	5%	Yes	3.97234	Yes
BETWEEN MD 5 AND MD 414	5405	5063	6%	Yes	4.72726	Yes
BETWEEN MD 218 AND MD 5	6520	6364	2%	Yes	1.94363	Yes
BETWEEN FORESTVILLE AND MD 218	5785	5657	2%	Yes	1.69229	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6840	6705	2%	Yes	1.64044	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7400	7401	0%	Yes	0.01162	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	8080	8342	-3%	Yes	2.89137	Yes
BETWEEN ARENA DR AND MD 214	8040	8286	-3%	Yes	2.72277	Yes
BETWEEN MD 202 AND ARENA DR	7785	8097	-4%	Yes	3.5012	Yes
BETWEEN US 50 AND MD 202	7855	7744	1%	Yes	1.25687	Yes
BETWEEN MD 450 AND US 50	8180	8364	-2%	Yes	2.02308	Yes
BETWEEN MD 295 AND MD 450	8205	8403	-2%	Yes	2.17281	Yes
BETWEEN MD 201 AND MD 295	8280	8537	-3%	Yes	2.80268	Yes
BETWEEN GREENBELT STATION AND MD 201	7410	7778	-5%	Yes	4.22292	Yes
BETWEEN GREENBELT STATION AND US 1	7465	7835	-5%	Yes	4.2303	Yes
BETWEEN US 1 AND I-95	7010	7524	-7%	Yes	6.02956	No
BETWEEN MD 650 AND I-95	6540	6471	1%	Yes	0.85548	Yes
BETWEEN MD 193 AND MD 650	5735	6108	-7%	Yes	4.84722	Yes
BETWEEN MD US 29 AND MD 193	6020	6450	-7%	Yes	5.44566	No
BETWEEN MD 97 AND US 29	7100	7053	1%	Yes	0.55871	Yes
BETWEEN MD 185 AND MD 97	8225	8202	0%	Yes	0.25378	Yes
BETWEEN MD 355 AND MD 185	7745	7704	1%	Yes	0.4665	Yes
BETWEEN I-270 EAST AND MD 187	4425	4284	3%	Yes	2.13673	Yes
BETWEEN I-270 WEST AND MD 187	4605	4604	0%	Yes	0.01474	Yes
BETWEEN MD 190 AND I-270	10180	9883	3%	Yes	2.96533	Yes
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8565	8345	3%	Yes	2.39258	Yes
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9115	8873	3%	Yes	2.55175	Yes

Figure C.6: I-495 Outer Loop 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop				Calibration not met		
WOODROW WILSON BRIDGE	7880	7861	0%	Yes	0.21417	Yes
BETWEEN MD 210 AND I-295	4585	4618	-1%	Yes	0.48648	Yes
BETWEEN MD 414 AND MD 210	4810	4826	0%	Yes	0.23051	Yes
BETWEEN MD 5 AND MD 414	4855	4748	2%	Yes	1.54417	Yes
BETWEEN MD 218 AND MD 5	5760	5685	1%	Yes	0.99144	Yes
BETWEEN FORESTVILLE AND MD 218	5090	5027	1%	Yes	0.88579	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6095	6044	1%	Yes	0.65463	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	6825	6914	-1%	Yes	1.07381	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7535	7470	1%	Yes	0.75043	Yes
BETWEEN ARENA DR AND MD 214	7605	7573	0%	Yes	0.36733	Yes
BETWEEN MD 202 AND ARENA DR	7355	7520	-2%	Yes	1.91324	Yes
BETWEEN US 50 AND MD 202	7390	7698	-4%	Yes	3.54609	Yes
BETWEEN MD 450 AND US 50	8095	8569	-6%	Yes	5.19283	No
BETWEEN MD 295 AND MD 450	7875	8385	-6%	Yes	5.6562	No
BETWEEN MD 201 AND MD 295	7780	8252	-6%	Yes	5.27185	No
BETWEEN GREENBELT STATION AND MD 201	7050	7490	-6%	Yes	5.16043	No
BETWEEN GREENBELT STATION AND US 1	7105	7553	-6%	Yes	5.23306	No
BETWEEN US 1 AND I-95	6925	7361	-6%	Yes	5.15877	No
BETWEEN MD 650 AND I-95	6200	6722	-8%	Yes	6.49412	No
BETWEEN MD 193 AND MD 650	5340	5956	-12%	No	8.19659	No
BETWEEN MD US 29 AND MD 193	5555	6278	-13%	No	9.39952	No
BETWEEN MD 97 AND US 29	6545	6850	-5%	Yes	3.72686	Yes
BETWEEN MD 185 AND MD 97	8090	8266	-2%	Yes	1.94621	Yes
BETWEEN MD 355 AND MD 185	8235	8311	-1%	Yes	0.83557	Yes
BETWEEN I-270 EAST AND MD 187	4010	3848	4%	Yes	2.58448	Yes
BETWEEN I-270 WEST AND MD 187	4070	4073	0%	Yes	0.04702	Yes
BETWEEN MD 190 AND I-270	9130	9627	-5%	Yes	5.13204	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7900	8260	-5%	Yes	4.00495	Yes
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8950	9254	-3%	Yes	3.18644	Yes

Figure C.7: I-495 Outer Loop 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop				Calibration not met		
WOODROW WILSON BRIDGE	9190	9151	0%	Yes	0.40726	Yes
BETWEEN MD 210 AND I-295	7575	7543	0%	Yes	0.36806	Yes
BETWEEN MD 414 AND MD 210	7375	7304	1%	Yes	0.82875	Yes
BETWEEN MD 5 AND MD 414	6720	6714	0%	Yes	0.07321	Yes
BETWEEN MD 218 AND MD 5	6580	6703	-2%	Yes	1.50929	Yes
BETWEEN FORESTVILLE AND MD 218	6175	6234	-1%	Yes	0.74903	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7235	7296	-1%	Yes	0.71564	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7665	7708	-1%	Yes	0.49046	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7725	7146	7%	Yes	6.71465	No
BETWEEN ARENA DR AND MD 214	7385	6917	6%	Yes	5.5343	No
BETWEEN MD 202 AND ARENA DR	7480	7066	6%	Yes	4.85449	Yes
BETWEEN US 50 AND MD 202	7680	7205	6%	Yes	5.50597	No
BETWEEN MD 450 AND US 50	7570	7188	5%	Yes	4.44697	Yes
BETWEEN MD 295 AND MD 450	7020	6520	7%	Yes	6.07681	No
BETWEEN MD 201 AND MD 295	8100	6933	14%	No	13.4606	No
BETWEEN GREENBELT STATION AND MD 201	8340	7313	12%	No	11.6088	No
BETWEEN GREENBELT STATION AND US 1	8655	7637	12%	No	11.2791	No
BETWEEN US 1 AND I-95	9280	8364	10%	Yes	9.75241	No
BETWEEN MD 650 AND I-95	7920	6943	12%	No	11.3333	No
BETWEEN MD 193 AND MD 650	7440	6698	10%	Yes	8.82521	No
BETWEEN MD US 29 AND MD 193	7115	6511	8%	Yes	7.31758	No
BETWEEN MD 97 AND US 29	7730	7164	7%	Yes	6.55882	No
BETWEEN MD 185 AND MD 97	7770	7371	5%	Yes	4.58575	Yes
BETWEEN MD 355 AND MD 185	7710	7521	2%	Yes	2.16577	Yes
BETWEEN I-270 EAST AND MD 187	3970	3909	2%	Yes	0.97187	Yes
BETWEEN I-270 WEST AND MD 187	4185	4121	2%	Yes	0.99311	Yes
BETWEEN MD 190 AND I-270	7780	7251	7%	Yes	6.10206	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7295	6777	7%	Yes	6.17542	No
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8535	8107	5%	Yes	4.69198	Yes

Figure C.8: I-495 Outer Loop 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop					Calibrated	
WOODROW WILSON BRIDGE	9340	9161	2%	Yes	1.8611	Yes
BETWEEN MD 210 AND I-295	7585	7450	2%	Yes	1.55703	Yes
BETWEEN MD 414 AND MD 210	7350	7201	2%	Yes	1.74685	Yes
BETWEEN MD 5 AND MD 414	6695	6600	1%	Yes	1.16518	Yes
BETWEEN MD 218 AND MD 5	6455	6558	-2%	Yes	1.27692	Yes
BETWEEN FORESTVILLE AND MD 218	6050	6210	-3%	Yes	2.04357	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7010	7331	-5%	Yes	3.7908	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7325	7681	-5%	Yes	4.10991	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7325	7491	-2%	Yes	1.92867	Yes
BETWEEN ARENA DR AND MD 214	6765	7060	-4%	Yes	3.54817	Yes
BETWEEN MD 202 AND ARENA DR	6795	7096	-4%	Yes	3.61173	Yes
BETWEEN US 50 AND MD 202	6845	7106	-4%	Yes	3.12502	Yes
BETWEEN MD 450 AND US 50	6760	6720	1%	Yes	0.48723	Yes
BETWEEN MD 295 AND MD 450	6205	6143	1%	Yes	0.78906	Yes
BETWEEN MD 201 AND MD 295	7070	6756	4%	Yes	3.77656	Yes
BETWEEN GREENBELT STATION AND MD 201	7450	7164	4%	Yes	3.34577	Yes
BETWEEN GREENBELT STATION AND US 1	7985	7661	4%	Yes	3.66318	Yes
BETWEEN US 1 AND I-95	8835	8499	4%	Yes	3.60915	Yes
BETWEEN MD 650 AND I-95	8165	7713	6%	Yes	5.07289	No
BETWEEN MD 193 AND MD 650	7765	7357	5%	Yes	4.69214	Yes
BETWEEN MD US 29 AND MD 193	7245	6879	5%	Yes	4.35529	Yes
BETWEEN MD 97 AND US 29	7980	7627	4%	Yes	3.99604	Yes
BETWEEN MD 185 AND MD 97	7960	7658	4%	Yes	3.41751	Yes
BETWEEN MD 355 AND MD 185	7960	7590	5%	Yes	4.19616	Yes
BETWEEN I-270 EAST AND MD 187	4015	3808	5%	Yes	3.30978	Yes
BETWEEN I-270 WEST AND MD 187	4165	3898	6%	Yes	4.20512	Yes
BETWEEN MD 190 AND I-270	7625	6900	10%	Yes	8.50736	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7150	6469	10%	Yes	8.25258	No
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8315	7742	7%	Yes	6.39495	No

