Evaluation/Calibration Report

Florida, SPS-1

Task Order 3, CLIN 2
Visit Date: December 16 and 17, 2003

List of Tables

List of Figures

1 Executive Summary

A visit was made to the Florida SPS-1 on December 16 and 17, 2003 for the purposes of conducting a field performance evaluation and calibration of the WIM system located on US 27, 13.8 miles South of SR 80.

The site is instrumented with Kistler quartz sensors and PAT DAW190 WIM Controller.

The validation used the following trucks:

1) 3S2 with air suspension tandems loaded to 90,520 lbs.
2) A Class 9 truck loaded to 38,380 lbs.

The overweight on the standard truck was not correctable for the runs conducted for this evaluation. The speeds ranged from 44.0 to 66.0 mph. The temperatures ranged from 61.0 To 89.0 degrees Fahrenheit in the two days of the performance evaluation. The final runs had a temperature range of 61.0 to 73.0 degrees Fahrenheit

Table 1 Post-Validation results – 120100 –17 December 2003

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	3.5% ± 25.5%	Fail
Loaded tandem axles	±15 percent	-2.1% ± 21.4%	Fail
Gross vehicle weights	±10 percent	1.0% ± 14.7%	Fail
Vehicle speed	±1 mph [2 km/hr]	±1.6 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	± 0.1 ft	Pass

This site fails all LTPP precision requirements except Axle spacing. The failure is due to the wide variation in weights obtained from the WIM equipment. It was observed in the field during the validation, that when the variation was large, the left wheel weight was usually significantly less than the right wheel weight. This is believed most likely to be caused by the sensors not being ground such that they were consistently level or slightly below the adjacent pavement surfaces. Another possible cause could be slight pavement distortions just outside or inside the wheel paths causing the wheels to be oscillating up and down as they rolled across the pavement, applying inconsistent wheel loads to the WIM sensors, depending on transverse location of the wheels, and possibly related to vehicle speed.

The agency did all computations for factor adjustments and made all equipment changes. This was expected given the information on the Traffic Sheet 18 completed as part of the assessment visit held on December 3, 2003.

The following remedial actions are recommended so that this site may meet LTPP precision requirements. First, to grind the sensors to the manufacturer's specifications and then re-try the calibration/validation process and see if that eliminates the problems. If that does not correct the problem, then the second

recommendation would be to grind the pavement to smooth out the problems indicated in profile/WIM Profile Index. Should this action be required, reinstallation of one or both of the sensors may be necessary.

The correction of the classification algorithm identified during the assessment is still outstanding.

2 Corrective Actions Recommended

Grind the sensors such that they meet the manufacturer's specifications all the way across the lane. After the sensors are ground, it is recommended to attempt to calibrate and validate the system, paying special attention to left and right wheel weights. If this does not correct the problem, then the second option would be to grind the pavement to meet the LTPP smoothness specifications.

A correction of the system classification algorithm needs to be performed to circumvent Class 5 vehicles being classified as Class 3 vehicles. This can be achieved by reducing the minimum axle spacing of Class 5 vehicles, decreasing the maximum axle spacing of Class 3 vehicles and including weight characteristics in the classification process for these two vehicle types. Class 5 vehicles may weigh two to four times a Class 3 vehicle and thus loading estimates may be affected if the volumes of misclassified Class 5s are high. The agency is aware of this problem and taking steps to correct it. A date for the correction of this system has not been provided. This is an outstanding item form the assessment completed December 3, 2003.

3 Post Calibration Analysis

This final analysis is based on test runs conducted on December 17, 2003 from 12:00 p.m. until 3:00 p.m. at test site 120100 on U.S. 27, 13.6 miles south of SR 80. This SPS-1 site is at milepost 12.03 on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs. The two trucks used for initial calibration and for the subsequent testing included:

1. A five-axle tractor semi-trailer loaded to 90,520 lb.
2. A five-axle tractor semi-trailer loaded to 38,380 lbs.

The front axle suspension of both of the five-axle tractor semi-trailer consisted of two taper leaf springs. The drive tandem axles of the tractor and the tandem axle of the trailers used air suspension.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 45.0 to 66.0 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 61.5 to 72.5 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 2.

As seen in Table 2 the site failed LTPP precision requirements except the axle spacing.

Table 2 Post-Validation Results - 120100 –17 December 2003

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	3.5% ± 25.5%	Fail
Loaded tandem axles	±15 percent	- 2.1% ± 21.4%	Fail
Gross vehicle weights	±10 percent	1.0% ± 14.7%	Fail
Vehicle speed	±1 mph [2 km/hr]	±1.6 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	± 0.1 ft	Pass

The test runs were conducted primarily during the early afternoon hours and resulted in a very 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 3 speed groups and 2 temperature groups.

The distribution of runs within these groupings is illustrated in Figure 3-1. The speed groups were divided as follows: Low speed = 45.0-50.0 mph, Medium speed = 51.0-56.9 mph and High speed = 57.0+ mph. The two temperature groups were created by splitting the runs between those at 61.5 - 64.01 for Low temperature and 64.02 – 72.5 for High temperature.

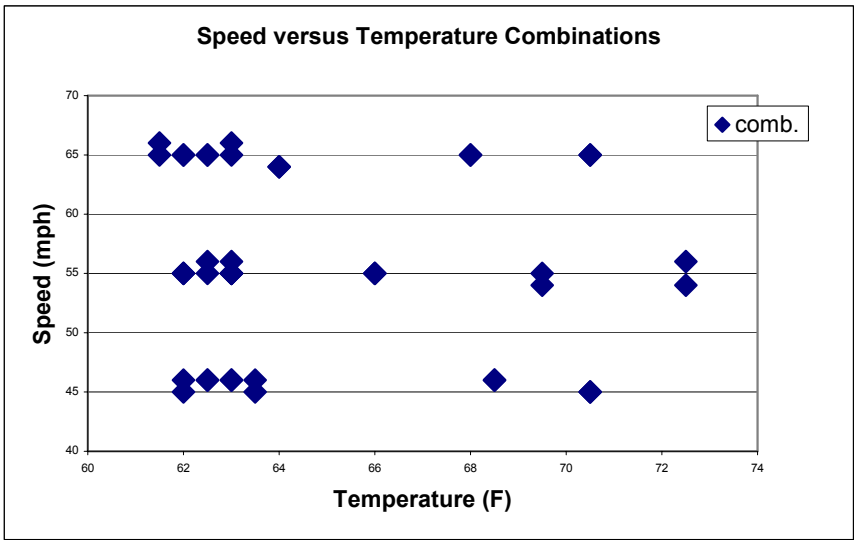


Figure 3-1 Post-Validation Speed-Temperature Distribution Graph – 120100 – 17 December 2003

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

Figure 3-2 shows the by truck GVW percent error by Truck and Speed graph for the population as a whole. As seen from the figure the percent error of GVW varied significantly with increase in speed for the truck 1. The equipment was overestimating weight at low speeds and underestimating at high speeds. However, for truck 2 the error

did not vary significantly. The pattern for truck 1 was repeated when it was used two days later on the SPS-5 with a lighter load. It is presumed since the pavement smoothness characteristics are different that the trend is truck related and not site related. Graphically it can be seen that using only Truck 2 values will not result in the site meeting the definition of research quality. Graphically truck 2 displays larger variability that truck 1.

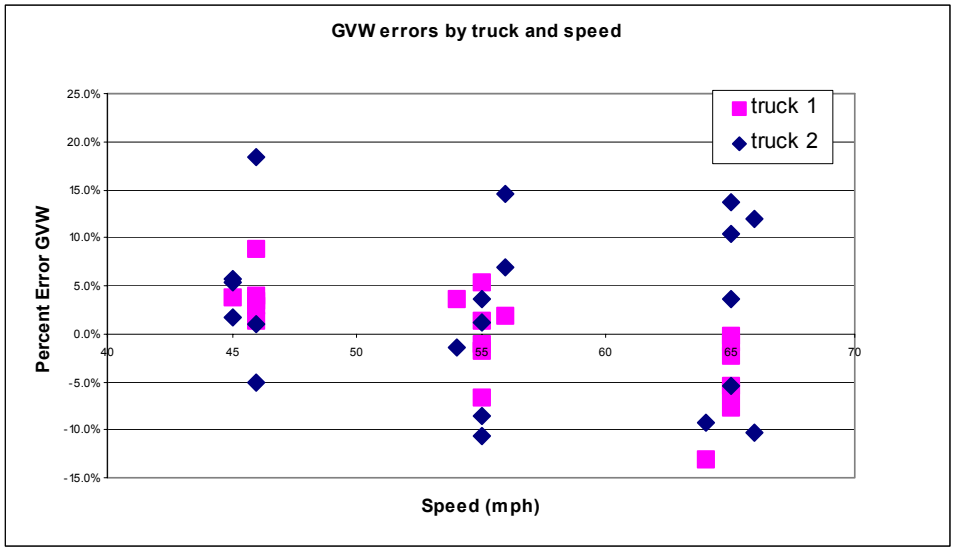


Figure 3-2 Post-Validation GVW Errors by Truck and Speed - 120100 - 17 December 2003

Figure 3-3 shows the relationship between temperature and GVW percentage error. The figure shows that for truck 1 and truck 2 the variability in GVW error apparently decreased with increasing temperature.

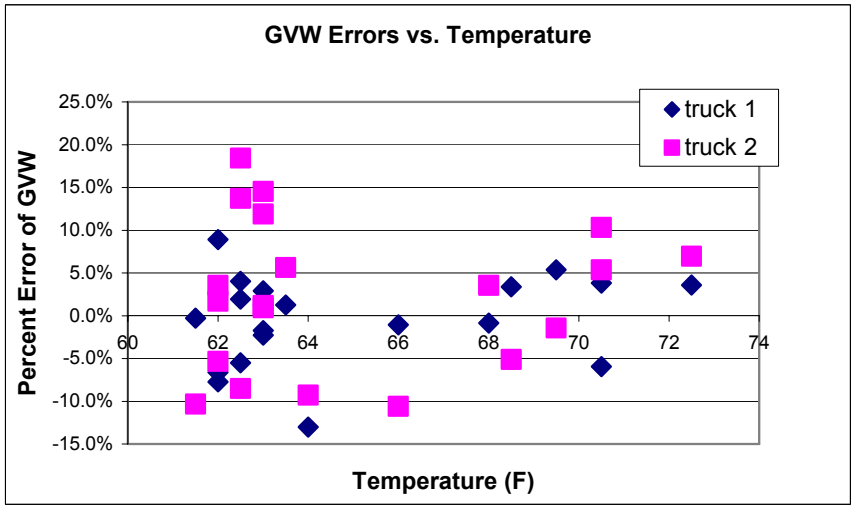


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature by Truck – 120100 - 17 December 2003

Figure 3-4 shows the relationship between the spacing errors in feet and speeds. From the figure it appears that the spacing measurement is not significantly affected by speed.

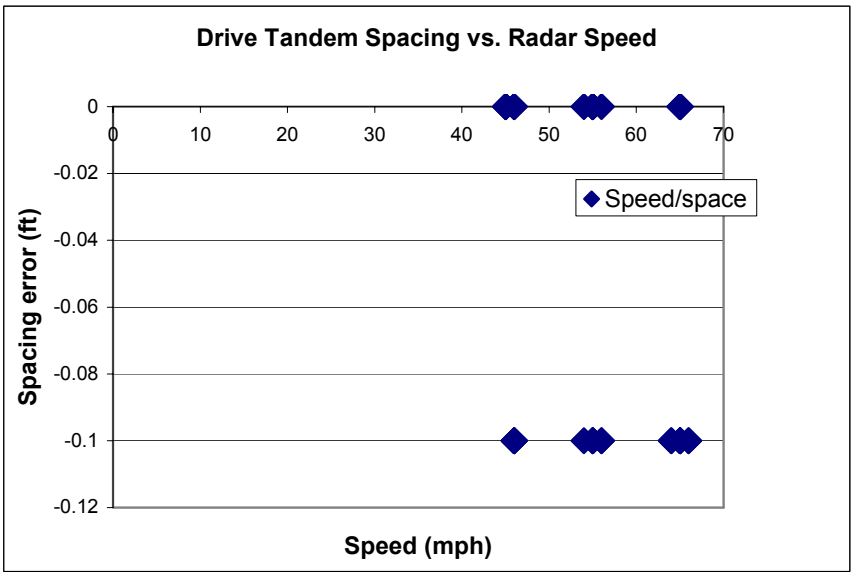


Figure 3-4 Post-Validation Speed versus spacing graph – 120100 - 17 December 2003

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 61.5 to 64.01 for Low temperature and 64.02 to 72.5 for High temperature.

As seen from Table 3, Figure 3-5 and Figure 3-6 it appears that the errors are within the tolerance limits. However, the percent error of weight for single axles is not affected with increase in temperature. The percent error in GVW for the truck decreases with increase in temperature.

Table 3 Post-Validation Results by Temperature Bin – 120100 –17 December 2003

Element	95% Limit	Low Temp.	Med. Temp.	High Temp.
Single axles	±20 %	2.7% ± 25.9%	N/A	4.9% ± 28.2%
Tandem axles	±15 %	-2.0% ± 22.9%	N/A	-2.3% ± 19.7%
GVW	±10 %	0.8% ± 16.6%	N/A	1.2% ± 12.3%
Speed	±1 mph	±1.7 mph	N/A	±1.7 mph
Axle spacing	± 0.5 ft	±0.1 ft	N/A	±0.1 ft

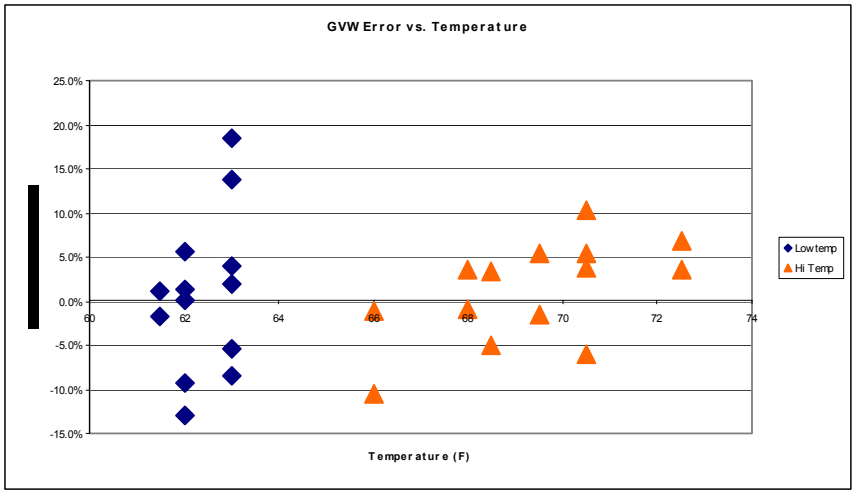


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Group – 120100 – 17 December 2003

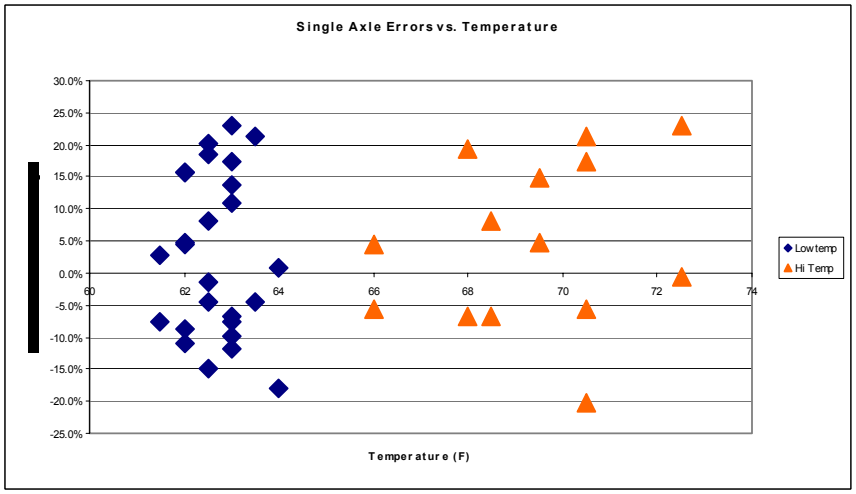


Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group - 120100 – 17 December 2003

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 45.0-50.0 mph, Medium speed = 51.0-56.9 mph and High speed = 57.0+ mph.

From Table 4 it appears that the errors consistently exceed the tolerable limits. This is reinforced in Figure 3-7 through Figure 3-10. It appears that for truck 1 the equipment is overestimating the GVW and single axle weights at low speeds and underestimating the same at high speeds. For truck 2, there is no significant variation in the percent error for GVW and single axle weight with increase in speed.

