Validation Report

Maryland, SPS-5

Task Order 11, CLIN 2
March 21 and 22, 2006

List of Tables

List of Figures

1 Executive Summary

A visit was made to the Maryland SPS-5 beginning on March 21 and continuing through March 22, 2006 for the purposes of conducting a field validation of the WIM system located on US 15 at milepost 4.7. The LTPP lane is the northbound lane of a two lane highway and only the LTPP lane is instrumented. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site was installed as part of the SPS WIM Phase II contract from October 17 to October 26, 2005. The site was subsequently calibrated by the vendor on December 1, 2005. Additional vendor validation testing occurred on February 28, 2006.

The sensors are installed in newly installed (Summer 2005) Portland concrete cement section 400 feet long. The WIM sensors are approximately 350 feet from the pavement transition.

The site is instrumented with IRD/PAT Traffic bending plate WIM sensors and WIM controller.

The agency uses the LTPP ETG version 2 algorithm to classify vehicles in the FHWA 13-bin classification scheme. In addition, the classification scheme includes a class 15 for unclassified vehicles.

This site meets LTPP precision requirements for weight, speed and spacing.

This site meets the overall classification requirement of less than two percent unclassified. However, it does not meet the less than two percent trucks misclassified criteria.

The majority of vehicles that were misclassified were Class 3s, Class 4s and Class 5s that were being misidentified within the category of light single unit vehicles, i.e. 3s classified as 5s, Class 4s classified as Class 5s, and 5s being classified as 3s.

The pavement condition appeared to be satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly. A visual survey determined that there is no discernable bouncing or avoidance by trucks in the sensor area.

It was observed during the validation that the LTPP lane is utilized by a small number of southbound traveling vehicles for passing.

The validation used the following trucks:

1) 3S2 with air suspension tandems loaded to 70,700 lbs; the "golden" truck.
2) 3S2 with air suspension tandems loaded to 66,690 lbs; the "partial" truck.

The validation speeds ranged from 43 to 56 miles per hour. The pavement temperatures ranged from 25 to 57 degrees Fahrenheit.

Table 1-1 Post-Validation results – 240500 – 22-Mar-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	2.5 ± 7.5%	Pass
Tandem axles	±15 percent	2.9 ± 6.5%	Pass
GVW	±10 percent	2.8 ± 6.2%	Pass
Speed	±1 mph [2 km/hr]	0.1 ± 0.8 mph	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads and the field validation procedures do not include verification of that information.

Table 1-2 Results Based on ASTM E-1318-02 Test Procedures

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

2 Corrective Actions Recommended

The system algorithm needs to be reviewed to determine the cross-misclassification of Class 3, 4 and 5 vehicles. No other corrective actions are required at this site at this time.

3 Post Calibration Analysis

This final analysis is based on test runs conducted on March 22, 2006 from mid-morning to mid-afternoon at test site 240500 on US 15. This SPS-5 site is at milepost 4.7 and is located in the northbound lane of a two-lane facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1. 3S2 with a tractor having an air suspension tandem and trailer with standard rear tandem and air suspension loaded to 70,700 lbs.
2. 3S2 with a tractor having an air suspension tandem and trailer with standard rear tandem and air suspension loaded to 66,690 lbs.

Each truck made a total of 22 passes over the WIM scale at speeds ranging from approximately 45 to 55 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 25 to 57 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

As shown in Table 3-1 this site meets all LTPP requirements for research quality data.

Table 3-1 Post-Validation Results - 240500 – 22-Mar-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	2.5 ± 7.5%	Pass
Tandem axles	±15 percent	2.9 ± 6.5%	Pass
GVW	±10 percent	2.8 ± 6.2%	Pass
Speed	±1 mph [2 km/hr]	0.1 ± 0.8 mph	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

The test runs were conducted primarily during the mid-morning to mid-afternoon hours, resulting in a range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into 3 speed groups and 3 temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs.

The speed groups were divided as follows: Low speed - 40 to 46 mph, Medium speed - 47 to 52 mph and High speed - 53+ mph. The three temperature groups were created by splitting the runs between those at 20 to 42 degrees Fahrenheit for Low temperature, 43 to 50 degrees Fahrenheit for Medium temperature and 50 to 60 degrees Fahrenheit for High temperature.

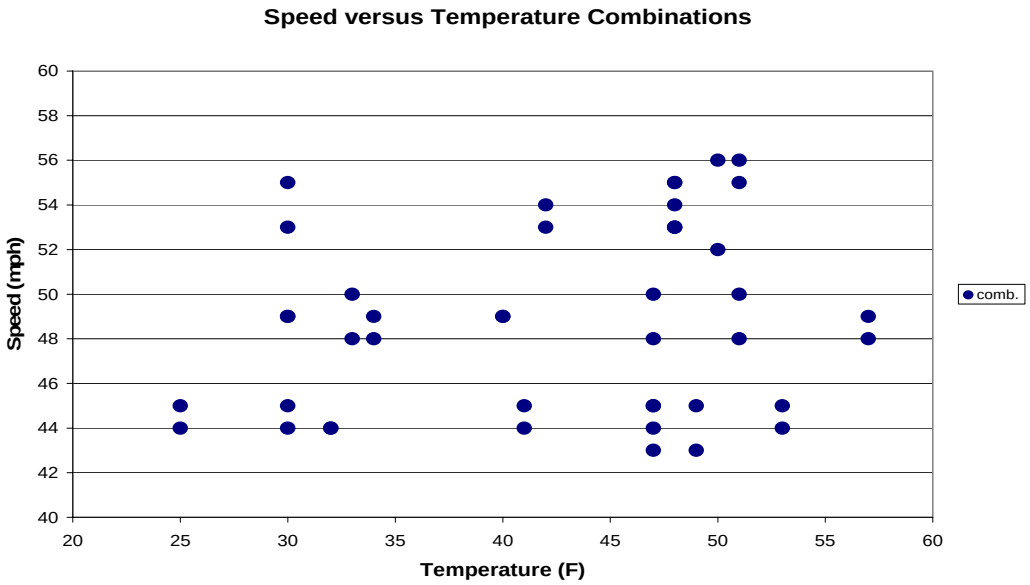

Figure 3-1 Post-Validation Speed-Temperature Distribution – 240500 – 22-Mar-2006

A series of graphs was developed to investigate visually any sign of a relationship between speed or temperature and the scale performance. Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole.

From Figure 3-2 it can be seen that the GVW error estimate of the WIM equipment is greater at the low and medium speeds when compared to the high speeds. The scatter appears to be consistent over the entire range of speeds.

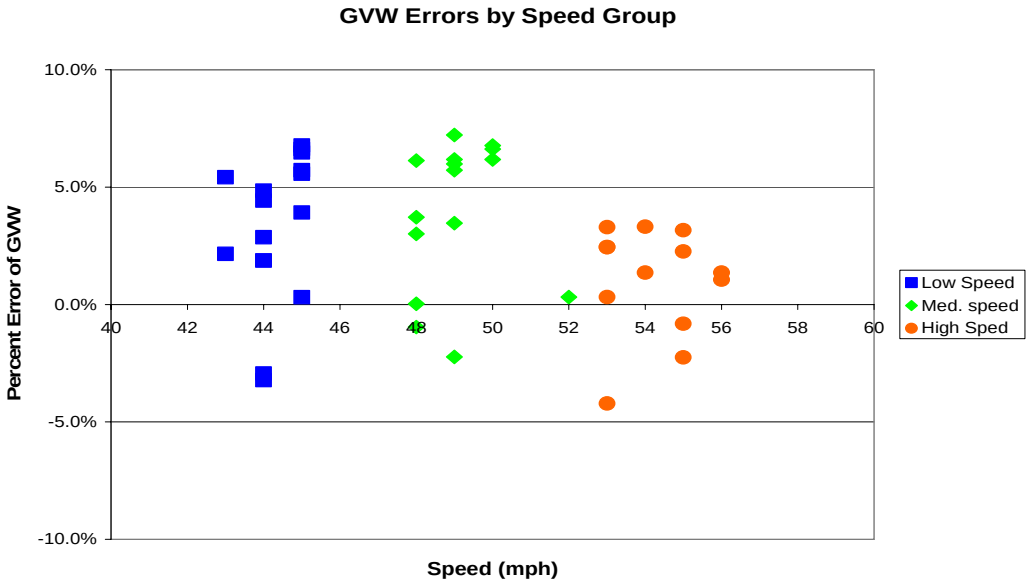

Figure 3-2 Post-validation GVW Percent Error vs. Speed– 240500 –22-Mar-2006

Figure 3-3 shows the relationship between temperature and GVW percentage error. The graph illustrates that there does not appear to be a relationship between GVW error and pavement temperature.

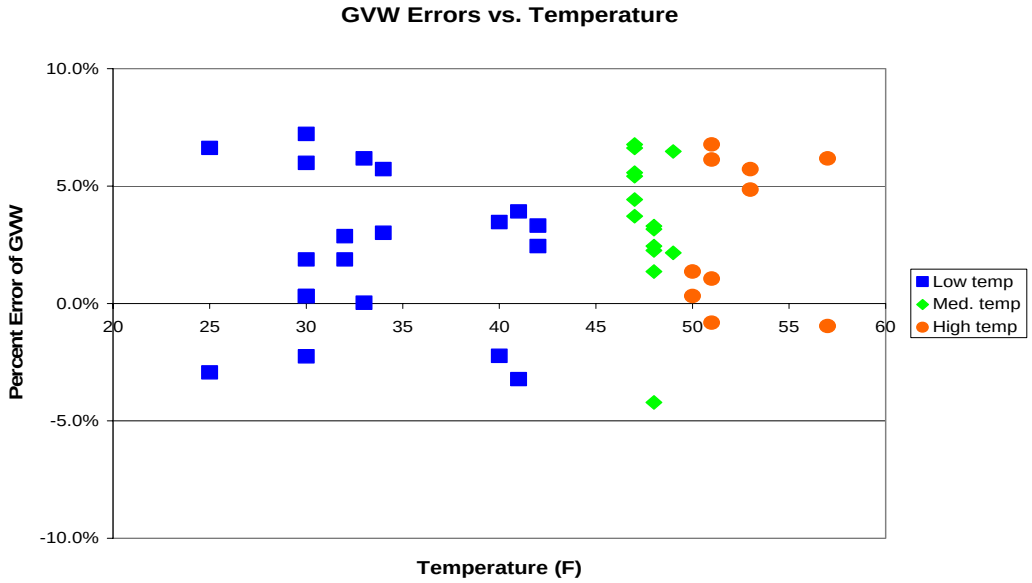

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature– 240500 – 22-Mar-2006

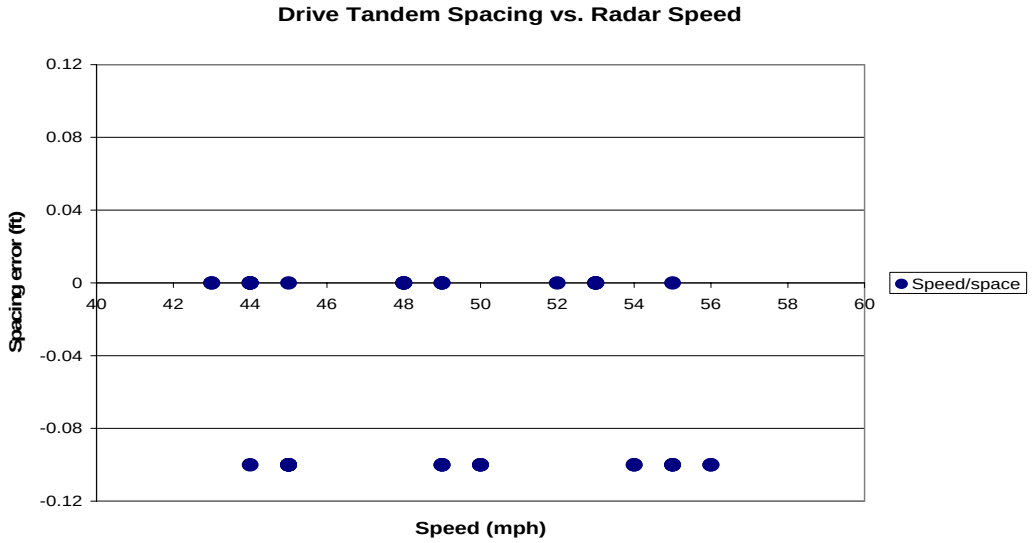

Figure 3-4 Post-Validation Spacing vs. Speed - 240500 – 22-Mar-2006

Figure 3-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations.

Axle spacing errors appear to be consistent throughout the test truck speed range and are limited to maximums of about 1.2 inches (0.1 feet). Vehicle speeds appear to have no effect on the error of measured axle spacing.

3.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 20 to 42 degrees Fahrenheit for Low temperature, 43 to 50 degrees Fahrenheit for Medium temperature and 50 to 60 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 240500 –22-Mar-2006

Element	95% Limit	Low Temp. 20 - 42 °F	Medium Temp. 43 - 50 °F	High Temp. 50 - 60 °F
Steering axles	±20 %	2.3 ± 8.1%	2.8 ± 8.8%	2.6 ± 7.4%
Tandem axles	±15 %	2.2 ± 6.9%	3.7 ± 5.9%	3.1 ± 7.2%
GVW	±10 %	2.2 ± 6.8%	3.5 ± 6.1%	3.0 ± 7.0%
Speed	±1 mph	0.1 ± 0.5 mph	0.2 ± 1.3 mph	0.0 ± 1.1 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

From Table 3-2 it appears that changes in temperature do not significantly affect mean errors of weight estimates. The scatter of GVW errors appears to remain consistent throughout the entire temperature range.

Figure 3-5 shows the distribution of GVW errors versus temperature by truck. The GVW results for the Golden truck (squares) and the partially loaded truck (diamonds) indicate a lack of relationship between the GVW mean error and the pavement temperature.

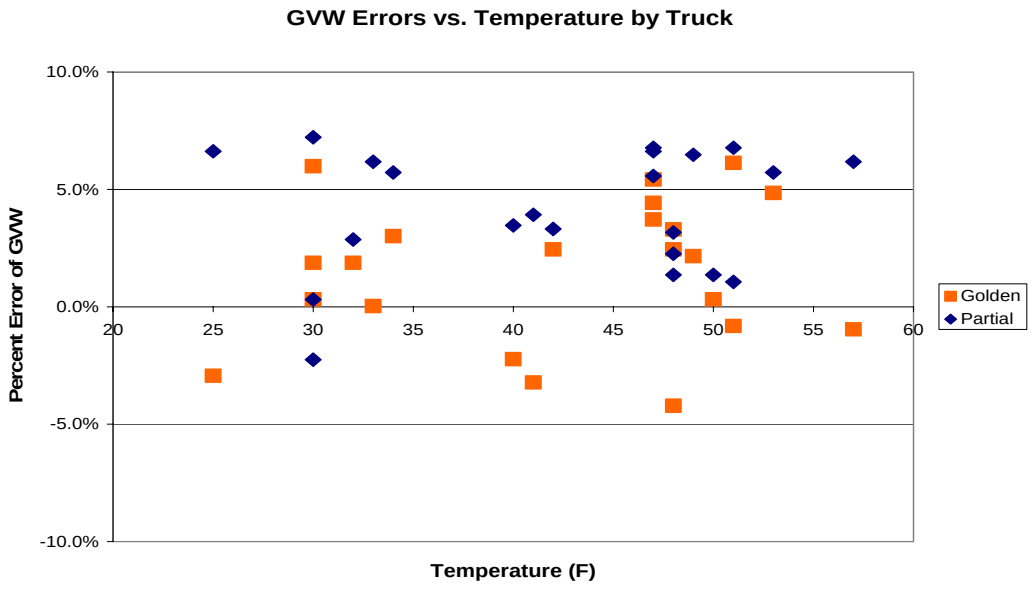

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 240500 – 22-Mar-2006

Figure 3-6 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The figure illustrates a tendency to overestimate weights of steering axles by this WIM equipment at all temperatures.

