Validation Report

Florida, SPS-5
Task Order 19, CLIN 2
May 23, 2007

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1 Executive Summary

A visit was made to the Florida 0500 on May 23, 2007 for the purposes of conducting a validation of the WIM system located on U.S. 1 at 4.5 miles north of SR 706. The SPS-5 is located in the righthand, southbound lane of a four-lane divided facility. The posted speed limit at this location is 55 mph. The LTPP lane is one of 4 lanes instrumented at this site. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This is the fourth validation visit to this location. The site was installed in June 2003 by the agency.

This site meets all LTPP precision requirements except speed which is not considered sufficient to disqualify the site as having research quality data. The classification algorithm does not provide research quality classification information. The majority of the vehicles at the site are Class 5 box trucks.

The site is instrumented with quartz piezo sensors and PAT DAW 190 electronics. It is installed in asphalt concrete. Lane 1 and Lane 4 are instrumented for WIM, while Lanes 2 and 3 are instrumented for classification only. The LTPP lane is identified as Lane 4 in the WIM controller.

The validation used the following trucks:

1) 5-axle tractor-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 74,490 lbs., the "golden" truck.
2) 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a steel spring suspension loaded to 65,600 lbs., the partial truck.

The validation speeds ranged from 32 to 54 miles per hour. The pavement temperatures ranged from 101 to 121 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

Table 1-1 Post-Validation results – 120500 – 23-May-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	2.8 ± 12.2%	Pass
Tandem axles	±15 percent	-1.8 ± 8.9%	Pass
GVW	±10 percent	-1.1 ± 7.1%	Pass
Speed	**±1 mph [2 km/hr]**	**0.2 ± 1.9 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0 ± 0.1 ft	Pass

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. The WIM index values are either under or within the may or may not affect performance thresholds.

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.

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

This site needs three years of data to meet the goal of five years of research quality data.

2 Corrective Actions Recommended

Both sections of both WIM sensors indicate minimal tolerances for insulation resistance levels. The right section of the trailing sensor indicates a value below the manufacturer's recommended tolerance, although all sensors appear to be working normally. All capacitance levels have increased since the last validation visit, indicating that the sensors may be deteriorating internally. **These sensors should be checked periodically and the data from the site should be reviewed on at least a monthly basis. Data that reflects variability and imbalance when comparing left and right axles may indicate that one of the sensors has failed.**

3 Post Calibration Analysis

This final analysis is based on test runs conducted May 23, 2007 during the afternoon at test site 120500 on U.S. 1. This SPS-5 site is on the southbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for the calibration and for the subsequent validation included:

1. 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and an air suspension loaded to 74,490 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and a steel spring suspension loaded to 65,600 lbs., the partial truck.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 32 to 54 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 101 to 121 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

Table 3-1 has the statistics that indicate a successful validation for this site. The failure to meet the speed criterion is not grounds for rejecting a determination that the site is capable of producing research quality data.

Table 3-1 Post-Validation Results – 120500 – 23-May-2007

SPS-1, -2, -5, -6 and -8	**95 %Confidence Limit of Error**	**Site Values**	**Pass/Fail**
Steering axles	±20 percent	2.8 ± 12.2%	Pass
Tandem axles	±15 percent	-1.8 ± 8.9%	Pass
GVW	±10 percent	-1.1 ± 7.1%	Pass
Speed	**±1 mph [2 km/hr]**	**0.2 ± 1.9 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0 ± 0.1 ft	Pass

The test runs were conducted primarily during the late morning and early afternoon hours under intermittently cloudy conditions, resulting in a limited 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 three speed groups and two 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 not achieved for this set of validation runs. Later afternoon runs were not expected to bring an increase in temperatures. Adding data at the lower end of range would have required operations after sunset.

The three speed groups were divided as follows: Low speed – 30 to 39 mph, Medium speed – 40 to 49 mph and High speed – 50 + mph. The two temperature groups were created by splitting the runs between those at 100 to 110 degrees Fahrenheit for Low temperature and 111 to 121 degrees Fahrenheit for High temperature.

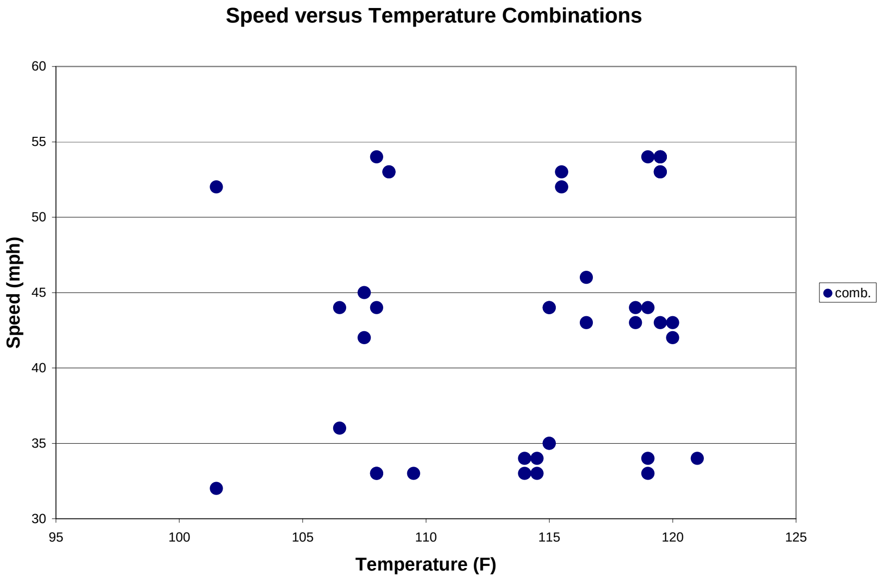


Figure 3-1 Post-Validation Speed-Temperature Distribution – 120500 – 23-May-2007

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. There is a slight upwards trend in average errors with speed. The variability is not apparently affected.

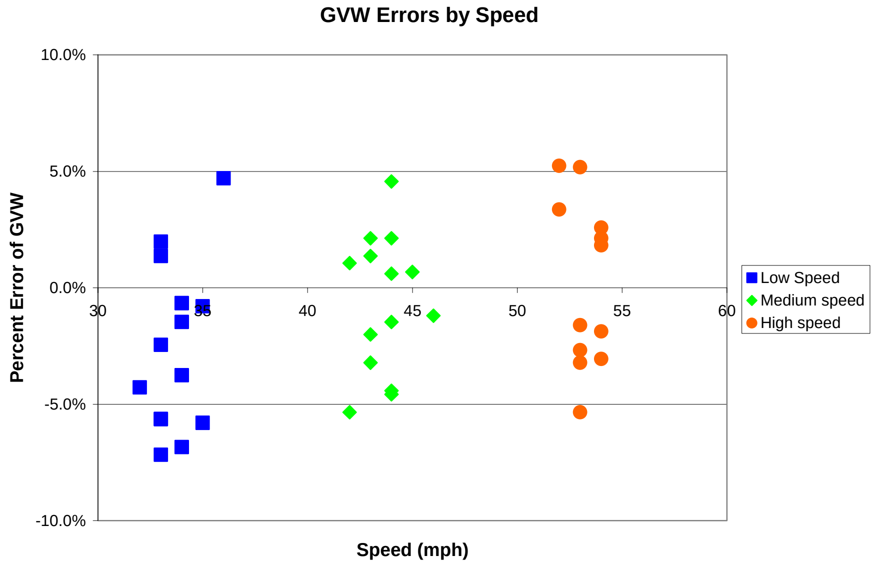


Figure 3-2 Post-validation GVW Percent Error vs. Speed – 120500 – 23-May-2007

Figure 3-3 shows the relationship between temperature and GVW percentage error. Temperatures in the observed ranges appear to have no influence on the results.

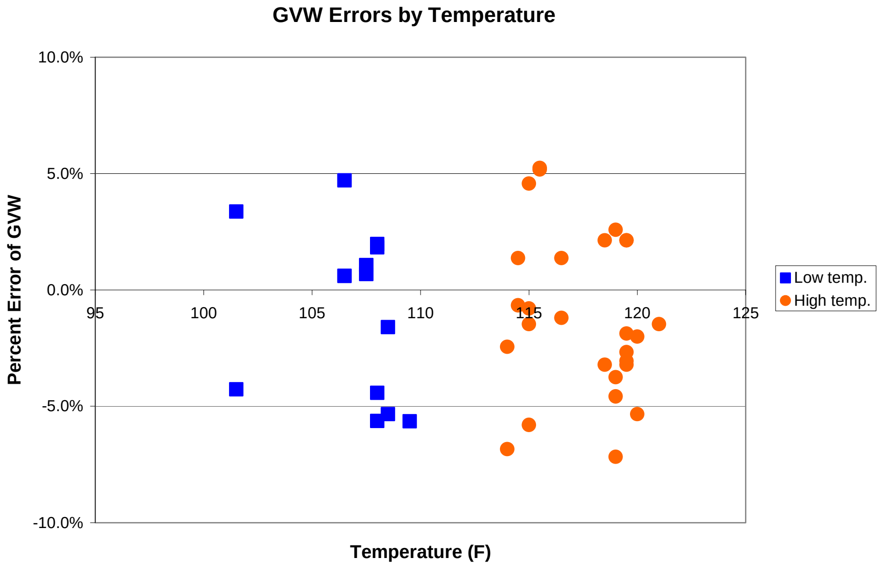


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 120500 – 23-May-2007

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. Figure 3-4 indicates no apparent influence of speed on spacing error.

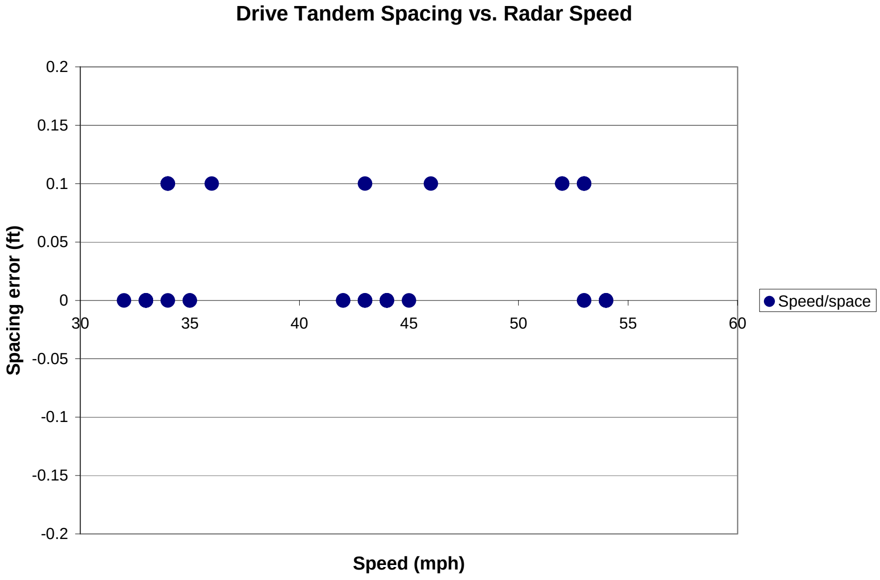


Figure 3-4 Post-Validation Spacing vs. Speed – 120500 – 23-May-2007

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 100 to 110 degrees Fahrenheit for Low temperature and 111 to 121 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 120500 – 23-May-2007

Element	**95% Limit**	**Low Temperature 100 to 110 °F**	**High Temperature 111 to 121 °F**
Steering axles	±20 %	3.7 ± 9.9%	2.4 ± 13.7%
Tandem axles	±15 %	-1.8 ± 8.8%	-1.8 ± 9.3%
GVW	±10 %	-1.0 ± 8.0%	-1.1 ± 7.2%
Speed	±1 mph	0.2 ± 2.5 mph	0.2 ± 1.8 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Table 3-2 shows that splitting the runs into two temperature groups' produces very similar statistics for each of the loading elements. Steering axles tend to be overestimated and tandem axles and GVW underestimated.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. The two trucks display very similar GVW characteristics over the observed temperature range.

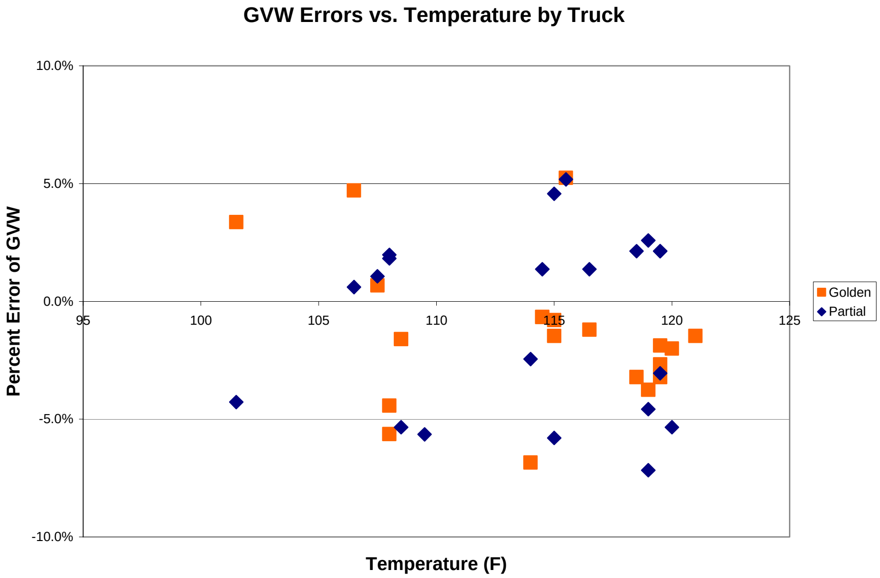


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 120500 – 23-May-2007

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.

Figure 3-6 illustrates a slight decrease in the estimation error for steering axles with temperature. There is slight increase in the variability observed at the upper end of the observed range.

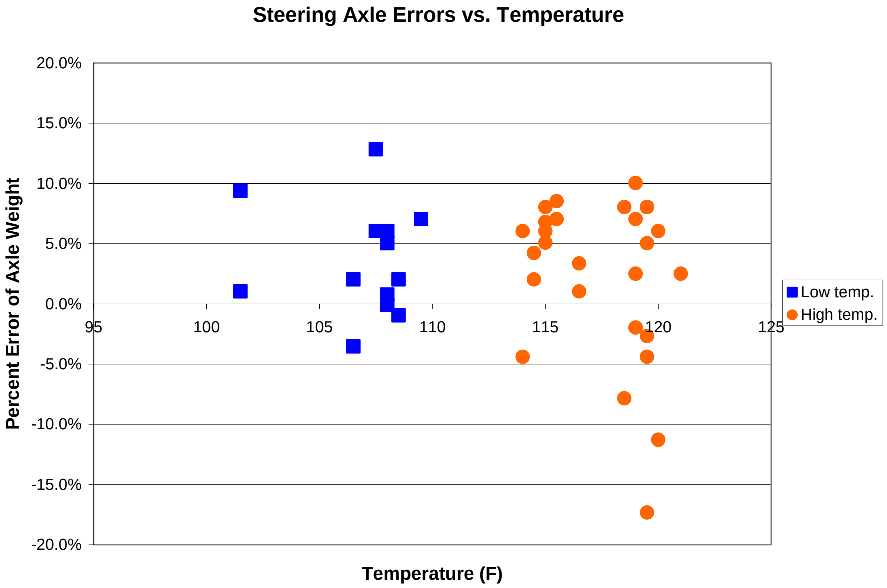


Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 120500 – 23-May-2007

3.2 Speed-based Analysis

The three speed groups were divided using 30 to 39 mph for Low speed, 40 to 49 mph for Medium speed and 50+ mph for High speed.

Table 3-3 Post-Validation Results by Speed Bin – 120500 – 23-May-2007

Element	**95% Limit**	**Low Speed 30 to 39 mph**	**Medium Speed 40 to 49 mph**	**High Speed 50+ mph**
Steering axles	+20 %	2.3 ± 7.8%	3.4 ± 13.9%	2.8 ± 17.7%
Tandem axles	+15 %	-3.6 ± 9.3%	-1.4 ± 8.9%	-0.3 ± 8.5%
GVW	+10 %	-2.6 ± 7.8%	-0.7 ± 6.4%	0.2 ± 7.9%
Speed	+1 mph	0.4 ± 1.8 mph	-0.1 ± 2.3 mph	0.3 ± 2.1 mph
Axle spacing	+ 0.5 ft	0 .0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Table 3-3 shows an increasing level of variability in the steering axle errors with increasing speed. The same trend is not observed for either GVW or tandem axle loading errors. The bias of the loading estimates tends closer to zero the higher the speeds are. Ninety percent of the trucks in the post-validation speed verification are traveling in the high speed group.