Table 4 Post-Validation Results by Speed Bin – 120100 –17 December 2003

Element	95% Limit	Low Speed	Med. Speed	High Speed
Single axles	±20 %	5.8% ± 24.8%	4.7% ± 24.2%	0.3% ± 32.6%
Tandem axles	±15 %	1.4% ± 19.7%	-3.2% ± 24.7%	-4.0% ± 20.4%
GVW	±10 %	4.3% ± 12.3%	0.6% ± 14.0%	-1.5% ± 18.4%
Speed	±1 mph	±1.7 mph	±1.5 mph	±2.0 mph
Axle spacing	± 0.5 ft	±0.1 ft	±0.1 ft	±0.1 ft

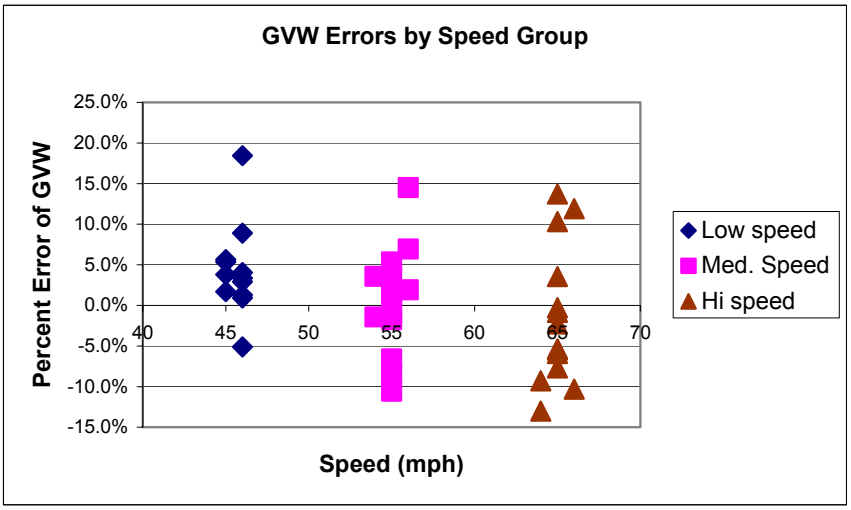


Figure 3-7 Post-Validation GVW Percent Error vs. Speed group - 120100 – 17 December 2003

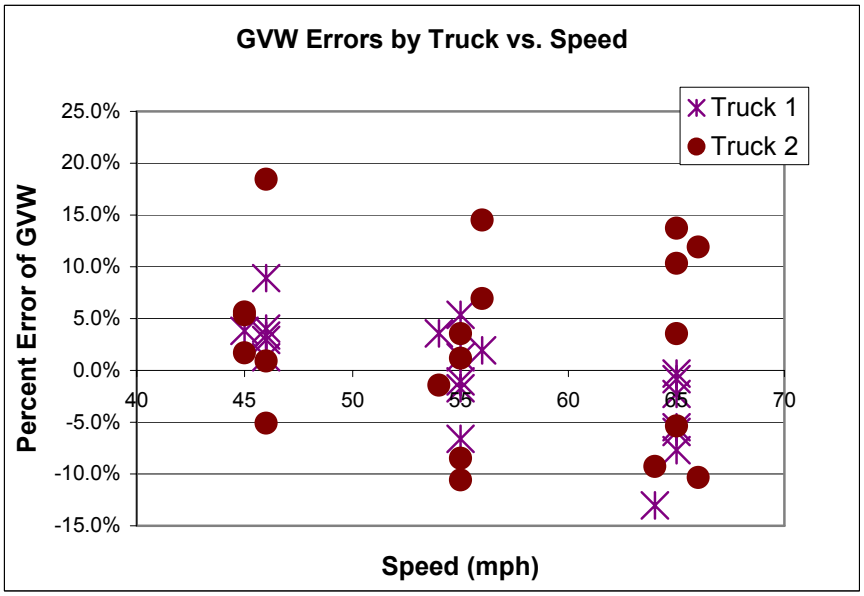


Figure 3-8 Post-Validation GVW Percent Error vs. Speed by Truck – 120100 – 17 December 2003

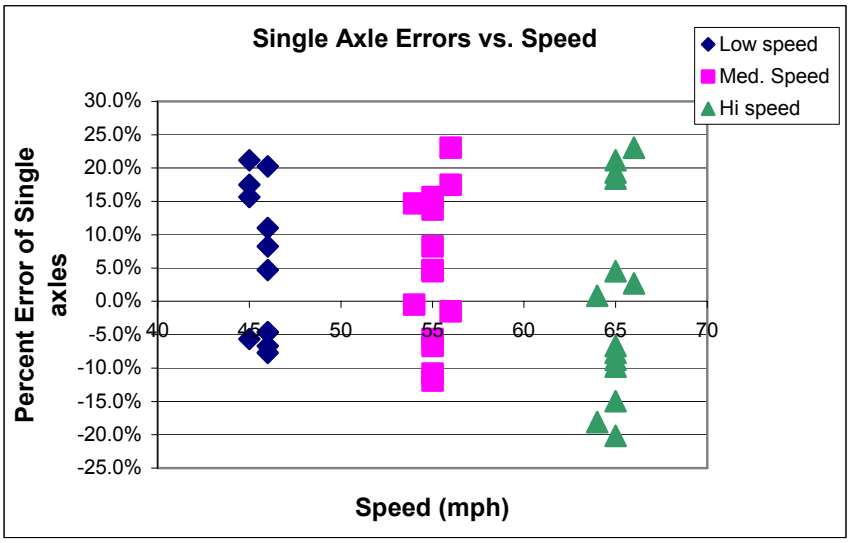


Figure 3-9 Post-Validation Steering Axle Percent Error vs. Speed Group - 120100 – 17 December 2003

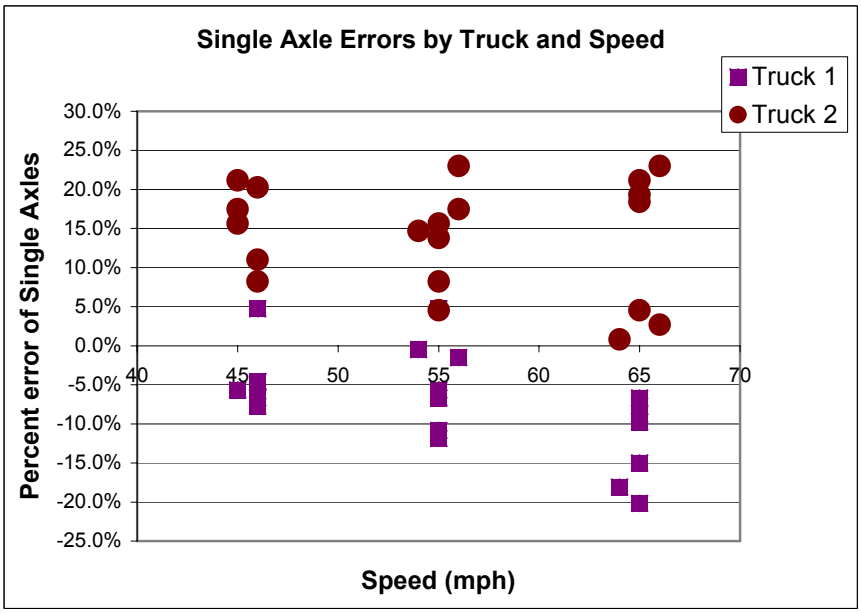


Figure 3-10 Post-Validation Steering Axle Percent Error vs. Speed by truck - 120100 – 17 December 2003

4 Pavement Discussion

During our initial assessment visit on December 3, 2003 and again with our performance evaluation and calibration visit on December 16-17, 2003, we did not note any significant pavement distress that would affect the performance of the WIM scales.

During the initial assessment moderate bouncing was detected 350 feet to 400 feet from the WIM area, however, it appeared that the trucks stabilized prior to reaching the WIM scale area. We did note that while no pavement distresses were observed that would cause this motion, the existence of a subtle hump or dip was suspected.

There was no discernable motion of the trucks approaching or leaving the sensor area and daylight could not be seen between the tires and the pavement, indicating that the tires were fully touching the pavement and sensors.

Again, as discussed in the next section, there are a total of 17 profile passes, which exceeded the WIM Index value of 0.789 m/km. This presumes a roughness, which may influence sensor output. This added with the sensor not being flush with the pavement is most likely to have an adverse effect.

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. The Long Range Index (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 short Range Index (SRI) incorporates a shorter section of pavement profile beginning 2.7 m prior to the WIM scale and ending 0.5 m after the scale.

Profile data collected at the SPS WIM location by Fugro BRE Inc. on November 11, 2003 were processed through the LTPP SPS WIM Index software. This WIM scale is installed on an asphalt concrete pavement. The results are shown in Table 5.

A total of 10 profiler passes were conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM section, 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 done 6 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).

Table 5 shows the computed index values for all the 10 profiler passes for this WIM site. The average values over the passes at each path were also calculated when three or more passes are completed. These are shown in the right most column of the table. Values above the index limits are presented in italics.

Table 5 Long Range Index (LRI) and Short Range Index (SRI)

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Pass 6**	**Ave.**
Center	LWP	LRI (m/km)	0.712	0.685	0.653	0.484	0.593	0.574	**0.617**

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Pass 6**	**Ave.**
		SRI (m/km)	*0.822*	*0.842*	0.774	0.272	0.664	0.755	**0.688**
	RWP	LRI (m/km)	0.690	0.779	0.705	*0.928*	*0.821*	0.724	**0.775**
		SRI (m/km)	0.578	0.671	0.693	*0.918*	0.516	*0.845*	**0.704**
Left Shift	LWP	LRI (m/km)	*0.848*	*0.909*					
		SRI (m/km)	0.579	*1.113*					
	RWP	LRI (m/km)	0.634	0.688					
		SRI (m/km)	0.696	0.687					
Right Shift	LWP	LRI (m/km)	*1.008*	*0.812*					
		SRI (m/km)	*1.764*	*1.356*					
	RWP	LRI (m/km)	*1.039*	*1.416*					
		SRI (m/km)	*0.907*	*1.098*					

There are 17 passes at which the WIM Index value of 0.789 m/km is exceeded as can be seen in the table. When all values are less than 0.789 it is presumed unlikely that pavement conditions will significantly influence sensor output. Values above that level may or may not influence the reported weights and potentially vehicle spacings. Since all the LRI and SRI values in the right shift exceed the threshold, grinding was recommended as a corrective action in the assessment report. However, while performing validation the field personnel observed that there were errors in the data collected by the equipment when the trucks were traveling on the left side of the travel lane. Figure 12-1 shows the LRI and SRI for left wheel path in left shift. In view of that, grinding is recommended for the entire section.

4.2 Distress survey and any applicable photos

The pavement appears to be in good condition with little or no distress, however, the existence of a slight hump or dip in the pavement is suspected 350 feet to 400 feet prior to the WIM area.

4.3 Vehicle-pavement interaction discussion

It was observed in the field during the validation, that the when the variation was large, the left wheel weight was usually significantly less than the right wheel weight. This is believed to be most likely caused by the sensors not being ground such that they were consistently level or slightly below the adjacent pavement surfaces. Another possible cause could be slight pavement distortions just outside or inside the wheel paths causing the wheels to be oscillating up and down as they rolled across the pavement, applying inconsistent wheel loads to the WIM sensors, depending on transverse location of the wheels and possibly related to vehicle speed.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Kistler quartz weighing sensors and a PAT America DAW190 WIM Controller. These sensors are 6’ in length (1/2 lane) and are installed in an asphalt concrete pavement, 12 feet apart in a staggered configuration. The roadway outside this short section is asphalt.

The following changes were observed in the equipment since the assessment occurred. Due to intermittent low left wheel weights with regard to consistent right wheel weights, the operation of the in-road sensors was re-investigated. All sensors were checked electronically and all sensors indicated acceptable capacitance, resistance and amplitude levels.

The installation of the sensors was then closely inspected. The epoxy material covering the top of both sensors was discovered to be from 1/32" to 1/16" above the pavement surface in some areas, with the left (leading) sensor higher than the right (trailing) sensor.

After discussions with representatives of the manufacturer, Kistler Instruments, it was determined that due to the critical aspects involved with ensuring that the epoxy is ground perfectly flush with the pavement surface during the sensor installation, the problems associated with the left wheel weights could, with high probability, be attributed to the high level of the epoxy covering the sensor.

It is our recommendation that the following actions should be taken to remedy the existing condition; the left and right wheel weight differences from recent site historical data should be compared and documented. With a lane closure in place, the sensors should then be ground perfectly flush with the pavement surface, following the manufacturer's installation guidelines. Afterward, the left/right wheel weight data should be reanalyzed to determine if the corrective action had a positive effect on the right/left wheel path differences, where after, the plausibility of a re-evaluation could be determined.

5.1 Pre-Evaluation Diagnostics

A complete electronic and electrical check of all system components including in-road sensors, solar panel, charging circuit, and telephone service were performed immediately prior to the evaluation. All sensors and system components were found to be in working order and with all values within acceptable tolerances.

A complete visual inspection of all WIM system and support components was also performed. All components were found to be in excellent physical condition.

During the evaluation process, due to significant fluctuations of the left wheel weights being reported by the WIM equipment, the sensors and WIM equipment were retested, with all indications that all equipment was still operating within acceptable tolerances.

5.2 Calibration Process

The equipment went through 3 iterations of the calibration process between the initial 40 runs and the final 40 runs. Agency staff made all factor computations and equipment adjustments with data provided by the evaluation staff. The computations and factor

adjustments were discussed before implementation but the agency assumed responsibility for making all changes.

5.2.1 Calibration Iteration 1

Table 6, Table 7, and Figure 5-1 show the information of calibration iteration 1. These changes made significant reductions in the bias of the measurements but did not improve the precision noticeably.

Table 6 Calibration information (Iteration 1) – 120100 – 16 December 2003

Factors prior to Calibration	Factors after Iteration 1
PATRDC - DIRECT19200 Continuous Log 10:58:33 Tue 16 December 2003 0 Weight select: lbs Length select: feet Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1030** **Corr.-Fact. 2: 1030** **Corr.-Fact. 3: 1080** Speed-Point 1: 4500 Speed-Point 2: 6000 Speed-Point 3: 7500	PATRDC - DIRECT19200 Continuous Log 13:45:48 Tue 16 December 2003 0 Weight select: lbs Length select: feet Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1200** **Corr.-Fact. 2: 1130** **Corr.-Fact. 3: 1135** Speed-Point 1: 4500 Speed-Point 2: 6000 Speed-Point 3: 7500

Table 7 Iteration 1 Results – 120100 – 16 December 2003

SPS-1, -2, -5, -6 and –8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-0.1% ± 25.2%	Fail
Loaded tandem axles	±15 percent	-6.6% ± 20.1%	Fail
Gross vehicle weights	±10 percent	-3.9% ± 17.5%	Fail
Vehicle speed	±1 mph [2 km/hr]	±2.3 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	±0.1 ft	Pass

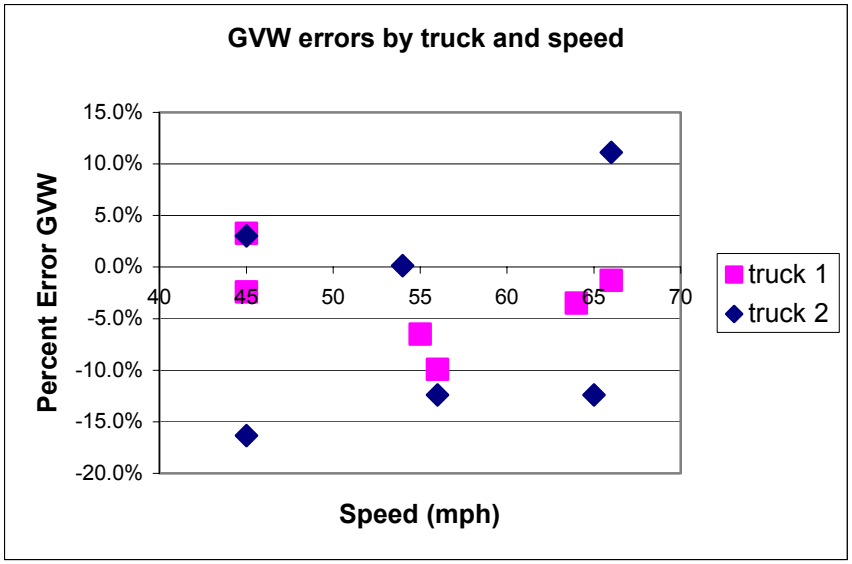


Figure 5-1 Calibration Iteration 1 GVW Percent Error vs. Speed by Truck – 120100 - 16 December 2003

5.2.2 Calibration Iteration 2

Table 8, Table 9 and Figure 5-2 show the information of calibration iteration 2. The result of this change was to generally overestimate weights and increase the variability of the weight data.

