Validation Report

New Mexico, SPS-1
Task Order 16, CLIN 2
August 20 to 21, 2008

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1 Executive Summary

A visit was made to the New Mexico 0100 on August 20 to 21, 2008 for the purposes of conducting a validation of the WIM system located on Interstate 25 0.7 mi north of the Rincon interchange. The SPS-1 is located in the righthand, northbound lane of a four-lane divided facility. The posted speed limit at this location is 75 mph. The LTPP lane is the only lane that is instrumented at this site. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This is the first validation visit to this location. The site was installed on April 1 to 30, 2008 by International Road Dynamics Inc. The site was calibrated as a part of the installation process on May 15, 2008. This site has been relocated approximately .5 mile from the previous installation for the SPS-1.

This site demonstrates the ability to produce research quality loading data under the observed conditions. The classification data is also of research quality for Traffic Monitoring Guide Classes based on validation results. However, data from the post- visit download; indicates an unacceptable percentage of unclassified and unknown vehicles.

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

The validation used the following trucks:

1) 5-axle tractor-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 76,670 lbs., the "golden" truck.
2) 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 66,920 lbs., the "partial" truck.

The validation speeds ranged from 60 to 75 miles per hour. The pavement temperatures ranged from 81 to 140 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was also achieved.

Table 1-1 – Post-Validation Results – 350100 – 21-Aug-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 5.5%	Pass
Tandem axles	±15 percent	1.1 ± 7.1%	Pass
GVW	±10 percent	1.0 ± 4.9%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: bko*

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

No profile data has been collected at this site since its installation. It is not known when a visit is scheduled to collect it. When profile data becomes available WIMIndex values will be computed and an amended report submitted.

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

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

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

Prepared: sfm *Checked: bko*

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

2 Corrective Actions Recommended

Between the installer's calibration of the site and this validation, grinding of the quartz sensors was required to keep them flush with the pavement. The pavement sensor interface should be monitored on maintenance visits.

The post-validation download of records for August 28, 2008 had nearly 5 percent unknown and unclassified vehicles. This clearly exceeds the 2 percent threshold for research quality classification data. The unclassified vehicles should be investigated and the necessary algorithm modifications considered.

3 Post Calibration Analysis

This final analysis is based on test runs conducted August 21, 2008 from mid-morning to mid-afternoon at test site 350100 on Interstate 25. This SPS-1 site is at milepost 36.1 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for the calibration and for the subsequent validation included:

1. 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and air suspension loaded to 76,670 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 66,920 lbs., the "partial" truck.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 60 to 75 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 81 to 140 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was also achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

Table 3-1 shows that the site is producing research quality loading data.

Table 3-1 - Post-Validation Results – 350100 – 21-Aug-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.8 ± 5.5%	Pass
Tandem axles	±15 percent	1.1 ± 7.1%	Pass
GVW	±10 percent	1.0 ± 4.9%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: bko*

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 data set was split into three speed groups and three temperature groups. The distribution of runs by speed

and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was achieved for this set of validation runs.

The three speed groups were divided as follows: Low speed – 60 to 64 mph, Medium speed – 65 to 71 mph and High speed – 72 + mph. The three temperature groups were created by splitting the runs between those at 81 to 100 degrees Fahrenheit for Low temperature, 101 to 125 degrees Fahrenheit for Medium temperature and 126 to 140 degrees Fahrenheit for High temperature.