Figure C.9: I-270 Southbound 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB					Calibration not met	
BETWEEN MD 85 AND MD 80	3290	3320	-1%	Yes	0.52184	Yes
BETWEEN MD 80 AND MD 109	3730	3549	5%	Yes	3.00025	Yes
BETWEEN MD 109 AND MD 121	4220	3969	6%	Yes	3.92259	Yes
BETWEEN MD 121 AND MD 27	5000	4747	5%	Yes	3.6241	Yes
BETWEEN MD 27 AND MD 118	4995	5144	-3%	Yes	2.09268	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	5455	5742	-5%	Yes	3.83571	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	7180	7525	-5%	Yes	4.02348	Yes
BETWEEN MD 124 AND MD 117	7565	8025	-6%	Yes	5.21014	No
BETWEEN MD 117 AND I-370	9300	9867	-6%	Yes	5.7919	No
BETWEEN I-370 AND SHADY GROVE RD	9715	9787	-1%	Yes	0.72913	Yes
BETWEEN SHADY GROVE RD AND MD 28	9225	9354	-1%	Yes	1.33842	Yes
BETWEEN MD 28 AND MD 189	9990	9752	2%	Yes	2.3955	Yes
BETWEEN MD 189 AND MONTROSE RD	10135	9713	4%	Yes	4.23613	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	10825	10203	6%	Yes	6.06606	No
BETWEEN I-270 SPLIT AND MD 187	5160	4796	7%	Yes	5.1591	No
BETWEEN MD 187 AND I-495	4485	4022	10%	No	7.09917	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5665	5368	5%	Yes	3.99875	Yes
BETWEEN DEMOCRACY BLVD AND I-495	5575	5386	3%	Yes	2.55301	Yes

Figure C.10: I-270 Southbound 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB					Calibration not met	
BETWEEN MD 85 AND MD 80	3085	3096	0%	Yes	0.19787	Yes
BETWEEN MD 80 AND MD 109	3375	3526	-4%	Yes	2.57061	Yes
BETWEEN MD 109 AND MD 121	3790	3958	-4%	Yes	2.69917	Yes
BETWEEN MD 121 AND MD 27	4460	4659	-4%	Yes	2.9471	Yes
BETWEEN MD 27 AND MD 118	4555	4833	-6%	Yes	4.05764	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	5135	5606	-9%	Yes	6.42708	No
BETWEEN MIDDLEBROOK ROAD AND MD 124	6740	7274	-8%	Yes	6.37933	No
BETWEEN MD 124 AND MD 117	7255	7695	-6%	Yes	5.08917	No
BETWEEN MD 117 AND I-370	8965	9395	-5%	Yes	4.48794	Yes
BETWEEN I-370 AND SHADY GROVE RD	8905	8862	0%	Yes	0.45622	Yes
BETWEEN SHADY GROVE RD AND MD 28	8310	8239	1%	Yes	0.78053	Yes
BETWEEN MD 28 AND MD 189	9065	8695	4%	Yes	3.92641	Yes
BETWEEN MD 189 AND MONTROSE RD	9295	9072	2%	Yes	2.32702	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	10005	9818	2%	Yes	1.87833	Yes
BETWEEN I-270 SPLIT AND MD 187	4735	4719	0%	Yes	0.23272	Yes
BETWEEN MD 187 AND I-495	3975	3747	6%	Yes	3.66931	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5270	5344	-1%	Yes	1.0158	Yes
BETWEEN DEMOCRACY BLVD AND I-495	5060	5436	-7%	Yes	5.19028	No

Figure C.11: I-270 Southbound 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB					Calibrated	
BETWEEN MD 85 AND MD 80	2360	2352	0%	Yes	0.16482	Yes
BETWEEN MD 80 AND MD 109	2215	2143	3%	Yes	1.54242	Yes
BETWEEN MD 109 AND MD 121	2315	2217	4%	Yes	2.05871	Yes
BETWEEN MD 121 AND MD 27	2700	2613	3%	Yes	1.68797	Yes
BETWEEN MD 27 AND MD 118	3120	3038	3%	Yes	1.47778	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3700	3631	2%	Yes	1.13968	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	4595	4492	2%	Yes	1.52807	Yes
BETWEEN MD 124 AND MD 117	4930	4903	1%	Yes	0.38507	Yes
BETWEEN MD 117 AND I-370	6565	6512	1%	Yes	0.65545	Yes
BETWEEN I-370 AND SHADY GROVE RD	5865	5806	1%	Yes	0.77235	Yes
BETWEEN SHADY GROVE RD AND MD 28	6565	6798	-4%	Yes	2.85049	Yes
BETWEEN MD 28 AND MD 189	7330	7513	-2%	Yes	2.12425	Yes
BETWEEN MD 189 AND MONTROSE RD	7110	7257	-2%	Yes	1.7344	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	7310	7215	1%	Yes	1.11476	Yes
BETWEEN I-270 SPLIT AND MD 187	3450	3587	-4%	Yes	2.30963	Yes
BETWEEN MD 187 AND I-495	3665	3671	0%	Yes	0.09907	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	3860	3565	8%	Yes	4.8416	Yes
BETWEEN DEMOCRACY BLVD AND I-495	3595	3427	5%	Yes	2.83527	Yes

Figure C.12: I-270 Southbound 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB					Calibrated	
BETWEEN MD 85 AND MD 80	2730	2725	0%	Yes	0.09574	Yes
BETWEEN MD 80 AND MD 109	2535	2500	1%	Yes	0.69756	Yes
BETWEEN MD 109 AND MD 121	2650	2599	2%	Yes	0.99551	Yes
BETWEEN MD 121 AND MD 27	3130	3066	2%	Yes	1.14984	Yes
BETWEEN MD 27 AND MD 118	3300	3252	1%	Yes	0.83863	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3905	3852	1%	Yes	0.85103	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	5020	4954	1%	Yes	0.9346	Yes
BETWEEN MD 124 AND MD 117	5350	5352	0%	Yes	0.02734	Yes
BETWEEN MD 117 AND I-370	7050	7048	0%	Yes	0.02382	Yes
BETWEEN I-370 AND SHADY GROVE RD	6320	6307	0%	Yes	0.16361	Yes
BETWEEN SHADY GROVE RD AND MD 28	7305	7557	-3%	Yes	2.92332	Yes
BETWEEN MD 28 AND MD 189	8120	8357	-3%	Yes	2.6111	Yes
BETWEEN MD 189 AND MONTROSE RD	7720	7933	-3%	Yes	2.40766	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	7535	7487	1%	Yes	0.55385	Yes
BETWEEN I-270 SPLIT AND MD 187	3475	3567	-3%	Yes	1.55044	Yes
BETWEEN MD 187 AND I-495	3625	3533	3%	Yes	1.53783	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4060	3888	4%	Yes	2.72844	Yes
BETWEEN DEMOCRACY BLVD AND I-495	3460	3283	5%	Yes	3.04833	Yes

Figure C.13: I-270 Northbound 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4085	3486	15%	No	9.73566	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	3510	2983	15%	No	9.24917	No
BETWEEN MD 187 AND I-495	3340	3389	-1%	Yes	0.84476	Yes
BETWEEN I-270 SPLIT AND MD 187	2600	2530	3%	Yes	1.38215	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	6110	5588	9%	Yes	6.82542	No
BETWEEN MD 189 AND MONTROSE RD	5625	5069	10%	Yes	7.60361	No
BETWEEN MD 28 AND MD 189	5610	5027	10%	No	7.99418	No
BETWEEN SHADY GROVE RD AND MD 28	4775	4192	12%	No	8.70683	No
BETWEEN I-370 AND SHADY GROVE RD	3890	3535	9%	Yes	5.82633	No
BETWEEN MD 117 AND I-370	4580	4160	9%	Yes	6.35343	No
BETWEEN MD 124 AND MD 117	3680	3843	-4%	Yes	2.65771	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	3665	3598	2%	Yes	1.11181	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	2975	2927	2%	Yes	0.8836	Yes
BETWEEN MD 27 AND MD 118	2665	2639	1%	Yes	0.50488	Yes
BETWEEN MD 121 AND MD 27	2390	2343	2%	Yes	0.96615	Yes
BETWEEN MD 109 AND MD 121	2215	2157	3%	Yes	1.24052	Yes
BETWEEN MD 80 AND MD 109	2155	2068	4%	Yes	1.89332	Yes
BETWEEN MD 85 AND MD 80	2540	2384	6%	Yes	3.14399	Yes

Figure C.14: I-270 Northbound 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4900	4399	10%	No	7.34742	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4360	3804	13%	No	8.70238	No
BETWEEN MD 187 AND I-495	4440	4640	-5%	Yes	2.96826	Yes
BETWEEN I-270 SPLIT AND MD 187	3935	3973	-1%	Yes	0.60432	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	8295	7874	5%	Yes	4.68226	Yes
BETWEEN MD 189 AND MONTROSE RD	7895	7309	7%	Yes	6.721	No
BETWEEN MD 28 AND MD 189	7825	7171	8%	Yes	7.55275	No
BETWEEN SHADY GROVE RD AND MD 28	6460	5815	10%	Yes	8.23311	No
BETWEEN I-370 AND SHADY GROVE RD	5110	4761	7%	Yes	4.96775	Yes
BETWEEN MD 117 AND I-370	5895	5189	12%	No	9.48356	No
BETWEEN MD 124 AND MD 117	4485	4675	-4%	Yes	2.80751	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	4315	4199	3%	Yes	1.7779	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3450	3355	3%	Yes	1.62864	Yes
BETWEEN MD 27 AND MD 118	2855	2772	3%	Yes	1.56478	Yes
BETWEEN MD 121 AND MD 27	2505	2434	3%	Yes	1.42874	Yes
BETWEEN MD 109 AND MD 121	2365	2312	2%	Yes	1.09599	Yes
BETWEEN MD 80 AND MD 109	2320	2267	2%	Yes	1.10669	Yes
BETWEEN MD 85 AND MD 80	2665	2609	2%	Yes	1.09052	Yes