Table 8 Calibration information (Iteration 2) – 120100 – 17 December 2003

Factors prior to Iteration 2	Factors after Iteration 2
PATRDC - DIRECT19200 Continuous Log 13:45:48 Tue 16 December2003 Weight select: lbs Length select: feet Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1200** **Corr.-Fact. 2: 1130** **Corr.-Fact. 3: 1135** Speed-Point 1: 4500 Speed-Point 2: 6000	ATRDC - 19200 Direct Connect Continuous Log 11:22:07 Wed 17 December 2003 Weight select: lbs Length select: feet Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1275** **Corr.-Fact. 2: 1200** **Corr.-Fact. 3: 1135** Speed-Point 1: 4500 Speed-Point 2: 6000

Factors prior to Iteration 2	Factors after Iteration 2
Speed-Point 3: 7500	Speed-Point 3: 7500

Table 9 Iteration 2 Results – 120100 - 17 December 2003

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	2.9% ± 39.3%	Fail
Loaded tandem axles	±15 percent	2.1% ± 31.2%	Fail
Gross vehicle weights	±10 percent	2.6% ± 32.1%	Fail
Vehicle speed	±1 mph [2 km/hr]	±1.8 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	±0.1 ft	Pass

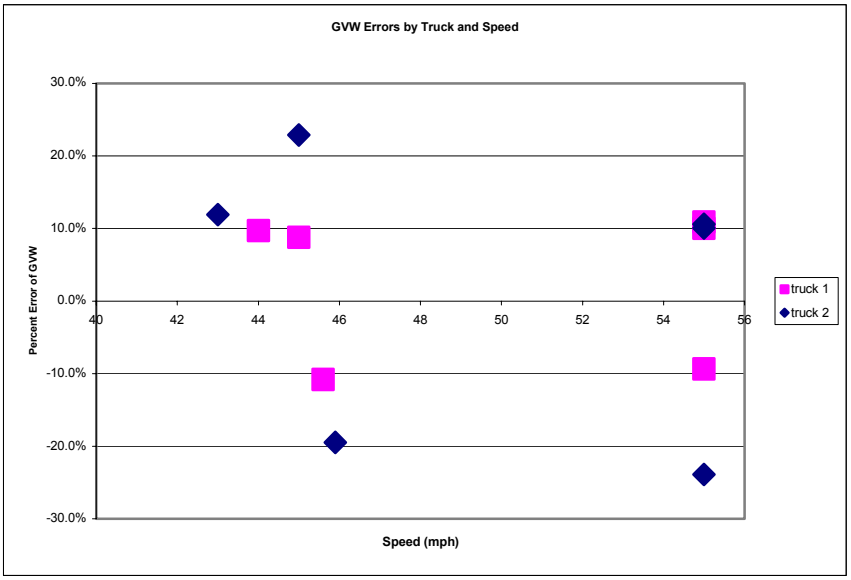


Figure 5-2 Calibration Iteration 2 GVW Percent Error vs. Speed by Truck – 120100 - 17 December 2003

5.2.3 Calibration Iteration 3

Table 10, Table 11 and Figure 5-3 show the information of calibration iteration 3.While iteration 3 brought the variability back to the levels observed with Iteration 1, the bias was an even larger over estimate of the various weights.

Table 10 Calibration information (Iteration 3) – 120100 – 17 December 2003

Factors prior to Iteration 3	Factors after Iteration 3
ATRDC - 19200 Direct Connect Continuous Log 11:22:07 Wed 17 December 2003 Weight select: lbs Length select: feet	PATRDC - 19200 Direct Connect Continuous Log 15:01:04 Wed 17 December 2003 Weight select: lbs Length select: feet

Factors prior to Iteration 3	Factors after Iteration 3
Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1275** **Corr.-Fact. 2: 1200** **Corr.-Fact. 3: 1135** Speed-Point 1: 4500 Speed-Point 2: 6000 Speed-Point 3: 7500	Speed select: mph Lane 4 Sensitivity Piezo 1 : 1000 Sensitivity Piezo 2 : 1020 Sensitivity : 665 Frontaxle Corr.-Factor : 1000 Temperature Corr.-Fact. : 1000 Lin. 0 kips Corr.-Fact.: 1000 Lin. 10 kips Corr.-Fact.: 1000 **Corr.-Fact. 1: 1275** **Corr.-Fact. 2: 1200** **Corr.-Fact. 3: 1135** Speed-Point 1: 4500 Speed-Point 2: 6000 Speed-Point 3: 7500

Table 11 Iteration 3 Results –120100 - 17 December 2003

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-3.6% ± 23.5%	Fail
Loaded tandem axles	±15 percent	-9.2% ± 20.4%	Fail
Gross vehicle weights	±10 percent	-6.3% ± 16.4%	Fail
Vehicle speed	±1 mph [2 km/hr]	±1.9 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	±0.1 ft	Pass

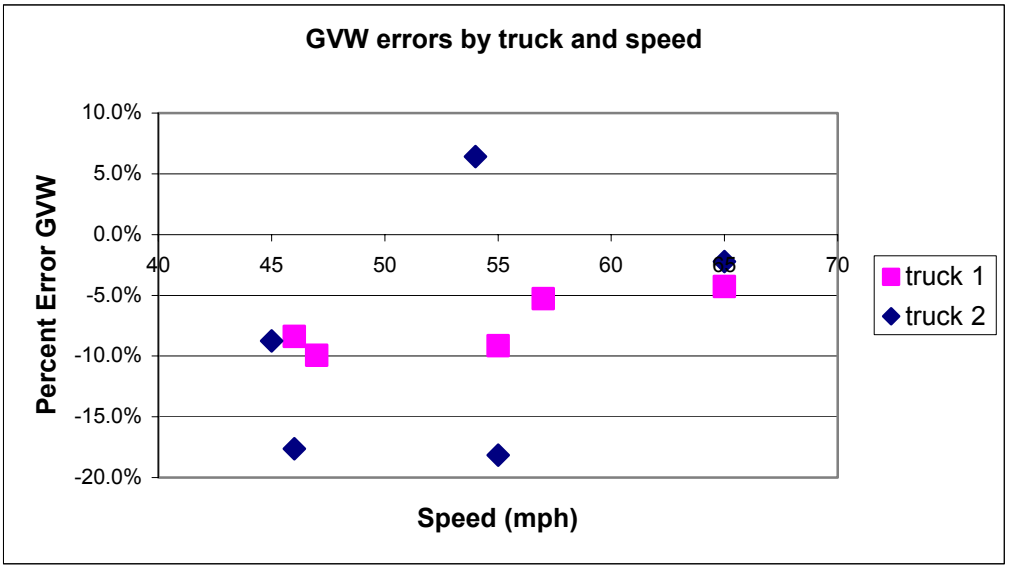


Figure 5-3 Calibration Iteration 3 GVW Percent Error vs. Speed by Truck – 120100 - 17 December 2003

5.3 Historical calibration information

This site has validation information from previous visits as follows:

Table 12 Classification Validation History - 120100 –17 December 2003

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
07/09/2003	No data available					

Table 13 Weight Validation History - 120100 –17 December 2003

Date	**Method**	**Mean Error and SD**		
		GVW	**Single Axles**	**Tandem Axles**
07/09/2003	Traffic Stream (Static Scale)	1.6_3.9	2.9_2.9	2.2_4.9

5.4 Projected Maintenance/Replacement Requirements

No maintenance activities are recommended beyond that customarily implemented by the agency or suggested by the equipment manufactures.

Corrective actions with respect to sensors have been discussed previously.

The classification algorithm modification has been previously recommended.

6 Pre-Validation Analysis

This initial analysis is based on test runs conducted December 16, 2003, during late morning hours at test site 120100 on US 27, 13.8 miles South of SR 80.

For the initial validation each truck made a total of 40 passes over the WIM scale at speeds ranging from approximately 44.0 to 66.0 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 80.5 to 89.0 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 14.

As seen in Table 14 the site failed all the values except the loaded single axles and the axle spacing length. As of the beginning of the evaluation the site had a bias to under estimate weights.

Table 14 Pre-Validation Results - 120100 –16 December 2003

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-9.3 % ± 18.2%	Pass
Loaded tandem axles	±15 percent	-17.8 % ± 23.3%	Fail
Gross vehicle weights	±10 percent	-15.0 % ± 18.2%	Fail
Vehicle speed	±1 mph [2 km/hr]	±1.7 mph	Fail
Axle spacing length	± 0.5 ft [150 mm]	±0.1 ft	Pass

The test runs were conducted primarily during late morning hours. The result was a very narrow range of pavement temperatures mostly likely due to the validation being done in the winter season. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into 3 speed groups and 2 temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The speed groups were divided as follows: Low speed = 44.0-50.0 mph, Medium speed = 51.0-56.9 mph and High speed = 57.0+ mph. The two temperature range groups were created by splitting the runs between those at 81.0 to 82.5 for the Low temperature group and 82.6 to 89.0 for High temperature group. This produced two temperature groups of approximately equal size.

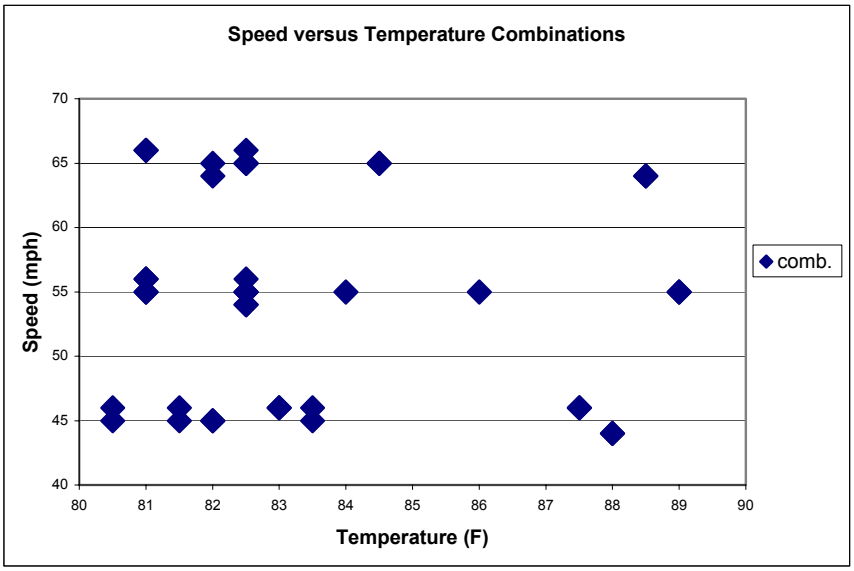


Figure 6-1 Pre-Validation Speed -Temperature Distribution Graph – 120100 – 16 December 2003

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

Figure 6-2 shows the by truck GVW percent error vs. Speed graph for the population as a whole. As seen in the figure it appears that the error in GVW decreases with increased

speed. Between the trucks, the percent error in GVW for truck 1 is significantly higher than truck 2. However the variability associated with truck 1 is graphically smaller than that of truck 2.

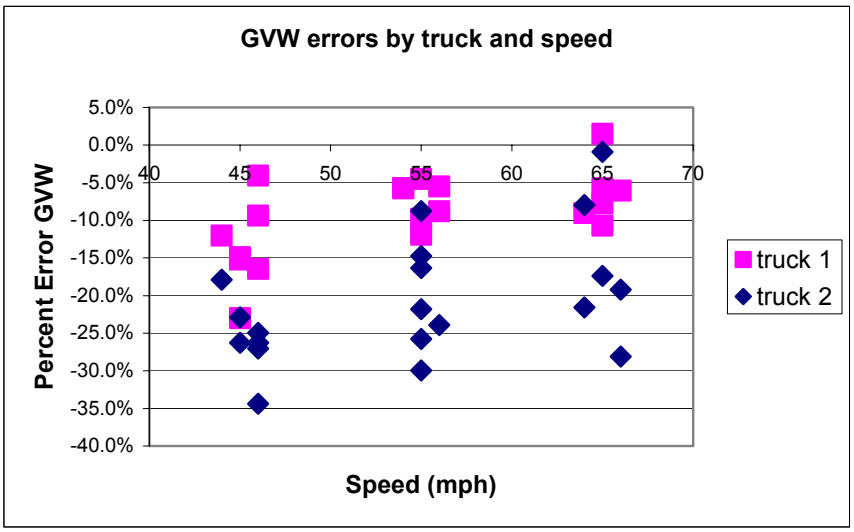


Figure 6-2 Pre-validation GVW Percent Error vs. Speed by truck – 120100 – 16 December 2003

Figure 6-3 shows the relationship between temperature and GVW percentage error. The figure shows that percent error of GVW decreased for truck 1 with increase in temperature whereas it increased for truck 2.

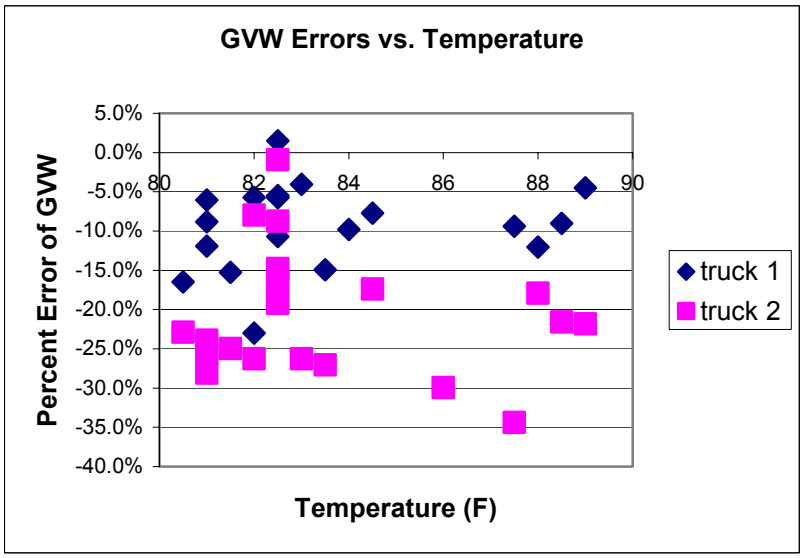


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature by Truck – 120100 – 16 December 2003

Figure 6-4 shows the relationship between the spacing errors in feet and speeds. From the figure it is evident that the speed is not significantly affecting the measurement of axle spacing.

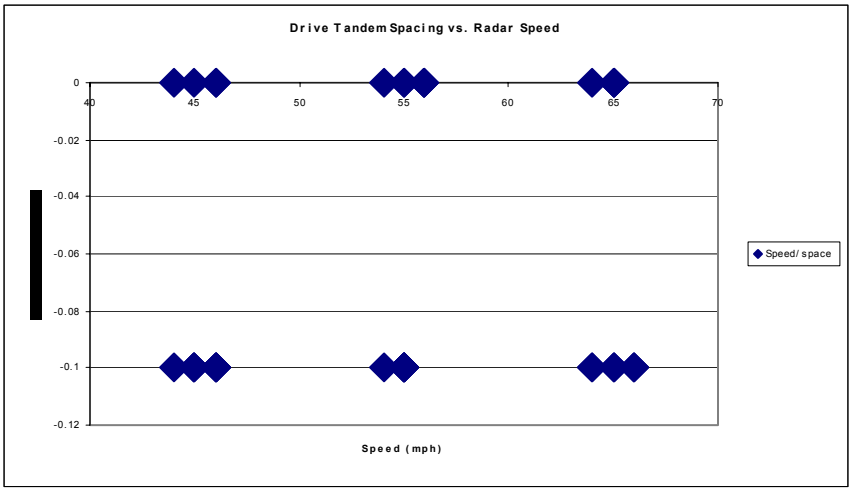


Figure 6-4 Pre-Validation Speed versus spacing graph - 120100 – 16 December 2003

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 81.0 to 82.5 for low temperature and 82.6 to 89.0 for High temperature.

Table 15 Pre-Validation Results by Temperature Bin – 120100 – 16 December 2003

Element	95% Limit	Low Temp.	Med. Temp.	High Temp.
Single axles	±20 %	-13.5 % ± 19.1%	N/A	-10.6 % ± 14.3%
Tandem axles	±15 %	-20.3 % ± 22.6%	N/A	-19.2 % ± 23.2%
GVW	±10 %	- 17.6 % ± 17.8%	N/A	-16.7 % ±19.9%
Speed	±1 mph	±2.1 mph	N/A	±1.7 mph
Axle spacing	± 0.5 ft	±0.1 ft	N/A	±0.1 ft

From Table 7, Figure 6-5 and Figure 6-6, and, it appears that the errors in GVW is not significantly affected by the temperature.

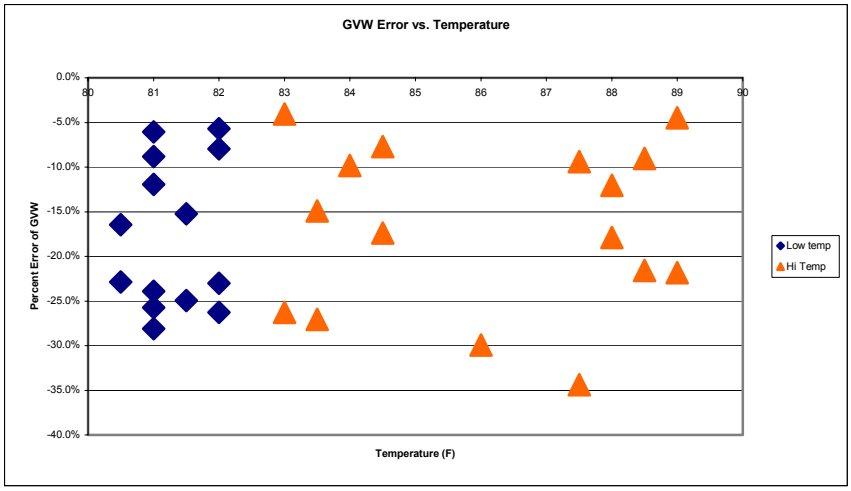


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Group – 120100 – 16 December 2003

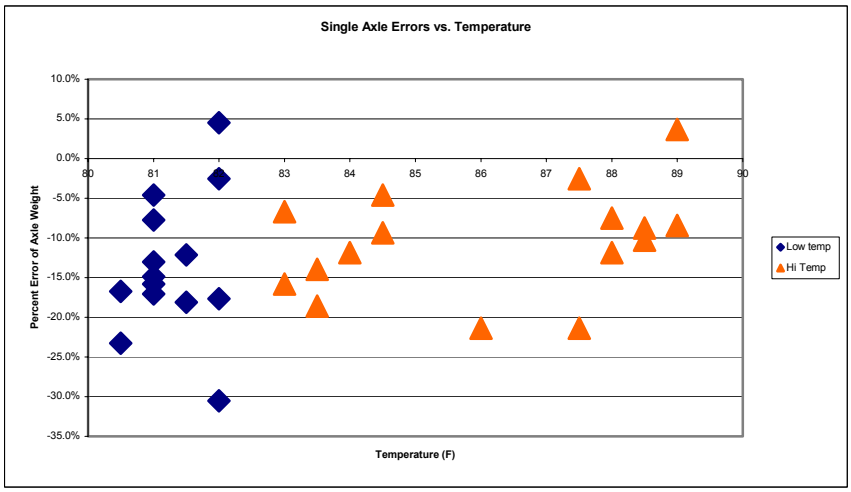


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by group - 120100 – 16 December 2003

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 44.0-50.0 mph, Medium speed = 51.0-56.9 mph and High speed = 57.0+ mph.

