Preliminary Validation Report

Texas, SPS 480100

Task Order, CLIN2
April 26-28, 2005

1 Executive Summary 1
2 Corrective Actions Recommended 3
3 Post Validation Analysis 3
3.1 Temperature-based Analysis 6
3.2 Speed-based Analysis 8
3.3 Classification Validation 10
3.4 Evaluation by ASTM E-1318 Criteria 11
4 Pavement Discussion 11
4.1 Profile analysis (Pending Receipt) 12
4.2 Distress survey and any applicable photos 12
4.3 Vehicle-pavement interaction discussion 13
5 Equipment Discussion 13
5.1 Pre-Evaluation Diagnostics 13
5.2 Calibration Process 14
5.3 Summary of Traffic Sheet 16s 14
5.4 Projected Maintenance/Replacement Requirements 14
6 Pre-Validation Analysis 14
6.1 Temperature-based Analysis 18
6.2 Speed-based Analysis 20
6.3 Classification Validation 21
7 Data Availability and Quality 22
8 Data Sheets 25
9 Updated handout guide and Sheet 17 26
10 Updated Sheet 18 26
11 Traffic Sheet 16(s) 26

List of Tables

Table 1-1 Post-Validation Results – 480100 – 27-Apr-2005 2
Table 1-2 Results Based on ASTM E-1318-02 Test Procedures.. 2
Table 3-1 Post-Validation Results - 480100 – 27-Apr-2005.. 4
Table 3-2 Post-Validation Results by Temperature Bin – 480100 –27-Apr-2005 6
Table 3-3 Post-Validation Results by Speed Bin – 480100 – 27-Apr-2005........................ 8
Table 3-4 Truck Misclassification Percentages for 480100 – 27-Apr-2005...................... 10
Table 3-5 Truck Classification Mean Differences for 480100 – 27-Apr-2005 11
Table 3-6 Results of Validation Using ASTM E-1318-02 Criteria 11
Table 5-1 Classification Validation History - 480100 –27-Apr-2005.............................. 14
Table 5-2 Weight Validation History - 480100 –27-Apr-2005 14
Table 6-1 Pre-Validation Results - 480100 – 26-Apr-2005.. 15
Table 6-2 Pre-Validation Results by Temperature Bin - 480100 –26-Apr-2005 18
Table 6-3 Pre-Validation Results by Speed Bin - 480100 –26-Apr-2005 20
Table 6-4 Truck Misclassification Percentages for 480100 – 26-Apr-2005...................... 22
Table 6-5 Truck Classification Mean Differences for 480100 – 26-Apr-2005 22
Table 7-1 GVW Characteristics of Major sub-groups of Trucks - 480199 –26-Apr-2005 24

List of Figures

Figure 3-1 Post-Validation Speed-Temperature Distribution – 480100 – 27-Apr-2005.... 4
Figure 3-2 Post-Validation GVW Percent Error vs. Speed– 480100 –27-Apr-2005 5
Figure 3-3 Post-Validation GVW Percent Error vs. Temperature– 480100 – 27-Apr-2005 5
Figure 3-4 Post-Validation Spacing vs. Speed – 480100 – 27-Apr-2005........................... 6
Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 27-Apr-2005 7
Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 480100 – 27-Apr-2005 8
Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 480100 – 27-Apr-2005.. 9
Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group- 480100 – 27-Apr-2005.. 9
Figure 4-1 Photo of the WIM Sensors – Upstream_View – 480100 - 27-Apr-2005........ 12
Figure 4-2 Photo of the AC/PCC Pavement interface – 480100 - 27-Apr-2005.............. 13
Figure 6-1 Pre-Validation Speed-Temperature Distribution – 480100 – 26-Apr-2005 ... 16
Figure 6-2 Pre-Validation GVW Percent Error vs. Speed– 480100 –26-Apr-2005......... 16
Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature -480100 –26-Apr-2005 17
Figure 6-4 Pre-Validation Spacing vs. Speed - 480100 – 26-Apr-2005........................... 18
Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 26-Apr-2005 19

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 480100 – 26-Apr-2005 19
Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group – 480100 – 26-Apr-2005 20
Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 480100 –26-Apr-2005 21
Figure 7-1 Expected GVW Distribution Texas VI Class 9 (TMG Class 9) – 480100 –26-Apr-2005 24
Figure 7-2 Expected Vehicle Distribution Using Texas VI Classification Scheme- 480100 –26-Apr-2005 25
Figure 7-3 Expected Speed Distribution - 480100 –26-Apr-2005 25

1 Executive Summary

A visit was made to the Texas SPS 480100 beginning on April 26 and continuing through April 28, 2005 for the purposes of conducting a Validation of the WIM system located on US 281, 9.1 miles north of State Route 186, near Edinburg, TX. The validation procedures were in accordance with LTPP's Data Collection Guide dated August 31, 2001.

The site is instrumented with PAT bending plate and loop sensors with DAW-190 electronics.

The agency is utilizing the Texas-VI classification scheme for this sensor set, while utilizing a modified FHWA 13-bin classification scheme for the 0199 site sensors.

This site was installed in February 2005 as part of the relocation and replacement of the WIM System sensors and equipment for the SPS 0100 site. The sensors are installed in the southbound direction approximately 800 feet south of the original site. The controller identifies this as Lane #4. Along with the instrumentation of the LTPP lane, the State also instrumented the other southbound lane as well as the two northbound lanes at this location. They also installed Kistler quartz piezo sensors in the LTPP lane approximately 11 feet south of the trailing edge of the last bending plate sensor for this lane (This equipment is identified as SPS 480199 and was validated as an additional lane). The WIM controller is housed in shared cabinet along with the controller for the 0199 site. The sensors were installed in newly constructed portland concrete cement which was ground for smoothness prior to the installation.

This site meets all LTPP loading precision requirements except speed, which is not considered sufficient to disqualify the site as having research quality data.

This site meets the overall classification requirement of less than two percent unclassified. However, it does not meet the less than two percent trucks misclassified criteria. The classification algorithm currently in use is not providing research quality classification data.

The validation used the following trucks:

1) 3S2 with a tractor having an air suspension tandem and a trailer with a standard tandem and air suspension loaded to 77,650 lbs.
2) 3S3 with a tractor having a walking beam suspension tandem and trailer with tridem and air suspension, loaded to 79,940 lbs.
3) 3S2 with a tractor having an air suspension tandem and a trailer with a standard rear tandem and a leaf spring suspension, loaded to 56,990 lbs.

The validation speeds ranged from 60 to 73 miles per hour. The site is currently posted with a speed limit of 70 miles per hour.

The pavement temperatures ranged from 93 to 115 degrees Fahrenheit.

Table 1-1 Post-Validation Results – 480100 – 27-Apr-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-4.9 ± 6.3 %	Pass
Tandem axles	±15 percent	1.8 ± 6.6 %	Pass
Gross vehicle weights	±10 percent	1.4 ± 3.9 %	Pass
Axle groups	±15 percent	2.3 ± 6.6 %	Pass
Speed	**±1 mph [2 km/hr]**	**2.5 ± 2.0 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	-0.1 ± 0.4 ft	Pass

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

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

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

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

2 Corrective Actions Recommended

The system's classification algorithms should be reviewed to correct the problem of small Class 5 vehicles being classified as Class 3 vehicles.

This misclassification failure is not considered significant under the proposed modification to the definition of research quality classification data (by the Traffic ETG) that includes only heavy vehicles (Class 6 and above).

3 Post Validation Analysis

This final analysis is based on test runs conducted April 27, 2005 from early to mid-afternoon at test site 480100 on US Route 281. This SPS-1 site is located in Hidalgo County 9.1 miles north of State Route 186 on the southbound, right hand lane of a divided four-lane facility and identified in the WIM controller as Lane #4. No auto-calibration was used during test runs.

The three trucks used for initial calibration and for the subsequent testing included:

1) 3S2 with a tractor having an air suspension tandem and a trailer having air suspension, loaded to 77,650 lbs.
2) 3S3 with a tractor having a walking beam suspension tandem and a trailer with a tridem and air suspension, loaded to 79,940 lbs.
3) 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and leaf spring suspension, loaded to about 56,990 lbs.

These trucks made a total of 42 passes over the WIM scale at speeds ranging from approximately 58 to 70 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 93 to 115 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

As shown in Table 3-1, the site meets passed all of the performance criteria for weight and spacing. It did not meet the requirements for speed which is not considered sufficient to disqualify the site as having research quality data.

It should be noted, that since the axle spacing measurements (which are dependant on accurate speed measurements) did meet the performance requirements, it is likely that the failure of speed measurements is the result of errors in the speed values that were obtained by radar and to which the WIM equipment output was compared. On several occasions, the radar gun operator had difficulty in getting good measurements of test truck speeds due to the proximity of other vehicles and to the difficulty in positioning the radar gun at a narrow angle to the roadway.

Table 3-1 Post-Validation Results - 480100 – 27-Apr-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-4.9 ± 6.3 %	Pass
Tandem axles	±15 percent	1.8 ± 6.6 %	Pass
Gross vehicle weights	±10 percent	1.4 ± 3.9 %	Pass
Axle groups	±15 percent	2.3 ± 6.6 %	Pass
Speed	**±1 mph [2 km/hr]**	**2.5 ± 2.0 mph**	**Fail**
Axle spacing	± 0.5 ft [150 mm]	-0.1 ± 0.4 ft	Pass

The test runs were conducted primarily during the early afternoon hours, resulting in a narrow range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed was achieved but the desired 30 degree temperature range was not achieved for this set of validation runs during the six hour period in which it was conducted.

The speed groups were divided as follows: Low speed – 58 to 61 mph, Medium speed – 62 to 65 mph and High speed 66+ mph. The two temperature groups were created by splitting the runs between those less than or equal to 105 degrees Fahrenheit for Low temperature and greater than 105 degrees Fahrenheit for High temperature.

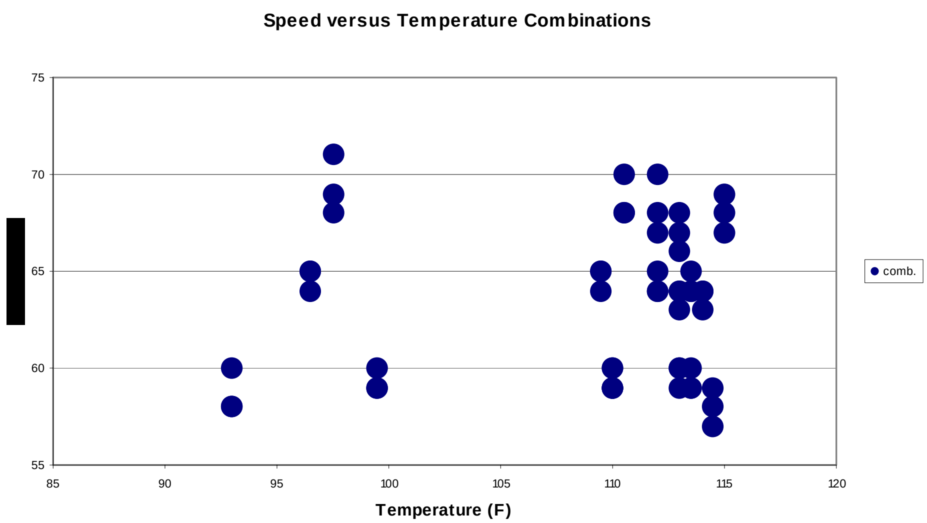

Figure 3-1 Post-Validation Speed-Temperature Distribution – 480100 – 27-Apr-2005

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

Figure 3-2 shows little change in estimates with speed except for the increasing variability at higher speeds.

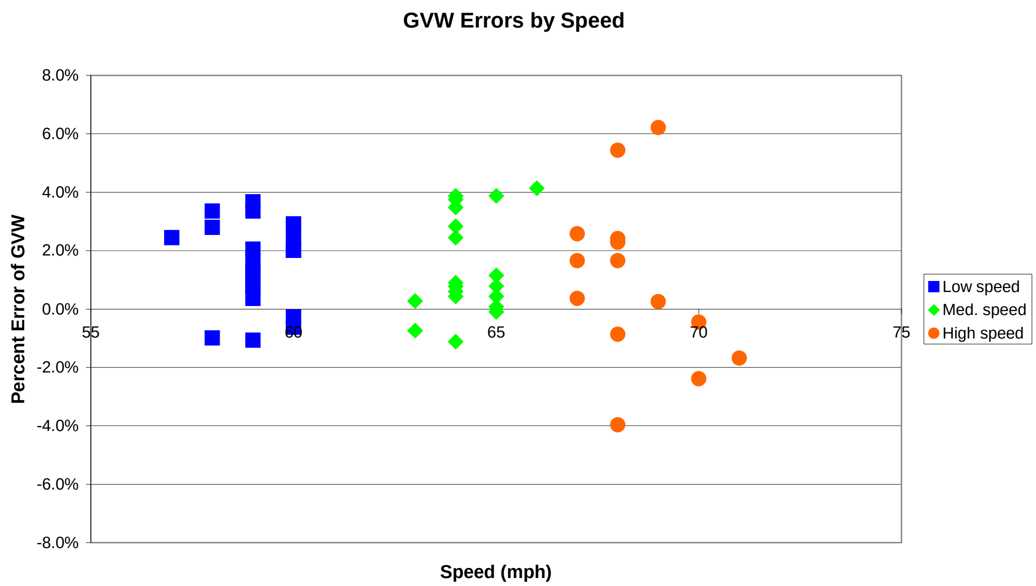

Figure 3-2 Post-Validation GVW Percent Error vs. Speed– 480100 –27-Apr-2005

Figure 3-3 shows the relationship between Temperature and GVW percentage error. There is a little, if any relationship between the GVW estimates and temperatures within the observed range.

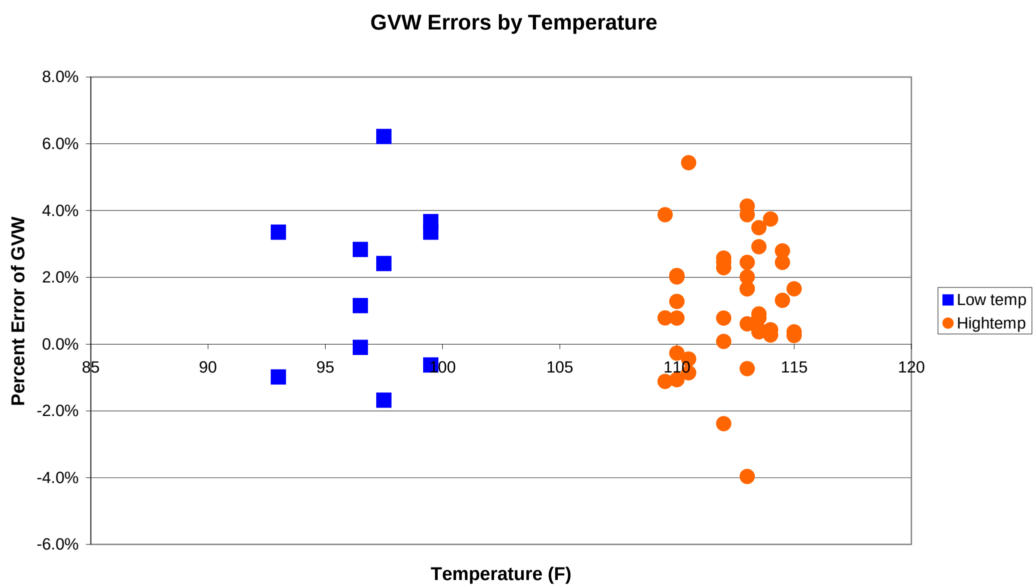

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature– 480100 – 27-Apr-2005

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

Axle spacing errors appear to be approximately symmetrical and are limited to maximums of about 5 inches (0.4 feet). Vehicle speed appears to have little influence on the error of measured axle spacing.