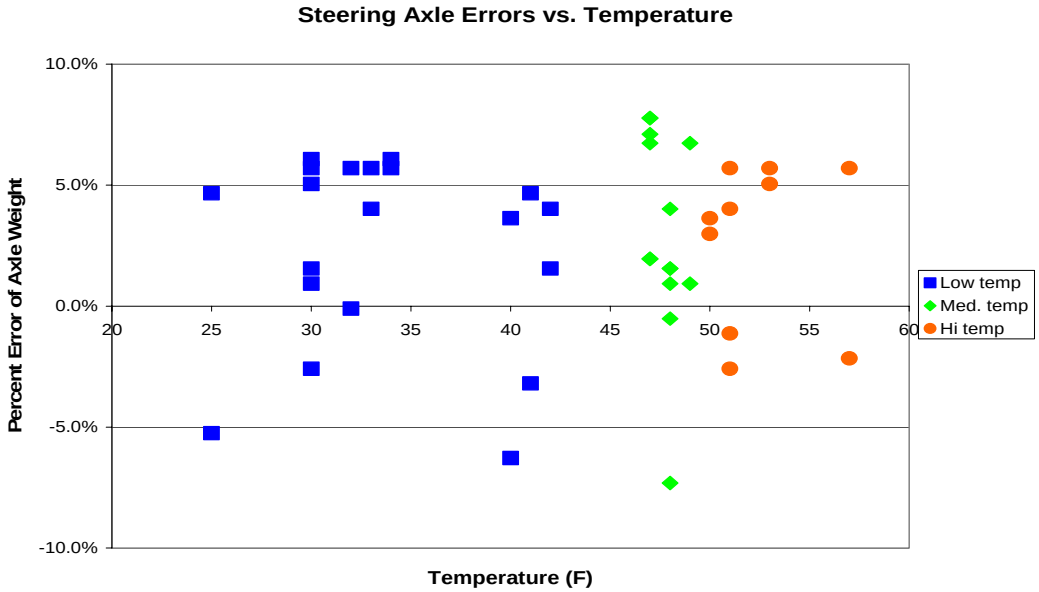

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group - 240500 –22-Mar-2006

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 40 to 46 mph, Medium speed - 47 to 52 mph and High speed - 53+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 240500 – 22-Mar-2006

Element	95% Limit	Low Speed 40 to 46 mph	Medium Speed 47 to 52 mph	High Speed 53+ mph
Steering axles	±20 %	3.3±7.8%	3.7±7.6%	0.2±6.9%
Tandem axles	±15 %	3.4±6.6%	3.8±7.1%	1.1±4.9%
GVW	±10 %	3.3±6.6%	3.9±6.7%	1.0±5.0%
Speed	±1 mph	0.0±0.8 mph	0.2±0.9 mph	0.1±1.1 mph
Axle spacing	± 0.5 ft	0.0±0.1 ft	0.0±0.1 ft	-0.1±0.1 ft

From Table 3-3 it appears that the mean error and the scatter of error for all weights decline at high speeds.

Figure 3-7 illustrates the tendency of the WIM equipment to report a greater mean error and with a wider scatter of error at low and medium speeds when compared to high speeds.

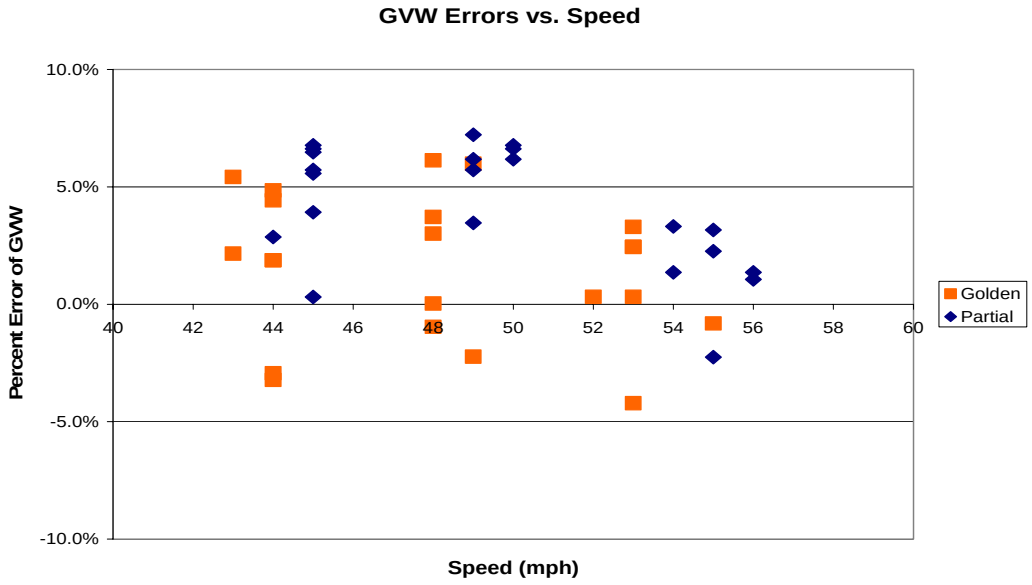

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 240500 –22-Mar-2006

Figure 3-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. Figure 3-8 shows how the WIM equipment generally overestimates the steering axle weights at low and medium speeds. Variability of error also appears to be greater at the low and medium speeds when compared with high speed error variability

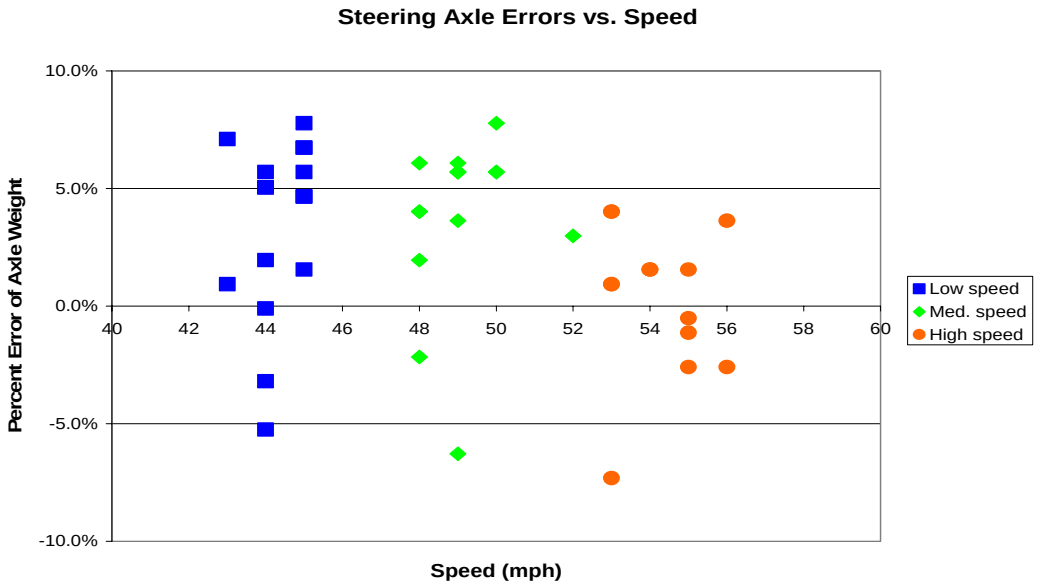

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group- 240500 –22-Mar-2006

3.3 Classification Validation

The agency uses the LTPP ETG version 2 algorithm to classify vehicles in the FHWA 13-bin classification scheme. In addition, the classification scheme includes a class 15 for unclassified vehicles.

A sample of 84 trucks and 7 hours of data was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 7.8% and is driven by class 3, 4, and 5 misclassifications.

Table 3-4 Truck Misclassification Percentages for 240500 - 22-Mar-2006

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100%	5	20%	6	0%
7	N/A				
8	0%	9	0%	10	N/A
11	N/A	12	N/A	13	N/A

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them are matches, the error rate is 25 percent.

The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 3-5 Truck Classification Mean Differences for 240500 - 22-Mar-2006

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	-100	5	25	6	0
7	N/A				
8	0	9	0	10	N/A
11	N/A	12	N/A	13	N/A

These error rates are normalized to represent how many vehicles of the class are expected to be over or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual "hundred observed". Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many more than those that might actually present exist. N/A means no vehicles of the class recorded by either the equipment or the observer.

The class 3, 4, and 5 misclassification problem is not significant enough to fail the site as providing research quality data.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 standard for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads, and the validation does not include that information.

Table 3-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

4 Pavement Discussion

The pavement condition did not influence truck movement across the sensors. This pavement was installed and ground within the past year. It was checked using the LTPP straightedge (20-foot) method prior to site installation.

4.1 Profile analysis

Upon receipt of post-WIM installation profile data, it will be processed and an amended report submitted.

4.2 Distress survey and any applicable photos

During a visual survey of the pavement no distresses that would influence truck movement across the WIM scales were noted.

4.3 Vehicle-pavement interaction discussion

A visual observation of the trucks as they approach, transverse and leave the sensor area did not indicate any visible motion of the trucks that would affect the performance of the WIM scales. Trucks appear to track down the wheel path and daylight cannot be seen between the tires and any of the sensors for the equipment. It was observed that the northbound lane is sometimes used by southbound traffic for passing, resulting in class 15 designations for those vehicles passing over the WIM scales in the opposite direction.

5 Equipment Discussion

The traffic monitoring equipment at this location includes IRD/PAT Traffic bending plate WIM sensors and WIM controller. These sensors are installed ten feet apart in a staggered configuration in a Portland concrete cement pavement. The roadway outside this short section is asphalt. The Portland concrete cement pavement has been colored to match the asphalt.

All equipment and sensors were installed from October 17 to October 26, 2005 as part of the SPS WIM Phase II contract.

5.1 Pre-Evaluation Diagnostics

A complete electronic and electrical check of all system components including in-road sensors, electrical power, and telephone service were performed immediately prior to the validation. All sensors and system components were found to be within operating parameters.

5.2 Calibration Process

The equipment required no iterations of the calibration process between the initial 40 runs and the final 40 runs.

Due to the mean values of the pre-validation test results, it was decided that a calibration of the equipment would not significantly improve the accuracies of the WIM system so a calibration of the equipment was deemed unnecessary.

5.3 Summary of Traffic Sheet 16s

This is a new installation. There is no prior validation information available for this equipment. Validation information from the current validation is included in Table 5-1 below. All information prior to March 21, 2006 is for a different piece of equipment. The date for 1999 was provided by the agency.

Table 5-1 Classification Validation History - 240500 –22-Mar-2006

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Class 10	
11/12/1999	Parallel Classifiers	77	132	178	10	0
3/7/2003						
5/24/2004						
1/4/2005	Manual	0	0	-2		
03/21/2006	Manual	-3.6	16.7	55.6		0.0
03/22/2006	Manual	0.0	0.0	25.0		0.0

Table 5-2 has the information found in TRF_CALIBRATION_WIM for site visits and Sheet 16s submitted for this validation. The June 12, 2001 validation was an LTPP pilot study for the SPS WIM study.

Table 5-2 Weight Validation History - 240500 –22-Mar-2006

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
11/12/1999	Traffic Stream (25)			
6/12/2001	Test Trucks (2)			
4/30/2002	Test Trucks (2)	-0.1 (11.5)	5.9 (12.9)	
5/7/2003	Test Trucks (1)	10.6 (18.8)	6.5 (21.1)	
5/24/2004	Test Trucks (1)	2.3 (3.7)	1.1 (10.2)	
03/21/2006	Test Trucks (2)	1.0 (2.6)	1.1 (4.2)	0.9 (2.8)
03/22/2006	Test Trucks (2)	2.8 (3.1)	2.5 (3.7)	2.9 (3.3)

5.4 Projected Maintenance/Replacement Requirements

The system algorithm at this site needs to be reviewed to correct the Class 3, Class 4 and Class 5 cross-misclassification problem. There are no other corrective actions required at this site.

Under a separate LTPP contract, this site is to be visited semi-annually for routine preventive equipment diagnostics and inspection.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted March 21, 2006 from the mid-morning to mid-afternoon hours at test site 240500 on US-15. This SPS-5 site is at

milepost 4.7 on the northbound lane of a two-lane facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1. 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and air suspension loaded to 70,620 lbs.
2. 3S2 with a tractor having an air suspension tandem and trailer with standard rear tandem and air suspension loaded to 66,450 lbs.

For the initial validation each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 43 to 55 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 37 to 58 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 6-1.

As shown in Table 6-1 this site meets all LTPP requirements for research quality data.

Table 6-1 Pre-Validation Results - 240500 – 21-Mar-2006

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	1.1 ± 8.5%	Pass
Tandem axles	±15 percent	0.9 ± 5.5%	Pass
GVW	±10 percent	1.0 ± 5.3%	Pass
Speed	±1 mph [2 km/hr]	0.1 ± 0.8 mph	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

The test runs were conducted primarily during the mid-morning to mid-afternoon hours, resulting in a range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into 3 speed groups and 3 temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that a range of speed and temperature combinations was achieved although the range of temperatures was not as great as desired.

The speed groups were divided as follows: Low speed - 40 to 46 mph, Medium speed - 47 to 52 mph and High speed - 53+ mph. The three temperature groups were created by splitting the runs between those at 30 to 42 degrees Fahrenheit for Low temperature, 43 to 50 degrees Fahrenheit for Medium temperature and 50 to 60 degrees Fahrenheit for High temperature.

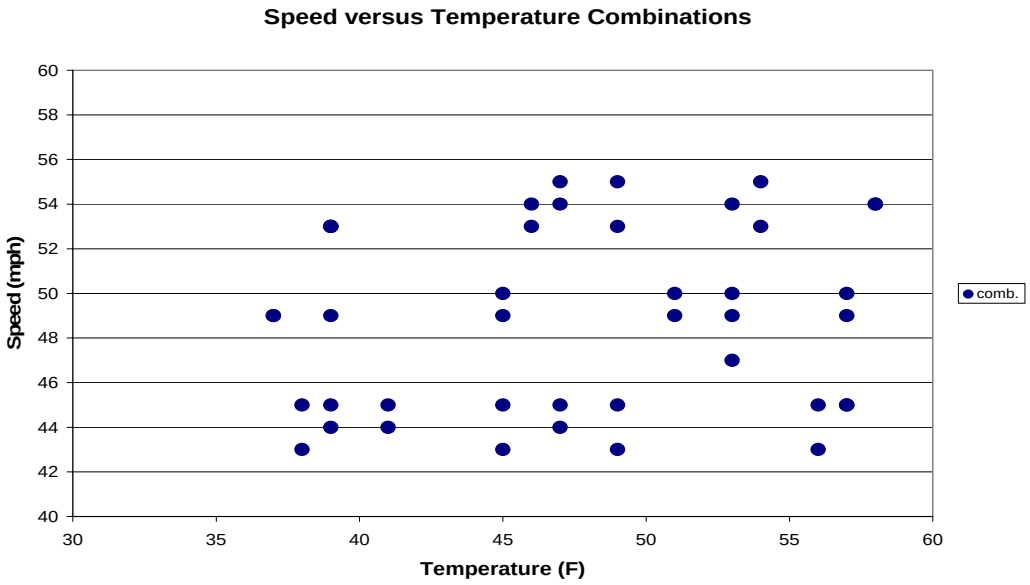

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 240500 – 21-Mar-2006

A series of graphs was developed to investigate visually for any sign of any relationship between speed or temperature and the scale performance.

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The equipment appears to overestimate the GVW at the low and medium speeds. Variability in GVW error appears to remain consistent throughout the entire speed range.

