
# I-95 Corridor Coalition

## I-95 Corridor Coalition Vehicle Probe Project: Validation of INRIX Data

Monthly Report: Virginia

I-95 CORRIDOR COALITION

*June 2015*

# I-95 CORRIDOR COALITION VEHICLE PROBE PROJECT VALIDATION OF INRIX DATA JUNE 2015

## *Monthly Report*

*Prepared for:*

I-95 Corridor Coalition

*Sponsored by:*

I-95 Corridor Coalition

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*June 2015*

# Evaluation Results for the State of Virginia

## *Executive Summary*

The data from the Vehicle Probe Project is validated using Bluetooth™ Traffic Monitoring (BTM) technology on a near monthly basis. The validation of arterial data is similar to that of freeway data, however the following should be noted. The boundaries of the speed bins used for arterials are different than those used for freeways to accommodate the lower speeds on this type of corridor.

BTMs sensor were deployed at the beginning and ending points of eight different segments along the US-1 corridor. There are two lanes per direction with an average signal density of 1.5 signal per mile. Average Annual Daily Traffic (AADT) along the corridor is 21,500 and the speed limit is 45 MPH.

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The Bluetooth sensor deployment covers the range from Joplin Road to Harrison Road along US-1. Travel time data was collected for both directions along the arterial, between January 15 and January 28, 2015. The dataset collected represents approximately 1433 hours of observations along eight arterial segments, totaling approximately 34 miles. The total number of effective five-minute travel time samples observed was 17,191.

ES Table 1, below summarizes the results of the comparison between the BTM reference data and the INRIX data for arterial segments during the above noted time period. As shown, the average absolute speed error (AASE) was within specification in all speed bins when compared with the Standard Error of the Mean (SEM) Band. The Speed Error Bias (SEB) was within specifications for all speed bins except 0-15 MPH when compared with the Standard Error of the Mean (SEM) Band. Although the data are compared to these specifications, caution should be used when using probe data on arterial roadways. Other factors including signal density and traffic volume should be considered.

**ES Table 1 - Virginia Evaluation Summary for Arterial**

| Speed Bin | Absolute Speed Error (<10mph) | | Speed Error Bias (<5mph) | | Number of 5 Minute Samples | Hours of Data Collection |
|---|---|---|---|---|---|---|
| | Comparison with SEM Band | Comparison with Mean | Comparison with SEM Band | Comparison with Mean | | |
| 0-15 MPH | 8.8 | 11.8 | 8.7 | 11.7 | 647 | 54 |
| 15-25 MPH | 3.3 | 7.2 | 2.9 | 5.8 | 3062 | 255 |
| 25-35 MPH | 1.7 | 5.4 | 0.8 | 2.4 | 4075 | 340 |
| >35 MPH | 2.1 | 5.6 | -1.4 | -3.0 | 9407 | 784 |
| All Speeds | 2.5 | 6.1 | 0.3 | 0.4 | 17191 | 1433 |

Based upon data collected from Jan 15th, 2015 through Jan 28th, 2015 across 33.8 miles of roadway.

## *Data Collection*

Travel time samples were collected along eight arterial segments with the assistance of Virginia Department of Transportation (VDOT) personnel. Arterial segments studied were located along the US-1 corridor from Joplin Road to Harrison Road. Travel time data was collected for both directions along the US-1 arterial between January 15 and January 28, 2015. Segment locations were chosen with a high-likelihood of observing recurrent and non-recurrent congestion during peak and off-peak periods.

Figure 1 presents an overview snapshot of the placement of sensors for the collection of data on the US-1 corridor in Virginia. Red segments represent arterial segments selected for analysis. There are two lanes per direction with average signal density of 1.5 signal per mile. Average Annual Daily Traffic (AADT) along the corridor is 21,500 and the speed limit is 45 MPH.