From Table 16, Figure 6-7 through Figure 6-10 it can be seen that the percent error of GVW decreased as the speed increased. In Figure 6-8 it would appear that the under estimation is decreasing as the speed increases. Additionally it would appear that the variability associated with truck 1 is less than that of truck 2.

Table 16 Pre-Validation Results by Speed Bin - 120100 – 16 December 2003

Element	95% Limit	Low Speed	Med. Speed	High Speed
Single axles	±20 %	-15.5 % ± 15.6%	-7.7 % ± 17.6%	-3.9 % ± 17.4%
Tandem axles	±15 %	-22.2 % ±23.4%	-16.7% ± 22.9%	-14.1 % ± 24.0%
GVW	±10 %	-19.6 % ± 17.7%	-13.8 % ± 18.3%	-11.1 % ± 19.3%
Speed	±1 mph	±2.2 mph	±1.6 mph	±1.7 mph
Axle spacing	± 0.5 ft	±0.1 ft	±0.1 ft	±0.1 ft

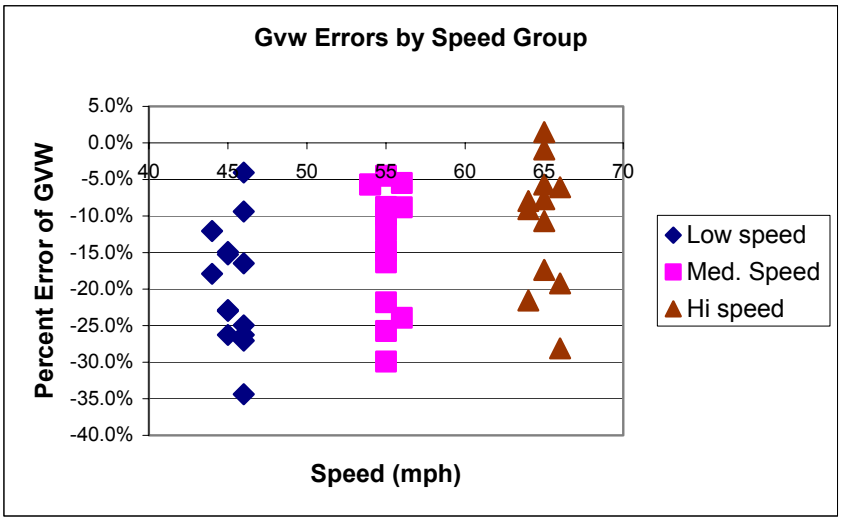


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed group - 120100 – 16 December 2003

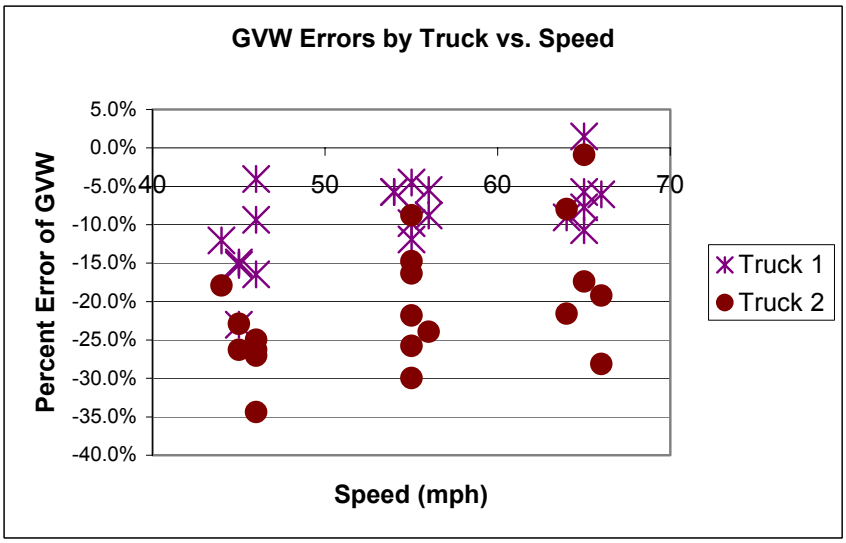


Figure 6-8 Pre-Validation GVW Percent Error vs. Speed by Truck – 120100 – 16 December 2003

For the steering axles, the equipment was underestimating the weights at low speeds whereas it was nearly unbiased at high speeds for both the trucks. The trend shown in Figure 6-9 is very similar to that in Figure 6-7. This is encouraging because if the overall trend can be diminished from the GVW, the single axle trend should also be reduced as the entire vehicle appears to act the same way as its parts. It should be noted that when the single axles are compared by truck. In Figure 6-10 their variability appears the same, which is not the case with their respective GVW.

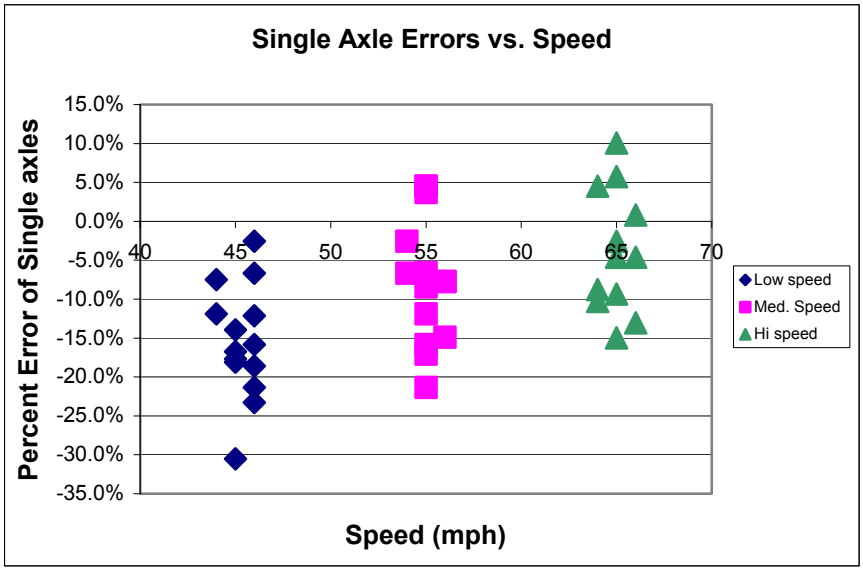


Figure 6-9 Pre-Validation Steering Axle Percent Error vs. Speed group - 120100 – 16 December 2003

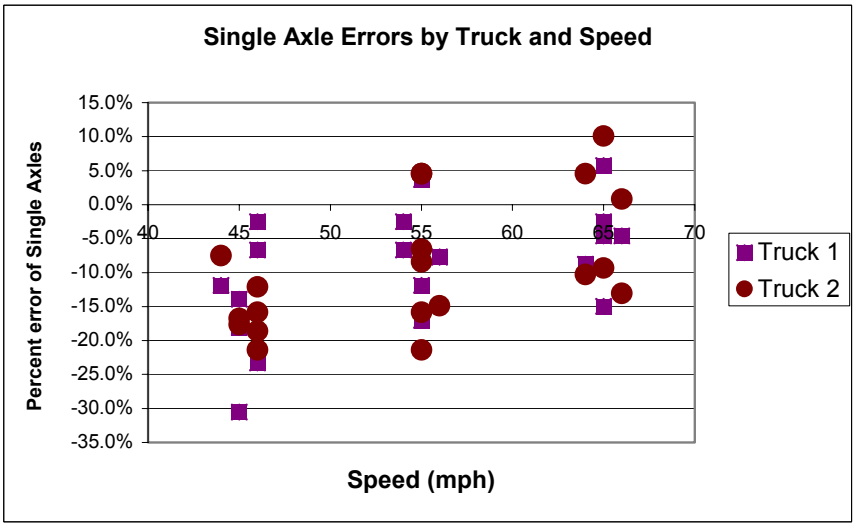


Figure 6-10 Pre-Validation Steering Axle Percent Error vs. Speed by truck - 120100 – 16 December 2003

7 Data Availability and Quality

As of December 24, 2003 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 17. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 1996, 2000 And 2001 have a sufficient quantity to be considered complete years of data. In the absence of previously gathered validation information it can be seen that at least 5 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight and classification data.

Table 17 Amount of Traffic Data Available 120100 – 17 December 2003

Year	Class Days	Months	Coverage	Weight Days	Months	Coverage
1996	215	11	Complete Week	319	12	Complete Week
1999	145	6	Complete Week	193	8	Complete Week
2000	263	11	Complete Week	276	11	Complete Week
2001	325	12	Complete Week	287	11	Complete Week

Class 9's constitute more than 70 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 will need to be determined by the RSCs 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 18 Characteristics of Major sub-groups of Trucks - 120100 –17 December 2003

	Class 9	
Percentage Overweights	1%	
Percentage Underweights	1%	
Unloaded Peak	36,000 lbs	
Loaded Peak	76,000 lbs	

The expected percentage unclassified is 2 based on the pre-validation classification check and no changes being made to the classification algorithm in the course of the evaluation.

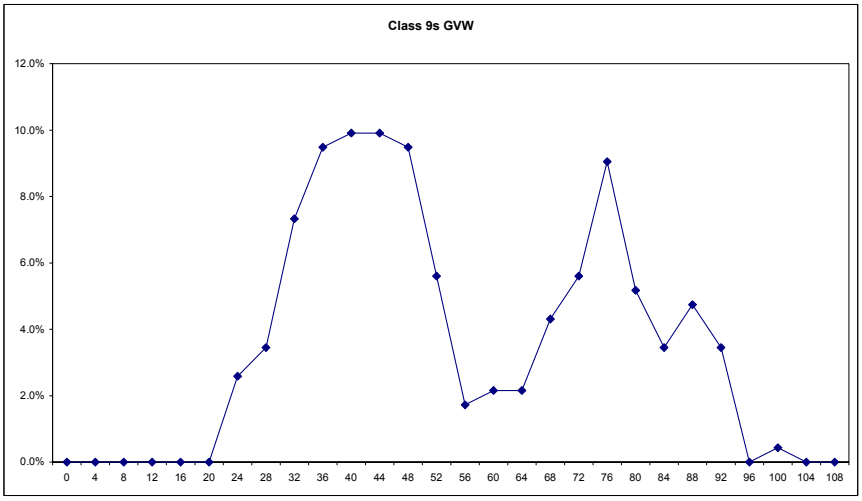


Figure 7-1 Graph of Expected GVW distribution Class 9 – 120100 –17 December 2003

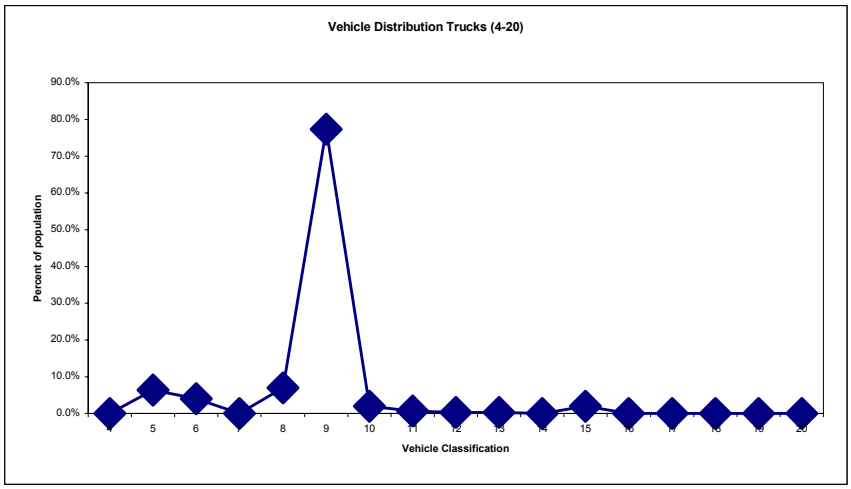


Figure 7-2 Expected vehicle distribution - 120100 –17-December-2003

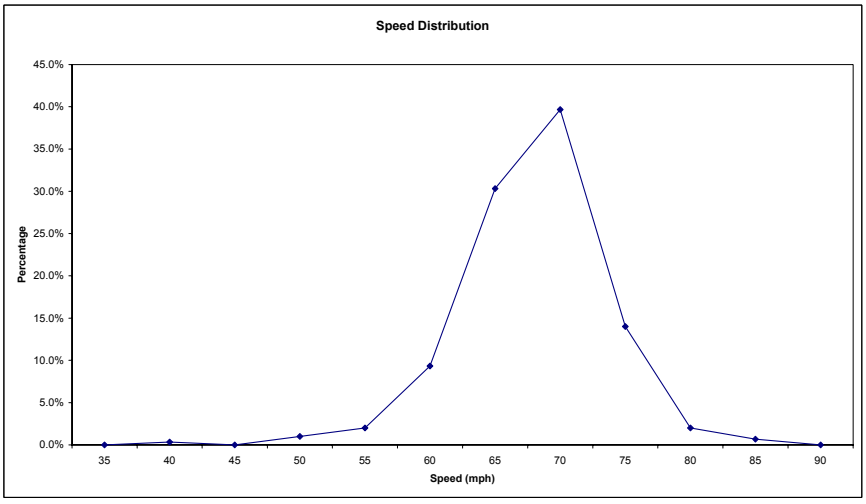


Figure 7-3 Expected speed distribution - 120100 –17 December 2003

8 Data Sheets

The following is a listing of data sheets incorporated in this report in Appendix A:

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – Class 9 (4 pages)

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

Sheet 21 – Pre-validation (5 pages)
Sheet 21 – Calibration Iteration 1 – (2 pages)
Sheet 21 – Calibration Iteration 2 – (2 pages)
Sheet 21 – Calibration Iteration 3 - (2 pages)
Sheet 21 – Post-validation (5 pages)

Narrative of Calibration procedures (1 page)

9 Updated handout guide and Sheet 17

A copy of the handout has been included following page 27. It includes a current Sheet 17 with all applicable maps and photographs. The major change in the Updated Handout Guide reflects a change of location in the certified scales utilized.

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 Updated Sheet 18.

12 Smoothness Index Over the Section

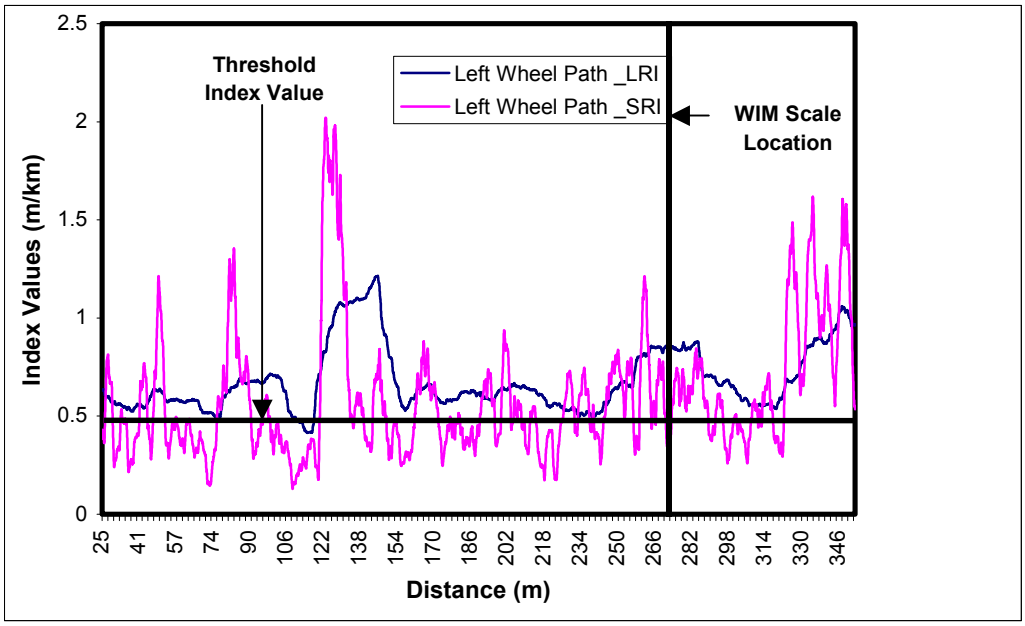


Figure 12-1 Typical Left Wheel Path Smoothness Index Graph - 120100

HANDOUT GUIDE FOR SPS WIM EVALUATION

STATE: Florida

SHRP ID: 0100

Figures

1. General Information

SITE ID: *120100*

LOCATION: *US 27 South, 13.8 miles south of SR 80, South Bay*

VISIT DATE: *December 16(&17), 2003*

VISIT TYPE: *Evaluation*

2. Contact Information

POINTS OF CONTACT:

Assessment Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*
Charlie Copeland, 301-210-5105, crcopeland@mactec.com

Highway Agency: *Walton Jones, 850-414-4726, walton.jones@dot.state.fl.us*
Mike Leggett, 850-414-4727, Michael.Leggett@dot.state.fl.us

