PROBABILITY OF REAL-TIME DATA AS A FUNCTION OF HOURLY VOLUME, ASSESSMENT OF THE I-95 VEHICLE PROBE PROJECT DATA

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ABSTRACT

The Vehicle Probe Project (VPP) is an outsourced traffic monitoring system established by the I-95 Corridor Coalition and has been active since July 2008. By contractual agreement with the vendor, INRIX Corporation, travel time and speed data are provided to minimum quality specifications whenever traffic flow exceeds 500 vehicles per hour (vph). The monthly validation program has confirmed the quality of the data by comparing VPP data against travel times collected using Bluetooth™ traffic monitoring equipment, but typically during high volume periods when congestion is likely. Validation has not been confirmed for minimum flow conditions (less than 500 vph) due in part to lack of accurate volume data as well as the low probability of observing traffic congestion at low volumes. The VPP provides an indication of real-time data by the *score* attribute. When *s*core is equal to 30, the traffic data is based on real-time information. A score less than 30 indicates reliance on historical data. Studies have shown that traffic data based primarily on historical data do not meet minimum quality specifications during moderate and severe congestion. By using volume data from the Maryland State Highway Administration and the Delaware Department of Transportation from permanent count locations, the likelihood of acquiring real-time data (as evidenced by score equal 30) as a function of hourly volume is established.

Key Words: Vehicle Probe Project, INRIX, Real-time, Score

INTRODUCTION

The I-95 Vehicle Probe Project (VPP) has provided travel time data on a network of over 5,000 freeway miles and approximately 900 arterial miles from New Jersey to Florida since July 2008.The main source of the VPP data is fleet vehicles with global positioning system (GPS) equipment. The VPP data are used in a variety of applications involving traffic management, traveler information and planning activities for both long distance and local trips. In addition to travel time and speed, the system provides additional attributes. One of these attributes, referred to as *score*, has three levels: 10, 20, and 30. A score of 30 indicates

that enough base data was available to estimate traffic conditions in real-time, rather than using either a historical speed based on time of day and day of week (indicated by score of 20), or free-flow speed for the facility (indicated by a score of 10). Although a score of 30 does not guarantee quality data, the cumulative results of the VPP validation process combined with the investigations of the correlation of Absolute Average Speed Error (AASE) with score provides sufficient evidence that a score of 30 is a reliable indicator of data quality. The percentage of data with score equal 30 is the metric used in this study. This research established the percentage of a score of 30 as a function of traffic volume, providing insight into when and where the VPP provides quality data.

The specifications for the VPP system require that real-time data be delivered on any roadway in which the hourly directional flow exceeds 500 vehicles per hour (vph). At the time of the VPP program development, various technologies were competing for providing the travel time and speed data. Common to all technologies was probe sampling, that is a portion of the traffic stream were monitored or sampled (each technology in a different way) in order to estimate the travel time and speed of the traffic stream. This differs from traditional sensing in which a roadside detector directly measures the speed of each vehicle. Systems relying on sampled data, such as probe systems, become statistically insignificant when the volume of traffic is so low that the number of vehicle samples diminishes. Due to the inherent sampling limitation, a lower volume threshold of 500 vph was designated. Also any traffic flow, particularly on freeways, below 500 vph is expected to be free-flow, and highly unlikely to experience congestion.

The VPP has been actively delivering real-time traffic data to the Corridor Coalition since July 2008. The VPP validation program has confirmed the quality specifications in terms of AASE, and Speed Error Bias (SEB). However, maintaining data quality at the minimum volume specification remains problematic to verify. In this research VPP archive data was analyzed against volume flow data available from the Maryland State Highway Administration (SHA) and the Delaware Department of Transportation (DOT) in order to characterize the relationship between availability of real-time data and hourly traffic volume. Knowing this relationship, the percentage of real time data from the VPP can be predicted by knowing hourly traffic volume of the highway. VPP data are archived within the Regional Integrated Transportation Information System (RITIS) which is maintained by the University of Maryland's Center for Advanced Traffic Technology Laboratory (CATT Lab). Traffic volumes were obtained from permanent traffic sensors via the respective road authorities.

ANALYSIS

Volume data from Maryland and Delaware freeways were obtained from Maryland SHA and Delaware DOT. In Maryland data the analysis spans January 1, 2009 through December 31, 2009, corresponding to the available volume data from Maryland SHA, as well as the VPP archive data from RITIS. Data from the VPP is limited to July 2008 forward. Additionally, validation studies indicated a significant improvement in the percentage of real-time data available from the VPP between 2008 and 2009. Maryland SHA 2010 volume data were not yet available at the time of the analysis. Delaware DOT provided data from May 1, 2010 through May 1, 2011 from their system of newly installed radar units along I-95. Locations were selected based on the availability of volume data from permanent sensors and availability of the VPP archive for the same location. Overall this consisted of 28 locations in Maryland and 13 locations in Delaware as shown in Figure 1 and Figure 2.