Figure 3-7 graphically shows the trends identified in Table 3-3. It is important to note that the trend is the same for both vehicles so pavement influence on the results is expected to be low.

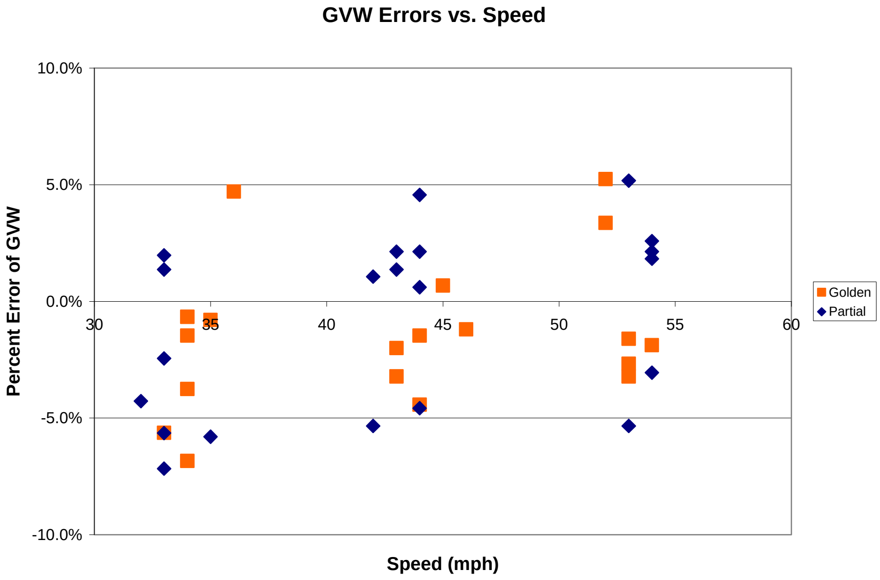


Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 120500 – 23-May-2007

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. The outlier at high speed is real and not a data entry artifact. Without it the slight upward trend in errors would be more noticeable and the variability for steering axles less.

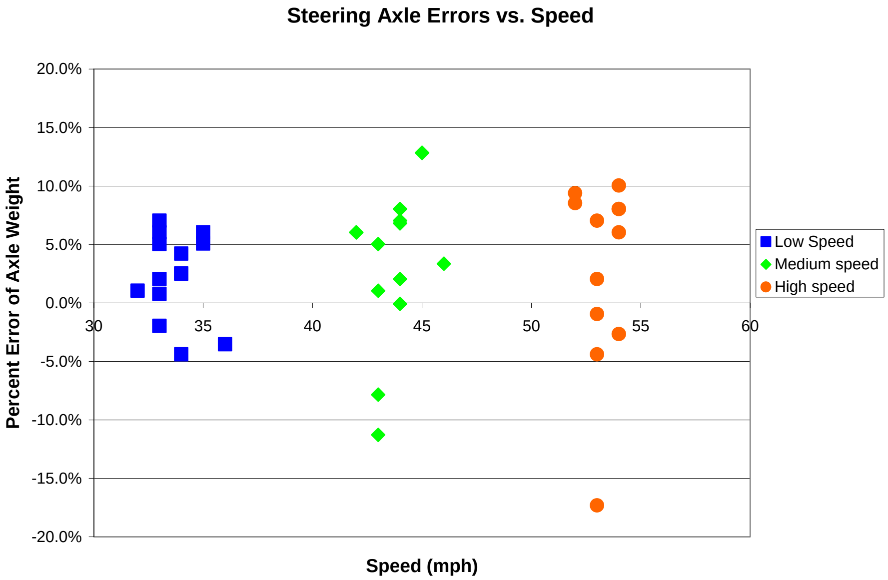


Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 120500 – 23-May-2007

3.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of three hours of data was collected at the site. This site is dominated by 2-axle single unit trucks and very few heavy combination vehicles. Video was taken at the site to provide ground truth for the evaluation. Based on the sample it was determined that there are zero percent unknown vehicles and zero 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 44.7 percent. This low volume truck site is dominated by single unit vehicles. The large observed error rates are a function of both the low volume of vehicles observed and the fact that the observed single unit vehicles have very similar lengths. Since weight is not used to classify vehicles, differentiation between visually different but identical length vehicles is unlikely.

Table 3-4 Truck Misclassification Percentages for 120500 – 23-May-2007

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	50	5	52	6	0
7	0				
8	67	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 120500 – 23-May-2007

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	-50	5	-32	6	0
7	0				
8	-67	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 by the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

The agency has put extensive effort into improving its classification algorithm in the area of single unit vehicles. In the absence of adding weight to the classification criteria or changing to image based methods no substantial improvement is expected.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria 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.

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 appear to influence truck movement across the sensors.

4.1 Profile Analysis

The WIM site is a section of pavement that is 305 meters long with the WIM scale located at 274.5 meters from the beginning of the test section. An ICC profiler was used to collect longitudinal profiles of the test section with a sampling interval of 25 millimeters.

Profile data collected at the SPS WIM location by Fugro South, Inc. on July 27, 2006 were processed through the LTPP SPS WIM Index software, version 1.1. This WIM scale is installed on a flexible pavement.

A total of 8 profiler passes were conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM sections, the requirements have been a minimum of 3 passes in the center of the lane and one shifted to each side. For this site the RSC has completed 4 passes at the center of the lane, 2 passes shifted to the left side of the lane, and 2 passes shifted to the right side of the lane. Shifts to the sides of the lanes were made such that data were collected as close to the lane edges as was safely possible. For each profiler pass, profiles were recorded under the left wheel path (LWP) and the right wheel path (RWP).

The SPS WIM Index software was developed with four different indices: LRI, SRI, Peak LRI and Peak SRI. The LRI incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The SRI incorporates a shorter section of pavement profile beginning 2.74 m prior to the WIM scale and ending 0.46 m after the scale. The LRI and SRI are the index values for the actual location of the WIM scale. Peak LRI is the highest value of LRI, within 30 m prior to the scale. Peak SRI indicates the highest value of SRI that is located between 2.45 m prior to the scale and 1.5 m after the scale. Also, a range for each of the indices was developed to provide the smoothness criteria. The ranges are shown in Table 4-1. When all of the values are below the lower thresholds, it is presumed unlikely that pavement smoothness will significantly influence sensor output. When one or more values exceed an upper threshold there is a reasonable expectation that the pavement smoothness will influence the outcome of the validation. When all values are below the upper threshold but not all below the lower threshold, the pavement smoothness may or may not influence the validation outcome.

Table 4-1 Thresholds for WIM Index Values

Index	**Lower Threshold (m/km)**	**Upper Threshold (m/km)**
LRI	0.50	2.1
SRI	0.50	2.1
Peak LRI	0.50	2.1
Peak SRI	0.75	2.9

Table 4-2 shows the computed index values for all 8 profiler passes for this WIM site. The average values over the passes in each path were also calculated when three or more passes were completed. These are shown in the right most column of the table. Values below the index limits are presented in italics and values above the index limits are presented in bold.

Table 4-2 WIM Index Values - 120500 – 27-Jul-2006

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Ave.**
Center	LWP	LRI (m/km)	0.793	0.634	0.760	0.586	0.693
		SRI (m/km)	0.642	*0.475*	0.623	*0.480*	0.555
		Peak LRI (m/km)	0.822	0.742	0.822	0.685	0.768
		Peak SRI (m/km)	0.753	0.798	0.806	0.831	0.797
	RWP	LRI (m/km)	0.680	0.833	0.710	0.820	0.761
		SRI (m/km)	0.603	*0.486*	*0.435*	*0.410*	*0.484*
		Peak LRI (m/km)	0.840	0.848	0.743	0.849	0.820
		Peak SRI (m/km)	*0.684*	*0.660*	*0.616*	*0.602*	*0.640*
Left Shift	LWP	LRI (m/km)	0.843	0.812			
		SRI (m/km)	*0.383*	0.604			
		Peak LRI (m/km)	0.855	0.848			
		Peak SRI (m/km)	*0.558*	*0.613*			
	RWP	LRI (m/km)	0.591	0.527			
		SRI (m/km)	*0.284*	*0.308*			
		Peak LRI (m/km)	0.627	0.566			
		Peak SRI (m/km)	*0.499*	*0.548*			
Right Shift	LWP	LRI (m/km)	0.962	0.803			
		SRI (m/km)	0.801	0.721			
		Peak LRI (m/km)	0.964	0.980			
		Peak SRI (m/km)	1.015	0.845			
	RWP	LRI (m/km)	0.626	0.711			
		SRI (m/km)	0.558	0.808			
		Peak LRI (m/km)	0.632	0.720			
		Peak SRI (m/km)	*0.700*	0.845			

From Table 4-2 it can be seen that most of indices computed from the profiles are between the upper and lower threshold values. Seventeen of the SRI and Peak SRI values are below the lower threshold limit indicating that conditions close to the scale are highly unlikely to impact the measurements made by the scale.

Table 4-3 shows the computed index values for the prior site validation. Although the computations were done with an earlier version of the WIM Index software, the difference in LRI and SRI values between the two versions has been found to be less than 3 percent. Fifteen of the values computed for the prior visit were below the lower threshold values. Additionally, the values from this previous visit are lower than those from the current visit indicating some deterioration of the pavement around the scale.

Table 4-3 WIM Index values (1.0) - 120500 – 07-April-2004

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Ave.**
Center	LWP	LRI (m/km)	0.580	0.573	0.621	0.575	0.587
		SRI (m/km)	*0.404*	*0.308*	*0.474*	*0.489*	*0.419*
	RWP	LRI (m/km)	0.715	0.594	0.589	0.626	0.631
		SRI (m/km)	*0.559*	*0.403*	*0.354*	*0.415*	*0.433*
Left Shift	LWP	LRI (m/km)	0.591	0.555			
		SRI (m/km)	0.702	*0.394*			
	RWP	LRI (m/km)	0.589	0.579			
		SRI (m/km)	*0.496*	*0.489*			
Right Shift	LWP	LRI (m/km)	0.535	0.509			
		SRI (m/km)	*0.447*	*0.450*			
	RWP	LRI (m/km)	0.725	0.720			
		SRI (m/km)	*0.407*	*0.628*			

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, traverse 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 of any of the sensors for the equipment.

5 Equipment Discussion

The traffic monitoring equipment at this location includes quartz piezo and PAT DAW 190. These sensors are installed in asphalt concrete pavement.

There were no changes in basic equipment operating condition since the validation on September 13, 2006.

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. Both sections of both WIM sensors indicate minimal tolerances for insulation resistance levels. The right section of the trailing sensor indicates a value below the manufacturer’s recommended tolerance, although all sensors appear to be working normally. All capacitance levels have increased since the last validation visit, indicating that the sensors may be deteriorating internally.

5.2 Calibration Process

The equipment required one iteration of the calibration process between the initial 40 runs and the final 40 runs.

5.2.1 Calibration Iteration 1

The first calibration iteration removed the severe underestimation observed during the preliminary validation at the site.

Table 5-1 Calibration Iteration 1 Results – 120500 – 23-May-2007 (11:48:00 AM)

SPS-1, -2, -5, -6 and -8	**95 %Confidence Limit of Error**	**Site Values**	**Pass/Fail**
Steering axles	+20 percent	2.3 ± 10.1%	Pass
Tandem axles	+15 percent	-1.6 ± 8.5%	Pass
GVW	+10 percent	-0.9 ± 7.8%	Pass
Speed	**+1 mph**	**0.1 ± 2.6 mph**	**Fail**
Axle spacing	+ 0.5 ft	0 ± 0.1 ft	Pass

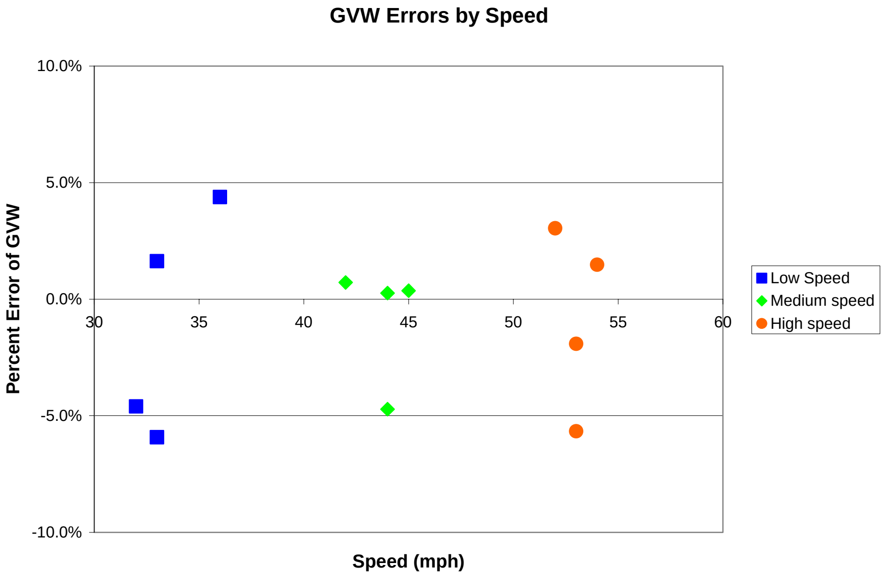


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed Group – 120500 – 23-May-2007 (11:48:00 AM)

5.3 Summary of Traffic Sheet 16s

This site has validation information from previous visits as well as the current one in the tables below. Table 5-2 has the information found in TRF_CALIBRATION_AVC for Sheet 16s submitted prior to this validation as well as the information for the current visit The shaded rows indicate the validation points when research quality data was being produced.

Table 5-2 Classification Validation History – 120500 – 23-May-2007

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Other 2	
5/24/07*	Manual	0	-67			0
5/23/07	Manual	-50	-78			0
9/13/06	Manual	0	0	0		0
3/03/05	Manual	0	0	-5		3
3/02/05	Manual	0	0	-5		1
12/04/03	Manual	0	0	36		2

*The date following the site visit is used for the post-validation to avoid database data entry problems.

Table 5-3 has the information found in TRF_CALIBRATION_WIM for Sheet 16s submitted prior to this validation as well as the information for the current visit. The shaded rows indicate the validation points when research quality data was being produced.

Table 5-3 Weight Validation History – 120500 – 23-May-2007

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
5/24/07*	Test Trucks	-1.1 (3.5)	2.8 (6)	-1.8 (4.5)
5/23/07	Test Trucks	-11 (3.2)	-9.8 (6.3)	-11.3 (4.3)
9/13/06	Test Trucks	0.0 (3.8)	0.0 (5.6)	0.6 (3.7)
9/13/06	Test Trucks	-4.4 (3.7)	-3.2 (6.0)	-4.6 (3.3)
3/3/05	Test Trucks	-1.6 (3.2)	1.7 (4.9)	-3.0 (2.9)
3/2/05	Test trucks	-1.2 (3.6)	2.0 (4.4)	-1.8 (3.1)
12/18/03	Test Trucks	-0.6 (2.6)	3.4 (4.5)	-0.3 (3.3)
7/10/03	Test Trucks	0.9 (2.5)	4.1 (3.1)	0.4 (3.3)

*The date following the site visit is used for the post-validation to avoid database data entry problems.

5.4 Projected Maintenance/Replacement Requirements

Data from this site should continue to be monitored on a frequent basis due to the sensor readings measured prior to beginning the validation. The remaining life of the weight sensors is uncertain and replacement should be anticipated.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted May 23, 2007 *and time of day* at 120500 on 4.5 miles north of SR 706. This SPS-5 site is on U.S. 1 in the southbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation and for the subsequent calibration included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and an air suspension loaded to 74,730 lbs.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandemand a steel spring suspension loaded to 65,830 lbs., the partial truck.

For the initial validation each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 33 to 55 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 86 to 107degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

It is obvious from direct inspection of Table 6-1 that the variability of the statistics is acceptable but the bias is not. The severe underestimation for all loading statistics is the basis for the site's failure to produce research quality data.