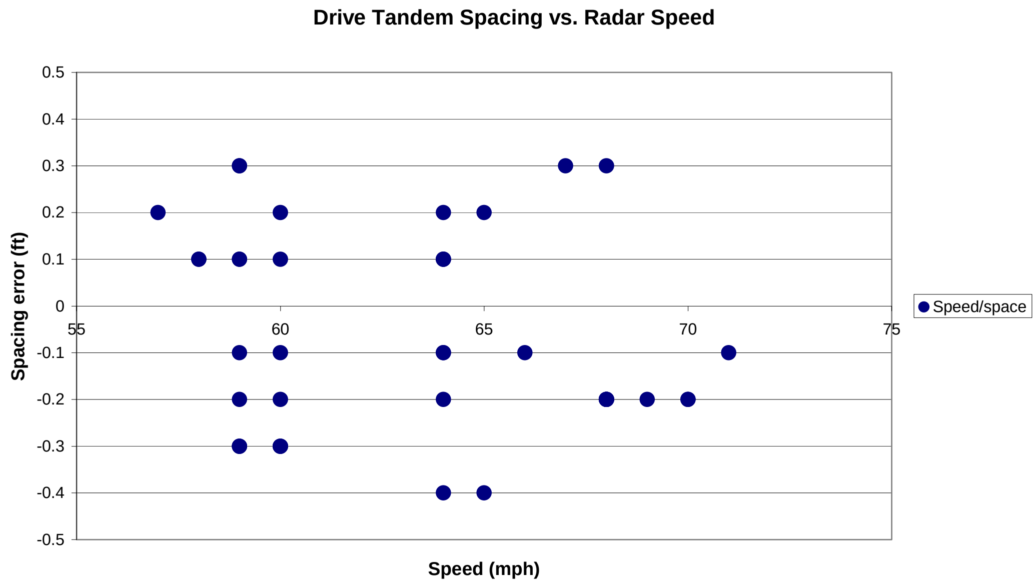

Figure 3-4 Post-Validation Spacing vs. Speed – 480100 – 27-Apr-2005

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at less than or equal to 105 degrees Fahrenheit for Low temperature and those greater than 105 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 480100 –27-Apr-2005

Element	**95% Limit**	**Low Temperature 93 – 104 °F**	**High Temperature 105 – 115 °F**
Single axles	±20 %	-3.3 ± 4.3 %	-5.3 ± 6.6 %
Tandem axles	±15 %	2.0 ± 7.5 %	1.7 ± 6.5 %
GVW	±10 %	1.8 ± 5.1 %	1.2 ± 3.7 %
Axle Groups	±15 %	2.4 ± 7.3 %	2.2 ± 6.5 %
Speed	**±1 mph**	**1.9 ± 2.0 mph**	**2.6 ± 1.9 mph**
Axle spacing	± 0.5 ft	-0.0 ± 0.3 ft	-0.1 ± 0.4 ft

The table indicates that the desired 30 degree Fahrenheit distribution of temperature range was not achieved for this set of validation runs, during the six hour period in which it was conducted.

Figure 3-5 shows the distribution of GVW errors versus Temperature by Truck. All of the vehicles appear to exhibit the same trend.

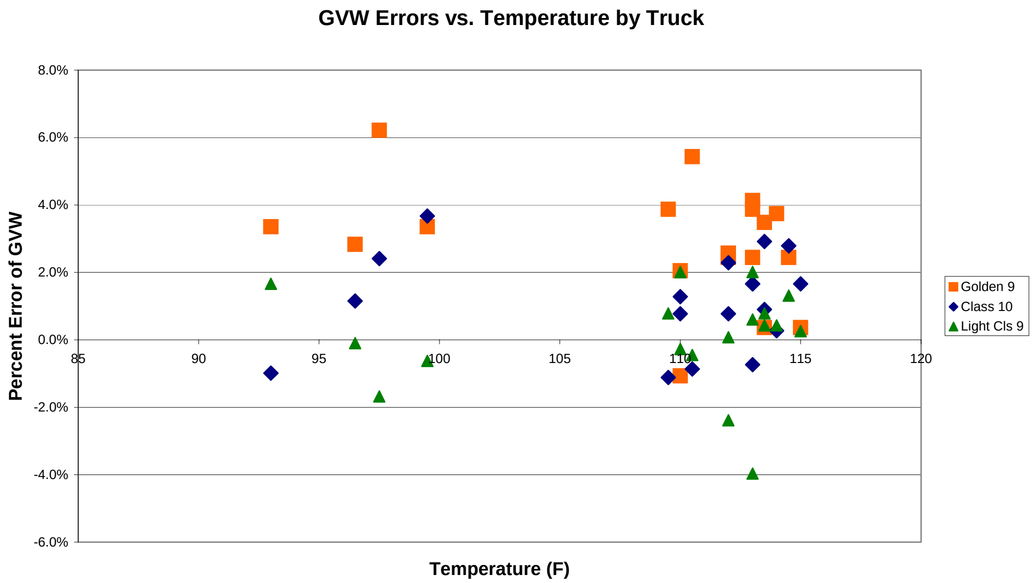

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 27-Apr-2005

Figure 3-6 shows the relation between Steering Axle errors and Temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with both Class 9 and Class 10 vehicles.

The figure shows an increasing variability in error as temperatures increase.

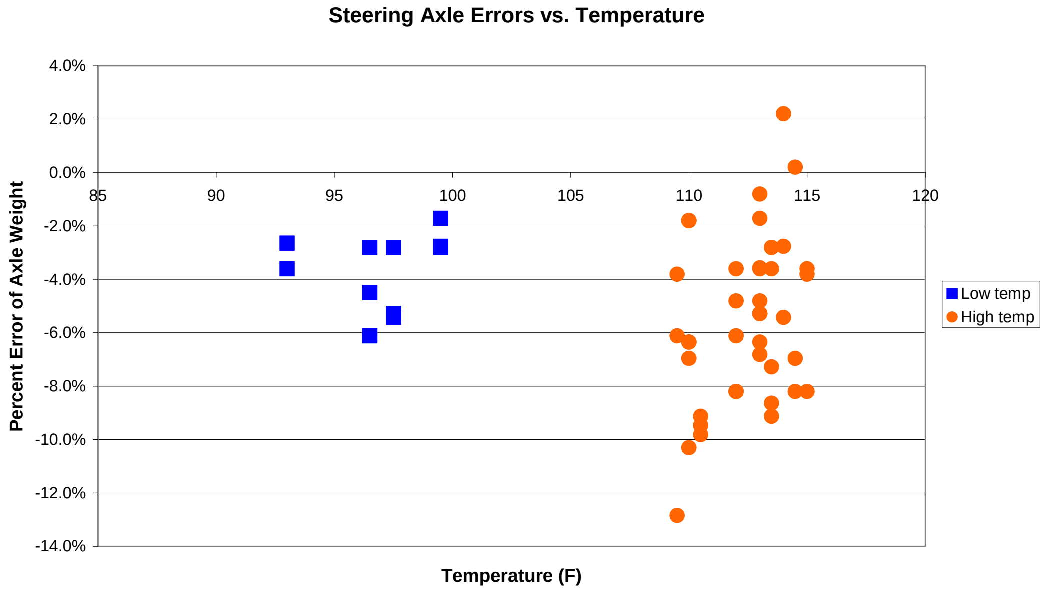

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 480100 – 27-Apr-2005

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 58 to 61 mph, Medium speed – 62 to 65 mph and High speed 66+ mph.

Table 3-3 Post-Validation Results by Speed Bin – 480100 – 27-Apr-2005

Element	95% Limit	Low Speed 58 to 61 mph	Medium Speed 62 to 65 mph	High Speed 66 to 70 mph
Single axles	±20 %	4.5 ± 6.8 %	-4.6 ± 6.3 %	-5.8 ± 6.7 %
Tandem axles	±15 %	2.4 ± 4.6 %	1.8 ± 7.2 %	0.9 ± 8.8 %
GVW	±10 %	1.5 ± 3.0 %	1.5 ± 3.6 %	1.0 ± 6.1 %
Axle Groups	±15 %	2.9 ± 5.1 %	2.0 ± 6.7 %	2.3 ± 9.0 %
Speed	**±1 mph**	**2.6 ± 1.9 mph**	**2.3 ± 2.1 mph**	**2.6 ± 2.4 mph**
Axle spacing	± 0.5 ft	0.4± 0.4 ft	0.0 ± 0.3 ft	-0.1± 0.4 ft

It appears that the GVW equipment at this site underestimates steering axle weights and that this underestimation increases somewhat when vehicle speed increases towards the legal limit of 70 mph. The effect of speed on axle group and gross vehicle weights is almost negligible with the exception of a marked increase in the variability of GVW estimates as speeds increase towards 70 mph.

Figure 3-7 illustrates the effect of speed on the estimates by truck. The Golden 9 (squares) appears to have an increasing overestimate as speed increases. In contrast, the Light Class 9 (triangles) appears to be overestimated at low speeds and underestimated at higher speeds. The Class 10 (diamonds) does not appear to have estimates influenced by changes in speed. These by vehicle tendencies may be related to one or more of the following: vehicle suspension characteristics, amount of load and pavement smoothness.

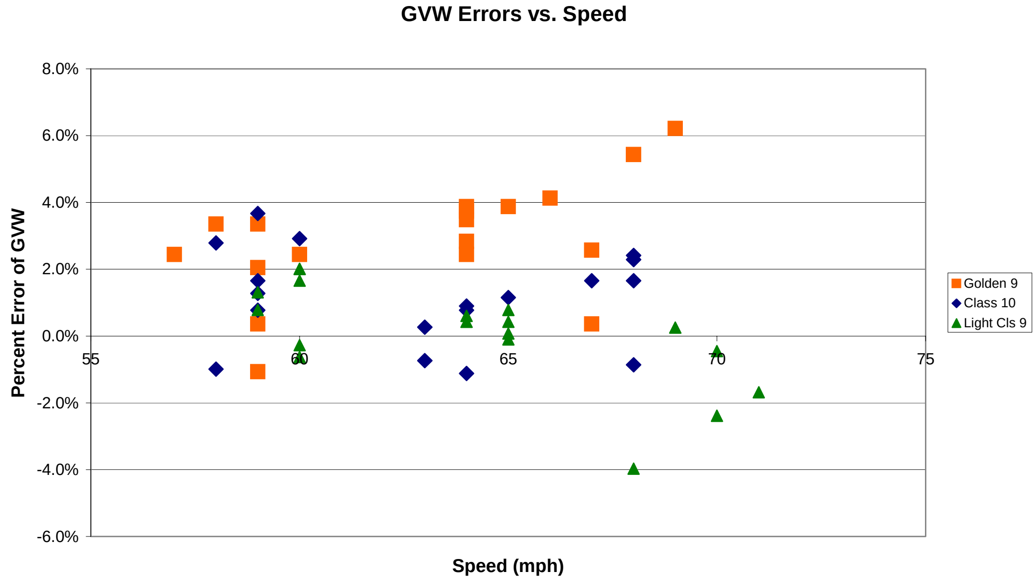

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 480100 – 27-Apr-2005

Figure 3-8 shows the relation between Steering Axle errors and Seed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 10 vehicles. The figure illustrates a modest increase in the size of the underestimate for steering axles as speeds increase. Additionally, while the speeds increase, the variability of the steering axle errors appears to decrease.

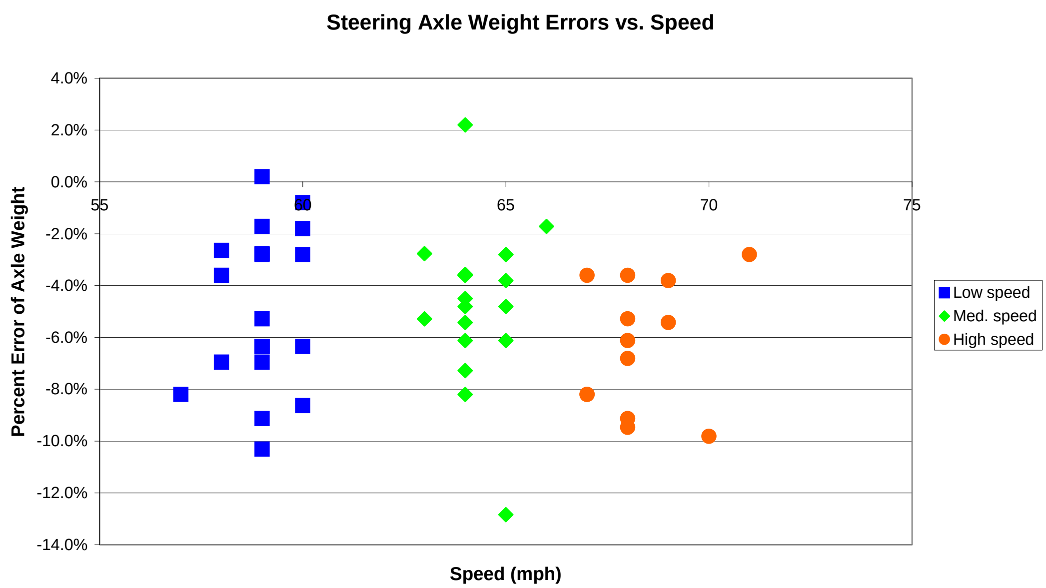

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group- 480100 – 27-Apr-2005

3.3 Classification Validation

The agency uses the Texas-VI classification scheme. This scheme is described in Appendix A. Output from the classifier was converted to equivalent FHWA 13-bin values for comparison purposes.

The figures in Table 3-4 are based on computations done after transforming the reported Texas-VI classes to the TMG 13-bin classes. The transformation was done in this fashion because assigning vehicles to classes for purposes of matching requires knowledge of both axle spacings and vehicle weights. Axle spacings can be inferred from the visual record in post processing; vehicle weights cannot. The overall percentage misclassified is fifteen percent.

This value is strongly biased by errors in classifying single unit vehicles which account for about seventeen percent of the truck sample. The misclassification percentage for Class 8s is associated with 3 reported when only one was observed. The misclassification percentage for Class 13s is one error in 4 observations. The misclassification percentage for Class 4s comes from 1 observation which was recognized by the equipment as a "bus".

Two samples of approximately 100 vehicles each, primarily trucks, were collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on this sample it was determined that there are no unknown vehicles and one unclassified vehicle.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. The following are the classification error rates by class:

Table 3-4 Truck Misclassification Percentages for 480100 – 27-Apr-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	100	5	33	6	0
7	N/A				
8	67	9	6	10	N/A
11	N/A	12	N/A	13	25

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

Table 3-5 Truck Classification Mean Differences for 480100 – 27-Apr-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	-100	5	-13	6	0
7	N/A				
8	-200	9	-2	10	N/A
11	N/A	12	N/A	13	-25

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

3.4 Evaluation by ASTM E-1318 Criteria

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

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

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

4 Pavement Discussion

The sensors are installed in newly constructed Portland concrete cement which was ground for smoothness prior to the installation.