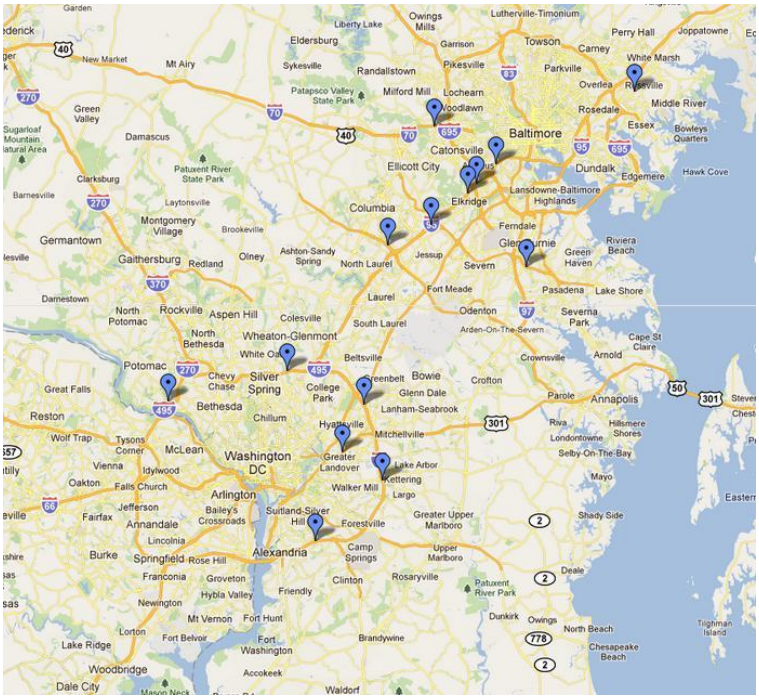

Figure 1. Volume sensor locations in Maryland

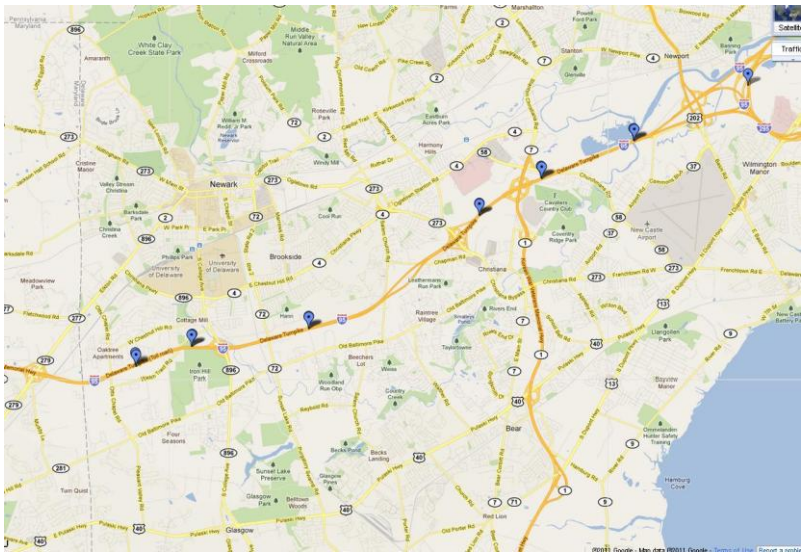

Figure 2. Volume sensor locations in Delaware

Maryland SHA permanent count data is categorized into two groups. The first group contains sites from I-95 and I-495 which are 4 lanes of traffic and which have corresponding higher traffic volumes. The second group contains data from other Maryland freeways, which are two-three lanes with less volume than I-95 and I-495. The results are presented for I-95/I-495, other freeways, and as a combined set. Table A1-1 indicates the name, route number, location and direction of permanent count stations of each group. For each sensor site the corresponding Traffic Massage Channel (TMC) code of the segment containing the volume sensor is identified for both directions of travel. Delaware DOT permanent count data consists of data from I-95. Table A1-2 presents the same information in table A1-1 for Delaware DOT stations.

The percentage of score equal 30 was determined for each hour at each location. Data was aggregated by hourly volumes reported from the sensor stations for each station using the binning categories defined in Table 1. Within the VPP program different processing algorithms are used during nighttime hours from 10PM to 5AM than daytime hours from 5AM to 10PM. Correspondingly, the results for each time period were analyzed separately in this research. The tabular results contain data for each TMC for each hour of the day. The tabular data include the number of records with a score of 30, total number of records, and the percentage of record with score equal 30. The tabular results for each TMC were combined into groups. Within Maryland the groups include I-95/I-495 and other freeways as previously described. Other freeways are subdivided into 2 and 3 lane facilities.

Minimum Traffic Volume	Maximum Traffic Volume	Bin Representative
0	200	100
200	400	300
400	600	500
600	800	700
800	1000	900
1000	1500	1250
1500	2000	1750
2000	3000	2500
3000	4000	3500
4000	5000	4500
5000	6000	5500
6000	7000	6500
7000	8000	7500
8000	9000	8500

Table 1. Traffic Volume Bins.

In subsequent charts and graphs, speed categories from Table 1 may be referenced by either their representative volume, or their bin number. Table 2 shows the result for all I-95/I-495 segments in Maryland during the day. The second column reflects the number of TMC's having data for the specific speed bin. Not all TMC segments possess data across the entire range of volume. The third field is the average score equal 30 for all TMCs. For each volume bin the mean is calculated by the sum of all records with score equal 30 from all TMCs divided by the sum of all records from all TMCs. The fourth column is the standard deviation of individual TMC percentages. The standard deviation for the volume bin is calculated from the individual percentages from each TMC (if the TMC has no records in that volume bin, it is omitted from the calculation). Note that the standard deviation weights all TMCs equally, regardless of the number of records in the volume bin (unless there are none, in which case it is omitted).

In order to establish confidence bounds on the composite percentage of score equal 30, the standard error in the estimate of the mean was calculated based on equation 1.0. On normally distributed data, this calculation provides the 96^{th} confidence interval for the true mean. For example, if another freeway with similar properties as I-95 were analyzed, the percentage of score equal 30 will be within the band shown with a probability of 96 percent. This band is on both sides of the mean with the same distance from it. Standard deviation, mean, and the number of data point are used to calculate this band as shown in equation 1. The fifth and the sixth fields of table 2 are lower and upper bounds of this band and the seventh field shows the number of observations.