Table 6-1 Pre-Validation Results – 120500 – 23-May-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	**±20 percent**	**-9.8 ± 12.8%**	**Fail**
Tandem axles	**±15 percent**	**-11.3 ± 8.5%**	**Fail**
GVW	**±10 percent**	**-11.0 ± 6.4%**	**Fail**
Speed	**±1 mph [2 km/hr]**	**-0.1 ± 1.5 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

The test runs were conducted primarily during the morning and afternoon hours under mostly cloudy conditions, resulting in a narrow 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 three speed groups and two temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs.

The three speed groups were divided into 30 to 39 mph for Low speed, 40 to 49 mph for Medium speed and 50+ mph for High speed. The two temperature groups were created by splitting the runs between those at 80 to 96 degrees Fahrenheit for Low temperature and 97 to 107 degrees Fahrenheit for High temperature.

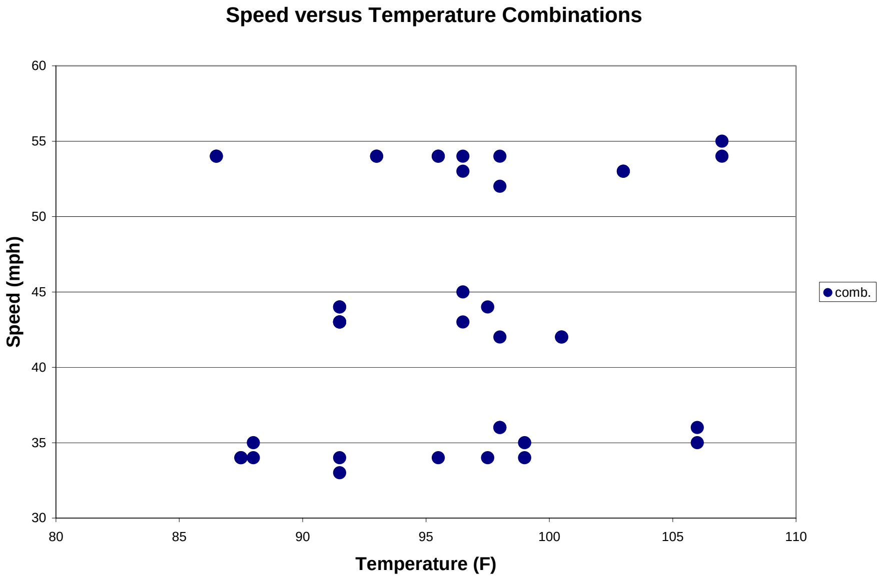


Figure 6-1 Pre-Validation Speed-Temperature Distribution – 120500 – 23-May-2007

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. There is no apparent trend in either bias or variability with speed.

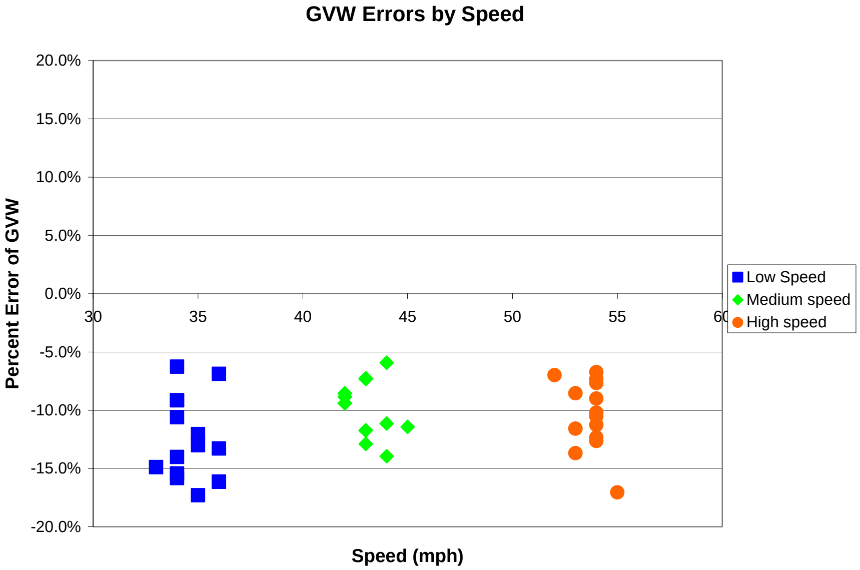


Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 120500 – 23-May-2007

Figure 6-3 shows the relationship between temperature and GVW percentage error. Temperature has no apparent influence on the observed error rates.

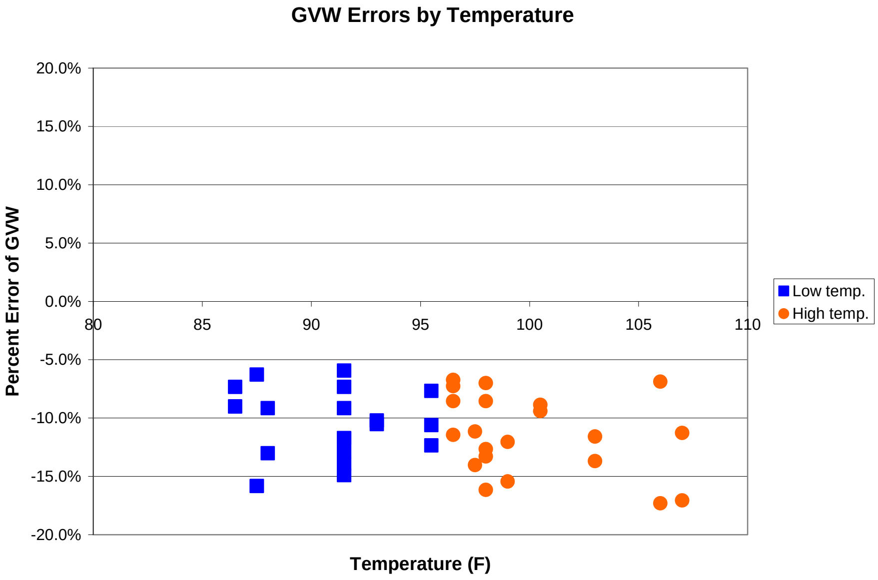


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 120500 – 23-May-2007

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. There is no indication that speed affects the observed spacing errors.

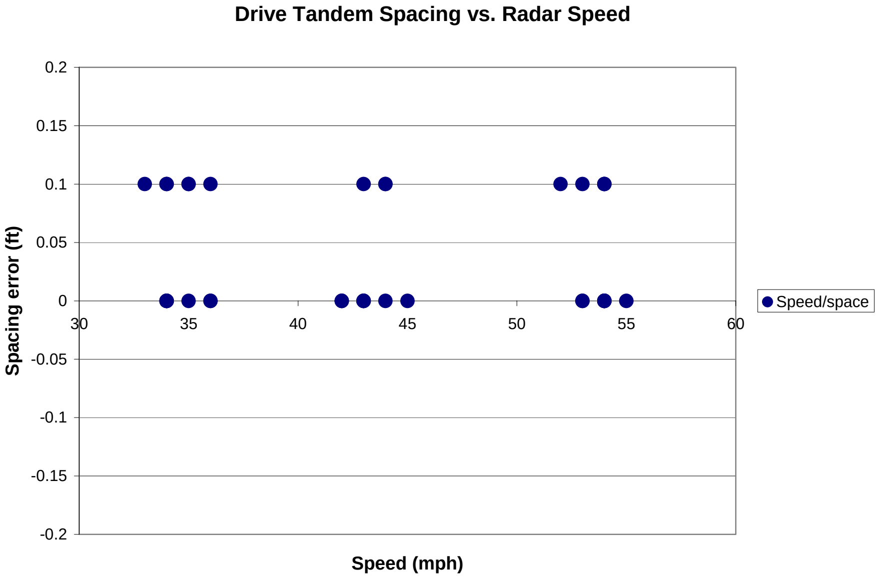


Figure 6-4 Pre-Validation Spacing vs. Speed - 120500 – 23-May-2007

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 80 to 96 degrees Fahrenheit for Low temperature and 97 to 107 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin – 120500 – 23-May-2007

Element	**95% Limit**	**Low Temperature 80 to 96 °F**	**High Temperature 97 to 107 °F**
Steering axles	+20 %	-10.8 ± 14.1%	-8.9 ± 12.6%
Tandem axles	+15 %	-10.6 ± 8.3%	-11.9 ± 8.8%
GVW	+10 %	-10.5 ± 6.1%	-11.4 ± 7.1%
Speed	+1 mph	-0.2 ± 1.5 mph	0.0 ± 1.7 mph
Axle spacing	+ 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Table 6-2 shows slight differences in mean error for statistics in both temperature groups. There is essentially no difference in variability for the two groups.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. The results for each of the vehicles are similar across the observed range of temperatures.

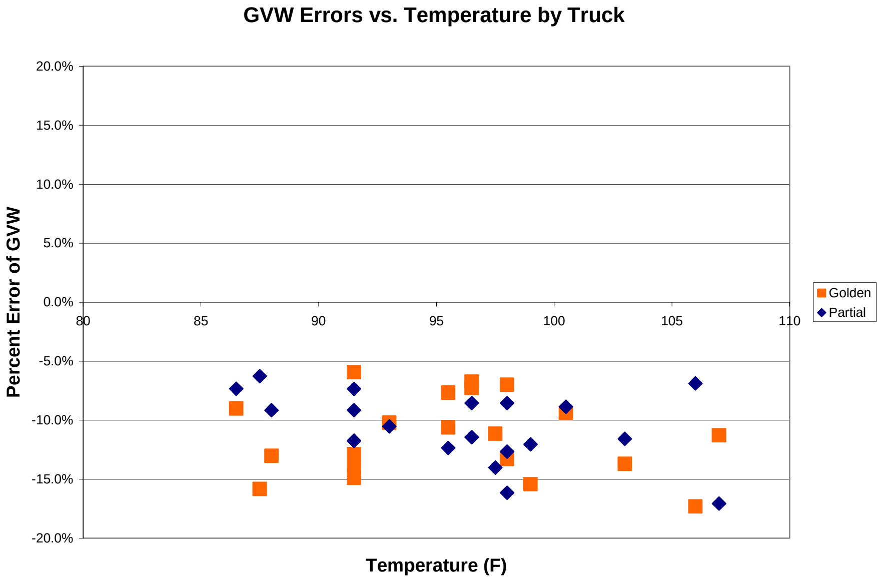


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 120500 – 23-May-2007

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 auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 vehicles.

Figure 6-6 shows no apparent difference in steering axle errors within the observed temperature range.

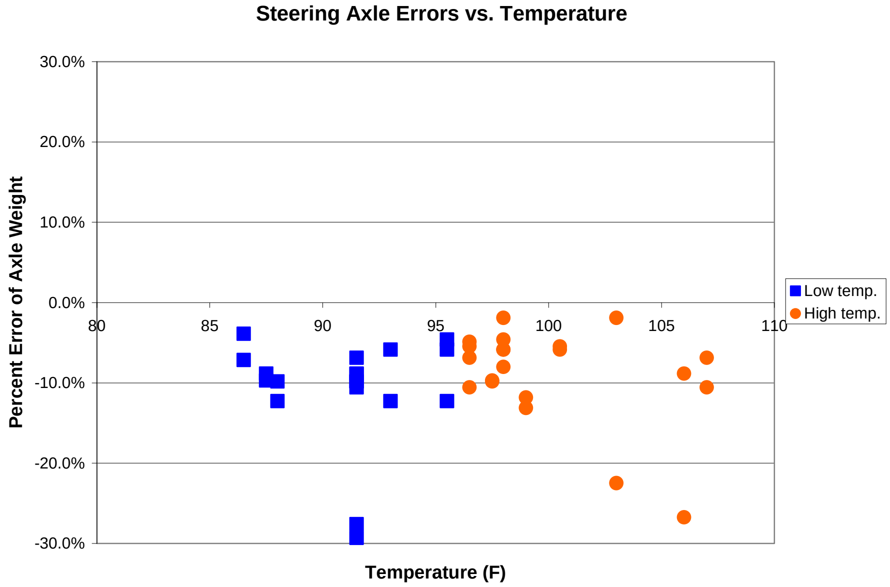


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 120500 – 23-May-2007

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 30 to 39 mph, Medium speed – 40 to 49 mph and High speed – 50+ mph.

Table 6-3 Pre-Validation Results by Speed Bin – 120500 – 23-May-2007

Element	**95% Limit**	**Low Speed 30 to 39 mph**	**Medium Speed 40 to 49 mph**	**High Speed 50+ mph**
Steering axles	±20 %	-11.0 ± 10.8%	-11.6 ± 17.8%	-7.0 ± 11.4%
Tandem axles	±15 %	-12.8 ± 10%	-9.7 ± 6.8%	-11.1 ± 8%
GVW	±10 %	-12.4 ± 7.6%	-10.0 ± 5.5%	-10.4 ± 6.4%
Speed	±1 mph	-0.4 ± 2.0 mph	0.3 ± 1.0 mph	-0.2 ± 1.5 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Table 6-3 shows substantial underestimation of single axle, tandem axle and GVW loading at the site. The variability for all those elements is however within the bounds of research quality data.

Figure 6-7 shows the GVW errors with speed by truck. The trucks follow very similar trends. The “golden” truck (squares) has decreasing error in the estimates as the speed increases. The partial truck (diamonds) appears to have little if any change in the associated errors as speeds increase.

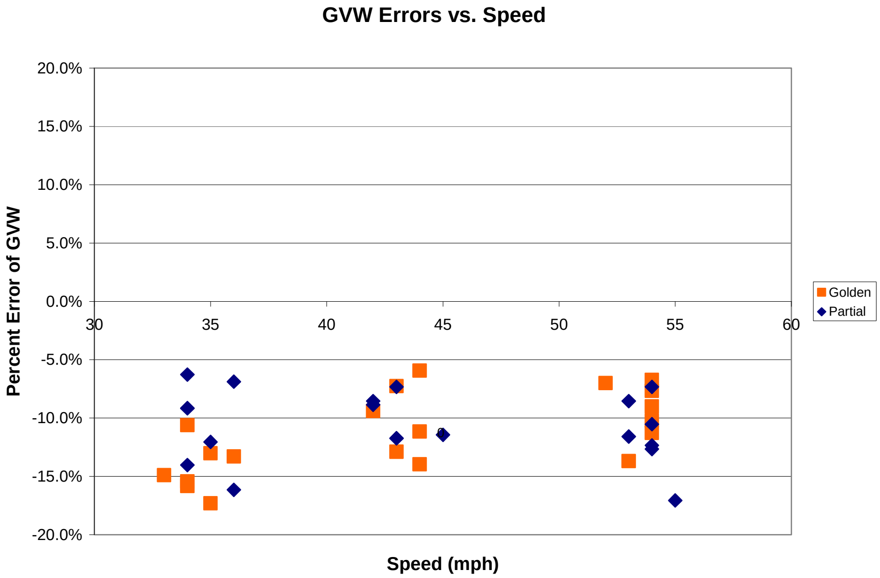


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 120500 –23-May-2007

Figure 6-8 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 calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 vehicles. The error in steering axle estimates decreases with increasing speed. The increase in speed appears to have no influence on variability.

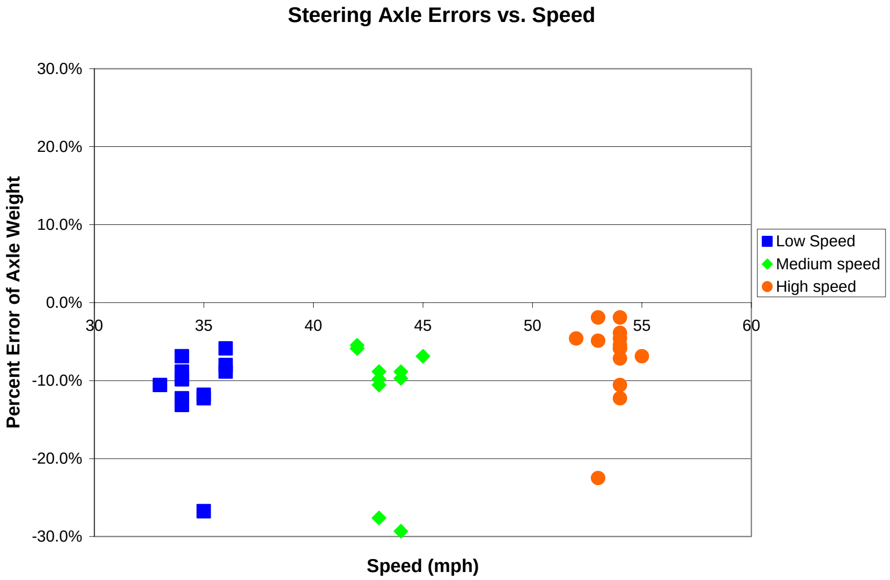


Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 120500 – 23-May-2007

6.3 Classification Validation

The agency uses a modified FHWA 13 bin classification scheme. The modification utilizes a Class 15 for unknown vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. Video was taken at the site to provide ground truth for the evaluation. Based on the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles. This low volume truck site is dominated by single unit vehicles. The large observed error rates are a function of both the low volume of vehicles observed and the fact that the observed single unit vehicles have very similar lengths. Since weight is not used to classify vehicles, differentiation between visually different but identical length vehicles is unlikely.