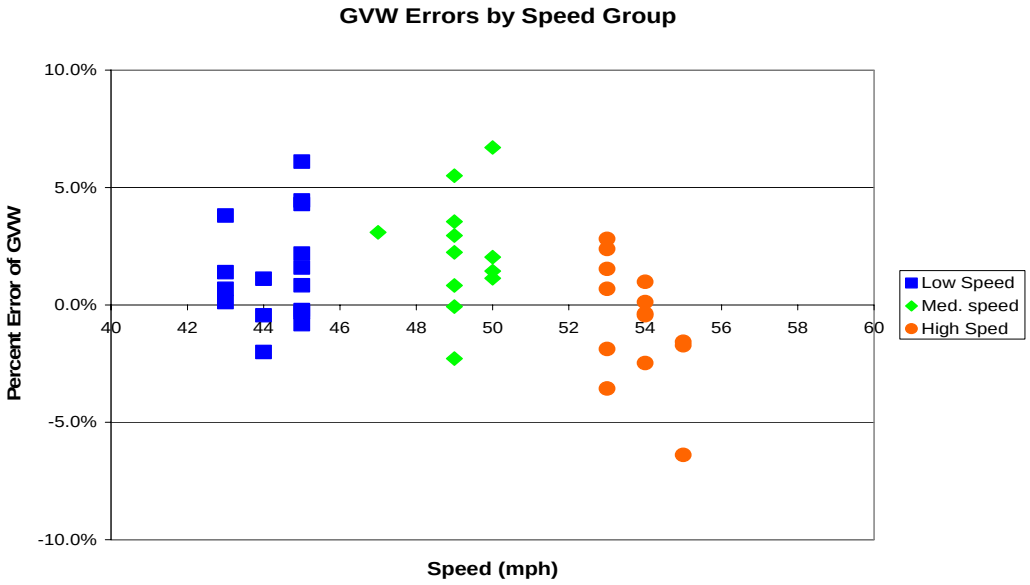

Figure 6-2 Pre-validation GVW Percent Error vs. Speed– 240500 –21-Mar-2006

Figure 6-3 shows the relationship between temperature and GVW percentage error. There does not appear to a relationship between GVW error and temperature at this site.

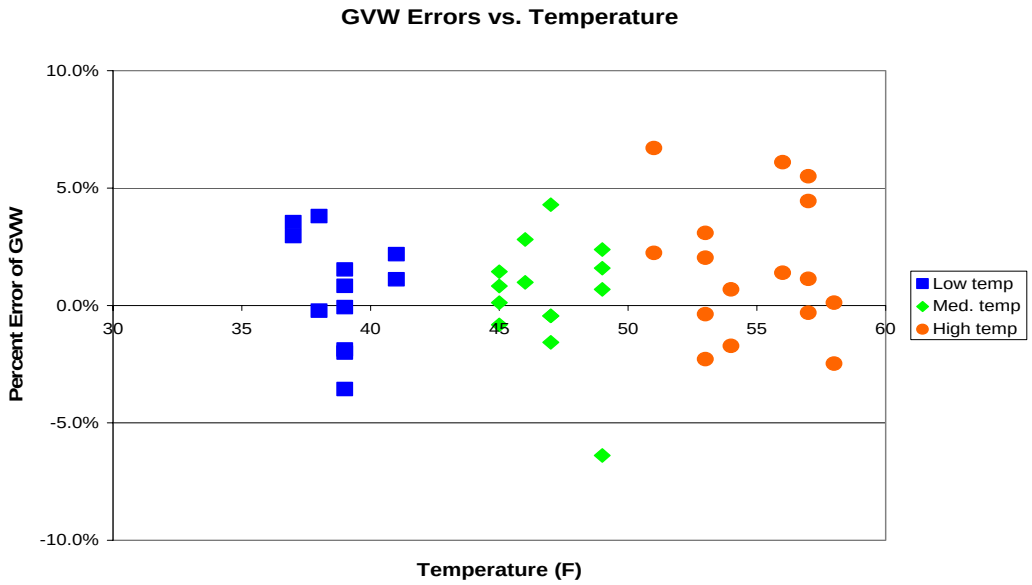

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature - – 240500 –21-Mar-2006

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. This figure indicates that there is no effect from speed on the ability of the WIM equipment to measure axle spacing.

Figure 6-4 Pre-Validation Spacing vs. Speed - 240500 – 21-Mar-2006

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 30 to 42 degrees Fahrenheit for Low temperature, 43 to 50 degrees Fahrenheit for Medium temperature and 50 to 60 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin - 240500 –21-Mar-2006

Element	95% Limit	Low Temperature 30 to 42 °F	Medium Temperature 43 to 50 °F	High Temperature 50 to 60 °F
Steering axles	±20 %	1.6 ± 10.2%	0.3 ± 10.2%	1.3 ± 7.4%
Tandem axles	±15 %	0.6 ± 4.7%	0.4 ± 5.5%	1.6 ± 6.3%
GVW	±10 %	0.7 ± 5.1%	0.4 ± 5.4%	1.6 ± 6.2%
Speed	±1 mph	0.3 ± 1.4 mph	0.1 ± 0.6 mph	0.0 ± 0.5 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

As shown in Table 6-2, mean error and variability in error for tandem and GVW weights are fairly consistent over the course of the entire speed range, with only a moderate increase in overestimation as the temperature increases. When compared with tandem and GVW error variability, steering axle error variability is higher at low and medium temperatures.

Figure 6-5 shows the distribution of GVW errors versus temperature by truck. The WIM equipment appears to generally overestimate the GVW for both trucks over the course of the entire temperature range.

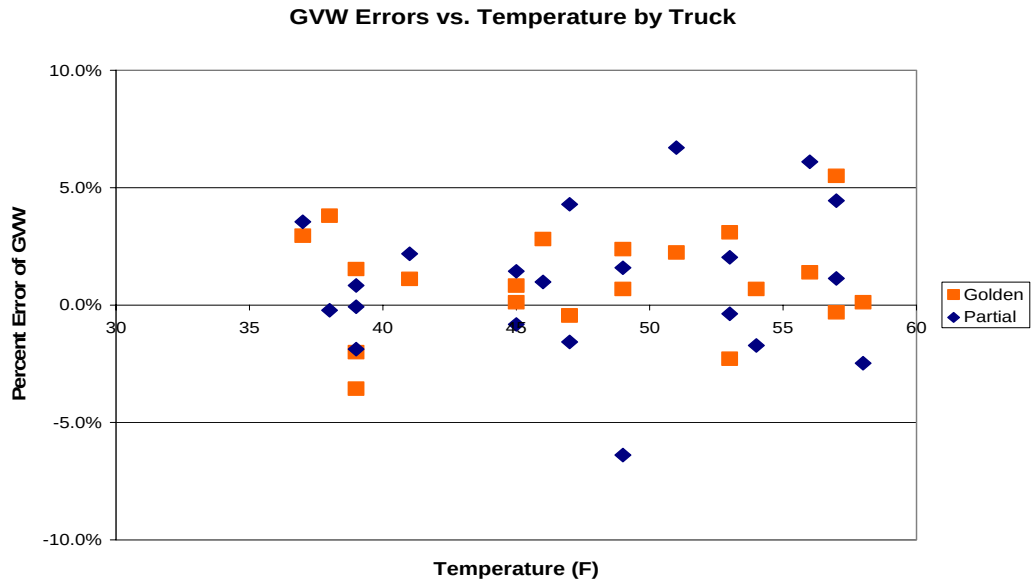

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 240500 –21-Mar-2006

Figure 6-6 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. From the figure it can be seen that the equipment consistently overestimates steering axle weights at all temperatures. Variability of error appears to be consistent throughout the entire temperature range.

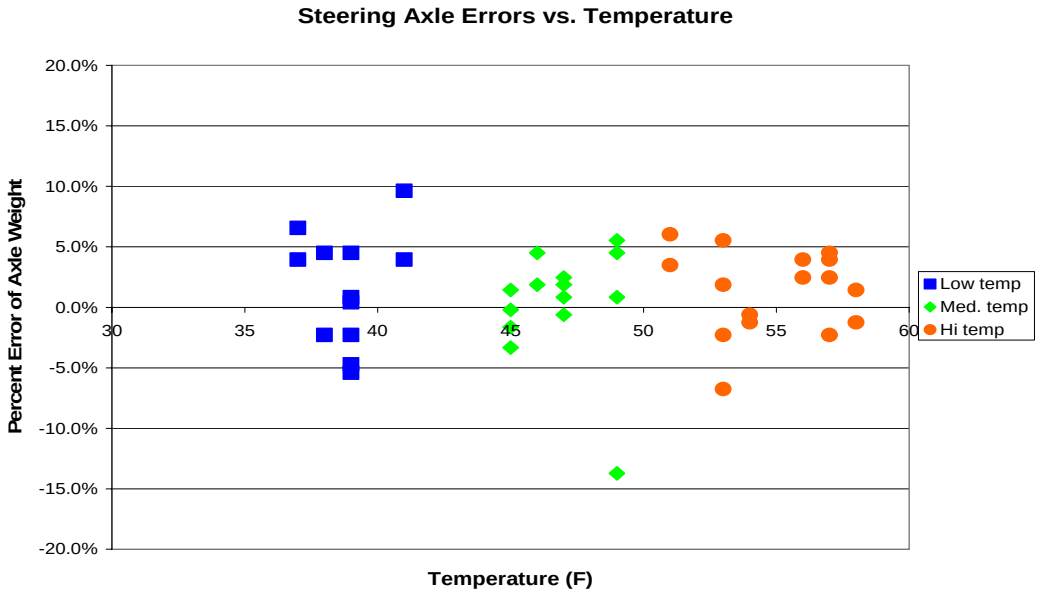

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group - 240500 –21-Mar-2006

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed - 40 to 46 mph, Medium speed – 47 to 52 mph and High speed - 53+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 240500 –21-Mar-2006

Element	95% Limit	Low Speed 40 to 46 mph	Medium Speed 47 to 52 mph	High Speed 53+ mph
Steering axles	±20 %	2.2 ± 6.7%	1.8 ± 8.9%	-0.8 ± 10.7%
Tandem axles	±15 %	1.3 ± 5.0%	2.3 ± 5.2%	-0.7 ± 5.2%
GVW	±10 %	1.4 ± 4.7%	2.3 ± 5.3%	-0.7 ± 5.3%
Speed	±1 mph	0.2 ± 1.2 mph	0.0 ± 0.0 mph	0.1 ± 0.8 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

From Table 6-3 it appears that for the truck population as a whole, errors in weight estimates progress from an overestimation at low and medium speeds, to a slight underestimation at high speeds. Variability in error is consistent for tandem and GVW errors. Variability in steering axle weight estimate errors appears to be higher at all speeds.

Figure 6-7 illustrates the tendency of the errors in GVW to decrease at higher speeds for both the Golden (squares) and partially loaded (diamonds) trucks. Variability in GVW error for both trucks appears to remain consistent throughout the entire speed range.

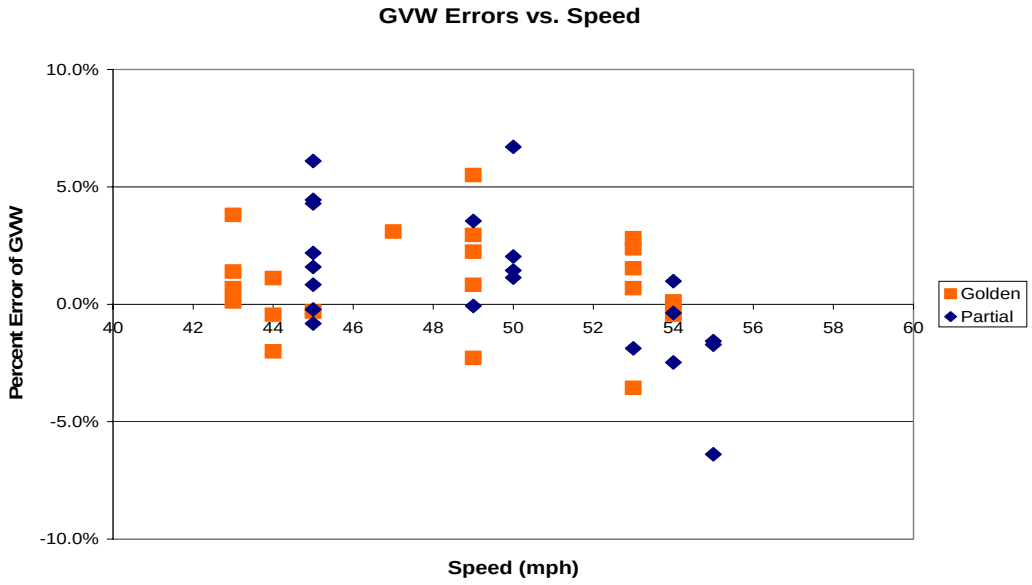

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 240500 –21-Mar-2006

Figure 6-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are

associated only with Class 9 vehicles. From the figure it can be seen that steering axle estimates progress from a slight overestimation at lower speeds to a slight underestimation at higher speeds. Variability in steering axle error appears to remain consistent throughout the entire speed range.

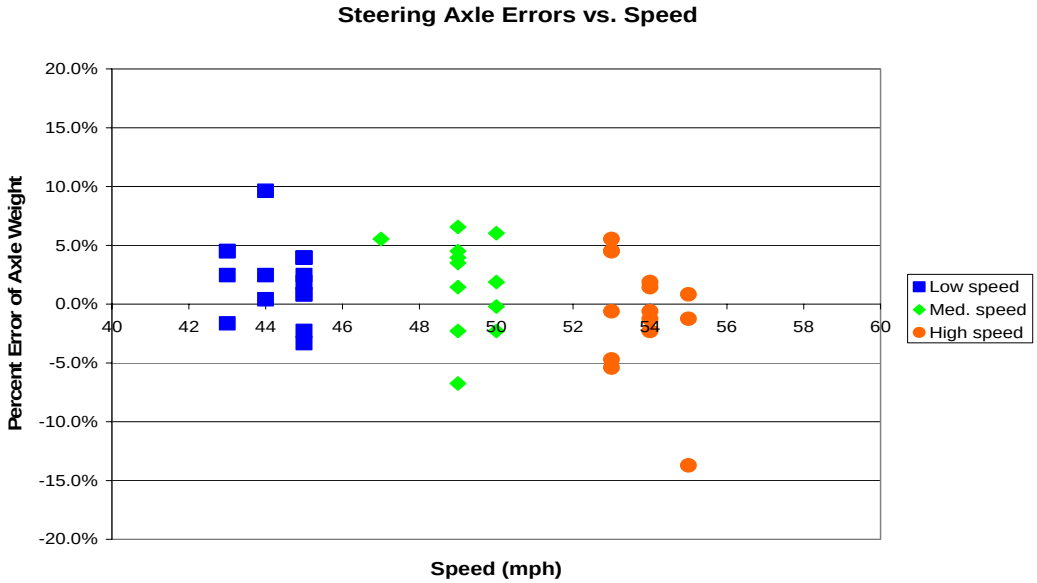

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 240500 –21-Mar-2006

6.3 Classification Validation

The agency uses the LTPP ETG version 2 algorithm to classify vehicles in the FHWA 13-bin classification scheme. In addition the classification scheme includes a class, 15, for unclassified vehicles.

A sample of 66 trucks and 7 hours of data was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is 24.1%.

Table 6-4 Truck Misclassification Percentages for 240500 - 21-Mar-2006

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100%	5	39%	6	0%
7	N/A				
8	14%	9	4%	10	N/A
11	N/A	12	N/A	13	N/A

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them are matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 6-5 Truck Classification Mean Differences for 240500 - 21-Mar-2006

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	-41	5	55	6	0
7	N/A				
8	16	9	-4	10	N/A
11	N/A	12	N/A	13	N/A

These error rates are normalized to represent how many vehicles of the class are expected to be over- or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual "hundred observed". Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many more than those that might actually present exist. N/A means no vehicles of the class recorded by either the equipment or the observer. The class 3, 4, and 5 misclassification problem is not significant enough to fail the site as providing research quality data.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads and the validation does not include that information.

Table 6-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GWV	± 10%	100%	Pass

7 Data Availability and Quality

As of March 31, 2006 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements.