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	5	0.588	0.304	0.321	0.855	330
2	16	0.781	0.128	0.719	0.844	3330
3	17	0.696	0.124	0.638	0.755	11337
4	18	0.725	0.116	0.671	0.779	26597
5	18	0.752	0.067	0.721	0.783	31465
6	18	0.799	0.071	0.766	0.832	77574
7	18	0.880	0.050	0.857	0.904	94475
8	18	0.925	0.039	0.907	0.943	369187
9	18	0.948	0.030	0.934	0.962	754512
10	18	0.962	0.028	0.950	0.975	1103948
11	18	0.976	0.015	0.968	0.983	1282352
12	18	0.984	0.044	0.963	1.000	963171
13	15	0.989	0.014	0.982	0.996	466058
14	12	0.993	0.006	0.990	0.997	51736

Table 2. Percentage of Score Equal 30 for I-95/I-495 Segments in Maryland during Daytime Hours

$$Confidence\_Bounds = Mean \pm \frac{1.96\,SD}{\sqrt{N}} \quad (1)$$

Where:
Confidence Bounds: The upper and lower bounds of the confidence band,
SD: The standard deviation of observations
N: Number of observations.

Since the confidence bounds are related to percentage of score equal to 30, the bounds are limited to a minimum of zero and maximum of one. Figure 3 depicts the mean and confidence bounds of the percentage of score equal 30 against the left vertical axis for daytime hours on I-95/I-495 segments in Maryland, corresponding to the data shown in Table 2. The number of records for each traffic volume bin is also presented references to the right vertical axis.

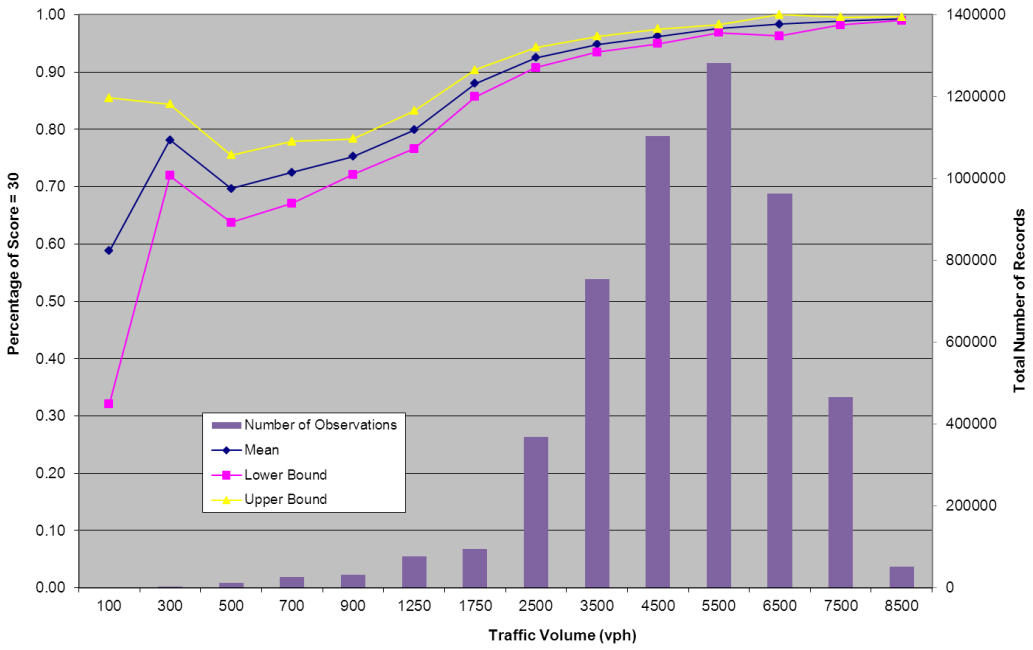

Figure 3. Percentage of Score Equal 30 and Number of Records for Daytime Hour on I-95/I-495 Segments in Maryland

Table A1-3 and Figure 4 show the same results for I-95/I-495 segments in Maryland during nighttime hours.

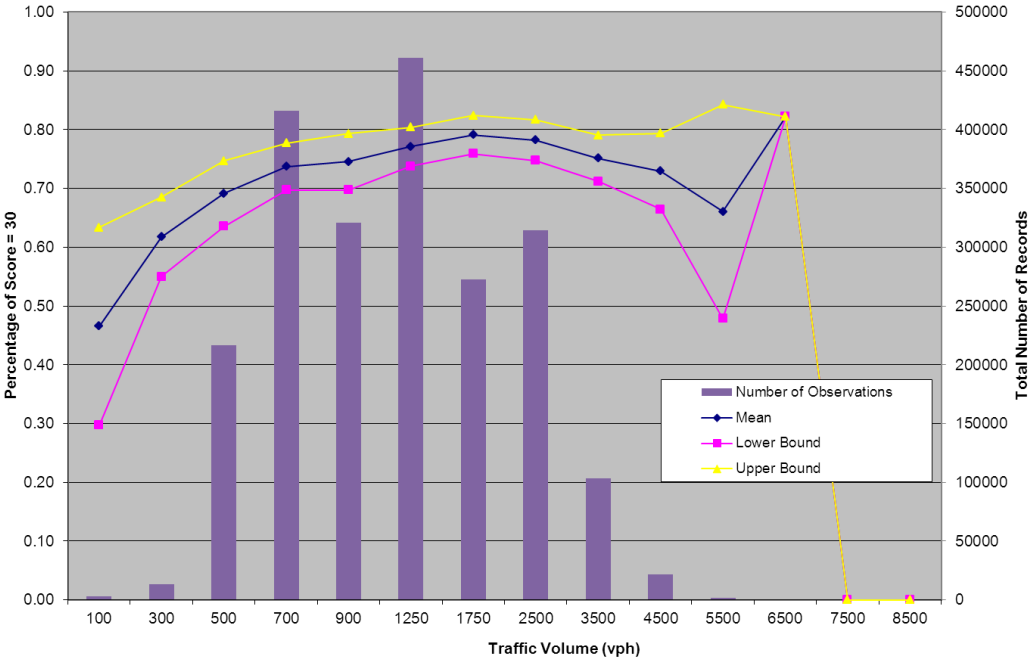

Figure 4. Percentage of Score Equal 30 and Number of All Observations According to Traffic Volume during Nighttime Hours on I-95/I-495 in Maryland

All segments on I-95/I-495are4 lanes. Other freeways selected in this study have either two lanes or three lanes in each direction. Other freeways were divided into two groups: two lane and three lane freeways and results compiled accordingly. Tables 3 and 4 present the tabular results for two lane and three lane freeways in Maryland during daytime respectively. Figure

5 shows the mean percentage of detection and total number records for other freeway segments in Maryland during the daytime for both two lane and three lane freeways.