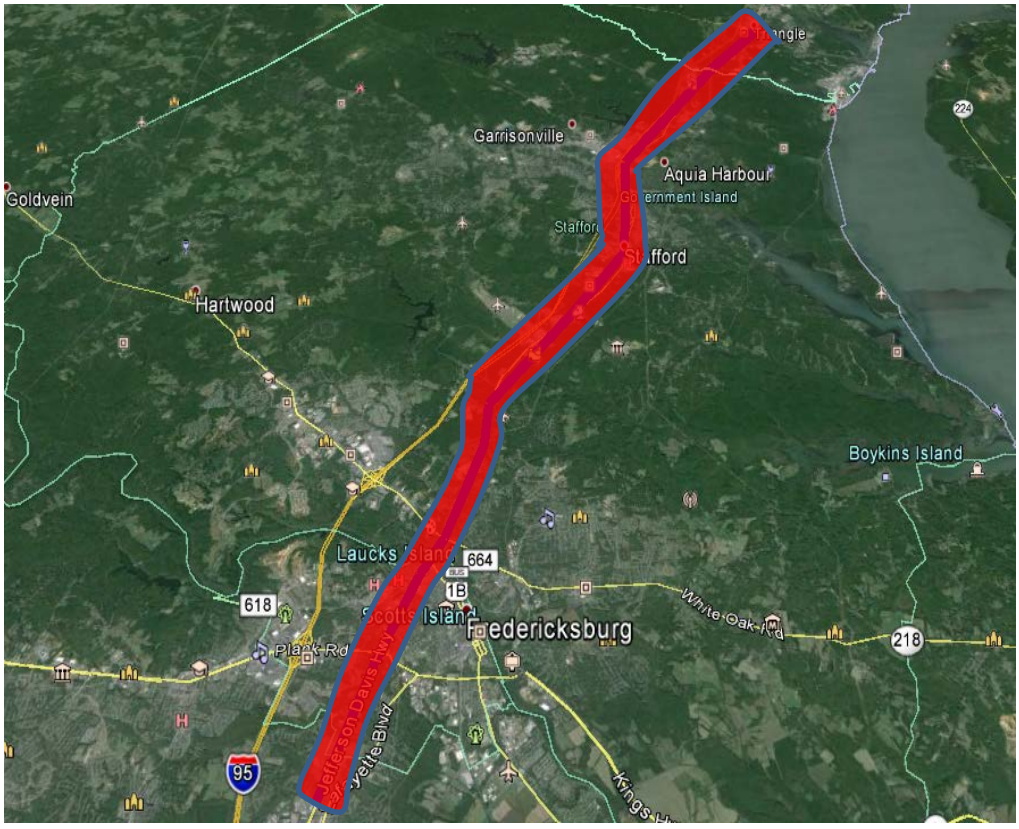


**Figure 1** — Locations of all segments selected for analysis in Virginia

## TMC segments selected for validation in Virginia

Table 1 presents a list of data collection segments from Virginia. In total, these segments cover a total length of approximately 33.8 arterial miles. Data collection segments are comprised of one or more Traffic Message Channel (TMC) base segments, such that the total length of the data collection segment is one mile long or greater for arterials. When appropriate, consecutive TMC segments are combined to form a data collection segment longer than one mile. The results of the validation performed on eight arterial segments are included in this report. Table 1 contains the summary information on each data collection segment. The latitude/longitude coordinates of the locations at which the Bluetooth sensors were deployed along the US-1 in Northern Virginia are provided in Table 1 as well as an active map link to view the data collection segment in detail. Click on the map link to see a detailed map for the respective data collection segment. It should be noted that the configuration of the test segments is often such that the endpoint of one segment coincides with the start point of the next segment, so that one Bluetooth sensor covers both data collection segments.

Table 1 also provides data on the precise length of the TMCs comprising the test segment as compared to the measured length between Bluetooth™ Traffic Monitoring (BTM) sensors placed on the roadway. An algorithm was developed and documented in a separate report[1] as part of the initial VPP project and is being used for the validation of all vendors in VPPII. Details of the algorithm used to estimate equivalent path travel times based on INRIX data feeds for individual data collection segments are provided in this separate report. This algorithm finds an equivalent INRIX travel time (and therefore travel speed) corresponding to each sample BTM travel time observation on the test segment of interest.