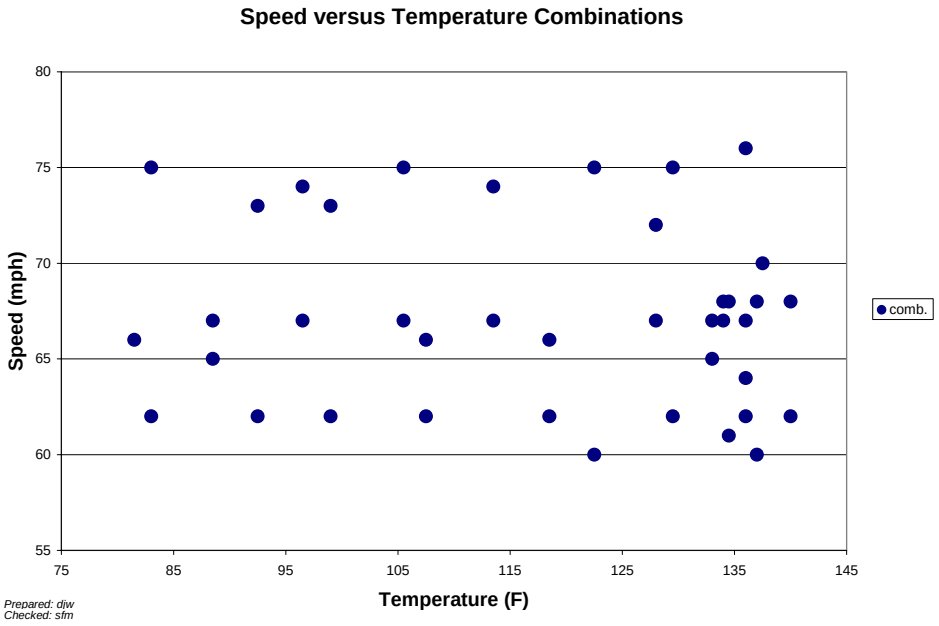


Figure 3-1 - Post-Validation Speed-Temperature Distribution – 350100 – 21-Aug-2008

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

Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. Overestimation of GVW was observed at low speed. Points are scattered in a similar pattern at all speeds. The calibration factor adjustments apparently did not create a similar degree of adjustment for all speed bins.

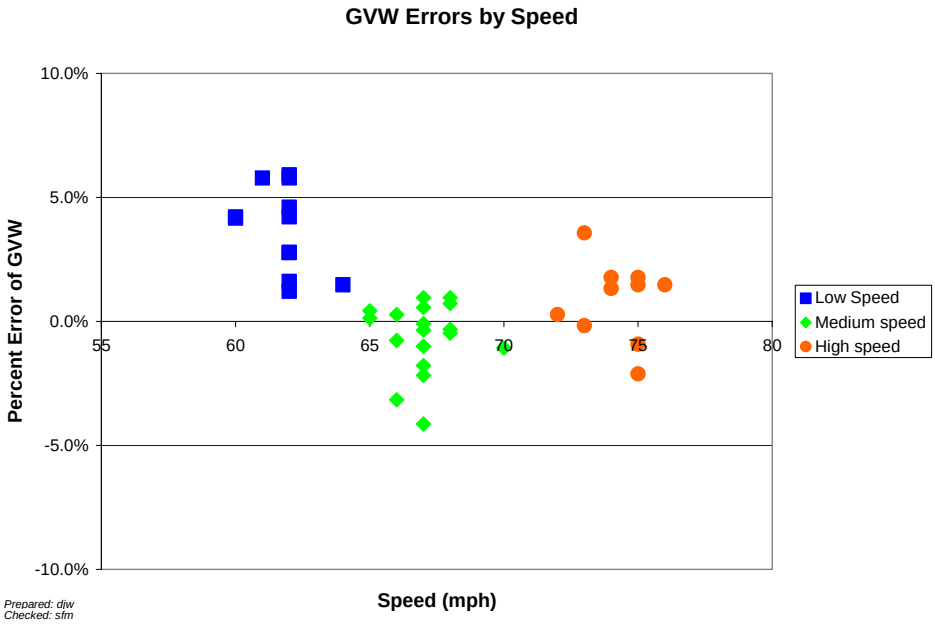


Figure 3-2 - Post-Validation GVW Percent Error vs. Speed – 350100 – 21-Aug-2008

Figure 3-3 shows the relationship between temperature and GVW percentage error. The GVW percent error has a tendency to increase slightly at high temperatures. The scatter is consistent across the temperature bins. The "outlier" for underestimation at medium temperature is a valid data point.