Figure C.15: I-270 Northbound 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	5135	4802	6%	Yes	4.72424	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	6295	5305	16%	No	12.9993	No
BETWEEN MD 187 AND I-495	4300	4227	2%	Yes	1.11799	Yes
BETWEEN I-270 SPLIT AND MD 187	5130	4901	4%	Yes	3.23354	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	11425	10770	6%	Yes	6.21769	No
BETWEEN MD 189 AND MONTROSE RD	11740	11161	5%	Yes	5.41086	No
BETWEEN MD 28 AND MD 189	11980	11418	5%	Yes	5.19591	No
BETWEEN SHADY GROVE RD AND MD 28	10985	10760	2%	Yes	2.15783	Yes
BETWEEN I-370 AND SHADY GROVE RD	10995	10469	5%	Yes	5.07745	No
BETWEEN MD 117 AND I-370	10715	10308	4%	Yes	3.96974	Yes
BETWEEN MD 124 AND MD 117	9170	8796	4%	Yes	3.94603	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	8250	8031	3%	Yes	2.42727	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	6945	6736	3%	Yes	2.52698	Yes
BETWEEN MD 27 AND MD 118	6365	6257	2%	Yes	1.35949	Yes
BETWEEN MD 121 AND MD 27	5200	4947	5%	Yes	3.55195	Yes
BETWEEN MD 109 AND MD 121	4630	4263	8%	Yes	5.50373	No
BETWEEN MD 80 AND MD 109	4555	4192	8%	Yes	5.48899	No
BETWEEN MD 85 AND MD 80	4625	4230	9%	Yes	5.93633	No

Figure C.16: I-270 Northbound 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4940	4690	5%	Yes	3.60281	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	6290	5199	17%	No	14.3946	No
BETWEEN MD 187 AND I-495	4350	4107	6%	Yes	3.73691	Yes
BETWEEN I-270 SPLIT AND MD 187	5150	4911	5%	Yes	3.36971	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	11440	10862	5%	Yes	5.47357	No
BETWEEN MD 189 AND MONTROSE RD	11655	11151	4%	Yes	4.71977	Yes
BETWEEN MD 28 AND MD 189	11615	11158	4%	Yes	4.28273	Yes
BETWEEN SHADY GROVE RD AND MD 28	10465	10461	0%	Yes	0.0391	Yes
BETWEEN I-370 AND SHADY GROVE RD	10445	10112	3%	Yes	3.28458	Yes
BETWEEN MD 117 AND I-370	10610	10028	5%	Yes	5.72933	No
BETWEEN MD 124 AND MD 117	9240	8648	6%	Yes	6.25973	No
BETWEEN MIDDLEBROOK ROAD AND MD 124	8340	7888	5%	Yes	5.01789	No
BETWEEN MD 118 AND MIDDLEBROOK RD	7025	6719	4%	Yes	3.6913	Yes
BETWEEN MD 27 AND MD 118	6475	6205	4%	Yes	3.39093	Yes
BETWEEN MD 121 AND MD 27	5280	4898	7%	Yes	5.35485	No
BETWEEN MD 109 AND MD 121	4645	4320	7%	Yes	4.85426	Yes
BETWEEN MD 80 AND MD 109	4540	4258	6%	Yes	4.25179	Yes
BETWEEN MD 85 AND MD 80	4445	4177	6%	Yes	4.08174	Yes



APPENDIX D

Volume Charts

Figure D.1: I-495 Inner Loop – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

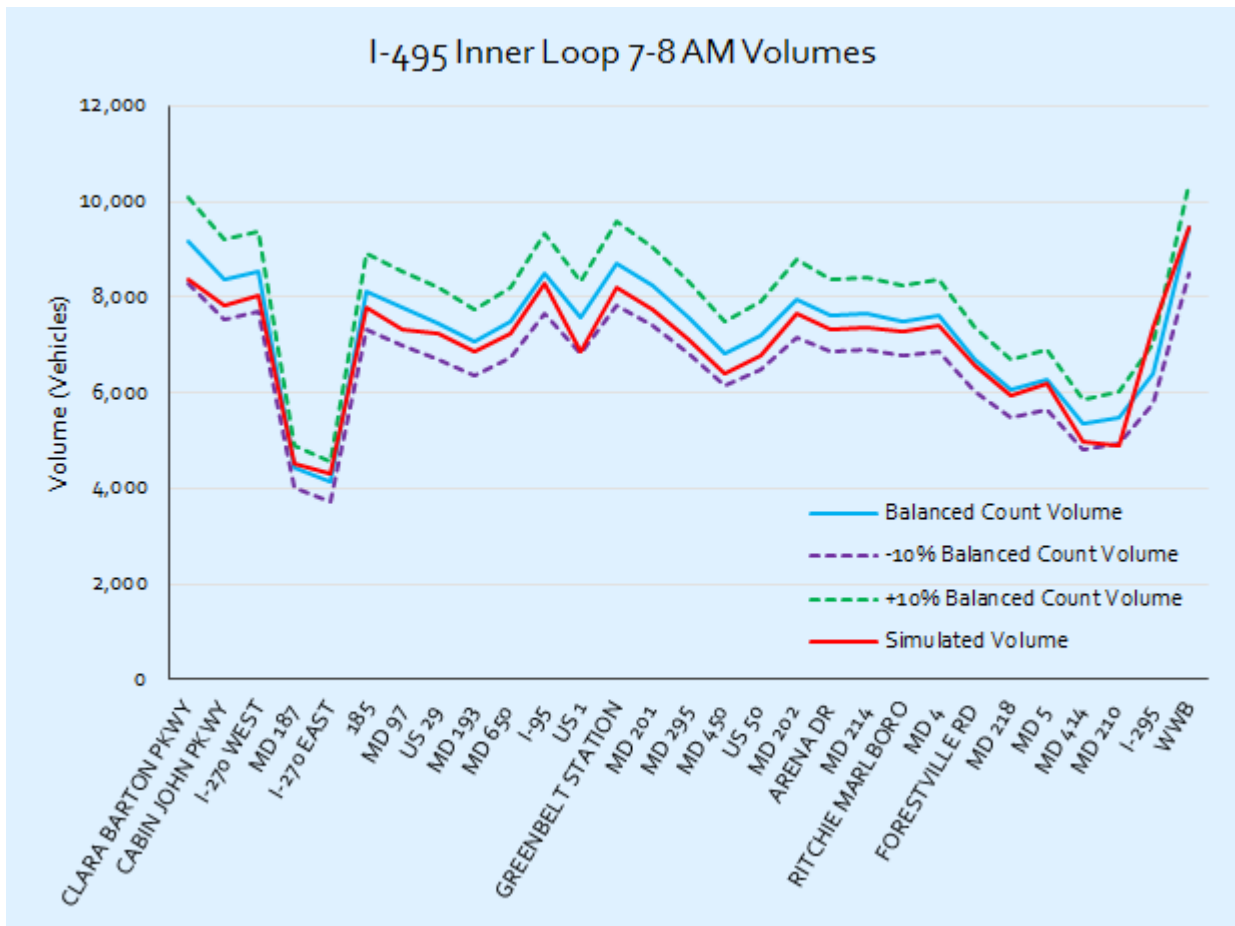


Figure D.2: I-495 Inner Loop – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

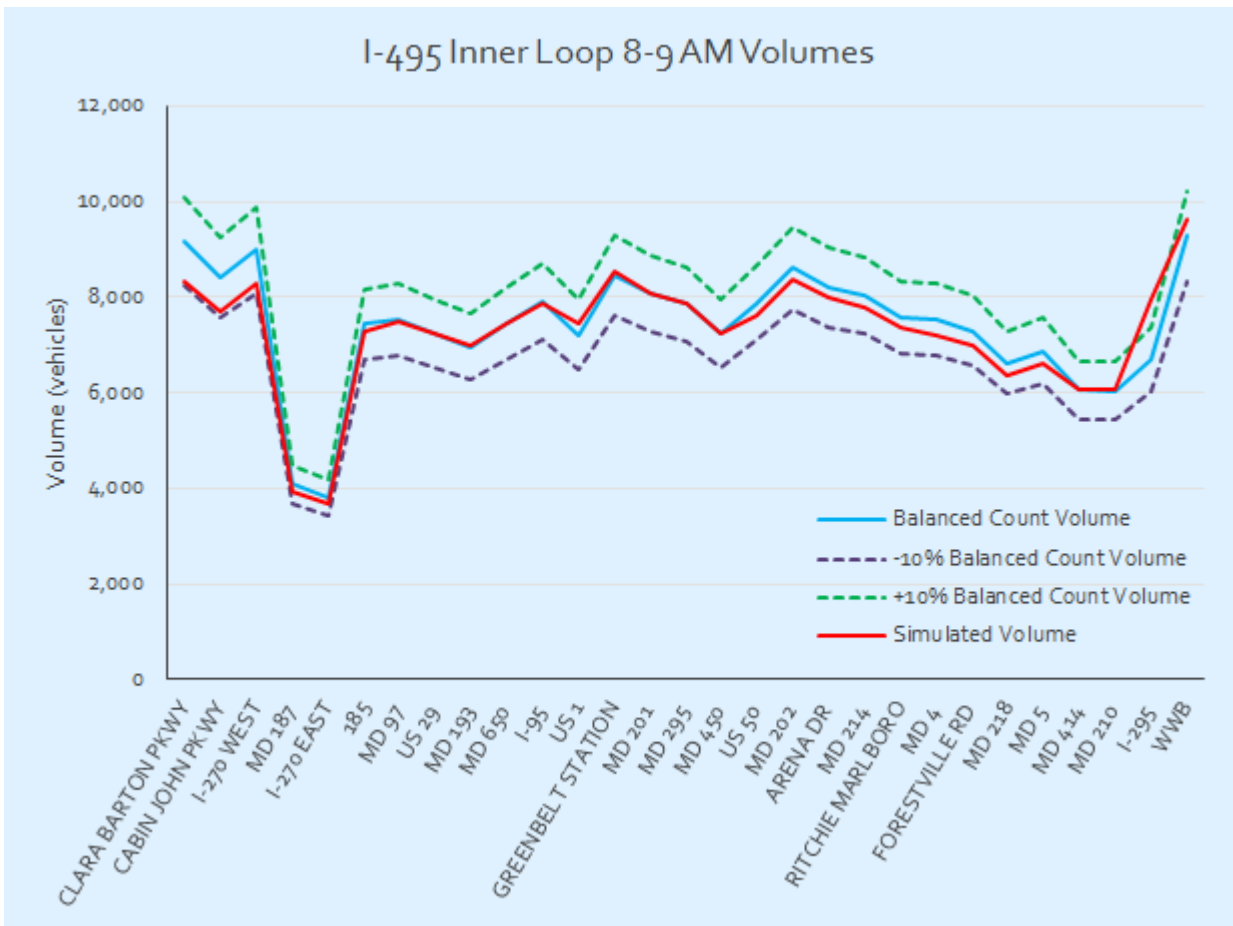


Figure D.3: I-495 Inner Loop – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