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	4	0.206	0.150	0.059	0.353	5772
2	4	0.252	0.118	0.136	0.368	18804
3	4	0.353	0.120	0.235	0.471	19773
4	4	0.448	0.135	0.315	0.580	17904
5	4	0.524	0.157	0.370	0.678	25480
6	4	0.499	0.230	0.274	0.725	113390
7	4	0.576	0.184	0.396	0.756	169053
8	4	0.806	0.085	0.723	0.889	542344
9	4	0.953	0.031	0.923	0.983	230102
10	4	0.941	0.042	0.900	0.983	114142
11	3	0.939	0.482	0.394	1.000	32902

Table 3. Percentage of Score Equal 30 for 3 Lane Other Freeway Segments in Maryland during Daytime Hours

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	6	0.138	0.104	0.054	0.221	22887
2	6	0.265	0.076	0.204	0.326	71369
3	6	0.379	0.144	0.264	0.494	107661
4	6	0.497	0.137	0.388	0.607	132412
5	6	0.719	0.179	0.576	0.862	233060
6	6	0.637	0.223	0.459	0.815	288463
7	6	0.714	0.155	0.590	0.837	454595
8	5	0.742	0.348	0.436	1.000	384259
9	4	0.940	0.488	0.462	1.000	119208
10	3	0.934	0.514	0.353	1.000	63189

Table 4. Percentage of Score Equal 30 for 2 Lane Other Freeway Segments in Maryland during Daytime Hours

Note that data in Tables 3 and 4 do not cover all high traffic volume bins, reflecting the lower capacity of these freeways.

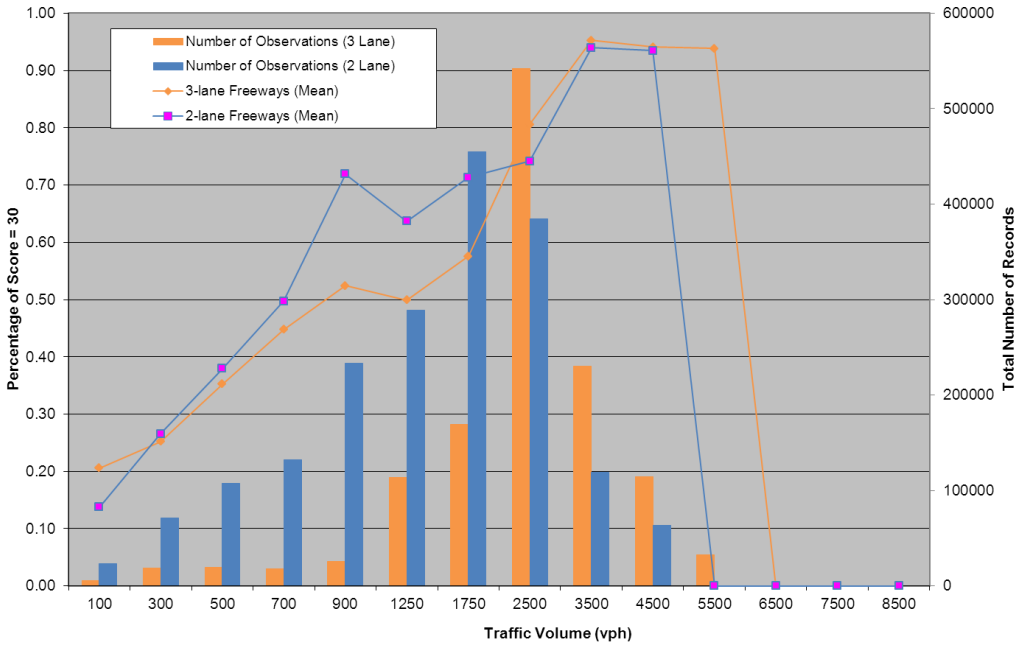

Figure 5. Percentage of Score Equal 30 and Number of Records for Other Freeways in Maryland during Daytime Hours

Tables A1-4 and A1-5 present tabular results for three-lane and two-lane other freeway segments in Maryland during nighttime respectively. Figure 6 illustrates the mean percentage of score equal 30 and number of observations for other freeway segments in Maryland during the nighttime.