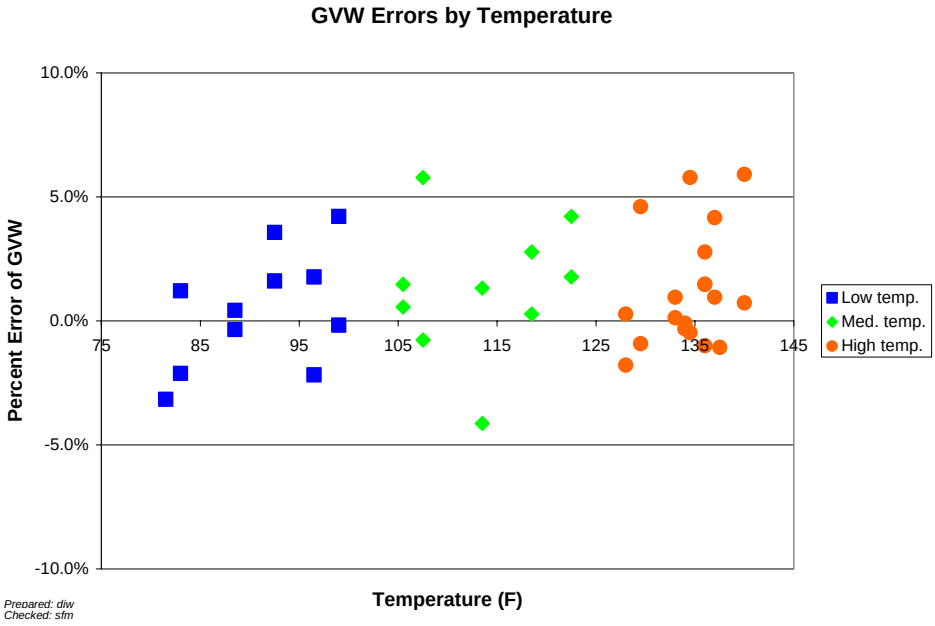


Figure 3-3 - Post-Validation GVW Percent Error vs. Temperature – 350100 – 21-Aug-2008

Figure 3-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. The error in spacing is not influenced by speed.

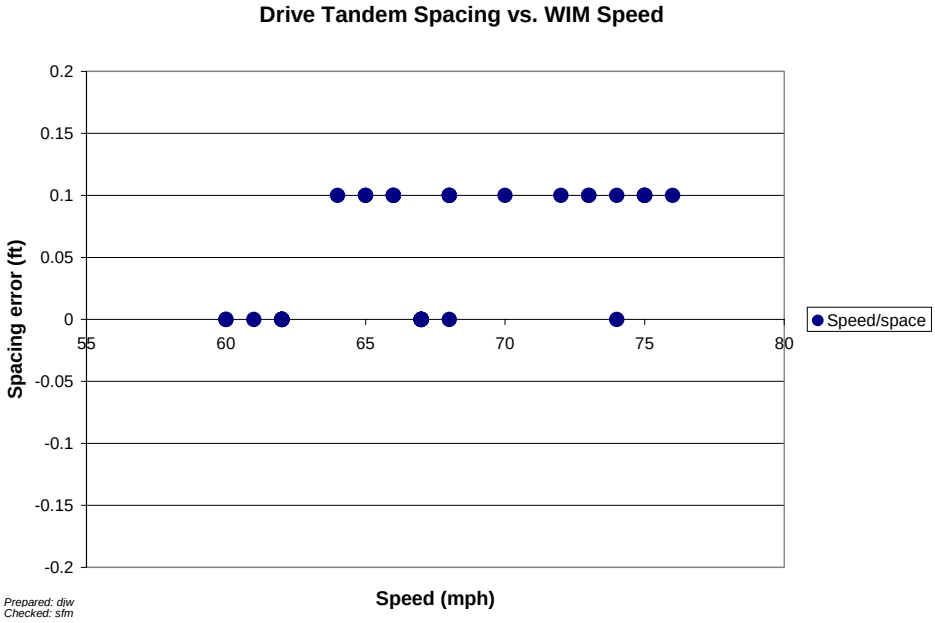


Figure 3-4 - Post-Validation Spacing vs. Speed – 350100 – 21-Aug-2008

3.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 81 to 100 degrees Fahrenheit for Low temperature, 101 to 125 degrees Fahrenheit for Medium temperature and 126 to 140 degrees Fahrenheit for High temperature.