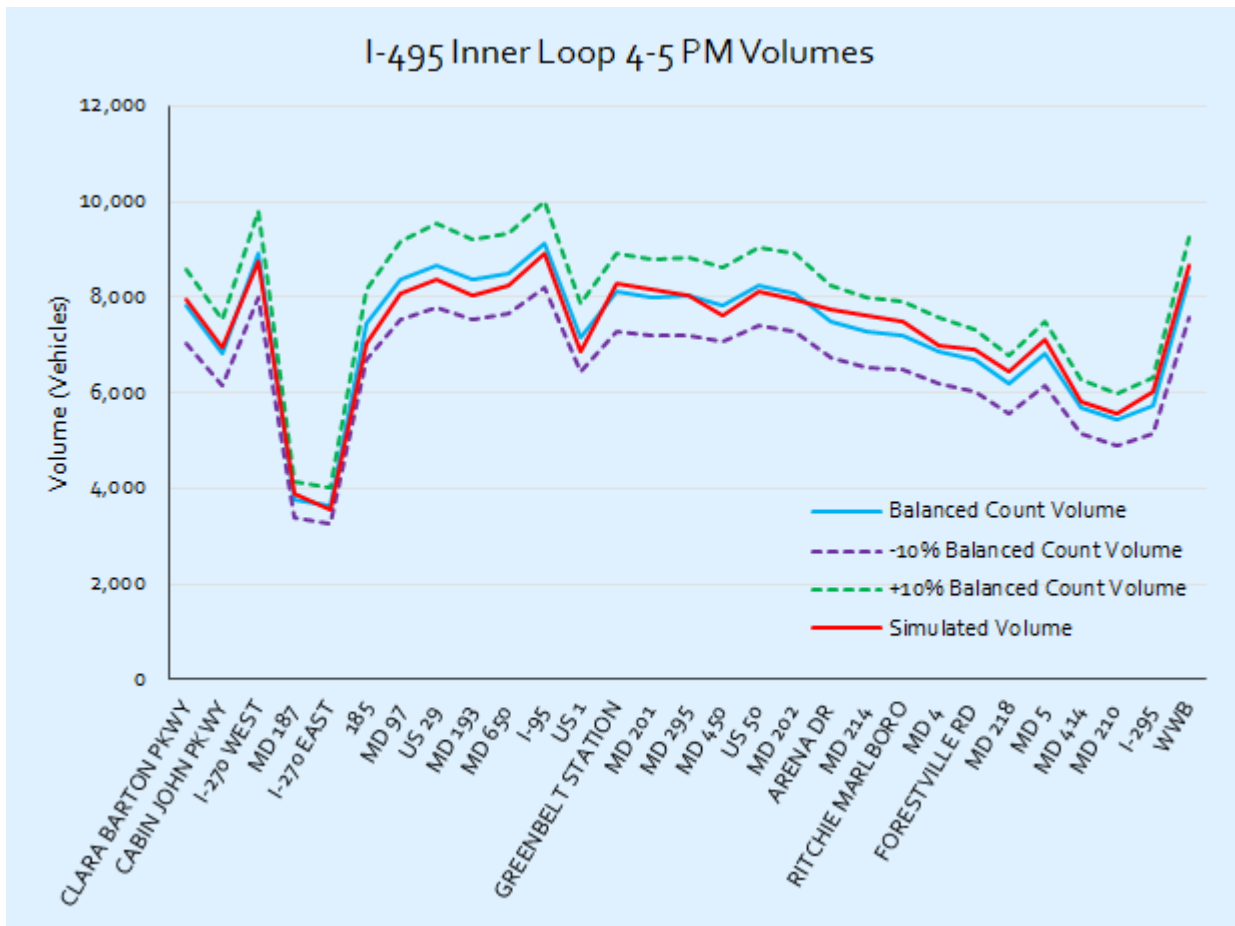


Figure D.4: I-495 Inner Loop – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

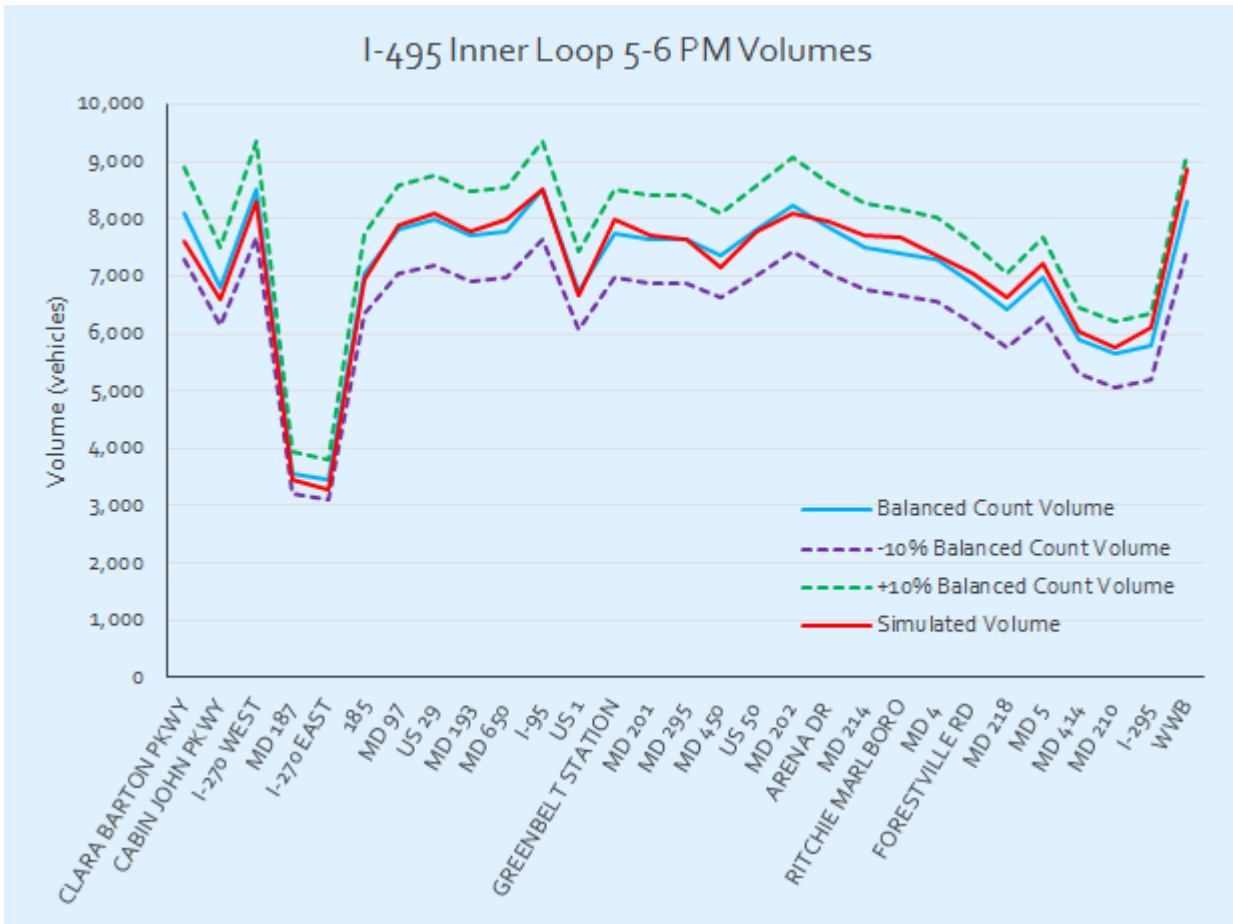


Figure D.5: I-495 Outer Loop – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