Data that has validation information available has been reviewed in light of the patterns present in the two weeks immediately following a validation/calibration activity. A determination of research quality data is based on the consistency with the validation pattern. Data that follows consistent and rational patterns in the absence of calibration information may be considered nominally of research quality pending validation information with which to compare it. Data that is inconsistent with expected patterns and has no supporting validation information is not considered research quality.

The amount and coverage for the site is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 2000 to 2003 have a sufficient quantity to be considered complete years of classification data. Only 2001 to 2003 have sufficient quantity of weight data for complete years. **Together with the previously gathered calibration information it can be seen that at least 5 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research quality data.**

Table 7-1 Amount of Traffic Data Available 240500 –21-Mar-2006

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1994	154	6	Full Week	156	6	Full Week
1995	1	1	Weekday(s)	None		
1996	63	3	Full Week	None		
1999	11	2	Weekday(s)	19	2	Full Week
2000	299	12	Full Week	37	3	Full Week
2001	327	12	Full Week	353	12	Full Week
2002	340	12	Full Week	343	12	Full Week
2003	316	12	Full Week	316	12	Full Week

GVW graphs and characteristics associated with them are used as data screening tools. As a result classes constituting more that ten percent of the truck population are considered major sub-groups whose evaluation characteristics should be identified for use in screening. The typical values to be used for reviewing incoming data after a validation are determined starting with data from the day after the completion of a validation.

Class 9s and Class 5s constitute more than 10 percent of the truck population. Based on the data collected from the end of the last calibration iteration the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the RSC on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 7-2 is generated with a column for every vehicle class 4 or higher that represents 10 percent or more of the truck (class 4-20) population. In creating Table 7-2 the following definitions are used:

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.
- Class 9 unloaded peak is the bin less than 44,000 pounds with the greatest percentage of trucks.
- Class 9 loaded peak is the bin 60,000 pounds or larger with the greatest percentage of trucks.
- For all other trucks the typical axle configuration is used to determine the maximum allowable weight based on 18,000 pounds for single axles and 34,000 pounds for tandem axles. A ten percent cushion above that maximum is used to set the overweight threshold.
- For all other trucks in the absence of site specific information the computation of under weights assumes the power unit weighs 10,000 pounds and each axle on a trailer 5,000 pounds. Ninety percent of the total for the unloaded configuration is the value below which a truck is considered under weight.
- For all trucks other than class 9s that have a bi-modal distribution the unloaded peak is defined to be in a bin less than or equal to half of the allowable maximum weight.
- For all trucks other than class 9s that have a bi-modal distribution the loaded peak is defined to be in a bin greater than or equal to half of the allowable maximum weight.

There may be more than one bin identified for the unloaded or loaded peak due to the small sample size collected after validation. Where only one peak exists, the Peak rather than a loaded or unloaded peak is identified. This may happen with single unit trucks. It is not expected to occur with combination vehicles.

Table 7-2 GVW Characteristics of Major sub-groups of Trucks - 240500 –21-Mar-2006

Characteristic	Class 9	Class 5
Percentage Overweights	0.6%	0%
Percentage Underweights	0.3%	28.1%
Unloaded Peak	36,000 lbs	
Loaded Peak	72,000 lbs	
Peak		12,000 lbs

The expected percentage of unclassified vehicles is 1.8%. This is based on the percentage of unclassified vehicles in the post-validation data download. It is believed that the majority of unclassified vehicles are due to southbound vehicles using the northbound lane for passing.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-4. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. They should however provide a sense of the

statistics expected when SPS comparison data is computed for the post-validation Sheet 16.

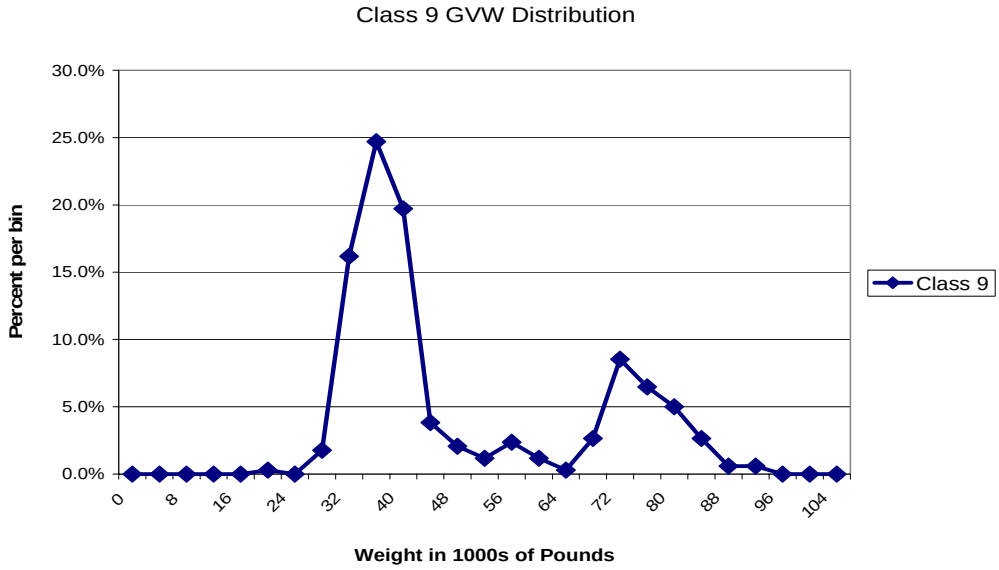

Figure 7-1 Expected GVW Distribution Class 9 – 240500 –22-Mar-2006

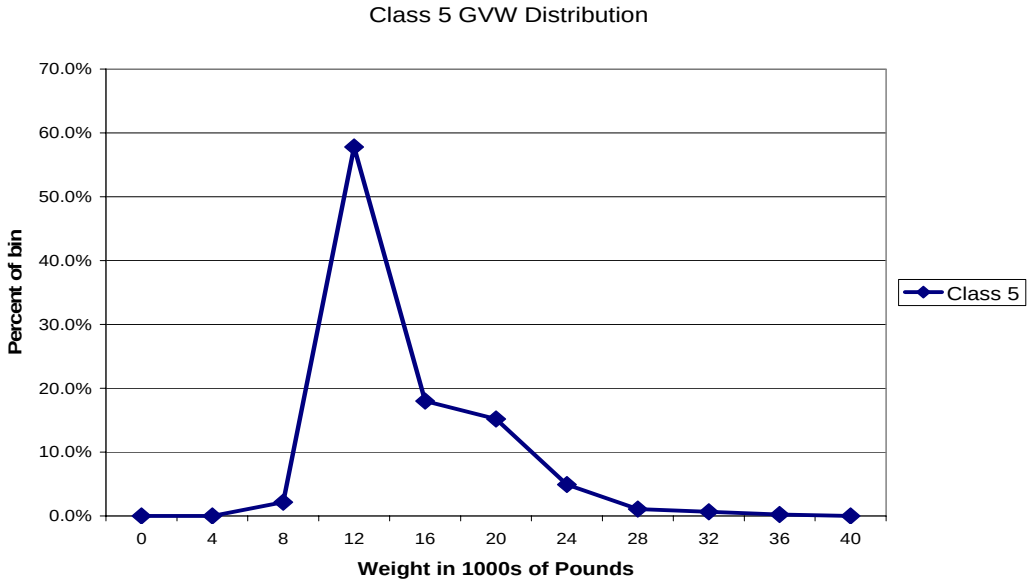

Figure 7-2 Expected GVW Distribution Class 5 – 240500 –22-Mar-2006

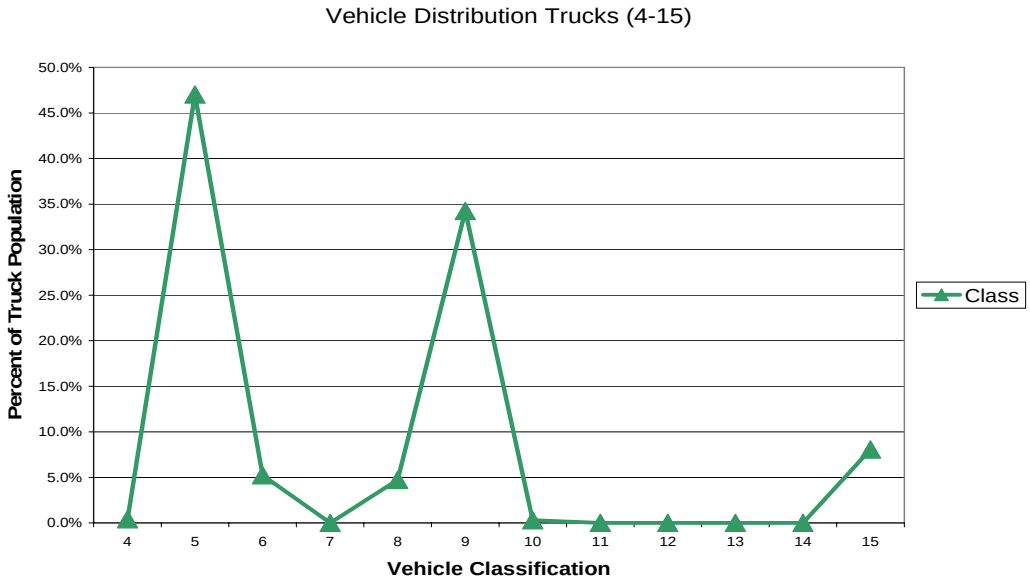

Figure 7-3 Expected Vehicle Distribution - 240500 –22-Mar-2006

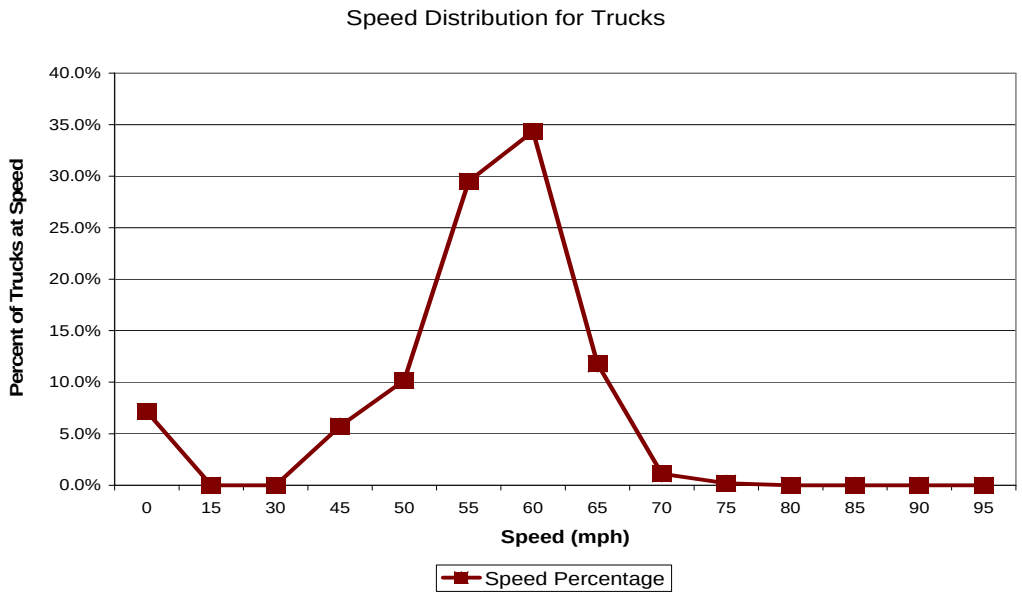

Figure 7-4 Expected Speed Distribution - 240500 –22-Mar-2006

8 Data Sheets

The following is a listing of data sheets incorporated in Appendix A.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 3S2 partially loaded air suspension (4 pages)

Sheet 20 – Speed and Classification verification – pre-validation (2 pages)

Sheet 20 – Speed and Classification verification – post-validation (2 pages)

Sheet 21 – Pre-validation (6 pages)
Sheet 21 – Post-validation (6 pages)

Test Truck Photographs (8 pages)

Site Factors (1 page)

Site Controller Algorithm (10 pages)

9 Updated handout guide and Sheet 17

A copy of the handout has been included following page 25. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

A current Sheet 18 indicating the contacts, conditions for assessments and evaluations has been attached following the updated handout guide.

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Maryland

SHRP ID: 0500

Photos

1. General Information

SITE ID: *240500*

LOCATION: *US-15 North, milepost 4.62, approximately 10 miles south of Frederick, Maryland.*

VISIT DATE: *Beginning Tuesday, March 21, 2006 at 9:00 a.m.*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*
William (Joey) Comer, 301-210-5105, wjcomer@mactec.com

Highway Agency: *Albin Blazucki, 410-321-3118, ablazucki@sha.state.md.us*

Barry Balzanna, 410-545-5509, bbalzanna@sha.state.md.us

Michael Baxter, 410-545-5511, mbaxter@sha.state.md.us

Jim Brown, 301-624-8252, jbrown@sha.state.md.us

FHWA COTR: *Debbie Walker, 202-493-3068, deborah.walker@fhwa.dot.gov*

FHWA Division Office Liaison: *Azmat Hussain, azmat.hussain@fhwa.dot.gov*

LTPP SPS WIM WEB PAGE: *http://www.tfhrc.gov/pavement/ltpp/spstraffic/index.htm*

3. Agenda

BRIEFING DATE: *None Requested*

ON SITE PERIOD: *Beginning Tuesday, March 21, 2006 at 9:00 am.*

TRUCK ROUTE CHECK: *Completed at Phase II Site Evaluation visit – See Truck Route*

4. Site Location/ Directions

NEAREST AIRPORT: *Washington Dulles International Airport (26.4 miles).*

DIRECTIONS TO THE SITE: *Approximately 10 miles south of Frederick, Maryland on US 15.*

MEETING LOCATION: *On site beginning at 9:00 am.*

WIM SITE LOCATION: *Located in the northbound driving lane of US 15, milepost 4.62. GPS: 39°19.839'N, 77°30.610'W.*

WIM SITE LOCATION MAP:

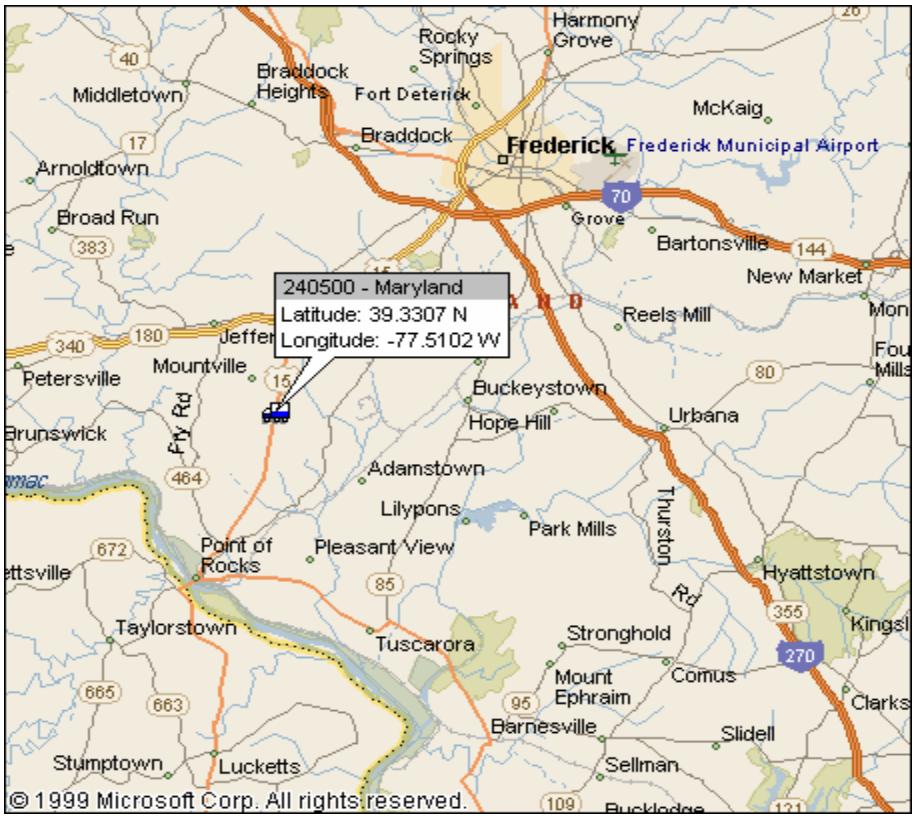

Figure 4-1 - WIM Site Location - 240500 - Maryland

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *New Market Certified Scales, I-70, Eastbound side, approximately 8.5 miles east of Frederick, MD.*

Trucks –
Company – William S. Fout, Inc., Frederick, MD
Contact – Jerry Pulliam, 301-662-1989

TRUCK ROUTE:

Southbound turnaround – 3.2 miles to Point of Rocks Road
Northbound turnaround - .6 miles to Mountville Road (MD 28)
Total distance = 7.6 miles
Total time = 10 minutes

Southbound vehicles make a left on Point of Rocks road followed by a left on to Ballenger Creek Pike, a left on East Basford Road and a right on to US 15 northbound. After crossing the scale the trucks proceed northbound on US 15 to interchange at MD 28 (Mountville Road).