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

FHWA Division Office Liaison: *Greg Schiess, 850-942-9650, Ext. 3023, greg.scheiss@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: ***Not applicable.***

ONSITE PERIOD: *December 16, 2003 (and December 17 subject to validation findings.)*

TRUCK ROUTE CHECK: *Completed (See Page 3)*

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: *13.8 miles south of SR 80, south of South Bay.*

MEETING LOCATION: *On site 8 a.m., December 16, 2003.*

WIM SITE LOCATION: *US 27, milepost 12.03 (Latitude: 26.48096; Longitude: -80.65128)*

WIM SITE LOCATION MAP:*See Figure 4.1*

Figure 4.1: Site 120100 in Florida

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Glades Truck Ice, 1501 S. Main Street, Belle Glade, FL 33430. $5 per truck (includes all axles and gross). Open from 8.00 a.m. to 8.00 p.m. – weekdays. Phone No: (561) 996-7710.*

TRUCK ROUTE:

- *Northbound: Truck Crossing at 0.746 miles from site (26^0 29.396' North and 80^0 39.474' West)(For low speeds).*
- *Northbound: Truck Crossing at 1.372 miles from site (26^0 29.840' North and 80^0 34.817' West)*
- *Southbound: Truck Crossing at 0.848 miles from site (26^0 28.267' North and 80^0 38.599' West).*

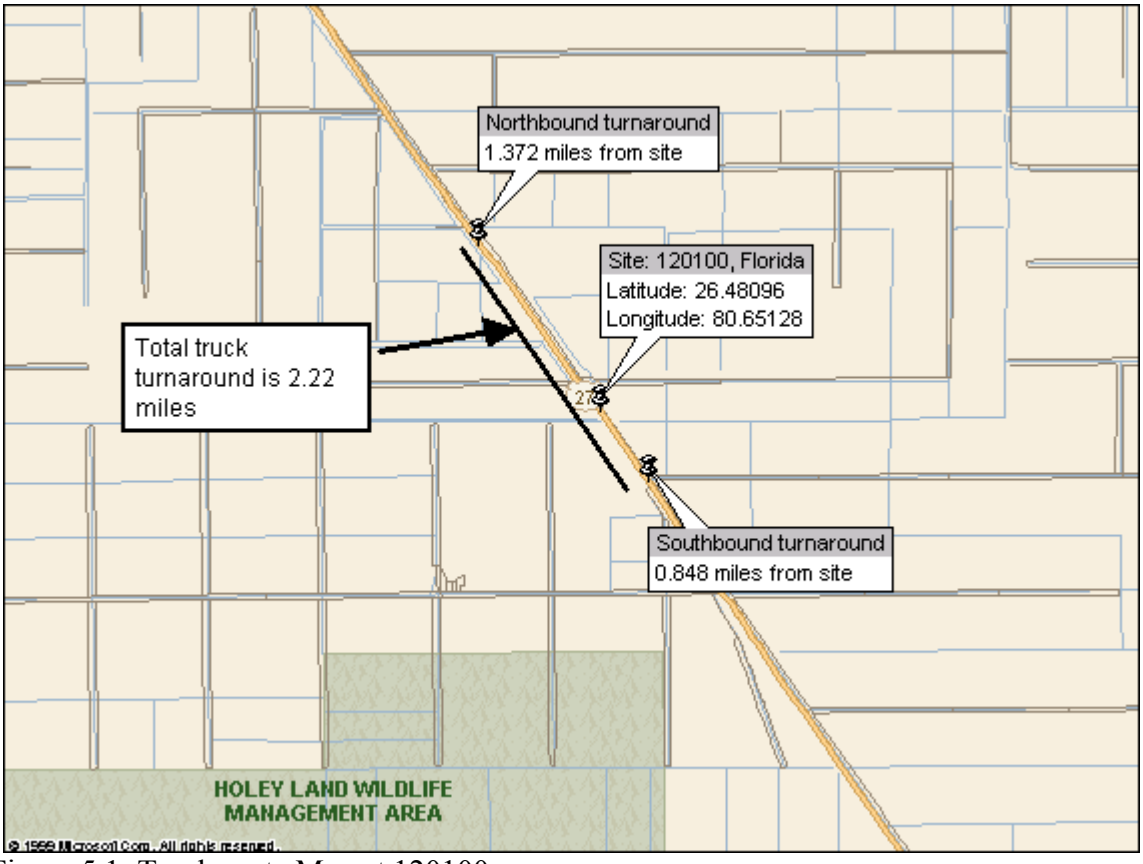


Figure 5.1: Truck route Map at 120100

6. Sheet 17 – Florida (120100)

1.* ROUTE ___US 27____ 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__ _1__ _0__ _8__
Distance from sensor to nearest upstream SPS Section ___ _7__ _2__ _8__ 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 * 12' Merge Lane between LTPP Lane and Shoulder

4.* PAVEMENT TYPE _____Asphalt Concrete_____ _____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _____12-03-03_____ Distress ~~Map~~ Photo Filename
Downstream_TO_2_12_12A_0100_12_03_03.JPG_____
Date _____12-03-03_____ Distress ~~Map~~ Photo Filename
Upstream_TO_2_12_12A_0100_12_03_03.JPG_____
Date _____ Distress Map Filename _____

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 _6_ _8_ ft

Distance from system __ __ __ ft

TYPE _____334B_____

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) 414-4727

11. * POWER

Distance to cabinet from drop ___ _1__ _5__ ft Overhead / underground / solar / AC in cabinet?

Service provider _____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop ___ _4__ _5__ ft Overhead / under ground / cell?

Service provider _____ Phone Number _____

13.* SYSTEM (software & version no.)- _____DAW – 190 Ver. 3.18 4/2/03___

Computer connection – RS232 / Parallel port / USB / Other _____

14. * TEST TRUCK TURNAROUND time ___6____ minutes DISTANCE _4_. _4_ mi.

15. PHOTOS FILENAME

Power source _ Solar_Panels_TO_2_12_12A_0100_12_03_03.JPG__

Phone source __ Telephone_Drop_TO_2_12_12A_0100_12_03_03.JPG__

Cabinet exterior __ Cabinet_Exterior_1_TO_2_12_12A_0100_12_03_03.JPG__

Cabinet interior __ Cabinet_Interior_1_TO_2_12_12A_0100_12_03_03.JPG_

Weight sensors __ Leading_Quartz_Sensor_TO_2_12_12A_0100_12_03_03.JPG

Classification sensors ___ Loop_Sensor_TO_2_12_12A_0100_12_03_03.JPG__

Other sensors _____

Description _____

Downstream direction at sensors on LTPP lane _

Downstream_TO_2_12_12A_0100_12_03_03.JPG___

Upstream direction at sensors on LTPP lane _

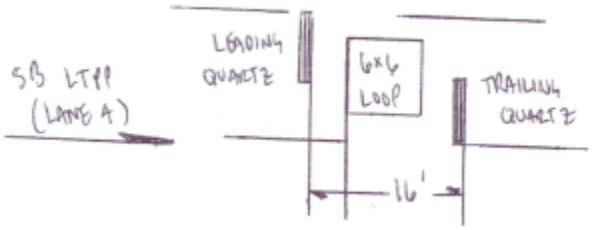
Upstream_TO_2_12_12A_0100_12_03_03.JPG_____

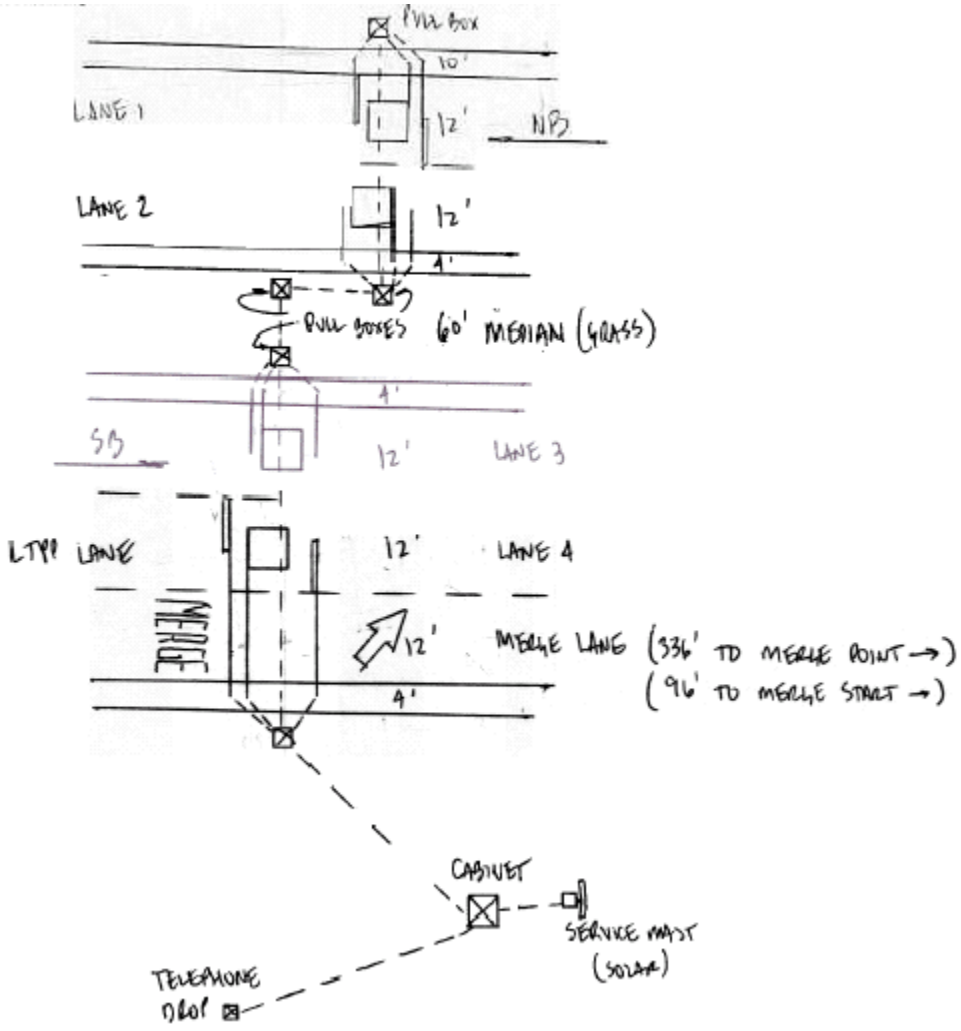
COMMENTS _____GPS Coordinates: Latitude: 26.48096; Longitude -80.65128____
_ Posted speed limit – 65 mph._____
_____Amenities:_____
_____Cleniston (30 miles, Best Western)_____
_____
_____South Bay (13.5 miles)_____
_____Chevron, Shell (Mini-Mart)_____
_____
_____Belle Glade (17.0) miles)_____
_____Various Fast Food _____
_____Bank Of America_____
_____Various Gas Stations_____
_____Budget Inn_____
_____Radio Shack_____
_____Winn Dixie_____
_____
_____West Palm Beach (55 miles)_____
_____Various Amenities_____
_____
_____Predominant Trucks – Empty Sugar Cane Haulers, Loaded 500 Haulers_____
_____
_____ ___Types of Trucks: Two Class 9s_____
_____Expected Weight Ranges:_Truck 1 – 72,000 to 80,000 legal limit on gross and axles, air suspension; Truck 2 – partially loaded 40,000 – 46,000 lbs no suspension requirements_____ _____
_____
Speeds to be run: 45 to 65 mph_____
_____Corrective actions recommended: System classification algorithm (significant problems with 3/5 differentiation); Grinding of the travel lane pavement._____
_____
_____Speed Bias is 0.4 mph and Standard Deviation is 0.7 mph._____
_____
_____
_____

COMPLETED BY _____Charlie Copeland_____

PHONE __301-210-5105____ DATE COMPLETED _1_ 2_ /_1_ 6_ / _2_ 0_ 0_ 3

Sketch of equipment layout





Site Map

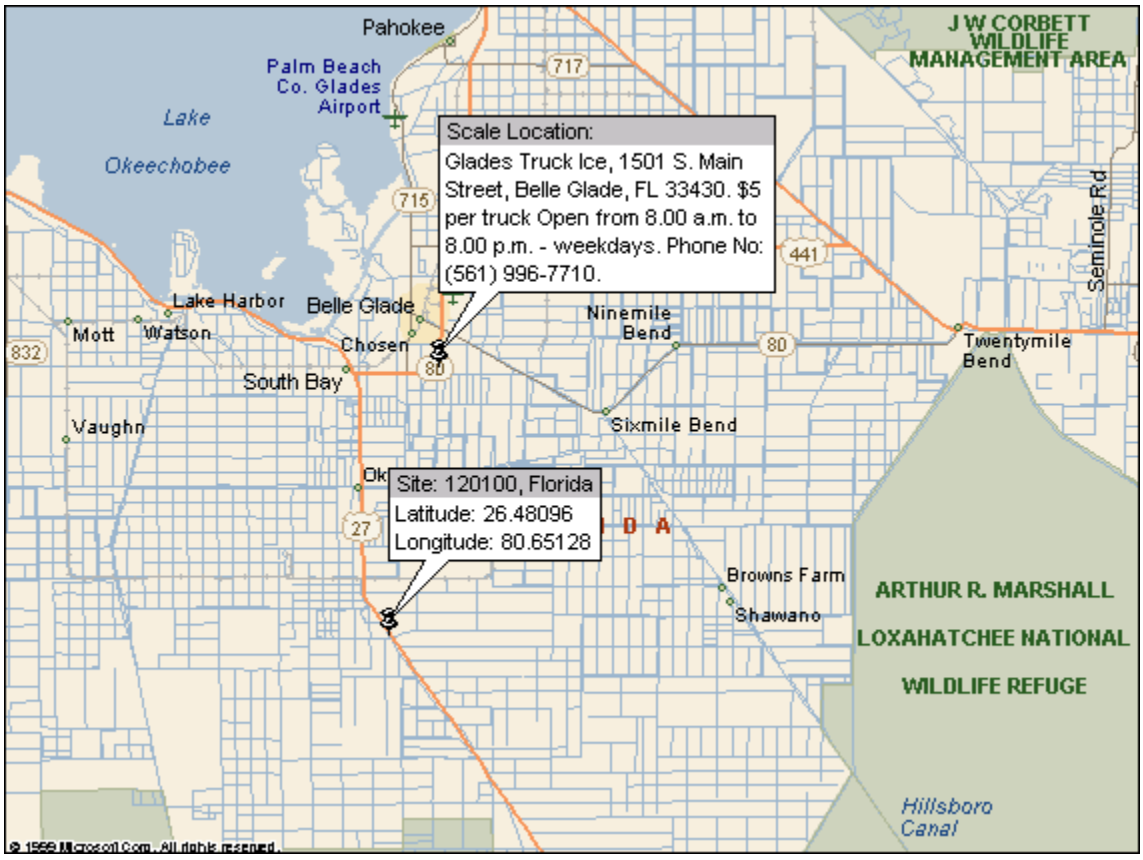


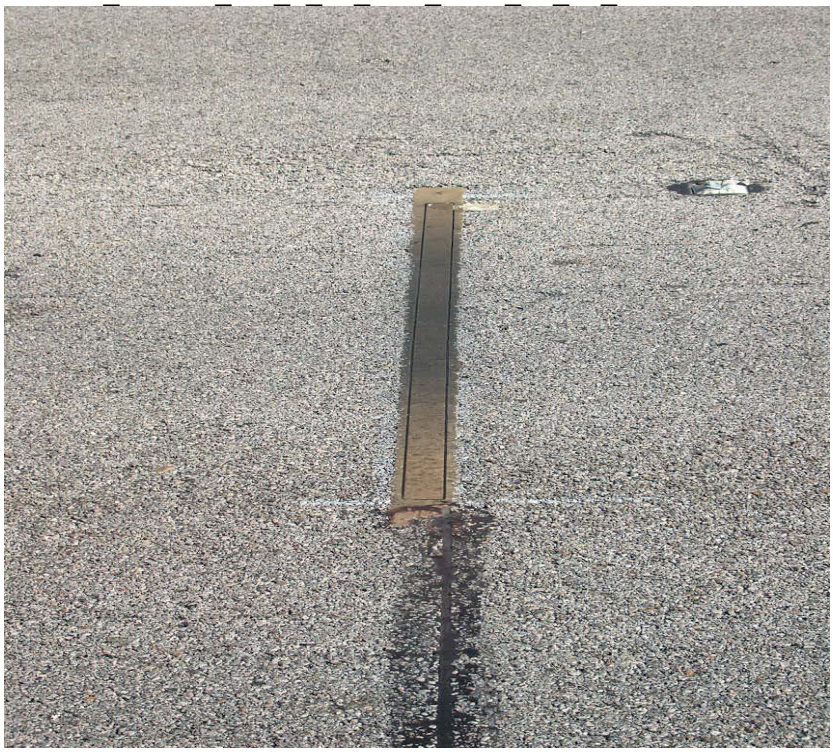
Figure 6.1: Site Map at 120100

Downstream_TO_2_12_12A_0100_12_03_03.JPG (Distress Photo 1)

