Validation Report

Indiana, SPS-6
Task Order 25, CLIN 2
September 3 to 4, 2008

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1 Executive Summary

A visit was made to the Indiana 0600 on September 3 to 4, 2008 for the purposes of conducting a validation of the WIM system located on US 31, approximately .6 miles south of SR 10. The SPS-6 is located in the righthand, northbound lane of a four-lane divided facility. The posted speed limit at this location is 60 mph. The LTPP lane is one of 4 lanes instrumented at this site. Only the LTPP lane was validated. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This site was reinstalled at its original location under the Phase II WIM Installation contract. This is the first validation visit to this location. The site was installed on June 23 to July 1, 2008 by International Road Dynamics Inc..

This site demonstrates the ability to produce research quality loading data under the observed conditions. The classification data is also of research quality for Traffic Monitoring Guide Classes.

The site is instrumented with quartz piezo and iSINC electronics. It is installed in asphalt concrete.

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 77,000 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 an air suspension loaded to 65,270 lbs., the "partial" truck.

The validation speeds ranged from 52 to 66 miles per hour. The 15th percentile speed of heavy trucks at this location exceeded 55 mph. Due to the low percentage of heavy trucks traveling below than that speed, it was determined that running the test trucks with 50 mph target for the lower range of speeds presented unacceptable operating conditions. Running speed of test trucks for safe operation in prevailing traffic also produced an unusual number of runs in excess of the posted speed limit. The pavement temperatures ranged from 71 to 81 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 – 180600 – 04-Sep-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-0.8 ± 6.8%	Pass
Tandem axles	±15 percent	-1.7 ± 4.0%	Pass
GVW	±10 percent	-1.7 ± 1.7%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

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 upper threshold of the WIM index was not exceeded. Twenty of the individually calculated index values fell below the lower threshold value.

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

Prepared: djw *Checked: bko*

During electronic checks, it was discovered that the system power supply that is used to charge the system battery was inoperative. Replacement or repair is recommended.

This site needs 5 years of data to meet the goal of five years of research quality data.

2 Corrective Actions Recommended

The system power supply either needs to be repaired or replaced. During electronic checks, it was discovered that the system power supply that is used to charge the system battery was inoperative.

No other corrective actions are required at this time.

3 Post Calibration Analysis

This final analysis is based on test runs conducted September 4, 2008 during the morning and early afternoon hours at test site 180600 on US 31. This SPS-6 site is at milepost 216.9 on the northbound, 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 air suspension loaded to 77,000 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 an air suspension loaded to 65,270 lbs., the "partial" truck.

Each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 52 to 66 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 71 to 81 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.

As shown in Table 3-1, this site meets all of the performance criteria for research quality data.

Table 3-1 - Post-Validation Results – 180600 – 04-Sep-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-0.8 ± 6.8%	Pass
Tandem axles	±15 percent	-1.7 ± 4.0%	Pass
GVW	±10 percent	-1.7 ± 1.7%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the morning and early afternoon hours under cloudy and rainy weather conditions, resulting in a very narrow range of pavement temperatures. The runs were conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the data set was split into three speed groups and left in one temperature group. 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.

The three speed groups were divided as follows: Low speed – 52 to 57 mph, Medium speed – 58 to 63 mph and High speed – 64 + mph. The 15th percentile speed of heavy trucks at this location was 55 mph. Due to the low percentage of heavy trucks traveling below than that speed, it was determined that running the test trucks with 50 mph target for the lower range of speeds presented unacceptable operating conditions. The running speed of test trucks for safe operation in prevailing traffic also produced an unusual number of runs in excess of the posted speed limit. The one temperature group was created by indentifying the runs between 71 to 81 degrees Fahrenheit as the Medium temperature group.

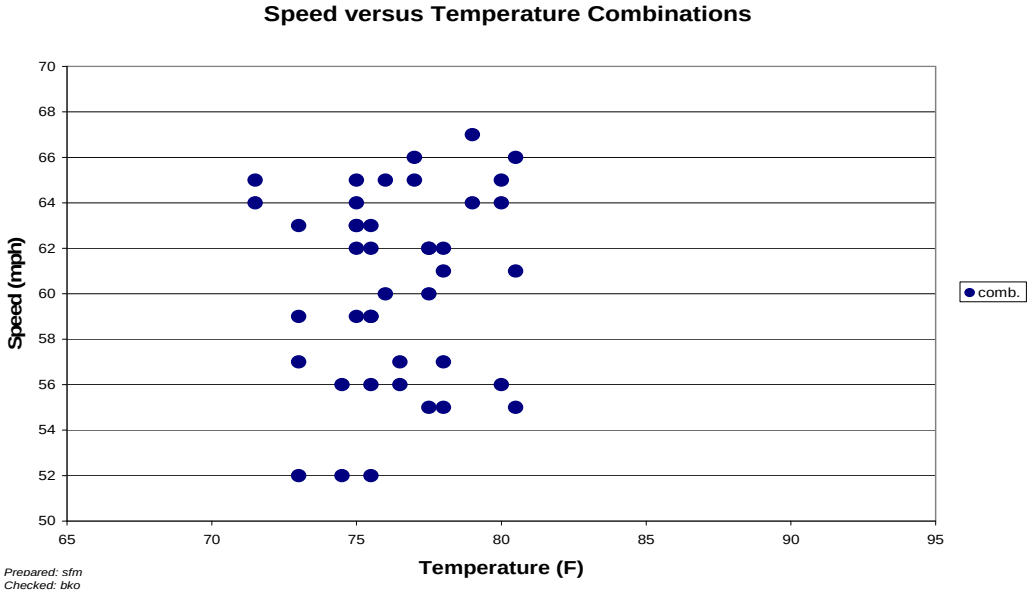

Figure 3-1 - Post-Validation Speed-Temperature Distribution – 180600 – 04-Sep-2008

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. As shown in the figure, the equipment consistently somewhat underestimates GVW at all speeds. Variability in error is consistent throughout the entire speed range.

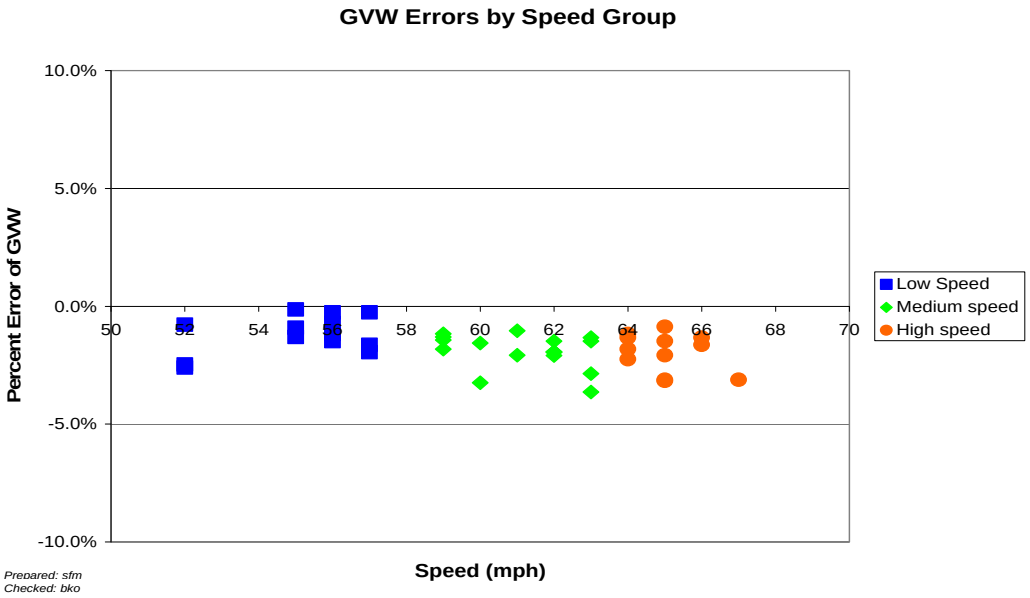

Figure 3-2 - Post-validation GVW Percent Error vs. Speed – 180600 – 04-Sep-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. There does not appear to be a GVW estimation trend related to temperature in this limited range.

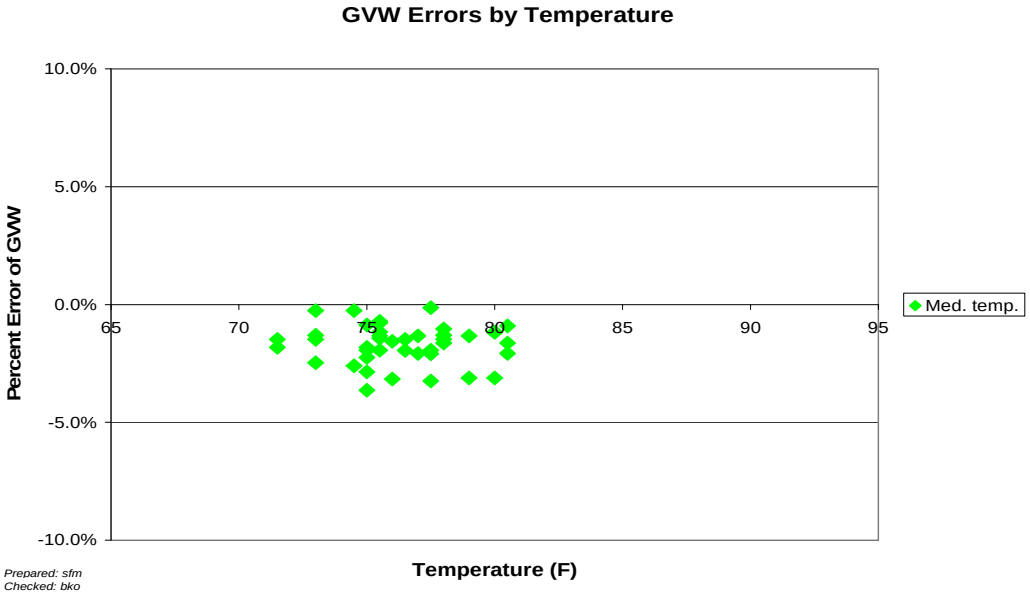

Figure 3-3 - Post-Validation GVW Percent Error vs. Temperature – 180600 – 04-Sep-2008

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. There does not appear to be a relationship between speed and axle spacing measurement.

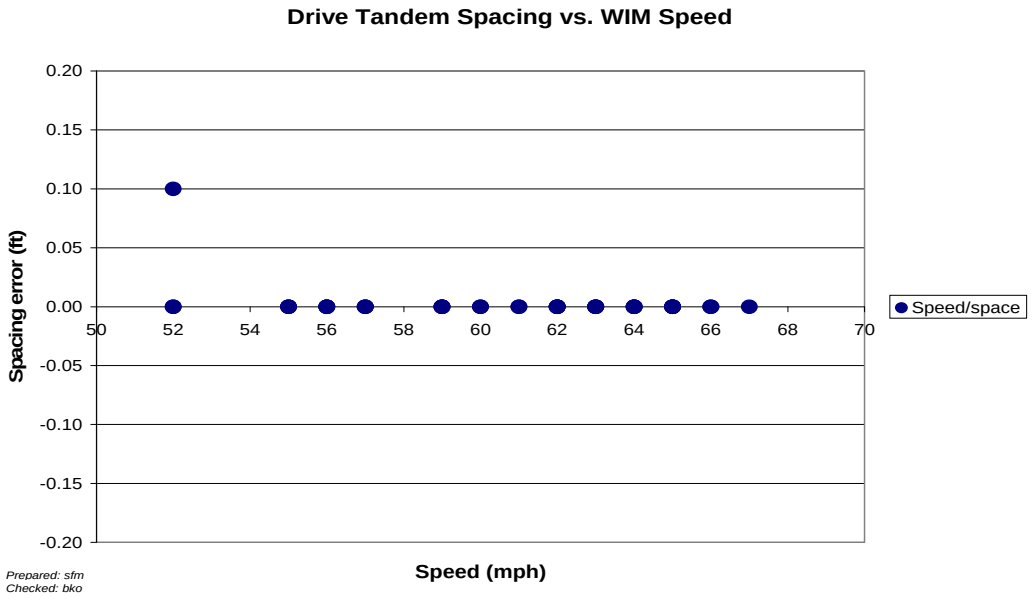

Figure 3-4 - Post-Validation Spacing vs. Speed – 180600 – 04-Sep-2008

3.1 Temperature-based Analysis

The one temperature group is a combination all of the runs between 71 to 81 degrees Fahrenheit as the Medium temperature group.

Table 3-2 - Post-Validation Results by Temperature Bin – 180600 – 04-Sep-2008

Element	95% Limit	Medium Temperature 71 to 81 °F
Steering axles	±20 %	-0.8 ± 6.8%
Tandem axles	±15 %	-1.7 ± 4.0%
GVW	±10 %	-1.7 ± 1.7%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

Table 3-2, has the same statistics as the overall evaluation.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. From the figure, it appears that GVW mean error by truck by temperature is similar. The equipment appears to consistently underestimate GVW for both trucks at all temperatures and variability appears to be consistent over the entire temperature range.

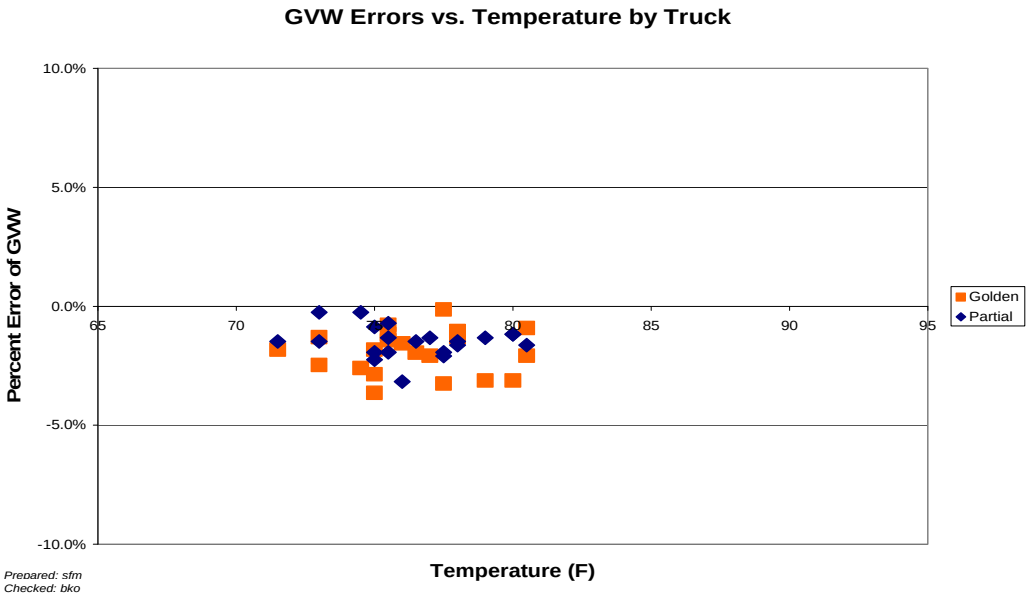

Figure 3-5 - Post-Validation GVW Percent Error vs. Temperature by Truck – 180600 – 04-Sep-2008

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.

From the figure, it can be seen that the equipment estimates steering axle weights with reasonable accuracy throughout the limited temperature range. Variability in steering axle error appears to be consistent throughout the observations.