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 45.3 percent.

Table 6-4 Truck Misclassification Percentages for 120500 – 23-May-2007

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	67	5	40	6	0
7	0				
8	78	9	50	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 120500 – 23-May-2007

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	-67	5	0	6	0
7	0				
8	-78	9	-50	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 vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

Without using weight as a part of the classification algorithm (which cannot be done by an observer) the high error rates are highly likely at this site.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria 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 not have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

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%	90%	Fail
Axle Groups	± 15%	77.5%	Fail
GVW	± 10%	40%	Fail

6.5 Prior Validations

The last validation for this site was done September 13, 2006. It was the third validation of the site. The site was producing research quality data. Figure 6-9 shows the GVW Percent Error vs. Speed for the post validation runs. The site was validated with two trucks. The “Golden” truck was loaded to 74,730 lbs. The “Class 5” truck which was loaded to 23,170 lbs.

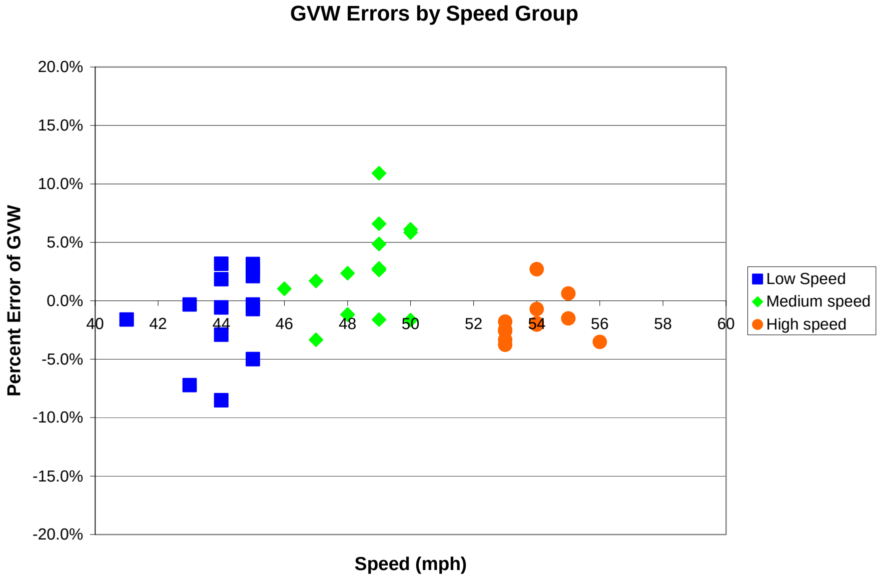


Figure 6-9 Last Validation GVW Percent Error vs. Speed – 120500 – 13-Sep-2020

Table 6-7 shows the overall results from the last validation. There was slight increase in variability of errors for steering and tandem axles and a decrease in variability for GVW errors. The significant change in the seven month interval was the pronounced change in bias.

Table 6-7 Last Validation Final Results – 120500 – 13-Sep-2020

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	+20 percent	0.8 ± 8.8%	Pass
Single axles	+20 percent	0.0 ± 11.1%	Pass
Tandem axles	+15 percent	0.6 ± 7.4%	Pass
GVW	+10 percent	0.0 ± 7.6%	Pass
Speed	+1 mph [2 km/hr]	0.1 ± 0.6 mph	Pass
Axle spacing	+ 0.5 ft [150mm]	0.1 ± 0.1 ft	Pass

Through this validation the equipment has been observed at temperature from 69 to 119 degrees Fahrenheit.

Table 6-8 has the results at the end of the last validation by temperature. Temperatures for the current pre-validation conditions were only slightly higher than those for the final validation on the last site visit.

Table 6-8 Last Validation Results by Temperature Bin – 120500 – 13-Sep-2020

Element	95% Limit	Medium Temperature 112 - 119 °F
Steering axles	±20 %	0.8 ± 8.8%
Class 9 Steering	±20 %	-0.4 ± 7.7%
Single axles	±20 %	0.0 ± 11.1%
Tandem axles	±15 %	0.6 ± 7.4%
GVW	±10 %	0.0 ± 7.6%
Speed	±1 mph	0.1 ± 0.6 mph
Axle spacing	± 0.5 ft	0.1 ± 0.1 ft

Table 6-9 has the results of the prior post validation by speed groups. The equipment at the time generally estimated all weights fairly accurately at all speeds. Variability appeared to increase for single axles as speeds increase, decrease for tandem weights as speed increases, and decrease for GVW at high speeds. The current validation used a ten miles per hour wider speed range with the increase being on the low end of the range.

Table 6-9 Last Validation Results by Speed Bin – 120500 – 13-Sep-2020

Element	**95% Limit**	**Low Speed 41 to 45 mph**	**Medium Speed 46 to 50 mph**	**High Speed 51+ mph**
Steering axles	±20 %	1.2 ± 7.0%	1.5 ± 8.4%	-0.5 ± 13.0%
Class 9 Steering	±20 %	0.5 ± 8.0%	0.2 ± 9.2%	-1.9 ± 9.7%
Single axles	±20 %	-0.7 ± 10.2%	1.6 ± 11.6%	-1.4 ± 13.0%
Tandem axles	±15 %	0.1 ± 9.5%	2.9 ± 6.4%	-1.5 ± 4.7%
GVW	±10 %	-1.0 ± 8.1%	2.4 ± 8.4%	-1.7 ± 4.1%
Speed	±1 mph	0.1 ± 0.6 mph	0.1 ± 0.6 mph	0.2 ± 0.9 mph
Axle spacing	± 0.5 ft	0.1 ± 0.1 ft	0.1 ± 0.1 ft	0.1 ± 0.1 ft

7 Data Availability and Quality

As of May 23, 2007 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 a majority of the years have a sufficient quantity to be considered complete years of data. However, for the years prior to the start of the SPS WIM Pooled Fund Study no validation or calibration information is available. Based on this lack, together with the previously gathered calibration information it can be seen that at least three additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data.

Table 7-1 Amount of Traffic Data Available 120500 – 23-May-2007

Year	**Classification Days**	**Months**	**Coverage**	**Weight Days**	**Months**	**Coverage**
1991	32	3	Full Week	14	2	Full Week
1992	183	8	Full Week	21	3	Full Week
1993	None			7	2	Full Week
1994	243	8	Full Week	16	3	Full Week
1995	57	2	Full Week	None		
1996	98	5	Full Week	84	7	Full Week
1997	215	10	Full Week	21	3	Full Week
1998	359	12	Full Week	345	12	Full Week
1999	257	9	Full Week	270	9	Full Week
2000	356	12	Full Week	31	1	Full Week
2001	352	12	Full Week	None		
2002	243	9	Full Week	336	12	Full Week
2003	261	10	Full Week	267	11	Full Week
2004	291	11	Full Week	297	10	Full Week
2005	314	12	Full Week	328	12	Full Week
2006	168	6	Full Week	121	6	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 5s and Class 6s 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 – 120500 – 23-May-2007

Characteristic	**Class 9**	**Class 6**	**Class 5**
Percentage Overweights	0.0%	0.0%	0.0%
Percentage Underweights	0.0%	0.0%	N/A
Unloaded Peak	36 kips		
Loaded Peak	68 kips		
Peak		36 to 40 kips	16 kips

The expected percentage of unclassified vehicles is 0.0%. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-5. 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.

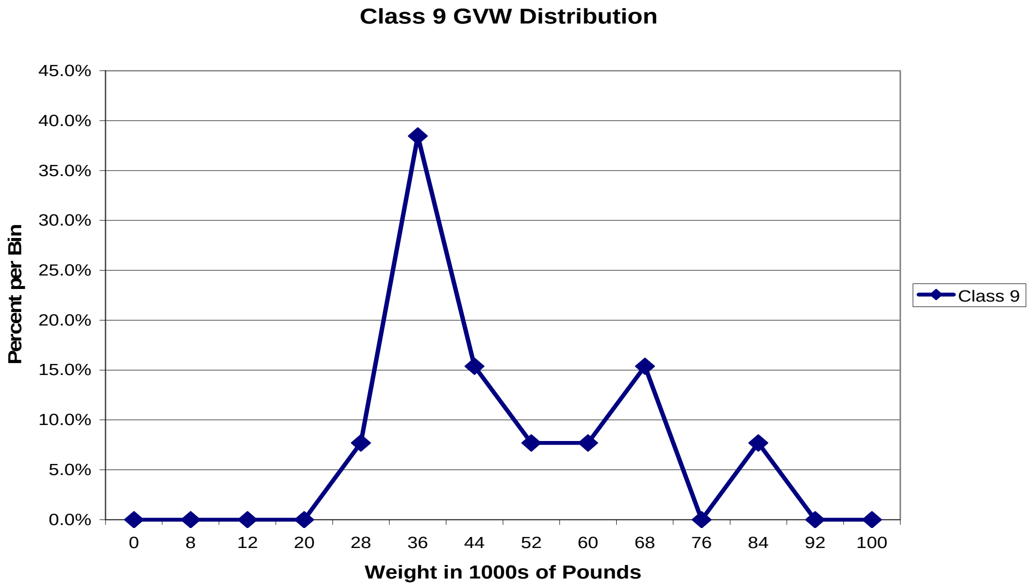


Figure 7-1 Expected GVW Distribution Class 9 – 120500 – 23-May-2007

Figure 7-2 Expected GVW Distribution Class 6 – 120500 – 23-May-2007

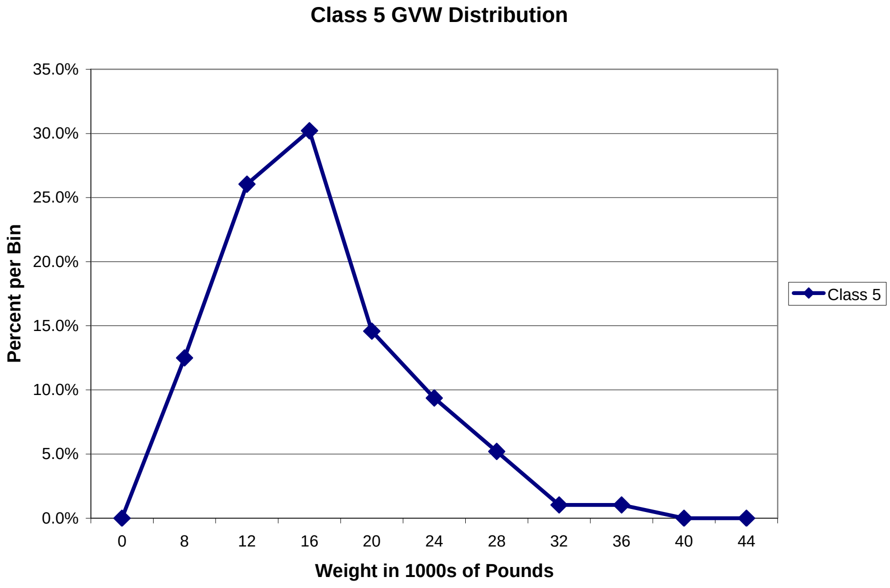


Figure 7-3 Expected GVW Distribution Class 5 – 120500 – 23-May-2007

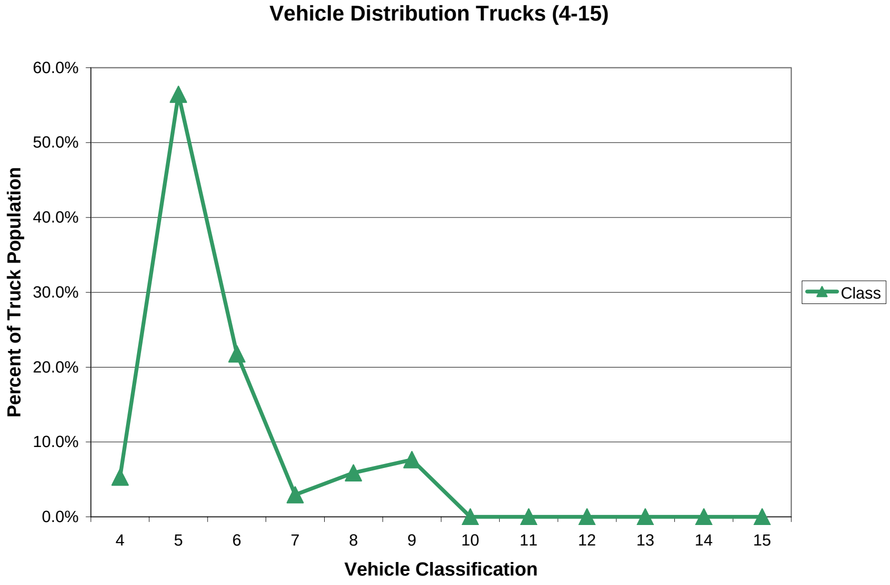


Figure 7-4 Expected Vehicle Distribution – 120500 – 23-May-2007

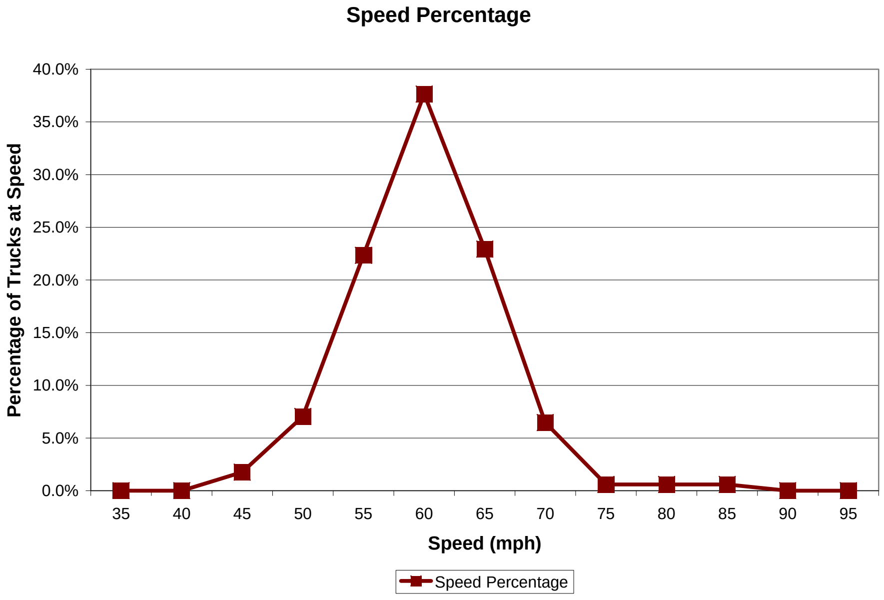


Figure 7-5 Expected Speed Distribution – 120500 – 23-May-2007

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 (4 pages)

Sheet 20 – Speed and Classification verification – Pre-Validation (1 page)
Sheet 20 – Speed and Classification verification – Post-Validation (1 page)

Sheet 21 – Pre-Validation (3 pages)
Sheet 21 – Calibration Iteration 1 (1 page)
Sheet 21 – Post-Validation (2 pages)

Calibration Iteration 1 Worksheets – (1 page)

Test Truck Photographs (6 pages)

Final System Parameters (1 page)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following page 32. It includes a current Sheet 17 with all applicable maps and photographs.

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 and before Appendix A.