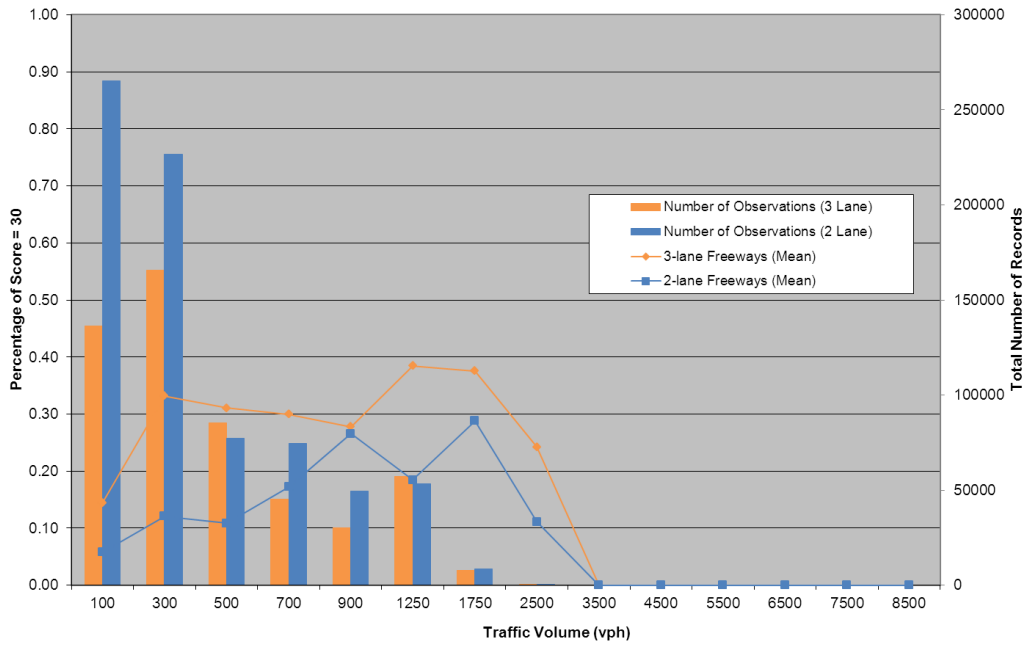

Figure 6. Percentage of Score Equal 30 and Number of All Observations According to Traffic Volume during Nighttime Hours in Other Freeway Segments in Maryland

The same methodology was applied to Delaware I-95 freeway segments. Table 5 presents tabular results during daytime hours. Figure 7 presents the mean percentage of score equal 30, confidence bands, and number of records for Delaware daytime data. The results from I-

95 in Delaware as shown in Figure 7 differs from the results from I-95/I-495 in Maryland in that the percentage of score equal 30 is consistently higher, and the volume curve for Delaware is not uni-modal as in Maryland. Delaware exhibits two distinct peaks at 700 and 2500 vehicles per hour, whereas Maryland has a single peak volume at 5500 vehicles per hour.

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	5	0.976	0.156	0.895	1.000	14887
2	16	0.853	0.105	0.798	0.908	11192
3	17	0.948	0.053	0.920	0.976	29462
4	18	0.977	0.016	0.969	0.985	256815
5	18	0.977	0.045	0.954	1.000	195832
6	18	0.980	0.037	0.960	0.999	239711
7	18	0.985	0.022	0.974	0.997	268927
8	18	0.989	0.007	0.985	0.992	461366
9	18	0.994	0.003	0.992	0.996	349954
10	18	0.994	0.004	0.992	0.996	358075
11	18	0.997	0.003	0.995	0.998	331866
12	18	0.996	0.006	0.993	0.999	281180
13	15	0.995	0.008	0.990	0.999	95056
14	12	0.994	0.004	0.992	0.997	30077

Table 5. Percentage of Score Equal 30 for I-95 Segments in Delaware during Daytime Hours

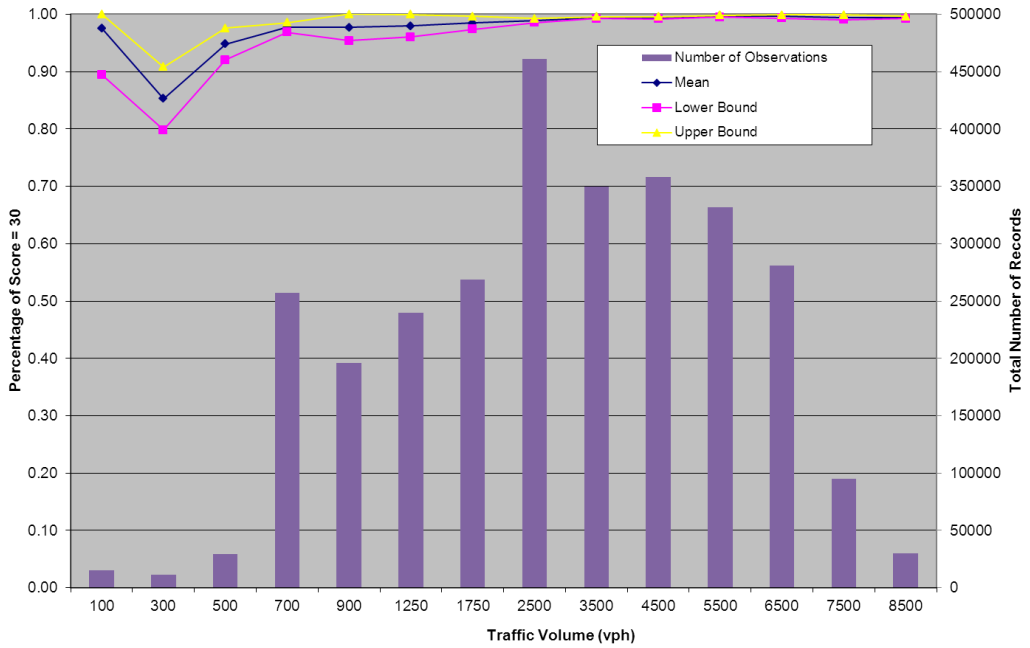

Figure 7. Percentage of a Score of 30 and Number of Records for I-95 Segments in Delaware during Daytime Hours

Table A1-6 and Figure 8 show the tabular and graphical result for Delaware I-95 segments during nighttime hours.