The pavement smoothness did not contribute to out-of-range results.

The pavement condition did not appear to influence truck movement across the sensors.

4.1 Profile analysis (Pending Receipt)

The Regional Support Contractor as of June 10, 2005 had not submitted the most recent profile data available. This site was scheduled for profiling during the last week in May 2005, and the RSC confirmed that they had collected the data.

Upon receipt of the profile data, it will be processed and an amended report submitted.

4.2 Distress survey and any applicable photos

All sensors are installed in a Portland concrete cement slab. Pavement condition in the area near these sensors is excellent with no significant distress of any kind. The AC surface beyond this slab has little rutting and few other distresses. However, there is a transverse crack near the interface between the AC and PCC surfaces. The truck traffic displays some bouncing near this interface but it dampens by the time these vehicles reach the scale. Figures 4-1 and 4-2 show the areas near the WIM sensors and the interface between the AC and PCC pavement surfaces upstream of the WIM scale.

Figure 4-1 Photo of the WIM Sensors – Upstream_View – 480100 - 27-Apr-2005

Figure 4-2 Photo of the AC/PCC Pavement interface – 480100 - 27-Apr-2005

4.3 Vehicle-pavement interaction discussion

Vehicles display no bouncing as they as they pass over the scale. They appear to track straight over the wheel paths with no signs of weaving. As noted previously, there was some slight bouncing as the trucks passed over the AC/PCC pavement interface upstream of the WIM scales but this appeared to disappear before the vehicles reached the WIM sensors.

5 Equipment Discussion

The traffic monitoring equipment at this location includes two vehicle detection loops in the center of the southbound lane, longitudinally separated by 12 feet. Two bending plates are installed in the right and left wheel paths, offset longitudinally by 17 feet. These sensors are installed such that the first loop is followed by a bending plate, then the other loop and finally the last bending plate. These sensors are installed in a PCC pavement section. The roadway outside this short section is asphalt. The controller is a PAT model DAW-190 that was also used to collect WIM and classification information from similar equipment installed on each of the other three lanes.

5.1 Pre-Evaluation Diagnostics

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

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

5.2 Calibration Process

The equipment required no iterations of the calibration process between the initial 43 runs and the final 54 runs. Both the initial and final runs produced excellent results from the WIM equipment at this site

5.3 Summary of Traffic Sheet 16s

Since this site was recently installed, the only validation information is from the recent visit and is shown in Table 5-1 below.

Table 5-1 Classification Validation History - 480100 –27-Apr-2005

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Class 5	Other 2	
4-27-05	No. of Trucks	0		-13.0		0
4-26-05	No. of Trucks	-5.0				0

Table 5-2 reflects the information from the Sheet 16s for the current visit.

Table 5-2 Weight Validation History - 480100 –27-Apr-2005

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
4-27-05	Test Trucks	1.4%	-4.9%	1.8%
4-26-05	Test Trucks	0.5%	-2.5%	0.5%

5.4 Projected Maintenance/Replacement Requirements

No corrective measures need to be performed at this time to the equipment or the pavement.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted April 26, 2005 from late morning until early evening at test site 480100 on US Route 281. This SPS-1 site is located in Hidalgo County 9.1 miles north of State Highway 186 on the southbound, right hand lane of a divided four-lane facility. No auto-calibration was used during test runs.

The three trucks used for initial calibration and for the subsequent testing included:

1. 3S2 with a tractor having an air suspension tandem and a trailer with a standard tandem and air suspension, loaded to 77,650 lbs.
2. 3S3 with a tractor having a walking beam suspension tandem and a trailer with a tridem and air suspension, loaded to 79,940 lbs.

3. 3S2 with a tractor having an air suspension tandem and a trailer with standard rear tandem and leaf spring suspension, loaded to 56,990 lbs.

These trucks made a total of 43 passes over the WIM scale at speeds ranging from approximately 55 to 73 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 82 to103 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

This site meets all LTPP precision requirements except speed measurements which are not considered sufficient to disqualify the site as having research quality data. Since axle spacing measurements (which are dependant on accurate speed measurements) did meet these requirements, it is likely that the failure of speed measurements to do so is the result of errors in the speed values that were obtained by radar and to which the WIM equipment output were compared. On several occasions, the radar gun operator had difficulty in getting good measurements of test truck speeds due to the proximity of other vehicles and to the difficulty in positioning the radar gun at a narrow angle to the roadway.

Since weight precision requirements were met, no calibration of the weight sensors was warranted.

Table 6-1 Pre-Validation Results - 480100 – 26-Apr-2005

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Single axles	±20 percent	-2.5 ± 5.1 %	Pass
Tandem axles	±15 percent	0.5 ± 6.9 %	Pass
Gross vehicle weights	±10 percent	0.5 ± 4.1 %	Pass
Axle groups	±15 percent	1.3 ± 7.1 %	Pass
Vehicle speed	±1 mph [2 km/hr]	**2.3 ± 3.5 mph**	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	**-0.1 ± 0.5 ft**	**Fail**

The test runs began at around noon, then the test trucks were diverted to other lanes and the bulk of the testing on this site was done during the late afternoon hours. This resulted in somewhat narrow band 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 6-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs although a broader range of pavement temperatures would have been desirable.

The speed groups were divided as follows: Low speed – 52 to 61 mph, Medium speed – 62 to 65 mph and High speed 66+ mph. The two temperature groups were created by splitting the runs between those at less than or equal to 95 degrees Fahrenheit for Low temperature and greater than 95 degrees Fahrenheit for High temperature.

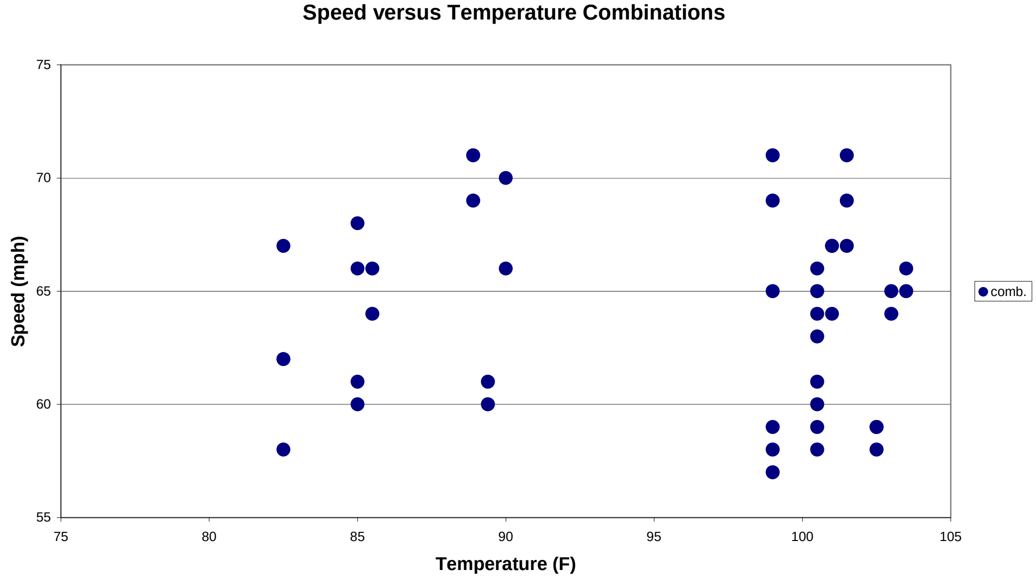

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 480100 – 26-Apr-2005

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. There is very little relation between Speed and GVW errors.

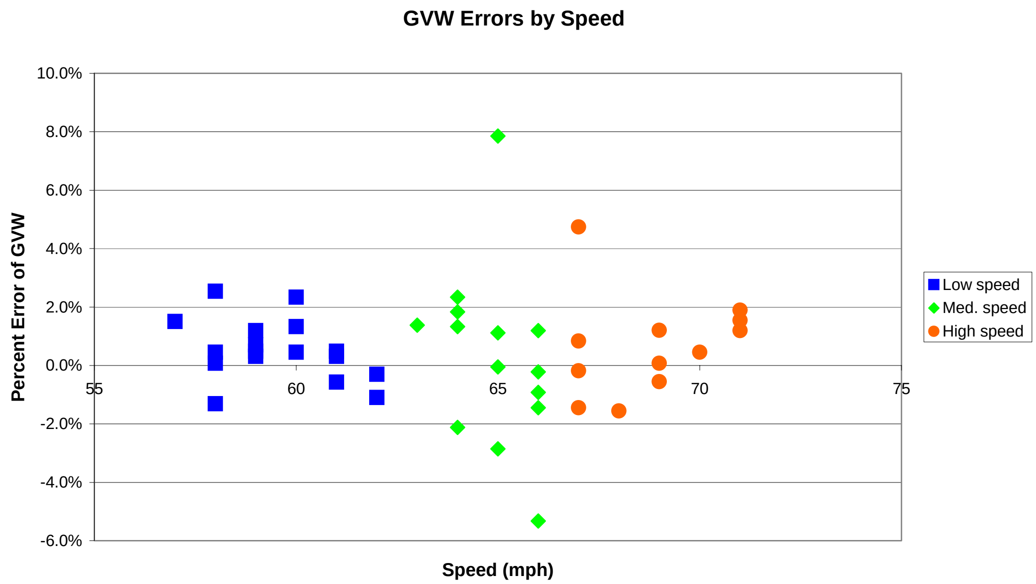

Figure 6-2 Pre-Validation GVW Percent Error vs. Speed– 480100 –26-Apr-2005

Figure 6-3 shows the relationship between Temperature and GVW percentage error. Pavement temperatures of less than 95 degrees Fahrenheit exhibit less variability in GVW estimates of the test trucks. The wide range of errors is similar to the results seen for post-validation. Although the mean percent error appears to remain close to zero, higher pavement temperatures tend to coincide with somewhat greater variability in those errors.

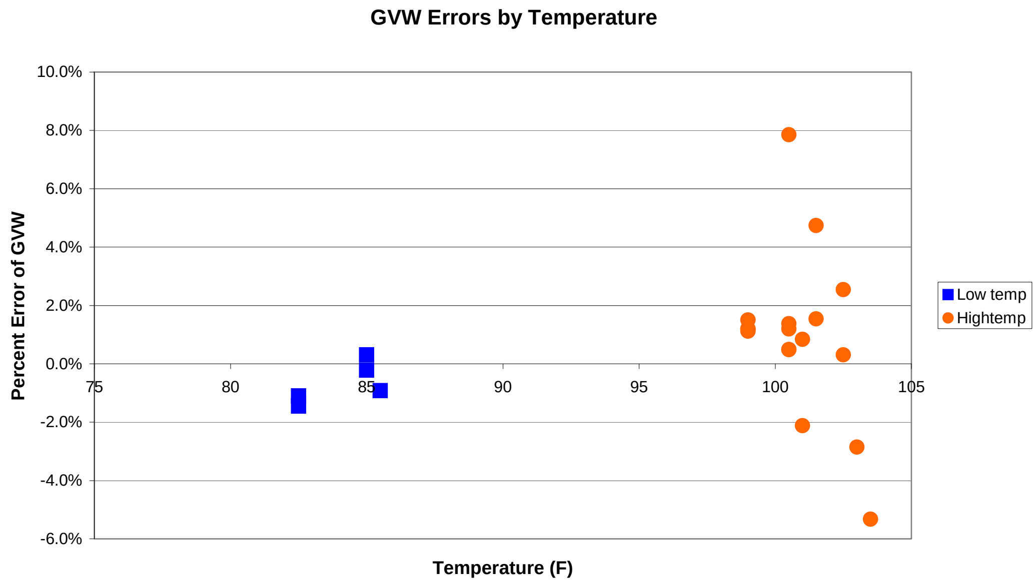

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature -480100 –26-Apr-2005

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

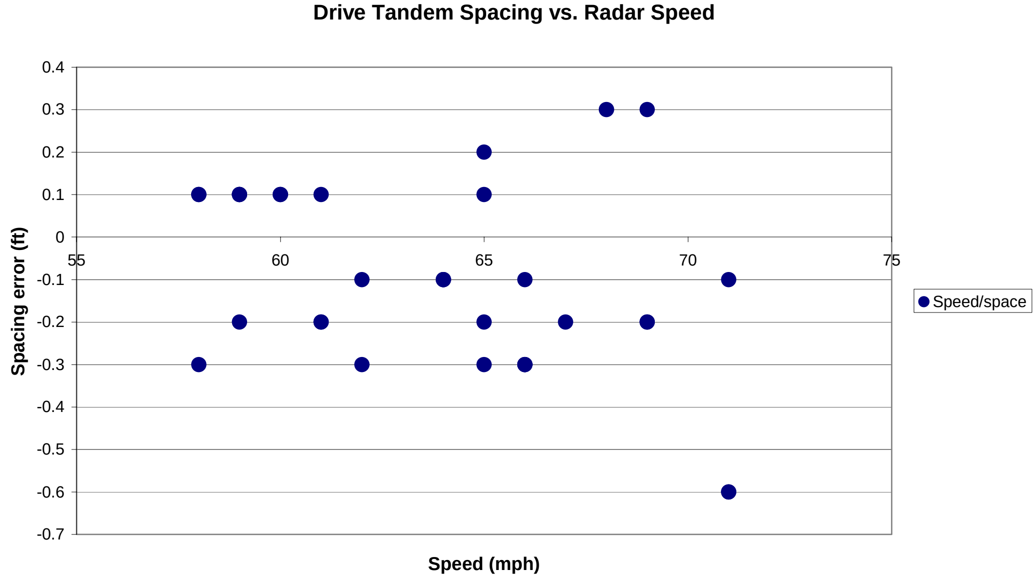

Figure 6-4 Pre-Validation Spacing vs. Speed - 480100 – 26-Apr-2005

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at temperatures less than or equal to 95 degrees Fahrenheit for Low temperature and those at temperatures greater than 95 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin - 480100 –26-Apr-2005

Element	**95% Limit**	**Low Temperature 82 to 95 °F**	**High Temperature 95 to 104 °F**
Single axles	±20 %	-1.8 ± 6.0 %	-2.9 ± 4.7 %
Tandem axles	±15 %	-0.7 ± 5.4 %	1.1 ± 7.5 %
GVW	±10 %	-0.1 ± 2.4 %	0.9 ± 4.8 %
Axle Groups	±15 %	0.4 ± 6.3 %	1.9 ± 7.5%
Speed	**±1 mph**	**1.6 ± 3.5 mph**	**2.7 ± 3.4 mph**
Axle spacing	± 0.5 ft	-0.1 ± 0.5 ft	-0.1 ± 0.4 ft

Increasing pavement temperatures appears to result in slightly increasing estimates of GVW and Axle Group weights but slightly decreases estimates of Steering Axle weights. More significantly, the variability in GVW and Axle Group weight increased when higher temperatures are experienced.

Figure 6-5 shows the distribution of GVW errors versus Temperature by Truck. This graph shows no substantive temperature effects on the performance of the WIM.