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Florida

SHRP ID: 0500

Figures

1. General Information

SITE ID: *120500*

LOCATION: *US 1 South, 4.5 miles North of SR 706*

VISIT DATE: *May 23rd, 2007*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team Leader: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*

Agency: *Richard Reel, 850-414-4709, richard.reel@dot.state.fl.us*

Walton Jones, 850-414-4726, walton.jones@dot.state.fl.us

Mike Leggett, 850-414-4727, michael.Leggett@dot.state.fl.us

Bouzid Choubane, 352-955-6302, bouzid.choubane@dot.state.fl.us

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

FHWA Division Office Liaison: *Norbert Munoz, 850-942-9650, ext. 3036, norbert.munoz@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *None requested.*

ONSITE PERIOD: *May 23rd, 2007*

TRUCK ROUTE CHECK: N/A

4. Site Location/ Directions

NEAREST AIRPORT: *Palm Beach International Airport, West Palm Beach, Florida or Fort Lauderdale/Hollywood International Airport, Fort Lauderdale, Florida.*

DIRECTIONS TO THE SITE: *4.5 miles north of SR 706, near Tequesta.*

MEETING LOCATION: *On site at 9:00am, May 23rd, 2007*

WIM SITE LOCATION: US 1 *(Latitude: 26.99734; Longitude: -80.09726)*

WIM SITE LOCATION MAP: *See Figure 4.1*

Figure 4-1: Site 120500 in Florida

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION:

Pre – CAT Certified Scales, 225 North Highway 27, South Bay, FL, open 24 hours; $8.50 first weigh, $1.00 re-weigh, Phone No: (561) 992-4800

Post – CAT Certified Scales at Pilot Travel Center, I-95 exit 129, Ft. Pierce, FL, 34945 $8.50 per run, reweighs $1.00; Manager - Dennis Rodricks, 561-466-7160, Lat. 27.413770 Long. -80.395260

TRUCK ROUTE:

- *Northbound Turnaround: 1.779 miles from the site (27^0 00.783' North and 80^0 06.246' West).*
- *Southbound Turnaround: 0.52 miles from site (26^0 59.399' North and 80^0 05.659' West).*

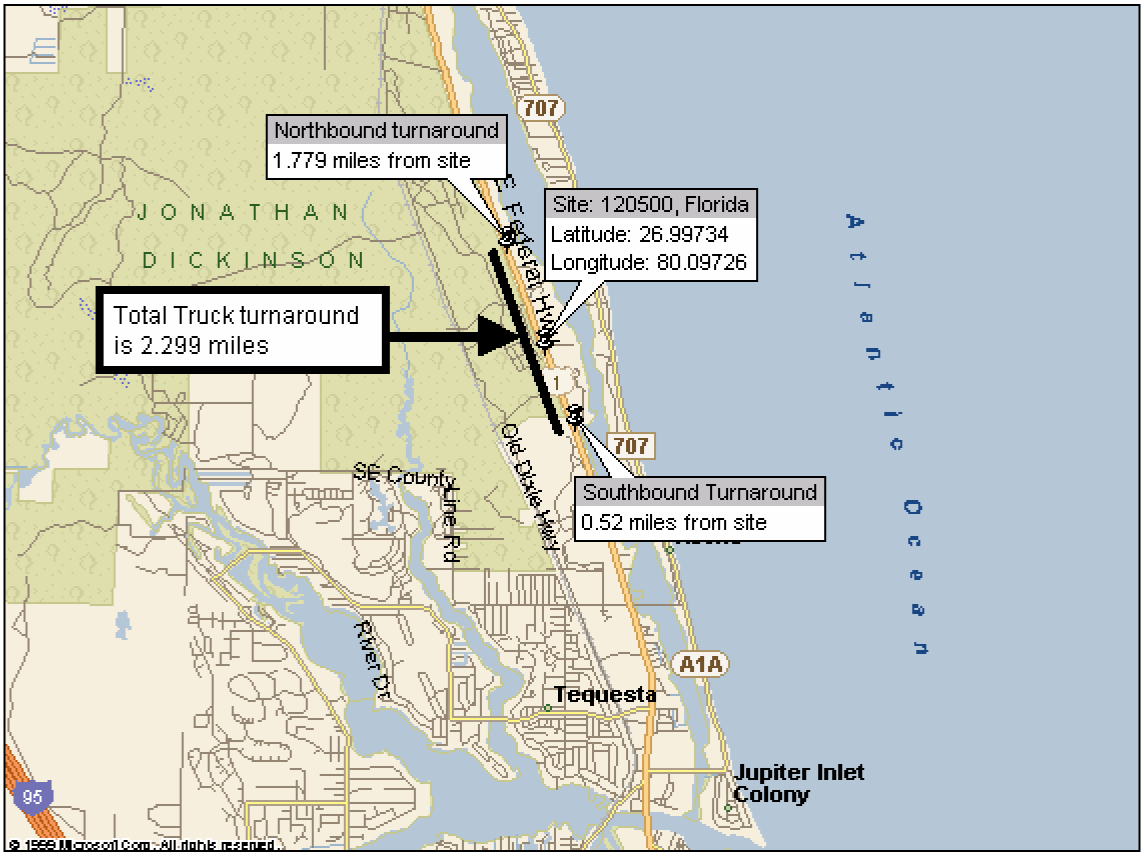


Figure 5-1: Truck Route map of 120500

6. Sheet 17 – Florida (120500)

1.* ROUTE ___US 1____ MILEPOST __N/A_____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__ _5__ _4__
Distance from sensor to nearest upstream SPS Section ___ _1__ _8__ _2__ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _1_ _2_ 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 ___ _4__ ft

4.* PAVEMENT TYPE ______Asphalt Concrete_____ ______________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date 5/23/2007__ Photo - 120500_2007_05_23_Downstream.JPG
Date 5/23/2007_ Photo - 120500_2007_05_23_Upstream.JPG
Date _________ Photo ____

6. * SENSOR SEQUENCE _____Quartz Sensor – Loop – Quartz Sensor___

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 ___ ___ . ___ 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 _3_ _2_ ft

Distance from system __1_2_9 __ ft

TYPE _______334 B____________________

CABINET ACCESS controlled by LTPP / [✓ STATE] / JOINT

Contact - name and phone number _____Kip Jones (850) 414-4726__

Alternate - name and phone number __Michael Leggett (850) 414-4726__

11. * POWER

Distance to cabinet from drop ___ ___ _5__ ft Overhead / underground / [✓ solar] / AC in cabinet?

Service provider ______________ Phone number _____________________

12. * TELEPHONE

Distance to cabinet from drop ___ ____ ___ ft Overhead / underground / [✓ cell]?

Service provider _________________ Phone Number ________________

13.* SYSTEM (software & version no.)- _____PAT DAW 190 _______

Computer connection – [✓ RS232] / Parallel port / USB / Other _______________

14. * TEST TRUCK TURNAROUND time ___6____ minutes DISTANCE _3.4__ mi.

15. PHOTOS	FILENAME
Power source	120500_2007_05_23__Solar_Panels.JPG
	120500__2007_05_23_Service_Mast.JPG
Phone source	120500_2007_05_23_Modem.JPG
Cabinet exterior	120500_2007_05_23_Cabinet_Exterior.JPG
Cabinet interior	120500_2007_05_23_Cabinet_Interior_Front.JPG
	120500_2007_05_23_Cabinet_Interior_Back.JPG
Weight sensors	
	120500_2007_05_23_Leading_WIM_Sensor.JPG
	120500_2007_05_23_Trailing_WIM_Sensor.JPG
Classification sensors	____
Other sensors	Loop____
Description	120500_2007_05_23_Loop_Sensor.JPG
Downstream direction at sensors on LTPP lane	
	120500_2007_05_23_Downstream.JPG _
Upstream direction at sensors on LTPP lane	
	120500_2007_05_23_Upstream.JPG

COMMENTS ____________GPS Coordinates: Latitude: 26.99734; Longitude: -80.09726

______________Amenities:

______________ Various Hotels, Restaurants, Gas Stations located 5 miles South of site in Jupiter.

___________Types of Trucks: Two Class 9s

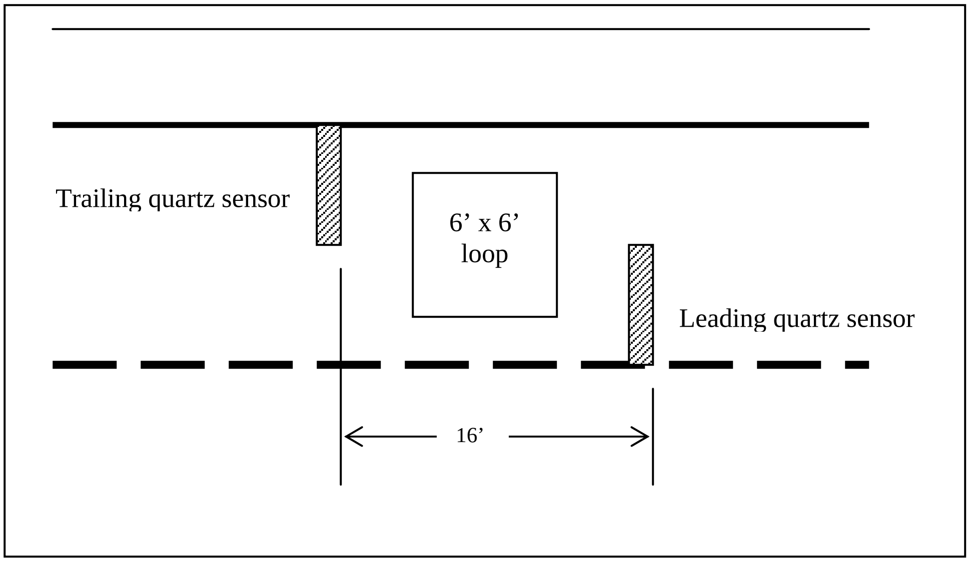
___________Expected Weight Ranges: Truck 1 – 72,000 to 80,000 lbs.; legal limit on gross and axles, air suspension; Truck 2 – 60,000 – 65,000 lbs, no suspension requirements

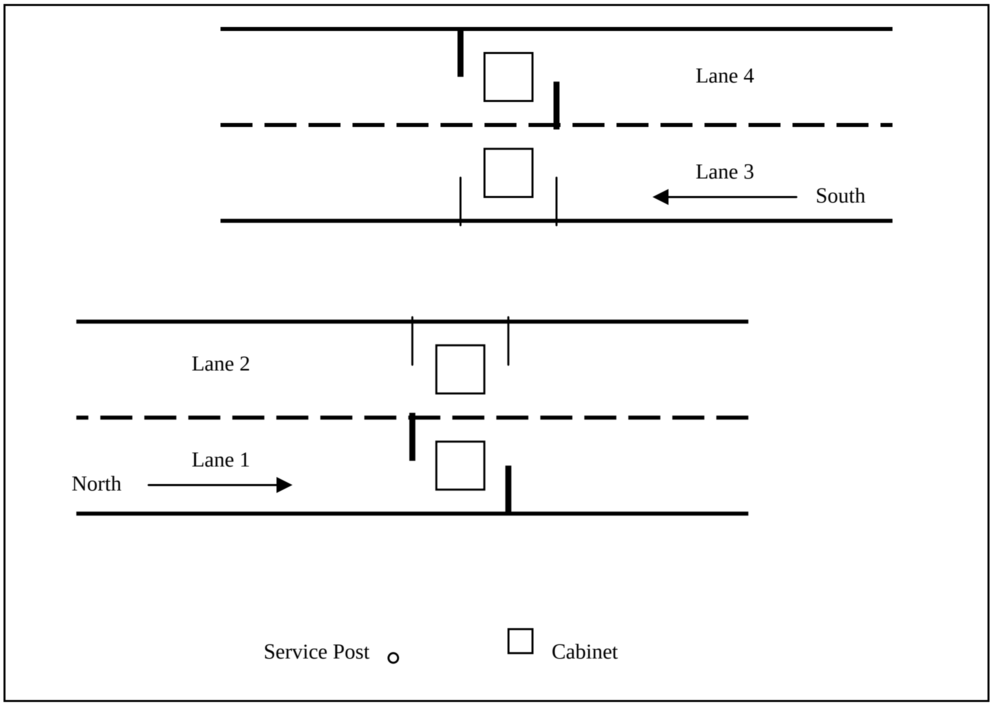
___________Speeds to be run: 35, 45 and 55 mph