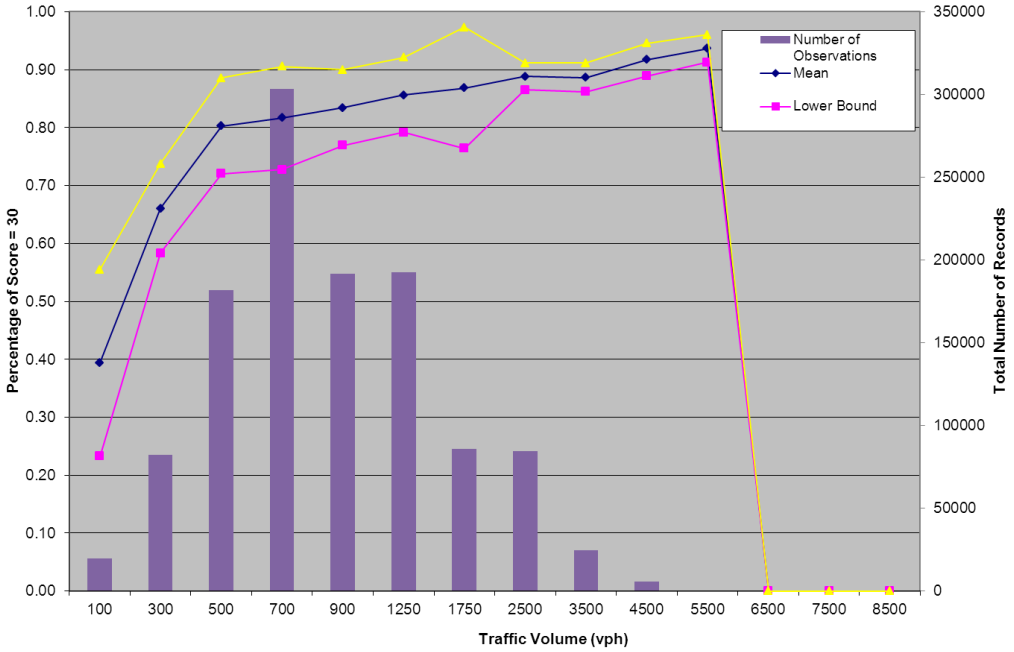

Figure 8. Percentage of a Score of 30 and Number of All Observations According to Traffic Volume during Nighttime Hours in I-95 in Delaware

RESULTS AND OBSERVATIONS

Figure 9 shows the results for all daytime data from Maryland and Delaware, contrasting the mean percentage of score equal 30 for different freeway types. The percentage of score equal 30 increases with traffic volume. The higher volume freeways, specifically I-95/I-495 in Maryland and I-95 in Delaware maintain a higher percentage of score equal 30 into lower volumes than do the two and three lane freeways in Maryland. A major portion of INRIX data comes from commercial vehicle fleets which frequently traffic major corridors more than commuter routes. This may explain I-95/I-495 have higher percentage of score equal 30 at lower volumes than do other two and three lane freeways in Maryland. I-95 in Delaware has the highest percentage of score equal to 30, staying above 90 percent even down to 500 vph. The range of percent score equal 30 at 500 vph spans from 35 percent for two and three lane freeways in Maryland to a high of over 90 percent for I-95 in Delaware. Results for all type of highways begin to merge at and above 2,000 vph, at which all freeways exhibit percent score equal 30 near or above 90 percent.

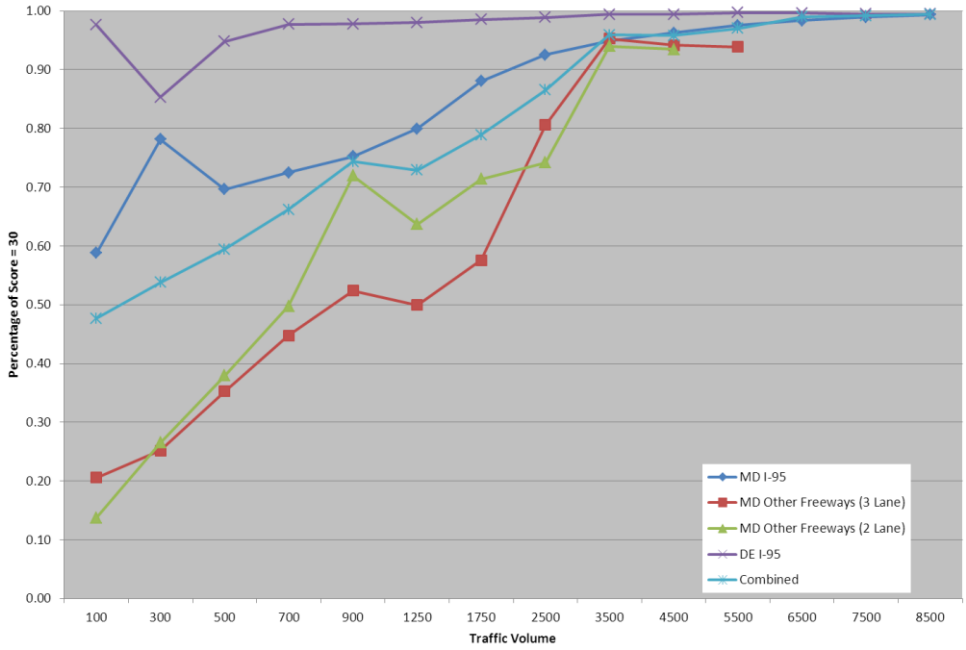

Figure 9. Mean Percentage of Score Equal 30 by Traffic Volume during Daytime Hours

Figure 10 shows the combined results for the nighttime hours. The performance of I-95/I-495 in Maryland and that of I-95 in Delaware converge, though I-95 in Delaware performs consistently better, though not by as large a margin as in daytime hours. Two lane and three-lane freeways in Maryland achieve a maximum of 40 percent score equal 30, even at the highest volume, maintaining at least a 30 percent gap between the four lane freeways.