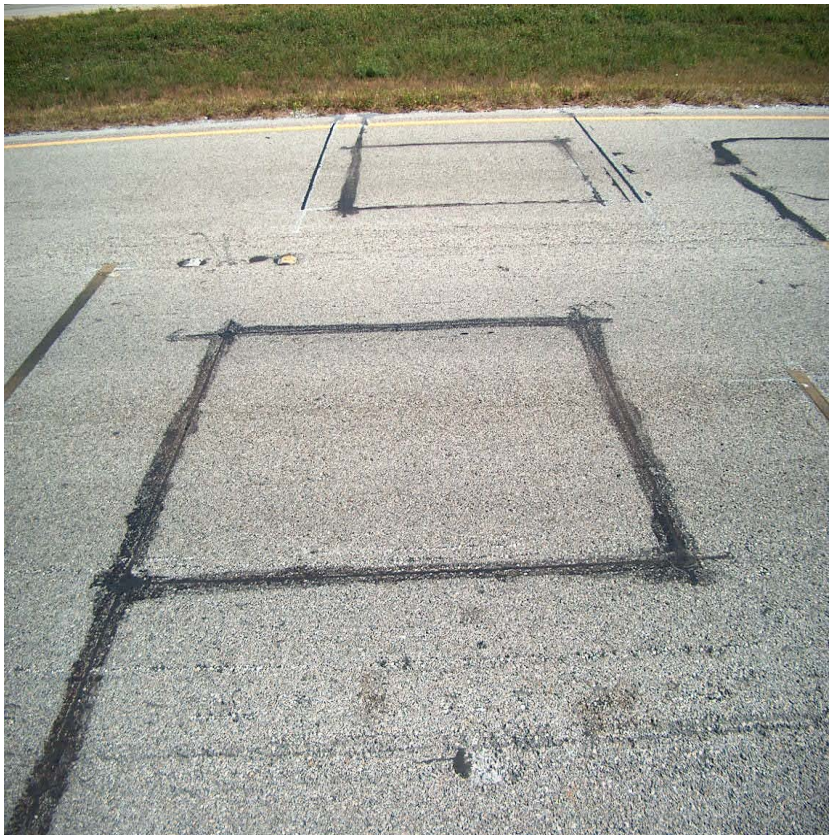
Upstream_TO_2_12_12A_0100_12_03_03.JPG (Distress Photo 2)

Cabinet_Exterior_TO_2_12_12A_0100_12_03_03.JPG

Cabinet_Interior_TO_2_12_12A_0100_12_03_03.JPG



Leading_Quartz_Sensor_TO_2_12_12A_0100_12_03_03.JPG



Loop_Sensor_TO_2_12_12A_0100_12_03_03.JPG

Downstream_TO_2_12_12A_0100_12_03_03.JPG

Upstream_TO_2_12_12A_0100_12_03_03.JPG

WIM SITE COORDINATION

SPS Project_ID _0_ 1_ 0_ 0_

1. Equipment –
   - Maintenance – contract with purchase / separate contract LTPP / separate contract State / state personnel
     Contact _____Kip Jones (850) 414-4726 _____

   - Purchase by LTPP / State
     Constraints on specifications (sensor, electronics, warranties, maintenance, installation)

   - Installation – Included with purchase / separate contract by State / state personnel / LTPP contract

   - Calibration – Vendor / State / LTPP

   - Manuals and software – State / LTPP

   - Pavement PCC/AC – always new / replacement as needed / grinding and maintenance as needed / maintenance only / no remediation

   - Power - overhead / underground / solar billed to State / LTPP / N/A

   - Communication - Landline / Cellular / Other billed to State / LTPP / N/A

2. Site visits – Evaluation

   - WIM Validation Check - advance notice required __14___ days / weeks

   - Trucks – air suspension 3S2 State / LTPP
     2nd common State / LTPP
     3rd common State / LTPP
     4th common State / LTPP
     Loads State / LTPP
     Contact __ Palm Beach Equipment Rental, 171 NW 13th St., Boca Raton, FL 33432. Ph: (561) 738-7707_____

     Drivers State / LTPP
     Contact __ Palm Beach Equipment Rental, 171 NW 13th St., Boca Raton, FL 33432. Ph: (561) 738-7707_____

     Contractors with prior successful experience in WIM calibration in state:
     _____FTE, DTS, MACTEC, Inc._____
     Nearest static scale (commercial or enforcement)
     _____

   - Profiling – short wave -- permanent / temporary site marking

WIM SITE COORDINATION SPS Project_ID _0_ 1_ 0_ 0_

-- long wave – permanent / temporary site marking

- Pre-visit data
  --Classification and speed: Contact ____Richard Reel _(850) 414 4709_____
  --Typical operating conditions (congestion, high truck volumes)
  Contact _____Michael Leggett (850) 414-4727_____
  -- Equipment operational status: Contact _ Michael Leggett (850) 414-4727_

- Access to cabinet
  State only / Joint / LTPP Key / Combination

- State personnel required on site Y / N
  Contact information _____ Kip Jones (850) 414-4726 _____

- Enforcement Coordination required Y / N
  Contact information _____

- Traffic Control Required Y/ N
  Contact information _____

- Maximum number of personnel on site _5__;
  Invitees _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

3. Data Processing
   - Down load State only / LTPP read only / LTPP download / LTPP download and copy to state
   - Data Review State per LTPP guidelines / State weekly / LTPP
   - Data submission for QC State - weekly; twice a month; monthly / LTPP

4. Site visits – Validation

   - WIM Validation Check - advance notice required _14____ days / weeks
     LTPP Semi-annually / Sate per LTPP protocol semi-annually / State other

   - Trucks – air suspension 3S2 State / LTPP
     2nd common State / LTPP
     3rd common State / LTPP
     4th common State / LTPP
     Loads State / LTPP

WIM SITE COORDINATION SPS Project_ID _0_ 1_ 0_ 0_

Contact __ Palm Beach Equipment Rental, 171 NW 13th St., Boca Raton, FL 33432. Ph: (561) 738-7707_____

Drivers State / LTPP
Contact _ Palm Beach Equipment Rental, 171 NW 13th St., Boca Raton, FL 33432. Ph: (561) 738-7707_____

Contractors with prior successful experience in WIM calibration in state:
_____DTS, FTE, MACTEC, Inc. _____

- Profiling – short wave -- permanent / temporary site marking
  -- long wave – permanent / temporary site marking

- Pre-visit data
  – Classification and speed: Contact _Richard Reel __(850) 414 4709_____
  -- Equipment operational status: Contact __ Michael Leggett (850) 414-4727____

- Access to cabinet
  State only / Joint / LTPP Key / Combination

- State personnel required on site Y / N
  Contact information ____ Kip Jones (850) 414-4726 _____

- Enforcement Coordination required Y / N
  Contact information _____

- Traffic Control Required Y/ N
  Contact information _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

5. Site visit – Construction

- Construction schedule and verification – Contact __ Kip Jones (850) 414-4726 ____

- Notice for straightedge and grinding check - ___4___ days / weeks
  On site lead to direct / accept grinding – State / LTPP

- WIM Calibration - advance notice required _14____ days / weeks
  Number of lanes -- ___1___
  LTPP / State per LTPP protocol / State Other _____

- Trucks – air suspension 3S2 State / LTPP

WIM SITE COORDINATION SPS Project_ID _0_ 1_ 0_ 0_

2nd common	State / LTPP
Loads	State / LTPP
Drivers	State / LTPP

Contractors with prior successful experience in WIM calibration in state:
_____DTS, FTE, MACTEC, Inc._____

- Profiling – straight edge -- permanent / temporary site marking
  -- long wave – permanent / temporary site marking

- Pre-visit data
  – Classification and speed: Contact _Richard Reel __(850) 414 4709_____
  -- Equipment operational status: Contact __ Michael Leggett (850) 414-4727____

- Access to cabinet
  State only / Joint / LTPP Key / Combination

- State personnel required on site Y / N
  Contact information _____ Kip Jones (850) 414-4726 _____

- Enforcement Coordination required Y / N
  Contact information _____

- Traffic Control Required Y/ N
  Contact information _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

6. Special conditions
   - Funds and accountability
   - Reports
   - Other

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [9_ _9 _3 _5] *STATE CODE [_1 _2] *SHRP SECTION ID [_0 _1 _0 _0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_1 _2 / _1 _6 / _2 _0 _0 _3]

2. * TYPE OF EQUIPMENT CALIBRATED _ _ WIM __ CLASSIFIER _XX__ BOTH

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

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 _XX___ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO _XX___ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   _ __ OTHER (SPECIFY) _____ _____

5. EQUIPMENT MANUFACTURER _____ PAT DAW 190_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

   __ _2_ __ NUMBER OF TRUCKS COMPARED __ _2_ __ NUMBER OF TEST TRUCKS USED

   __ _20_ __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	__Class 9____	_____1_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	__Class 9_____	1_____
3 - OTHER (DESCRIBE)	3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ _-15.0%__ ___ __STANDARD DEVIATION _9.0%_
   DYNAMIC AND STATIC SINGLE AXLES ___ -9.3%_ ___ __ STANDARD DEVIATION __ _9.0%_ __
   DYNAMIC AND STATIC DOUBLE AXLES ___ -17.8%___ __ _ STANDARD DEVIATION __ _11.7%____

8. ___ _3___ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _____ _45-50, 51-56.9, 57-66 mph_ _ _____ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) __1080(75mph), 1030(60mph), 1030(45mph)_ ___
___ . ___ ___

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:
   _XX__ VIDEO _- MANUAL ___ PARALLEL CLASSIFIERS

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:

*** FHWA CLASS 9 ____ _-10____	FHWA CLASS __5__	____ -_25_ ____ ____
*** FHWA CLASS 8 ____ _-3 ____	FHWA CLASS ____	____ ____ ____ ____
	FHWA CLASS ____	____ ____ ____ ____
	FHWA CLASS ____	____ ____ ____ ____

   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ __2_ ____

PERSON LEADING CALIBRATION EFFORT: ____Dean J. Wolf_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [9_ _9 _3 _5] *STATE CODE [_1 _2] *SHRP SECTION ID [_0 _1 _0 _0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_1 _2 / _1 _7 / _2 _0 _0 _3]

2. * TYPE OF EQUIPMENT CALIBRATED _XX _ WIM __ CLASSIFIER _ BOTH

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

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 __XX__ QUARTZ PIEZO
____ CHANNELIZED FLAT PIEZO _XX___ INDUCTANCE LOOPS ____ CAPACITANCE PADS
_ _ OTHER (SPECIFY) _____ _____

5. EQUIPMENT MANUFACTURER _____ PAT DAW 190_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

__ _2_ __ 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	__Class 9____	_____1_____
	2	__Class 9_____	1_____
	3	_____	_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ _1.0%__ ___ __ STANDARD DEVIATION __ 7.2%__ __
DYNAMIC AND STATIC SINGLE AXLES ___ 3.5%_ ___ __ STANDARD DEVIATION __ _12.65%_ __
DYNAMIC AND STATIC DOUBLE AXLES ___ -2.1%___ __ _ STANDARD DEVIATION __ _10.7%____

8. ___ _3___ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _____ _45-50, 51-56.9, 57-66 mph _ _ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ _1135(75mph), 1200(60mph), 1275(45mph)__
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 __ MANUAL ___ PARALLEL CLASSIFIERS

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

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

PERSON LEADING CALIBRATION EFFORT: ____Dean J. Wolf_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0100
*CALIBRATION TEST TRUCK # 1	* DATE	12/16/2003

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		9,810	9480	(D) / C
B		13,820	13640	(D) / C
C		13,570	13720	(D) / C
D		25,950	25060	(D) / C
E		27,370	28150	(D) / C
F				D / C

ignored pass #1 kmA 12/23

GVW (same units as axles)

7. a) Empty GVW ≈31,000

*b) Average Pre-Test Loaded weight ~~90,520~~ 90513.3
*c) Post Test Loaded Weight 90,000
*d) Difference Post Test – Pre-test -513.33

GEOMETRY

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

9. a) * Make: Freightliner b) * Model: FL112

10.* Trailer Load Distribution Description:

60' boom lift, 40' boom lift, 15,000# counter weight

11. a) Tractor Tare Weight (units): ~15,000
b). Trailer Tare Weight (units): ~15,000) 31,000#

Sheet 19	* STATE CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0100
*CALIBRATION TEST TRUCK # 1	* DATE	12/16/2003

Rev. 08/31/01

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

A to B 13' 10" B to C 4' 4" C to D 30' 1"

D to E 4' 1" E to F _____

Wheelbased (measured A to last) 52' 2" Computed _____

13. *Kingpin Offset From Axle B (units) +1' 10" (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R22.5	Leaf - 2 taper
B	295/75R22.5	air
C	295/75R22.5	air
D	10R17.5	air
E	10R17.5	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	0100
*CALIBRATION TEST TRUCK # 1	* DATE	12/16/2003

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 0100
*CALIBRATION TEST TRUCK # 1	* DATE 12/16/2003

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.											

Driver wasn't releasing brakes all the way. Ignore Pass #1 for axle weights

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10080	13680	13500	26340	26900		90500
2	9800	13840	13680	26320	26860		90500
3	9820	13800	13460	25580	27880		~~90560~~ 90540
Average	9810	13820	13570	25,950	27,370		90520

only Pass #2+3 for axles

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							
2							
3							
Average							

Measured By CRC Verified By _____

Sheet 19	* STATE_CODE 12
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE 12/16/2003

Rev. 08/31/01

PART

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		10,980	10,640	(D) / C
B		8,467	8360	(D) / C
C		8,293	8200	(D) / C
D		5,587	5660	(D) / C
E		5,047	5100	(D) / C
F				D / C

GVW (same units as axles)

38373.3

7. a) Empty GVW 38,380

*b) Average Pre-Test Loaded weight 38,380
*c) Post Test Loaded Weight 38120
*d) Difference Post Test – Pre-test -253.33

GEOMETRY

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

9. a) * Make: Freightliner b) * Model: FL120

10.* Trailer Load Distribution Description:

Empty

1. a) Tractor Tare Weight (units):

b). Trailer Tare Weight (units):

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0100
*CALIBRATION TEST TRUCK # 2	* DATE	12/16/2003

Rev. 08/31/01

4'5" up

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

A to B 19' 1" B to C 4'4" C to D 32'8"

D to E 4' 1" E to F

Wheelbased (measured A to last) 60'2" Computed _____

13. *Kingpin Offset From Axle B (units) +2' 0" (_____)
(+ 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 ← 11R24.5 up	leaf, 2, tapered
B	11R24.5	air
C	11R24.5	air
D	10R17.5	air
E	10R17.5	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 0100
*CALIBRATION TEST TRUCK # 2	* DATE

Rev. 08/31/01

Table 1

Axle A				Axle D		Axle E			
	II			IV		V			
	-I		-II		-III	-IV			
V	VI-		VII-		VIII-	IX`		X	
-VI	VII		VIII		IX				
								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		III		IV		V		V	
		-I		-II		-III		-IV			
V		VI-		VII-		VIII-		IX`		X	
		VII		VIII		IX					
										XI	

Sheet 19	* STATE_CODE	12
LTPP Traffic Data	* SPS PROJECT ID	0100
*CALIBRATION TEST TRUCK # 1	* DATE	12/16/2003

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	10,980	8,480	8,300	5,560	5,080		38,380
2	10,980	8,460	8,280	5,660	4,980		38,380
3	10,980	8,460	8,300	5,540	5,080		38,380
Average	10,980	8,467	8,293	5,587	5,047		38,380

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							
2							
3							
Average							

Measured By CRC

Verified By

Sheet 20	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
Speed and Classification Checks * 1 of* 2	* DATE	12/16/2003

Rev. 08/31/2001....

PRE-TEST SPEED CHECKS

WIM speed	WIM ~~class~~ speed	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM ~~class~~ speed	WIM Record	Obs. Speed	Obs Class
	64		64			59		60	
	63		64			71		72	
	77		77			63		63	
	74		74			75		75	
	68		68			67		67	
	59		59			69		70	
	72		72			65		66	
	71		70			35		34	
	68		70			62		62	
	72		72			65		64	
	70		71			64		64	
	68		68			71		71	
	71		71			67		67	
	57		57			71		71	
	64		64			70		70	
	64		64			72		73	
	63		63			71		72	
	63		63			69		69	
	63		63			69		71	
	66		66			72		72	
	62		62			56		56	
	70		69			65		65	
	67		67			69		70	
	56		56			64		64	
	67		67			65		65	

Recorded by DAW Direction S Lane 4 Time from _____ to _____

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

Rev. 08/31/2001....

PRE-TEST SPEED CHECKS

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
55			55		64			64	
60			59		72			72	
60			60		69			68	
48			48		68			67	
67			66		68			68	
59			60		63			63	
64			64		58			58	
64			64		61			61	
65			63		60			61	
71			71		61			61	
71			70		63			63	
72			72		70			70	
57			57		70			70	
60			61		61			62	
61			61		58			59	
60			60		70			70	
65			64		70			70	
65			65		66			65	
68			66		71			70	
61			61		72			72	
62			62		56			56	
69			60		55			55	
60			61		62			62	
60			61		77			77	
66			67		67			66	

Recorded by DW Direction S Lane 4 Time from _____ to _____

Post calibration class check

Sheet 20	* STATE CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 2	* DATE 12/16/2003

Rev. 08/31/2001....