COMPLETED BY _____Dean J. Wolf

PHONE __301-210-5105___ DATE COMPLETED _0_5_ /_2_3_ / _2_0_0_7_

Sketch of equipment layout





Site Map

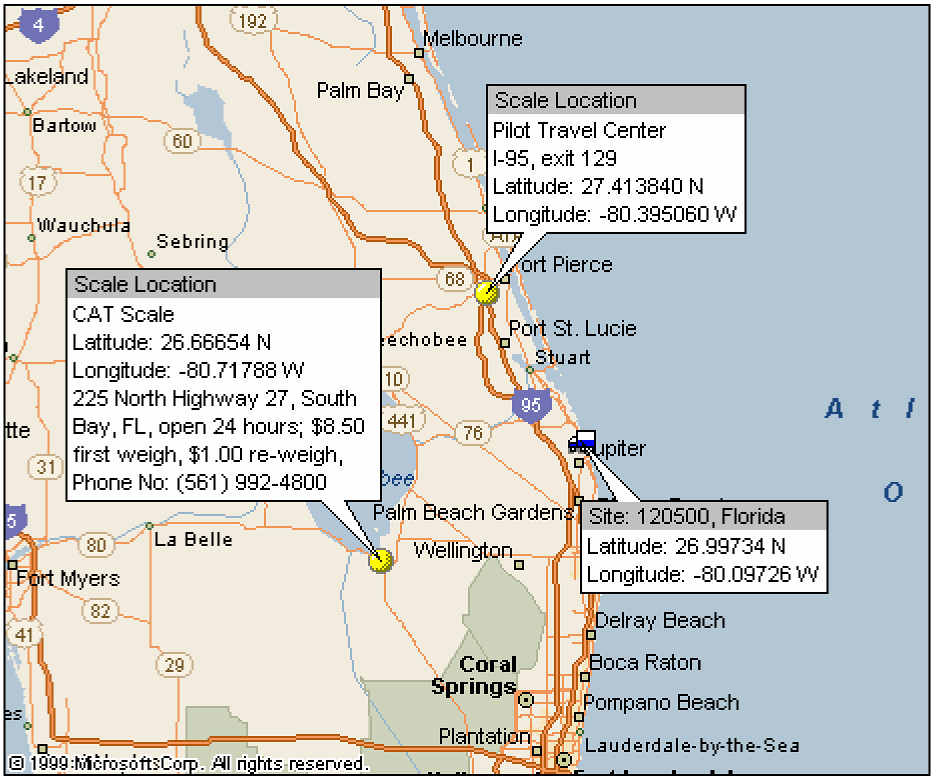


Figure 6-1: Site Map of 120500

Photo 1 - 120500_2007_05_23_Downstream.JPG

Photo 2 - 120500_2007_05_23_Upstream.JPG

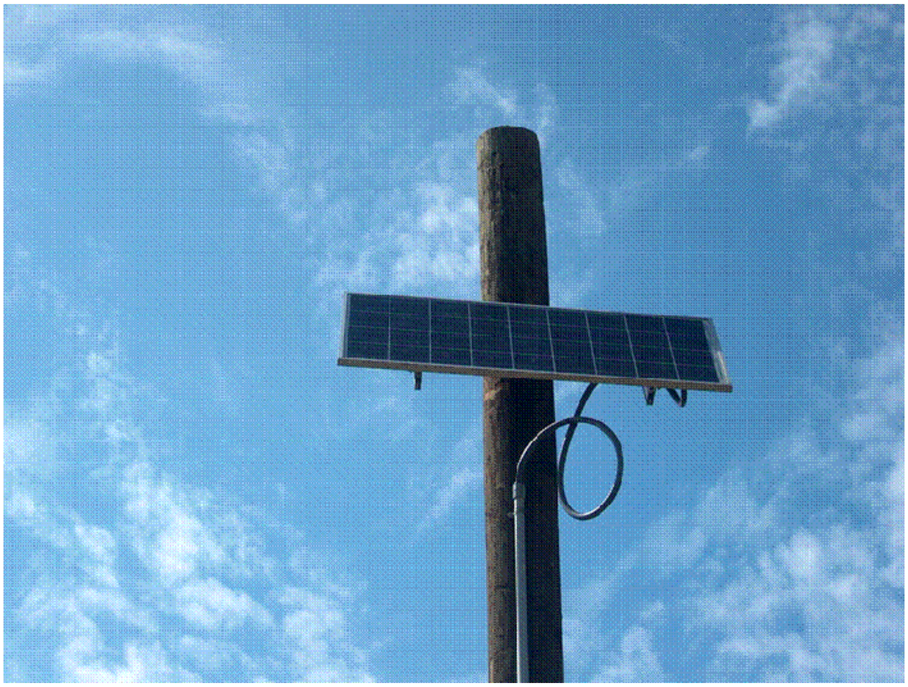


Photo 3 - 120500_2007_05_23_Solar_Panels.JPG

Photo 4 - 120500_2007_05_23_Service_Mast.JPG

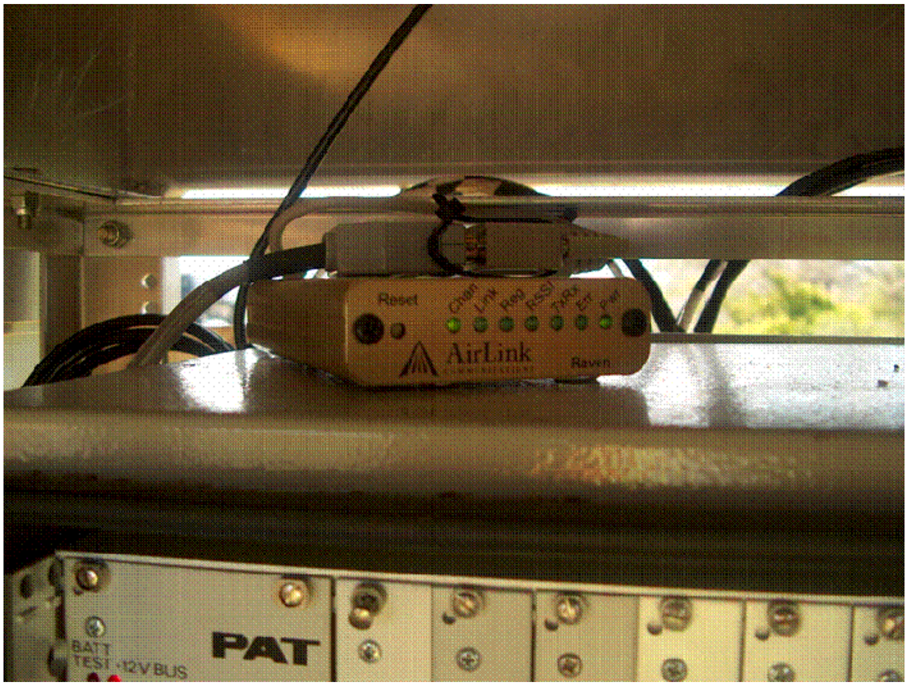


Photo 5 - 120500_2007_05_23_Modem.JPG

Photo 6 - 120500_2007_05_23_Cabinet_Exterior.JPG

Photo 7 - 120500_2007_05_23_Cabinet_Interior_Front.JPG

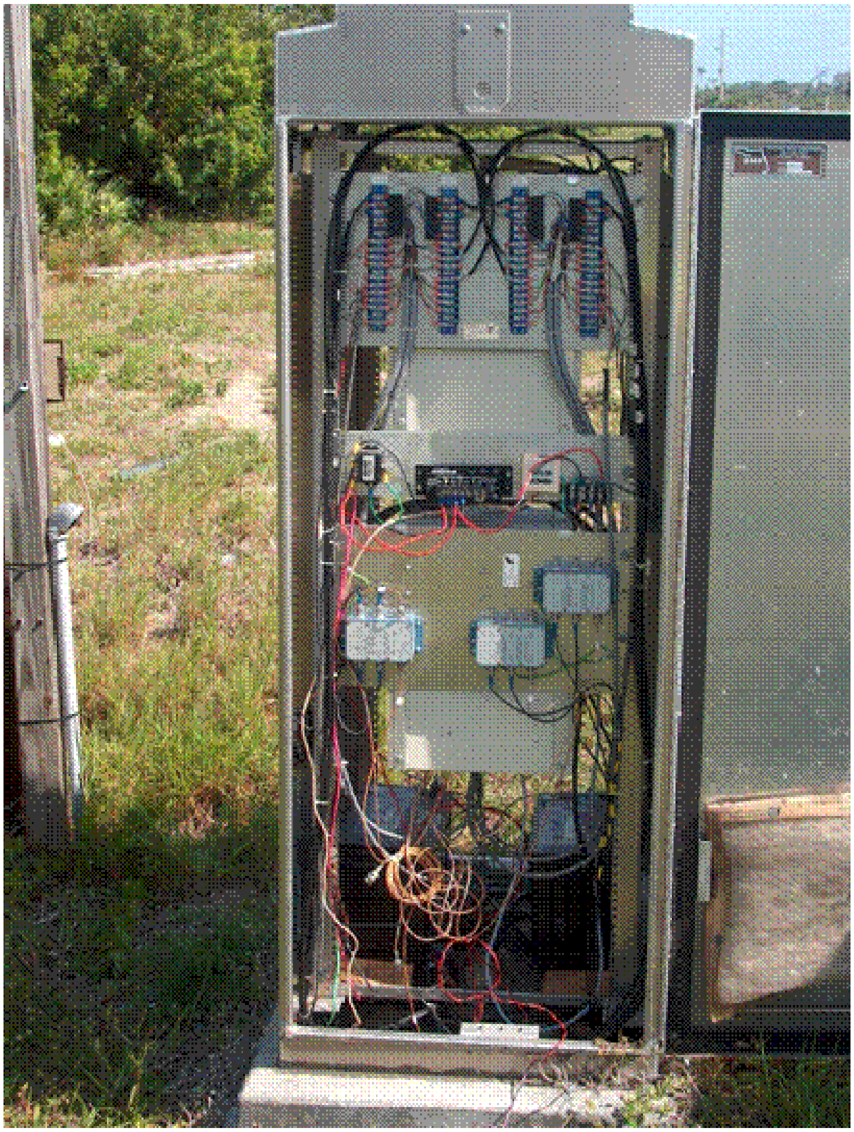


Photo 8 - 120500_2007_05_23_Cabinet_Interior_Back.JPG

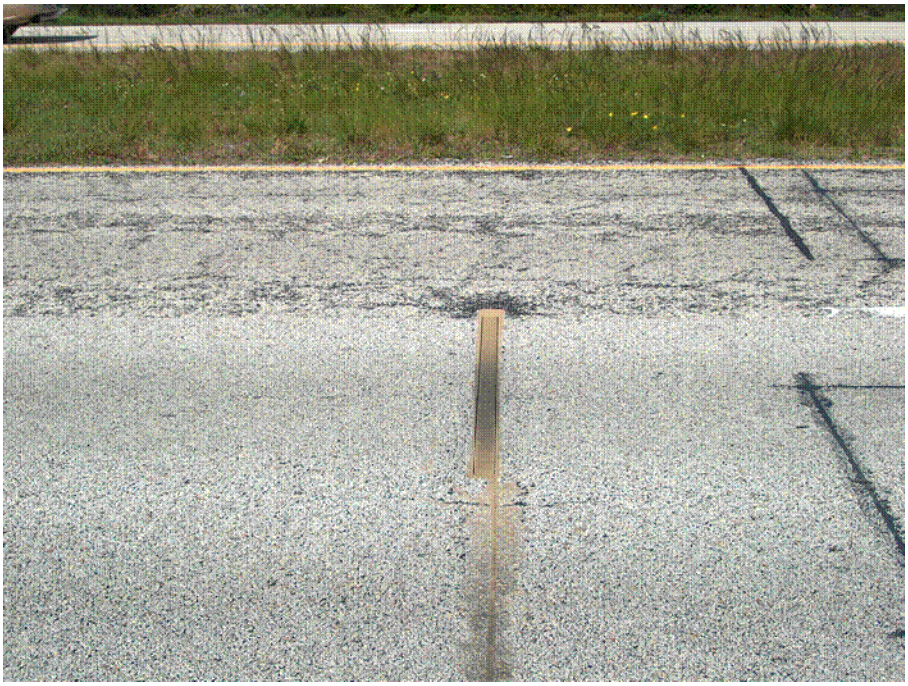


Photo 9 - 120500_2007_05_23_Leading_WIM_Sensor.JPG

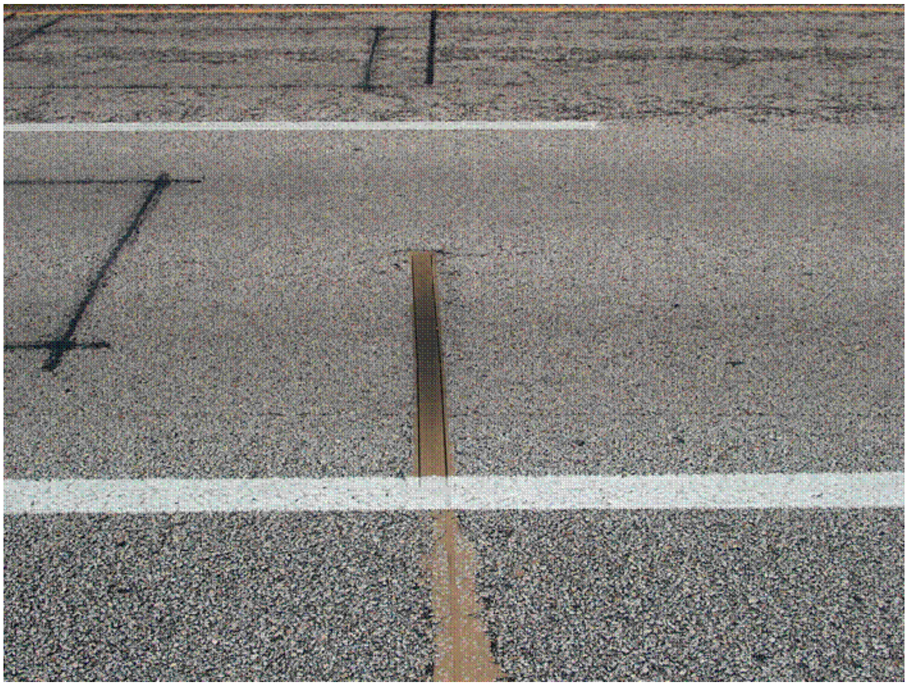


Photo 10 - 120500_2007_05_23_Trailing_WIM_Sensor.JPG

Photo 11 - 120500_2007_05_23_Loop_Sensor.JPG

SHEET 18	STATE CODE [_1_2_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_5_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_5_ / _2 _3_ / _2_0 _0_7_

Rev. 05/25/04

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

   b. Data Review –
      X State per LTPP guidelines
      ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      ☐ LTPP

   c. Data submission –
      ☐ State – ☐ Weekly ☐ Twice a month X Monthly ☐ Quarterly
      X LTPP

2. EQUIPMENT –
   a. Purchase –
      X State
      ☐ LTPP

   b. Installation –
      X Included with purchase
      ☐ Separate contract by State
      ☐ State personnel
      ☐ LTPP contract

   c. Maintenance –
      ☐ Contract with purchase – Expiration Date _______
      ☐ Separate contract LTPP – Expiration Date _______
      X Separate contract State – Expiration Date _______
      ☐ State personnel

   d. Calibration –
      X Vendor
      ☐ State
      ☐ LTPP

   e. Manuals and software control –
      X State
      ☐ LTPP

   f. Power –

i. Type –	ii. Payment –
☐ Overhead	☐ State
☐ Underground	☐ LTPP
X Solar	X N/A

SHEET 18	STATE CODE [_1_2_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_5_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_5_ / _2 _3_ / _2_0 _0_7_

Rev. 05/25/04

g. Communication –

i. Type –
☐ Landline
XCellular
☐ Other

ii. Payment –
X State
☐ LTPP
☐ N/A

3. PAVEMENT –

a. Type –
☐ Portland Concrete Cement
X Asphalt Concrete

b. Allowable rehabilitation activities –
☐ Always new
X Replacement as needed
☐ Grinding and maintenance as needed
☐ Maintenance only
☐ No remediation

c. Profiling Site Markings –
☐ Permanent
X Temporary

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required ___14__ X days ☐ weeks

b. Notice for straightedge and grinding check - ___4___ ☐ days X weeks

i. On site lead –
X State
☐ LTPP

ii. Accept grinding –
X State
☐ LTPP

c. Authorization to calibrate site –
X State only
☐ LTPP

d. Calibration Routine –
X LTPP – ☐ Semi-annually X Annually
☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
X State other – ___________________________

SHEET 18	STATE CODE [_1_2_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_5_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_5_ / _2 _3_ / _2_0 _0_7_

Rev. 05/25/04

e. Test Vehicles
  i. Trucks –
    1st – Air suspension 3S2 ☐ State X LTPP
    2nd – Class 5 ☐ State X LTPP
    3rd – ________________ ☐ State ☐ LTPP
    4th – ________________ ☐ State ☐ LTPP

  ii. Loads – ☐ State X LTPP

  iii. Drivers – ☐ State X LTPP

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

_______FTE, DTS, MACTEC Engineering and Consulting, Inc.______________

g. Access to cabinet
  i. Personnel Access –
    X State only
    ☐ Joint
    ☐ LTPP

  ii. Physical Access –
    X Key
    ☐ Combination

h. State personnel required on site – X Yes ☐No

i. Traffic Control Required – ☐Yes X No

j. Enforcement Coordination Required – ☐Yes X No

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

b. Reports – ____

c. Other – ____

d. Special Conditions – ____

6. CONTACTS –

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

Name: ___Michael Leggett_______ Phone: __(850) 414-4727____

Agency: ____ARA____________________________________

SHEET 18	STATE CODE [_1_2_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_5_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_5_ / _2 _3_ / _2_0 _0_7_

Rev. 05/25/04

b. Maintenance (equipment) –

Name: ___Kip Jones___________ Phone: __(850) 414-4726___

Agency: ___FL DOT_______________________________

c. Data Processing and Pre-Visit Data –

Name: ___Richard Reel________ Phone: _(850) 414 4709_

Agency: ____

d. Construction schedule and verification –

Name: ____Kip Joes__________ Phone: __(850) 414-4726___

Agency: ____

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

Name: __Billy Graham__________ Phone: __(352) 748-6066___

Agency: ___Graham Trucking Lines, Coleman FL ___33521

f. Traffic Control –

Name: _______________________ Phone: _________________

Agency: ____

g. Enforcement Coordination –

Name: _______________________ Phone: _________________

Agency: ____

h. Nearest Static Scale

Name: __CAT Scales Falcon Citgo Truck Stop___________________

Location: __I-95 Exit 129, Ft. Pierce FL 34945_____________________

Phone: ___ (561) 466-7160___________________________________

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [12] *SHRP SECTION ID [0500]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [5/23/2007]

2. * TYPE OF EQUIPMENT CALIBRATED ____ WIM ____ CLASSIFIER _X_ BOTH

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic___________________________________

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

__ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	2
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___-11.0 STANDARD DEVIATION ___3.2
DYNAMIC AND STATIC SINGLE AXLES ___-9.8 STANDARD DEVIATION ___6.3
DYNAMIC AND STATIC DOUBLE AXLES ___-11.3 STANDARD DEVIATION ___4.3

8. 3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ _34_ __45__ __55_ ______ __ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___1030___

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 _X__ TIME ___ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ -50.0 FHWA CLASS ___ ____ ____ _____
*** FHWA CLASS 8 ____ -78.0 FHWA CLASS ___ ____ ____ _____
FHWA CLASS ___ ____ ____ _____
FHWA CLASS ___ ____ ____ _____
*** PERCENT “UNCLASSIFIED” VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC____________________
CONTACT INFORMATION: ______301-210-5105___________________________________ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [12] *SHRP SECTION ID [0500]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [5/23/2007]

2. * TYPE OF EQUIPMENT CALIBRATED ____ WIM ____ CLASSIFIER _X_ BOTH

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic___________________________________

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

__ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	2
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---

DYNAMIC AND STATIC GVW	-1.1	STANDARD DEVIATION	3.5
DYNAMIC AND STATIC SINGLE AXLES	2.8	STANDARD DEVIATION	6.0
DYNAMIC AND STATIC DOUBLE AXLES	-1.8	STANDARD DEVIATION	4.5

8. 3 ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ _35_ __45__ __55_ _____ __ __ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___1030___