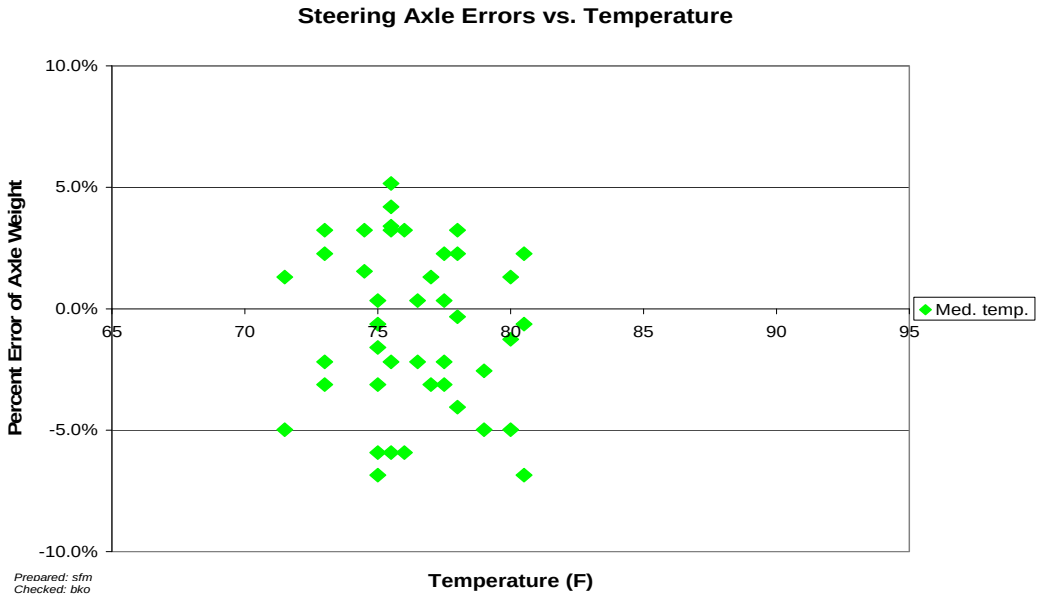

Figure 3-6 - Post-Validation Steering Axle Error vs. Temperature by Group – 180600 – 04-Sep-2008

3.2 Speed-based Analysis

The three speed groups were created using 52 to 57 mph for Low speed, 58 to 63 mph for Medium speed and 64+ mph for High speed.

Table 3-3 - Post-Validation Results by Speed Bin – 180600 – 04-Sep-2008

Element	95% Limit	Low Speed 52 to 57 mph	Medium Speed 58 to 63 mph	High Speed 64+ mph
Steering axles	±20 %	1.0 ± 4.4%	-0.5 ± 7.6%	-3.2 ± 6.6%
Tandem axles	±15 %	-1.4 ± 5.0%	-2.1 ± 3.3%	-1.6 ± 4.0%
GVW	±10 %	-1.2 ± 1.8%	-1.9 ± 1.5%	-1.9 ± 1.8%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 3-3, it can be seen that the equipment tends to underestimate GVW and tandem axle weights at all speeds. Steering axle weights are underestimated at the higher speeds. Variability in error for each weight is generally consistent throughout the entire speed range.

Figure 3-7 illustrates that the equipment underestimates GVW for both trucks consistently throughout the entire speed range. Variability in GVW error is consistent for each truck and for the truck population as a whole at all speeds.

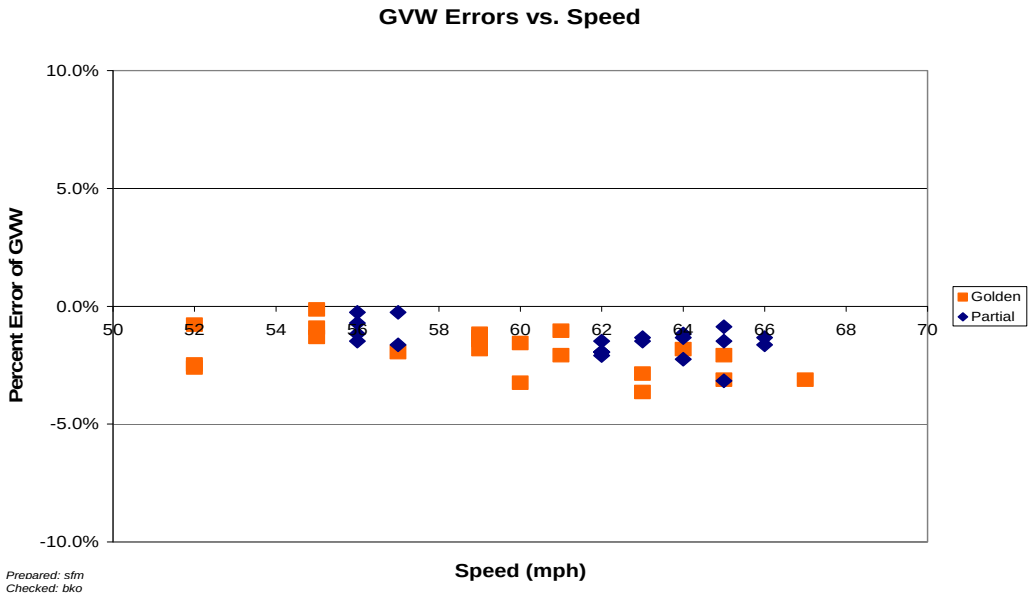

Figure 3-7 - Post-Validation GVW Percent Error vs. Speed by Truck – 180600 – 04-Sep-2008

Figure 3-8 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 auto-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 appears that the WIM equipment underestimates steering axle weights at the higher speeds. The variability of error also seems to be greater at the higher speeds.

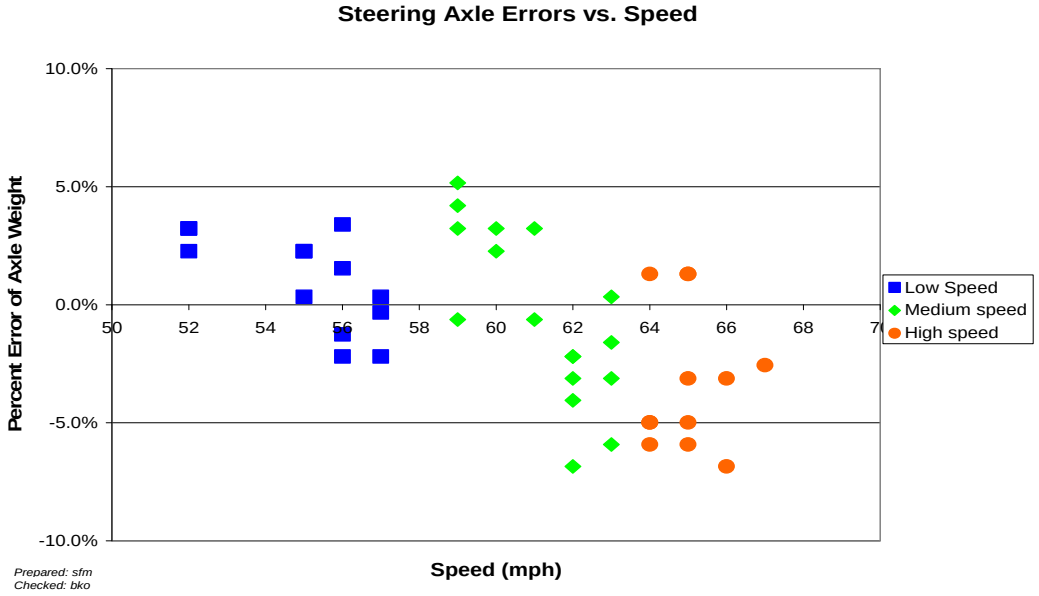

Figure 3-8 - Post-Validation Steering Axle Percent Error vs. Speed by Group – 180600 – 04-Sep-2008

3.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to define unclassified vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. 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 2.0 percent.

Table 3-4 - Truck Misclassification Percentages for 180600 – 04-Sep-2008

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	N/A	5	6	6	0
7	0				
8	25	9	0	10	0
11	0	12	N/A	13	N/A

Prepared: djw *Checked: bko*

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. The percentage misclassified for Class 8 represents one of four Class 8s recorded by the equipment that was actually a Class 5.

Table 3-5 - Truck Classification Mean Differences for 180600 – 04-Sep-2008

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	N/A	5	- 6	6	0
7	0				
8	33	9	0	10	0
11	0	12	N/A	13	N/A

Prepared: djw *Checked: bko*

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 (UNK) 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.

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. Since the classification data met research quality standards for heavy trucks, the observed bias and variability are thought to be more strongly related to radar speed precision than errors in the WIM equipment.

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

Prepared: djw *Checked: bko*

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 Stantec on July 21, 2008 were processed through the LTPP SPS WIM Index software, version 1.1. This WIM scale is installed on flexible pavement.

A total of 11 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 Regional Support Contractor has completed 5 passes at the center of the lane, 3 passes shifted to the left side of the lane, and 3 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, version 1.0 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

Prepared: als *Checked: jrn*

Table 4-2 shows the computed index values for all 11 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 above the upper index limits are presented in bold and values below the lower index limits are presented in italics.

Table 4-2 - WIM Index Values – 180600 –21-Jul-2008

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	*0.489*	0.511	0.580	0.537	0.661	0.556
		SRI (m/km)	*0.462*	*0.495*	*0.408*	0.614	0.763	0.548
		Peak LRI (m/km)	*0.490*	0.528	0.602	0.538	0.661	0.564
		Peak SRI (m/km)	*0.473*	*0.600*	*0.546*	0.792	1.808	0.844
	RWP	LRI (m/km)	0.853	0.793	0.837	0.829	0.838	0.830
		SRI (m/km)	2.085	2.061	*0.453*	2.042	1.964	1.721
		Peak LRI (m/km)	0.853	0.795	0.872	0.829	0.838	0.837
		Peak SRI (m/km)	2.326	2.270	*0.542*	2.385	2.352	1.975
Left Shift	LWP	LRI (m/km)	0.502	0.528	0.509			0.513
		SRI (m/km)	*0.499*	*0.481*	*0.488*			*0.489*
		Peak LRI (m/km)	0.637	0.611	0.592			0.613
		Peak SRI (m/km)	*0.519*	*0.536*	*0.498*			*0.518*
	RWP	LRI (m/km)	0.687	0.721	0.695			0.701
		SRI (m/km)	1.645	1.622	1.626			1.631
		Peak LRI (m/km)	0.689	0.721	0.695			0.702
		Peak SRI (m/km)	1.804	1.786	1.732			1.774
Right Shift	LWP	LRI (m/km)	0.565	0.576	0.546			0.562
		SRI (m/km)	*0.456*	*0.491*	0.521			*0.489*
		Peak LRI (m/km)	0.590	0.580	0.569			0.580
		Peak SRI (m/km)	*0.688*	*0.664*	*0.634*			*0.662*
	RWP	LRI (m/km)	0.901	0.862	0.889			0.884
		SRI (m/km)	2.100	1.892	1.968			1.987
		Peak LRI (m/km)	0.902	0.862	0.889			0.884
		Peak SRI (m/km)	2.267	2.025	2.087			2.126

Prepared: als Checked: jrn

From Table 4-2 it can be seen that 20 of the indices are below the lower threshold values with the remainder of the values falling between the lower and upper thresholds. These values are inconclusive in identifying if the pavement roughness interferes with the successful calibration of the site. However, as the site is meeting the quality standard for data collection, no remediation is required to correct the roughness at this time.

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 and any of the sensors for the equipment.

5 Equipment Discussion

The traffic monitoring equipment at this location includes quartz piezo sensors and iSINC electronics. The sensors are installed in asphalt concrete pavement.

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 evaluation. **During electronic checks, it was discovered that the system power supply that is used to charge the system battery was inoperative**. All other sensors and system components were found to be within operating parameters.

5.2 Calibration Process

No calibration iterations were required. Improvement of the statistics was desired so one iteration of the calibration process was conducted between the initial 40 runs and the final 40 runs.

The operating system weight compensation parameters that were in place prior to the Pre-Validation as a result of the installation calibration are in Table 5-1.

Table 5-1 - Initial System Parameters - 180600 - 03-Sep-2008

Speed Bin	Sensor 1	Sensor 2
80 kph	3390	3267
88 kph	3390	3267
96 kph	3390	3267
105 kph	3325	3204
112 kph	3194	3050

Prepared: djw *Checked: bko*

5.2.1 Calibration Iteration 1

For this equipment, there are 5 speed designated weight compensation factors that are adjusted to directly affect the weight reported by the WIM equipment. To reduce overestimation of weights these factors are reduced by the same percentage of the overestimation. If the weights are underestimated, these factors are increased by the same percentage as the mean error.

As a result of the Pre-Validation test runs, where GVW error ranged from +1.5% at the lower speeds, to +4.9% at the higher speeds the compensation factors were adjusted as shown in Table 5-2.

Table 5-2 - Calibration Iteration 1 - Change in Parameters - 180600 - 04-Sep-2008

Speed Bins	Sensor 1	Change	Sensor 2	Change
80 kph	3328	-1.8%	3207	-1.8%
88 kph	3328	-1.8%	3207	-1.8%
96 kph	3244	-4.3%	3127	-4.3%
105 kph	3161	-4.9%	3046	-4.9%
112 kph	3194	N/C	3050	N/C

Prepared: djw *Checked: bko*

Table 5-3 shows the results of the calibration iteration. The average errors went from over estimation to a slight under estimation. Variability was essentially unchanged. No additional iterations were made.

Table 5-3 - Calibration Iteration 1 Results – 180600 – 04-Sep-2008 (09:03 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-1.3 ± 8.0%	Pass
Tandem axles	±15 percent	-1.8 ± 3.9%	Pass
GVW	±10 percent	-1.9 ± 2.1%	Pass
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: djw *Checked: bko*

Figure 5-1 graphically shows the calibration iteration results from Table 5-3.

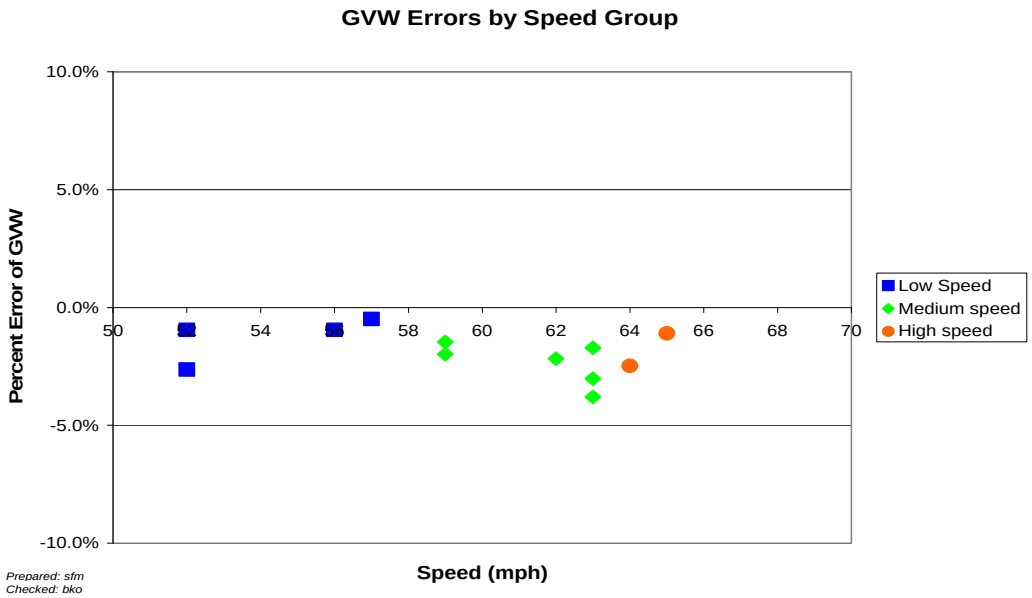

Figure 5-1 - Calibration Iteration 1 GVW Percent Error vs. Speed Group – 180600 – 04-Sep-2008 (09:03 AM)

5.3 Summary of Traffic Sheet 16s

Table 5-4 has the information for TRF_CALIBRATION_AVC for Sheet 16s for the current visit. The Sheet 16s available reflect only this contractor's validation visits for this particular sensor installation. The information from the Sheet 16 from the contractor's assessment has been omitted since different equipment and algorithms were used.

Table 5-4 - Classification Validation History – 180600 – 04-Sep-2008

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
04-Sep-08	Manual	0	33			0
03-Sep-08	Manual	0	0			0

Prepared: djw *Checked: bko*

Table 5-5 has the information for TRF_CALIBRATION_WIM for Sheet 16s for the current visit. The Sheet 16s available reflect only this contractor's validation visit.

Table 5-5 - Weight Validation History – 180600 – 04-Sep-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
04-Sep-08	Test Trucks	-1.7 (0.8)	-0.8 (3.4)	-1.7 (2.0)
03-Sep-08	Test Trucks	3.7 (1.6)	1.8 (2.6)	4.2 (2.5)

Prepared: djw *Checked: bko*

5.4 Projected Maintenance/Replacement Requirements

This site is scheduled for semi-annual maintenance under the installation contract.