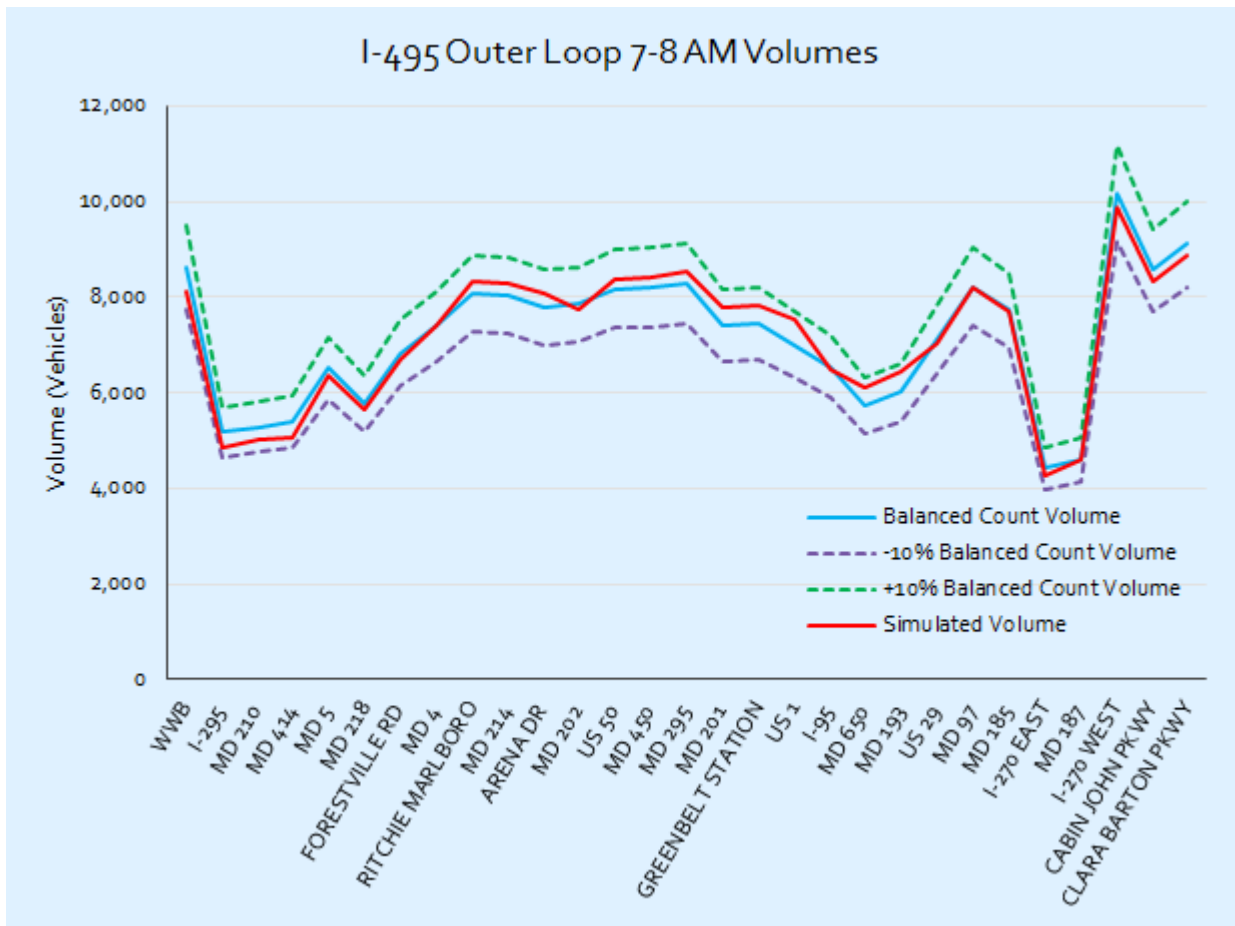


Figure D.6: I-495 Outer Loop – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

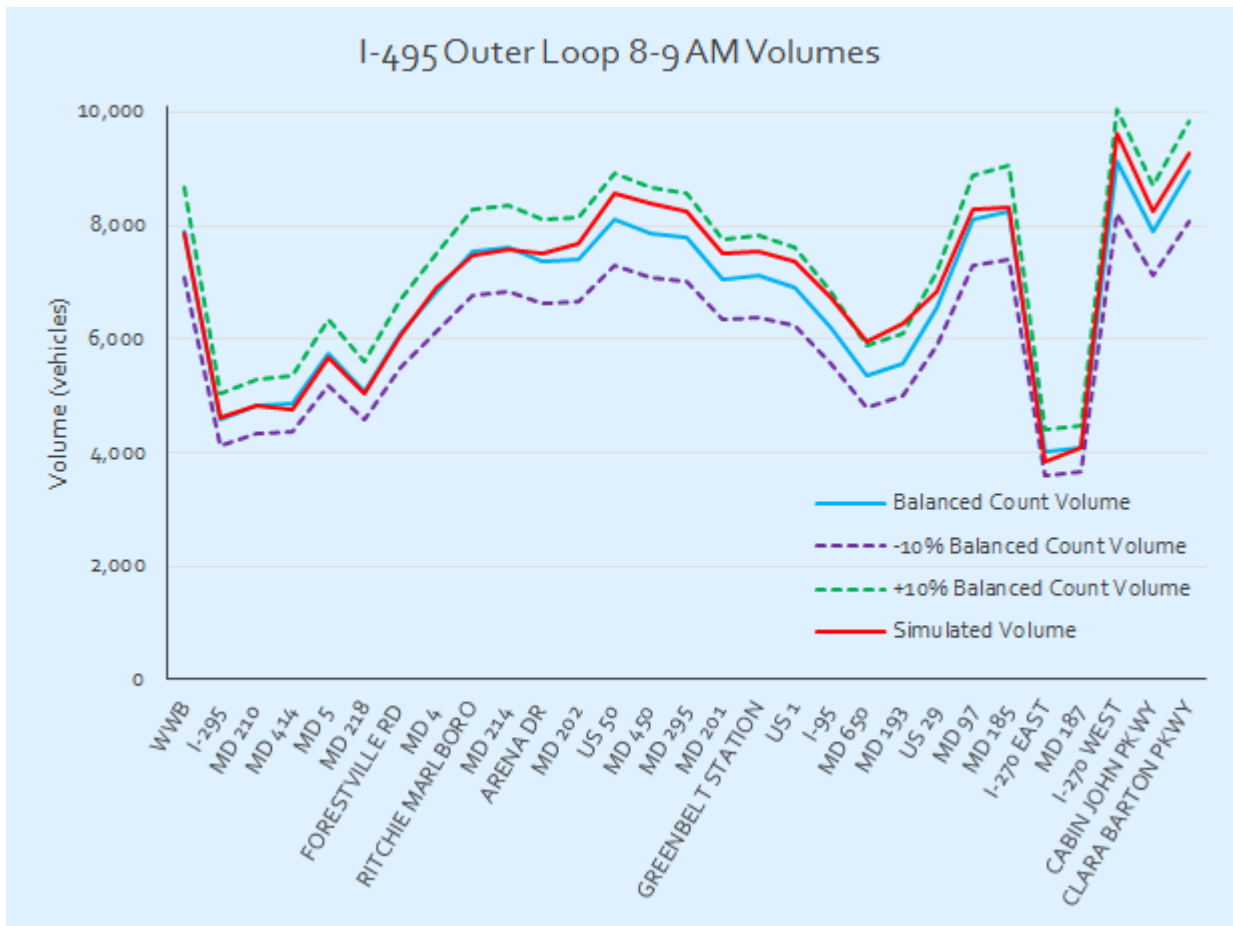


Figure D.7: I-495 Outer Loop – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

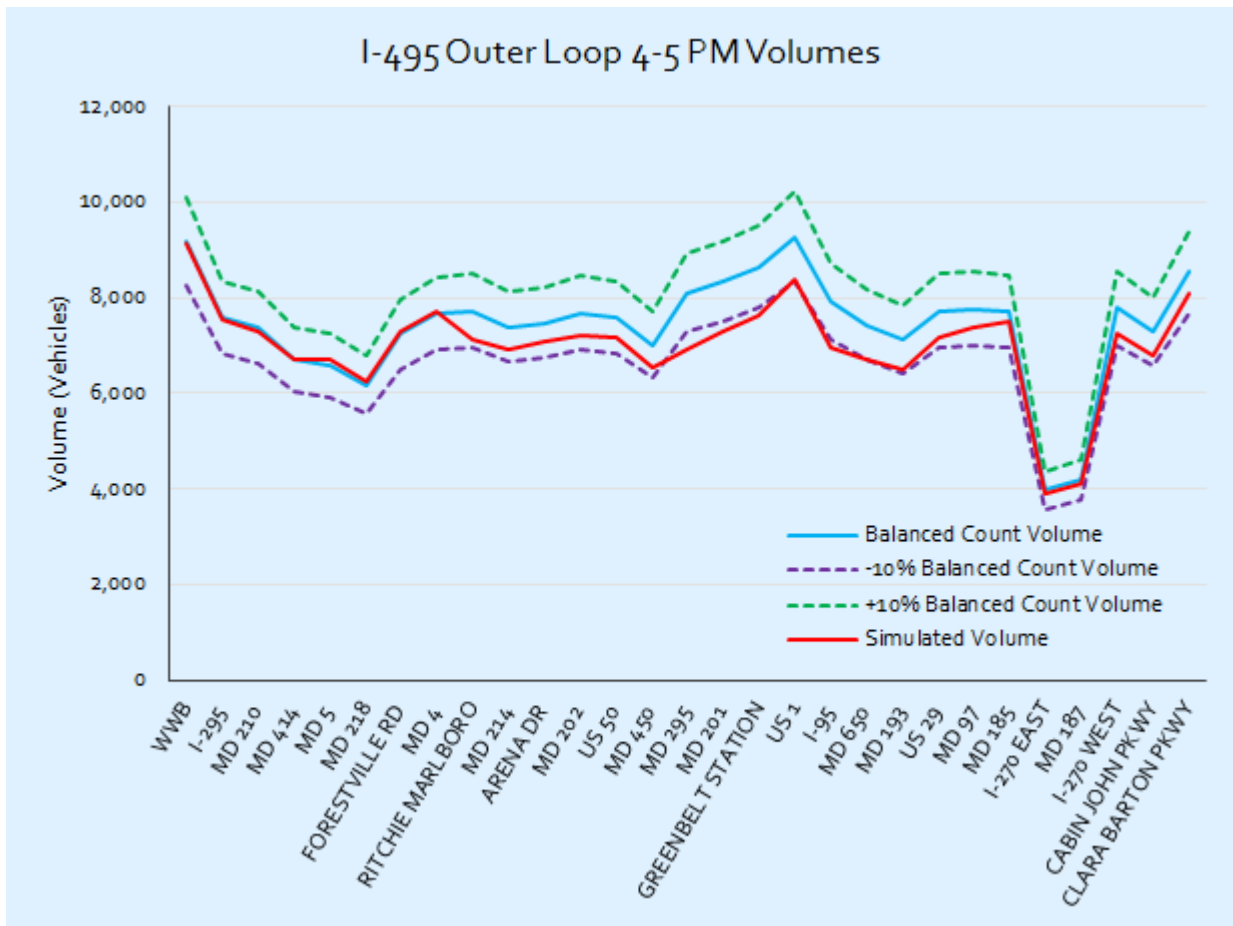


Figure D.8: I-495 Outer Loop – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