Table 3-2 - Post-Validation Results by Temperature Bin – 350100 – 21-Aug-2008

Element	95% Limit	Low Temperature 81 to 100 °F	Medium Temperature 101 to 125 °F	High Temperature 126 to 140 °F
Steering axles	±20 %	1.6 ± 6.3%	1.3 ± 6.3%	0.1 ± 5.4%
Tandem axles	±15 %	0.4 ± 8.0%	1.4 ± 8.0%	1.4 ± 6.7%
GVW	±10 %	0.4 ± 5.2%	1.3 ± 6.1%	1.2 ± 4.9%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.1 ± 0.1 ft	0.0 ± 0.1 ft

Prepared: sfm *Checked: bko*

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. The trucks have similar patterns with temperature. The scatter across temperatures appears to be less with the partial truck (diamonds) than with the golden truck (squares).

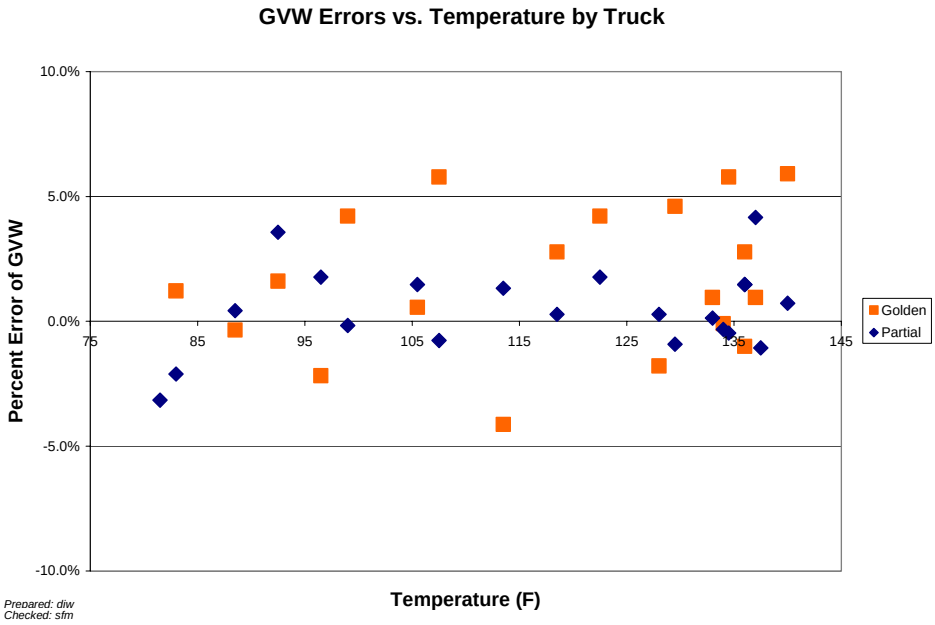


Figure 3-5 - Post-Validation GVW Percent Error vs. Temperature by Truck – 350100 – 21-Aug-2008

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

Temperature does not appear to influence scatter of steering axle error. There appears to be a slight decrease in error with increasing temperature.