[1] Ali Haghani, Masoud Hamedi, Kaveh Farokhi Sadabadi, Estimation of Travel Times for Multiple TMC Segments, prepared for I-95 Corridor Coalition, February 2010 (link)

**Table 1**
**Segments selected for validation in Virginia**

| SEGMENT | DESCRIPTION | | | TMC CODES | | Deployment | | |
|---|---|---|---|---|---|---|---|---|
| (Map Link) | Highway | State | Starting at | Begin | Number | Begin Lat/Lon | | Length |
| | Pennsylvania | County | Ending at | End | Length | End Lat/Lon | | % Diff |
| **Arterials** | | | | | | | | All Lengths in Miles |
| A1 | US-1 | Virginia | Joplin Rd | 110-09526 | 2.13 | 38.545472 | -77.336879 | 2.19 |
| VA10-0001 | Southbound | Prince William | Russell Rd | 110N09526 | 2 | 38.521074 | -77.360451 | 2.82% |
| A2 | US-1 | Virginia | Russell Rd | 110-09525 | 4.65 | 38.521074 | -77.360451 | 4.75 |
| VA10-0002 | Southbound | Stafford | VA-610/Garrisonville Rd | 110-09525 | 1 | 38.4637 | -77.405727 | 2.03% |
| A5 | US-1 | Virginia | American Legion Rd | 110-09522 | 2.70 | 38.395746 | -77.429713 | 2.74 |
| VA10-0005 | Southbound | Stafford | Mountain View Rd | 110-09522 | 1 | 38.363967 | -77.45708 | 1.48% |
| A6 | US-1 | Virginia | Mountain View Rd | 110-09521 | 0.90 | 38.363967 | -77.45708 | 0.86 |
| VA10-0006 | Southbound | Stafford | Forbes St | 110-09521 | 1 | 38.351058 | -77.457959 | -4.45% |
| A7 | US-1 | Virginia | Forbes St | 110-09520 | 1.97 | 38.351058 | -77.457959 | 2.00 |
| VA10-0007 | Southbound | Stafford | US-17/VA-212/Warrenton Rd | 110-09520 | 1 | 38.324019 | -77.468435 | 1.52% |
| A8 | US-1 | Virginia | US-17/VA-212/Warrenton Rd | 110-09519 | 0.76 | 38.324019 | -77.468435 | 0.76 |
| VA10-0008 | Southbound | Stafford | Fall Hill Ave | 110-09519 | 1 | 38.314289 | -77.474837 | 0.00% |
| A9 | US-1 | Virginia | Fall Hill Ave | 110N09519 | 1.56 | 38.314289 | -77.474837 | 1.50 |
| VA10-0009 | Southbound | Fredericksburg | VA-3/William St | 110N09518 | 3 | 38.293127 | -77.484856 | -3.83% |
| A10 | US-1 | Virginia | VA-3/William St | 110-09517 | 2.08 | 38.293127 | -77.484856 | 2.12 |
| VA10-0010 | Southbound | Spotsylvania | Harrison Rd | 110N09517 | 2 | 38.264219 | -77.495507 | 1.93% |