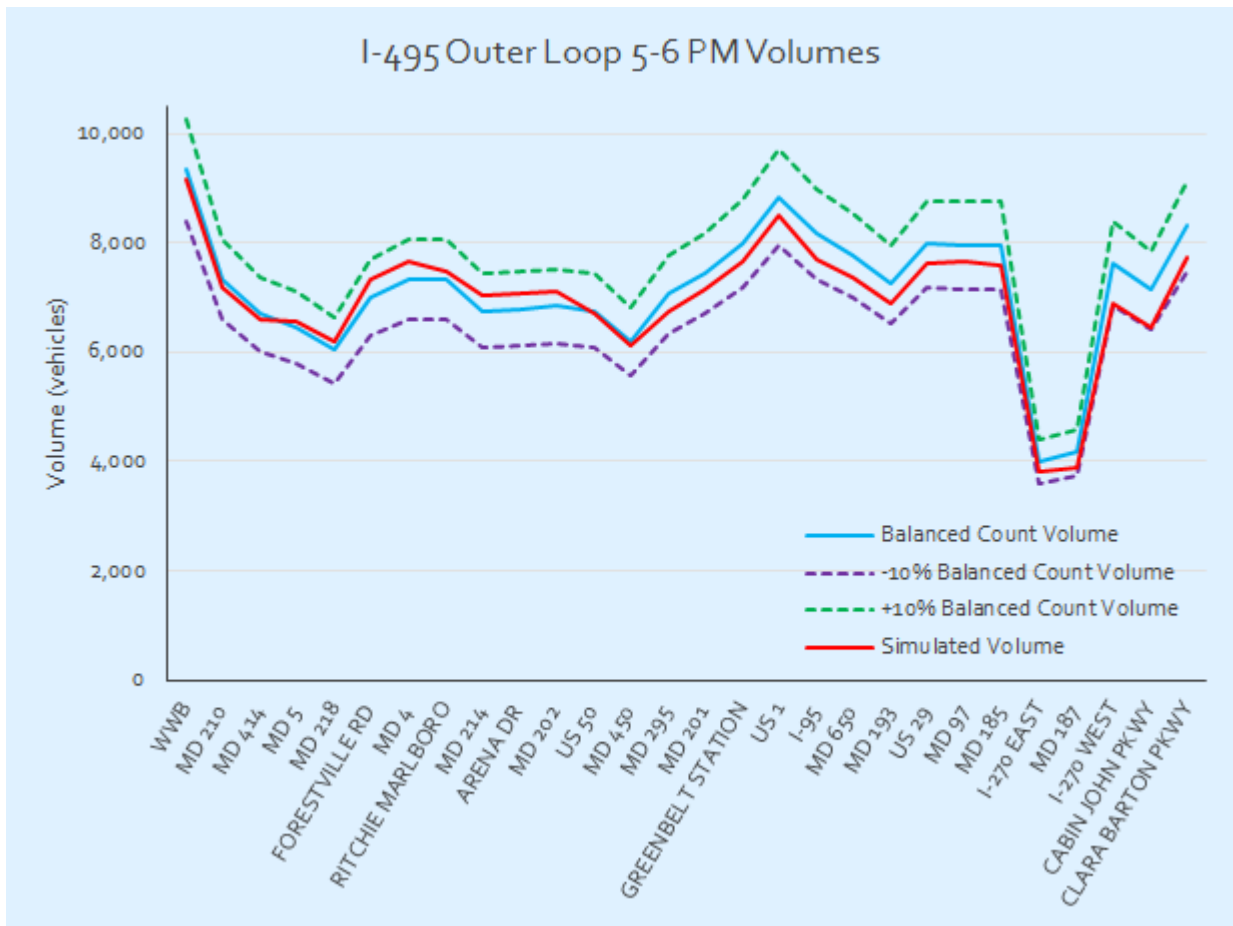


Figure D.9: I-270 Southbound – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

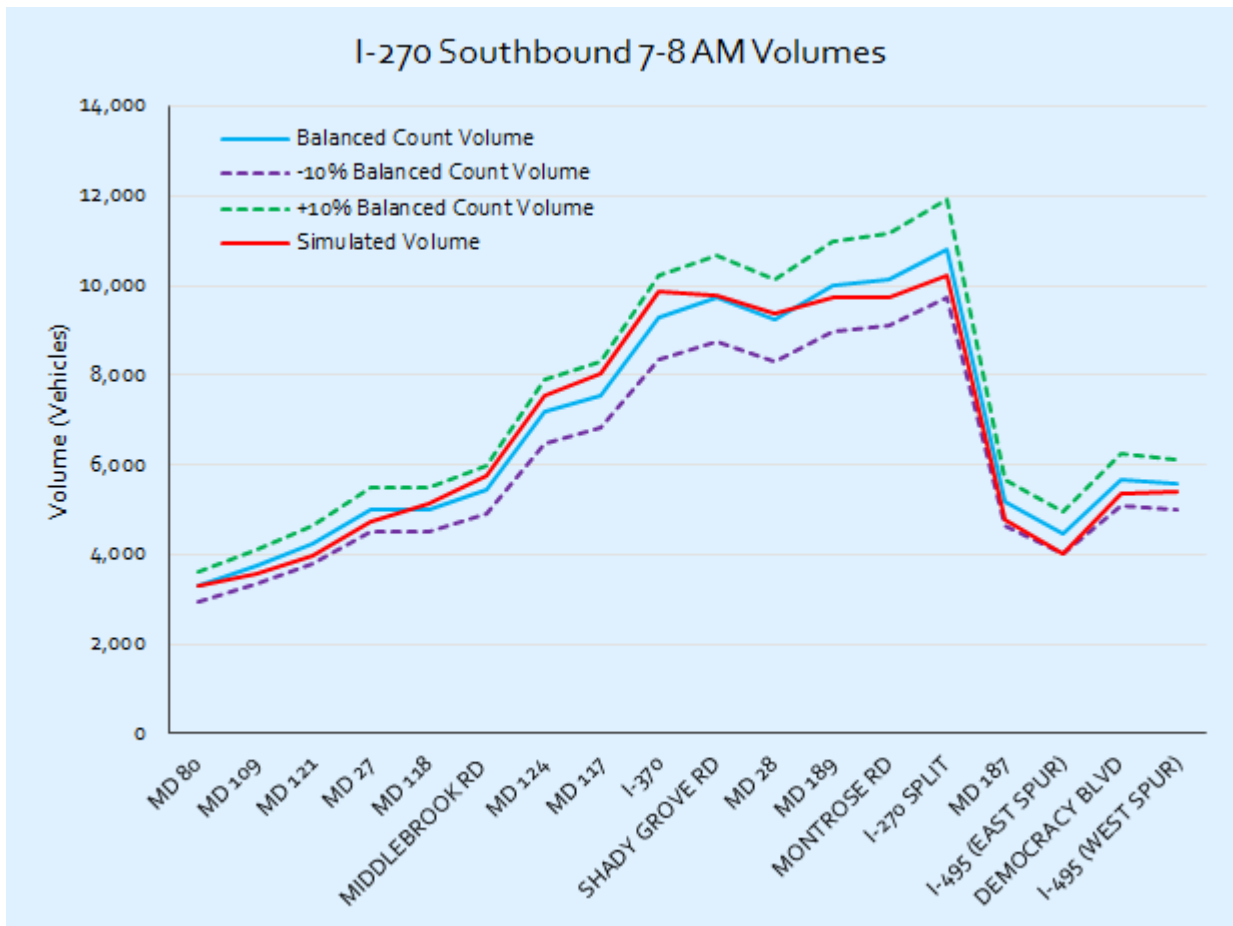


Figure D.10: I-270 Southbound – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

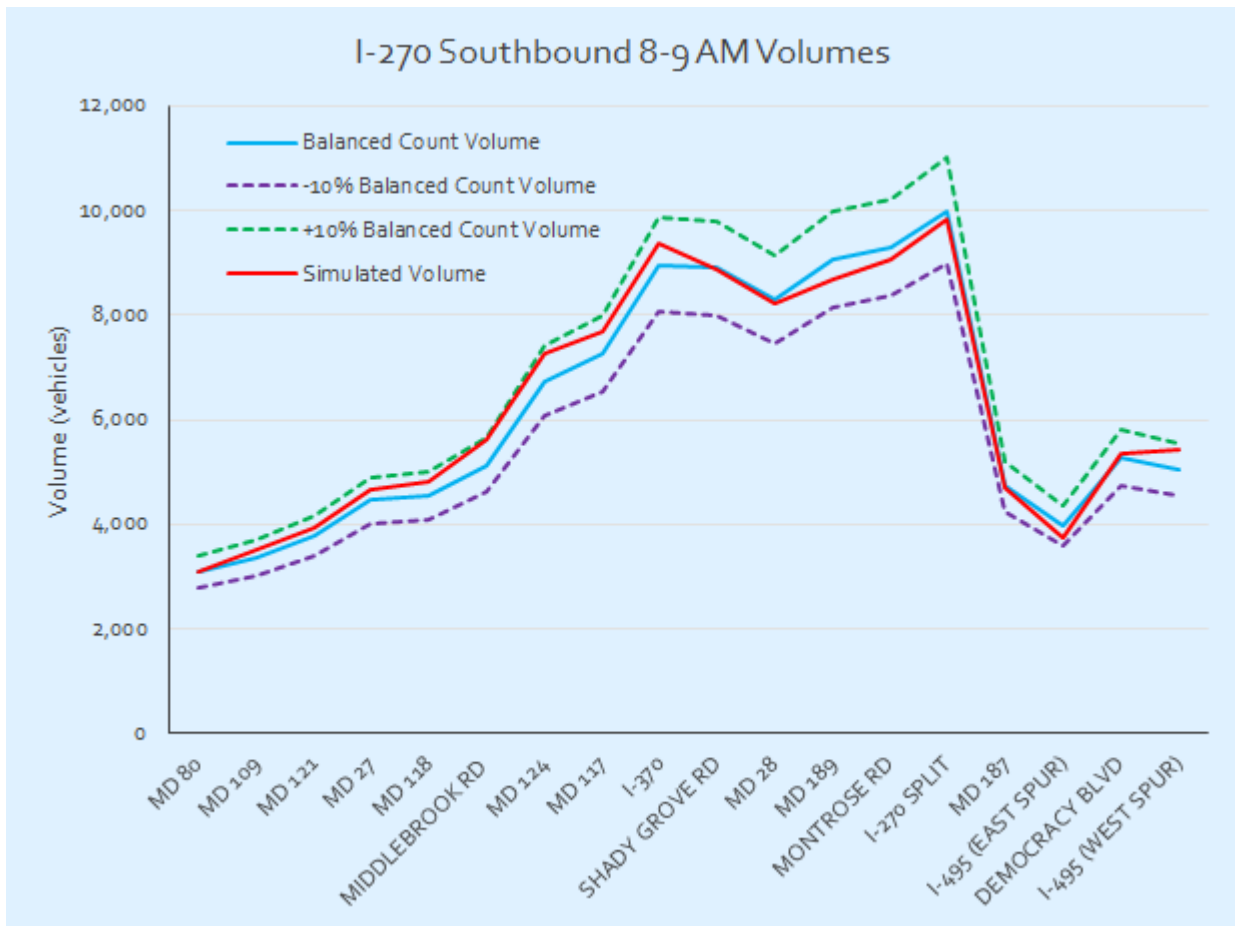


Figure D.11: I-270 Southbound – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