The power supply should be replaced so that battery power will be available to the system.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted September 3, 2008 during the late morning to mid-afternoon hours at test site 180600 on US 31. This SPS-6 site is at milepost 216.9 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation 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 77,200 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 an air suspension loaded to 65,490 lbs., the "partial" truck.

For the initial validation each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 51 to 68 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 123degrees 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.

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

Table 6-1 - Pre-Validation Results – 180600 – 03-Sep-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	1.8 ± 5.3%	Pass
Tandem axles	±15 percent	4.2 ± 4.9%	Pass
GVW	±10 percent	3.7 ± 3.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: djw *Checked: bko*

The test runs were conducted primarily during the late morning to mid-afternoon hours under partly cloudy weather conditions, resulting in a range of pavement temperatures. The runs were 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 three 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 51 to 55 mph for Low speed, 56 to 62 mph for Medium speed and 63+ mph for High speed. The three temperature groups were created by splitting the runs between those at 101 to 110 degrees Fahrenheit for Low temperature, 111 to 118 degrees Fahrenheit for Medium temperature and 119 to 123 degrees Fahrenheit for High temperature.

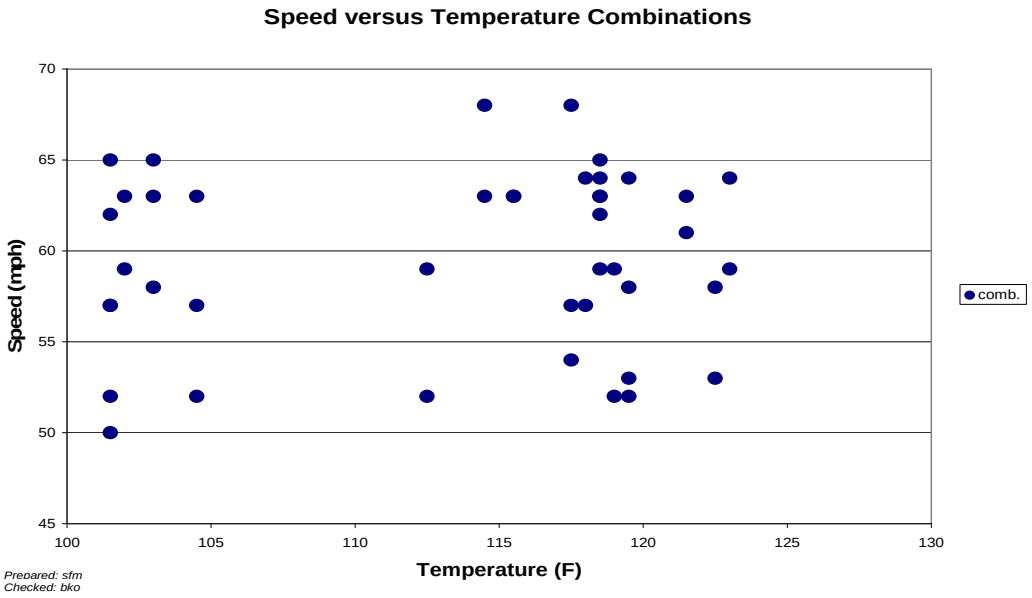

Figure 6-1 - Pre-Validation Speed-Temperature Distribution – 180600 – 03-Sep-2008

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 figure illustrates the tendency for the equipment to increasingly overestimate GVW as speed increases. Variability appears to be reasonably consistent throughout the entire speed range.

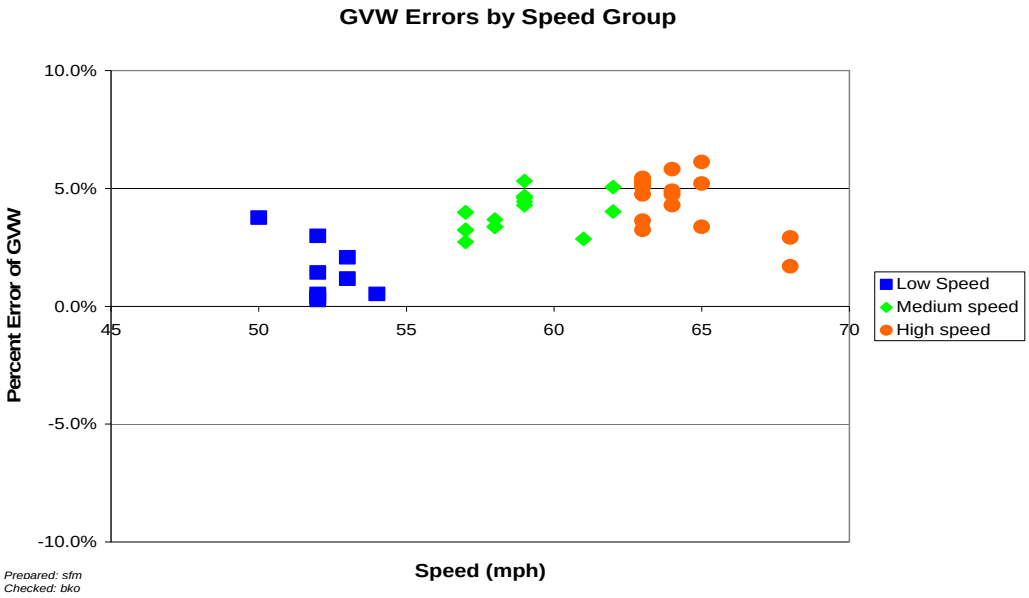

Figure 6-2 - Pre-Validation GVW Percent Error vs. Speed – 180600 – 03-Sep-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. From the figure, it appears that the GVW is overestimated at all temperatures. Variability appears to be consistent over the entire temperature range.

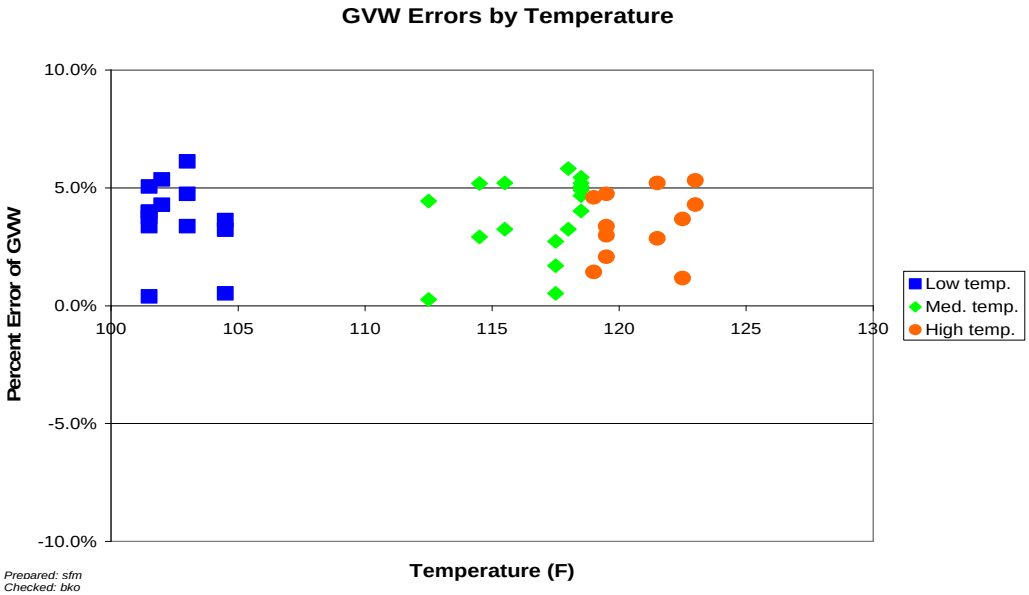

Figure 6-3 - Pre-Validation GVW Percent Error vs. Temperature – 180600 – 03-Sep-2008

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. The graph indicates that the errors in tandem spacings for the test trucks were not affected by changes in speed.

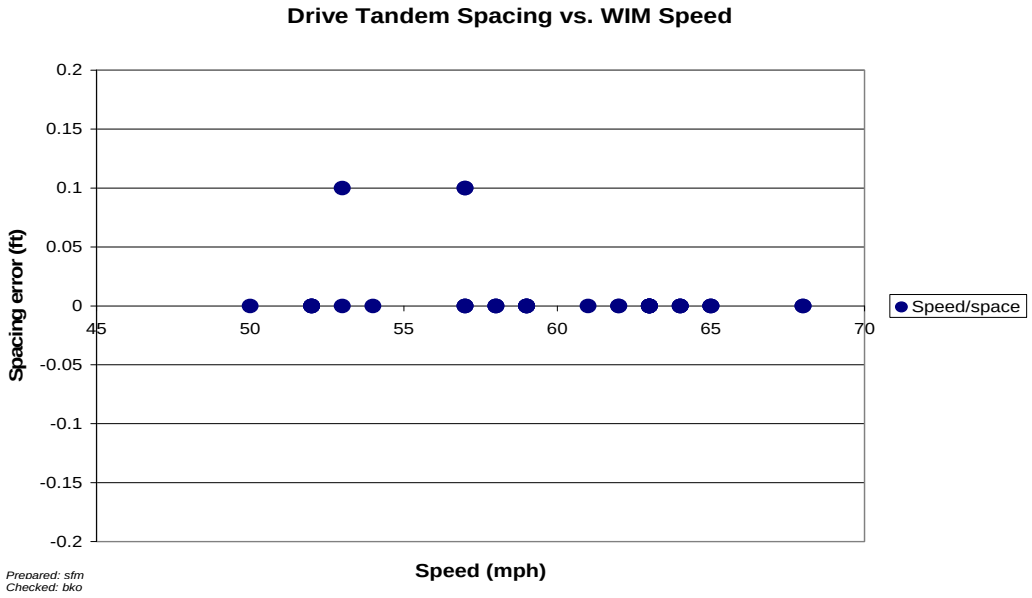

Figure 6-4 - Pre-Validation Spacing vs. Speed - 180600 – 03-Sep-2008

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 101 to 110 degrees Fahrenheit for Low temperature, 111 to 118 degrees Fahrenheit for Medium temperature and 119 to 123 degrees Fahrenheit for High temperature.

Table 6-2 - Pre-Validation Results by Temperature Bin – 180600 – 03-Sep-2008

Element	95% Limit	Low Temperature 101 to 110 °F	Medium Temperature 111 to 118 °F	High Temperature 119 to 123 °F
Steering axles	±20 %	2.0 ± 5.7%	2.0 ± 6.5%	1.4 ± 4.7%
Tandem axles	±15 %	4.3 ± 5.4%	4.3 ± 4.8%	4.0 ± 5.4%
GVW	±10 %	3.7 ± 3.5%	3.8 ± 3.6%	3.5 ± 3.1%
Axle spacing	± 0.5 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: djw *Checked: bko*

From Table 6-2, it can be seen that all weights are overestimated at all temperatures. Variability in error for each weight is reasonably consistent throughout the entire temperature range.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. The equipment overestimates GVW for both trucks at all temperatures. Variability in GVW error for the golden truck (squares) appears to be greater when compared with the variability in GVW error for the partial truck (diamonds).

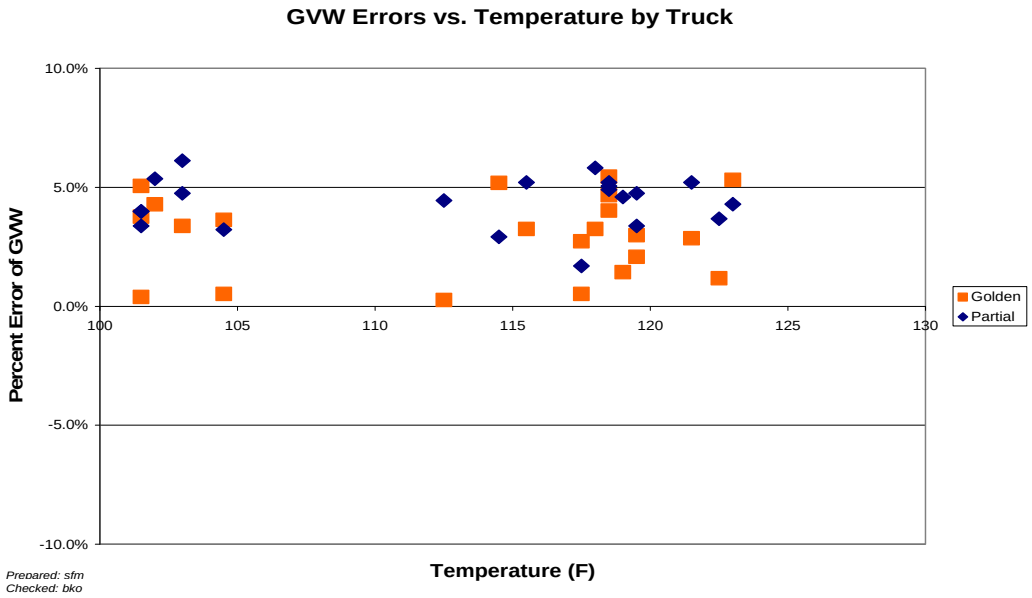

Figure 6-5 - Pre-Validation GVW Percent Error vs. Temperature by Truck – 180600 – 03-Sep-2008

Figure 6-6 shows the relationship 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 only with Class 9 vehicles. The figure shows that steering axle weights are overestimated by the equipment at all temperatures. Variability in steering axle error appears to be consistent throughout the entire temperature range.

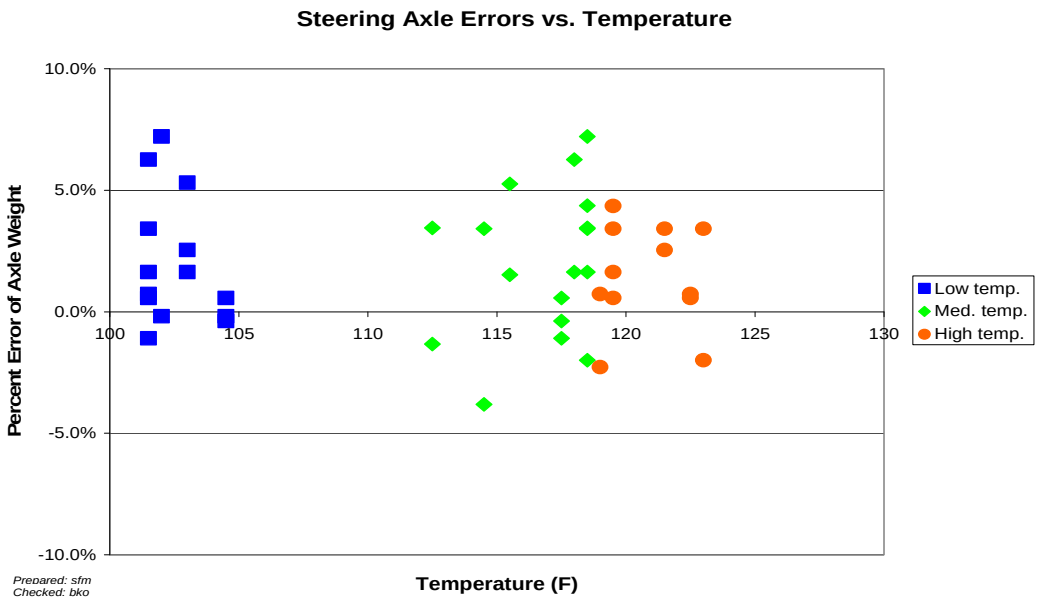

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 180600 – 03-Sep-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 51 to 55 mph, Medium speed – 56 to 62 mph and High speed – 63+ mph. The 15th percentile speed of heavy trucks at this location exceeded 55 mph. Due to the low percentage of heavy trucks traveling below than that speed, it was determined that running the test trucks with 50 mph target for the lower range of speeds presented unacceptable operating conditions. Running speed of test trucks for safe operation in prevailing traffic also produced an unusual number of runs in excess of the posted speed limit.