**Table 1 (Cont'd)**
**Segments selected for validation in Virginia**

| SEGMENT | DESCRIPTION | | | TMC CODES | | Deployment | | |
|---|---|---|---|---|---|---|---|---|
| (Map Link) | Highway | State | Starting at | Begin | Number | Begin Lat/Lon | | Length |
| | Pennsylvania | County | Ending at | End | Length | End Lat/Lon | | % Diff |
| **Arterials** | | | | | | | | All Lengths in Miles |
| A11 | US-1 | Virginia | Harrison Rd | 110-09522 | 2.15 | 38.264113 | -77.495391 | 2.12 |
| VA10-0011 | Northbound | Stafford | VA-3/William St | 110-09522 | 2 | 38.294 | -77.484411 | -1.40% |
| A12 | US-1 | Virginia | VA-3/William St | 110-09521 | 1.50 | 38.294 | -77.484411 | 1.51 |
| VA10-0012 | Northbound | Stafford | Fall Hill Ave | 110-09521 | 3 | 38.314236 | -77.474704 | 0.67% |
| A13 | US-1 | Virginia | Fall Hill Ave | 110-09520 | 0.76 | 38.314236 | -77.474704 | 0.76 |
| VA10-0013 | Northbound | Stafford | US-17/VA-212/Warrenton Rd | 110-09520 | 1 | 38.324019 | -77.468435 | 0.00% |
| A14 | US-1 | Virginia | US-17/VA-212/Warrenton Rd | 110-09519 | 1.98 | 38.324019 | -77.468435 | 2.01 |
| VA10-0014 | Northbound | Stafford | Forbes St | 110-09519 | 1 | 38.351058 | -77.457959 | 1.52% |
| A15 | US-1 | Virginia | Forbes St | 110N09519 | 0.90 | 38.351058 | -77.457959 | 0.86 |
| VA10-0015 | Northbound | Fredericksburg | Mountain View Rd | 110N09518 | 1 | 38.363946 | -77.456898 | -4.46% |
| A16 | US-1 | Virginia | Mountain View Rd | 110-09517 | 2.69 | 38.363946 | -77.456898 | 2.73 |
| VA10-0016 | Northbound | Spotsylvania | American Legion Rd | 110N09517 | 1 | 38.395712 | -77.429605 | 1.48% |
| A19 | US-1 | Virginia | VA-610/Garrisonville Rd | 110+09526 | 4.84 | 38.661743 | -77.247195 | 4.75 |
| VA10-0019 | Northbound | Prince William | Russell Rd | 110+09526 | 1 | 38.677623 | -77.230068 | -1.86% |
| A20 | US-1 | Virginia | Russell Rd | 110P09526 | 2.04 | 38.677623 | -77.230068 | 2.17 |
| VA10-0020 | Northbound | Prince William | Joplin Rd | 110+09527 | 2 | 38.705713 | -77.205011 | 6.36% |

## *Analysis of Arterial Results*

Table 2 summarizes the data quality measures obtained as a result of comparison between Bluetooth and all reported INRIX speeds. Specifications used for comparison include the Average Absolute Speed Error (AASE) and the Speed Error Bias (SEB).

Average Absolute Speed Error (AASE)
The AASE is defined as the mean absolute value of the difference between the mean speed reported from the VPP and the ground truth mean speed for a specified time period. The AASE is the primary accuracy metric. Based on the contract specifications, the speed data from the VPP shall have a maximum average absolute error of 10 miles per hour (MPH) in each of four speed ranges: 0-15 MPH, 15-25 MPH, 25-35 MPH, and > 35 MPH.

Speed Error Bias (SEB)
The SEB is defined as the average speed error (not the absolute value) in each speed range. SEB is a measure of whether the speed reported in the VPP consistently under or over estimates speed as compared to ground truth speed. Based on the contract specifications, the VPP data shall have a maximum SEB of +/- 5 MPH in each of speed ranges as defined above.

The results are presented as compared against the mean of the ground truth data as well as the $95^{th}$ percent confidence interval for the mean, referred to as the Standard Error of the Mean (SEM) band. The SEM band takes into account any uncertainty in the ground truth speed as measured by BTM equipment due to limited samples and/or data variance. Contract specifications are assessed against the SEM band. (See the *Vehicle Probe Project: Data Use and Application Guide* for additional details on the validation process.) The AASE in the lower two speed bands have proven to be the critical specification (and most difficult) to attain. As shown, the average absolute speed error (AASE) was within specification for all the speed bins when compared with the Standard Error of the Mean (SEM) Band. The Speed Error Bias (SEB) was within specifications for all speed bins except 0-15 MPH when compared with the Standard Error of the Mean (SEM) Band.