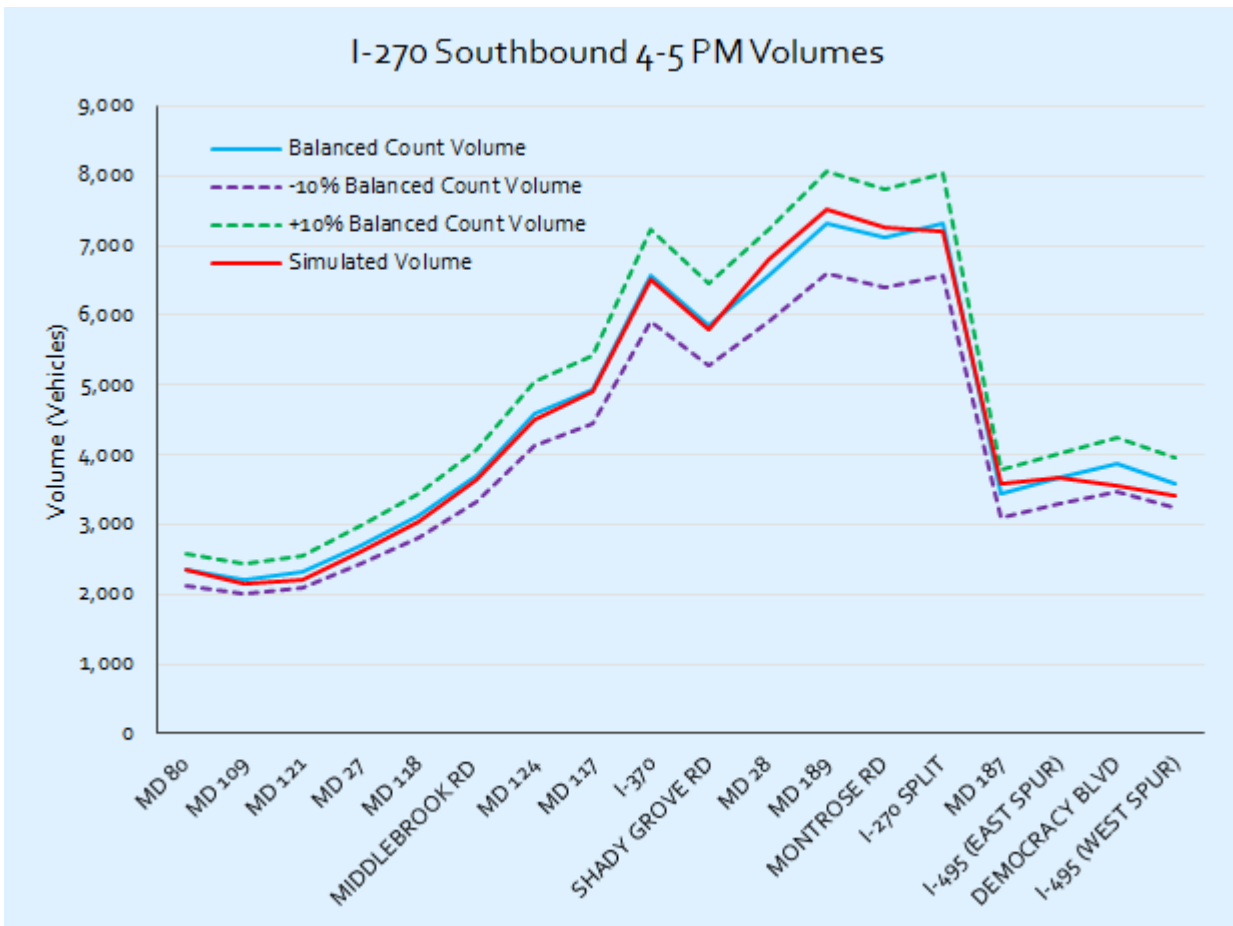


Figure D.12: I-270 Southbound – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

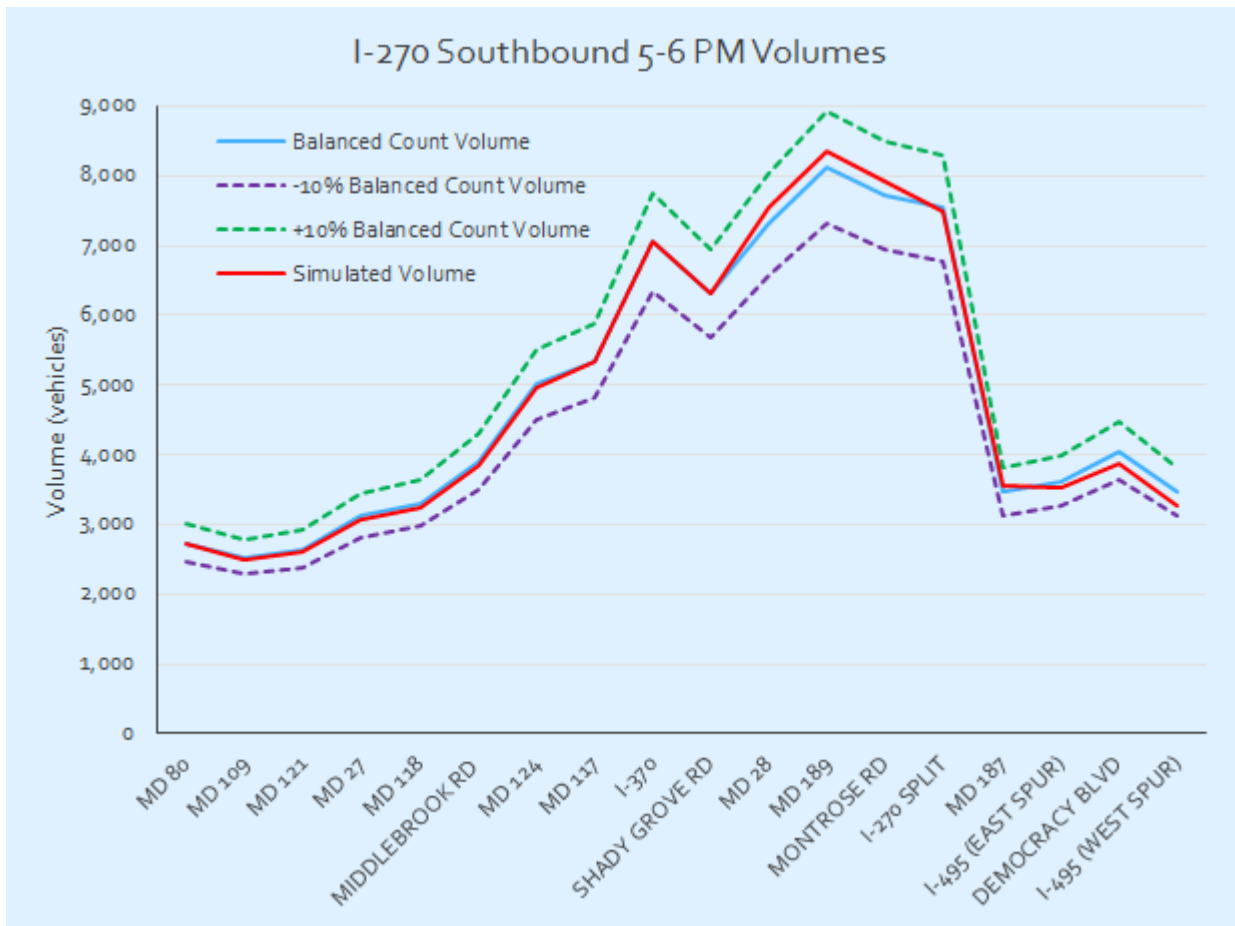


Figure D.13: I-270 Northbound – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