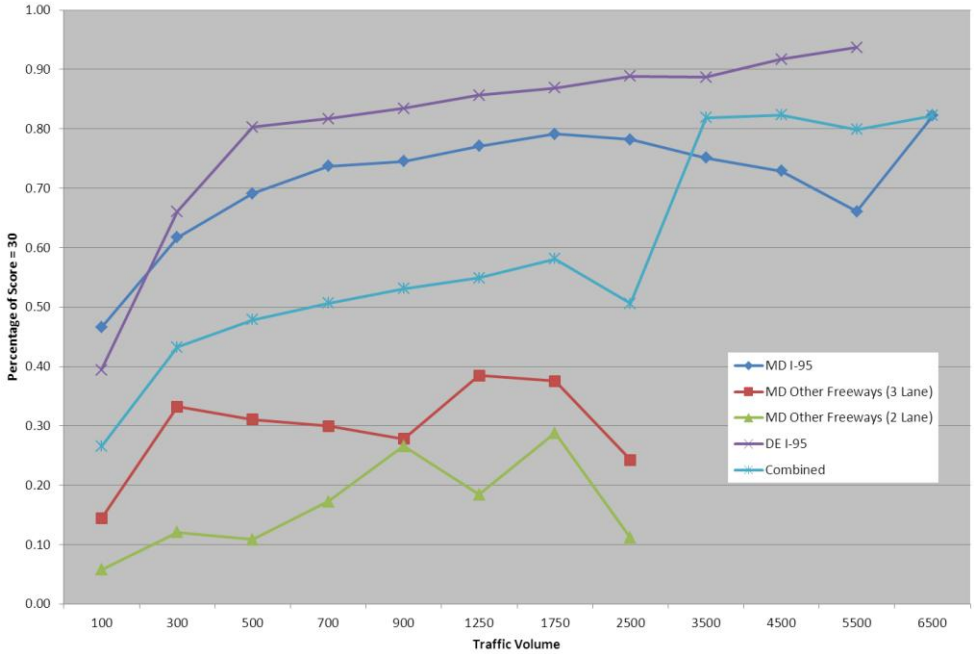

Figure 10. Mean of Percentage of Score Equal 30 during Nighttime Hours for All Freeway Types

CONCLUSIONS

In this research, the VPP archive data was analyzed to find the relationship between the percentage of real time data and hourly traffic volume. The data is real time when the score is equal to 30. When scores equal 10 and 20, the estimates of traffic volume are primarily dependent on historical data. By knowing this relationship the efficiency of gathering VPP data for some specific corridors is predictable. The results of the analysis as illustrated in all figures indicate the following:

- For daytime hours, the 500 vph threshold correspond to a roughly 60 percent of obtaining real-time data (all freeways combined as shown in Figure 10). However the variation between facility types is significant. Two and three lane freeways in Maryland are less than 40 percent, while I-95/I-495 is approximately 70 percent, and I-95 in Delaware is 95 percent.
- Significant differences exist in the percent of score equal 30 for the various groups analyzed particularly for volume flows less than 2,000 vph. This suggests that facility type has a significant impact on the minimum flow threshold.
- The percentage of score equal to 30 on four lane facilities in Maryland and Delaware was consistently higher than two and three lane facilities at all volumes. This suggests that VPP data from larger freeways can maintain data quality at lower flow rates than on smaller freeways. Although not confirmed, it suggests that the percentage of probe vehicles is consistently higher on these major facilities.
- The percent of score equal 30 was highest for I-95 in Delaware, which was also the more recent data analyzed. A possible cause is continued improvement in the VPP since the Delaware analysis reflected the system in 2010 and 2011, while the Maryland analysis was restricted to 2009.
- Nighttime performance was significantly less than daytime at each volume level. The percent score equal 30 did raise above 40 percent for two and three lane freeways even for volumes of 2,000 and greater. The performance decrease on I-95 & I-495 was less than their daytime counterpart, but generally above 70 percent for any volume of 500 vph or greater. Higher flows are required at night than during the day to achieve the same percentage of real-time data.

The results of the analysis confirmed the volume dependence critical for quality real-time data. The results indicated improvement in real-time data for increasing volume during daytime hours for all facility types. Although all monotonically increasing with volume, each type of facility exhibited differing percentages of score below 2000 vehicles per hour (vph). Above 2000 vph, all facilities achieved 90 percent or higher score equal 30. During nighttime hours, four lane facilities exhibited increasing real-time data with increasing volume, however, the two and three lane facilities never exceeded 40 percent score equal 30, even at volumes of 2,000 or greater. Variance in performance between various types of facilities is significant. The reasons for the variance are unknown and warrant further study described below.

- The differences between four lane facilities in Maryland and Delaware may be attributable in part to improvements in the VPP system between 2009 and 2010/2011. The Maryland analysis can be repeated with volume data from 2010 (recently made available) and compared with results from Delaware to test this hypothesis.
- The variation between the facilities exhibited a high degree of variability. The threshold for quality data (as measured by percent of score equal 30) may be

dependent on regional factors. This can be tested by analyzing additional freeway data from other states, and noting facility characteristics such as percent heavy trucks. It is also noted that the type of permanent counter differed between Maryland and Delaware, and should be noted in any future analysis.

Overall, the study confirmed the relationship of increasing availability of real-time data with increasing traffic volume as measured by the percent of score equal 30. The contract language is imprecise concerning the metric to determine minimum volume threshold of 500 vph. If 50 percent score equal 30 is taken as the demarcation of the minimum volume threshold, then combined (two, three and four lane freeways) the VPP appears to be at or near the threshold.