**TABLE 2 Data quality measures for arterial segments in Virginia**

| SPEED BIN | Data Quality Measures for | | | | No. of 5 Minute Samples | Hours of Data Collection |
|---|---|---|---|---|---|---|
| | 1.96 SEM Band | | Mean | | | |
| | SEB 5 mph (contract specifications) | AASE 10 mph (contract specifications) | SEB | AASE | | |
| 0-15 | 8.7 | 8.8 | 11.7 | 11.8 | 647 | 53.9 |
| 15-25 | 2.9 | 3.3 | 5.8 | 7.2 | 3062 | 255.2 |
| 25-35 | 0.8 | 1.7 | 2.4 | 5.4 | 4075 | 339.6 |
| 35+ | -1.4 | 2.1 | -3.0 | 5.6 | 9407 | 783.9 |

Table 3 shows the percentage of the time INRIX data falls within 5 mph of the SEM band and the mean for each speed bin for all arterial data segments in this validation report.

**Table 3 Percent observations meeting data quality criteria for arterial segments in Virginia**

| SPEED BIN | Data Quality Measures for | | | | No. of Obs. |
|---|---|---|---|---|---|
| | 1.96 SEM Band | | Mean | | |
| | Percentage falling inside the band | Percentage falling within 5 mph of the band | Percentage equal to the mean | Percentage within 5 mph of the mean | |
| 0-15 | 12% | 37% | 0% | 17% | 647 |
| 15-25 | 41% | 73% | 0% | 40% | 3062 |
| 25-35 | 60% | 87% | 0% | 55% | 4075 |
| 35+ | 55% | 83% | 0% | 54% | 9407 |

Tables 4 and 5 present detailed data for individual TMC segments in this validation in a similar format as Tables 2 and 3, respectively. Note that for some segments and in some speed bins the comparison results may not be reliable due to the small number of observations.

**Table 4**
**Data quality measures for individual arterial validation segments in the state of Virginia**

| TMC | Standard TMC length | Bluetooth distance | SPEED BIN | Data Quality Measures for | | | | No. of Obs. |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.96 SEM Band | | Mean | | |
| | | | | Speed Error Bias | Average Absolute Speed Error | Speed Error Bias | Average Absolute Speed Error | |
| **VA10-0001** | 2.13 | 2.13 | 0-15 | - | - | - | - | - |
| | | | 15-25 | - | - | - | - | - |
| | | | 25-35 | - | - | - | - | - |
| | | | 35+ | -2.1 | 2.5 | -5.2 | 6.4 | 879 |
| **VA10-0002** | 4.77 | 4.77 | 0-15 | 14.3 | 14.3 | 16.8 | 16.8 | 8* |
| | | | 15-25 | 3.7 | 3.7 | 7.1 | 7.1 | 87 |
| | | | 25-35 | 1.3 | 2.2 | 4.2 | 6.2 | 98 |
| | | | 35+ | -1.2 | 1.9 | -1.8 | 4.7 | 292 |
| **VA10-0005** | 2.70 | 2.70 | 0-15 | - | - | - | - | - |
| | | | 15-25 | - | - | - | - | - |
| | | | 25-35 | 7.0 | 7.0 | 14.6 | 14.6 | 14* |
| | | | 35+ | 0.2 | 1.9 | 1.0 | 4.8 | 744 |
| **VA10-0006** | 0.90 | 0.90 | 0-15 | - | - | - | - | - |
| | | | 15-25 | 12.9 | 12.9 | 17.2 | 17.2 | 3* |
| | | | 25-35 | 2.1 | 2.4 | 7.7 | 8.4 | 72 |
| | | | 35+ | -1.2 | 1.8 | -3.0 | 5.4 | 1329 |
| **VA10-0007** | 1.97 | 1.97 | 0-15 | 16.5 | 16.5 | 18.4 | 18.4 | 72 |
| | | | 15-25 | 9.4 | 9.4 | 13.5 | 13.6 | 157 |
| | | | 25-35 | 2.5 | 2.6 | 6.9 | 7.7 | 362 |
| | | | 35+ | -1.0 | 2.0 | -1.9 | 4.9 | 149 |
| **VA10-0008** | 0.76 | 0.76 | 0-15 | 3.7 | 4.0 | 5.5 | 6.2 | 72 |
| | | | 15-25 | 0.7 | 1.7 | 1.2 | 4.5 | 913 |
| | | | 25-35 | -1.8 | 2.1 | -5.0 | 6.1 | 358 |
| | | | 35+ | -5.3 | 5.3 | -14.4 | 14.4 | 53 |
| **VA10-0009** | 1.57 | 1.57 | 0-15 | 8.0 | 8.0 | 13.5 | 13.5 | 7* |
| | | | 15-25 | 3.2 | 3.5 | 6.2 | 6.9 | 48 |
| | | | 25-35 | -0.4 | 1.3 | -1.4 | 4.9 | 343 |
| | | | 35+ | -5.4 | 5.4 | -9.0 | 9.2 | 231 |
| **VA10-0010** | 2.08 | 2.08 | 0-15 | - | - | - | - | - |
| | | | 15-25 | 6.2 | 6.2 | 10.0 | 10.0 | 74 |
| | | | 25-35 | 1.9 | 2.0 | 4.4 | 5.3 | 727 |
| | | | 35+ | -0.7 | 1.3 | -1.9 | 4.1 | 534 |