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 _X_ TIME __ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ 0.0
*** FHWA CLASS 8 ____ -67.0
FHWA CLASS ____ ____ ____ _____
FHWA CLASS ____ ____ ____ _____
FHWA CLASS ____ ____ ____ _____
FHWA CLASS ____ ____ ____ _____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC____________________
CONTACT INFORMATION: ______301-210-5105___________________________________ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 5/23/07

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		11740	11480	[✓ D] / C
B		14587	14510	[✓ D] / C
C		14587	14510	[✓ D] / C
D		16907	16880	[✓ D] / C
E		16907	16880	[✓ D] / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 74727

*c) Post Test Loaded Weight 74260

*d) Difference Post Test – Pre-test -467 ✓

GEOMETRY

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

9. a) * Make: MACK b) * Model: CL700

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 5/23/07

Rev. 08/31/01

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

A to B 14.9
B to C 4.3
C to D 31.8
D to E 4.1
E to F ______

Wheelbased (measured A to last) ______ Computed 55.1

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	425/45R22.5	4 leaf steel spring
B	11R24.5	air
C	11R24.5	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	12
LTPP Traffic Data	* SPS PROJECT ID	0500
*CALIBRATION TEST TRUCK # 1	* DATE	05/23/07

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 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 1	* DATE 5/23/2007

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	11700	14600	14600	16910	16910		74720
2	11720	14600	14600	16910	16910		74740
3	11800	14560	14560	16900	16900		74720
Average	11740	145~~80~~	1459~~0~~	169~~10~~	169~~10~~		747~~30~~
		87	87	07	07		727

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11480	14510	14510	16880	16880		74260
2							
3							
Average	11480	14510	14510	16880	16880		74260

Measured By

Verified By

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 05/23/07

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		10093	9900	[✓ D] / C
B		13303	13270	[✓ D] / C
C		13303	13270	[✓ D] / C
D		14563	14470	[✓ D] / C
E		14563	14470	[✓ D] / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight 65827

*c) Post Test Loaded Weight 65380

*d) Difference Post Test – Pre-test -447

GEOMETRY

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

9. a) * Make: KENWORTH   b) * Model: W900

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED EVENLY ALONG TRAILER

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

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK #2	* DATE 05/23/07

Rev. 08/31/01

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

A to B 19.0 B to C 4.5 C to D 30.7

D to E 4.0 E to F ______

Wheelbased (measured A to last) ______ Computed 58.2

13. *Kingpin Offset From Axle B (units) ______(+2.8)__
(+ 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	4 leaf spring
B	11R24.5	air
C	11R24.5	air
D	295/75R22.5	steel spring
E	295/75R22.5	steel spring
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK #2	* DATE 05/23/2007

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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 12
LTPP Traffic Data	* SPS PROJECT ID 0500
*CALIBRATION TEST TRUCK # 2	* DATE 05/23/07

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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	10120	13260	13260	14590	14590		65820
2	10060	13320	13320	14560	14560		65820
3	10100	13330	13330	14540	14540		65840
Average	10093	13303	13303	14563	14563		~~65830~~ 827

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1							
2							
3							
Average							

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	9900	13270	13270	14470	14470		65380
2							
3							
Average	9900	13270	13270	14470	14470		65380

Measured By ______

Verified By ______

6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Sheet_19.doc

94.80
215.80
325.60

Sheet 20	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 1 of* 1	* DATE 05/22/2007

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
51	5	12223	51	5	61	~~9~~5	2761	61	~~9~~5
51	3	12562	54	5 -	64	5	2766	62	5
50	3	12683	50	8 -	57	5	2879	56	4
62	3	12694	62	9 -	59	5	2905	58	5
57	5	12940	58	4 -	62	5	2929	62	5
60	5	13147	60	5	49	7	3007	48	7
53	5	13221	51	5	58	6	3038	58	6
59	5	13264	55	4	57	3	3046	56	8 -
57	4	13284	55	4	56	5	3081	54	4 -
61	6	13608	61	6	57	3	3221	57	5 -
58	3	1773	56	8 -	64	5	3291	64	8 -
59	3	1847	59	5 -	48	3	3356	49	5 -
50	5	1887	52	5	51	5	3357	51	5
50	3	1953	51	5 -	56	4	3433	54	4
61	7	2043	59	7	57	5	3445	58	5
64	6	2117	64	6	62	5	3488	62	5
56	3	2195	56	8 -	53	5	3720	51	5
55	5	2244	55	8 -	62	5	3816	62	5
60	5	2266	59	5	55	5	4072	55	5
57	3	2311	59	5 -	61	8	4079	61	8
54	5	2424	56	5	52	6	4100	53	6
50	9	2511	51	9	53	3	4258	52	8
56	5	2534	52	5					
56	8	2595	56	8					
64	5	2652	64	5					

5+ 2 ax tr.
810 w/ 3 ax tr
bus 21.1'
21.1 ft space
23.1 ft space
4:50pm 5/22/07
7:20 am 5/23/07

bus 21.2
22.7
bus 21.7
23.0
8:20 am
9:20 am

Recorded by RP Direction SB Lane 1 Time from 3:50 pm to 4:50 pm 5/22

7:20 to 9:20 am 5/23

6420060018_SPSWIM_TO_19_12_2.88_0500_Pre_Sheet_20.doc

Sheet 20	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
Speed and Classification Checks * 1 of* 1	* DATE 05/24/2007

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
47	9	11022	47	9	60	~~60~~ 5	13447	59	5
57	9	11025	57	9	55	4	13462	53	4
62	5	11075	60	5	49	5	13597	47	5
51	5	11076	50	5	59	7	13746	60	7
52	3	11219	52	5	57	5	13777	55	4
55	6	11299	54	6	51	3	13854	50	5
57	3	11359	56	5	47	3	14676	43	5
52	5	11395	52	8	48	5	14726	46	5
52	3	11496	51	5	38	3	15199	38	5
65	6	11500	64	6	54	5	15751	54	5
54	3	11627	55	5					
53	8	11651	53	8					
50	3	11829	49	8					
45	4	11922	43	4					
52	5	12087	52	5					
66	9	12173	65	9					
57	5	12313	55	5					
50	5	12700	50	5					
57	5	12702	55	5					
62	5	12726	62	5					
62	3	12793	59	5					
53	3	12889	51	5					
56	3	13228	54	5					
44	5	13252	48	5					
59	5	13257	58	9					

Recorded by DJW Direction SOUTH Lane 4 Time from 2:45 to 5:45

6420060018_SPSWIM_TO_19_12_2.88_0500_Post_Sheet_20.doc

RP

9921

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 1 of 3	* DATE 05/23/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
91.5	34	2	1	9:36	5238	34	4.6/4.8	5.8/5.8	5.9/5.6	6.4/6.7	7.1/7.0		59.8	19.2	4.5	30.9	4.1	
91.5	33	1	1	9:37	5254	34	5.2/5.3	6.3/6.6	6.1/5.4	6.4/8.4	6.3/7.5		63.6	14.9	4.4	31.8	4.1	
91.5	43	2	2	9:40	5303	44	4.4/4.7	5.8/6.3	6.0/6.2	5.2/5.5	7.8/6.2		58.1	19.2	4.5	31.0	4.0	
91.5	43	1	2	9:41	5324	43	4.2/4.3	6.0/7.2	6.3/6.7	6.0/9.7	5.5/9.3		65.1	14.9	4.4	32.0	4.1	
93	54	2	3	9:43	5374	54	4.1/5.4	5.7/5.8	5.5/5.5	5.5/6.1	7.8/7.4		58.9	19.2	4.5	30.9	4.0	
93	52	1	3	9:45	5405	54	5.0/5.3	6.3/6.8	6.9/5.8	6.8/8.8	6.8/8.5		67.1	14.9	4.4	31.9	4.1	
88	34	2	4	9:47	5439	33	4.5/4.6	5.6/6.0	5.8/5.5	7.3/6.3	7.1/6.9		59.8	19.1	4.5	30.8	4.1	
88	35	1	4	9:50	5505	34	5.2/5.1	6.2/6.7	6.2/5.6	6.8/8.6	6.4/8.2		65.0	14.9	4.4	31.8	4.1	
91.5	43	2	5	9:51	5518	43	4.0/5.1	6.2/6.0	6.3/5.9	5.7/6.4	8.0/7.5		61.0	19.2	4.5	30.8	4.0	
91.5	44	1	5	9:55	5579	44	5.7/5.0	7.0/7.5	7.0/6.5	6.4/9.1	6.5/9.5		70.3	14.9	4.4	31.9	4.1	
86.5	54	2	6	9:57	5607	53	4.7/5.5	5.6/5.9	6.2/5.5	6.6/6.1	8.2/7.1		61.0	19.2	4.5	30.9	4.0	
86.5	54	1	6	9:59	5650	54	5.7/5.2	6.7/6.8	6.6/6.0	6.5/8.8	6.8/9.0		68.0	14.9	4.4	31.9	4.1	
87.5	34	2	7	10:01	5681	34	4.4/4.8	5.9/5.7	5.9/5.7	7.8/6.7	7.6/7.1		61.7	19.1	4.5	30.8	4.1	
87.5	34	1	7	10:02	5718	34	5.3/4.8	6.0/6.2	6.3/5.8	6.1/8.1	6.3/8.0		62.9	14.9	4.3	31.8	4.1	
91.5	43	2	8	10:05	5762	43	4.4/4.8	6.0/5.9	6.3/5.8	4.1/6.6	7.5/6.6		58.1	19.1	4.5	30.9	4.0	
91.5	44	1	8	10:07	5795	44	4.0/4.3	5.9/7.2	6.1/6.4	5.9/9.4	5.9/9.2		64.3	14.9	4.3	32.0	4.1	

Recorded by ______ Checked by RP

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 05/21/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
	~~42~~	~~2~~	~~9~~	~~10:09~~	~~5795~~ ~~5833~~	~~44~~	~~5.1/5.5~~	~~2.8/3.1~~	~~3.1/2.3~~	~~2.2/2.4~~	~~1.9/2.4~~		~~30.9~~					
	~~53~~	~~2~~	~~9~~															
~~95.5~~	~~42~~	~~1~~	~~9~~	~~10:07~~	~~5795~~	~~44~~	~~4.0/4.3~~	~~5.9/7.2~~	~~6.1/6.4~~	~~5.9/9.4~~	~~5.9/7.2~~		~~64.3~~	~~14.9~~	~~4.3~~	~~32.0~~	~~4.1~~	
95.5	54	1	9	10:11	5871	53	5.8/5.4	6.6/7.2	6.6/6.2	6.3/9.4	6.5/9.1		69.0	14.8	4.4	32.0	4.1	
95.5	54	2	9	10:14	5923	54	4.6/4.9	6.0/5.5	5.8/5.6	6.1/5.9	6.5/6.9		57.7	19.1	4.5	30.8	4.0	
95.5	34	1	10	10:16	5963	34	5.3/5.0	6.3/7.1	6.2/5.7	7.1/9.1	6.4/8.3		66.8	14.9	4.4	31.9	4.1	
97.5	34	2	10	10:17	5987	34	4.6/4.5	5.8/6.0	5.7/5.7	6.3/5.7	6.2/6.2		56.6	19.2	4.5	30.8	4.1	
97.5	44	1	11	10:20	6061	44	5.3/5.3	6.6/7.0	6.5/6.0	6.3/8.6	6.4/8.4		66.4	14.9	4.4	32.0	4.1	
98	42	2	11	10:22	6085	42	4.7/4.8	6.1/6.0	6.4/6.2	5.3/6.3	7.7/6.8		60.2	19.2	4.5	30.9	4.0	
98	52	1	12	10:25	6124	52	5.5/5.7	6.7/7.2	6.5/5.9	7.1/9.4	6.5/8.9		69.5	14.9	4.4	31.9	4.1	
98	54	2	12	10:26	6164	54	4.6/5.3	5.7/5.5	5.4/5.6	4.1/6.1	7.6/7.5		57.5	19.2	4.5	31.0	4.0	
98	36	1	13	10:29	6231	34	5.4/5.4	6.2/6.7	6.2/5.8	6.4/8.5	6.2/8.0		64.8	14.9	4.4	31.9	4.0	
98	36	2	13	10:31	6266	34	4.7/4.8	5.2/5.2	5.9/6.2	5.9/5.8	6.2/6.3		55.2	19.3	4.5	30.9	4.0	
96.5	43	1	14	10:34	6320	44	5.4/5.1	6.7/7.4	6.9/6.2	7.0/9.1	6.7/8.9		69.3	14.9	4.3	31.9	4.1	
96.5	45	2	14	10:35	6344	45	4.6/4.8	6.3/6.4	6.4/4.9	7.0/6.1	7.8/7.0		58.3	19.1	4.5	30.9	4.0	
96.5	54	1	15	10:38	6390	54	5.8/5.3	6.9/7.1	6.9/5.7	6.6/9.4	6.9/9.1		69.7	14.8	4.3	31.9	4.0	

Recorded by DJW

Checked by RP

Sheet 21	* STATE CODE 12
LTPP Traffic Data	*SPS PROJECT ID 0500
WIM System Test Truck Records 3 of 3	* DATE 05/23/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
96.5	53	2	15	10:39	6406	53	4.5/5.1	6.2/5.7	6.2/5.7	6.2/6.3	7.1/7.3		60.2	19.2	4.5	31.0	4.1	
99	34	1	16	10:42	6450	35	5.0/5.2	6.3/6.5	6.2/5.2	6.5/8.4	6.1/7.9		63.2	14.9	4.4	31.9	4.1	
99	35	2	16	10:44	6479	34	4.0/4.9	6.0/5.8	5.9/5.2	4.7/6.9	7.4/7.3		57.9	19.2	4.5	31.0	4.0	
100.5	43	1	17	10:47	6532	43	5.0/6.1	6.3/6.9	6.6/6.0	6.4/9.1	6.9/8.4		67.7	14.9	4.3	31.9	4.0	
100.5	42	2	17	10:48	6570	42	4.7/4.8	6.4/6.0	6.2/5.9	5.2/5.8	7.5/7.5		60.0	19.1	4.5	30.9	4.0	
103	53	1	18	10:50	6605	53	4.4/4.7	6.5/6.6	6.2/5.4	6.4/9.2	6.2/9.1		64.5	14.8	4.4	31.9	4.1	
103	53	2	18	10:53	6639	54	4.8/5.1	5.5/5.6	5.9/5.3	5.9/6.0	7.5/6.7		58.2	19.2	4.5	30.9	4.0	
106	35	1	19	10:55	6668	35	4.3/4.3	6.2/6.7	5.8/5.4	6.0/8.6	6.1/8.4		61.8	14.9	4.4	31.8	4.1	
106	36	2	19	10:56	6711	36	4.2/5.0	5.9/5.6	5.9/5.6	7.0/6.6	7.8/7.7		61.3	19.2	4.5	30.9	4.0	
107	54	1	20	11:00	6773	54	5.3/5.2	6.3/6.5	6.8/5.9	6.5/8.6	6.5/8.8		66.3	14.9	4.3	32.0	4.1	
107	55	2	20	11:01	6794	55	4.4/5.0	5.6/5.1	5.7/4.8	4.4/6.4	6.6/6.7		54.6	19.2	4.5	30.9	4.0	

Recorded by QJW

Checked by RP

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0500
WIM System Test Truck Records 1 of 1	* DATE	05/23/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
108	33	1	1	11:25	7216	35	6.2/5.5	6.9/6.9	7.2/6.0	6.8/9.6	6.8/8.5		70.3	14.9	4.3	31.9	4.1	
108	33	2	1	11:27	7253	33	5.3/5.2	6.6/6.7	7.0/6.2	6.5/7.2	8.1/8.0		66.9	19.2	4.5	30.9	4.0	
107.5	45	1	2	11:30	7299	43	6.1/7.0	7.3/7.5	7.7/6.3	7.2/9.4	7.3/9.2		75	14.9	4.3	31.9	4.1	
107.5	42	2	2	11:32	7321	43	5.1/5.5	6.4/6.3	6.9/6.7	7.7/6.7	7.9/6.9		66.3	19.2	4.5	30.8	4.0	
108	44	1	3	11:35	7377	44	5.9/5.7	6.9/7.1	7.2/6.2	6.7/9.4	6.7/9.4		71.2	14.9	4.3	31.9	4.0	
108	54	2	3	11:35	7390	54	5.0/5.6	6.8/7.0	7.0/6.3	6.2/7.0	8.5/7.4		66.8	19.2	4.5	30.9	4.0	
101.5	52	1	4	11:39	7441	53	6.0/6.7	6.9/8.5	7.3/6.8	7.0/10.8	7.2/9.9		77.0	14.9	4.4	32.0	4.1	
101.5	32	2	4	11:40	7469	32	5.1/5.0	6.5/6.5	6.6/6.2	6.0/6.2	7.7/7.0		62.8	19.2	4.5	30.9	4.0	
106.5	36	1	5	11:43	7526	36	5.8/5.4	7.7/8.5	7.4/6.8	8.0/10.6	7.8/9.8		78.0	14.9	4.4	31.9	4.1	
106.5	44	2	5	11:44	7560	42	4.9/5.3	6.8/7.2	7.0/6.4	5.5/7.4	8.2/7.3		66.0	19.2	4.5	30.9	4.0	
108.5	53	1	6	11:48	7628	54	5.6/5.9	7.4/7.5	7.3/6.7	7.3/9.1	7.3/9.1		73.3	14.9	4.4	32.0	4.1	
108.5	53	2	6	11:48	7630	53	5.0/5.2	6.6/6.4	6.1/6.3	5.5/6.1	7.7/7.2		62.1	19.2	4.5	30.9	4.0	