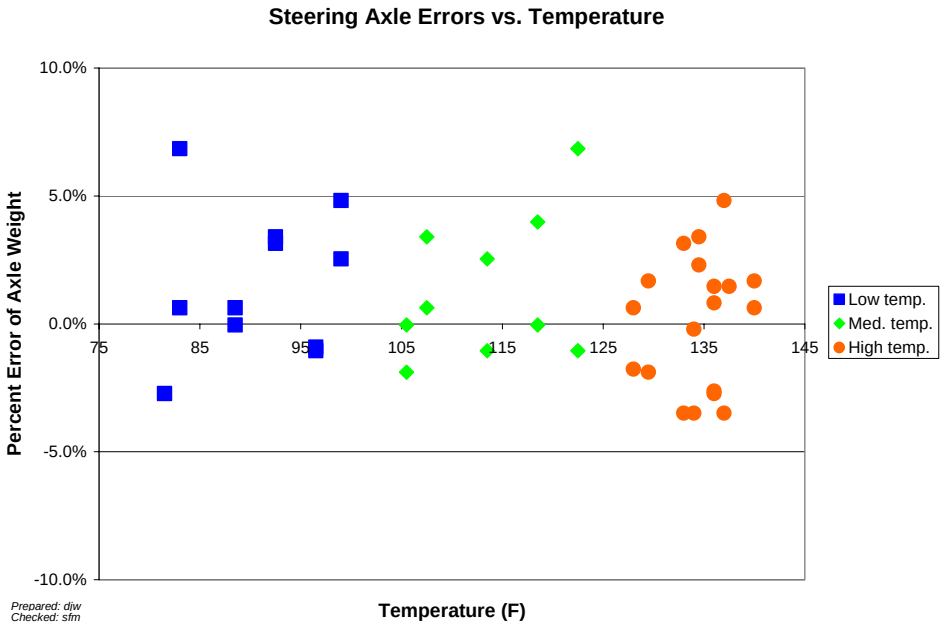


Figure 3-6 - Post-Validation Steering Axle Error vs. Temperature by Group – 350100 – 21-Aug-2008

3.2 Speed-based Analysis

The three speed groups were created using 60 to 64 mph for Low speed, 65 to 71 mph for Medium speed and 72+ mph for High speed.

Table 3-3 - Post-Validation Results by Speed Bin – 350100 – 21-Aug-2008

Element	95% Limit	Low Speed 60 to 64 mph	Medium Speed 65 to 71 mph	High Speed 72+ mph
Steering axles	±20 %	3.1 ± 4.9%	-0.2 ± 5.0%	0.0 ± 5.4%
Tandem axles	±15 %	3.7 ± 6.6%	-0.7 ± 6.1%	1.3 ± 6.5%
GVW	±10 %	3.7 ± 3.8%	-0.6 ± 3.0%	0.8 ± 3.6%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.1 ± 0.1 ft	0.1 ± 0.1 ft

Prepared: sfm *Checked: bko*

Figure 3-7 shows the results for GVW errors by truck with speed. The golden truck (squares) did not run at high speed due to an engine governor limiting it to 68 mph. As the 85 percentile speed at this site using the WIM data is 65 mph, this was not considered detrimental to the validation.

The overestimation of GVW is higher at low speed. This may reflect the characteristics of the golden truck which completed the majority of runs at this speed. The amount of scatter for both trucks is similar at all speeds.