*Results in the specified row may not be reliable due to small number of observations

## Table 4 (Cont'd)
## Data quality measures for individual arterial validation segments in the state of Virginia

| TMC | Standard TMC length | Bluetooth distance | SPEED BIN | Data Quality Measures for | | | | No. of Obs. |
|---|---|---|---|---|---|---|---|---|
| | | | | 1.96 SEM Band | | Mean | | |
| | | | | Speed Error Bias | Average Absolute Speed Error | Speed Error Bias | Average Absolute Speed Error | |
| **VA10-0011** | 2.15 | 2.15 | 0-15 | - | - | - | - | - |
| | | | 15-25 | 6.6 | 6.6 | 18.5 | 18.5 | 12* |
| | | | 25-35 | 1.3 | 1.8 | 3.5 | 4.7 | 167 |
| | | | 35+ | -1.2 | 2.0 | -2.9 | 5.0 | 1083 |
| **VA10-0012** | 1.49 | 1.49 | 0-15 | 7.7 | 7.7 | 14.6 | 14.6 | 14* |
| | | | 15-25 | 3.5 | 3.7 | 6.6 | 7.2 | 278 |
| | | | 25-35 | 0.6 | 1.5 | 1.0 | 3.9 | 190 |
| | | | 35+ | -3.0 | 3.0 | -7.3 | 7.3 | 22* |
| **VA10-0013** | 0.76 | 0.76 | 0-15 | 7.6 | 7.6 | 10.6 | 10.6 | 433 |
| | | | 15-25 | 1.9 | 2.4 | 4.4 | 6.1 | 699 |
| | | | 25-35 | -0.7 | 1.8 | -1.5 | 6.0 | 166 |
| | | | 35+ | -3.3 | 3.3 | -10.2 | 10.2 | 14* |
| **VA10-0014** | 1.98 | 1.98 | 0-15 | 26.4 | 26.4 | 29.6 | 29.6 | 2* |
| | | | 15-25 | 5.7 | 5.7 | 15.9 | 15.9 | 3* |
| | | | 25-35 | 1.7 | 2.0 | 5.4 | 6.0 | 25* |
| | | | 35+ | -2.8 | 3.1 | -5.1 | 6.0 | 539 |
| **VA10-0015** | 0.90 | 0.90 | 0-15 | 18.7 | 18.7 | 30.7 | 30.7 | 2* |
| | | | 15-25 | 10.0 | 10.0 | 16.8 | 17.6 | 17* |
| | | | 25-35 | 3.7 | 3.7 | 11.0 | 11.2 | 149 |
| | | | 35+ | -0.5 | 1.6 | -0.6 | 5.6 | 1238 |
| **VA10-0016** | 2.69 | 2.69 | 0-15 | - | - | - | - | - |
| | | | 15-25 | - | - | - | - | - |
| | | | 25-35 | 2.9 | 2.9 | 6.4 | 6.4 | 1* |
| | | | 35+ | -0.4 | 1.5 | -0.6 | 4.3 | 585 |
| **VA10-0019** | 4.84 | 4.84 | 0-15 | 34.2 | 34.2 | 35.4 | 35.4 | 5* |
| | | | 15-25 | 13.7 | 13.7 | 23.5 | 23.5 | 9* |
| | | | 25-35 | 3.1 | 3.1 | 14.5 | 14.5 | 28* |
| | | | 35+ | -1.4 | 2.1 | -2.3 | 4.5 | 340 |
| **VA10-0020** | 2.04 | 2.04 | 0-15 | - | - | - | - | - |
| | | | 15-25 | - | - | - | - | - |
| | | | 25-35 | 1.5 | 2.3 | 4.4 | 6.3 | 94 |
| | | | 35+ | -2.0 | 2.4 | -4.2 | 6.1 | 680 |