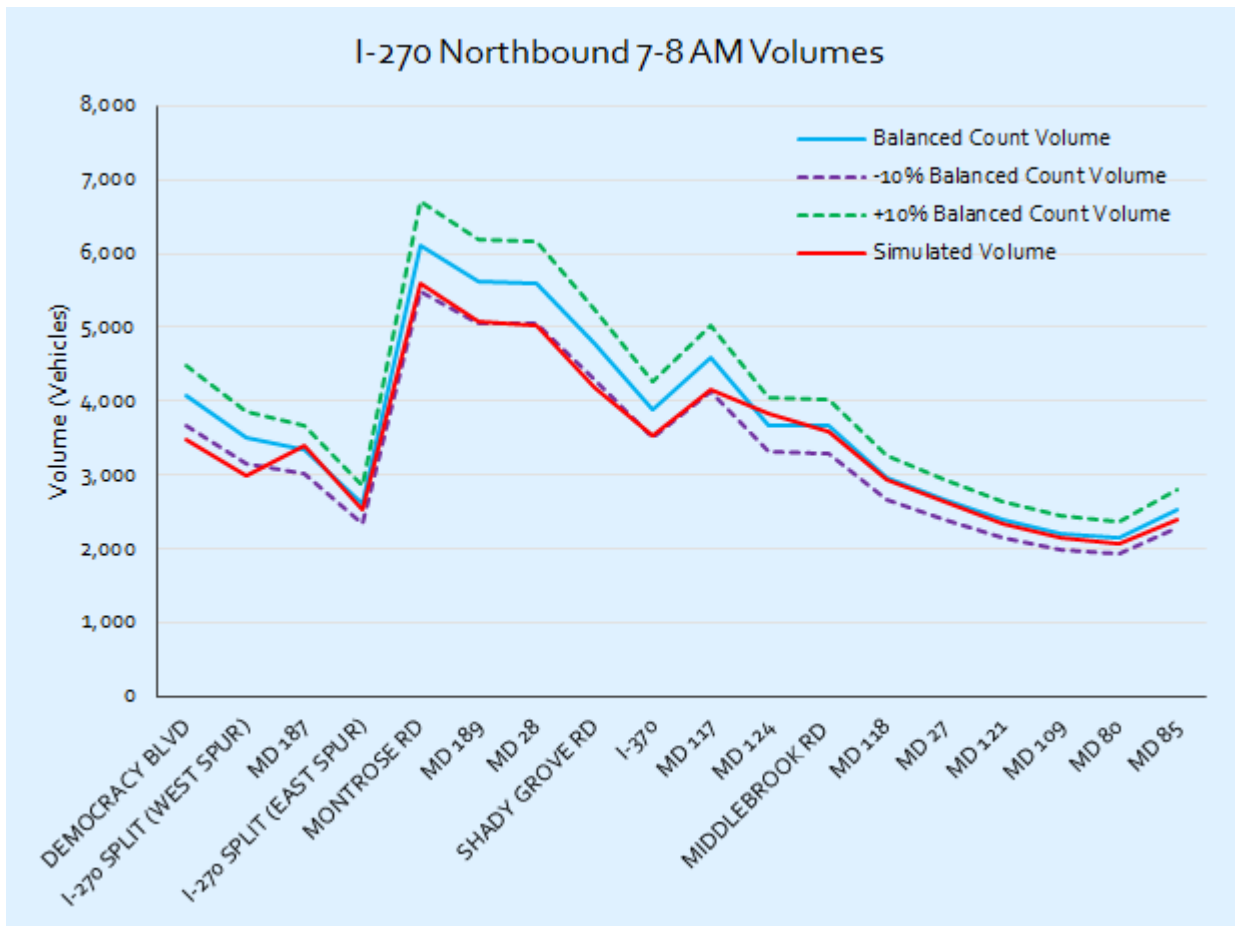


Figure D.14: I-270 Northbound – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

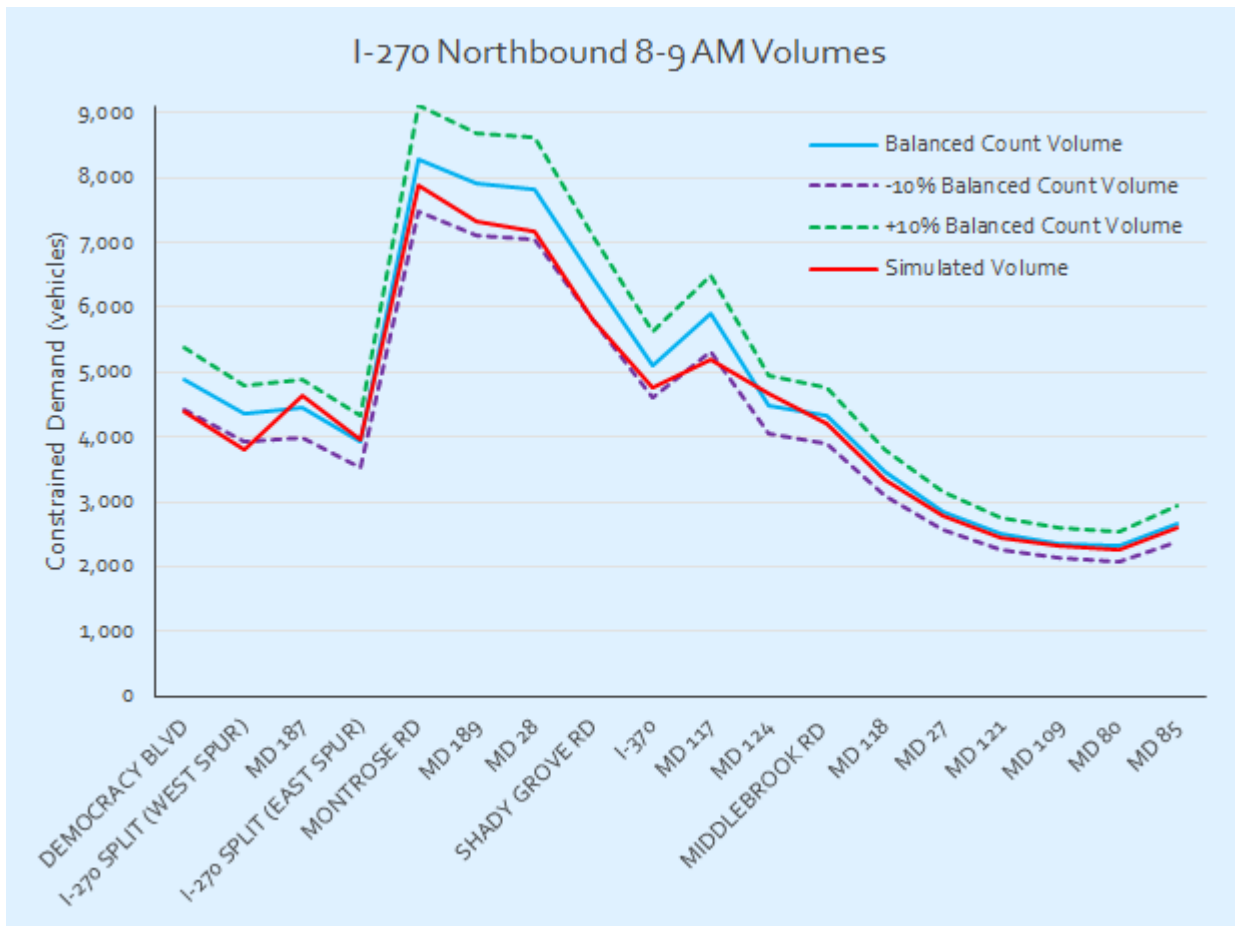


Figure D.15: I-270 Northbound – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

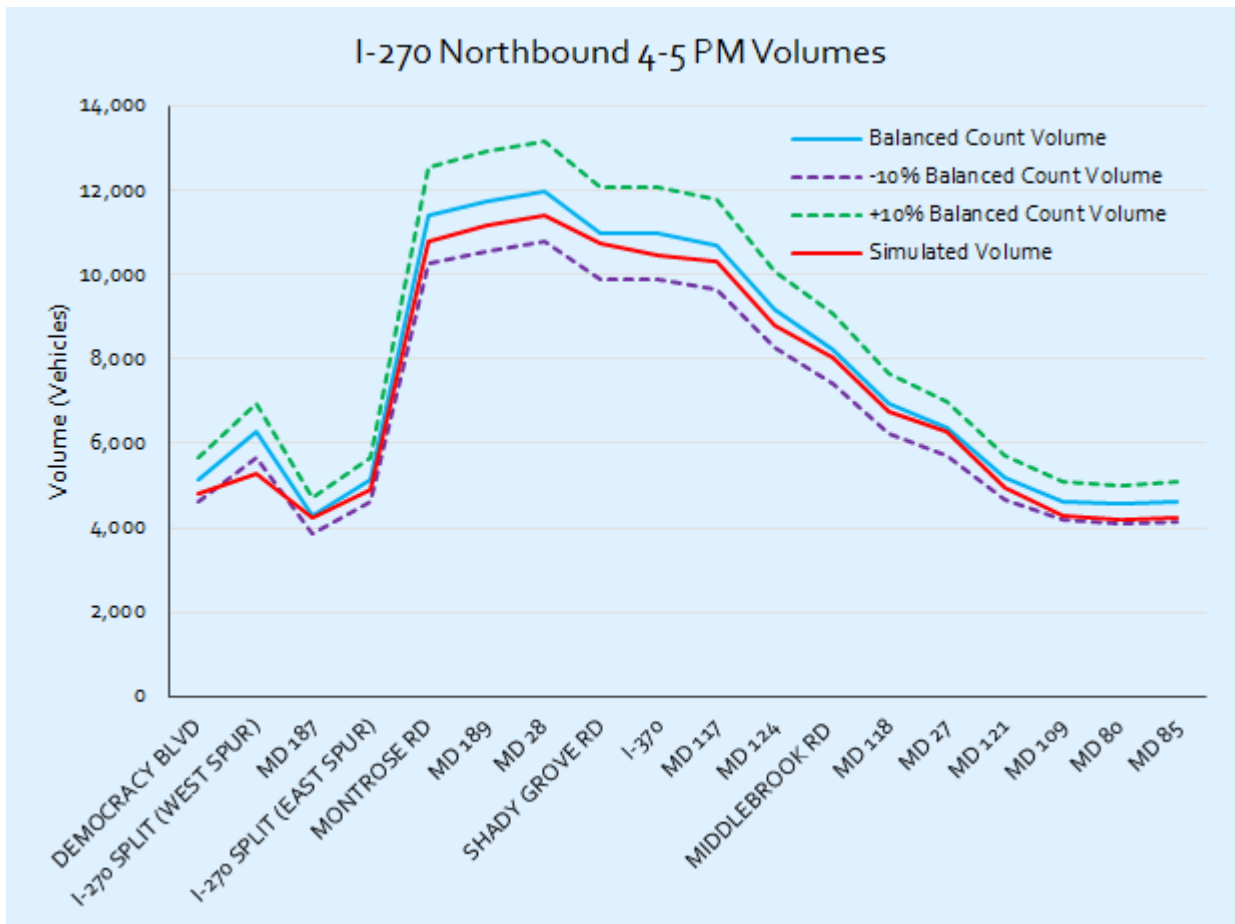


Figure D.16: I-270 Northbound – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