Recorded by DJV

Checked by RP

121.5

Sheet 21
LTPP Traffic Data
WIM System Test Truck Records 1 of 2

* STATE_CODE 12
*SPS PROJECT_ID 0500
* DATE 05/23/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
~~109.5~~	~~35~~	~~1~~	~~7~~	~~13:06~~														
109.5	33	2	7	13:06	9070	34	5.3/5.4	6.1/6.6	6.0/5.8	6.4/5.8	7.4/7.2		61.9	19.2	4.5	30.8	4.0	
115	44	1	7	13:10	9126	44	6.2/6.2	6.8/7.7	7.2/6.4	7.2/9.1	7.4/9.1		73.4	14.9	4.3	31.9	4.0	
115	44	2	8	13:11	9128	44	5.5/5.3	6.9/7.2	7.0/6.6	6.9/7.4	8.0/7.7		68.6	19.2	4.5	30.9	4.0	
115.5	52	1	8	13:15	9208	54	6.4/6.2	7.5/8.1	7.8/6.5	7.9/10.4	7.4/10.2		78.4	14.9	4.4	31.9	4.1	
115.5	53	2	9	13:15	9212	53	4.7/6.0	6.8/7.0	7.1/6.4	7.0/7.1	9.0/8.0		69.0	19.2	4.5	30.9	4.0	
115	35	1	9	13:20	9288	34	6.2/6.0	6.7/7.5	7.2/6.5	7.4/9.9	7.1/9.3		73.9	14.9	4.3	31.9	4.1	
115	35	2	10	13:20	9292	35	5.2/5.4	6.3/6.2	6.2/6.1	5.4/6.6	7.6/6.8		61.8	19.2	4.5	30.8	4.0	
116.5	46	1	10	13:26	9426	45	5.8/6.2	7.1/7.8	7.0/6.6	6.7/9.9	7.2/9.2		73.6	14.9	4.4	32.0	4.1	
116.5	43	2	11	13:28	9454	43	5.2/4.9	6.8/7.2	7.2/6.8	6.6/6.8	8.0/7.0		66.5	19.1	4.5	30.8	4.0	
119.5	53	1	11	13:31	9526	53	5.0/4.6	6.5/8.2	6.9/6.3	7.4/10.2	6.8/10.2		72.1	14.8	4.4	31.9	4.1	
119.5	54	2	12	13:32	9540	54	5.3/5.5	6.4/6.5	6.7/5.8	6.2/6.2	8.2/6.8		63.6	19.1	4.5	30.8	4.0	
119	34	1	12	13:37	9631	34	5.8/6.1	6.6/7.2	7.1/5.9	7.2/9.5	7.2/9.1		71.7	14.9	4.4	31.9	4.1	
119	33	2	13	13:38	9651	35	4.5/5.3	6.0/5.8	6.0/5.6	6.4/7.0	6.8/7.6		60.9	19.2	4.5	30.8	4.0	
119.5	53	1	13	13:41	9725	53	5.4/5.7	7.5/7.8	7.1/5.9	7.2/9.5	6.9/9.4		72.5	14.9	4.4	31.9	4.1	
119.5	43	2	14	13:43	9747	43	5.0/5.5	7.0/7.2	7.0/6.8	5.5/7.6	8.1/7.3		67.0	19.1	4.5	30.9	4.0	

Recorded by DJW

Checked by RP

see cal 1 for 1st 12 passes of post 40

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0500
WIM System Test Truck Records 2 of 2	* DATE 05/23/2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
114	34	1	14	13:46	9810	34	5.7/5.4	6.7/7.2	6.9/5.7	7.2/8.9	7.0/8.8		69.4	14.9	4.4	31.8	4.1	
114	33	2	15	13:46	9816	34	5.3/5.3	6.5/6.3	6.7/6.0	7.1/6.4	7.0/7.3		64.0	19.1	4.5	30.8	4.0	
118.5	43	1	15	13:51	9931	45	5.4/5.3	6.8/8.3	6.5/6.7	6.4/10.0	6.4/10.4		72.1	14.9	4.4	32.0	4.1	
118.5	44	2	16	13:52	9941	44	5.5/5.3	6.4/6.9	6.6/6.4	8.4/6.5	7.9/7.0		67.0	19.1	4.5	30.7	4.0	
119.5	54	1	16	13:56	10027	54	5.5/5.8	6.8/7.5	7.7/6.7	7.2/9.7	6.9/9.3		73.1	14.9	4.3	32.0	4.1	
119.5	54	2	17	13:56	10033	55	5.0/5.8	7.0/6.6	7.0/6.4	6.5/7.1	7.4/8.3		67.0	19.1	4.5	30.9	4.0	
121.0	34	1	17	13:59	10109	34	5.9/6.0	6.7/7.6	6.9/6.5	7.7/9.8	7.0/9.3		73.4	14.9	4.4	31.9	4.1	
~~121.0~~	~~33~~	~~2~~	~~18~~	~~14:00~~	~~10131~~	~~32~~	~~5.2/5.1~~	~~6.3/7.0~~	~~6.4/6.3~~	~~3.6/5.8~~	~~7.2/7.1~~		~~59.8~~	~~19.2~~	~~4.5~~	~~31.0~~	~~4.0~~	
120.0	43	1	18	14:04	10201	44	5.7/4.6	7.0/7.8	7.3/6.9	6.8/10.4	6.2/10.4		73.0	14.8	4.3	31.9	4.1	
120.0	42	2	18	14:05	10217	42	5.0/5.6	6.5/6.9	6.6/6.2	5.7/5.1	7.7/6.7		62.1	19.2	4.5	30.9	4.0	
~~119.0~~	~~53~~	~~1~~	~~19~~	~~14:08~~	~~10260~~	~~54~~	~~7.5/5.9~~	~~7.1/8.6~~	~~8.1/7.5~~	~~7.5/10.8~~	~~7.6/11.0~~		~~81.5~~	~~14.9~~	~~4.4~~	~~32.0~~	~~4.1~~	
119.0	54	2	20 19	14:09	10282	52	5.0/6.0	6.6/6.2	6.5/6.0	6.9/7.0	8.4/8.7		67.3	19.2	4.5	30.9	4.0	
114.5	34	1	20 19	14:13	10366	34	6.1/6.0	6.8/7.7	7.2/6.6	7.6/9.7	7.6/9.2		74.0	14.9	4.3	31.8	4.1	
114.5	33	2	20	14:14	10373	33	4.9/5.3	6.7/6.5	7.0/6.2	7.3/8.2	7.5/6.9		66.5	19.2	4.5	30.9	4.1	
~~119.0~~	~~43~~	~~1~~	~~21~~	~~14:19~~	~~10475~~	~~43~~	~~4.0/5.8~~	~~5.8/7.2~~	~~5.6/5.9~~	~~3.5/8.7~~	~~3.7/8.0~~		~~58.4~~	~~14.9~~	~~4.4~~	~~32.0~~	~~4.1~~	
119.0	44	2	20	14:20	10489	44	5.3/5.4	7.0/6.5	6.8/6.3	4.7/6.3	7.5/6.8		62.6	19.2	4.5	30.9	4.0	

9.1 *

+9.0 *

*

Recorded by DJW

Checked by RP

3.11.2. Iteration 1 Worksheet

SPS - 5

Date 5 23.07

Beginning factors:

Speed Point (mph)	**Name**	**Value**
Overall	SENSITIVITY	~~100~~ 810
Front Axle	SENS PIEZO 1	1065
1 – ( )	2	1000
2 – (30)	CORR FACTOR 1	1020
3 – (45)	2	1080
4 – (60)	3	1030
5 – ( )	FRONT AXLE	1000

Errors (Pre-Validation):

	Speed Point 1 (30)	Speed Point 2 (45)	Speed Point 3 (60)	Speed Point 4 ( )	Speed Point 5 ( )
F/A	- 10	- 8	- 4		
Tandem	- 18	- 10	- 10		
GVW	- 15	- 10	- 10		

Adjustments:

	Raise	Lower	Percentage
Overall	☑	☐	11.1
Front Axle	☐	☐	
Speed Point 1	☑	☐	2.0
Speed Point 2	☐	☐	
Speed Point 3	☐	☐	
Speed Point 4	☐	☐	
Speed Point 5	☐	☐	

End factors:

Speed Point (mph)	**Name**	**Value**
Overall	SENSITIVITY	900
Front Axle	SENS PIEZO 1	1065
1 – ( )	2	1000
2 – (30)	CORR FACTOR 1	1040
3 – (45)	2	1080
4 – (60)	3	1030
5 – ( )	FRONT AXLE	1000

Task Leader Initials: DW

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

May 23, 2007

STATE: Florida

SHRP ID: 0500

Photo 1 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_1_Tractor.JPG

Photo 2 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_1_Trailer.JPG

Photo 3 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_1_Suspension_1.JPG

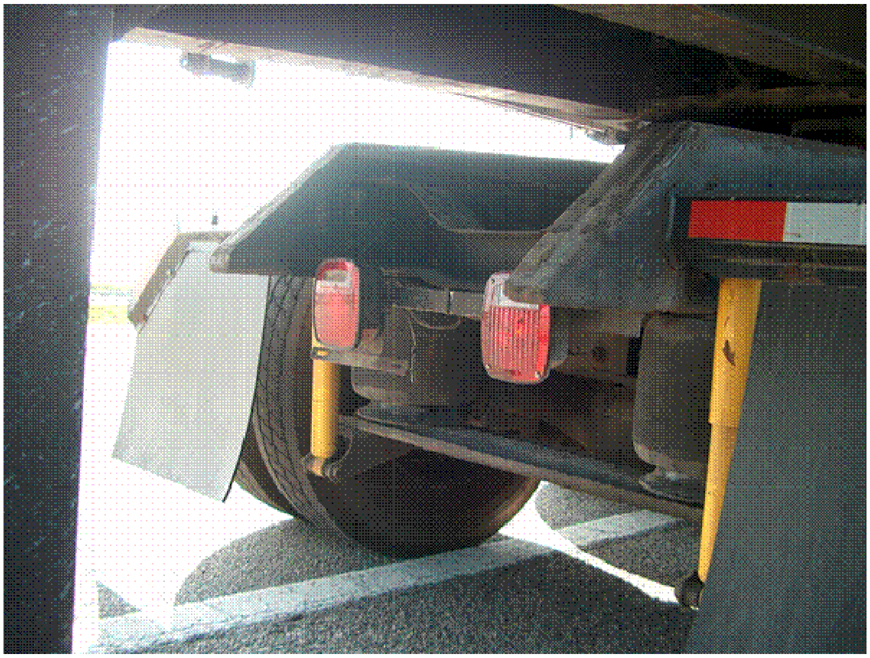

Photo 4 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_1_Suspension_2.JPG

Photo 5 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_1_Suspension_3.JPG

Photo 6 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Tractor.JPG

Photo 7 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Trailer.JPG

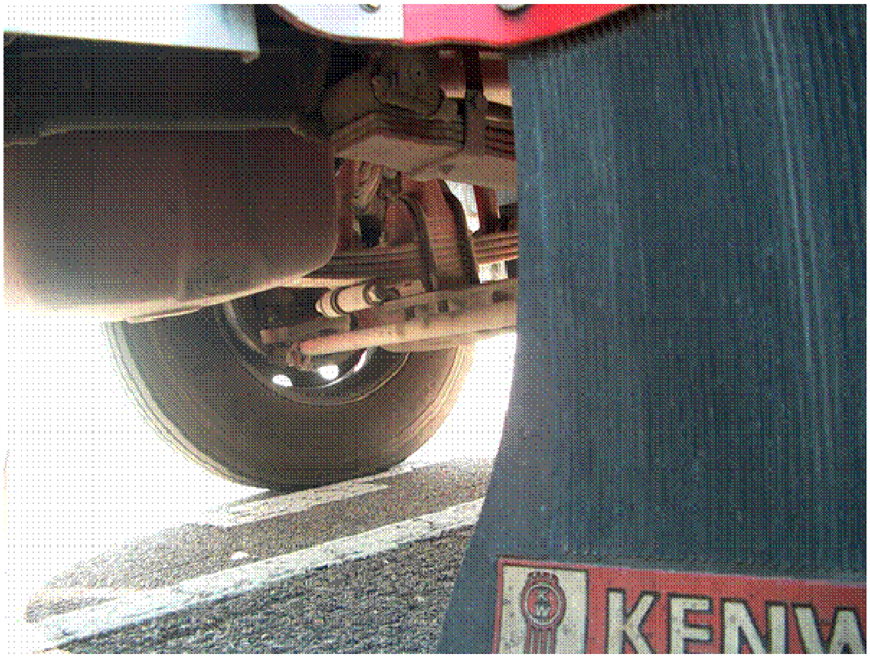

Photo 8 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Suspension_1.JPG

Photo 9 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Suspension_2.JPG

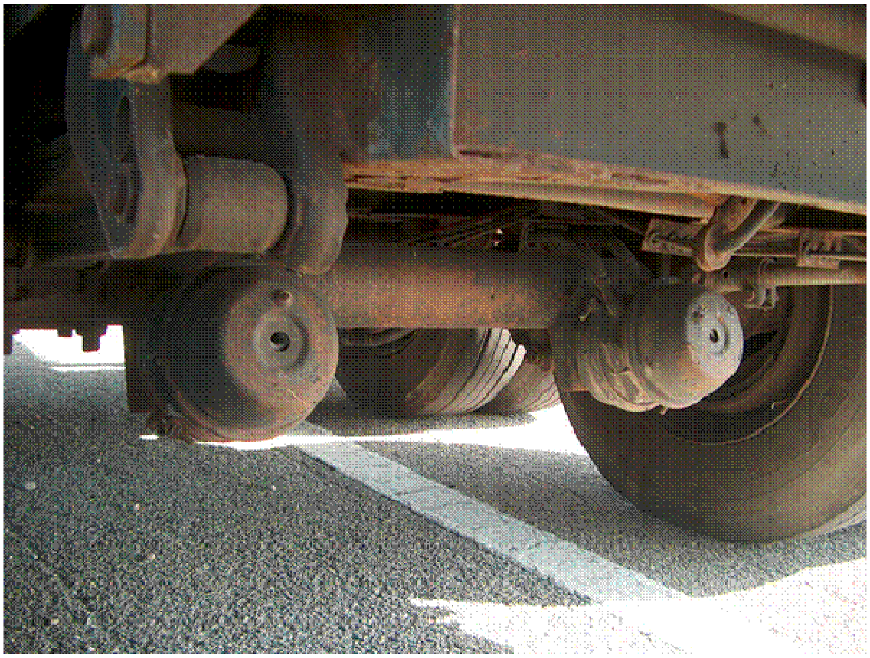

Photo 10 - 6420060018_SPSWIM_TO_19_12_2.88_0500_Truck_2_Suspension_3.JPG

System Operating Parameters

Florida SPS-5 (Lane 4)

Validation Visit – 23 May, 2007

Calibration factors for Lane 1

Overall Sensitivity	900
Front Axle Correction Factor	1000
Sensitivity Piezo 1	1065
Sensitivity Piezo 2	1000
Speed Correction Factor 1	1040
Speed Correction Factor 2	1080
Speed Correction Factor 3	1030