*Results in the specified row may not be reliable due to small number of observations

## Table 5
## Observations meeting data quality criteria for individual arterial validation segments in the state of Virginia

| TMC | SPEED BIN | Data Quality Measures for | | | | | | | | No. of Obs. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.96 SEM Band | | | | Mean | | | | |
| | | Speed Error Bias | | Average Absolute Speed Error | | Speed Error Bias | | Average Absolute Speed Error | | |
| | | No. falling inside the band | % falling inside the band | No. falling within 5 mph of the band | % falling within 5 mph of the band | No. equal to the mean | % equal to the mean | No. within 5 mph of the mean | % within 5 mph of the mean | |
| VA10-0001 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | - | - | - | - | - | - | - | - | - |
| | 25-35 | - | - | - | - | - | - | - | - | - |
| | 35+ | 84 | 10% | 480 | 55% | 182 | 21% | 559 | 64% | 879 |
| VA10-0002 | 0-15 | 1 | 13% | 2 | 25% | 1 | 13% | 2 | 25% | 8* |
| | 15-25 | 0 | 0% | 43 | 49% | 1 | 1% | 51 | 59% | 87 |
| | 25-35 | 14 | 14% | 58 | 59% | 32 | 33% | 66 | 67% | 98 |
| | 35+ | 41 | 14% | 194 | 66% | 79 | 27% | 212 | 73% | 292 |
| VA10-0005 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | - | - | - | - | - | - | - | - | - |
| | 25-35 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 14* |
| | 35+ | 112 | 15% | 522 | 70% | 212 | 28% | 572 | 77% | 744 |
| VA10-0006 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 3* |
| | 25-35 | 8 | 11% | 28 | 39% | 14 | 19% | 37 | 51% | 72 |
| | 35+ | 257 | 19% | 894 | 67% | 481 | 36% | 988 | 74% | 1329 |
| VA10-0007 | 0-15 | 0 | 0% | 3 | 4% | 0 | 0% | 3 | 4% | 72 |
| | 15-25 | 5 | 3% | 21 | 13% | 11 | 7% | 27 | 17% | 157 |
| | 25-35 | 24 | 7% | 158 | 44% | 66 | 18% | 212 | 59% | 362 |
| | 35+ | 35 | 23% | 106 | 71% | 59 | 40% | 113 | 76% | 149 |
| VA10-0008 | 0-15 | 7 | 10% | 39 | 54% | 10 | 14% | 43 | 60% | 72 |
| | 15-25 | 180 | 20% | 667 | 73% | 319 | 35% | 726 | 80% | 913 |
| | 25-35 | 48 | 13% | 212 | 59% | 97 | 27% | 253 | 71% | 358 |
| | 35+ | 1 | 2% | 9 | 17% | 6 | 11% | 15 | 28% | 53 |
| VA10-0009 | 0-15 | 0 | 0% | 1 | 14% | 1 | 14% | 2 | 29% | 7* |
| | 15-25 | 6 | 13% | 25 | 52% | 9 | 19% | 27 | 56% | 48 |
| | 25-35 | 55 | 16% | 229 | 67% | 103 | 30% | 267 | 78% | 343 |
| | 35+ | 11 | 5% | 62 | 27% | 22 | 10% | 73 | 32% | 231 |
| VA10-0010 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | 1 | 1% | 14 | 19% | 2 | 3% | 20 | 27% | 74 |
| | 25-35 | 110 | 15% | 473 | 65% | 205 | 28% | 523 | 72% | 727 |
| | 35+ | 111 | 21% | 405 | 76% | 192 | 36% | 436 | 82% | 534 |