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
	9			9		9			9
	9			9		9			9
	9			9		9			9
	9			9		9			9
	8			8		6			6
	8			8		9			9
	9			9		9			9
	9			9		9			9
	9			9		9			9
	9			9		3			3
	9			9		9			9
	9			9		9			9
	9			9		3			3
	9			9		9			9
	3			3		9			9
	9			9		9			9
	9			9		3			3
	6			6		3			3
	3			3		3			3
	8			8		3			3
	8			8		9			9
	9			9		9			9
	8			8		9			9
	9			9		9			9
	9			9		9			9

Recorded by CRC Direction S Lane 4 Time from 11:07 to 12:04

Sheet 20	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0700
Speed and Classification Checks * 2 of* 2	* DATE 12/16/2003

Rev. 08/31/2001.... CLASS CHECK - PRE-TEST

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
	5			5		9			9
	9			9		3			3
	9			9		9			9
	9			9		8			8
	9			9		9			9
	3			5		9			9
	10			10		9			9
	8			8		9			9
	8			8		15			8
	9			9		9			9
	9			9		5			5
	9			9		9			9
	3			3		9			9
	6			6		8			8
	9			9		5			5
	13	very close together		9		9			9
				9		9			9
	9			9		9			9
	9			9		15			15
	9			9		9			9
	9			9		9			9
	9			9		3			3
	9			9		9			9
	9			9		9			9
	9			9		6			6

Recorded by CRC Direction S Lane 4 Time from 12:06 to 12:58

Pre calibration

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 1 of 5	* DATE	12/16/2003

Rev. 08/31/2001

truck 1 = loaded (90.5)
truck 2 = empty (38.4)

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
88	44	1	1	11:15:24	3495	~~45~~ 45.6	4.2 / 4.3	5.8 / 6.3	5.7 / 6.1	10.4 / 12.9	11.3 / 12.2		79.4	13.8	4.2	30.1	4.1	
88	44	2	1	11:15:28	3496	~~45~~ 45.2	4.8 / 5.2	4.0 / 3.1	3.4 / 2.7	2.8 / 1.9	2.0 / 1.5		31.4	19.3	4.3	32.6	4.1	
89	55	1	2	11:22:15	3560	~~55~~ 55.2	4.7 / 5.3	6.1 / 6.8	5.6 / 6.9	11.3 / 13.9	12.1 / 13.3		86.2	13.9	4.2	30.1	4.1	
89	55	2	2	11:22:17	3561	~~55~~ 55.4	5.0 / 4.9	4.0 / 2.4	3.5 / 2.9	2.1 / 1.5	2.3 / 1.3		29.9	19.2	4.2	32.6	4.0	
88.5	64	1	3	11:26:35	3622	~~64~~ 64.3	4.2 / ~~4.5~~ 4.6	6.3 / 6.7	6.3 / 6.6	10.8 / 13.2	11.7 / 11.8		82.1	13.7	4.3	30.1	4.0	
88.5	64	2	3	11:28:31	3624	~~65~~ 65.1	4.9 / 4.8	4.3 / 2.1	4.0 / 2.8	2.2 / 1.8	2.1 / ~~1.1~~ 1.0		~~30.1~~ 30	19.2	4.2	32.5	4.1	
87.5	46	1	4	11:34:31	3677	~~45~~ 45.7	4.5 / ~~5.0~~ 4.9	5.5 / 6.7	5.6 / 6.5	10.9 / 13.3	11.5 / ~~12.5~~ 12.4		81.8	13.8	4.2	30.1	4.1	
87.5	46	2	4	11:34:44	3682	~~44~~ 44.7	4.8 / ~~5.6~~ 3.7	3.9 / 1.9	2.8 / 2.8	1.2 / 1.3	2.0 / 0.8		25.1	19.2	4.2	32.7	4.0	

Recorded by DJW

Checked by KMA

Sheet 21	* STATE_CODE	1 2
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
WIM System Test Truck Records 2 of 5	* DATE	1 2 / 1 6 / 2 0 0 3

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
84	55	1	5	11:41:57	3729	~~56~~ 56.1	4.2 / 4.3	6.0 / 6.0	5.6 / 6.4	10.6 / 13.9	11.7 / 12.7		81.4	13.8	4.3	30.1	4.0	
86	55	2	5	11:40:59	3730	~~55~~ 55.6	4.8 / ~~3.6~~ 3.7	~~3.7~~ 2.0	~~3.6~~ 2.2	2.3 / 1.4	2.3 / 0.9		26.8	19.2	4.2	32.6	4.1	
84.5	65	1	6	11:48:58	3790	~~66~~ 66.1	4.4 / 4.8	6.5 / 6.5	6.1 / 6.6	10.5 / 13.1	12.0 / 12.7		83.3	13.8	4.3	30.1	4.0	
84.5	65	2	6	11:49:00	3791	~~64~~ 65	5.0 / 4.8	~~4.2~~ 4.3 / 2.0	4.1 / 2.8	3.5 / 1.4	2.5 / 1.2		31.6	19.2	4.2	32.5	4.1	
83.5	45	1	7	11:54:43	3847	~~44~~ 45	4.4 / 3.9	5.4 / 5.6	5.3 / 5.7	10.8 / 12.4	11.4 / 11.8		76.8	13.8	4.2	30.2	4.1	
83.5	46	2	7	11:54:47	3849	~~46~~ 46.8	4.7 / 4.1	4.0 / 2.3	3.6 / 2.2	2.5 / 1.3	2.2 / 1.0		27.9	19.2	4.2	32.6	4.0	
82.5	54	1	8	12:02:22	3910	~~55~~ 55.9	4.2 / 5.2	6.3 / ~~6.5~~ 6.6	6.1 / 7.0	10.9 / 13.9	11.6 / 13.3		85.1	13.8	4.2	30.1	4.0	
82.5	55	2	8	12:02:26	3911	~~55~~ 55.9	5.0 / 6.3	3.3 / ~~3.1~~ 3.2	~~3.6~~ 3.7 / 3.4	2.3 / 1.9	~~2.0~~ 2.2 / 0.8		32.0	19.2	4.2	32.6	4.1	

Recorded by DSW

Checked by

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 3 of 5	* DATE	12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
82	65	1	9	12:10:46	3990	~~65~~ 65.3	4.4 / 5.0	5.8 / 6.8	5.6 / 7.3	10.9 / 14.6	11.6 / 13.1		85.1	13.9	4.3	30.1	4.0	
82	64	2	9	12:10:48	3993	~~65~~ 65.5	5.0 / 6.3	4.3 / 3.3	~~3.9~~ 3.4	2.9 / 2.0	~~2.4~~ 1.8 2.3		35.2	19.2	4.2	32.7	4.0	
81.5	45	1	10	12:16:26	4034	~~46~~ 46.6	4.2 / 3.7	5.6 / 5.7	5.7 / ~~5.5~~	10.6 / 12.5	11.4 / 11.7		76.5	13.8	4.2	30.1	4.0	
81.5	46	2	10	12:16:28	4035	~~45~~ 45.2	4.8 / 4.7	3.7 / 2.8	3.1 / 3.1	1.7 / 1.5	2.0 / 1.2		28.7	19.2	4.3	32.7	4.1	
81.0	55	1	11	12:23:42	4096	55.5 ~~55~~	4.1 / 3.9	6.0 / 5.9	5.8 / 5.9	10.6 / 13.3	11.8 / 12.2		79.5	13.8	4.3	30.1	4.0	
81.0	55	2	11	12:23:45	4097	54.7 ~~54~~	4.8 / 4.3	3.9 / ~~1.9~~ 2.0	3.9 / 2.5	2.2 / 1.6	2.2 / 1.1		28.4	19.2	4.2	32.6	4.0	
81.0	64	1	12	12:31:12	4155	~~65~~ 65.2	4.4 / 4.8	6.3 / 6.7	5.9 / 7.2	10.8 / 13.7	11.0 / 13.9		84.8	13.8	4.2	30.1	4.0	
81.0	66	2	12	12:31:13	4156	~~65~~ 65.3	4.9 / 4.5	4.2 / 2.1	4.1 / ~~1.4~~ 1.5	2.3 / ~~1.1~~ 1.0	2.2 / 0.7		27.5	19.2	4.2	32.5	4.0	

Recorded by DJW

Checked by MA

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 4 of 5	* DATE 12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
82.0	45	1	13	12:37:41	4210	~~46~~ 46.1	4.4 / 2.3	6.3 / 5.1	5.9 / 4.6	11.0 / 9.2	~~12.1~~ 12.0 / 8.8		69.5	13.8	4.3	30.1	4.0	
82.0	45	2	13	12:37:45	4212	~~47~~ 47.4	4.6 / 4.3	~~4.0~~ 4.1 / 2.5	3.6 / 3.0	1.5 / 1.6	2.2 / .8		28.2	19.2	4.2	32.7	4.0	
82.5	56	1	14	12:46:45	4316	~~57~~	4.0 / 4.9	6.1 / 6.9	5.7 / 7.0	11.1 / 14.2	11.5 / 13.8		85.3	13.9	4.3	30.2	4.1	
82.5	55	2	14	12:46:47	4317	~~56~~ 56.7	4.8 / 5.3	4.2 / 3.5	4.1 / 3.2	2.3 / 1.8	1.9 / 1.5		32.6	19.2	4.2	32.7	4.0	
82.5	65	1	15	12:54:50	4397	66	4.4 / 5.8	6.6 / 7.5	6.5 / 7.7	12.0 / 15.4	12.3 / ~~17.3~~ 13.4		91.6	13.9	4.3	30.1	4.1	
82.5	65	2	15	12:54:55	4398	~~65~~ 65.5	4.9 / 7.0	4.2 / 4.4	4.2 / 4.2	1.9 / 2.6	2.4 / 2.0		37.9	19.3	4.2	32.8	4.0	
83.0	46	1	16	13:00:37	4453	~~47~~ 47.8	3.7 / 5.3	6.2 / 7.6	5.7 / 7.2	10.7 / ~~14.0~~ 14.9	11.4 / 13.8		~~84.5~~ 86.6	13.9	~~4.2~~ 4.3	~~30.2~~ 32.5	4.1	
83.0	46	2	16	13:00:41	4454	~~46~~ 46.7	4.9 / 4.2	3.3 / 2.0	3.6 / 2.9	3.0 / 1.9	~~2.1~~ 2.2 / 0.7		28.2	19.2	4.2	32.5	4.1	

Recorded by DW

Checked by KMA

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 5 of 5	* DATE	12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
82.5	54	1	17	13:07:07	4519	~~56~~ 58.1	4.2 / 4.8	4.4 / 6.9	5.8 / 6.9	11.2 / 14.2	11.6 / 13.1		85.1	13.9	4.3	30.2	4.0	
82.5	55	2	17	13:07:09	4520	~~56~~ 56.5	5.0 / 6.3	~~4.2~~ 3.6 3.7 / 3.6	4.2 / 3.6	1.9 / 2.3	~~2.2~~ 2.3 / 1.5		34.9	19.2	4.2	32.6	4.1	
80.5	46	1	18	13:22:51	4671	~~46~~ 46.8	3.9 / 3.5	5.7 / 5.2	5.8 / 5.4	10.9 / 12.4	11.1 / 11.6		75.4	13.8	4.2	~~30.1~~ 30	4.1	
80.5	45	2	18	13:22:53	4672	~~45~~ 45.5	4.7 / 4.3	3.7 / 2.6	4.0 / 2.8	2.5 / 1.5	2.2 / 1.2		~~29~~ 29.5 / 29.6	19.2	4.2	32.6	4.0	
81.0	56	1	19	13:37:07	4808	~~56~~ 56.5	4.4 / 4.5	6.3 / 6.5	5.8 / 6.4	16.5 / 14.0	10.9 / 12.9		82.3	13.8	4.3	30.1	4.1	
81.0	56	2	19	13:37:09	4811	~~56~~ 56.1	4.6 / 4.6	3.9 / 2.6	3.1 / 2.7	2.7 / 1.4	2.3 / 1.2		29.1	19.2	4.3	32.6	4.0	
82.5	65	1	20	13:44:58	4869	~~66~~ 66.5	4.2 / 4.0	6.3 / 5.6	6.1 / 6.1	11.2 / 13.0	12.2 / 11.8		80.6	13.8	4.2	~~30.1~~ 30	4.0	
82.5	66	2	20	13:45:00	4870	~~65~~ 65.9	5.3 / 5.6	3.5 / 2.9	3.5 / 2.6	1.9 / 1.8	2.5 / 1.3		30.9	19.2	4.2	32.6	4.1	

Recorded by DJW

Checked by

Calibration run #1

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 1 of 2	* DATE	12/16/2003

Rev. 08/31/2001

CALIBRATION RUNS

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space	
83.0	45	1	1	15:29:50	5779	~~46~~ 46.1	4.4 / 4.1	6.7 / 6.5	6.6 / 6.4	~~12.1~~ 12.0 / 14.6	13.3 / 13.5		88.1	13.8	4.3	30.1	4.0		-2.6 ①
83.0	45	2	1	15:29:53	5781	~~43~~ 43.8	5.6 / 4.5	4.4 / 2.9	3.2 / 3.1	2.8 / 1.8	2.4 / 1.3		32.0	19.2	4.3	32.6	4.1		-16.6
83.0	55	1	2	15:36:41	5841	~~55~~ 55.5	4.8 / 3.9	6.3 / 5.8	5.7 / 5.9	11.6 / 14.2	12.6 / ~~13.7~~ 13.6		84.4	13.8	4.3	30.1	4.0		-6.7 ②
83.0	54	2	2	15:36:43	5842	~~55~~ 55.6	5.3 / 7.0	4.3 / 4.0	3.3 / 4.8	~~2.2~~ 2.3 / 2.6	2.5 / 2.2		38.3	19.3	4.3	32.7	4.1		-0.2
81.0	66	1	3	15:44:33	5934	~~66~~ 67	5.3 / 5.2	6.3 / 6.2	4.2 / 6.6	11.8 / 15.2	13.1 / 13.1		89.1	13.8	4.3	30.0	4.1		-1.0 ③
81.0	66	2	3	15:44:35	5936	~~67~~ 67.1	5.2 / 7.5	4.8 / 5.2	4.5 / 4.5	3.1 / 3.0	2.5 / 2.4		42.5	19.3	4.3	32.8	4.1		+10.6
81.0	45	1	4	15:49:45	5985	~~49~~ 47.1	~~4.7~~ 5.0 / 5.1	6.7 / 7.3	6.7 / 7.5	12.3 / 15.3	~~12.9~~ 13.0 / 14.6		93.2	13.8	4.3	30.1	4.0		+3.0 ④
81.0	45	2	4	15:49:50	5986	~~46~~ 46.7	5.3 / 7.3	4.8 / 4.0	4.3 / 4.4	3.0 / 2.6	2.5 / 1.7		39.4	19.3	4.2	32.7	4.1		-2.6

Recorded by DW

Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 2	* DATE 12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space	
80.5	56	1	5	15:56:34	6047	~~56.3~~ ~~56~~	4.9 3.3	6.2 5.2	5.9 5.2	12.1 12.9	12.8 12.8	81	81.3	13.8	4.3	30.2	4.1		-10.1 (5)
80.5	56	2	5	15:56:37	6048	~~56~~ ~~56.3~~	5.3 5.0	4.2 3.3	3.8 3.6	2.8 1.8	2.3 1.4		33.5	19.2	4.2	32.6	4.1		-12.7
80.0	64	1	6	16:04:25	6113	65.5 ~~65~~	4.6 4.4	6.8 6.1	6.5 6.7	11.5 14.1	13.0 13.5		87.1	13.8	4.2	30.1	4.0		-3.7 (6)
80.0	65	2	6	16:04:27	6114	~~65~~ 68	5.2 5.1	4.4 3.0	4.4 3.2	3.6 1.1	2.5 1.0		33.5	19.2	4.2	32.7	4.1		-12.7

Recorded by DJW

Checked by KMA

Shift to right Calibration run # 2

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 2	* DATE 12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
78	44	1	1	16:28:53	6314	~~44.7~~ ~~44~~	5.3 / 6.0	6.8 / 7.8	6.8 / 7.9	12.7 / 16.3	13.7 / 15.5		99.0	13.9	4.3	30.2	4.1	
78	43	2	1	16:28:57	6315	~~43~~ 43.7	6.1 / 6.5	4.3 / 4.2	4.3 / 5.4	3.2 / 2.9	2.5 / 3.3		42.8	19.2	4.2	32.7	4.0	
78	55	1	2	16:35:10	6366	55.4 ~~55~~	4.6 ~~6.0~~ 6.1	6.7 / 9.1	6.5 / 9.5	12.8 / 15.8	13.1 ~~13.2~~ / 15.2		99.3	13.8	4.3	30.2	4.0	
78	55	2	2	16:35:13	6367	~~55~~ 55.3	5.6 / 6.0	4.2 / 5.3	3.5 / 5.5	2.8 / 3.5	2.7 / 3.0		42.1	19.3	4.2	32.7	4.0	
77	45	1	3	16:48:41	6522	47.8 ~~47~~	4.9 ~~6.2~~ 6.3	6.9 / 8.1	6.5 / 7.9	12.6 / 16.7	13.3 / 15.2		98.2	13.9	4.3	30.2	4.1	
77	45	2	3	16:48:45	6525	46.4 ~~46~~	5.4 / 7.7	5.0 / 6.0	4.0 / 6.3	3.4 / 3.4	2.7 / 3.0		47.0	19.3	4.3	32.8	4.1	
76.5	55	1	4	16:55:14	6583	55.4 ~~55~~	4.9 / 6.2	6.4 ~~6.5~~ / 8.5	6.7 / 8.4	12.8 / 16.8	13.8 / 15.7		100.1	13.9	4.2	30.2	4.0	
76.5	55	2	4	16:55:16	6584	~~56.8~~ ~~56~~	5.1 / 7.1	4.7 / 5.1	~~5.1~~ 4.9 / 4.5	3.0 / 2.7	2.8 ~~2.4~~ 2.3		42.3	19.2	4.3	32.7	4.0	