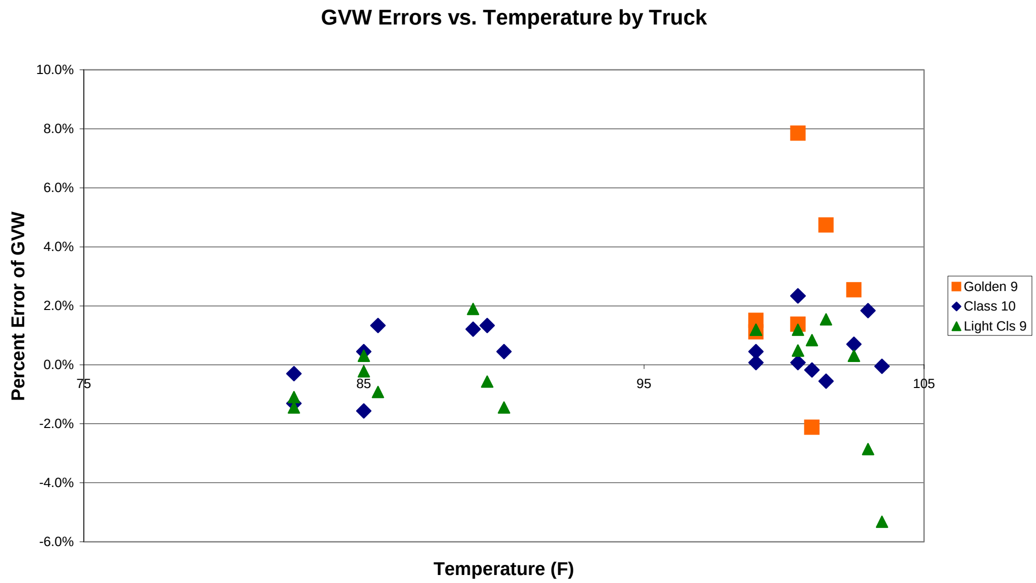

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 480100 – 26-Apr-2005

Figure 6-6 shows the relation between Steering Axle errors and Temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 10 vehicles. Steering axles tend weight errors tend to be slightly in the negative portion of the graph. Neither the central tendency nor the variability of these errors appears to be influenced by the pavement temperatures.

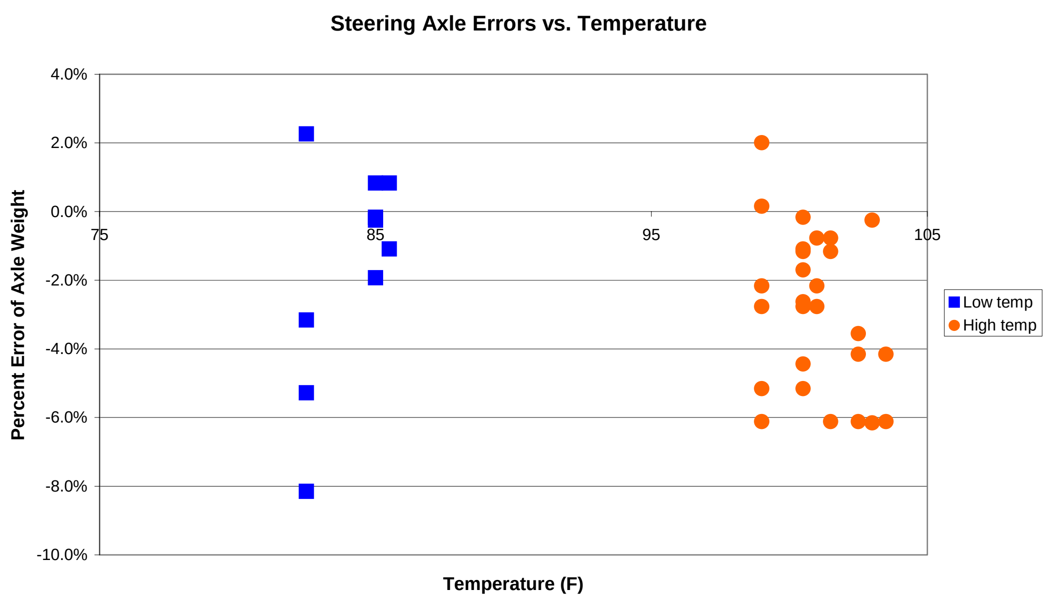

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 480100 – 26-Apr-2005

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 52 to 61 mph, Medium speed - 62-65 mph and High speed 66+ mph.

Table 6-3 Pre-Validation Results by Speed Bin - 480100 –26-Apr-2005

Element	**95% Limit**	**Low Speed 52 to 61 mph**	**Medium Speed 62 to 65 mph**	**High Speed 66 to 71 mph**
Single axles	±20 %	-2.5 ± 5.2 %	-2.1 ± 5.5 %	-3.0 ± 6.1 %
Tandem axles	±15 %	0.7 ± 4.1 %	-0.1 ± 9.2 %	0.9 ± 7.8 %
GVW	±10 %	0.5 ± 2.2 %	-0.3 ± 6.6 %	0.7 ± 3.7 %
Axle Groups	±15 %	1.5 ± 4.9 %	0.7 ± 9.4%	2.5 ± 7.7 %
Speed	±1 mph	**2.6 ± 2.6 mph**	**2.9 ± 4.2 mph**	**1.2 ± 3.6 mph**
Axle spacing	± 0.5 ft	0.3± 0.3 ft	-0.1 ± 0.3 ft	-0.1± 0.6 ft

It appears that the equipment at this site slightly underestimates Steering Axle weights and that this underestimation increases when vehicle speed increases towards the legal limit of 70 mph. The effect of Speed on Axle Group and GVW weights is mixed.

Figure 6-7 illustrates the relative stability of GVW errors through out the range.

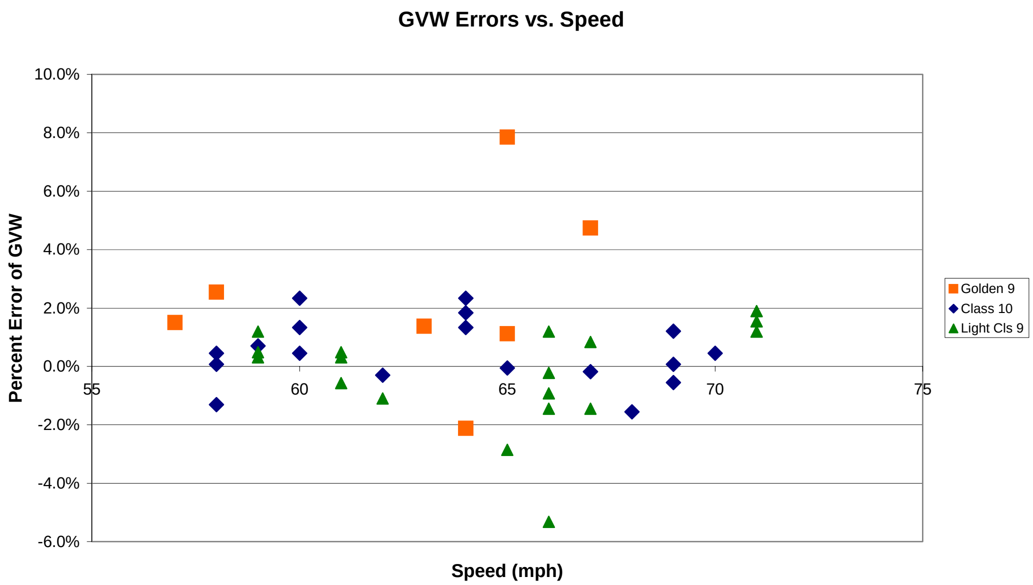

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group – 480100 – 26-Apr-2005

Figure 6-8 shows the relation between Steering Axle errors and Speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated with Class 9 and Class 10 vehicles. There is a slight tendency to increasing underestimates with increasing speed.

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 480100 –26-Apr-2005

6.3 Classification Validation

The agency uses the Texas-VI classification scheme. This scheme is described in Appendix A. Output from the classifier was converted to equivalent FHWA 13-bin values for comparison purposes. The results presented here are from manual counts compared with the classifier output for two 1-hour periods. The first was performed during the morning of April 26 and the second during the afternoon of April 27. There were no changes to any of the sensors, controller or algorithm between the two counts.

The percentage misclassified for Class 5s is based on 7 vehicles while the misclassification percentage for Class 8s is based on 3 vehicles and the Class 10 misclassification percentage is based on 4 vehicles.

Two samples of about 100 vehicles each, primarily trucks, were collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on this sample it was determined that there are no unknown vehicles and one unclassified vehicle.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. The following are the classification error rates by class:

Table 6-4 Truck Misclassification Percentages for 480100 – 26-Apr-2005

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	N/A	5	13	6	0
7	N/A				
8	40	9	5	10	25
11	0	12	0	13	N/A

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

Table 6-5 Truck Classification Mean Differences for 480100 – 26-Apr-2005

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	N/A	5	14	6	0
7	N/A				
8	67	9	-5	10	-25
11	0	12	0	13	N/A

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

7 Data Availability and Quality

As of 28 April 2005 this equipment has not produced any research quality data due to its recent installation as a secondary site. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP’s precision requirements. This is not expected to be the primary LTPP data source for research quality data. Information on data availability and quantity is part of the validation for the primary equipment, 480100.

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

Class 9s and Class 5s constitute more than 10 percent of the truck population. The graphs presented are based on the Texas VI classification scheme. In that scheme a Class 10 vehicle is equivalent to the TMG 13-bin Class 9 vehicle. Based on the data collected from the end of the post validation runs the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the RSC on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 7-1 is generated with a column for every vehicle Class 4 or higher that represents 10 percent or more of the truck (Class 4-20) population. Class 5s in the Texas VI classification scheme can correspond to Classes 3, 4 or 5 in the TMG 13-bin class scheme. Class 5s vehicles are therefore excluded. In creating Table 7-1 the following definitions are used:

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

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

Table 7-1 GVW Characteristics of Major sub-groups of Trucks - 480199 –26-Apr-2005

Characteristic	Texas VI Class 10
Percentage Overweights	0%
Percentage Underweights	0%
Unloaded Peak	38,000 lbs
Loaded Peak	78,000 lbs
Peak	68,000 to 72,000 lbs.

The expected percentage of unclassified vehicles is 2. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-3. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. Figure 7-1 through Figure 7-2 should however provide a sense of the statistics expected when SPS comparison data is computed for the post-validation Sheet 16, utilizing the agency's classification scheme. Figure 7-2 reflects the expected distribution for traffic data as collected prior to conversion to a TMG format. Speed data is not part of SPS comparison results.

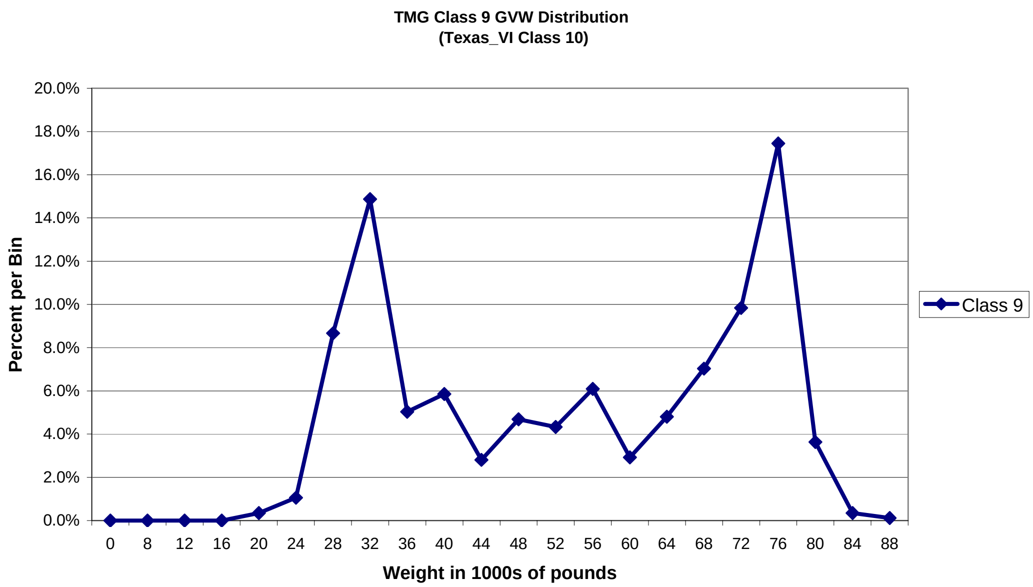

Figure 7-1 Expected GVW Distribution Texas VI Class 9 (TMG Class 9) – 480100 –26-Apr-2005

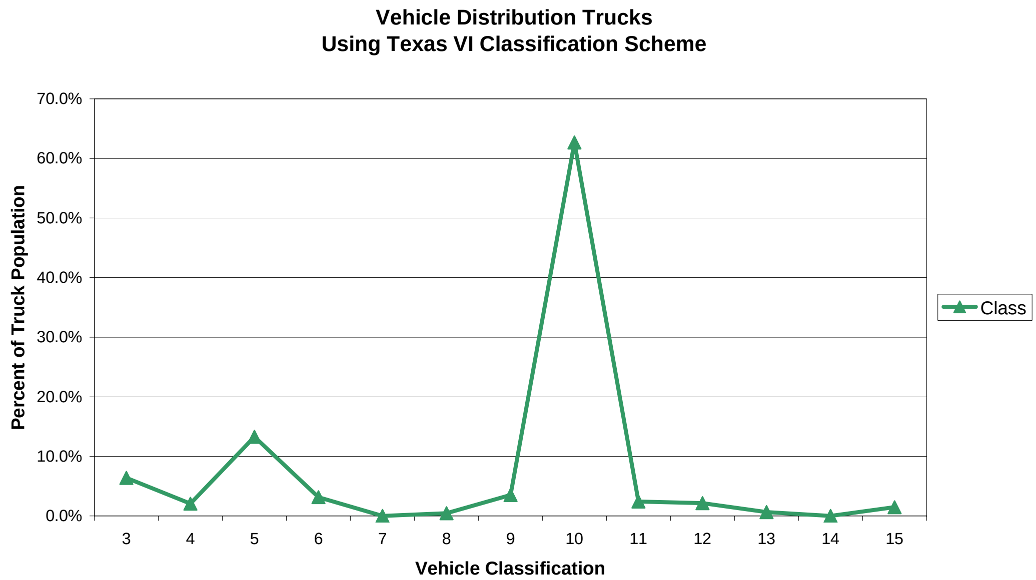

Figure 7-2 Expected Vehicle Distribution Using Texas VI Classification Scheme- 480100 – 26-Apr-2005

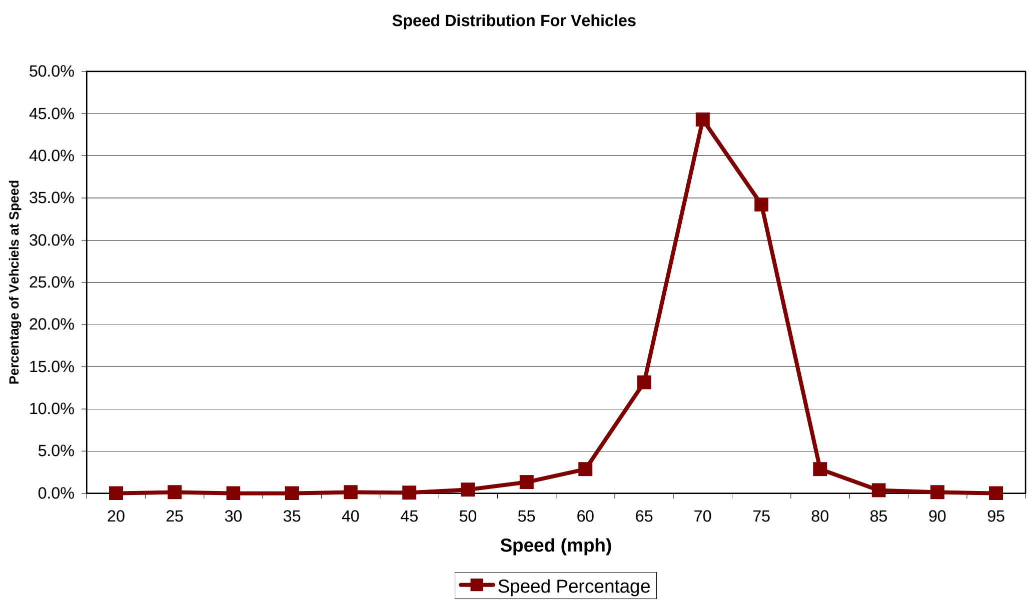

Figure 7-3 Expected Speed Distribution - 480100 –26-Apr-2005

8 Data Sheets

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

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 3S3 loaded walking beam and air suspension (4 pages)
Sheet 19 – Truck 3 – 3S2 loaded air and leaf spring suspension (4 pages)

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

Sheet 21 – Pre-Validation (3 pages)
Sheet 21 – Post-Validation (2 pages)

Test Truck Photographs – (8 pages)

Texas IV Classification Scheme (11 pages)

9 Updated handout guide and Sheet 17

A copy of the post visit handout has been included following page 26. It includes a current Sheet 17 that was completed during the validation visit along with all applicable maps and photographs. Changes include the addition of the truck route and a change of the scales. The scale at Love's Country Store was inoperable during the testing period so an alternate certified scale at the Edinburg truck stop was used. This scale is located immediately across US 281 from the location listed for Love's Country Store.