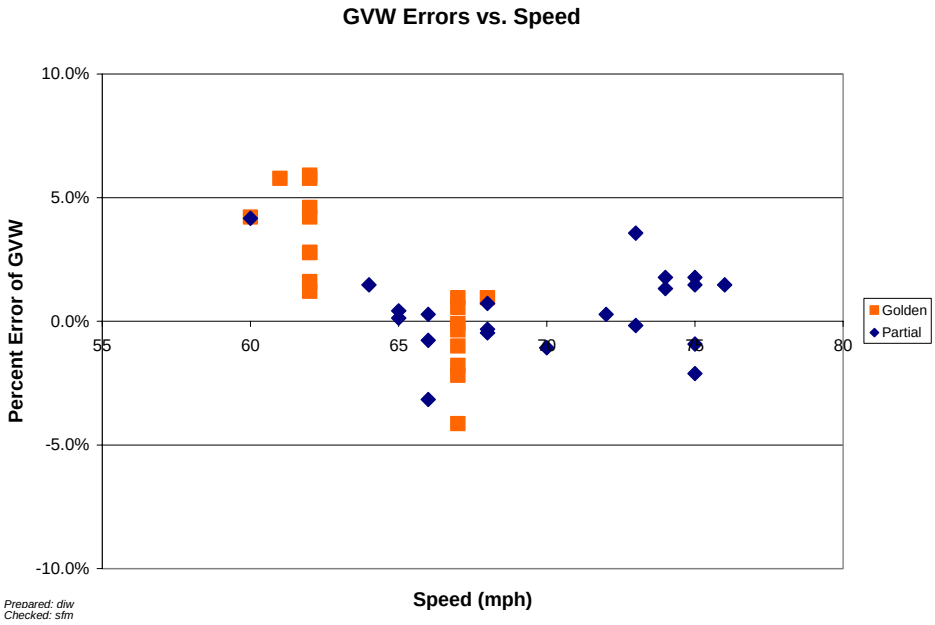


Figure 3-7 - Post-Validation GVW Percent Error vs. Speed by Truck – 350100 – 21-Aug-2008

Figure 3-8 shows the relationship between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles.

Steering axle error is overestimated at low speed. There is a downward trend in steering axle errors with increasing speed.

Figure 3-8 - Post-Validation Steering Axle Percent Error vs. Speed by Group – 350100 – 21-Aug-2008

3.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to define unclassified vehicles. Classification 14 is included for unknown vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles. **This is inconsistent with the data in the post-validation download.**

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 3-4 has the classification error rates by class. The overall misclassification rate is 2.0 percent.

Table 3-4 - Truck Misclassification Percentages for 350100 – 21-Aug-2008

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

Prepared: sfm *Checked: bko*

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

Table 3-5 - Truck Classification Mean Differences for 350100 – 21-Aug-2008

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

Prepared: sfm *Checked: bko*

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

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. The difference may be associated with the measurement technique.

3.4 Evaluation by ASTM E-1318 Criteria

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

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

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

Prepared: sfm *Checked: bko*

4 Pavement Discussion

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

4.1 Profile Analysis

Profile data collected since the site installation does not exist. It is not known when a visit is scheduled to collect it. An amended report will be submitted when the data is available.

4.2 Distress Survey and Any Applicable Photos

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

4.3 Vehicle-pavement Interaction Discussion

A visual observation of the trucks as they approach, traverse and leave the sensor area did not indicate any visible motion of the trucks that would affect the performance of the WIM scales. Trucks appear to track down the wheel path and daylight cannot be seen between the tires and any of the sensors for the equipment.

5 Equipment Discussion

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

Between the installation of the site and the beginning of the validation the pavement sank around the WIM sensors. This produced a bump in the pavement that required grinding the WIM sensors to make them once again flush with the pavement surface.

Photo 5-1 - Results of Grinding Leading WIM Sensor at Lane's Edge - 350100 - 20-Aug-2008

The grinding was done along the entire width of the lane for both sensors. Photo 5-1 shows the aftermath of grinding the leading WIM sensor all the way to the edge of the lane. Photo 5-2 shows the results of the same activity for the trailing sensor where the dust from grinding has dispersed from the wheelpath.

Photo 5-2 – Results of Grinding of Trailing Sensor - Full Lane Width - 350100 - 20-Aug-2008

5.1 Pre-Evaluation Diagnostics

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

5.2 Calibration Process

The equipment required one-iteration of the calibration process between the initial 40 runs and the final 40 runs to remove the observed bias.

The operating system weight compensation parameters that were in place prior to the Pre-Validation are in Table 5-1. The sensors are labeled simply 1 and 2 rather than right and left since this installation uses sensors across the full width of the roadway.

Table 5-1 - Initial System Parameters - 350100 - 20-Aug-2008

Speed Bin	Sensor 1	Sensor 2
88 kph	3315	2962
96 kph	3315	2962
105 kph	3332	2975
112 kph	3332	2975
120 kph	3332	2975

Prepared: sfm *Checked: bko*

5.2.1 Calibration Iteration 1

GVW was overestimated by approximately five percent at all speeds. The compensation factors were adjusted as shown in Table 5-2.

Table 5-2 - Calibration 1 - Change in Parameters - 350100 - 21-Aug-2008

Speed Bins	Sensor 1	Change	Sensor 2	Change
88 kph	3315	--	2962	--
96 kph	3315	--	2962	--
105 kph	3158	5.2%	2819	5.2%
112 kph	3146	5.6%	2809	5.6%
120 kph	3163	5.1%	2824	5.1%

Prepared: sfm *Checked: bko*

Table 5-3 shows the results of applying the factor adjustments after the initial 12 validation runs. The loading data is essentially unbiased over the range of speeds for a post-calibration verification.