@ 65 mph sensors unhooked

Recorded by CRC Checked by kmt

Shift to left

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 2 of 2	* DATE	12/16/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
75.5	X	1	1	17:25:00	6814	45.6 ~~45~~	5.1 2.4	7.3 6.2	6.8 5.8	13.0 10.3	13.9 9.7		80.5	13.8	4.3	30.1	4.1	
75.5	X	2	1	17:25:03	6815	45.9 ~~45~~	6.1 2.6	4.8 2.9	3.9 2.6	2.3 1.8	2.5 1.3		30.8	19.2	4.3	32.6	4.0	
85	55	1	2	17:31:05	6861	~~55.4~~ ~~55~~	4.9 2.2	6.8 5.9	6.6 5.7	12.6 10.3	13.4 13.4		81.8	13.8	4.2	~~30.1~~ 30	4.0	
85	55	2	2	17:31:07	6862	~~55~~ 55.3	5.4 3.9	4.1 1.9	4.1 2.1	2.5 1.4	~~2.6~~ 2.7 0.9		29.1	19.2	4.2	32.5	4.0	

Recorded by CRC Checked by [illegible]

Calibration run #3

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 1 of 2	* DATE	12/17/2003

Rev. 08/31/2001

90420
38120

38.1
90.4

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space	
69.5	46	1	1	9:05:35	2379	46.5 / ~~46~~	4.0 / ~~2.5~~ 3.4	6.8 / 5.4	6.7 / 5.3	12.2 / 12.4	13.5 / 12.3		82.7	13.8	4.3	30.1	4.0		-8.5 (7)
69.5	46	2	1	9:05:38	2380	~~48~~ / 48.3	5.5 / 4.8	4.2 / 2.8	3.8 / 2.2	3.1 / 1.8	2.2 / 1.2		31.5	19.2	4.3	32.6	4.1		-17.3
70.0	57	1	2	9:13:06	2436	~~57~~ / 57.4	4.6 / 4.2	6.3 / ~~6.0~~ 5.9	6.1 / 6.6	11.3 / 14.7	12.3 / 13.5		85.5	13.8	4.2	30.1	4.0		-5.4 (8)
70.0	55	2	2	9:13:09	2438	~~57~~ / 57.5	5.2 / 4.8	4.0 / 2.7	4.2 / 2.8	2.7 / 1.5	2.6 / .9		31.3	19.2	4.2	32.6	4.1		-17.8
70.0	65	1	3	9:20:21	2505	~~66~~ / 65.1	4.9 / 4.1	~~6.2~~ 6.3 / 6.4	~~6.5~~ 6.6 / 6.4	11.5 / 14.2	13.2 / 12.9		86.4	13.9	4.2	30.2	4.0		-4.4 (9)
70.0	65	2	3	9:20:22	2506	~~66~~ / 66.5	5.2 / ~~6.8~~ 6.6	4.8 / 4.3	4.6 / 3.6	2.1 / 2.3	2.4 / 1.5		37.4	19.2	4.2	32.6	4.0		-1.8
70.0	47	1	4	9:26:24	2559	47.8 / ~~47~~	4.8 / 3.3	6.5 / 5.3	6.3 / 5.1	12.2 / 12.7	12.9 / 12.1		81.3	13.8	4.3	30.1	4.1		-10.0 (10)
70.0	45	2	4	9:26:27	2561	45.8 / ~~45~~	~~5.6~~ 5.3	4.6 / 3.2	4.6 / 3.2	2.7 / ~~2.6~~ 1.7	2.5 / 1.5		34.9	19.2	4.2	32.6	4.0		-8.3

Recorded by DJW/CRC

Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 2	* DATE 12/17/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space	
70.0	55	1	5	9:32:51	2611	56.3 / ~~56~~	4.8 / 3.5	6.5 / 5.1	5.9 / 5.4	11.7 / 13.7	12.6 / ~~12.7~~ 12.7		82.0	13.8	4.3	30.1	4.1		-9.2 (11)
70.0	54	2	5	9:32:53	2612	55.3 / ~~55~~	5.1 / 7.0	4.8 / 4.8	4.1 / 4.9	2.6 / 2.5	2.7 / 2.3		40.7	19.2	4.2	32.7	4.0		+6.8
71.0	x	1	6	9:42:55	2710	~~65~~ 65.3 / ~~65~~	4.5 / ~~4.5~~ 4.4	6.9 / 6.0	6.6 / 6.8	11.8 / 14.2	12.4 / 13.6		87.3	13.8	4.2	30.1	4.0		-3.4 (12)
71.0	x	2	6	9:42:57	2711	~~66~~ 66.4	5.3 / 7.2	4.8 / 4.5	4.1 / 4.2	2.0 / 2.8	2.9 / 2.0		40.0	19.2	4.3	32.7	4.0		#4.9

Recorded by CRC

Checked by [illegible]

≈ 12:14 p.m. Norther started blowing Post Calibration

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 5	* DATE 12/17/2003

Rev. 08/31/2001

tec 3

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight	Axle B right / left weight	Axle C right / left weight	Axle D right / left weight	Axle E right / left weight	Axle F right / left weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
70.5	45	1	1	12:05:48	4027	46.7 / 46	4.9 / 4.2	7.6 / 6.6	7.2 / 6.9	~~12.9~~ 13.0 / 15.5	13.6 / 14.2		93.7	13.8	4.3	30.1	4.1	
70.5	45	2	1	12:05:50	4029	46	6.0 / 6.7	4.7 / 4.1	4.3 / 4.6	2.8 / 2.3	2.7 / 2.1		40.3	19.2	4.3	32.7	4.0	
72.5	54	1	2	12:13:30	4118	~~54~~ ~~55~~	5.0 / ~~4.5~~ 4.6	6.9 / 6.8	6.6 / 7.1	12.9 / 15.5	14.2 / 14.1		93.5	13.9	4.2	30.1	4.0	
72.5	~~56~~ 54	2	2	12:13:32	4120	~~56~~ 56.4	5.8 / 7.5	4.7 / 4.9	4.5 / 4.2	2.3 / ~~2.6~~ 2.7	~~2.2~~ 2.3 / 2.2		40.9	19.2	4.2	32.7	4.1	
70.5	65	1	3	12:22:04	4205	~~64~~ 64.4	~~5.1~~ 5.5 / ~~2.1~~ 2.2	7.2 / 5.7	7.3 / 5.3	13.1 / 9.1	14.7 / 14.7		84.9	13.7	4.2	30.0	4.0	
70.5	65	2	3	12:22:06	4206	~~65~~ 65.9	5.6 / 7.5	4.9 / 4.6	4.5 / 4.6	2.5 / 2.8	2.8 / 2.4		42.2	19.4	4.3	32.8	4.1	✓
69.5	55	1	4	12:36:19	4387	56.3 / 56	5.0 / 5.1	7.4 / 7.0	6.7 / 7.6	12.4 / 16.5	13.1 / 14.6		95.1 / ~~95.2~~	13.8	4.2	30 / ~~30.1~~	4.1	
69.5	54	2	4	12:36:21	4388	~~55~~ 55.4	5.9 / 6.5	4.4 / 4.3	4.5 / 3.8	1.5 / 2.1	~~2.6~~ 2.1 / 2.0		37.7	19.2	4.3	32.7	4.0	

Recorded by DJW / CRC Checked by KMA

second 2 45's on run

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 5	* DATE 12/17/2003

Rev. 08/31/2001

TEST 3

90.2

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
68.0	65	1	5	12:45:35	4460	65.1 / 65	4.6 / 4.4	7.0 / 6.4	6.8 / 6.7	11.9 / 14.7	13.2 / 13.8		89.5	13.8	4.3	30.1	4.0	
68.0	65	2	5	12:43:37	4461	66.7 / ~~66~~	5.7 / 7.2	4.8 / 3.9	4.8 / 4.0	2.6 / 2.4	2.3 / 1.8		39.6	19.2	4.2	32.7	4.1	
68.5	46	1	6	12:58:40	4635	46.3 / ~~46~~	4.9 / 4.1	7.1 / 6.7	6.7 / 6.7	12.8 / 15.6	14.0 / 14.8		93.3	13.8	4.3	30.1	4.0	
68.5	46	2	6	12:58:43	4636	~~45~~ 45.3	5.7 / 6.0	4.6 / 3.5	3.4 / 3.7	2.9 / 2.0	2.5 / 1.8		36.3	19.2	4.2	32.7	4.0	
64	55	1	7	13:05:25	4701	~~55~~ 55.9	5.0 / 4.1	6.7 / 6.1	6.2 / 4.3	12.4 / 14.7	13.4 / 14.4		89.3	13.8	4.3	~~30.1~~ 30	4.0	
66	55	2	7	13:05:28	4703	~~55~~ 56	5.5 / 5.8	4.8 / 2.7	3.9 / 3.6	2.7 / 1.6	2.2 / 1.3		34.2	19.2	4.2	32.6	4.0	✓
64	64	1	8	13:12:44	4760	~~65~~ 63.5	5.2 / 2.7	6.6 / 5.2	6.9 / 5.2	~~12.8~~ 12.7 / 10.2	13.5 / 10.3		71.5	13.0	4.2	~~30.1~~ 30	4.0	✓
64	64	2	8	13:12:45	4761	~~64~~ 64.2	5.4 / 5.5	4.2 / 3.3	4.6 / 3.3	2.5 / 1.9	2.5 / 1.9		34.7	19.2	4.2	32.6	4.0	

Recorded b DJW

Checked by KMA

Sheet 21	* STATE_CODE	1 2
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
M System Test Truck Records 3 of 5	* DATE	1 2 / 1 7 / 2 0 0 3

ass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
9	13:18:26	4816	~~48~~ ~~47~~	4.8 / 4.4	6.9 / 6.5	6.7 / 6.7	12.8 / 14.9	13.5 / 14.3		91.4	13.8	4.3	30.1	4.0	
9	13:18:34	4818	~~46~~ 46.2	~~6.0~~ 5.9 / 7.2	5.0 / 4.5	~~4.5~~ 4.4 / 4.2	1.4 / 2.6	2.7 / 2.5		40.4	19.3	4.3	32.8	4.0	
0	13:25:38	4872	~~56~~ 56.6	4.8 / 3.7	6.7 / 6.0	6.3 / 6.3	12.5 / 15.2	13.0 / 14.2		88.7	13.8	4.2	30.2	4.1	
0	13:25:40	4873	~~57~~ 57.7	5.3 / 7.0	4.8 / 4.7	4.6 / 4.0	1.5 / ~~2.2~~ 2.3	2.5 / 2.0		38.7	19.3	4.3	32.8	4.0	
1	13:33:16	4946	~~64~~ 64.7	4.7 / 3.5	6.8 / 5.2	~~7.0~~ 6.9 / 5.9	12.5 / 13.4	~~13.7~~ 13.6 / 12.6		85.3	13.8	4.2	30.0	4.1	
1	13:33:18	4948	~~66~~ 66.1	5.5 / 7.3	5.1 / 5.0	4.9 / 4.6	3.9 / 1.9	3.1 / ~~2.2~~ 2.3		43.5	19.2	4.3	32.6	4.1	✓
2	13:38:14	4985	~~46~~ 46.6	4.9 / 4.3	6.7 / 7.2	6.9 / 7.0	12.5 / 15.6	14.0 / 14.9		93.9	13.9	4.2	30.2	4.0	
2	13:38:14	4986	~~46~~ 46.8	5.5 / 7.5	5.0 / 5.3	5.2 / 6.1	1.7 / 3.1	2.9 / 2.9		45.3	19.3	4.2	32.7	4.0	✓

)JW

Checked by ~~kmp~~

Sheet 21	* STATE_CODE	12
LTPP Traffic Data	*SPS PROJECT_ID	0100
WIM System Test Truck Records 4 of 5	* DATE	12/17/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
62.5	56	1	13	13:44:43	5044	56	5.3 / 4.2	6.8 / 6.3	6.5 / 6.7	12.9 / 14.8	14.2 / 14.2		92.0	13.8	4.2	30.1	4.0	
62.5	55	2	13	13:44:45	5045	56.2	5.6 / 6.1	4.9 / 3.5	3.9 / 3.5	1.9 / 1.9	2.2 / 1.7		35.0	19.2	4.3	32.7	4.0	
62	65	1	14	13:52:11	5120	67.1	4.8 / 4.0	7.1 / 5.8	6.5 / 6.3	12.5 / 14.0	8.8 / 13.6		83.3	13.8	4.3	30.2	4.1	
62	65	2	14	13:52:13	5121	66.6	5.5 / 5.8	4.7 / 3.6	4.6 / 3.6	2.4 / 1.5	2.9 / 1.6		36.2	19.2	4.2	32.7	4.0	
62	46	1	15	13:58:35	5176	46.6	5.0 / 5.1	7.2 / 7.6	7.2 / 7.8	12.6 / 16.8	13.2 / 15.0		88.3	13.9	4.3	30.2	4.1	
62	45	2	15	13:58:38	5177	45	5.7 / 6.8	4.4 / 4.2	3.5 / 4.6	2.6 / 2.7	2.4 / 2.0		38.9	19.2	4.3	32.7	4.1	
62	55	1	16	14:05:07	5233	56.4	5.1 / 3.5	7.3 / 5.5	6.5 / 5.4	12.6 / 13.7	13.2 / 13.5		86.3	13.8	4.3	30.0	4.1	
62	55	2	16	14:05:12	5234	56.6	5.5 / 7.0	4.7 / 4.9	4.5 / 4.3	2.2 / 2.5	2.6 / 1.4		39.6	19.2	4.2	32.7	4.1	

Recorded by DJW Checked by

Sheet 21	* STATE_CODE 12
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 5 of 5	* DATE 12/17/2003

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
61.5	65	1	17	14:40:53	5802	66	4.5 / 4.4	7.0 / 6.5	6.5 / 6.7	12.3 / 15.0	~~13.2~~ 13.3 / 13.9		90.0	13.9	4.3	30.1	4.1	
61.5	66	2	17	14:40:56	5805	68.3	5.1 / 6.0	4.6 / 3.6	4.5 / 2.3	1.8 / 2.3	2.5 / 1.6		34.3	19.3	4.2	32.7	4.0	
63	44	1	18	14:46:20	5688	47.1	5.0 / 3.9	~~7.0~~ 6.9 / 6.3	7.1 / 6.7	13.2 / 15.1	14.4 / 14.4		92.9	13.9	4.2	30.0	4.1	
63	46	2	18	14:46:25	5689	~~47~~ 47.5	5.5 / 6.5	4.7 / 3.7	4.5 / 4.4	2.3 / 2.5	2.7 / 1.9		38.6	19.3	4.2	32.7	4.0	
63	55	1	19	~~15:42:45~~ 14:52	5764	~~58~~ 55.5	4.7 / 4.3	7.0 / 6.5	6.6 / 6.8	12.1 / 15.2	13.8 / 14.3		91.4	13.8	4.3	30.1	4.0	
63	56	2	19	14:52:47	5765	56.9	5.7 / 7.0	5.0 / 5.0	4.6 / 5.1	3.6 / 2.6	2.6 / 2.5		43.8	19.2	4.3	32.7	4.1	
63	65	1	20	15:00:02	5836	65.7	4.8 / 3.9	6.8 / 6.3	6.8 / 6.6	12.1 / 14.5	12.9 / 13.6		88.2	13.9	4.2	30.2	4.0	
63	66	2	20	15:00:03	5839	~~66~~ 66.3	5.5 / 7.8	5.1 / 3.9	4.6 / 4.3	3.2 / 3.1	3.1 / 2.3		42.6	19.2	4.2	32.7	4.1	

Recorded by DJW Checked by

The following procedure was used to calibrate the WIM system.

1. The error of the WIM system for each run was calculated by subtracting the gross weight reported by the WIM system from the known gross weight, the result then divided by the known gross weight.
2. The error percentage for each pass of the test vehicles was plotted on a graph by speed.
3. Grouping of the plots was analyzed at the WIM system's predetermined "speed points" of 45, 60, and 75 mph. (Speed points are selected at the time of the system's installation and are based on the entire speed range of all traffic. Although test vehicles are not run at the extreme speeds, the data is plotted and then extrapolated to mathematically determine the error percentages at these speeds. The largest spread possible is required in order to facilitate the inclusion of all vehicles, as well as increase the overall performance of the WIM system.)
4. Based on the grouping of the plotted errors at the three speed points, a correction percentage is visually determined. At the lowest speed point (45), a bias of approximately -16.5% was determined. The corresponding compensation factor for that speed point was then increased by 16.5%, from 1030 to 1200. Indicating a bias of -10% at the middle speed point, the middle factor was increased by 10%, from 1030 to 1130, and with an indication of a -5% bias at the high speed point, the high speed compensation factor was increased by 5% from 1080 to 1135.
5. After the first 12 calibration runs were performed, it was determined that the lowest and middle speed point test runs were still biased approximately -6.5%, and so the corresponding compensation factors were raised accordingly, from 1200 to 1275 and 1130 to 1200, respectively.
6. The final compensation factors for each speed point were as follows; 1275 for speed point 1 (45mph), 1200 for speed point 2 (60mph), and 1135 for speed point 3 (75mph).