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information. Since no changes were made to the calibration of this equipment during the course of this validation, the pre and post-calibration Sheet 16 information is the same.

POST-VISIT HANDOUT GUIDE FOR SPS WIM VALIDATION

STATE: Texas

SHRP ID: 480100

1. General Information 1
2. Contact Information 1
3. Agenda 1
4. Site Location/ Directions 2
5. Truck Route Information 4
6. Sheet 17 – Texas (480100) 6

Figures

Figure 3-1 - Briefing Location ... 2
Figure 4-1 - Site 4810100 in Texas ... 3
Figure 5-1 - Truck Route at 480100 in Texas ... 4
Figure 5-2 - Truck Scale Location for 480100 in Texas ... 5
Figure 6-1 – Sketch of Equipment Layout - 480100 in Texas ... 9
Figure 6-2 - Site Map 480100 in Texas ... 9

Photos

Photo 6-1 - TO_9_48_2.48_100_Downstream.JPG ... 10
Photo 6-2 - TO_9_48_2.48_100_Upstream.JPG ... 10
Photo 6-3 - TO_9_48_2.48_100_Cabinet_Exterior.JPG ... 11
Photo 6-4 - TO_9_48_2.48_100_Cabinet_Interior.JPG ... 11
Photo 6-5 - TO_9_48_2.48_100_Power_Service_Box.JPG ... 12
Photo 6-6 - TO_9_48_2.48_100_Telephone_Box.JPG ... 12
Photo 6-7 - TO_9_48_2.48_100_Telephone_Service_Box.JPG ... 13
Photo 6-8 - TO_9_48_2.48_100_Leading_Loop.JPG ... 13
Photo 6-9 - TO_9_48_2.48_100_Leading_Bending_Plate.JPG ... 14
Photo 6-10 - TO_9_48_2.48_100_Trailing_Loop.JPG ... 14
Photo 6-11 - TO_9_48_2.48_100_Trailing_Bending_Plate.JPG ... 15
Photo 6-12 - TO_9_48_2.48_100_Pull_Box.JPG ... 15
Photo 6-13 - TO_9_48_2.48_100_Asphalt_to_Concrete_Transition.JPG ... 16
Photo 6-14 - TO_9_48_2.48_100_Grinding_Start ... 16
Photo 6-15 - TO_9_48_2.48_100_Transverse_Crack.JPG ... 17

1. General Information

SITE ID: *480100*

LOCATION: *US 281 South, 9.1 Miles North of State Route 186*

VISIT DATE: *April 26 through April 28, 2005*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*
Randy Plett, 775-825-5885, rwplett@mactec.com

Highway Agency: *James Neidigh, 512-465-7657, JNeidigh@dot.state.tx.us*

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

FHWA Division Office Liaison: *Jim Travis, 512-536-5922, james.travis@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *April 25, 2005, 6:30 pm in the lobby of the La Quinta Inn & Suites Rio Grande Valley, located at 4603 North Cage Blvd., Pharr, TX 78577*

ON-SITE PERIOD: *Beginning April 26 through April, 28, 2005.*

TRUCK ROUTE CHECK: *Completed while on site.*

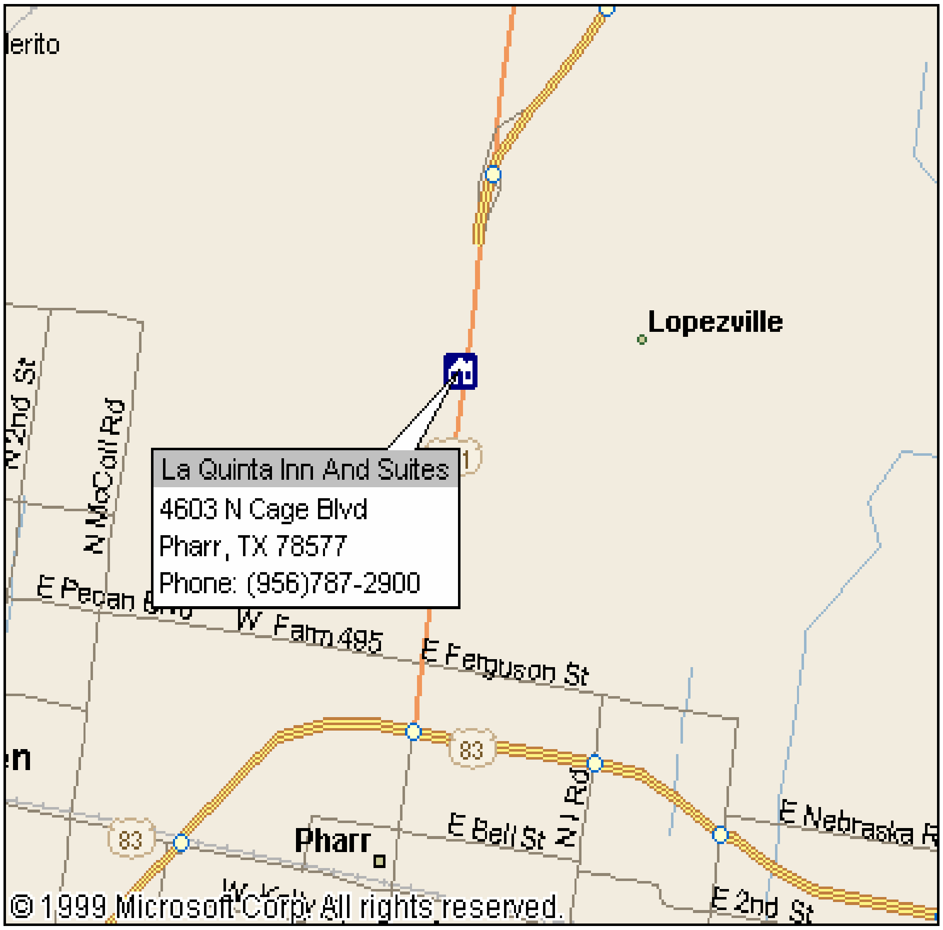

Figure 3-1 - Briefing Location

4. Site Location/ Directions

NEAREST AIRPORT: *McAllen International Airport, McAllen, Texas.*

DIRECTIONS TO THE SITE: *9.1 Miles North of State Route 186, approximately 30 miles north of Pharr, Texas.*

MEETING LOCATION: B*eginning at 8 a.m., April 26, 2005.*

WIM SITE LOCATION: *US 281 South, 9.1 Miles North of State Route 186 (Latitude: 26.6860; Longitude: -98.1147)*

WIM SITE LOCATION MAP:

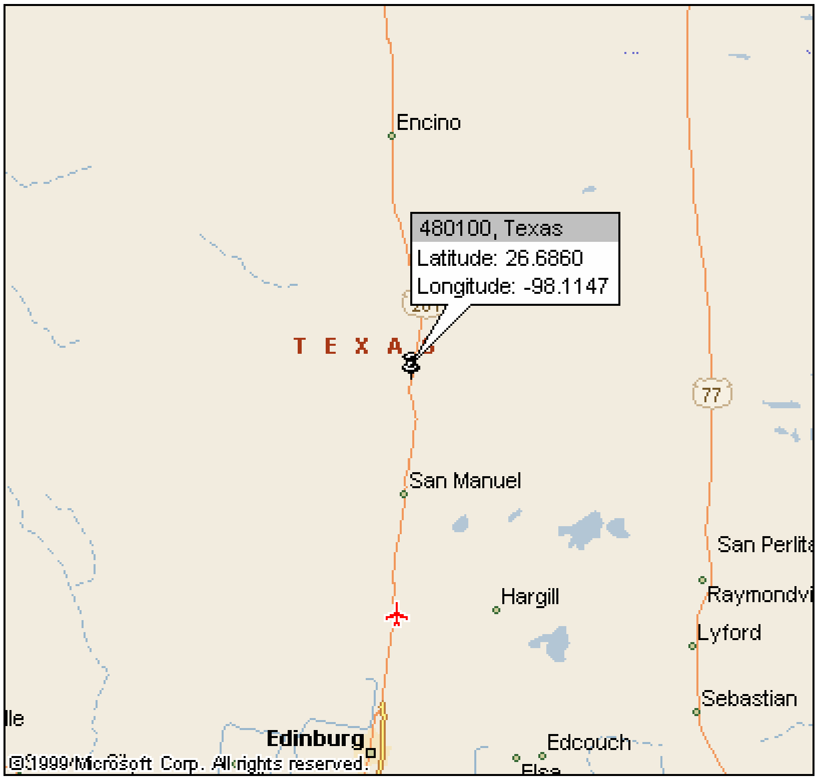

Figure 4-1 - Site 4810100 in Texas

5. Truck Route Information

ROUTE RESTRICTIONS: *None.*

SCALE LOCATION: *Edinburg Truck Stop, HWY 281, Edinburg, Texas 78539; Phone – (956) 383-0788; Lat: 26.45269, Long: -98.13128*

TRUCK ROUTE:

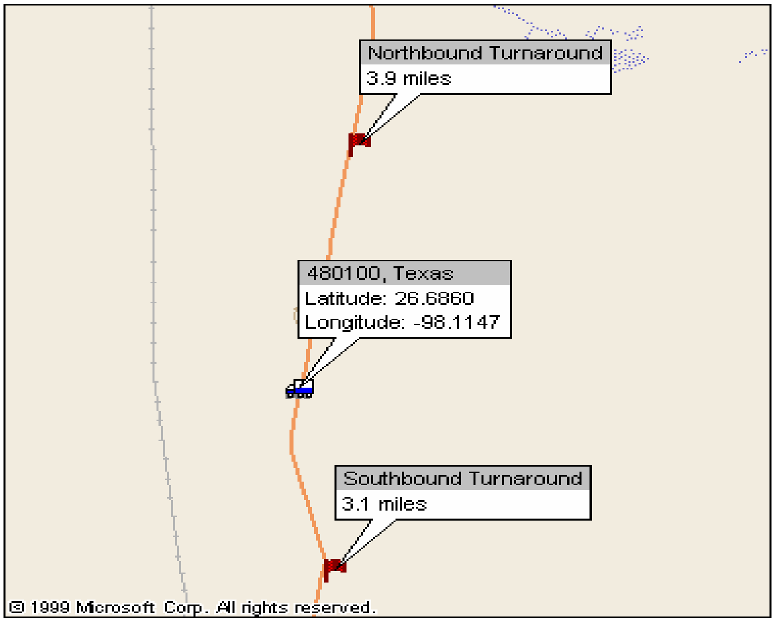

Figure 5-1 - Truck Route at 480100 in Texas

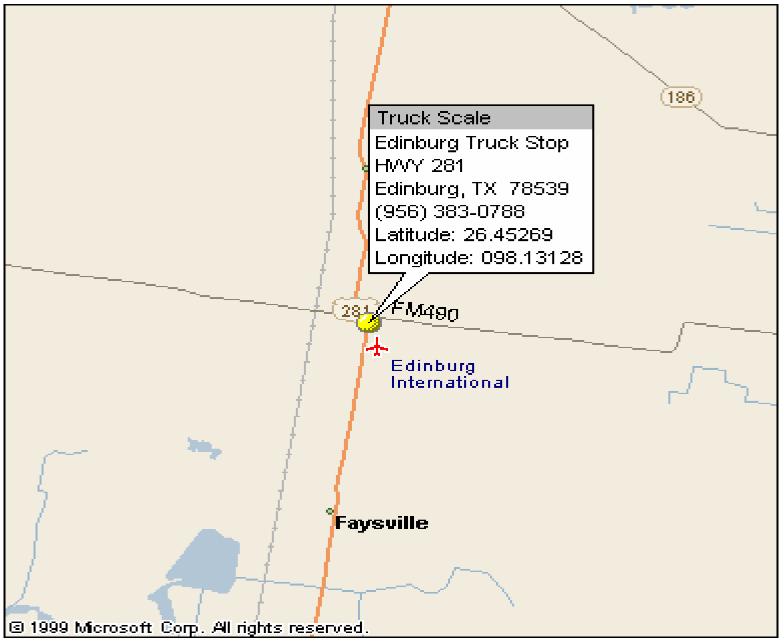

Figure 5-2 - Truck Scale Location for 480100 in Texas

6. Sheet 17 – Texas (480100)

1.* ROUTE ___US 281____ 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 __4_8_0_1_6_6__
Distance from sensor to nearest upstream SPS Section ____1_6_5_3______ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction _2___ Lane width __1_2__ ft

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

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

Shoulder width _1_0_ ft

4.* PAVEMENT TYPE ___Portland Concrete Cement______________________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date 4/26/05_Photo_TO_9_48_2.48_100_Asphalt_to_Concrete_Transition.JPG
Date _4/26/05_Photo__TO_9_48_2.48_100_Grinding_Start.JPG ______
Date _4/26/05_Photo__ TO_9_48_2.48_100_Transverse_Crack.JPG____

6. * SENSOR SEQUENCE _____Loop – Bending Plate – Loop – Bending Plate_____

7. * REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __

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

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

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

10. * CABINET LOCATION

Same side of road as LTPP lane Y / N Median Y/ N Behind barrier Y / N

Distance from edge of traveled lane _6_8__ ft

Distance from system __8_0__ ft

TYPE _____M_________________________

CABINET ACCESS controlled by LTPP / STATE / JOINT

Contact - name and phone number _Jim Neidigh_____________________

Alternate - name and phone number _Mike Lloyd____________________

11. * POWER

Distance to cabinet from drop __8_5_5____ ft Overhead / underground / solar / AC in cabinet?