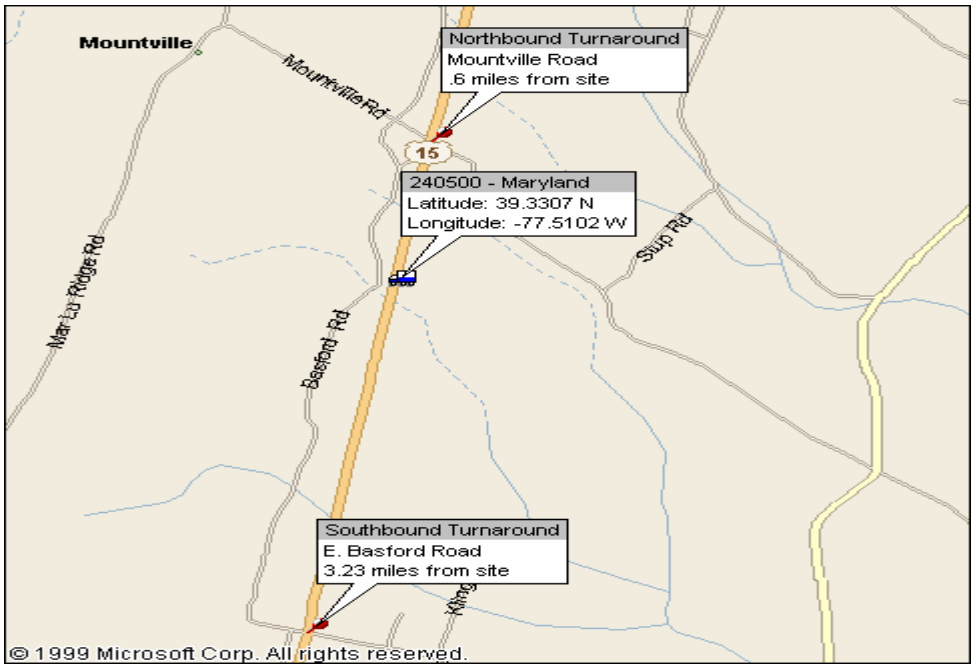

Figure 5-1 - Truck Route - 240500 - Maryland

6. Sheet 17 – Maryland (240500)

1.* ROUTE ___US-15_____ MILEPOST ___4.62____LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___<1%_____ % Sag vertical Y / N
Nearest SPS section upstream of the site __0_5_6_1___
Distance from sensor to nearest upstream SPS Section __4_5_0__ ___ ft.

3.* LANE CONFIGURATION
Lanes in LTPP direction _1___ Lane width __12__ ft

Median - 1 – painted
2 – physical barrier
3 – grass
4 – none

Shoulder - 1 – curb and gutter
2 – paved AC
3 – paved PCC
4 – unpaved
5 – none

Shoulder width __10 __ ft

4.* PAVEMENT TYPE _____Portland concrete cement_____ _____ _____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _____ Distress Photo_____
Date _____ Distress Photo_____
Date _____ Distress Photo_____

6. * SENSOR SEQUENCE
_____Loop – Bending Plate – Bending Plate – Loop_____
7. * REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / N
distance _____
Intersection/driveway within 300 m downstream of sensor location Y / N
distance _____
Is shoulder routinely used for turns or passing? Y / N

9. DRAINAGE (*Bending plate and load cell systems only)*
1 – Open to ground
2 – Pipe to culvert
3 – None

Clearance under plate ___ __6_. _0__ in
Clearance/access to flush fines from under system Y / N

10. * CABINET LOCATION

Same side of road as LTPP lane Y/N Median Y/N Behind barrier Y/N
Distance from edge of traveled lane __1_8___ ft
Distance from system __3_1_ __ ft
TYPE _____

CABINET ACCESS controlled by LTPP / STATE / JOINT?
Contact - name and phone number __Debbie Walker – 202-493-3061_
Alternate - name and phone number _____

11. * POWER

Distance to cabinet from drop __3_6_5___ ___ ftOverhead / underground / solar / AC in cabinet?
Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop __3_6_5__ ___ ft Overhead / under ground / cell?
Service provider ____Verizon____Site Phone Number __301-874-0732__

13. * SYSTEM (software & version no.)- _____
Computer connection – RS232 / Parallel port / USB / Other _____

14. * TEST TRUCK TURNAROUND time __10___ minutes DISTANCE __6.7__ mi.

15. PHOTOS FILENAME

Power source _Power_Service_Box_TO_11_24_2.55_0500_03_21_06.jpg__
Phone source _Telephone_Service_TO_11_24_2.55_0500_03_21_06.jpg__
Cabinet exterior _Cabinet_Exterior_TO_11_24_2.55_0500_03_21_06.jpg____
Cabinet interior _ Cabinet_Interior_TO_11_24_2.55_0500_03_21_06.jpg__
Weight sensors _ Leading_Weight_Sensor_TO_11_24_2.55_0500_03_21_06.jpg
_Trailing_Weight_sensor_TO_11_24_2.55_0500_03_21_06.jpg_
Classification sensors _____
Other sensors _Leading_Loop_Sensor_TO_11_24_2.55_0500_03_21_06.jpg_
Trailing_Loop_Sensor_TO_11_24_2.55_0500_03_21_06.jpg___
Description____Loop Sensors_____
Downstream direction at sensors on LTPP lane
_Downstream_TO_11_24_2.55_0500_03_21_06.jpg
Upstream direction at sensors on LTPP lane
_Upstream_TO_11_24_2.55_0500_03_21_06.jpg__

COMMENTS _____

_____All amenities approximately 8 miles north of site in Frederick._____

COMPLETED BY __Dean J. Wolf, MACTEC Engineering & Consulting, Inc_____

PHONE __301-210-5105_____ DATE COMPLETED _0_3_ /_2_1_ / _2_0_0_6_

Sketch of equipment layout

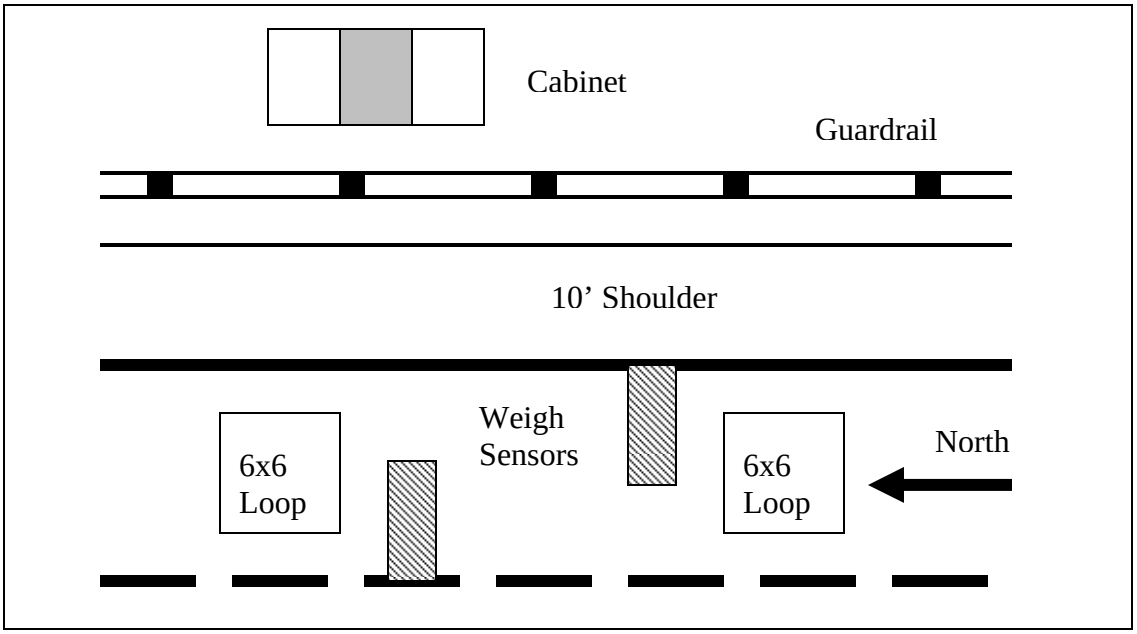

Figure 6-1 - TO_11_24_2.55_0500_Equipment_Layout

Photo 1 – Cabinet_Exterior_TO_11_24_2.55_0500_03_21_06.jpg

Photo 2 – Cabinet_Interior_TO_11_24_2.55_0500_03_21_06.jpg

Photo 3 – Power_Service_TO_11_24_2.55_0500_03_21_06.jpg

Photo 4 – Telephone_Service_TO_11_24_2.55_0500_03_21_06.jpg

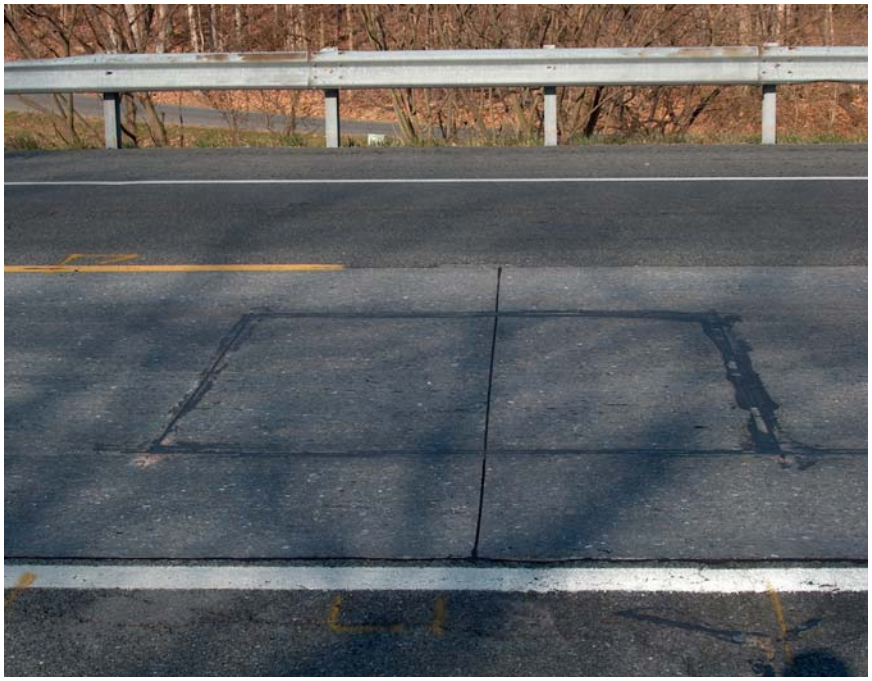

Photo 5 – Leading_Loop_Sensor_TO_11_24_2.55_0500_03_21_06.jpg

Photo 6 – Leading_Weight_Sensor_TO_11_24_2.55_0500_03_21_06.jpg

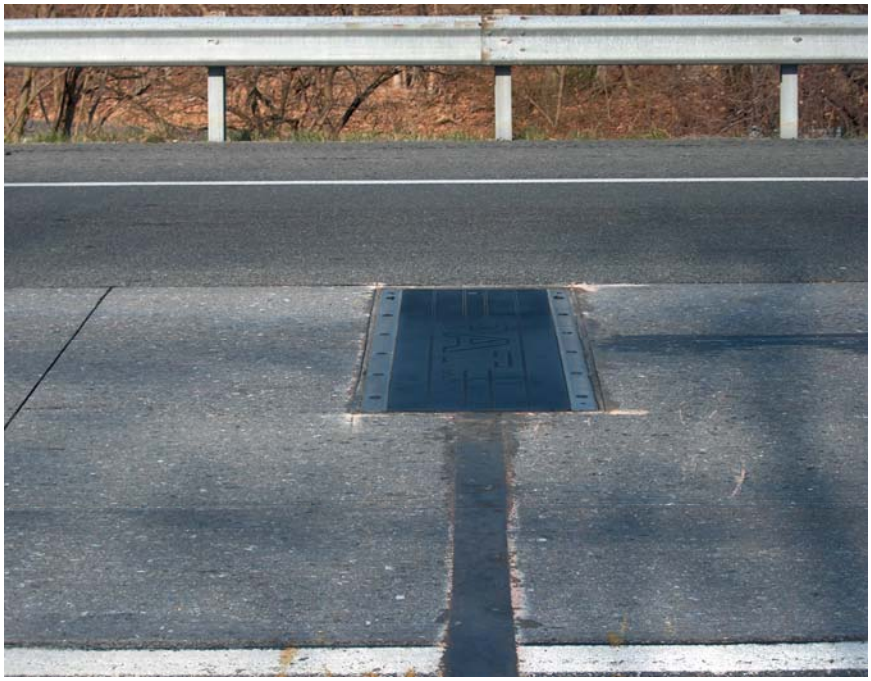

Photo 7 – Trailing_Weight_Sensor_TO_11_24_2.55_0500_03_21_06.jpg

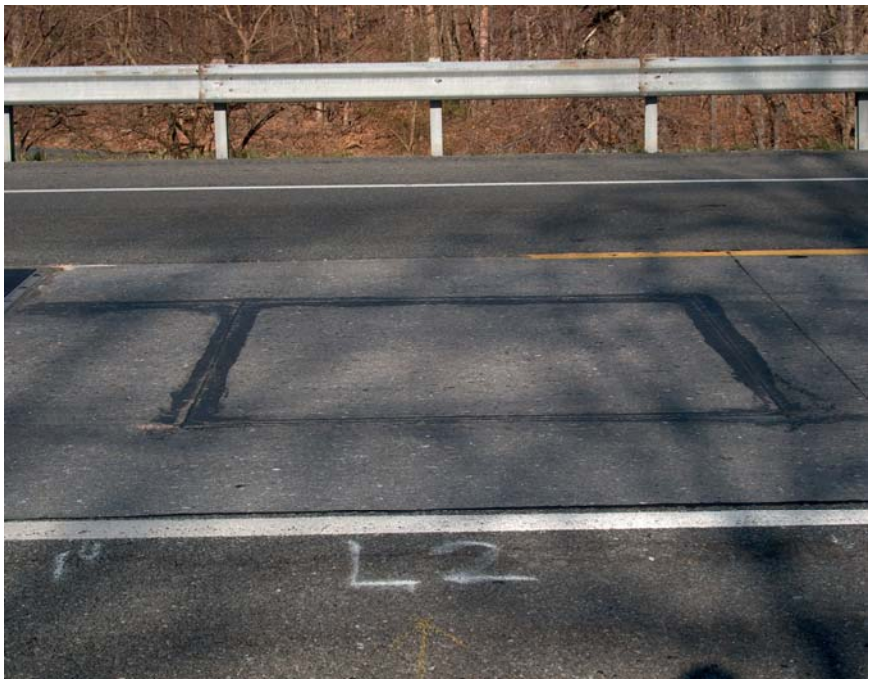

Photo 8 – Trailing_Loop_Sensor_TO_11_24_2.55_0500_03_21_06.jpg

Photo 9 – Upstream_TO_11_24_2.55_0500_03_21_06.jpg

Photo 10 – Downstream_TO_11_24_2.55_0500_03_21_06.jpg

SHEET 18	STATE CODE [2 4]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0500]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) [03/ 22 / 2005]