Table 6-3 - Pre-Validation Results by Speed Bin – 180600 – 03-Sep-2008

Element	95% Limit	Low Speed 51 to 55 mph	Medium Speed 56 to 62 mph	High Speed 63+ mph
Steering axles	±20 %	1.0 ± 5.8%	3.1 ± 5.6%	1.2 ± 5.0%
Tandem axles	±15 %	2.0 ± 7.2%	4.2 ± 3.3%	5.3 ± 3.7%
GVW	±10 %	1.5 ± 2.9%	3.9 ± 1.6%	4.6 ± 2.4%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

Prepared: djw *Checked: bko*

From Table 6-3, it can be seen that the equipment underestimates all weights at all speeds. Variability in error is generally consistent throughout the entire speed range for tandem axle weights and GVW. Variability in error for steering axle weights is greater at the lower speeds.

Figure 6-7 illustrates the tendency of the equipment to increasingly overestimate GVW for the golden truck (squares) as speed increases. For the partial truck, the equipment

increasingly overestimates GVW as speed increase but overestimates by a lesser degree at the highest speeds. Variability in GVW error appears to be consistent for both trucks throughout the entire speed range.

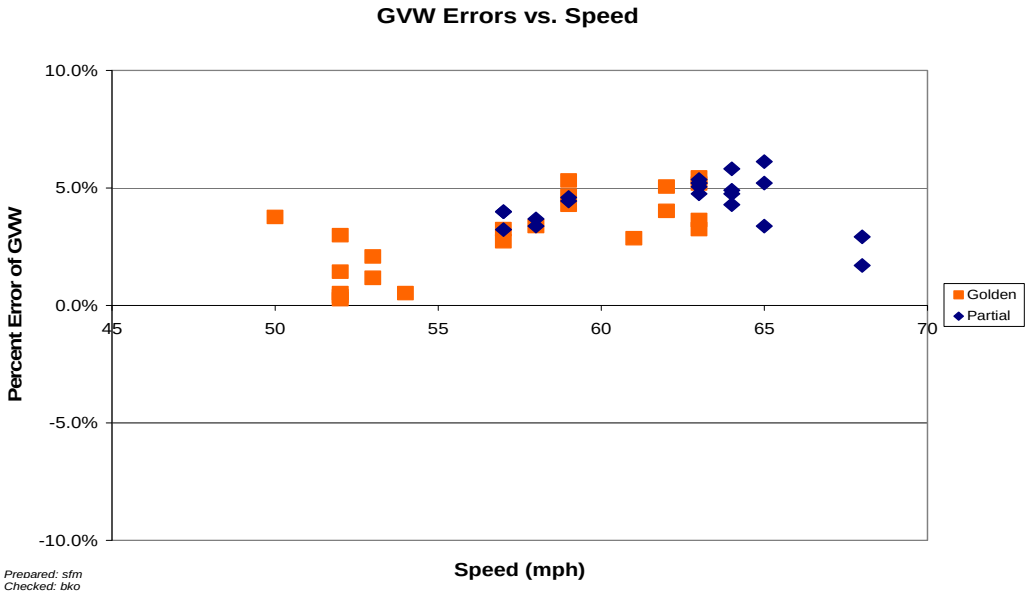

Figure 6-7 - Pre-Validation GVW Percent Error vs. Speed Group - 180600 –03-Sep-2008

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 only with Class 9 vehicles. From the figure, it appears that the equipment generally overestimates steering axle weights at all speeds. Variability in steering axle error appears to be consistent throughout the entire speed range.

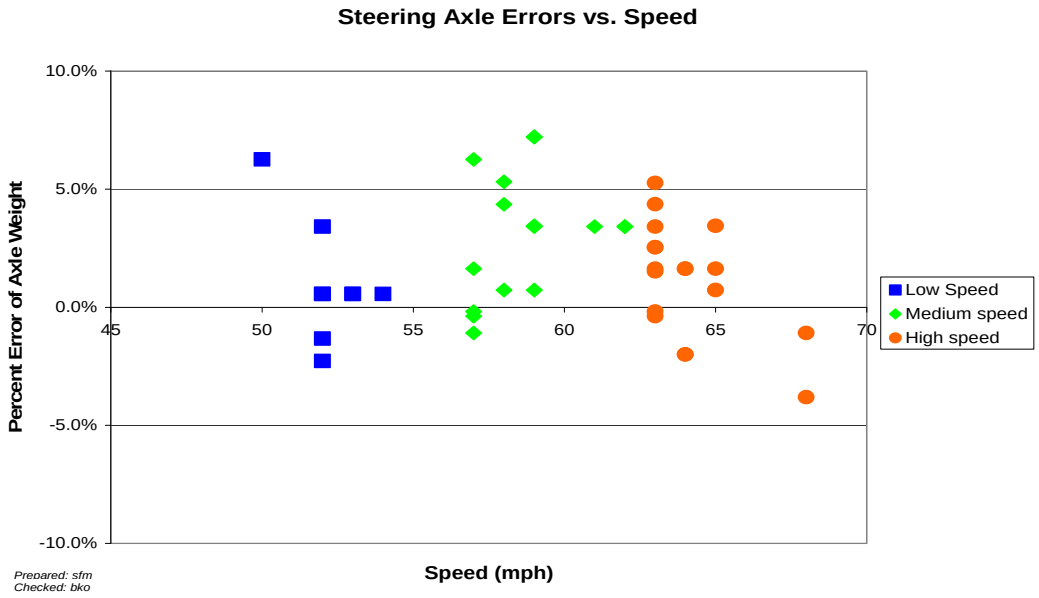

Figure 6-8 - Pre-Validation Steering Axle Percent Error vs. Speed Group - 180600 – 03-Sep-2008

6.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to define unclassified vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. The classification identification is to identify gross errors in classification, not validate the classification 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.

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 2.0 percent.

Table 6-4 - Truck Misclassification Percentages for 180600 – 03-Sep-2008

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

Prepared: djw *Checked: bko*

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 a re 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. The one hundred percent error for Class 4s represents a single vehicle which the equipment classified as Class 4 but was in fact a Class 5.

Table 6-5 - Truck Classification Mean Differences for 180600 – 03-Sep-2008

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

Prepared: djw *Checked: bko*

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.

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. Since the classification data met research quality standards for heavy trucks, the observed bias and variability are thought to be more strongly related to radar speed precision than errors in the WIM equipment.

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 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%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

Prepared: djw *Checked: bko*

7 Data Availability and Quality

As of September 3, 2008 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.

Since this is a newly installed site, there is no validated historical data available. In the absence of previously gathered validation information it can be seen that at least five additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data.

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.

Only Class 9s constitute more than 10 percent of the truck population. Based on the data collected following this validation 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 Regional Support Contractor 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 7-1 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 7-1 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.

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 7-1 - GVW Characteristics of Major sub-groups of Trucks – 180600 – 04-Sep-2008

Characteristic	Class 9
Percentage Overweights	0.7%
Percentage Underweights	0.0%
Unloaded Peak	32,000 lbs
Loaded Peak	76,000 lbs

Prepared: djw *Checked: bko*

The expected percentage of unclassified vehicles is 0.1%. 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 7-3. 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 period.

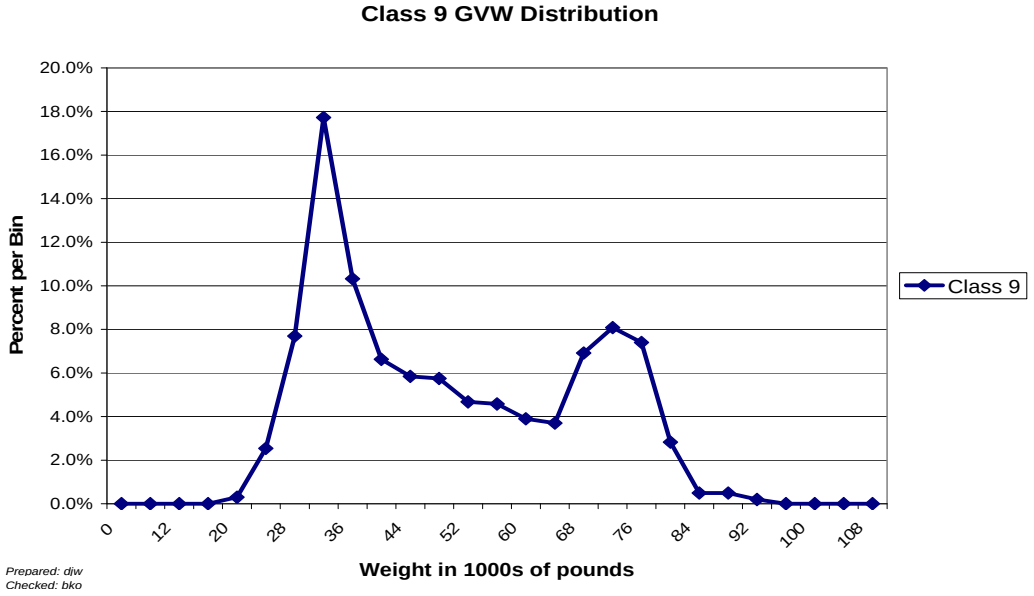

Figure 7-1 - Expected GVW Distribution Class 9 – 180600 – 04-Sep-2008

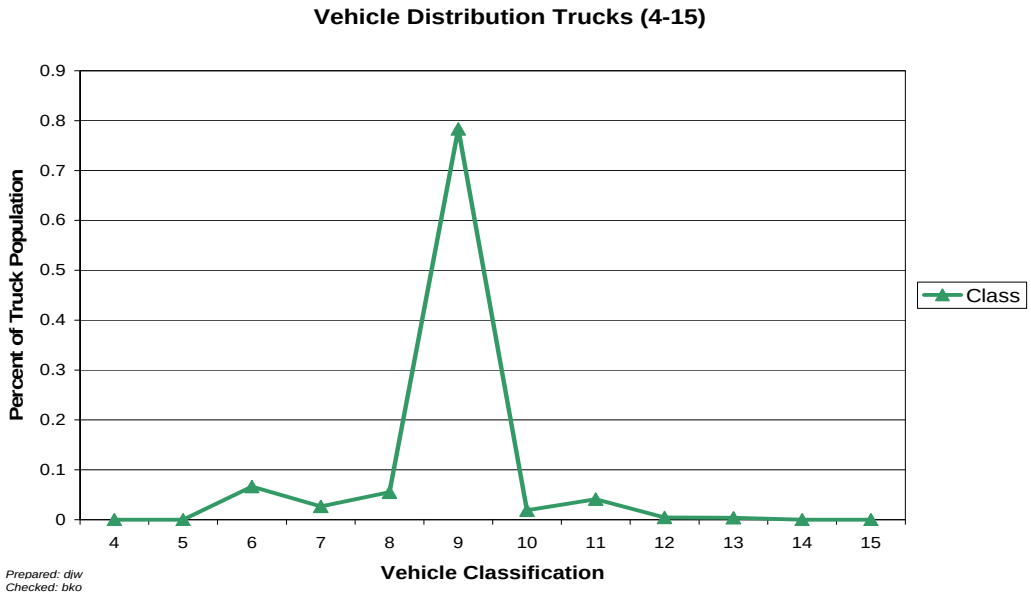

Figure 7-2 - Expected Vehicle Distribution – 180600 – 04-Sep-2008

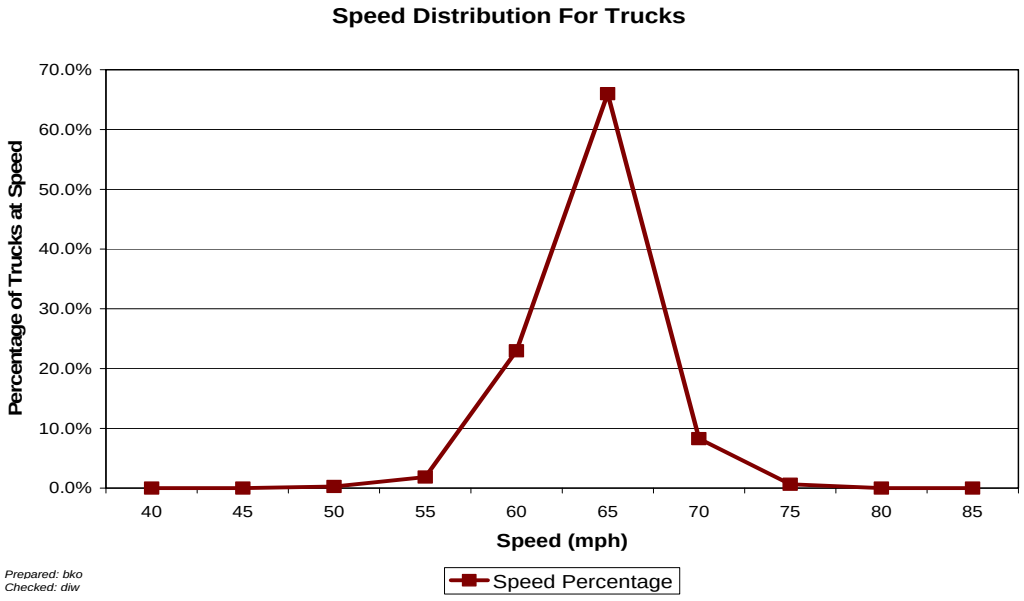

Figure 7-3 - Expected Speed Distribution – 180600 – 04-Sep-2008

8 Data Sheets

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

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

LTPP Mod 3 Classification Scheme (1 page)

Final System Parameters (1 page)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following this page. It includes a current Sheet 17 with all applicable maps and photographs. The following information has changed since the handout guide was prepared: a new state contact for WIM (Kirk Mangold) was 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.

PRE-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Indiana

SHRP ID: 0600

Figures

Photos

1. General Information

SITE ID: *180600*

LOCATION: *US31, milepost 216.9*

VISIT DATE: *September 3-4, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Kirk Mangold, 317-233-3690, kmangold@indot.in.gov*

William Flora, 317-233-1060, wflora@indot.in.gov

Marcia Gustafson, 317-232-5134, mgustafson@indot.in.gov

Bridgette Hail, 317-232-5463, bhail@indot.in.gov

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

FHWA Division Office Liaison:

Daniel Keefer

Tom Duncan

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

3. Agenda

BRIEFING DATE: *No briefing requested for this visit*

ON SITE PERIOD: *September 3 and 4, 2008, beginning at 9:00 a.m.*

TRUCK ROUTE CHECK: *See Truck Route*

4. Site Location/ Directions

NEAREST AIRPORT: *Michiana Regional Transportation Center Airport, South Bend, Indiana*

DIRECTIONS TO THE SITE: *Approximately .6 miles south of SR 10.*

MEETING LOCATION: *On site beginning at 9:00 a.m.*

WIM SITE LOCATION: *US31 North at milepost 216.9 (Latitude: 41.2239^0 and Longitude: -86.2602^0)*

WIM SITE LOCATION MAP:*See Figure 4.1*

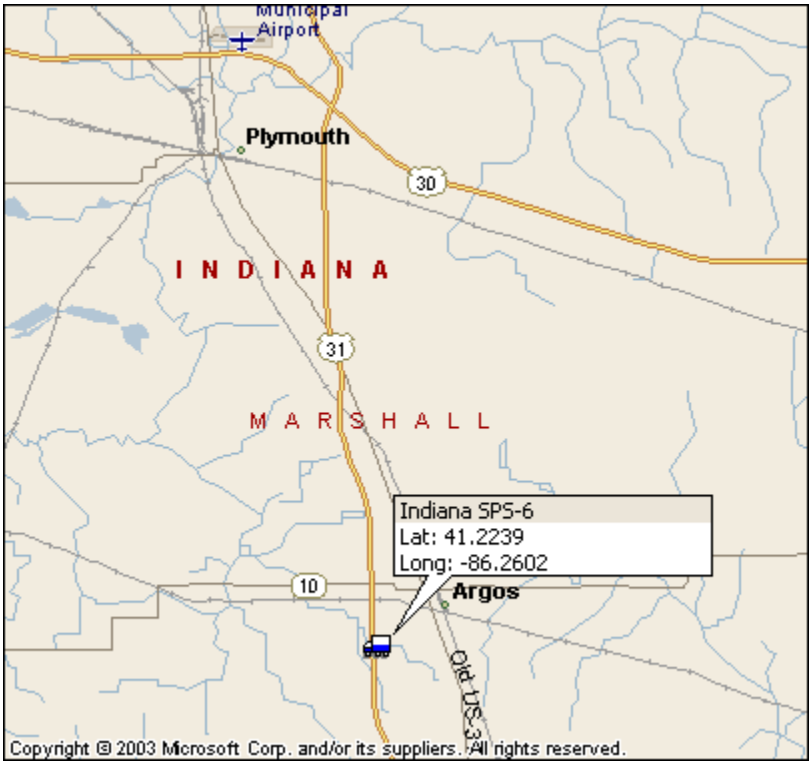

Figure 4-1 - Site Location for 180600 in Indiana

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Pilot Travel Center, US 30 and US31, Plymouth, IN, 574-936-6887, Latitude: 41.3620, Longitude: -86.3070.*