Service provider ____________________ Phone number _________________

12. * TELEPHONE

Distance to cabinet from drop ___1___ ___ ft overhead / under ground / cell?

Service provider ___ Valley Telephone __ Phone Number __(800) 292-7596___

13.* SYSTEM (software & version no.)- ____DAW-190______________

Computer connection – RS232 / Parallel port / USB / Other_______________

14. * TEST TRUCK TURNAROUND time __1_0__ minutes DISTANCE _6_._0_ mi.

15. PHOTOS FILENAME

Power source __ TO_9_48_2.48_100_Power_Service_Box.JPG _______

Phone source __ TO_9_48_2.48_100_Telephone_Service_Box.JPG ____

Cabinet exterior _ TO_9_48_2.48_100_Cabinet_Exterior.JPG____________

Cabinet interior __ TO_9_48_2.48_100_Cabinet_Interior.JPG ___________

Weight sensors __ TO_9_48_2.48_100_Leading_Bending_Plate.JPG _____

___ TO_9_48_2.48_100_Trailing_Bending_Plate.JPG

Classification sensors ____

Other sensors ______________________________

Description _Pull Box - TO_9_48_2.48_100_Pull_Box.JPG __________________

Downstream direction at sensors on LTPP lane _ TO_9_48_2.48_100_Downstream.JPG

Upstream direction at sensors on LTPP lane _ TO_9_48_2.48_100_Upstream.JPG ____

COMMENTS _______GPS Coordinates: Latitude: 26.6860; Longitude -98.1147______
_ Posted speed limit – 70 mph
________Amenities:

COMPLETED BY ____Dean J. Wolf______________________________

PHONE __(301) 210-5105_____________ DATE COMPLETED ___04/25/2005____

Sketch of equipment layout

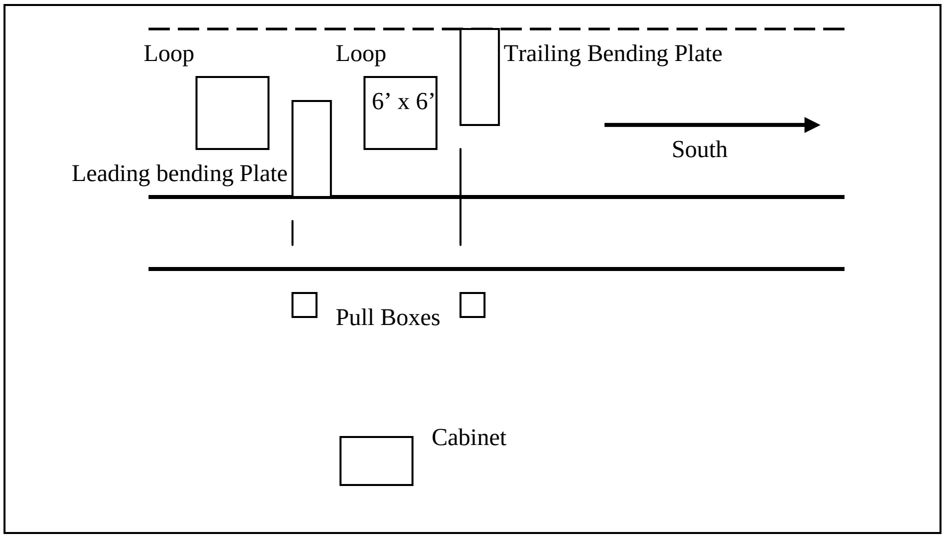

Figure 6-1 – Sketch of Equipment Layout - 480100 in Texas

Site Map

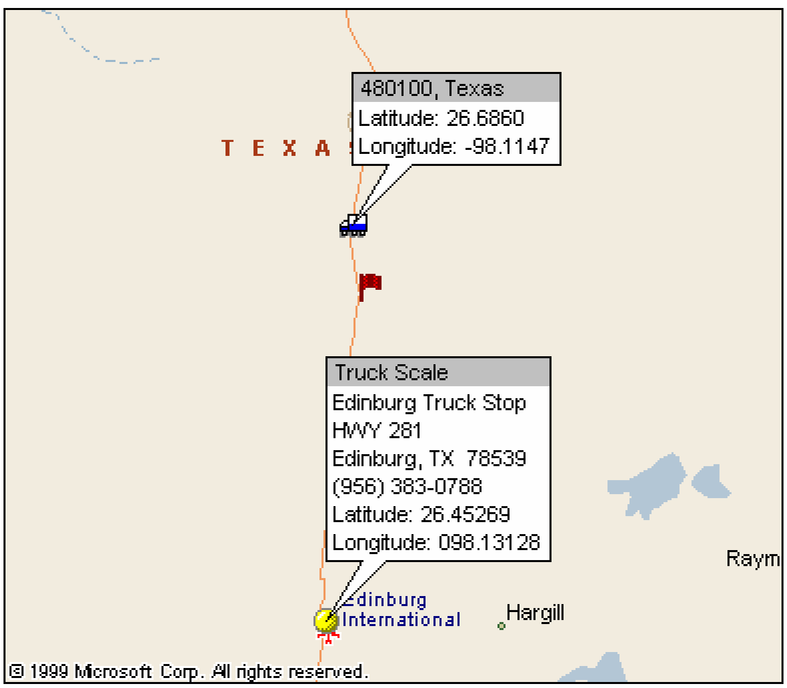

Figure 6-2 - Site Map 480100 in Texas

Photo 6-1 - TO_9_48_2.48_100_Downstream.JPG

Photo 6-2 - TO_9_48_2.48_100_Upstream.JPG

Photo 6-3 - TO_9_48_2.48_100_Cabinet_Exterior.JPG

Photo 6-4 - TO_9_48_2.48_100_Cabinet_Interior.JPG

Photo 6-5 - TO_9_48_2.48_100_Power_Service_Box.JPG

Photo 6-6 - TO_9_48_2.48_100_Telephone_Box.JPG

Photo 6-7 - TO_9_48_2.48_100_Telephone_Service_Box.JPG

Photo 6-8 - TO_9_48_2.48_100_Leading_Loop.JPG

Photo 6-9 - TO_9_48_2.48_100_Leading_Bending_Plate.JPG

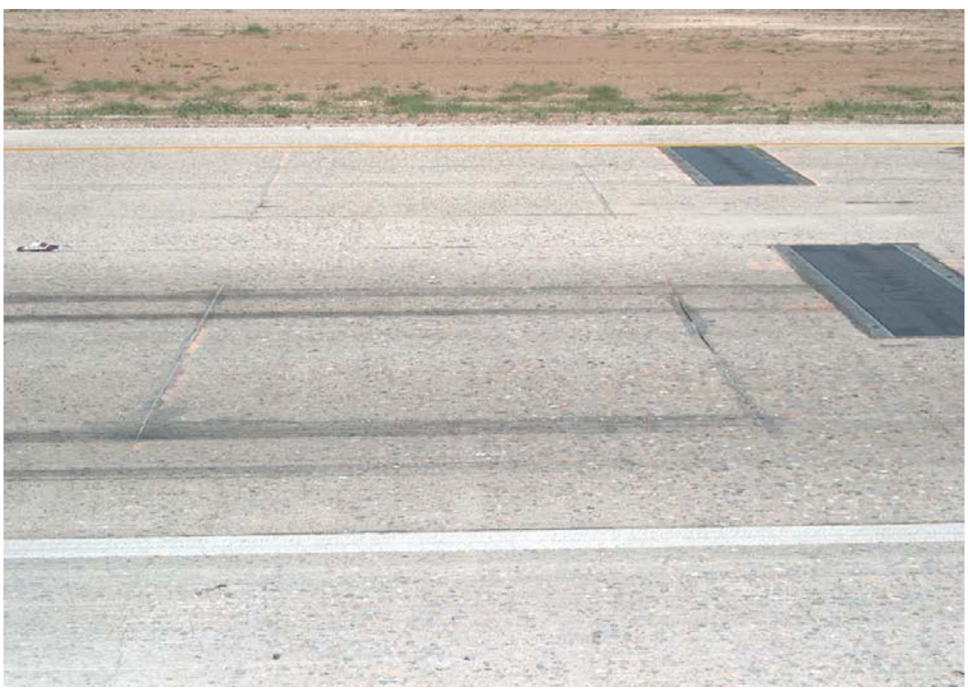

Photo 6-10 - TO_9_48_2.48_100_Trailing_Loop.JPG

Photo 6-11 - TO_9_48_2.48_100_Trailing_Bending_Plate.JPG

Photo 6-12 - TO_9_48_2.48_100_Pull_Box.JPG

Photo 6-13 - TO_9_48_2.48_100_Asphalt_to_Concrete_Transition.JPG

Photo 6-14 - TO_9_48_2.48_100_Grinding_Start

Photo 6-15 - TO_9_48_2.48_100_Transverse_Crack.JPG

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [01 00]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04 / 25 / 2005

Rev. 05/25/04

1. DATA PROCESSING –
   a. Down load –
      - ☒ State only
      - ☐ LTPP read only
      - ☐ LTPP download
      - ☐ LTPP download and copy to state
   b. Data Review –
      - ☒ State per LTPP guidelines
      - ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      - ☐ LTPP
   c. Data submission –
      - ☐ State – ☐ Weekly ☐ Twice a month ☐ Monthly ☒ Quarterly
      - ☐ LTPP
2. EQUIPMENT –
   a. Purchase –
      - ☒ State
      - ☐ LTPP
   b. Installation –
      - ☐ Included with purchase
      - ☐ Separate contract by State
      - ☒ State personnel
      - ☐ LTPP contract
   c. Maintenance –
      - ☐ Contract with purchase – Expiration Date _______
      - ☐ Separate contract LTPP – Expiration Date _______
      - ☐ Separate contract State – Expiration Date _______
      - ☒ State personnel
   d. Calibration –
      - ☐ Vendor
      - ☒ State
      - ☐ LTPP
   e. Manuals and software control –
      - ☒ State
      - ☐ LTPP
   f. Power –
      i. Type –
         - ☐ Overhead
         - ☒ Underground
         - ☐ Solar

      ii. Payment –
         - ☒ State
         - ☐ LTPP
         - ☐ N/A

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [01_00]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04/25/2005

Rev. 05/25/04

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

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

4. ON SITE ACTIVITIES –
   a. WIM Validation Check - advance notice required 6 ☐ days ☒ weeks
   b. Notice for straightedge and grinding check - 6 ☐ days ☒ weeks
      i. On site lead –
         ☒ State
         ☐ LTPP
      ii. Accept grinding –
         ☒ State
         ☐ LTPP
   c. Authorization to calibrate site –
      ☒ State only
      ☐ LTPP
   d. Calibration Routine –
      ☐ LTPP – ☐ Semi-annually ☐ Annually
      ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
      ☒ State other – 4 per year

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0 1 _ 0 0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 0 4 / 2 5 / 2 0 0 5

Rev. 05/25/04

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State ☐ LTPP HALE BOYS ☒
      2nd – ______ ☒ State ☐ LTPP
      3rd – ______ ☒ State ☐ LTPP
      4th – ______ ☐ State ☐ LTPP
   ii. Loads – ☒ State 2+3 ☐ LTPP
   iii. Drivers – ☒ State 2+3 ☐ LTPP

f. Contractor(s) with prior successful experience in WIM calibration in state:
~~HALE~~ ~~BOYS~~ IRD / ECM

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

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

i. Traffic Control Required – ☐Yes ☒No

j. Enforcement Coordination Required – ☐Yes ☒No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – STATE + POOLED FUND
   b. Reports – ______
   c. Other – ______
   d. Special Conditions – ______

6. CONTACTS –
   a. Equipment (operational status, access, etc.) –
      Name: JIM Phone: ______
      Agency: TXDOT

SHEET 18	STATE CODE [48]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0100]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 04/25/2005

Rev. 05/25/04

b. Maintenance (equipment) –

Name: JIM Phone: ______

Agency: ______

c. Data Processing and Pre-Visit Data –

Name: JIM Phone: ______

Agency: ______

d. Construction schedule and verification –

Name: JIM Phone: ______

Agency: ______

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

Name: JIM Phone: ______

Agency: ______

f. Traffic Control –

Name: JIM Phone: ______

Agency: ______

g. Enforcement Coordination – N/A

Name: ______ Phone: ______

Agency: ______

h. Nearest Static Scale

Name: TA Location: 22 MILES SOUTH - EDINBURG

Phone: ______

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [4_ _8] *SHRP SECTION ID [_0 _1 _0 _0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_4 __ / _2 _6 / _2 _0 _0 _5]

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

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

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

5. EQUIPMENT MANUFACTURER ___PAT____

WIM SYSTEM CALIBRATION SPECIFICS**

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

__ __ __ NUMBER OF TRUCKS COMPARED __ __ _3 NUMBER OF TEST TRUCKS USED

__ _14__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	____9___	__________1________
2	__10____	__________1_______
3	____9___	__________2________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ __ _0_ . _5 STANDARD DEVIATION __ _2 . _0
DYNAMIC AND STATIC SINGLE AXLES ___ _-_ __2 . _5 STANDARD DEVIATION __ _2 . _5
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _0_ . 5_ STANDARD DEVIATION __ _3 . _4

8. ___ _3_ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _58-61,_62-65,_66-70_____ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ ___2_6_0_0__ ___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 __- 5__ ____ FHWA CLASS ____ ____ ____ ____ ____
*** FHWA CLASS 8 ____ ____ ____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ____ . _0__

PERSON LEADING CALIBRATION EFFORT: ___Randy Plett____
CONTACT INFORMATION: ____775-875-5885____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [4_ _8] *SHRP SECTION ID [_0 _1 _0 _0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0 _4 / _2 _7 / _2 _0 _0 _5]

2. * TYPE OF EQUIPMENT CALIBRATED __ WIM __ CLASSIFIER __X BOTH

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
__X_ OTHER (SPECIFY) ___SPS WIM pooled fund validation___________________________________

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

5. EQUIPMENT MANUFACTURER ____PAT____

WIM SYSTEM CALIBRATION SPECIFICS**

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

__ __ __ NUMBER OF TRUCKS COMPARED __ __ _3 NUMBER OF TEST TRUCKS USED

__ _1 8_ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	____9__	__________1________
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	___10___	__________1________
3 - OTHER (DESCRIBE)	3	____9___	__________1________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___ __1 . 4_ STANDARD DEVIATION __ _1 . 9_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _-4 . 9_ STANDARD DEVIATION __ _3 . 1_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ __1 . 8_ STANDARD DEVIATION __ _3 . 3_

8. ___ _3__ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ___58-61_____ __62-65______ _66-70 ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ ___2_6_0_0__ ___

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ ______-_ FHWA CLASS _5__ ____ ___ __-13____
*** FHWA CLASS 8 ____ ____ ____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ____ . _0__

PERSON LEADING CALIBRATION EFFORT: ____Randy Plett____
CONTACT INFORMATION: ____775-825-5885_____________________________________ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE APRIL 26/2005

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		11070	10800	D / C
B		16200	16210	D / C
C		16200	16210	D / C
D		17090	16950	D / C
E		17090	16950	D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW UNK

*b) Average Pre-Test Loaded weight ~~77620~~ 77650

*c) Post Test Loaded Weight ~~77140~~ 76830

*d) Difference Post Test – Pre-test ~~-480~~ -820

GEOMETRY

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

9. a) * Make: FREIGHTLINER b) * Model: UNK

10.* Trailer Load Distribution Description:

METAL WEIGHTS NEAR CENTER OF THE TRAILER

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

b). Trailer Tare Weight (units): unk

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 1	* DATE 4/26/05

Rev. 08/31/01

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

A to B 16'3" B to C 4'3" C to D 30'5"

D to E 4'2" E to F ______

Wheelbased (measured A to last) ______ Computed 55' 1"

13. *Kingpin Offset From Axle B (units) 2'2" (______)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	LEAF SPRING - 2 LEAVES
B	275/80R22.5	AIR
C	295/75R22.5	"
D	235/75 R17.5	AIR
E	"	"
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK #__	* DATE 4/26/05

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK #__	* DATE 4/26/05

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 1st day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11100	16190	16190	17090	17090		77660
2	11080	16190	16190	17080	17080		77620
3	11020	16230	16230	17090	17090		77660
Average	~~11400~~ 11070	16200	16200	17090	17090		77650

1st day post 77140

Table 6. Raw data – Axle scales – pretest 2nd day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1 ~~post test 1st day~~							77040
2							77040
3 ~~post test 2nd day~~							76960
Average							77010

Table 7. Raw data – Axle scales – ~~post~~ post-test 2nd day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10540	16190	16190	16960	16960		76840
2	10480	16220	16220	16950	16950		76820
3	10480	16220	16220	16950	16950		76820
Average	10500	16210	16210	16950	16950		76830

Measured By RP Verified By ____

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE APR 26 / 2005

Rev. 08/31/01

PART I.