Rev. 05/18/04

1. DATA PROCESSING –
   a. Down load –
      □ State only
      □ LTPP read only
      □ LTPP download
      x LTPP download and copy to state

   b. Data Review –
      □ State per LTPP guidelines
      □ State – □ Weekly □ Twice a Month □ Monthly □ Quarterly
      x LTPP

   c. Data submission –
      □ State – □ Weekly □ Twice a month □ Monthly □ Quarterly
      x LTPP

2. EQUIPMENT –
   a. Purchase –
      x LTPP
      □ State

   b. Installation –
      □ Included with purchase
      □ Separate contract by State
      □ State personnel
      x LTPP contract

   c. Maintenance –
      x Contract with purchase
      □ Separate contract LTPP
      □ Separate contract State
      □ State personnel

   d. Calibration –
      x Vendor
      □ State
      □ LTPP

   e. Manuals and software control –
      □ State
      x LTPP

   f. Power –
      i. Type –
         □ Overhead
         x Underground
         □ Solar

ii. Payment –
x State
□ LTPP
□ N/A

g. Communication –
i. Type –
x Landline
□ Cellular
□ Other

ii. Payment –
x State
□ LTPP
□ N/A

3. PAVEMENT –
a. Type –
x Portland Concrete Cement
Asphalt Concrete

b. Condition –
□ Always new
□ Replacement as needed
x Grinding and maintenance as needed
□ Maintenance only
□ No remediation

c. Profiling Site Markings –
i. Short wave –
Permanent
x Temporary

ii. Long wave –
Permanent
x Temporary

4. ON SITE ACTIVITIES –
a. WIM Validation Check - advance notice required _1 week days / weeks

b. Notice for straightedge and grinding check - _1 week_ days / weeks
i. On site lead –
□ State
x LTPP

ii. Accept grinding –
□ State
x LTPP

c. Calibration Routine –
x LTPP – □ Semi-annually □ Annually
□ State per LTPP protocol – □ Semi-annually □ Annually
□ State other – _____

d. Test Vehicles
i. Trucks –

1st – Air suspension 3S2	□ State	x LTPP
2nd – _____	□ State	x LTPP
3rd – _____	□ State	x LTPP
4th – _____	□ State	x LTPP

ii. Loads – □ State x LTPP

iii. Drivers – □ State x LTPP

e. Contractor(s) with prior successful experience in WIM calibration in state:

_____

f. Access to cabinet
i. Personnel Access –
□ State only
□ Joint
x LTPP

ii. Physical Access –
□ Key
□ Combination

g. State personnel required on site – □Yes xNo

h. Traffic Control Required – □Yes xNo

i. Enforcement Coordination Required – □Yes xNo

j. Authorization to calibrate site –
□ State only
x LTPP

5. SITE SPECIFIC CONDITIONS –
a. Funds and accountability – _____

b. Reports – _____

c. Other – State requests 1 week notice of site validation/calibration activities. No site activities during inclement weather. Safety vests to be worn on site.

6. CONTACTS –

a. Equipment (operational status, access, etc.) –

Name: N/A_____ Phone: _____

Agency: _____

b. Data Processing and Pre-Visit Data –

Name: ___N/A_____ Phone: _____

Agency: _____

c. Construction schedule and verification –

Name: _____N/A_____ Phone: _____

Agency: _____

d. Test Vehicles (trucks, loads, drivers) –

Name: _____N/A_____ Phone: _____

Agency: _____

e. Traffic Control –

Name: If needed: Al Blazucki_____ Phone: 410-321-3118

Agency: MD State Hgwy. Admin._____

f. Enforcement Coordination –

Name: _____N/A_____ Phone: _____

Agency: _____

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [_M_D_-_5__] *STATE CODE [_2_4__] *SHRP SECTION ID [__0_5_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_3_ / _2_1_ / _2_0_0_6_]

2. * TYPE OF EQUIPMENT CALIBRATED _x_ WIM __ CLASSIFIER ___ BOTH

3. * REASON FOR CALIBRATION
   ____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
   ____ EQUIPMENT REPLACEMENT ____ TRAINING
   ____ DATA TRIGGERED SYSTEM REVISION __x_ NEW EQUIPMENT INSTALLATION
   ____ OTHER (SPECIFY) _____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
   ____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO __x_ BENDING PLATES
   ____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS ____ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER ___IRD_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.** CALIBRATION TECHNIQUE USED:
   ____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __x_ TEST TRUCKS
   __ __ __ NUMBER OF TRUCKS COMPARED __2__ __ NUMBER OF TEST TRUCKS USED
   __2_1 __ PASSES PER TRUCK

		TRUCK TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	__9_____	__1_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	__9_____	__1_____
3 - OTHER (DESCRIBE)	3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW __ ___ __1 . 0_ STANDARD DEVIATION __ _2 . 6_
   DYNAMIC AND STATIC SINGLE AXLES ___ ___ __1 . 1_ STANDARD DEVIATION __ _4 . 2_
   DYNAMIC AND STATIC DOUBLE AXLES ___ ___ __0 . 9_ STANDARD DEVIATION __ _2 . 8_

8. ___3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ___45_, _50_, _55___ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) __3_9_0_0 ___ . ___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) __N__
   IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: _____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
   ___ VIDEO _x_ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME __x_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ___0_. 0_ ____ FHWA CLASS ____ ____ ____ ____ ____
   *** FHWA CLASS 8 ___0_. 0_ ____ FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ ___0 . 0___

PERSON LEADING CALIBRATION EFFORT: _Dean J. Wolf, MACTEC Engineering & Consulting, Inc._____
CONTACT INFORMATION: ___(301) 210-5105_____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__M_D_-_5__] *STATE CODE [_2_4__] *SHRP SECTION ID [__0_5_0_0__]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_3_ / _2_2_ / _2_0_0_6_]

2. * TYPE OF EQUIPMENT CALIBRATED _x_ WIM __ CLASSIFIER ___ BOTH

3. * REASON FOR CALIBRATION
   ____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
   ____ EQUIPMENT REPLACEMENT ____ TRAINING
   ____ DATA TRIGGERED SYSTEM REVISION __x_ NEW EQUIPMENT INSTALLATION
   ____ OTHER (SPECIFY) _____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
   ____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO __x_ BENDING PLATES
   ____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS ____ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER ___IRD_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.** CALIBRATION TECHNIQUE USED:
   ____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __x_ TEST TRUCKS

   __ __ __ NUMBER OF TRUCKS COMPARED __2__ __ NUMBER OF TEST TRUCKS USED

   __2_1 __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	__9_____	__1_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	__9_____	__1_____
3 - OTHER (DESCRIBE)	3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ ___ __2 . 8_ STANDARD DEVIATION __ _3 . 1_
   DYNAMIC AND STATIC SINGLE AXLES ___ ___ __2 . 5_ STANDARD DEVIATION __ _3 . 7_
   DYNAMIC AND STATIC DOUBLE AXLES ___ ___ __2 . 9_ STANDARD DEVIATION __ _3 . 3_

8. ___3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ___45_, _50_, _55___ _____ _____ _____ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) __3_9_0_0_ . ___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) __N__
   IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: _____
   _____
   _____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
   ___ VIDEO _x_ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME __x_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ___0_. 0_ ____ FHWA CLASS ____ ____ ____ ____ ____
   *** FHWA CLASS 8 ___0_. 0_ ____ FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ ___0 . 0___

PERSON LEADING CALIBRATION EFFORT: _Dean J. Wolf, MACTEC Engineering & Consulting, Inc._____
CONTACT INFORMATION: ___(301) 210-5105_____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	26
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	3/21/06

Rev. 08/31/01

PART I.

1.* FHWA Class 9 2.* Number of Axles 5

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A				D / C
B				D / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW _____ *b) Average Pre-Test Loaded weight _____
*c) Post Test Loaded Weight _____
*d) Difference Post Test – Pre-test _____

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional b) * Sleeper Cab? Y / N

9. a) * Make: INTERNATIONAL b) * Model: 9200i

10.* Trailer Load Distribution Description:

Concrete blocks distributed evenly over length of trailer

11. a) Tractor Tare Weight (units): _____

b). Trailer Tare Weight (units): _____

Sheet 19	* STATE_CODE	24
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	03/21/06

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 12.2 B to C 4.4 C to D 32.6 32.9

D to E 4.1 E to F _____

Wheelbased (measured A to last) 53.2 Computed _____

13. *Kingpin Offset From Axle B (units) + 2.1 (_____)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	SPRING, 2 FULL LEAVES
B	11R22.5	AIR
C	11R22.5	AIR
D	11R24.5	AIR
E	11R24.5	AIR
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E
_____	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
_____	_____	_____	_____	_____

Sheet 19	* STATE_CODE	2
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	03/21/06

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE	24
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	03/21/06

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9820	16230	16230	14240	14240		70760
2	9820	16220	16220	14240	14240		70740
3	9880	16200	16200	14240	14240		70760
Average	9840	16220	16220	14240	14240		70750
	9680	16130	16130	14270	14270		70460

Table 6. Raw data – Axle scales – day 2 pre-weigh

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9860	16140	16140	14280	14280		70700
2	9880	16190	16190	14250	14250		70680
3	9800	16190	16190	14270	14270		70720
Average	9820	16173	16173	14267	14267		70700

Table 7. Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9580	16150	16150	14260	14260		70400
2							
3							
Average							

Measured By DJW Verified By _____

Sheet 19	* STATE_CODE	26
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	09 21 09

Rev. 08/31/01

PART I.

1.* FHWA Class 9 2.* Number of Axles 5

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A				D / C
B				D / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW _____ *b) Average Pre-Test Loaded weight _____
*c) Post Test Loaded Weight _____
*d) Difference Post Test – Pre-test _____

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional b) * Sleeper Cab? Y / N

9. a) * Make: KENWORTH b) * Model: T800

10.* Trailer Load Distribution Description:

concrete block on drive tandem
forklift over rear tandem

11. a) Tractor Tare Weight (units): _____
b). Trailer Tare Weight (units): _____

Sheet 19	* STATE_CODE	24
LTPP Traffic Data	* SPS PROJECT ID	0700
*CALIBRATION TEST TRUCK # 2	* DATE	03/21/06

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 15.4 B to C 4.6 C to D 33.8

D to E 4.2 E to F

Wheelbased (measured A to last) 58.0 Computed

13. *Kingpin Offset From Axle B (units) -2.3 ( )
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R24.5	Spring, 2 full leaves
B	11R24.5	Air
C	11R24.5	Air
D	11R22.5	Air
E	11R22.5	Air
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE	24
LTPP Traffic Data	* SPS PROJECT ID	0700
*CALIBRATION TEST TRUCK # 2	* DATE	03/21/06

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE	24
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 2	* DATE	03/21/06

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9740	13670	13670	14760	14760		66600
2	9680	13680	13680	14760	14760		66560
3	9680	13680	13680	14760	14760		66560
Average	9700	13680	13680	14760	14760		66570
	9540	13640	13640	14750	14750		66320

Table 6. Raw data – Axle scales – day 2 pre-weigh

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9760	~~14440~~ 13720	~~14440~~ 13720	~~14280~~ 14740	~~14280~~ 14740		66680 ~~70720~~
2	~~9760~~	~~14440~~ 13710	~~14440~~ 13710	~~14250~~ 14750	~~14250~~ 14750		66680 ~~70680~~
3	9760	~~14540~~ 13710	~~14690~~ 13710	~~14270~~ 14750	~~14270~~ 14750		66780 ~~70720~~
Average	9767	13713	13713	14747	14747		

Table 7. Raw data – Axle scales – post-test 14260 14260

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9600	13670	13670	14740	14760		66420
2							
3							
Average							

Measured By JW Verified By _____

Sheet 20	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
Speed and Classification Checks * 1 of* 2	* DATE	03/21/2006

Rev. 08/31/2001....

PRE-VALIDATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
59	6	7104	59	6	51	5	7326	51	5
52	9	7107	52	9	57	3	7329	57	3
49	5	7123	49	5	52	3	7333	52	3
65	9	7144	65	9	49	5	7335	49	5
57	9	7146	61	9	56	9	7342	56	9
54	9	7173	54	9	52	5	7345	52	3
60	9	7154	61	9	57	3	7365	57	3
60	9	7164	59	9	53	5	7325	57	3
53	5	7170	53	5	57	3	7339	56	3
55	5	7226	54	5	53	5	7326	52	3
57	8	7233	56	8	64	8	7398	63	9
54	5	7246	54	5	59	5	7403	56	3
58	5	7269	58	3	61	5	7420	61	5
57	5	7274	55	3	57	3	7428	55	3
59	5	7280	59	3	59	5	7438	59	3
62	3	7293	61	3	65	9	7438	65	9
62	5	7288	62	5	60	5	7451	61	5
59	5	7291	57	3	59	9	7470	59	9
52	3	7299	52	3	57	3	7479	58	3
58	3	7305	58	3	61	3	7482	61	3
62	5	7308	65	3	55	5	7486	55	3
53	5	7309	57	5	59	5	7492	59	4
56	3	7312	56	3	53	8	7493	53	8
60	6	7316	60	6	53	52	7495	51	3
59	5	7331	58	5	59	5	7500	59	5

Recorded by WLC Direction N Lane 1 Time from 2:30 to 3:15

Sheet 20	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
Speed and Classification Checks * 2 of* 2	* DATE	03/21/2006

Rev. 08/31/2001....

PRE-VALIDATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
67	3	7535	65	3	58	9	8059	58	9
59	9	7551	59	9	60	6	8113	61	6
56	5	7542	58	5	55	9	8117	55	9
57	8	7550	57	8	59	9	8119	59	9
54	9	7561	54	9	58	5	8129	58	5
57	9	7569	57	9	47	5	8116	46	5
58	3	7571	58	3	52	9	8147	51	5
55	8	7575	55	8	57	9	8166	57	9
48	3	7592	48	5	57	5	8173	56	5
54	3	7580	54	3	55	5	8215	54	5
49	5	7589	48	3	52	9	8274	52	9
49	3	7591	50	3	55	5	8279	53	5
49	9	7592	49	9	54	5	8291	54	5
55	5	7602	55	5	52	8	8304	51	8
62	3	7605	62	3	47	5	8317	47	5
60	5	7610	60	3	50	5	8336	50	5
60	5	7626	59	5	42	9	8357	42	9
57	3	7631	59	3	41	9	8358	41	9
52	5	7986	52	5	52	9	8396	50	9
57	5	7987	56	5	64	9	8452	63	9
54	5	7997	54	3	45	6	8470	44	6
60	3	8021	60	3	58	9	8493	59	9
61	9	8034	62	9	64	8	8507	63	8
57	9	8044	57	9	56	3	8514	57	3
59	9	8066	60	9	53	9	8521	53	9

Recorded by WAC Direction N Lane 1 Time from 3:15 to 4:00

Post - Validation

Sheet 20	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 1 of* 2	* DATE 03/22/2006

Rev. 08/31/2001....