*Results in the specified row may not be reliable due to small number of observations

## Table 5 (Cont'd)
## Observations meeting data quality criteria for individual arterial validation segments in the state of Virginia

| TMC | SPEED BIN | Data Quality Measures for | | | | | | | | No. of Obs. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.96 SEM Band | | | | Mean | | | | |
| | | Speed Error Bias | | Average Absolute Speed Error | | Speed Error Bias | | Average Absolute Speed Error | | |
| | | No. falling inside the band | % falling inside the band | No. falling within 5 mph of the band | % falling within 5 mph of the band | No. equal to the mean | % equal to the mean | No. within 5 mph of the mean | % within 5 mph of the mean | |
| VA10-0011 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 12* |
| | 25-35 | 25 | 15% | 115 | 69% | 52 | 31% | 129 | 77% | 167 |
| | 35+ | 142 | 13% | 725 | 67% | 257 | 24% | 815 | 75% | 1083 |
| VA10-0012 | 0-15 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 14* |
| | 15-25 | 13 | 5% | 120 | 43% | 29 | 10% | 146 | 53% | 278 |
| | 25-35 | 48 | 25% | 149 | 78% | 75 | 39% | 160 | 84% | 190 |
| | 35+ | 1 | 5% | 10 | 45% | 3 | 14% | 13 | 59% | 22* |
| VA10-0013 | 0-15 | 8 | 2% | 90 | 21% | 15 | 3% | 113 | 26% | 433 |
| | 15-25 | 95 | 14% | 418 | 60% | 197 | 28% | 479 | 69% | 699 |
| | 25-35 | 27 | 16% | 101 | 61% | 52 | 31% | 119 | 72% | 166 |
| | 35+ | 0 | 0% | 5 | 36% | 1 | 7% | 7 | 50% | 14* |
| VA10-0014 | 0-15 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 2* |
| | 15-25 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 3* |
| | 25-35 | 2 | 8% | 13 | 52% | 6 | 24% | 17 | 68% | 25* |
| | 35+ | 54 | 10% | 300 | 56% | 102 | 19% | 321 | 60% | 539 |
| VA10-0015 | 0-15 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 2* |
| | 15-25 | 3 | 18% | 5 | 29% | 5 | 29% | 5 | 29% | 17* |
| | 25-35 | 8 | 5% | 30 | 20% | 14 | 9% | 62 | 42% | 149 |
| | 35+ | 257 | 21% | 828 | 67% | 466 | 38% | 933 | 75% | 1238 |
| VA10-0016 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | - | - | - | - | - | - | - | - | - |
| | 25-35 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 1* |
| | 35+ | 109 | 19% | 443 | 76% | 200 | 34% | 476 | 81% | 585 |
| VA10-0019 | 0-15 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 5* |
| | 15-25 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 9* |
| | 25-35 | 0 | 0% | 1 | 4% | 0 | 0% | 9 | 32% | 28* |
| | 35+ | 54 | 16% | 244 | 72% | 90 | 26% | 256 | 75% | 340 |
| VA10-0020 | 0-15 | - | - | - | - | - | - | - | - | - |
| | 15-25 | - | - | - | - | - | - | - | - | - |
| | 25-35 | 11 | 12% | 50 | 53% | 24 | 26% | 64 | 68% | 94 |
| | 35+ | 117 | 17% | 439 | 65% | 217 | 32% | 484 | 71% | 680 |

*Results in the specified row may not be reliable due to small number of observations