1.* FHWA Class 10   2.* Number of Axles 6   ~~(OPERATED WITH REAR AXLE LIFTED)~~

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		12140	~~11960~~ ~~12050~~ 11720	D / C
B		13900	~~13750~~ ~~13820~~ 13780	D / C
C		13900	~~13750~~ ~~13820~~ 13780	D / C
D		~~13500~~ 13200	~~13520~~ ~~13180~~ 13150	D / C
E		~~13500~~ 13200	~~13510~~ ~~13180~~ 13150	D / C
F		~~13000~~ 13600	~~13010~~ ~~13580~~ 13550	D / C

GVW (same units as axles)

7. a) Empty GVW UNK

*b) Average Pre-Test Loaded weight 79940

*c) Post Test Loaded Weight ~~79500~~ ~~79630~~ 79140

*d) Difference Post Test – Pre-test ~~-440~~ ~~-310~~ -800

GEOMETRY

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

9. a) * Make: STERLING   b) * Model: UNK

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS + BARRIER

CENTERED ON TRAILER

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

b). Trailer Tare Weight (units): UNK

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE 4/26/05

Rev. 08/31/01

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

A to B 13' 8"   ~~B~~ B to C ~~18~~ 4' 5"   C to D ~~19'3" + 12'8"~~ 31' 11"

D to E 9' 2"   E to F 9' 2"

Wheelbased (measured A to last) ________   Computed 58' 4"

13. *Kingpin Offset From Axle B (units) 13" (________)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	LEAF SRING - 8 LEAVES
B	"	WALKING BEAM
C	"	"
D	255/70-22.5	AIR BAG
E	"	"
F	"	"

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE 4/26/05

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 2	* DATE 4/26/05

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 1st day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12140	13900	13900	13200	13200	13600	79940
2	12120	13910	13910	13200	13200	13600	79940
3	12160	13890	13890	13200	13200	13600	79940
Average	12140	13900	13900	13200	13200	13600	79940

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1 day 1 post	11960	13750	13750	13210	13210	13610	79500
2							
3 day 2 post	11720	13780	13780	13150	13150	13550	79140
Average							

Table 7. Raw data – Axle scales – ~~post~~ pre-test 2nd day

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12180	13750	13750	13190	13190	13590	79640
2	12020	13850	13850	~~13850~~ 13170	13170	13570	79640
3	11960	13870	13870	13170	13170	13570	79600
Average	12050	13820	13820	13180	13180	13580	79630

Measured By RP Verified By ____________

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 3	* DATE APRIL 26 / 2005

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		10170	~~9900~~ ~~10100~~ 9860	D / C
B		12110	~~12090~~ ~~12210~~ 12160	D / C
C		12110	~~12090~~ ~~12210~~ 12160	D / C
D		11300	~~11270~~ ~~11260~~ 11240	D / C
E		11300	~~11270~~ ~~11260~~ 11240	D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW unk

*b) Average Pre-Test Loaded weight 56990

*c) Post Test Loaded Weight ~~56620~~ ~~57050~~ 56660

*d) Difference Post Test – Pre-test ~~-370~~ ~~+60~~ -300

GEOMETRY

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

9. a) * Make: FREIGHTLINER b) * Model: FL 112

10.* Trailer Load Distribution Description:

CONCRETE BLOCKS LOADED OVER THE DRIVE AND TRAILER TANDEM AXLE GROUPS

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

b). Trailer Tare Weight (units): unk

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 3	* DATE 4/26/05

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths 32' 5'

A to B 12' 1" B to C ~~13'~~ 4'5" C to D ~~16' 10" + 15' 7"~~

D to E 4' 1" E to F ~~16' 10" + 19' 8"~~

Wheelbased (measured A to last) ~~53'~~ 0" Computed 53' 0"

13. *Kingpin Offset From Axle B (units) 15" (______)
(+ is to the rear)

SUSPENSION

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

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

40000
26400
13600

Sheet 19	* STATE_CODE 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 3	* DATE 4/26/05

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 48
LTPP Traffic Data	* SPS PROJECT ID 0100
*CALIBRATION TEST TRUCK # 3	* DATE 4/26/05

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	10160	12120	12120	11290	11290		56980
2	10260	12040	12040	11320	11320		56980
3	10100	12170	12170	11280	11280		57000
Average	10170	12110	12110	11300	11300		~~57000~~ 56990

Table 6. Raw data – Axle scales –

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1 post day 1	9900	12090	12090	11270	11270		56620
2							
3 post day 2	9860	12160	12160	11240	11240		56660
Average							

Table 7. Raw data – Axle scales – ~~post~~ pre-test day 2

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10080	12210	12210	11270	11270		57040
2	10120	12220	12220	11250	11250		57060
3	10100	12200	12200	11270	11270		57040
Average	10100	12210	12210	11260	11260		57050

Measured By hf Verified By ______________________

SB

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 2	* DATE 04/26/2005

Rev. 08/31/2001….

PRE-CALIBRATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
~~23~~	~~10~~	~~1400~~	~~6~~	~~9~~	70	10	1611	68	9
67	10	1414	70	9	75	5	1619	79	5
65	10	1419	66	9	73	10	1624	71	9
68	5	1425	66	3	70	6	1629	69	6
75	10	1430	73	9	70	5	1644	70	3
65	5	1432	64	5	70	10	1647	68	9
73	3	1439	72	3	65	13	1659	64	12
68	10	1483	67	9	57	3	1669	56	3
67	10	1494	65	9	~~—~~	~~—~~	~~1674~~		
68	10	1497	67	9	68	11	1678	70	10
75	3	1505	71	3	67	10	1689	65	9
57	2	1515	55	2	56	5	1694	54	5
73	10	1517	70	9	55	5	1696	55	5
70	10	1521	69	9	70	10	1702	69	9
68	10	1525	67	9	73	3	1708	71	3
73	9	1538	71	8	75	10	1733	73	9
75	10	1595	73	9	73	10	1738	70	9
65	10	1548	64	9	65	10	1748	65	9
68	10	1560	67	9	67	10	1759	65	9
73	5	1565	70	5	75	10	1778	72	9
73	10	1575	70	9	70	10	1803	68	9
67	10	1583	65	9	63	9	1823	67	9
55	3	1592	53	3	57	15	1827	57	10 — SHORT TANDEM
73	5	1604	71	3	65	3	1836	63	3
73	10	1610	71	9	63	2	1839	63	2

Recorded by ______ Direction S Lane 4 Time from ______ to ______

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 04/26/2005

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
63	10	1852	61	9	65	10	2118	63	9
73	3	1857	72	3	63	10	2119	60	9
63	10	1864	62	9	~~62~~	~~10~~	~~2~~		
65	3	1871	68	3	73	10	2132	72	9
65	3	1887	69	3	55	5	2139	55	5
67	10	1914	65	9	68	10	2143	67	9
68	10	1927	67	9	67	10	2146	66	9
65	10	1936	64	9	67	10	2147	65	9
73	10	1954	71	9	70	10	2150	68	9
73	10	1958	70	9	73	5	2151	69	3
77	6	1967	75	9	67	10	2152	65	9
68	12	1995	67	11	70	5	2155	68	3
70	12	2012	69	11	67	2	2156	68	2
70	10	2015	69	9	70	10	2162	69	9
63	11	2029	64	10	70	9	2163	69	8
73	10	2048	71	9	68	3	2175	67	3
77	5	2052	75	5	73	10	2188	70	9
73	3	2059	75	3	70	8	2195	69	8
70	10	2063	68	9	68	10	2200	69	9
70	10	2064	68	9	55	10	2206	54	9
60	3	2080	58	3	73	10	2210	71	9
68	11	2092	70	10	63	2	2214	74	2
63	9	2095	64	9	75	2	2215	75	3
77	10	2099	74	9	75	10	2219	73	9
67	10	2?	65	9	75	10	2229	73	9

Recorded by ________ Direction S Lane 4 Time from ________ to ________

68	2	2243	69	2	
67	2	2254	67	2	CONT.
62 ~~62~~	~~2~~	~~2256~~	~~66~~	~~2~~	OVER
68	10	2258	68	9	

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 2	* DATE 04/28/2005

Rev. 08/31/2001…. POST CALIBRATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
68	10	5800	67	9	70	10	5955	70	9
75	10	5806	73	9	75	3	5974	73	3
58	10	5807	60	9	68	10	5983	68	9
68	10	5820	67	9	60	10	5984	65	9
66	10	5823	66	9	70	5	5988	69	3
53	3	5825	53	2	70	2	5993	71	2
60	10	5827	59	9	65	2	6000	68	2
61	5	5832	62	5	70	10	6002	68	9
77	3	5843	78	3	68	10	6003	68	9
61	10	5846	57	9	63	10	6004	63	9
72	10	5849	70	9	72	10	6010	71	9
72	3	5851	72	3	70	10	6011	71	9
75	2	5858	76	3	66	10	6015	65	9
61	3	5863	60	3	65	3	6024	69	3
60	5	5869	60	5	70	3	6026	69	3
66	10	5870	65	9	66	10	6030	66	9
79	2	5886	80	2	66	3	6036	65	3
68	2	5888	67	9	66	2	6040	68	2
70	5	5892	69	5	72	2	6041	73	2
72	10	5907	69	9	70	10	6054	69	9
66	10	5916	65	9	68	2	6057	70	2
70	2	5920	70 ~~65~~	2	63	3	6060	63	3
70	3	5923	69	3	70	3	6061	69	3
70	10	5924	68	9	65	10	6065	64	9
63	2	5926	63	3	63	4	6067	62	5

Recorded by ________ Direction S Lane 4 Time from 3:38pm to 4:09

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 04/26/2005

Rev. 08/31/2001….

POST CALIBRATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
75	6	6076	71	6	72	3	6214	71	3
65	10	6081	63	9	68	3	6218	67	5
66	10	6085	65	9	72	2	6220	74	2
57	5	6087	65	3	75	10	6221	73	9
65	5	6088	65	3	68	3	6222	74	3
70	10	6093	70	9	77	3	6223	72	3
63	10	6102	62	9	70	9		71	9
68	9	6104	62	8	72	10	6226	72	9
60	5	6109	60	5	66	10	6227	72	9
66	4	6112	70	5	66	10	6230	66	9
68	10	6117	69	9	72	10	6232	70	9
70	2	6122	70	2	66	2	6236	69	2
63	10	6126	61	9	70	10	6241	69	9
	10+5		62	13	65	10	6243	64	9
63	11+5		62	13	66	3	6251	67	3
66	11+5		65	13	70	10	6255	69	9
72	11+5		65	13	53	8	6257	56	5
70	10	6171	70	9	66	10	6260	65	9
72	5	6181	70	3	60	10	6261	59	9
77	10	6188	74	9	79	5	6276	78	3
61	6	6194	61	6	72	10	6279	69	9
70	10	6195	69	9	70	4	6280		4
70	3	6205	68	3	66	10	6280	65	9
72	3	6210	71	3	66	2			2
75	2	6212	72	2	68	3		70	3

9 axles conc beams class 11+5

Recorded by ______ Direction ______ Lane ______ Time from 4:09 to 4:29

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of 3	* DATE 04/26/2005

Rev. 08/31/2001

pre-validation

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
82.5	58	2	1	11:55	2731	61	5.7 5.6	6.5 6.3	7.2 7	6.5 6.6	7 6.6	7 6.6	78.5	14	4.4	32	4	4
82.5	62	3	1	11:57	2745	62	5 4.7	6.1 6.6	6.1 6	5.3 3.5	6.7 6.3		56.2	12.3	4.1	32.8	4.1	
82.5	62	2	2	12:04	2822	65	6.1 6.1	6.8 6	7.2 6.8	6.1 6.8	6.8 7.3	6.7 6.6	79.3	13.8	4.3	31.9	3.9	4.3
82.5	67	3	2	12:06	2844	67	4.7 4.5	6 6.4	5.6 6.6	5.8 3.9	6.9 5.7		56	11.9	4.4	32.3	4	
85	68	2	3	12:14	2909	71	5.8 5.9	7 5.7	6.5 7.2	6.1 7.5	6.3 6.9	6.5 7	78.3	13.6	4.7	32.3	4.2	4.2
85	66	3	3	12:14	2910	67	5.2 4.8	6.5 6.1	6 6.2	5.4 3.6	7.7 5.4		56.7	11.9	4.4	31.9	4	
85	60	2	4	12:23	2968	61	5.9 6	6.7 6.5	7.1 7.2	7 6.8	6.8 6.7	6.7 6.7	79.9	13.6	4.4	31.6	4.4	4
85	61	3	4	12:23	2971	64	4.8 5.3	5.8 6.5	6 6.2	5.3 3.6	7.2 6.4		57	12.2	4.2	32.8	4.2	
85.5	64	2	5	12:32	3062	65	5.9 5.9	6.6 6.1	7.2 7.4	6.8 7.3	6.7 7.6	6.5 6.8	80.6	13.8	4.3	31.9	4.3	4.3
85.5	66	3	5	12:42	3063	69	5.1 5	5.9 6.7	5.9 6	5.3 3.6	7 5.7		56.3	12.7	4.1	33.2	4.1	
88.9	69	2	6	12:43	3150	71	5.7 5.7	6.6 6.9	7.6 6.7	6.9 7.5	6.6 6.9	6.6 6.8	80.5	13.6	4.7	31.9	4.2	4.2
88.9	71	3	6	12:45	3151	73	5.1 5.1	6.4 6.4	6.7 6.3	4.7 3.4	7.8 6		57.9	12.5	3.8	32.8	3.8	
89.4	60	2	7	13:04	3230	62	5.9 5.6	6.7 6.5	7 7.4	7.3 7.1	7.2 6.6	6.7 6.5	80.6	13.9	4.5	31.9	4.1	4.5
89.4	61	3	7	13:05	3231	62	5 4.6	6 6.3	5.7 6.2	5.5 3.8	7.7 5.8		56.5	11.9	4.5	31.9	4.1	
90	70	2	8	13:06	3305	67	6 5.7	7 6.2	7.2 6.8	6.7 6.7	6.7 7.3	7.1 6.6	79.9	14.2	4.4	32.3	4.4	4
90	66	3	8	13:26	3306	69	5.2 4.7	6.1 6.4	5.7 6.4	5.4 3.5	7.4 5.1		56	12.7	4.1	32.8	4.1	