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
59	6	14506	58	6	59	5	14700	58	5
52	8	14519	52	8	54	9	14703	55	9
54	9	14521	54	9	56	9	14709	56	9
43	9	14522	43	9	54	9	14722	55	9
45	9	14524	45	9	54	9	14727	53	9
53	9	14541	53	9	56	9	14736	56	9
48	9	14547	48	9	57	5	14739	57	5
50	5	14554	50	5	54	9	14740	54	9
55	9	14556	55	9	50	6	14751	50	6
58	5	14561	57	5	47	9	14753	47	9
55	5	14562	55	5	59	8	14762	58	8
62	9	14564	62	9	57	5	14779	56	5
55	5	14575	55	5	52	5	14791	53	5
53	9	14576	53	9	44	9	14804	44	9
60	5	14578	60	5	45	9	14805	45	9
49	9	14586	48	9	54	5	14976	54	5
50	9	14587	50	9	59	9	14992	58	9
62	5	14643	62	5	48	9	14994	48	9
57	6	14652	57	6	49	9	14995	49	9
52	9	14656	53	9	56	5	15053	56	5
57	6	14668	59	6	57	5	15057	56	5
55	9	14679	55	9	53	5	15060	53	5
57	9	14686	57	9	50	6	15065	50	6
57	5	14689	58	5	60	9	15073	60	9
53	9	14694	53	9	57	5	15077	57	5

Recorded by _____ Direction _____ Lane _____ Time from _____ to _____

Post - validation

Sheet 20	* STATE_CODE ____
LTPP Traffic Data	*SPS PROJECT_ID ____
Speed and Classification Checks * 2 of* 2	* DATE ____ / ____ / ____

Rev. 08/31/2001....

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
55	9	15078	54	9	38	9	15292	38	9
49	9	15156	49	9	47	3	15310	48	3
57	5	15160	57	4	45	3	15311	46	3
52	3	15172	52	3	54	3	15327	54	3
54	3	15177	54	3	50	6	15331	50	6
58	6	15186	59	6	52	9	15332	52	9
54	9	15189	54	9	42	5	15348	42	5
57	3	15193	57	3	38	3	15350	38	3
55	5	15195	55	3	54	9	15376	54	9
59	9	15208	59	9	55	6	15372	55	6
57	3	15208	58	3	59	5	15389	59	3
54	6	15213	54	6	62	9	15398	62	9
57	5	15217	56	5	59	5	15419	59	5
57	9	15224	57	9	60	5	15420	59	5
60	9	15226	60	9	49	6	15422	56	6
53	3	15231	54	3	55	5	15426	56	5
53	3	15234	52	3	54	6	15429	54	6
56	9	15253	50	9	49	5	15433	49	5
51	5	15256	52	3	46	5	15438	46	5
57	5	15259	57	3	63	5	15445	63	3
55	9	15266	55	9	49	6	15446	49	6
60	3	15293	60	3	59	9	15455	59	9
56	9	15274	56	9	59	9	15457	59	9
44	9	15276	45	9	61	9	15459	61	9
42	9	15278	43	9	57	5	15461	57	5

Recorded by _____ Direction ____ Lane ____ Time from _____ to _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 6	* DATE	03/21/2006

Rev. 08/31/2001

PRE - VALIDATION

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
38	43	1	1	9:59:35	5661	45	5.1/5.1	9.5/7.3	7.9/7.6	7.6/6.9	8.3/7.0		73.3	12.2	4.4	32	4.0	
38	45	2	1	9:59:50	5662	45	5.1/4.3	8.3/5.9	7.9/5.6	9.8/5.6	7.9/6.2		60.3	15.6	4.6	34.0	4.2	
37	49	1	2	10:11:36	5755	49	5.4/5.0	9.6/7.2	8.9/7.3	8.0/6.3	8.5/6.4		72.7	12.2	4.4	33.0	4.0	
37	49	2	2	10:11:53	5756	49	5.3/4.7	9.4/5.9	8.0/6.1	9.9/5.8	9.1/6.9		68.8	15.5	4.5	34.0	4.2	
39	53	1	3	10:22:37	5779	53	5.4/4.8	9.6/8.2	8.6/7.9	7.6/6.9	7.5/6.5		71.9	12.2	4.4	32.8	4.0	
39	53	2	3	10:22:53	5780	53	4.8/4.3	8.1/5.3	8.2/5.9	9.3/5.3	7.8/5.9		65.2	15.5	4.5	34.0	4.2	
41	44	1	4	10:35:52	5820	44	5.6/5.1	9.2/7.1	8.5/7.4	7.9/6.4	7.8/6.5		71.4	12.2	4.4	32.9	4.0	
41	45	2	4	10:36:10	5821	45	5.4/4.6	7.9/6.0	7.8/6.1	9.3/6.0	8.0/6.4		62.9	15.5	4.5	34.0	4.2	

Recorded by WJF

Checked by _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 2 of 6	* DATE	03 / 21 / 2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
45	49	1	5	10:46:20	5939	49	5.1 / 4.8	9.5 / 7.3	8.9 / 7.5	7.9 / 6.2	7.8 / 6.0		71.2	12.1	4.4	33.0	4.0	
45	50	2	5	10:46:32	5940	50	5.0 / 4.6	8.4 / 5.8	8.1 / 5.9	9.7 / 5.6	8.1 / 6.2		67.4	15.5	4.5	33.9	4.2	
42	54	1	6	10:52:08	5945	54	5.0 / 4.7	9.5 / 6.8	9.0 / 6.9	8.2 / 6.0	7.9 / 6.5		70.3	12.1	4.4	33	4.0	
42	55	2	6	10:53:18	5946	55	5.3 / 4.4	7.6 / 5.5	7.2 / 5.6	9.1 / 6.2	7.9 / 6.8		65.9	15.5	4.5	33.9	4.2	
39	44	1	7	11:02:36	6048	44	5.2 / 4.6	9.2 / 6.6	8.9 / 6.6	9.9 / 5.9	7.9 / 6.4		69.2	12.1	4.4	33.0	4.0	
39	45	2	7	11:08:02	6056	45	5.1 / 4.4	8.0 / 6.0	7.6 / 6.0	9.6 / 5.6	7.9 / 6.6		63.0	15.6	4.5	34.0	4.2	
35	53	1	8	11:13:48	6098	53	4.9 / 4.5	9.6 / 6.4	8.8 / 6.5	8.3 / 6.0	7.4 / 5.9		64.1	12.1	4.4	34.9	4.0	
39	49	2	8	11:13:53	6099	49	5.1 / 4.3	8.2 / 5.9	8.1 / 5.7	9.3 / 5.5	8.0 / 6.3		64.4	15.5	4.5	33.9	4.1	

Recorded by _____ Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 3 of 6	* DATE 03/21/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
49	53	1	9	11:38:56	6154	53	5.5 / 4.8	9.5 / 7.0	8.8 / 7.3	7.9 / 6.6	7.9 / 7.1		72.3	17.2	4.4	32.9	4.0	
49	55	2	9	11:38:05	6154	55	4.5 / 3.8	7.5 / 5.4	8.6 / 5.2	9.2 / 5.5	7.4 / 6.1		63.2	15.5	4.5	33.9	4.2	
45	43	1	10	11:38:00	6209	44	4.2 / 4.9	9.0 / 6.8	9.5 / 7.0	8.3 / 6.1	7.8 / 6.6		70.2	12.1	4.4	33.1	4.0	
45	45	2	10	11:38:16	6210	45	5.0 / 4.3	8.2 / 5.9	7.4 / 5.9	7.8 / 5.6	8.0 / 5.9		65.9	15.6	4.5	34.0	4.2	
49	43	1	11	12:40:59	6533	43	5.3 / 4.9	9.4 / 7.2	8.9 / 7.1	7.7 / 5.9	7.4 / 6.4		71.1	12.2	4.4	32.9	4.0	
48	45	2	11	12:41:03	6534	45	5.2 / 4.5	9.0 / 6.0	7.6 / 6.1	9.6 / 5.8	8.1 / 6.6		69.5	15.5	4.5	34.0	4.2	
53	47	1	12	12:50:46	6600	49	5.5 / 4.6	9.6 / 7.3	8.9 / 7.8	7.6 / 6.6	7.8 / 7.5		72.8	12.2	4.4	33.0	4.0	
53	50	2	12	12:51:04	6601	50	5.3 / 4.5	8.3 / 5.7	7.9 / 5.8	7.3 / 5.7	8.1 / 6.6		63.8	15.5	4.6	34.0	4.2	

Recorded by WJC

Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 4 of 6	* DATE 03 / 21 / 2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
46	53	1	13	13:00:52	6644	53	5.4 / 4.8	9.3 / 7.3	8.4 / 7.8	8.0 / 8.1	7.6 / 7.15		72.6	12.1	4.4	32.8	4.6	
46	53	2	13	13:01:12	6645	54	5.0 / 4.6	7.6 / 6.0	7.5 / 6.7	9.13 / 6.1	7.9 / 6.6		68.1	15.5	4.6	33.7	4.2	
42	41	1	14	13:11:09	6652	41	5.1 / 4.9	6.13 / 6.9	8.9 / 7.2	7.1 / 6.2	7.9 / 6.7		70.3	12.2	4.4	33.0	4.2	
43	45	2	14	13:11:30	6653	45	5.2 / 5.6	8.1 / 6.3	7.6 / 6.9	7.9 / 6.2	8.0 / 6.7		69.8	15.5	4.5	33.9	4.2	
51	49	1	15	13:21:17	6662	49	5.3 / 4.6	9.1 / 7.5	9.1 / 7.5	7.7 / 6.9	8.0 / 6.2		74.2	12.1	4.4	32.8	4.6	
51	50	2	15	13:21:36	6663	50	5.5 / 4.7	8.1 / 6.5	8.1 / 6.4	7.3 / 6.5	8.2 / 7.3		70.9	15.5	4.5	33.0	4.1	
54	53	1	16	13:31:44	6672	53	5.0 / 4.9	8.4 / 7.0	8.6 / 7.2	7.6 / 6.6	8.1 / 6.7		71.1	12.1	4.4	32.8	4.6	
54	55	2	16	13:31:59	6673	55	5.3 / 4.5	7.6 / 6.6	7.5 / 5.3	9.1 / 6.3	7.5 / 6.6		65.8	15.5	4.5	33.9	4.2	

Recorded by _____ Checked by _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 5 of 6	* DATE	03 /21 /2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
57	45	1	17	13:42:35	6880	45	5.3 / 4.9	9.5 / 6.9	8.7 / 6.9	7.6 / 6.6	7.6 / 6.6		70.4	12.2	4.4	33.0	4.0	
57	45	2	17	13:42:44	6881	45	5.4 / 4.6	8.2 / 6.2	8.9 / 5.8	10.0 / 6.0	8.0 / 6.9		69.4	15.5	4.5	34.0	4.2	
53	49	1	18	13:52:39	6932	49	5.3 / 4.9	9.4 / 7.9	9.0 / 7.9	8.2 / 7.2	7.4 / 7.1		74.5	12.1	4.4	32.9	4.0	
52	50	2	18	13:53:11	6933	50	5.0 / 4.4	8.2 / 5.8	8.0 / 5.4	9.2 / 6.0	8.1 / 6.5		69.2	15.5	4.5	33.9	4.1	
58	54	1	19	14:03:11	6937	54	5.2 / 4.7	9.4 / 6.9	9.0 / 7.1	9.3 / 6.2	8.3 / 6.4		70.2	12.2	4.4	32.9	4.0	
58	54	2	19	14:03:31	6938	55	5.2 / 4.8	9.3 / 5.6	8.3 / 5.5	9.2 / 6.2	7.9 / 6.1		64.8	15.5	4.6	33.9	4.2	
56	45	1	20	14:13:29	7064	45	5.1 / 4.9	9.5 / 7.2	8.2 / 7.2	7.8 / 6.1	8.1 / 6.8		71.6	12.2	4.4	33.6	4.0	
56	45	2	20	14:13:42	7065	45	5.4 / 4.6	8.0 / 6.6	7.8 / 6.6	7.7 / 6.5	8.2 / 7.1		70.5	15.5	4.5	33.9	4.2	

Recorded by WJC

Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 6 of 6	* DATE 03/21/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
	49	1	21	14:25:28	21	49	4.3 / 4.3	6.6 / 6.6	6.6 / 6.6	4.0 / 4.0	5.3 / 5.3		69.0	12.1	4.4	32.9	4.0	
	54	2	21	14:25:39	21	54	4.4 / 4.4	5.9 / 5.9	5.9 / 5.9	5.6 / 5.6	6.2 / 6.2		64.2	15.5	4.5	33.9	4.2	

Recorded by WLC

Checked by _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 6	* DATE	03/22/2005

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
25	44	1	1	9:34:21	13277	44	5.1 / 4.1	9.4 / 6.5	9.4 / 6.4	8.3 / 6.0	7.4 / 5.9		68.5	12.1	4.4	33.0	4.0	
25	45	2	1	9:34:30	13278	45	5.3 / 4.8	8.0 / 6.8	7.8 / 6.6	9.6 / 6.9	7.3 / 7.4		70.9	15.5	4.5	33.9	4.1	
33	48	1	2	9:46:05	13363	48	5.3 / 4.8	9.7 / 7.1	9.0 / 7.2	8.2 / 6.3	7.5 / 5.6		70.6	12.2	4.4	33.0	4.0	
33	50	2	2	9:47:22	13374	50	5.4 / 4.8	8.2 / 6.4	8.0 / 6.5	9.2 / 6.8	7.9 / 7.3		70.6	15.6	4.5	34.0	4.1	
30	53	1	3	9:57:10	13448	53	5.1 / 4.7	9.6 / 7.1	8.6 / 7.3	7.7 / 6.5	7.7 / 6.5		70.8	12.1	4.4	32.9	4.0	
30	55	2	3	9:57:42	13451	55	5.1 / 4.3	7.6 / 5.9	7.3 / 5.8	9.1 / 6.3	7.2 / 6.3		65.0	15.5	4.5	33.8	4.1	
30	44	1	2	10:09:31	13532	44	5.1 / 5.1	9.3 / 7.1	9.0 / 7.6	8.0 / 6.8	7.3 / 6.5		71.9	12.1	4.4	33.0	4.0	
30	45	2	2	10:09:52	13533	45	5.2 / 4.6	8.2 / 6.6	7.5 / 5.9	9.6 / 5.9	7.6 / 6.5		66.9	15.5	4.5	33.9	4.2	

Recorded by USGC

Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 6	* DATE 03/22/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
30	49	1	5	10:31:18	13602	49	5.3 / 5.0	9.0 / 7.7	8.8 / 7.1	7.7 / 7.1	8.2 / 7.6		74.8	12.1	4.4	32.8	4.0	
30	49	2	5	10:31:58	13603	49	5.4 / 4.8	8.3 / 6.6	7.9 / 6.7	9.6 / 6.6	8.0 / 7.4		71.5	15.5	4.5	33.9	4.1	
33	44	1	6	10:43:41	13743	44	4.9 / 4.8	9.2 / 7.3	6.9 / 5.6	7.5 / 6.9	8.1 / 6.7		71.9	12.1	4.4	32.9	4.0	
32	44	2	6	10:44:29	13751	44	5.5 / 4.9	8.0 / 6.2	7.8 / 6.3	9.5 / 6.0	7.3 / 6.8		68.4	15.6	4.5	34.0	4.2	
34	48	1	7	10:55:29	13868	49	5.5 / 4.8	9.4 / 7.3	6.9 / 7.6	8.0 / 6.5	8.5 / 6.4		72.7	12.1	4.4	32.9	4.0	
34	49	2	7	10:55:41	13869	49	5.5 / 4.7	8.6 / 6.1	8.3 / 6.3	10.0 / 6.1	8.2 / 6.8		70.3	15.6	4.5	34.0	4.2	
42	53	1	8	11:04:44	13936	53	5.3 / 4.8	8.9 / 7.6	8.5 / 7.8	8.1 / 7.4	7.1 / 6.7		72.3	12.2	4.4	32.8	4.0	
42	54	2	8	11:05:26	13939	54	5.2 / 4.6	7.8 / 6.2	7.9 / 6.4	9.3 / 6.5	7.5 / 7.2		68.9	15.5	4.5	33.9	4.2	