Table 5-3 - Calibration Iteration 1 Results – 350100 – 21-Aug-2008 (08:17 AM)

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	0.2 ± 6.2%	Pass
Tandem axles	±15 percent	0.0 ± 7.9%	Pass
GVW	±10 percent	-0.1 ± 5.2%	Pass
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: bko*

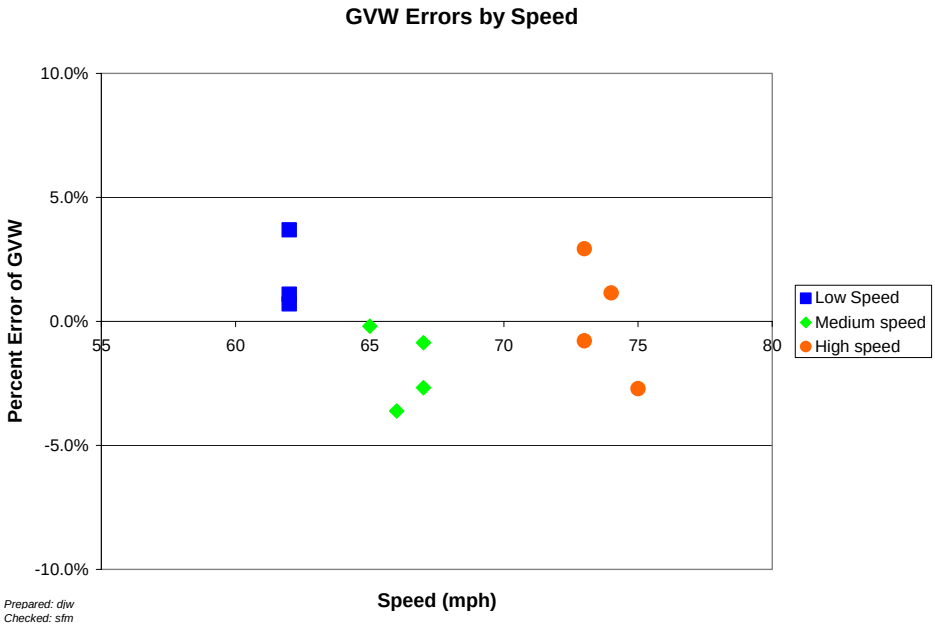


Figure 5-1 - Calibration Iteration 1 GVW Percent Error vs. Speed Group – 350100 – 21-Aug-2008 (08:17 AM)

5.3 Summary of Traffic Sheet 16s

Table 5-4 has the information for TRF_CALIBRATION_AVC for Sheet 16s for the current visit. The Sheet 16s available reflect only this contractor's validation visits and the current sensor installation.

Table 5-4 - Classification Validation History – 350100 – 21-Aug-2008

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
21-Aug-08	Manual	11	0	-	-	0.0
20-Aug-08	Manual	0	0	0 (class 5)	-	0.0

Prepared: sfm *Checked: bko*

Table 5-5 has the information for TRF_CALIBRATION_WIM for Sheet 16s submitted for the current visit. The Sheet 16s available are only for this contractor's validation visit and the current sensor installation.

Table 5-5 - Weight Validation History – 350100 – 21-Aug-2008

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
21-Aug-08	Test trucks	1.0 (2.4)	0.8 (2.7)	1.1 (3.6)
20-Aug-08	Test trucks	5.0 (1.6)	2.1 (2.3)	5.7 (3.1)

Prepared: sfm *Checked: bko*

5.4 Projected Maintenance/Replacement Requirements

The sensors at this site have been ground since the installation calibration to make them flush with the pavement. Evidence of grinding appears in Figure 5-2 and Figure 5-3.