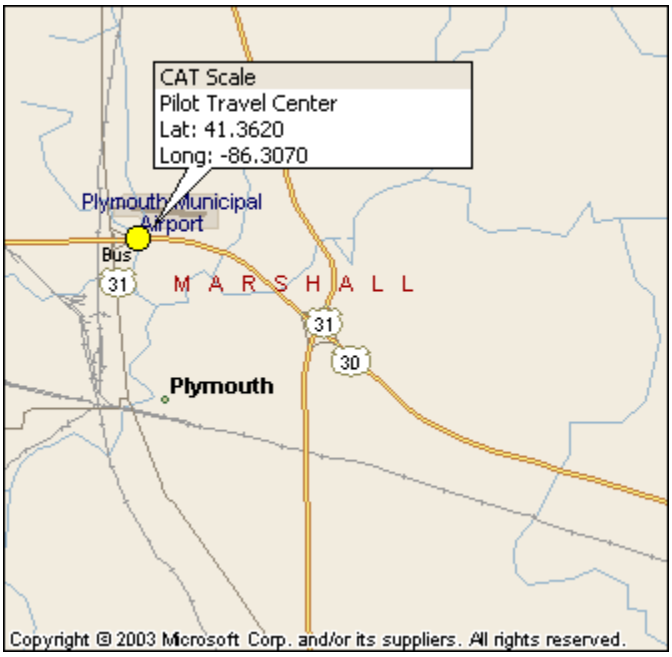

Figure 5-1 – Scale Location for 180600 in Indiana

TRUCK ROUTE:

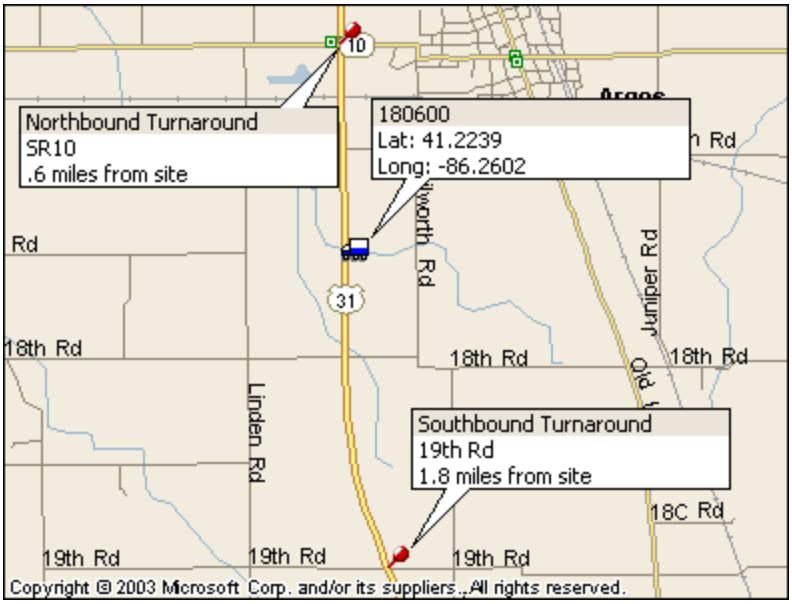

Figure 5-2 - Truck Route for 180600 in Indiana

- *Northbound .6 miles to SR10*
- *Southbound 1.8 miles to 19th Rd*

Total miles = 4.8 miles

6. Sheet 17 – Indiana (180600)

1.* ROUTE ___US31_____ MILEPOST _216.9___ LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade _<1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _1_8_0_6_0_1_
Distance from sensor to nearest upstream SPS Section __3_2_5_6__ 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 _1_1_ ft

4.* PAVEMENT TYPE ____asphalt_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date 08/20/2008 Distress Map Filename 180600_Upstream_08_20_08.jpg
Date 08/20/2008 Distress Map Filename 180600_Downstream_08_20 08.jpg
Date _____ Distress Map Filename _____

6. * SENSOR SEQUENCE _____loop – quartz – quartz - 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 _600'_
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 _6_4_ ft
Distance from system _7_0_ ft
TYPE _____3m_____

CABINET ACCESS controlled by LTPP / STATE / JOINT ?
Contact - name and phone number __Roy Czinku_____
Alternate - name and phone number __Kirk Mangold_____

11. * POWER

Distance to cabinet from drop _2_6_ ft Overhead /underground /solar /AC in cabinet?
Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop _2_6_ ft Overhead / under ground / cell?
Service provider _____ Phone Number _____

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

14. * TEST TRUCK TURNAROUND time ___9___ minutes DISTANCE __4.8__ mi.

15. PHOTOS	FILENAME
Power source	180600_Power_Meter_08_20_08_017.jpg
Phone source	180600_Telephone_Box_08_20_08_019.jpg
	180600_Phone_Modem_08_20_08_018.jpg
Cabinet exterior	180600_Cabinet_Exterior_08_20_08_020.jpg
Cabinet interior	180600_Cabinet_Interior_Front_08_20_08_021.jpg
	180600_Cabinet_Interior_Back_08_20_08_022.jpg
Weight sensors	180600_Leading_WIM_Sensor_08_20_08_012.jpg
	180600_Trailing_WIM_Sensor_08_20_08_013.jpg
Classification sensors	_____
Other sensors	180600_Leading_Loop_08_20_08_011.jpg
	180600_Trailing_Loop_08_20_08_014.jpg

Description _____Loops_____
Downstream direction at sensors on LTPP lane 180600_Upstream_08_20_08_015.jpg
Upstream direction at sensors on LTPP lane 180600_Downstream_08_20 08_016.jpg

COMMENTS _____
_____speed limit – 60 mph_____
_____additional key required for access_____