Recorded by _____ Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 6	* DATE 03/22/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
41	44	1	9	11:17:54	13947	44	5.1 / 4.3	9.6 / 6.5	9.2 / 6.3	8.5 / 5.9	8.2 / 5.8		66.3	12.2	4.4	33.0	4.0	
41	45	2	9	11:18:12	13948	45	5.3 / 4.8	8.1 / 6.3	7.5 / 6.3	9.8 / 6.4	7.7 / 6.9		69.1	15.6	4.6	34.0	4.2	
40	49	1	10	11:29:02	14012	49	5.2 / 5.9	9.5 / 6.5	9.5 / 6.5	8.3 / 6.1	8.4 / 5.1		69.0	12.1	4.4	32.9	4.0	
40	49	2	10	11:29:16	14013	49	5.3 / 4.9	8.5 / 6.0	8.0 / 6.1	9.6 / 5.9	8.0 / 6.6		68.8	15.6	4.6	34.1	4.1	
48	53	1	11	11:39:48	14066	54	4.8 / 4.2	9.2 / 6.6	8.4 / 6.5	8.1 / 5.9	7.9 / 5.7		67.6	12.1	4.4	32.9	4.0	
46	54	2	11	11:40:03	14068	54	5.3 / 4.5	7.8 / 6.0	7.8 / 6.0	9.2 / 6.1	7.6 / 7.0		67.4	15.5	4.5	34.0	4.2	
42	44	1	12	12:04:50	14213	44	4.8 / 5.1	9.0 / 7.9	8.1 / 7.9	8.0 / 7.2	7.6 / 7.6		73.9	12.1	4.5	32.8	4.0	
42	45	2	12	12:05:03	14215	45	5.6 / 4.8	9.1 / 6.6	7.7 / 6.7	9.6 / 6.6	7.7 / 7.2		70.7	15.5	4.5	33.9	4.0	

Recorded by WIM

Checked by _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0501
WIM System Test Truck Records 4 of 6	* DATE	03 / 22 / 2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
51	48	1	13	12:15:53	14281	49	5.3 / 4.8	9.4 / 7.5	9.3 / 7.4	8.1 / 7.1	8.5 / 7.2		74.9	12.1	4.4	32.9	4.0	
51	50	2	13	12:16:05	14282	50	5.5 / 4.7	8.4 / 6.4	8.0 / 6.6	9.5 / 6.7	7.8 / 7.4		71.0	15.6	4.5	33.9	4.1	
45	53	1	14	12:38:34	14340	53	5.4 / 4.9	9.5 / 7.3	9.2 / 7.7	8.0 / 7.2	7.7 / 6.1		72.9	12.1	4.4	32.8	4.0	
48	55	2	14	12:38:58	14344	55	5.3 / 4.5	7.5 / 6.5	7.5 / 6.4	9.3 / 6.9	7.8 / 9.0		68.6	15.5	4.5	33.8	4.1	
49	43	1	15	12:38:44	14408	44	4.7 / 5.1	9.2 / 7.9	8.6 / 6.8	7.4 / 7.3	6.7 / 9.0		72.1	12.1	4.4	32.8	4.0	
49	45	2	15	12:38:58	14409	44	5.4 / 4.9	8.0 / 6.7	7.5 / 6.8	9.5 / 6.8	7.9 / 7.2		70.8	15.5	4.5	33.9	4.1	
48	53	1	16	12:49:49	14462	54	5.3 / 4.5	9.4 / 7.0	9.6 / 7.0	8.2 / 6.4	8.8 / 5.9		72.3	12.1	4.4	32.9	4.0	
48	55	2	16	12:50:10	14463	55	5.0 / 4.6	7.6 / 6.5	7.4 / 6.3	9.9 / 7.0	7.4 / 7.3		69	15.5	4.5	33.9	4.0	

Recorded by _____ Checked by _____

Sheet 21	* STATE_CODE 24
LTPP Traffic Data	*SPS PROJECT_ID 8500
WIM System Test Truck Records 5 of 6	* DATE 03/22/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
47	43	1	17	13:01:22	14522	43	5.3 / 4.9	9.3 / 7.9	9.0 / 7.7	8.0 / 7.2	8.0 / 7.3		74.4	12.2	4.9	32.8	4.0	
47	45	2	17	13:01:39	14534	45	5.5 / 4.8	8.0 / 6.9	7.9 / 6.8	9.3 / 6.8	7.8 / 7.5		71.0	15.5	4.5	33.9	4.1	
47	48	1	18	13:13:15	14586	49	4.8 / 5.1	8.7 / 8.1	8.4 / 8.1	7.7 / 7.8	7.1 / 7.5		73.2	12.1	4.4	32.8	4.0	
47	50	2	18	13:13:24	14588	50	5.7 / 4.7	8.2 / 6.4	7.9 / 6.5	9.6 / 6.6	7.9 / 7.3		70.9	15.6	4.5	34.0	4.2	
51	55	1	19	13:24:58	14703	54	4.9 / 4.7	9.2 / 6.8	8.1 / 6.8	8.2 / 6.1	8.1 / 6.0		70.0	12.1	4.4	32.9	4.0	
51	56	2	19	13:25:04	14709	56	4.9 / 4.5	7.4 / 6.4	7.3 / 6.4	8.6 / 6.9	7.2 / 7.5		67.2	15.5	4.5	33.9	4.2	
53	44	1	20	13:39:59	14804	44	5.3 / 4.9	9.4 / 7.3	9.2 / 7.7	8.9 / 7.1	7.3 / 6.9		71.0	12.1	4.4	32.8	4.0	
53	45	2	20	13:40:09	14805	45	5.5 / 4.9	8.1 / 6.6	7.5 / 6.9	9.5 / 6.7	7.5 / 7.2		70.3	15.5	4.5	33.9	4.2	

Recorded by WGC

Checked by _____

Sheet 21	* STATE_CODE	24
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 6 of 6	* DATE	03/22/2006

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
52	48	1	21	14:06:45	14994	48	4.5 / 4.2	9.6 / 7.5	7.3 / 5.8	8.0 / 6.3	8.0 / 5.8		69.9	12.1	4.4	32.9	4.1	
54	49	2	21	14:02:02	14995	49	5.4 / 4.8	8.3 / 6.5	8.1 / 6.5	7.3 / 5.6	7.9 / 6.3		70.6	15.6	4.5	34.0	4.1	
50	52	1	22	14:13:15	15081	52	5.3 / 4.2	9.5 / 7.9	8.1 / 6.3	8.4 / 6.2	8.3 / 6.1		70.8	12.2	4.4	32.9	4.2	
50	55	2	22	14:12:30	15082	56	5.4 / 4.6	7.4 / 6.2	6.4 / 5.4	9.1 / 6.8	7.5 / 6.2		62.4	15.5	4.5	33.9	4.2	

Recorded by _____ Checked by _____

TEST TRUCK PHOTOGRAPHS FOR SPS WIM VALIDATION

STATE: Maryland

SHRP ID: 0500

Photo 1 - TO_11_24_2.55_0550_Golden_Truck_03_21_06

Photo 2 - TO_11_24_2.55_0550_Golden_Truck_Tractor_03_21_06

Photo 3 - TO_11_24_2.55_0550_Golden_Truck_Trailer_03_21_06

Photo 4 - TO_11_24_2.55_0550_Golden_Truck_Axle_1_Suspension_03_21_06

Photo 5 - TO_11_24_2.55_0550_Golden_Truck_Axles_2_3_Suspension_03_21_06

Photo 6 - TO_11_24_2.55_0550_Golden_Truck_Axles_4_5_Suspension_03_21_06

Photo 7 - TO_11_24_2.55_0550_Golden_Truck_Kingpin_03_21_06

Photo 8 - TO_11_24_2.55_0550_Partial_Truck_03_21_06

Photo 9 - TO_11_24_2.55_0550_Partial_Truck_Tractor_03_21_06

Photo 10 - TO_11_24_2.55_0550_Partial_Truck_Trailer_03_21_06

Photo 11 - TO_11_24_2.55_0550_Partial_Truck_Axle_1_Suspension_03_21_06

Photo 12 - TO_11_24_2.55_0550_Partial_Truck_Axle_2_3_Suspension_03_21_06

Photo 13 - TO_11_24_2.55_0550_Partial_Truck_Axles_4_5_Suspension_03_21_06

Photo 14 - TO_11_24_2.55_0550_Partial_Truck_Kingpin_03_21_06

Time of Change : 12-01-2005 12:00pm

Site Parameters

Lane **1**

Upstream Loop

Loop State **Enabled**
Module ID **9**
Channel ID **0**
Polarity **Active Low**
Width (cm) **285**

Downstream Loop

Loop State **Enabled**
Module ID **9**
Channel ID **1**
Polarity **Active Low**
Width (cm) **285**
Distance (cm) **720**

Axle Sensors

Axle **1**
Axle State **Enabled**
Module ID **5**
Channel ID **0**
Polarity Active **High**
Type **Bending Plate**
Distance (cm) **270**

Axle **2**
Axle State **Enabled**
Module ID **5**
Channel ID **1**
Polarity **Active High**
Type **Bending Plate**
Distance (cm) **640**

Calibration

Lane **1**

Axle Sensor **1**
Threshold **40**
WIM Calib Factors

Speed Bin **1**
Max Speed **72 kph (45 mph)**
Calibration Factor **3775**
Speed Bin **2**
Max Speed **80 kph (50 mph)**
Calibration Factor **3850**
Speed Bin **3**
Max Speed **88 kph (55 mph)**
Calibration Factor **3900**
Speed Bin **4**
Max Speed **96 kph (60 mph)**
Calibration Factor **3900**
Speed Bin **5**
Max Speed **105 kph (65 mph)**
Calibration Factor **3900**

Axle Sensor **2**
Threshold **40**
WIM Calib Factors

Speed Bin **1**
Max Speed **72 kph (45 mph)**
Calibration Factor **3775**
Speed Bin **2**
Max Speed **80 kph (50 mph)**
Calibration Factor **3850**
Speed Bin **3**
Max Speed **88 kph (55 mph)**
Calibration Factor **3900**
Speed Bin **4**
Max Speed **96 kph (60 mph)**
Calibration Factor **3900**
Speed Bin **5**
Max Speed **105 kph (65 mph)**
Calibration Factor **3900**

```
#
#
#          The following lines are required by RCS
#             Do not modify or delete them !!!
#
#     $Revision: 1.1 $
#     $Id: ltpp_etg.typ,v 1.1 2006-02-23 15:05:09-06 ianm Exp $
#
# Revision History
# 12/06/2005 AJP Created
#
# CLASSIFICATION DATA FILE
#
# Revision: 2.0
#
# DATA FORMAT OF THE .typ FILE:
#
#
# HEADER (each file has only one header)
#
# flag of compliance data
# tandem spacing
# tridem spacing
# tridem equal spacing tolerance
# quadrem spacing
# quadrem equal spacing tolerance
# number of vehicle classes (maximum 75)
# undefinable vehicle classes
# error vehicle classes
# autocalibration vehicle type
# number of vehicle types (maximum 60)
#
# DATA SECTION (each file can have more than one data section)
#
# vehicle classification
# number of axles
# list of minimum axles spacings
# list of maximum axles spacings
# list of axle markings
# list of minimum axle weights
# list of maximum axle weights
# minimum gvw
# maximum gvw
# minimum vehicle length
# maximum vehicle length
# minimum distance of front bumper and first axle, and of rear and last axle
# maximum distance of front bumper and first axle, and of rear and last axle
# compliance data table
#
# THE ACTUAL DATA IS STARTED HERE

1
192
384
10
0
0
```

```
16
15
15
21
29

# Default Vehicles
2
2
60
540
s s
332 332
333 333
664
666
120
600
0 0
0 0
0

#1. Motorcycle
1
2
1
183
x x
1 1
32767 32767
45
590
0
32767
0 0
32767 32767
0

#2. Car
2
2
1
308
x x
1 1
32767 32767
454
3628
0
32767
0 0
32767 32767
0

#3. OPV
3
2
```

```
308
488
x x
1 1
32767 32767
454
3628
0
32767
0 0
32767 32767
0

#4. Bus
4
2
704
1219
x x
1 1
32767 32767
5443
100000
0
32767
0 0
32767 32767
1

#5. 2D
5
2
244
704
x x
1 1
32767 32767
3629
100000
0
32767
0 0
32767 32767
1

#6. Car / 1 Axle Trailer
2
3
183 183
308 762
x x x
1 1 1
32767 32767 32767
454
5443
0
32767
```

```
0 0
32767 32767
0

#7. OPV / 1 Axle Trailer
3
3
308 183
488 762
x x x
1 1 1
32767 32767 32767
454
5443
0
32767
0 0
32767 32767
0

#8. 3 Axle Bus
4
3
704 91
1219 213
x x x
1 1 1
32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#9. 2D / 1 Axle Trailer
5
3
244 192
704 762
x x x
1 1 1
32767 32767 32767
5443
9071
0
32767
0 0
32767 32767
1

#10. 3 Axle Single Unit
6
3
183 76
704 192
```

```
x x x
1 1 1
32767 32767 32767
5443
100000
0
32767
0 0
32767 32767
1

#11. Semi 2-1
8
3
183 335
704 1219
x x x
1 1 1
32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#12. Car / 2 Axle Trailer
2
4
183 183 30
308 762 365
x x x x
1 1 1 1
32767 32767 32767 32767
454
5443
0
32767
0 0
32767 32767
0

#13. OPV / 2 Axle Trailer
3
4
308 183 30
488 762 365
x x x x
1 1 1 1
32767 32767 32767 32767
454
5443
0
32767
0 0
32767 32767
```

0

#14. 2D / 2 Axle Trailer
5
4
244 192 30
704 762 365
x x x x
1 1 1 1
32767 32767 32767 32767
5443
9071
0
32767
0 0
32767 32767
1

#15. 4 Axle Single Unit
7
4
183 76 76
704 192 396
x x x x
1 1 1 1
32767 32767 32767 32767
5443
100000
0
32767
0 0
32767 32767
1

#16. Semi 3-1
8
4
183 76 396
704 192 1372
x x x x
1 1 1 1
32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#17. Semi 2-2
8
4
183 335 91
704 1372 365
x x x x
1 1 1 1

```
32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#18. OPV / 3 Axle Trailer
3
5
308 183 30 30
488 762 365 365
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
454
5443
0
32767
0 0
32767 32767
0

#19. 2D / 3 Axle Trailer
5
5
244 192 30 30
704 548 365 365
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
5443
100000
0
32767
0 0
32767 32767
1

#20. 5 axle Single Unit
7
5
183 76 76 76
704 192 192 192
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
5443
100000
0
32767
0 0
32767 32767
1
```

#21. Semi 3-2
9
5
183 76 192 76
792 192 1372 365
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#22. Semi 2-1-2
11
5
183 335 183 335
792 792 610 792
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#23. Trk Trailer(3-2)
9
5
183 76 192 366
792 192 701 823
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#24. Semi 2-3
9
5
183 549 76 76
792 1372 192 192
x x x x x
1 1 1 1 1
32767 32767 32767 32767 32767
9072

```
100000
0
32767
0 0
32767 32767
1

#25. Semi 3-3
10
6
183 76 186 76 76
792 192 1372 365 335
x x x x x x
1 1 1 1 1 1
32767 32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#26. Semi 3-1-2
12
6
183 76 335 183 335
792 192 792 732 792
x x x x x x
1 1 1 1 1 1
32767 32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#27. Semi 3-*-*
13
7
183 91 91 91 91 91
1372 1372 1372 1372 1372 1372
x x x x x x x
1 1 1 1 1 1 1
32767 32767 32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#28. Semi 3-*-*
13
```

```
8
183 91 91 91 91 91 91
1372 1372 1372 1372 1372 1372 1372
x x x x x x x
1 1 1 1 1 1 1
32767 32767 32767 32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1

#29. Semi 3-*-*
13
9
183 91 91 91 91 91 91
1372 1372 1372 1372 1372 1372 1372 1372
x x x x x x x x
1 1 1 1 1 1 1 1
32767 32767 32767 32767 32767 32767 32767 32767 32767
9072
100000
0
32767
0 0
32767 32767
1
```