TMC	Station ID	Route Number	Location	Direction	Number of Lanes	AADT (2009)	Group
110+04421	P0039	I-95	South of MD 103	Northbound	4	193331	1
110-04420	P0039	I-95	South of MD 103	Southbound	4		1
110-04636	P0043	I-95	South of MD 214	Northbound	4	201196	1
110+04637	P0043	I-95	South of MD 214	Southbound	4		1
110-04640	P0049	I-95	At Temple Hill Rd	Northbound	4	143828	1
110+04641	P0049	I-95	At Temple Hill Rd	Southbound	4		1
110+04423	P0051	I-95	North of Howard County Line	Northbound	4	172509	1
110-04422	P0051	I-95	North of Howard County Line	Southbound	4		1
110-04631	P0055	I-95	North of Good Luck Rd	Northbound	4	204147	1
110+04632	P0055	I-95	North of Good Luck Rd	Southbound	4		1
110+04424	P0071	I-95	North of IS 195	Northbound	4	176796	1
110-04423	P0071	I-95	North of IS 195	Southbound	4		1
110+04425	P0079	I-95	South of John Ave	Northbound	4	182461	1
110-04424	P0079	I-95	South of John Ave	Southbound	4		1
110+04339	P0061	US 50	West of MD 202	Eastbound	2	76555	2
110-04338	P0061	US 50	West of MD 202	Westbound	2		2
110+04401	P0038	MD 100	West of Oakwood Rd	Westbound	2	75406	2
110-04400	P0038	MD 100	West of Oakwood Rd	Eastbound	2		2
110+04384	P0069	MD 32	West of I-95	Northbound	3	91311	2
110-04383	P0069	MD 32	West of I-95	Southbound	3		2
110+05067	P0057	US 40	East of MD 700	Eastbound	2	31828	2
110-05066	P0057	US 40	East of MD 700	Westbound	2		2
110+04483	P0053	I-70	West of I-695	Westbound	3	94221	2
110-04482	P0053	I-70	West of I-695	Eastbound	3		2
110+04616	P0040	I-495	At Persimmon Tree Rd	Eastbound	4	214005	1
110-04615	P0040	I-495	At Persimmon Tree Rd	Westbound	4		1
110+04626	P0041	I-495	West of MD 650	Eastbound	4	210927	1
110-04625	P0041	I-495	West of MD 650	Westbound	4		1

Table A1-1. Selected ATR stations in Maryland and their characteristics

TMC	Station ID	Route Number	Location	Direction	Number of Lanes
103-04102	200	I-95	South of Churchmans	Southbound	4
103+04103	201	I-95	South of Churchmans	Northbound	4
103+04104	202	I-95	At Marsh Area	Northbound	4
103-04103	203	I-95	At Marsh Area	Southbound	4
103+04099	842	I-95	South of Tolls	Northbound	4
103-04098	843	I-95	South of Tolls	Southbound	4
103+04101	944	I-95	North of Tolls	Northbound	4
103-04100	945	I-95	North of Tolls	Southbound	4
103+04100	1204	I-95	North of Tolls	Northbound	4
103-04099	1205	I-95	North of Tolls	Southbound	4
103-04101	1028	I-95	North of RT 273	Southbound	4
103+04102	1029	I-95	North of RT 273	Northbound	4
103+04107	1225	I-95	At I-495 Southbound Split	Northbound	4

Table A1-2. Selected sensor stations in Delaware and their characteristics

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	14	0.466	0.321	0.297	0.634	2482
2	18	0.617	0.146	0.550	0.685	10298
3	18	0.691	0.120	0.636	0.747	119125
4	18	0.737	0.086	0.697	0.777	239036
5	18	0.745	0.103	0.698	0.793	185592
6	18	0.771	0.072	0.738	0.804	324404
7	18	0.791	0.070	0.759	0.824	218657
8	18	0.782	0.075	0.748	0.817	362511
9	18	0.751	0.085	0.712	0.790	423646
10	14	0.729	0.124	0.664	0.794	477869
11	6	0.661	0.228	0.479	0.843	507511
12	1	0.822	0.000	0.822	0.822	355018

Table A1-3. Different statistics for I-95 segments in Maryland during nighttime hours

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	4	0.144	0.186	0.000	0.326	136377
2	4	0.332	0.253	0.084	0.580	165719
3	4	0.311	0.269	0.047	0.574	85509
4	4	0.300	0.216	0.088	0.511	45060
5	4	0.278	0.226	0.057	0.499	30026
6	4	0.385	0.240	0.149	0.620	57112
7	4	0.375	0.202	0.178	0.573	7843
8	3	0.242	0.237	0.000	0.510	598

Table A1-4. Different statistics for other freeway segments (Three Lane) in Maryland during nighttime hours

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	6	0.058	0.089	0.000	0.129	265151
2	6	0.121	0.102	0.039	0.202	226596
3	6	0.109	0.080	0.044	0.173	77192
4	6	0.172	0.125	0.072	0.273	74679
5	6	0.266	0.190	0.113	0.418	49537
6	4	0.184	0.092	0.094	0.275	53205
7	3	0.288	0.076	0.202	0.374	8545
8	2	0.111	0.000	0.111	0.111	180

Table A1-5. Different statistics for other freeway segments (Two Lane) in Maryland during nighttime hours

Bin Number	Number of TMC	Mean	Standard Deviation	Confidence Bounds		Number of Observations
				Lower	Upper	
1	5	0.394	0.308	0.233	0.555	19688
2	16	0.660	0.148	0.583	0.738	82090
3	17	0.803	0.158	0.720	0.886	181643
4	18	0.817	0.170	0.728	0.906	303593
5	18	0.834	0.125	0.769	0.900	191524
6	18	0.856	0.124	0.792	0.921	192391
7	18	0.869	0.200	0.764	0.973	86021
8	18	0.888	0.044	0.865	0.912	84495
9	18	0.887	0.047	0.862	0.911	24750
10	18	0.917	0.054	0.889	0.945	5569
11	18	0.937	0.045	0.913	0.960	395

Table A1-6. Different statistics for I-95 segments in Delaware during nighttime hours