Recorded by Odw

Checked by ____________

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 04/26/2005

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
100.5	58	2	9	13:27	4779	62	5.9	6.3	6.8	7	6.6	7.1	79.6	13.9	4.5	32.4	4.1	4.5
							5.5	6.4	7.7	6.6	7.1	6.8						
100.5	59	3	9	13:28	4780	62	5.3	6.3	6	5.5	7.3		57.1	12.3	4.5	32.8	4.1	
							4.7	6.1	6.1	3.6	6.2							
103	64	2	10	13:44	4851	67	5.9	6.5	7.1	6.7	6.6	6.8	81	14.2	4.4	32.3	4.4	4
							6	6.8	7.1	7.1	7.5	6.8						
103	65	3	10	13:45	4852	69	4.6	5.8	6	5.1	7.8		55.2	12.3	4.5	32.8	4.1	
							4.8	6.3	6.3	3.4	5							
103.5	65	2	11	13:47	4938	71	5.8	6.2	7.1	6.6	7	7.6	79.5	14	4.2	32.3	4.2	4.2
							5.4	6.1	7.6	7.1	6.8	6.3						
103.5	66	3	11	14:03	4940	73	5	5.3	5.8	5.4	7.2		53.8	12	4.3	32.3	4.3	
							4.6	5.9	5.6	3.8	5.2							
100.5	60	2	12	14:04	5175	62	6	6.8	7.3	7.4	7.1	6.6	81.4	13.9	4.5	32.4	4.1	4.5
							5.8	6.6	7.5	6.8	6.9	6.6						
100.5	61	3	12	14:05	5176	64	5	5.9	5.8	5.4	7.6		57.1	12.6	4.2	32.8	4.2	
							4.9	6.5	6.1	3.4	6.4							
100.5	65	1	1	15:46	5178	69	5.5	9.5	9.2	10.1	9.3		83.3	16.4	4.5	31	4.5	
							5	8.2	7.3	9.6	9.7							
101	67	2	13	15:47	5299	67	5.9	7	7.6	6.7	6.2	7	79.4	13.7	4.4	32.3	4.4	4
							5.7	6.2	6.6	6.5	7.6	6.5						
101	67	3	13	15:48	5302	67	5	6.4	6.1	5.5	8.1		57.3	11.9	4.4	32.3	4	
							4.8	6.3	5.9	3.3	5.9							
101	64	1	2	16:02	5307	64	5.4	8.7	8.6	8.1	8.2		75.6	16	4.2	30.2	4.2	
							5.3	7.8	7.8	7.7	7.9							
101.5	69	2	14	16:03	5383	71	6	6.3	7.7	6.7	6.5	6.2	79.1	14	4.2	32.3	4.2	4.2
							5.2	6.3	6.4	7.7	7.6	6.5						
101.5	71	3	14	16:04	5384	73	4.9	6.5	6.5	4.8	8.1		57.7	12	4.3	32.8	3.8	
							5	6.5	6.4	3.7	5.4							
101.5	67	1	3	16:20	5388	69	5.4	8.5	10.1	9.6	9.2		80.9	16.4	4.1	31	4.1	
							5.3	7.6	7.4	9	8.9							
102.5	59	2	15	16:22	5464	62	5.9	6.6	7.3	7	7.1	6.7	80.1	13.9	4.5	32.4	4.1	4.1
							5.3	7	7.6	6.3	6.8	6.6						

Recorded by ODW

Checked by ____________

Sheet 21	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 04/26/2005

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
102.5	59	3	15	16:23	5468	62	5 4.6	6.1 6.7	5.6 6	5.5 3.6	7.3 6.6		57	11.9	4.5	31.9	4.1	
102.5	58	1	4	16:35	5476	61	5.6 4.8	9 7.7	8.7 8.2	9.2 8.8	9.7 7.5		79.2	16.4	4.4	30.8	4	
100.5	64	2	16	16:36	5560	65	5.9 5.7	6.9 6.1	7.6 7.1	6.9 7.3	6.7 6.9	6.8 7.3	81.4	13.8	4.3	31.9	4.3	3.9
100.5	66	3	16	16:37	5567	69	4.8 4.7	6.1 6.6	6.3 5.9	5.7 3.4	8.1 5.9		57.5	12.3	4.1	32.8	4.1	
100.5	63	1	5	16:49	5575	65	5.3 5.3	8.6 7.9	9.2 7.8	7.6 9.3	8.2 9.2		78.3	16.4	4.3	31.1	3.9	
99	69	2	17	16:50	5642	71	6.2 5	6.2 6.5	7.4 7.6	6.7 7.8	6.6 7.1	6 6.7	79.6	14	4.2	32.3	4.2	4.2
99	71	3	17	16:51	5644	73	4.9 4.9	6.4 6.3	6.5 6.3	5 3.5	8.2 5.5		57.5	12.5	3.8	32.8	3.8	
99	65	1	6	17:03	5648	67	5.6 5.4	8.6 7.2	9.5 8	7.5 9.3	7.3 9.6		78.1	16.4	4	30.6	4	
99	58	2	18	17:04	5752	62	6.1 5.5	6.6 6.5	7.8 7.1	6.6 6.8	6.7 6.6	7.1 6.5	79.9	13.9	4.1	32.4	4.1	4.1
99	59	3	18	17:04	5755	64	5 4.5	6.2 6.4	6.2 6	6.2 3	7.7 6.3		57.5	12.6	4.2	32.8	4.2	
99	57	1	7	17:20	5757	59	5.8 5	8.8 8.1	8.6 8.3	9.4 7.6	8.8 8		78.4	16.4	4.3	30.4	4.3	
			truck 1 - 7															
			truck 2 - 18															
			truck 3 - 18		43													

Recorded by DAW

Checked by ____________

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 1 of* 2	* DATE 04/28/2005

Rev. 08/31/2001….

POST CALIBRATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
68	10	5800	67	9	70	10	5955	70	9
75	10	5806	73	9	75	3	5974	73	3
58	10	5807	60	9	68	10	5983	68	9
68	10	5820	67	9	60	10	5984	65	9
66	10	5823	66	9	70	5	5988	69	3
53	3	5825	53	2	70	2	5993	71	2
60	10	5827	59	9	65	2	6000	68	2
61	5	5832	62	5	70	10	6002	68	9
77	3	5843	78	3	68	10	6003	68	9
61	10	5846	57	9	63	10	6004	63	9
72	10	5849	70	9	72	10	6010	71	9
72	3	5851	72	3	70	10	6011	71	9
75	2	5858	76	3	66	10	6015	65	9
61	3	5863	60	3	65	3	6024	69	3
60	5	5869	60	5	70	3	6026	69	3
66	10	5870	65	9	66	10	6030	66	9
79	2	5886	80	2	66	3	6036	65	3
68	2	5888	67	9	66	2	6040	68	2
70	5	5892	69	5	72	2	6041	73	2
72	10	5907	69	9	70	10	6054	69	9
66	10	5916	65	9	68	2	6057	70	2
70	2	5920	70 ~~65~~	2	63	3	6060	63	3
70	3	5923	69	3	70	3	6061	69	3
70	10	5924	68	9	65	10	6065	64	9
63	2	5926	63	3	63	4	6067	62	5

Recorded by ____________ Direction S Lane 4 Time from 3:38pm to 4:09

Sheet 20	* STATE_CODE 48
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 04/26/2005

Rev. 08/31/2001.... POST CALIBRATION

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
75	6	6076	71	6	72	3	6214	71	3
65	10	6081	63	9	68	3	6218	67	5
66	10	6085	65	9	72	2	6220	74	2
57	5	6087	65	3	75	10	6221	73	9
65	5	6088	65	3	68	3	6222	74	3
70	10	6093	70	9	77	3	6223	72	3
63	10	6102	62	9	70	9		71	9
68	9	6104	62	8	72	10	6226	72	9
60	5	6109	60	5	66	10	6227	72	9
66	4	6112	70	5	66	10	6230	66	9
68	10	6117	69	9	72	10	6232	70	9
70	2	6122	70	2	66	2	6236	69	2
63	10	6126	61	9	70	10	6241	69	9
	10+5		62	13	65	10	6243	64	9
63	11+5		62	13	66	3	6251	67	3
66	11+5		65	13	70	10	6255	69	9
72	11+5		65	13	53	8	6257	56	5
70	10	6171	70	9	66	10	6260	65	9
72	5	6181	70	3	60	10	6261	59	9
77	10	6188	74	9	79	5	6276	78	3
61	6	6194	61	6	72	10	6279	69	9
70	10	6195	69	9	70	4	6280		4
70	3	6205	68	3	66	10	6280	65	9
72	3	6210	71	3	66	2			2
75	2	6212	72	2	68	3		70	3

9 axles conc beams class 11+5

Recorded by ______ Direction ______ Lane ______ Time from 4:09 to 4:29

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

STATE: Texas

SHRP ID: 480100

Photo 1 – TO_9_48_2.48_0100_Truck_1_Tractor.JPG

Photo 2 – TO_9_48_2.48_0100_Truck_1_Tractor_Suspension.JPG

Photo 3 – TO_9_48_2.48_0100_Truck_1_Trailer.JPG

Photo 4 – TO_9_48_2.48_0100_Truck_1_Trailer_Suspension.JPG

Photo 5 – TO_9_48_2.48_0100_Truck_2_Load.JPG

Photo 6 – TO_9_48_2.48_0100_Truck_2_Tractor.JPG

Photo 7 – TO_9_48_2.48_0100_Truck_2_Tractor_Suspension.JPG

Photo 8 – TO_9_48_2.48_0100_Truck_2_Trailer_Suspension.JPG

Photo 9 – TO_9_48_2.48_0100_Truck_2_Trailer_Suspension_2.JPG

Photo 10 – TO_9_48_2.48_0100_Truck_3_Load.JPG

Photo 11 – TO_9_48_2.48_0100_Truck_3_Tractor.JPG

Photo 12 – TO_9_48_2.48_0100_Truck_3_Tractor_Suspension.JPG

Photo 13 – TO_9_48_2.48_0100_Truck_3_Trailer_Suspension.JPG

ALGORITHMS FOR PAT
MODE: 3

Mode:3

No. of axles 2

Type		**2**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**10**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type		**2**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**1029**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**799**
Lim. Total Weight	**:**	**8000**

Type		**3**
Dist. Axle Low	**:**	**1030**
Dist. Axle High	**:**	**1330**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**799**
Lim. Total Weight	**:**	**8000**

Type		**4**
Dist. Axle Low	**:**	**2100**
Dist. Axle High	**:**	**4000**
Total Weight Low	**:**	**1650**
Total Weight High	**:**	**2500**
Lim. Total Weight	**:**	**8000**

Type		**5**
Dist. Axle Low	**:**	**1331**
Dist. Axle High	**:**	**2360**
Total Weight Low	**:**	**500**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type		**5**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2000**
Total Weight Low	**:**	**800**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**2**
Dist. Axle Low	**:**	**1029**
Dist. Axle High	**:**	**2010**
Total Weight Low	**:**	**10**
Total Weight High	**:**	**800**
Lim. Total Weight	**:**	**8000**

Type		**15**
	:	**0**
		0
		0
		0
		0
		0

No. of Axles :3

Type	**:**	**2**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**1029**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**2010**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**1199**
Lim. Total Weight	**:**	**8000**

Type	**:**	**3**
Dist. Axle Low	**:**	**1030**
Dist. Axle High	**:**	**1330**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**2040**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**4**
Dist. Axle Low	**:**	**2100**
Dist. Axle High	**:**	**4000**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**1200**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**5**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2360**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**2800**
Total Weight Low	**:**	**500**
Total Weight High	**:**	**1299**
Lim. Total Weight	**:**	**8000**

Type	**:**	**6**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2500**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**1300**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**8**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2000**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**6000**
Total Weight Low	**:**	**1300**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

No. of Axles :4

Type	**:**	**2**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**1029**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**2010**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**1999**
Lim. Total Weight	**:**	**8000**

Type	**:**	**3**
Dist. Axle Low	**:**	**1030**
Dist. Axle High	**:**	**1330**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**2500**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**1999**
Lim. Total Weight	**:**	**8000**

Type	**:**	**5**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2360**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**4000**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**2300**
Total Weight Low	**:**	**800**
Total Weight High	**:**	**1999**
Lim. Total Weight	**:**	**8000**

Type	**:**	**7**
Dist. Axle Low	**:**	**1310**
Dist. Axle High	**:**	**2300**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type		**9**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2000**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**4600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type		**9**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2000**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**4600**
Dist. Axle Low	**:**	**300**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

No. of Axles :5

Type	**:**	**10**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2500**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**4600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**1200**
Total Weight Low	**:**	**2100**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**12**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2000**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**3**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**1330**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**3200**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**5**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2360**
Dist. Axle Low	**:**	**600**
Dist. Axle High	**:**	**4000**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**360**
Total Weight Low	**:**	**100**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**6**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**1800**
Dist. Axle Low	**:**	**10**
Dist. Axle High	**:**	**2500**
Total Weight Low	**:**	**0**
Total Weight High	**:**	**2099**
Lim. Total Weight	**:**	**8000**

No. of Axles :6

Type	**:**	**11**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**1040**
Dist. Axle High	**:**	**4600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**13**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**1700**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**2400**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**13**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**4000**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**2600**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

No. of Axles :7

Type	**:**	**14**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2700**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**4000**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**601**
Dist. Axle High	**:**	**2700**
Dist. Axle Low	**:**	**1110**
Dist. Axle High	**:**	**2700**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**11**
Dist. Axle Low	**:**	**610**
Dist. Axle High	**:**	**2500**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**1040**
Dist. Axle High	**:**	**4200**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Dist. Axle Low	**:**	**340**
Dist. Axle High	**:**	**600**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

No. of Axles :8

Type	**:**	**11**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Dist. Axle Low	**:**	**100**
Dist. Axle High	**:**	**4500**
Total Weight Low	**:**	**2000**
Total Weight High	**:**	**0**
Lim. Total Weight	**:**	**8000**

Type	**:**	**15**	
		0	
		0	**Type 11 same w/8 or 9 axles**
		0	
		0	
		0	
		0	
		0	
		0	
		0	

END