COMPLETED BY _____Dean J. Wolf_____

PHONE __301-210-5105_____ DATE COMPLETED _0_9_ /_0_3_ / _2_0_0_8_

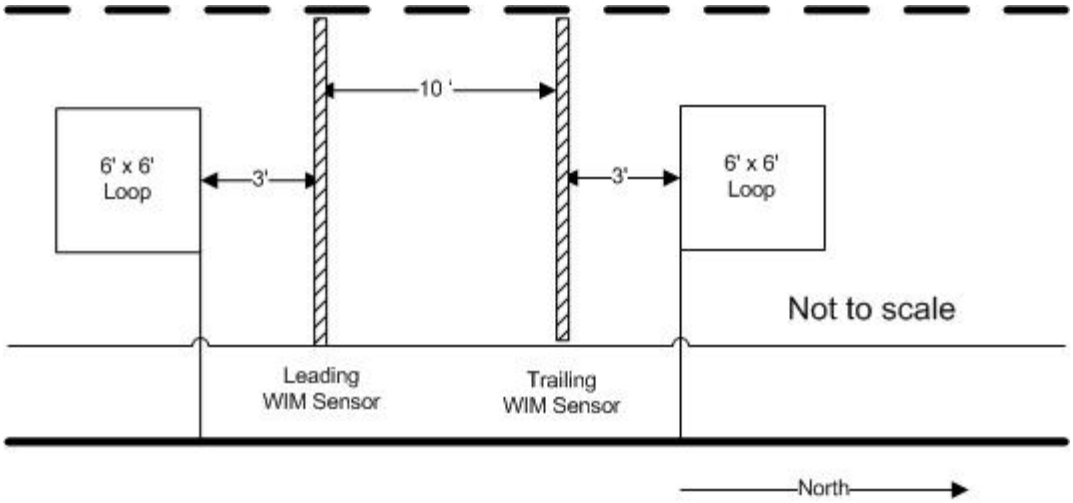

Figure 6-1 - Site Equipment Layout 180600

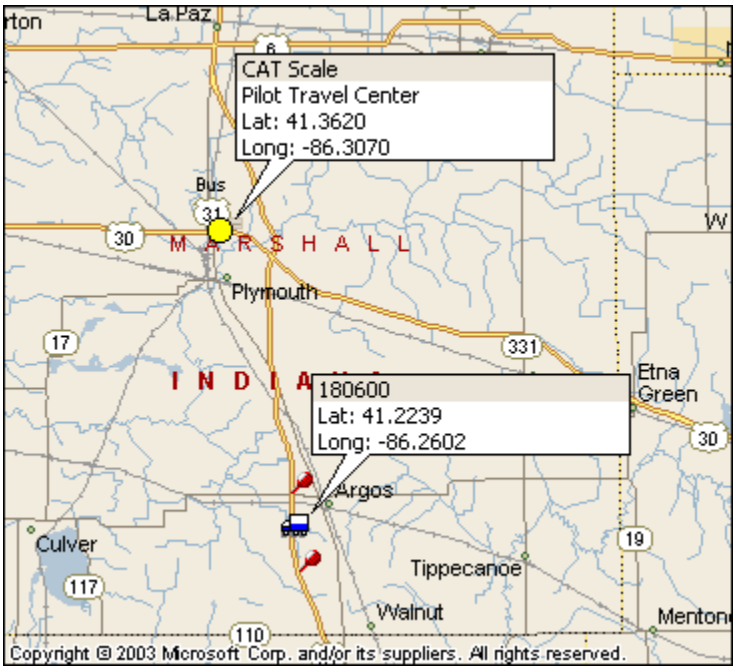

Figure 6-2 - Site Map for 180600 in Indiana

Photo 1 - 180600_Downstream_08_20 08_016.jpg

Photo 2 - 180600_Upstream_08_20_08_015.jpg

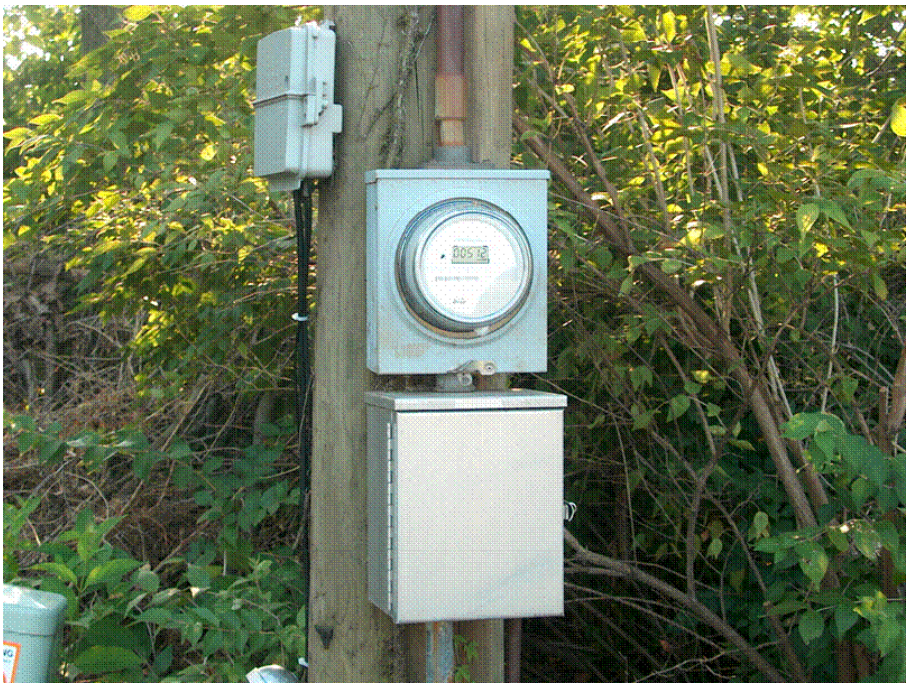

Photo 3 – 180600_Telephone_Box_08_20_08_019.jpg

Photo 4 - 180600_Power_Meter_08_20_08_017.jpg

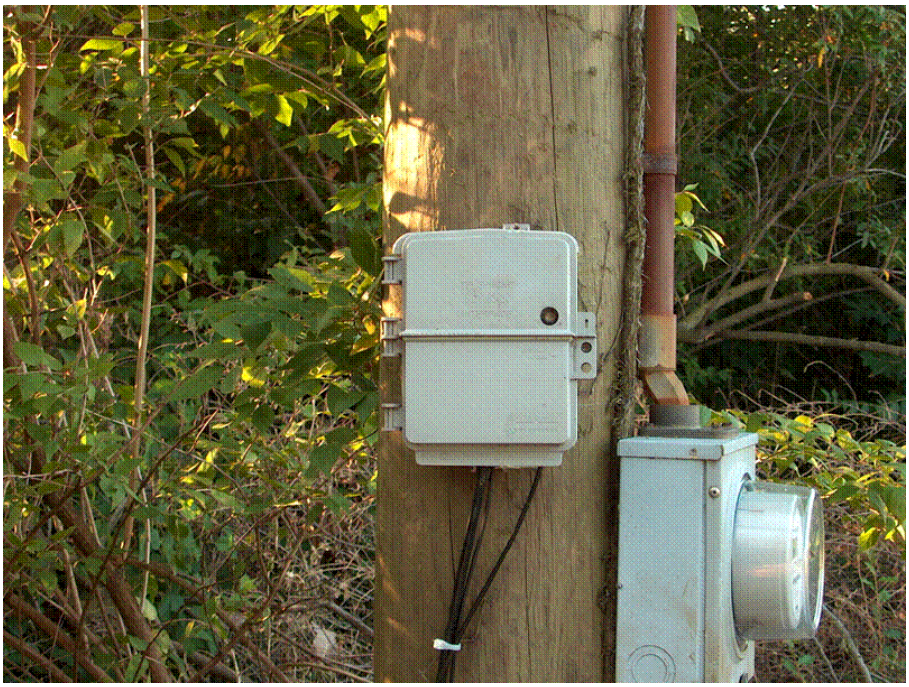

Photo 5 - 180600_Phone_Modem_08_20_08_018.jpg

Photo 6 - 180600_Cabinet_Exterior_08_20_08_020.jpg

Photo 7 - 180600_Cabinet_Interior_Front_08_20_08_021.jpg

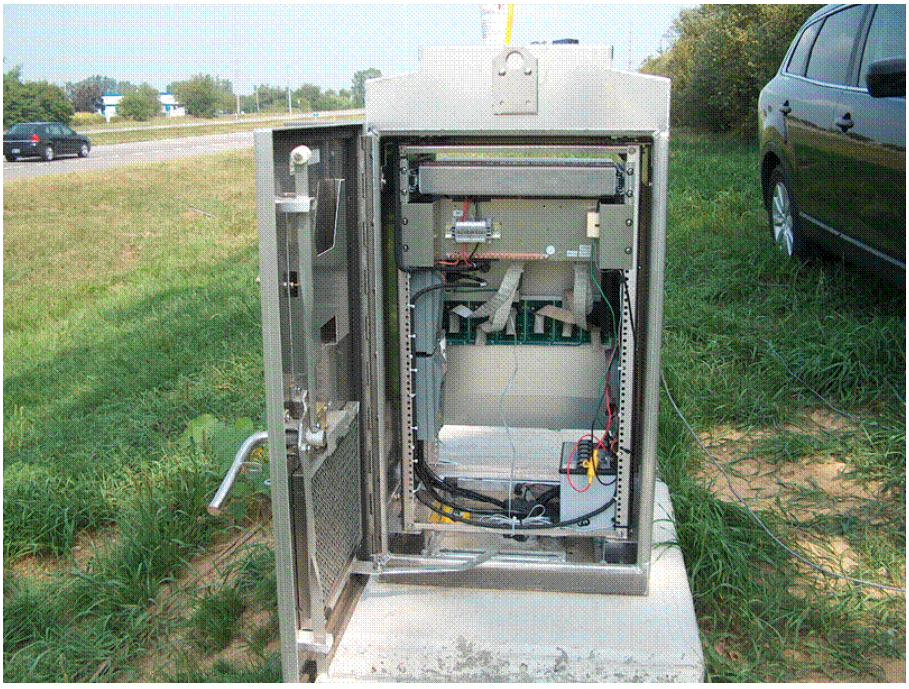

Photo 8 - 180600_Cabinet_Interior_Back_08_20_08_022.jpg

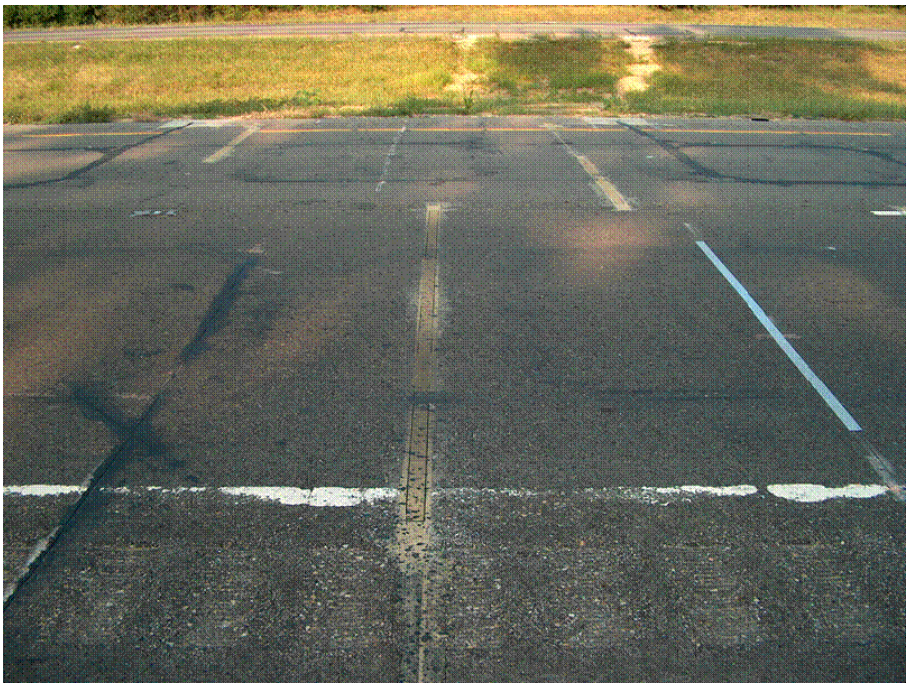

Photo 9 - 180600_Leading_WIM_Sensor_08_20_08_011.jpg

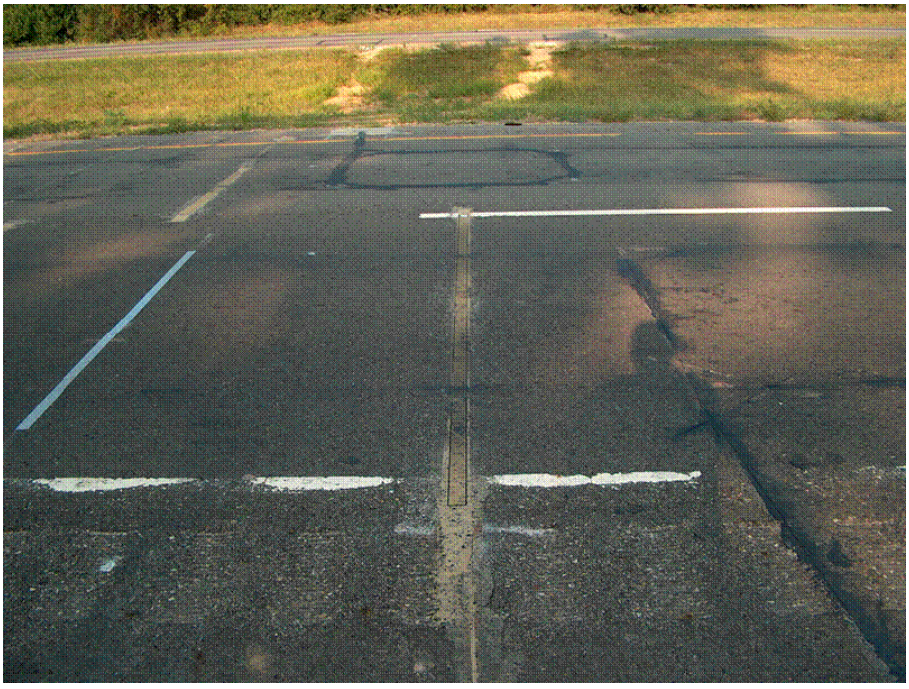

Photo 10 - 180600_Trailing_WIM_Sensor_08_20_08_013.jpg

Photo 11 - 180600_Trailing_Loop_08_20_08_014.jpg

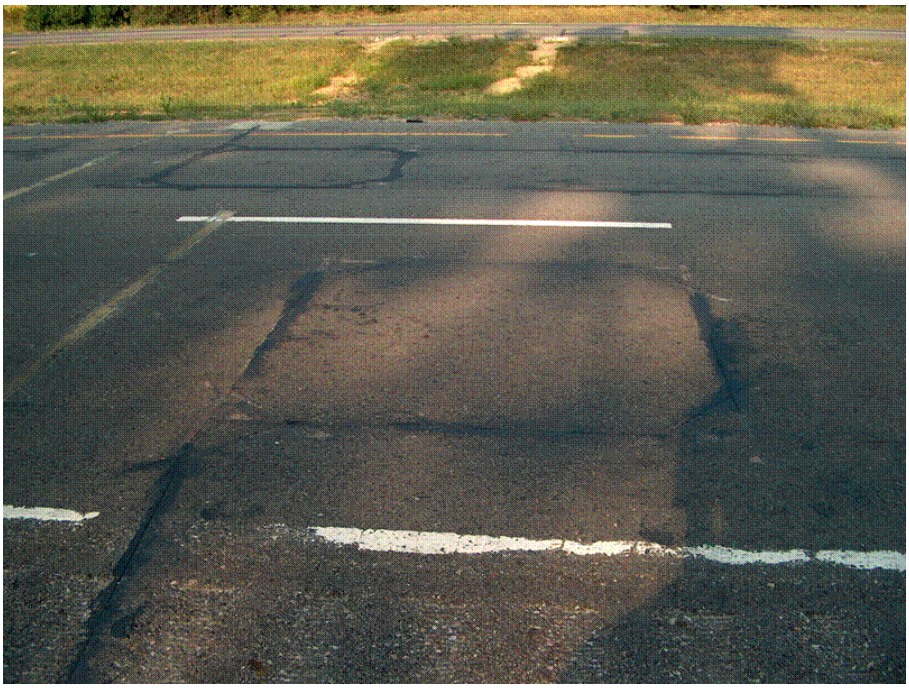

Photo 12 - 180600_Leading_Loop_08_20_08_013.jpg

SHEET 18	STATE CODE [18]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0600]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 9/3/2008

Rev. 05/15/07

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

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

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

2. EQUIPMENT –
   a. Purchase –
      - ☐ State
      - ☒ LTPP

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

   c. Maintenance –
      - ☒ Contract with purchase – Expiration Date _5 years from installation_
      - ☐ Separate contract LTPP – Expiration Date _____
      - ☐ Separate contract State – Expiration Date _____
      - ☐ State personnel

   d. Calibration –
      - ☒ Vendor
      - ☐ State
      - ☐ LTPP

   e. Manuals and software control –
      - ☐ State
      - ☒ LTPP

   f. Power –
      i. Type –
         - ☐ Overhead
         - ☒ Underground

      ii. Payment –
         - ☒ State
         - ☐ LTPP

☐ Solar ☐ N/A

SHEET 18	STATE CODE [18]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0600]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 9/3/2008

Rev. 05/15/07

g. Communication –
   i. Type –
      ☒ Landline
      ☐ Cellular
      ☐ Other
   ii. Payment –
      ☒ State
      ☐ LTPP
      ☐ N/A

3. PAVEMENT –
   a. Type –
      ☒ Portland Concrete Cement
      ☐ Asphalt Concrete
   b. Allowable rehabilitation activities –
      ☐ Always new
      ☐ Replacement as needed
      ☐ Grinding and maintenance as needed
      ☒ Maintenance only
      ☐ No remediation
   c. Profiling Site Markings –
      ☐ Permanent
      ☒ Temporary

4. ON SITE ACTIVITIES –
   a. WIM Validation Check - advance notice required _2__ ☐ days ☒ weeks
   b. Notice for straightedge and grinding check - __2_ ☐ days ☒ weeks
      i. On site lead –
         ☐ State
         ☒ LTPP
      ii. Accept grinding –
         ☐ State
         ☒ LTPP
   c. Authorization to calibrate site –
      ☐ State only
      ☒ LTPP
   d. Calibration Routine –
      ☒ LTPP – ☐ Semi-annually ☒ Annually
      ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
      ☐ State other – _____

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State ☒ LTPP
      2nd – 3S2 different weight/suspension ☐ State ☒ LTPP
      3rd – _____ ☐ State ☐ LTPP
      4th – _____ ☐ State ☐ LTPP
   ii. Loads – ☐ State ☒ LTPP
   iii. Drivers – ☐ State ☒ LTPP

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

_____

g. Access to cabinet
   i. Personnel Access –
      ☐ State only
      ☒ Joint
      ☐ LTPP
   ii. Physical Access –
      ☒ Key
      ☐ Combination

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

i. Traffic Control Required – ☐ Yes ☒ No

j. Enforcement Coordination Required – ☐ Yes ☒ 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: Roy Czinku Phone:(306) 653-6627

      Agency: IRD

b. Maintenance (equipment) –

Name: Roy Czinku Phone:(306) 653-6627

Agency: IRD

c. Data Processing and Pre-Visit Data –

Name: Roy Czinku Phone:(306) 653-6627

Agency: IRD

d. Construction schedule and verification –

Name: _____ Phone:_____

Agency: _____

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

Name: Tim Alen Phone:(524) 259-5407

Agency: Wendt & Sons

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: Pilot Travel Ctr Location:Business 31 & US30, Plymouth, IN

Phone: _____

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [18] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [9/3/2008]

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

   __22__ 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	1
	3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW 3.7 STANDARD DEVIATION 1.6
   DYNAMIC AND STATIC SINGLE AXLES 1.8 STANDARD DEVIATION 2.6
   DYNAMIC AND STATIC DOUBLE AXLES 4.2 STANDARD DEVIATION 2.5

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ 55 60 65 _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3325 / 3204___

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 _5_ ____ ____ -8
   *** FHWA CLASS 8 ____ 0.0 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 [18] *SHRP SECTION ID [0600]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [9/4/2008]

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

   __ 21__ 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	1
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW -1.7 STANDARD DEVIATION 0.8
   DYNAMIC AND STATIC SINGLE AXLES -0.8 STANDARD DEVIATION 3.4
   DYNAMIC AND STATIC DOUBLE AXLES -1.7 STANDARD DEVIATION 2.0

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ 55 60 65 _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3161 / 3046___

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 ____ 33.0 FHWA CLASS _5_ ____ ____ -6
   *** FHWA CLASS 8 ____ 0.0 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

APPENDIX A

Sheet 19	* STATE_CODE	_1_8_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE 9/3/05	

Rev. 08/31/01

#86

PART I.

1.* FHWA Class 9 2.* Number of Axles 5 Number of weight days _____

AXLES - units - (lbs) / 100s lbs / kg

GEOMETRY

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

9. a) * Make: EAGLE b) * Model: _____

10.* Trailer Load Distribution Description:

2 FORK LIFTS

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

b). Trailer Tare Weight (units): _____

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

A to B 15.9 B to C 4.3 C to D 30.1

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 54.4

13. *Kingpin Offset From Axle B (units) (+2.3 FT)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295R 24.5	2 FULL LEAF
B	80R 24.5	AIR
C	80R 24.5	AIR
D	70R 22.5	AIR
E	70R 22.5	AIR
F		

Sheet 19	* STATE CODE	
LTPP Traffic Data	* SPS PROJECT ID	0600
*CALIBRATION TEST TRUCK # 1	* DATE	9/3/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 77320
*c) Post Test Loaded Weight 77070
*d) Difference Post Test – Pre-test -250

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10480	14630	14630	18790	18790		77320
2	10600	14550	14550	18810	18810		77320
3							
Average	10540	14590	14590	18800	18800		77320

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	10560	14450	14450	18810	18810		77080
2	10520	14470	14470	18800	18800		77060
3							
Average	10540	14460	14460	18805	18805		77070

Measured By dlw Verified By SFM Weight date 9/3/08

Sheet 19	* STATE_CODE	_1_8_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0_
*CALIBRATION TEST TRUCK #_1_	* DATE	9/4/00

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 77130

*c) Post Test Loaded Weight 76870

*d) Difference Post Test – Pre-test -260

Table 5.2. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10300	14590	14590	18930	18930		77140
2	10480	14480	14480	18840	18840		77120
3							
Average	10390	14535	14535	18835	18835		77130

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10360	14430	14430	18820	18820		76860
2	10320	14460	14460	18820	18820		76880
3							
Average	10340	14445	14445	18820	18820		76870

Measured By JJW Verified By sfm Weight date 9/4/00

Sheet 19	* STATE_CODE _1_8_
LTPP Traffic Data	* SPS PROJECT ID _0_6_0_0_
*CALIBRATION TEST TRUCK #_2_	* DATE 9/3/08

Rev. 08/31/01

PART I.

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

AXLES - units (lbs) 100s lbs / kg

GEOMETRY

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

9. a) * Make: EAGLE b) * Model: _____

10.* Trailer Load Distribution Description:

1 FORK LIFT & 2 GANTRIES

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

b). Trailer Tare Weight (units): _____

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

A to B 5.6 19.5 B to C 4.3 C to D 35.8

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 63.7

13. *Kingpin Offset From Axle B (units) (+2.15FT)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 24.5	2 FULL LEAF
B	11R 24.5	AIR
C	11R 24.5	AIR
D	70R 22.5	AIR
E	70R 22.5	AIR
F		

Sheet 19	* STATE_CODE	18
LTPP Traffic Data	* SPS PROJECT ID	0600
*CALIBRATION TEST TRUCK #_2_	* DATE	9/3/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 65640
*c) Post Test Loaded Weight 65340
*d) Difference Post Test – Pre-test -300

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11100	13380	13380	13890	13890		65640
2	11100	13380	13380	13890	13890		65640
3							
Average	11100	13380	13380	13890	13890		65640

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	10940	13310	13310	13890	13890		65340
2	10940	13320	13320	13880	13880		65340
3							
Average	10940	13315	13315	13885	13885		65340

Measured By Mw Verified By sfm Weight date 9/3/08

Sheet 19	* STATE_CODE	_1_8_
LTPP Traffic Data	* SPS PROJECT ID	_0_6_0_0
*CALIBRATION TEST TRUCK #_2_	* DATE	9/4/08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 65420

*c) Post Test Loaded Weight 65110

*d) Difference Post Test – Pre-test -310

Table 5.2. Raw data – Axle scales – pre-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10800	13350	13350	13960	13960		65420
2	10800	13350	13350	13960	13960		65420
3							
Average	10880	13350	13350	13960	13960		65420

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10700	13270	13270	13930	13930		65100
2	10640	13300	13300	13940	13940		65120
3							
Average	10670	13285	13285	13935	13935		65110

Measured By dw Verified By sfm Weight date 9/4/08

Sheet 20	* STATE_CODE	1 8
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
Speed and Classification Checks * 1 of* 2	* DATE	9 / 3 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
64	9	25691	63	9	62	9	25879	62	9
60	7	25697	62	7	64	9	25882	63	9
62	9	25701	61	9	65	9	25883	64	9
61	6	25710	62	6	64	9	25885	64	9
66	5	25715	66	5	60	5	25897	59	5
62	9	25726	62	9	62	7	25915	62	7
59	9	25728	61	9	60	5	25925	60	5
64	9	25729	64	9	65	9	25926	65	9
69	9	25730	63	9	60	9	25932	61	9
62	9	25732	63	9	59	6	25944	60	6
60	5	25750	62	5	61	9	25950	61	9
62	7	25752	63	7	62	9	25952	61	9
62	9	25756	62	9	68	5	25966	68	5
62	9	25765	61	9	60	9	25971	58	9
59	9	25768	63	9	59	9	26002	59	9
63	9	25782	65	9	65	9	26010	64	9
62	7	25787	61	7	61	9	26021	63	9
60	7	25788	60	7	61	6	26022	62	6
64	9	25793	63	9	64	9	26025	64	9
65	9	25807	64	9	63	9	26035	63	9
64	9	25839	64	9	63	6	26048	64	6
59	9	25843	58	9	64	9	26057	64	9
56	9	25866	58	9	63	9	26064	63	9
57	5	25867	57	5	58	9	26066	57	9
52	10	25869	54	10	65	9	26067	65	9

Recorded by MARK Z Direction N Lane 1 Time from 12:15PM to 12:52PM

6420070022_SPSWIM_TO_25_18_2.105_0600_Sheet_20.doc

pre-validation

Sheet 20	* STATE_CODE	_1_8__
LTPP Traffic Data	*SPS PROJECT_ID	_0_6_0_0
Speed and Classification Checks * 2 of* 2	* DATE	9 / 3 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	26069	64	9	67	9	26309	67	9
62	9	26100	61	9	60	6	26313	63	6
62	9	26101	61	9	59	0	26347	58	9
61	9	26109	60	9	63	6	26349	59	6
55	9	26120	55	9	62	13	26350	59	13
56	9	26123	57	9	60	9	26354	60	9
63	9	26139	63	9	62	9	26355	62	9
59	6	26166	60	6	58	5	26368	58	5
65	9	26177	63	9	57	9	26373	55	9
60	9	26180	59	9	63	9	26381	60	9
64	5	26184	64	5	60	9	26387	61	9
62	11	26187	63	11	62	8	26403	62	8
65	5	26190	64	5	60	9	26435	59	9
57	5	26195	57	5	60	9	26446	58	9
63	9	26204	62	9	62	9	26450	59	9
64	4	26208	64	5	57	6	26458	58	6
64	9	26211	64	9	59	9	26462	59	9
66	9	26212	66	9	64	9	26468	63	9
60	9	26218	60	9	60	9	26470	60	9
62	9	26219	61	9	65	5	26483	64	5
57	5	26264	58	5	62	9	26541	62	9
62	9	26273	60	9	60	9	26542	60	9
65	6	26296	64	6	61	9	26545	60	9
59	9	26301	62	9	63	9	26556	63	9
61	9	26302	60	9	64	9	26582	63	9

5.1 *

Recorded by MARK Z Direction N Lane 1 Time from 12:52 PM to 1:35 PM

pre-validation

Sheet 20	* STATE_CODE	_1_8__
LTPP Traffic Data	*SPS PROJECT_ID	_0_6_0_0_
Speed and Classification Checks * 1 of* 2	* DATE	9 / 4 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
64	9	35225	63	9	66	7	35445	66	7
65	9	35229	65	9	60	9	35446	60	9
63	9	35236	61	9	64	9	35461	63	9
61	9	35251	61	9	64	7	35463	64	7
64	9	35252	64	9	57	9	35467	57	9
62	6	35288	63	6	66	9	35488	66	9
63	9	35289	64	9	65	5	35489	65	5
61	7	35320	60	7	62	9	35493	62	9
59	9	35325	59	9	63	9	35494	63	9
64	9	35332	59	9	63	9	35501	63	9
58	5	35335	58	5	61	9	35505	61	9
58	5	35336	60	5	61	5	35540	61	5
56	6	35337	56	6	59	9	35553	59	9
61	9	35339	61	9	60	5	35560	60	5
62	6	35353	62	6	59	9	35580	59	9
62	9	35368	61	9	60	9	35581	60	9
63	9	35383	63	9	60	9	35588	60	9
60	6	35385	62	6	57	10	35598	59	10
61	9	35388	60	9	62	9	35601	64	9
62	7	35421	62	7	65	9	35615	65	9
62	7	35423	62	7	60	9	35687	61	9
64	9	35426	64	9	63	6	35689	63	6
65	9	35428	64	9	59	7	35690	58	7
60	9	35430	62	9	60	5	35693	59	5
60	9	35435	60	9	52	9	35708	52	9

Recorded by MARK Z Direction N Lane 1 Time from 9:10 AM to 9:47 AM

6420070022_SPSWIM_TO_25_18_2.105_0600_Sheet_20.doc post-validation

Sheet 20	* STATE_CODE	18
LTPP Traffic Data	*SPS PROJECT_ID	0600
Speed and Classification Checks * 2 of* 2	* DATE	9 / 4 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	35762	62	9	62	5	36488	63	5
60	11	35764	60	11	59	9	36493	60	9
60	9	35773	60	9	65	8	36494	65	8
57	9	35796	57	9	65	5	36499	65	5
60	5	35823	61	5	61	9	36503	62	9
62	9	35847	62	9	64	9	36522	63	9
64	9	35842	63	9	49	9	36524	49	9
61	9	35850	62	9	62	8	36530	62	8
54	5	35857	55	5	60	6	36532	59	6
60	6	35860	61	6	60	9	36533	60	9
61	9	35870	61	9	60	9	36534	60	9
59	9	35879	61	9	59	9	36598	60	9
52	5	35885	52	5	65	9	36605	66	9
58	9	35888	58	9	60	5	36607	60	5
57	9	35889	59	9	60	9	36609	60	9
68	9	35964	67	9	60	5	36633	60	5
* 65	8	36005	64	5	57	8	36643	55	8
63	9	36016	62	9	57	5	36645	58	5
63	9	36018	62	9	60	9	36663	60	9
62	9	36034	61	9	65	9	36665	64	9
62	9	36466	62	9	62	5	36667	62	5
62	9	36468	62	9	61	9	36704	62	9
63	5	36470	63	5	61	6	36719	62	6
62	9	36471	62	9	65	6	36728	65	6
62	9	36476	62	9	62	6	36731	62	6

Recorded by MARK Z Direction N Lane 1 Time from 9:50 AM to 11:15 AM

6420070022_SPSWIM_TO_25_18_2.105_0600_Sheet_20.doc post-validation

Sheet 21	* STATE_CODE	18
LTPP Traffic Data	*SPS PROJECT_ID	0600
WIM System Test Truck Records 1 of 3	* DATE	9/3/08

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
101.5	55	2	1	11:18	24906	57	56/56	71/71	69/69	72/73	71/72		68.1	19.5	4.3	36.1	4.1	
101.5	51	1	1	11:18	24911	50	56/56	77/77	79/80	94/94	94/94		80.1	18.1	4.3	30.4	4.1	
102	60	2	2	11:23	24948	63	55/55	69/69	70/71	78/77	73/74		69.0	19.5	4.3	36.0	4.1	
102	58	1	2	11:24	24970	59	56/57	75/75	77/78	97/97	97/97		80.5	18.0	4.3	30.3	4.1	
101.5	63	2	3	11:28	25023	65	55/56	72/72	68/69	71/71	74/72		67.7	19.5	4.3	35.9	4.0	
101.5	60	1	3	11:33	25070	62	54/53	71/79	83/79	95/99	94/102		81.1	18.0	4.3	30.4	4.1	
101.5	56	2	4	11:34	25086	57	54/55	74/68	73/70	77/65	87/64		68.1	19.6	4.3	36.0	4.1	
101.5	53	1	4	11:40	25182	52	55/51	70/76	80/75	87/98	87/98		77.5	18.1	4.3	30.3	4.1	
103	62	2	5	11:41	25187	63	57/56	73/67	74/69	76/60	82/64		68.6	19.6	4.3	35.9	4.1	
103	56	1	5	11:46	25254	58	57/54	71/79	80/77	89/99	92/100		79.8	18.0	4.3	30.3	4.1	
103	63	2	6	11:46	25269	65	56/56	74/65	78/69	83/67	80/67		69.5	19.6	4.3	35.9	4.0	
104.5	55	2	7	11:53	25360	57	55/55	75/67	71/67	84/63	81/61		67.6	19.6	4.3	35.9	4.1	
104.5	61	1	6	11:55	25380	63	52/53	75/78	77/77	96/99	94/100		80.0	17.9	4.3	30.4	4.1	
104.5	58	1	7	12:02	25456	52	53/53	70/75	83/76	86/97	88/97		77.6	18.1	4.3	30.4	4.1	
112.5	60	2	8	13:04	26216	59	57/57	73/64	77/66	82/72	72/64		68.4	19.6	4.3	35.9	4.1	
112.5	52	1	8	13:05	26221	52	54/50	71/74	81/75	89/97	89/95		77.4	18.0	4.3	30.4	4.1	

Recorded by MARK Z Checked by

Joe 317-758-5945

Sheet 21	* STATE_CODE	1 8
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
WIM System Test Truck Records 2 of 3	* DATE	9 / 3 / 08

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
118	64	2	9	13:11	26303	64	59/53	77/67	75/67	81/68	82/65		69.3	19.6	4.3	35.9	4.1	
118	58	1	9	13:12	26317	57	55/57	71/73	79/79	89/10.1	91/10.2		79.7	18.0	4.4	30.3	4.1	
115.5	64	2	10	13:20	26485	64	64/52	78/70	72/68	74/66	81/65		68.9	19.6	4.3	36.0	4.1	
115.5	64	1	10	13:20	26407	63	54/53	75/81	76/75	95/96	92/10.0		79.7	18.0	4.3	30.3	4.1	
119.5	58	2	11	13:27	26486	58	59/56	77/64	72/65	76/67	71/69		67.7	19.6	4.3	35.9	4.0	
119.5	52	1	11	13:29	26509	52	55/54	73/80	80/76	87/98	92/99		79.5	18.0	4.3	30.3	4.1	
121.5	63	2	12	13:34	26566	63	57/56	74/66	78/66	83/66	72/71		68.9	19.6	4.3	35.9	4.0	
121.5	61	1	12	13:36	26595	59	57/52	71/74	80/76	94/99	94/98		79.4	17.9	4.3	30.5	4.1	
118.5	65	2	13	13:42	26681	65	57/57	73/67	78/67	78/66	82/65		68.9	19.6	4.3	35.9	4.0	
118.5	63	1	13	13:44	26711	63	54/56	74/75	82/79	99/98	96/10.0		81.4	17.9	4.3	30.5	4.1	
119.5	61	2	14	13:48	26765	64	55/57	73/69	74/68	76/67	85/61		68.6	19.6	4.3	35.9	4.0	
119.5	53	1	14	13:51	26798	53	53/53	77/78	80/76	89/97	89/96		78.8	18.0	4.3	30.4	4.1	
122.5	58	2	15	14:31	27322	58	58/53	71/66	72/67	79/69	80/66		67.9	19.5	4.3	35.8	4.1	
122.5	53	1	15	14:31	27333	53	55/51	75/73	79/76	90/96	90/96		78.1	18.1	4.4	30.4	4.1	
123	62	2	16	14:36	27395	64	54/54	70/67	77/70	75/69	78/68		68.3	19.6	4.3	36.1	4.1	
123	59	1	16	14:38	27416	59	55/54	74/72	83/83	95/99	98/10.2		81.3	18.0	4.3	30.3	4.1	

Recorded by MARK E

Checked by

Sheet 21	* STATE_CODE 18
LTPP Traffic Data	*SPS PROJECT_ID 0600
WIM System Test Truck Records 3 of 3	* DATE 9/3/08

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
114.5	65	2	17	14:45	27503	68	55/51	71/67	75/70	74/66	79/66		67.4	19.5	4.3	36.0	4.1	
114.5	62	1	17	14:46	27512	63	54/53	69/78	81/78	99/100	96/102		81.2	18.0	4.3	30.4	4.1	
119	59	2	18	14:52	27591	59	59/52	[illegible]	74/68	75/72	84/63		68.5	19.6	4.3	35.9	4.1	
119	52	1	18	14:54	27615	52	51/52	72/66 74/77	82/75	88/98	90/97		78.3	18.1	4.3	30.4	4.1	
118.5	58	1	19	15:01	27697	59	56/57	73/78	78/79	93/10.2	92/99		80.8	17.9	4.3	30.2	4.1	
118.5	64	2	19	14:58	27668	64	54/54	72/70	75/68	82/68	81/64		68.7	19.5	4.3	35.9	4.0	
118.5	62	1	20	15:09	27795	62	54/55	68/81	79/78	95/99	94/10.0		80.3	17.9	4.3	30.3	4.1	
118.5	62	2	20	15:14	27864	63	57/55	72/68	79/70	78/66	78/64		68.8	19.6	4.3	35.9	4.0	
118.5	52	1	21	15:17	27906	54	53/53	79/62	82/75	99/97	88/98		77.6	18.1	4.3	30.4	4.1	
117.5	66	2	21	15:22	27975	68	56/53	73/65	74/65	70/66	80/65		66.6	19.6	4.3	35.9	4.1	
117.5	57	1	22	15:25	28014	57	54/51	75/77	79/75	91/10.0	94/96		79.3	18.0	4.4	30.4	4.1	

Recorded by MARK Z Checked by

Sheet 21	* STATE_CODE	1 8
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
WIM System Test Truck Records 1 of 1	* DATE	9 / 4 / 08

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
73	57	2	1	9:03	35154	57	53/52	69/65	69/68	73/64	76/64		65.1	19.6	4.3	36.2	4.1	
73	52	1	1	9:04	35160	52	54/52	68/73	77/73	83/95	83/94		75.1	18.1	4.3	30.4	4.1	
75	61	2	2	9:09	35241	62	50/50	67/64	70/65	71/63	75/64		64.0	19.5	4.3	36.0	4.1	
75	59	1	2	9:11	35260	59	52/51	70/75	74/71	87/95	86/95		75.6	18.0	4.3	30.4	4.1	
75	64	2	3	9:18	35365	64	51/50	70/65	66/62	74/70	69/62		63.8	19.5	4.3	35.9	4.0	
75	63	1	3	9:19	35379	63	55/49	68/60	74/74	90/90	87/94		74.2	18.0	4.3	30.4	4.1	
75.5	56	2	4	9:24	35437	56	58/53	68/63	68/63	71/65	75/64		64.8	19.5	4.3	36.0	4.0	
75.5	52	1	4	9:26	35453	52	54/53	72/77	76/70	85/94	87/95		76.4	18.0	4.4	30.4	4.1	
73	63	2	5	9:29	35484	63	53/51	66/63	70/65	72/68	74/61		64.3	19.5	4.3	36.0	4.1	
73	58	1	5	9:31	35513	59	55/52	69/74	73/74	86/93	88/95		76.0	18.0	4.3	30.4	4.1	
75	65	2	6	9:37	35576	65	52/52	74/64	67/66	73/67	75/62		64.7	19.5	4.3	35.9	4.1	
75	63	1	6	9:40	35618	63	53/49	64/71	76/72	90/93	87/94		74.8	18.0	4.3	30.4	4.1	

Recorded by MARK Z _____ Checked by _____ _____

Sheet 21	* STATE_CODE	1 8
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
WIM System Test Truck Records 1 of 2	* DATE	9 / 4 / 08

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
75.5	62	2	7	9:48	35728	62	54/51	67/64	68/65	71/64	74/62		64.0	19.5	4.3	35.9	4.1	
75.5	58	1	7	9:53	35786	59	53/56	70/70	79/72	89/91	89/92		76.1	18.0	4.3	30.4	4.1	
71.5	64	2	8	9:57	35835	65	52/50	65/65	70/67	73/68	68/64		64.3	19.5	4.3	36.0	4.0	
71.5	63	1	8	10:03	35907	64	54/51	66/74	73/75	87/94	88/95		75.6	18.1	4.3	30.4	4.1	
74.5	56	2	9	10:04	35923	56	55/54	70/67	69/64	74/62	75/60		65.1	19.6	4.3	36.0	4.1	
74.5	52	1	9	10:10	35982	52	54/53	69/67	75/73	85/96	85/94		75.0	18.0	4.3	35.9	4.1	
75.5	63	2	10	10:11	35991	63	51/50	68/67	69/68	71/62	75/62		64.4	19.5	4.3	35.9	4.0	
75.5	58	1	10	10:16	36041	59	56/52	68/70	73/71	89/95	88/96		75.9	18.0	4.3	30.4	4.1	
78	56	2	11	10:59	36544	57	54/53	66/64	69/65	77/62	72/60		64.2	19.6	4.3	35.9	4.1	
78	55	1	11	11:00	36547	55	54/52	73/72	74/74	85/95	86/96		76.0	18.0	4.3	30.4	4.1	
78	61	2	12	11:04	36614	62	53/50	67/64	67/64	74/66	78/61		64.3	19.5	4.3	35.9	4.1	
78	60	1	12	11:06	36624	61	54/51	63/75	74/76	88/95	88/94		76.2	18.0	4.3	30.4	4.1	
79	64	2	13	11:12	36691	64	52/50	67/66	70/66	69/67	73/63		64.4	19.5	4.3	35.9	4.1	
79	66	1	13	11:14	36726	67	51/50	68/74	73/70	88/92	89/90		74.6	18.0	4.3	30.4	4.1	
76.5	53	2	14	11:18	36772	56	54/51	68/64	67/64	76/63	74/61		64.3	19.6	4.3	36.0	4.1	
76.5	56	1	14	11:22	36824	57	52/52	69/74	76/72	86/95	86/93		75.5	18.1	4.3	30.4	4.1	

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE	1 8
LTPP Traffic Data	*SPS PROJECT_ID	0 6 0 0
WIM System Test Truck Records 2 of 2	* DATE	9 / 4 / 08

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
77.5	62	2	15	11:25	36851	62	55/50	63/64	65/65	72/71	70/63		63.9	19.5	4.3	36.0	4.1	
77.5	61	1	15	11:28	36880	60	54/52	65/60	75/75	88/94	89/94		74.5	18.1	4.3	30.4	4.1	
77	66	2	16	11:32	36936	66	53/51	69/67	69/66	67/68	69/65		64.4	19.5	4.3	35.9	4.0	
77	64	1	16	11:36	36988	65	54/51	68/74	73/73	90/93	87/92		75.4	18.0	4.3	30.4	4.1	
77.5	63	2	17	11:38	37019	62	54/50	64/64	67/64	71/69	73/64		64.0	19.5	4.3	36.0	4.1	
77.5	56	1	17	11:42	37067	55	52/52	73/78	78/73	86/94	89/94		76.9	18.0	4.3	30.4	4.1	
76	65	2	18	11:46	37110	65	51/50	65/63	70/65	68/65	73/62		63.2	19.5	4.3	36.0	4.0	
76	59	1	18	11:50	37156	60	54/53	69/74	69/70	88/96	89/94		75.8	18.0	4.3	30.4	4.1	
80	56	2	19	11:52	37184	56	54/52	70/64	68/63	74/64	73/63		64.5	19.6	4.3	36.0	4.1	
80	65	1	19	11:58	37270	65	55/50	69/71	72/72	87/92	88/92		74.6	18.1	4.3	30.3	4.1	
80	64	2	20	11:59	37281	64	51/51	69/68	71/65	71/66	73/61		64.5	19.5	4.3	36.0	4.1	
80.5	56	1	20	12:05	37362	55	54/52	68/74	79/74	85/96	88/93		76.3	18.0	4.3	30.4	4.1	
80.5	66	2	21	12:05	37365	66	51/49	69/68	66/64	65/71	74/64		64.2	19.5	4.3	36.0	4.1	
80.5	61	1	21	12:11	37424	61	52/51	64/71	75/74	89/97	87/95		75.4	18.0	4.3	30.4	4.1	

Recorded by MARK Z

Checked by

6420070022_SPSWIM_TO_25_18_2.105_0600_~~Cal~~ Sheet_21.doc

POST VALIDATION

Calibration Worksheet

Site: __180600___

Calibration Iteration ___1___ Date 9/3/08

Beginning factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic compensation	100 %	
Distance	2x1 sen sep ~~[illegible] (cm)~~	304 cm	
1 – (50)	80 kph	3390	3267
2 – (55)	88 kph	3390	3267
3 – (60)	96 kph	3390	3267
4 – (65)	105 kph	3325	3204
5 – (70)	112 kph	3194	3050

Errors:

	Speed Point 1 (50)	Speed Point 2 (55)	Speed Point 3 (60)	Speed Point 4 (65)	Speed Point 5 (70)
F/A	+1.0	+1.0	+3.0	+1.1	
Tandem	+2.0	+2.0	+4.2	+5.3	
GVW	+1.5	+1.5	+3.9	+4.6	

Adjustments:

	Raise	Lower	Percentage
Overall	☑	☐	2
Front Axle	☑	☐	2 %
Speed Point 1	☐	☑	1.8 %
Speed Point 2	☐	☑	1.8 %
Speed Point 3	☐	☑	4.3 %
Speed Point 4	☐	☑	4.9 %
Speed Point 5	☐	☐	

End factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic compensation	102 %	
Distance	2x1 sen sep	304 cm	
1 – (50)	80 kph	3388	3207
2 – (55)	88 kph	3388	3207
3 – (60)	96 kph	3264	3127
4 – (65)	105 kph	3161	3046
5 – (70)	112 kph	3194	3050

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

09/03/2008

STATE: Indiana

SHRP ID: 0600

Photo 1 - Truck_1_Tractor_18_0600_08_20_08_001.jpg

Photo 2 - Truck_1_Trailer_Load_18_0600_08_20_08_002.jpg

Photo 3 - Truck_1_Suspension_1_18_0600_08_20_08_003.jpg

Photo 4 - Truck_1_Suspension_2_18_0600_08_20_08_004.jpg

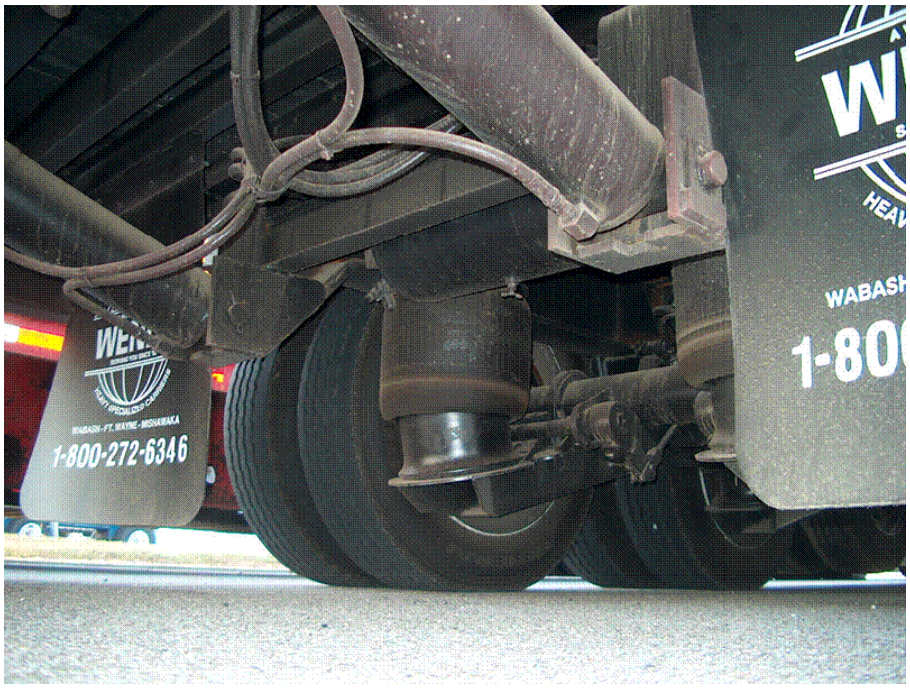

Photo 5 - Truck_1_Suspension_3_18_0600_08_20_08_005.jpg

Photo 6 - Truck_2_Tractor_18_0600_08_20_08_006.jpg

Photo 7 - Truck_2_Trailer_18_0600_08_20_08_007.jpg

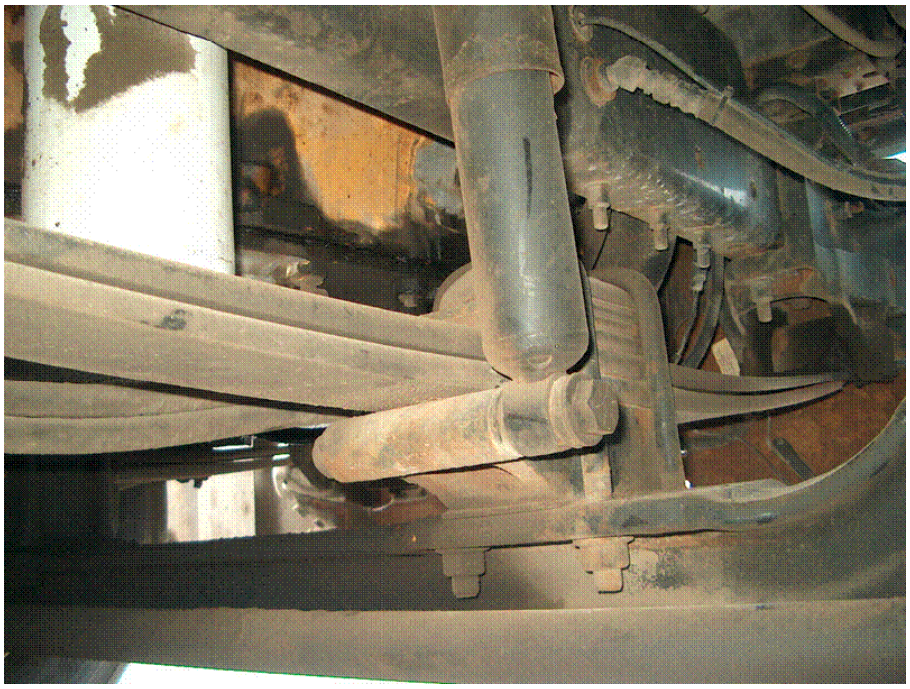

Photo 8 - Truck_2_Suspension_1_18_0600_08_20_08_008.jpg

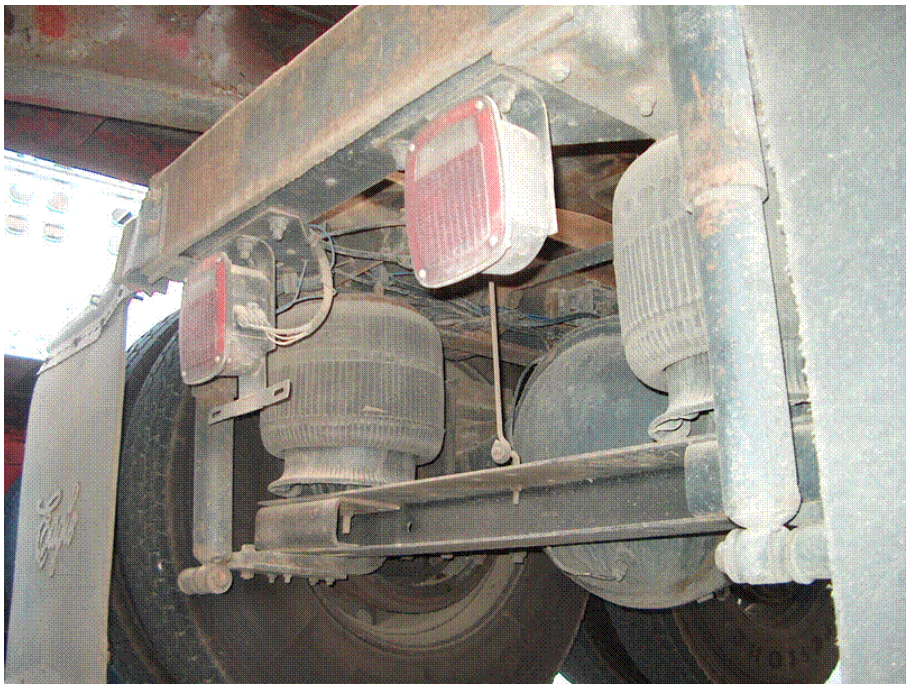

Photo 9 - Truck_2_Suspension_2_18_0600_08_20_08_009.jpg

Photo 10 - Truck_2_Suspension_3_18_0600_08_20_08_0010.jpg

ETG LTPP CLASS SCHEME, MOD 3

Class	Vehicle Type	No. Axles	Spacing 1	Spacing 2	Spacing 3	Spacing 4	Spacing 5	Spacing 6	Spacing 7	Spacing 8	Gross Weight Min-Max	Axle 1 Weight Min *
1	Motorcycle	2	1.00-5.99								0.10-3.00	
2	Passenger Car	2	6.00-10.10								1.00-7.99	
3	Other (Pickup/Van)	2	10.11-23.09								1.00-7.99	
4	Bus	2	23.10-40.00								12.00 >	
5	2D Single Unit	2	6.00-23.09								8.00 >	2.5
2	Car w/ 1 Axle Trailer	3	6.00-10.10	6.00-25.00							1.00-11.99	
3	Other w/ 1 Axle Trailer	3	10.11-23.09	6.00-25.00							1.00-11.99	
4	Bus	3	23.10-40.00	3.00-7.00							20.00 >	
5	2D w/ 1 Axle Trailer	3	6.00-23.09	6.30-30.00							12.00-19.99	2.5
6	3 Axle Single Unit	3	6.00-23.09	2.50-6.29							12.00 >	3.5
8	Semi, 2S1	3	6.00-23.09	11.00-45.00							20.00 >	3.5
2	Car w/ 2 Axle Trailer	4	6.00-10.10	6.00-30.00	1.00-11.99						1.00-11.99	
3	Other w/ 2 Axle Trailer	4	10.11-23.09	6.00-30.00	1.00-11.99						1.00-11.99	
5	2D w/ 2 Axle Trailer	4	6.00-26.00	6.30-40.00	1.00-20.00						12.00-19.99	2.5
7	4 Axle Single Unit	4	6.00-23.09	2.50-6.29	2.50-12.99						12.00 >	3.5
8	Semi, 3S1	4	6.00-26.00	2.50-6.29	13.00-50.00						20.00 >	5.0
8	Semi, 2S2	4	6.00-26.00	8.00-45.00	2.50-20.00						20.00 >	3.5
3	Other w/ 3 Axle Trailer	5	10.11-23.09	6.00-25.00	1.00-11.99	1.00-11.99					1.00-11.99	
5	2D w/ 3 Axle Trailer	5	6.00-23.09	6.30-35.00	1.00-25.00	1.00-11.99					12.00-19.99	2.5
7	5 Axle Single Unit	5	6.00-23.09	2.50-6.29	2.50-6.29	2.50-6.30					12.00 >	3.5
9	Semi, 3S2	5	6.00-30.00	2.50-6.29	6.30-65.00	2.50-11.99					20.00 >	5.0
9	Truck+FullTrailer (3-2)	5	6.00-30.00	2.50-6.29	6.30-50.00	12.00-27.00					20.00>	3.5
9	Semi, 2S3	5	6.00-30.00	16.00-45.00	2.50-6.30	2.50-6.30					20.00 >	3.5
11	Semi+FullTrailer, 2S12	5	6.00-30.00	11.00-26.00	6.00-20.00	11.00-26.00					20.00 >	3.5
10	Semi, 3S3	6	6.00-26.00	2.50-6.30	6.10-50.00	2.50-11.99	2.50-10.99				20.00 >	5.0
12	Semi+Full Trailer, 3S12	6	6.00-26.00	2.50-6.30	11.00-26.00	6.00-24.00	11.00-26.00				20.00 >	5.0
13	7 Axle Multi's	7	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00			20.00 >	5.0
13	8 Axle Multi's	8	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00		20.00 >	5.0
13	9 Axle Multi's	9	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	20.00 >	5.0

Spacings in feet
Weights in kips (Lbs/1000)
* Suggested Axle 1 minimum weight threshold if allowed by WIM system's class algorithm programming

System Operating Parameters

Indiana SPS-6 (Lane 1)

Calibration Factors for Sensor #1

Validation Visit	Aug 03, 2008	Validation Visit	July 17, 2008
Dynamic Compensation	100%		
Axle Sensor Separation	304 cm		
80 kph	3328	80 kph	3390
88 kph	3328	88 kph	3390
96 kph	3244	96 kph	3390
105 kph	3161	105 kph	3325
112 kph	3194	112 kph	3194

Calibration Factors for Sensor #2

Validation Visit	Aug 03, 2008	Validation Visit	July 17, 2008
Dynamic Compensation	102%		
Axle Sensor Separation	304 cm		
80 kph	3207	80 kph	3267
88 kph	3207	88 kph	3267
96 kph	3127	96 kph	3267
105 kph	3046	105 kph	3204
112 kph	3050	112 kph	3050