Figure 5-2 - Illustration of Grinding at End of Sensor Array - 350100 - 20-Aug-2008

Figure 5-3 - Illustration of Grinding at Shoulder Edge of Sensor - 350100 - 20-Aug-2008

Vehicles traversing the sensors have removed the grinding residue from the wheel path.

This site is scheduled for semi-annual maintenance under the installation contract. The pavement sensor interface will need to be monitored at future site visits.

6 Pre-Validation Analysis

This Pre-Validation analysis is based on test runs conducted August 20, 2008 from mid-morning to mid-afternoon at test site 350100 on Interstate 25. This SPS-1 site is at milepost 36.1 on the northbound, righthand of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and an air suspension loaded to 76,430 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having an air suspension and a trailer with a standard rear tandem and an air suspension loaded to 66,790 lbs., the "partial" truck.

For the initial validation each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 58 to 75 miles per hour. The desired speed range was achieved during this validation.

Pavement surface temperatures were recorded during the test runs ranging from about 75 to 138 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was also achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

Table 6-1 shows that the site was producing research quality data at the beginning of the validation. However, the loading statistics indicate that weights were being overestimated. In the case of GVW the overestimation is approximately five percent. On the basis of that bias a calibration iteration was considered necessary.

Table 6-1 - Pre-Validation Results – 350100 – 20-Aug-2008

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	2.1 ± 4.7%	Pass
Tandem axles	±15 percent	5.7 ± 6.2%	Pass
GVW	±10 percent	5.0 ± 3.2%	Pass
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

Prepared: sfm *Checked: bko*

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 three temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired

distribution of speed and temperature combinations was achieved for this set of validation runs.

The three speed groups were divided into 58 to 64 mph for Low speed, 65 to 71 mph for Medium speed and 72+ mph for High speed. The three temperature groups were created by splitting the runs between those at 75 to 96 degrees Fahrenheit for Low temperature, 97 to 119 degrees Fahrenheit for Medium temperature and 120 to 138 degrees Fahrenheit for High temperature.

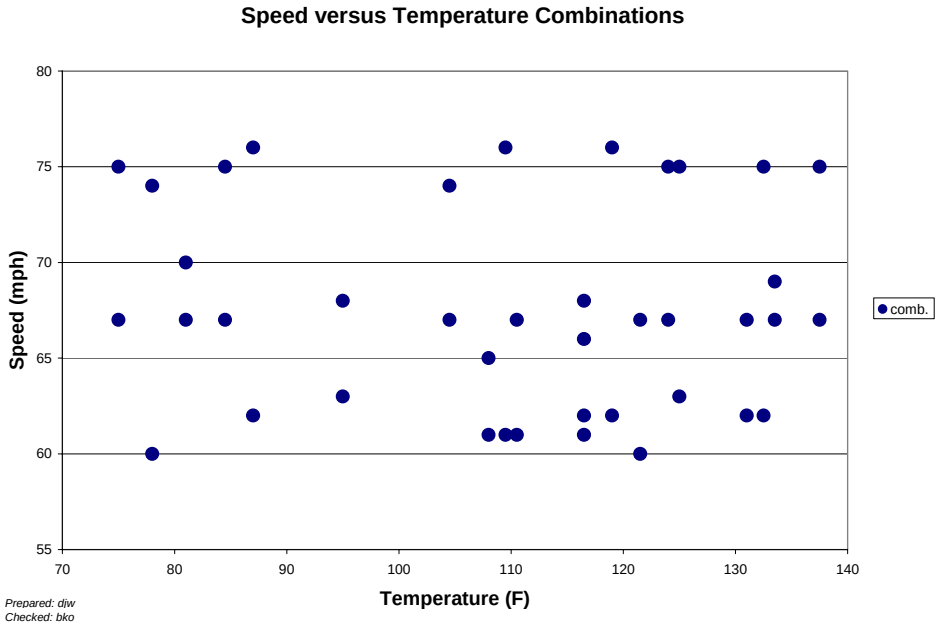


Figure 6-1 - Pre-Validation Speed-Temperature Distribution – 350100 – 20-Aug-2008

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

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The overestimation of GVW was observed at all speeds with essentially the same degree of scatter.

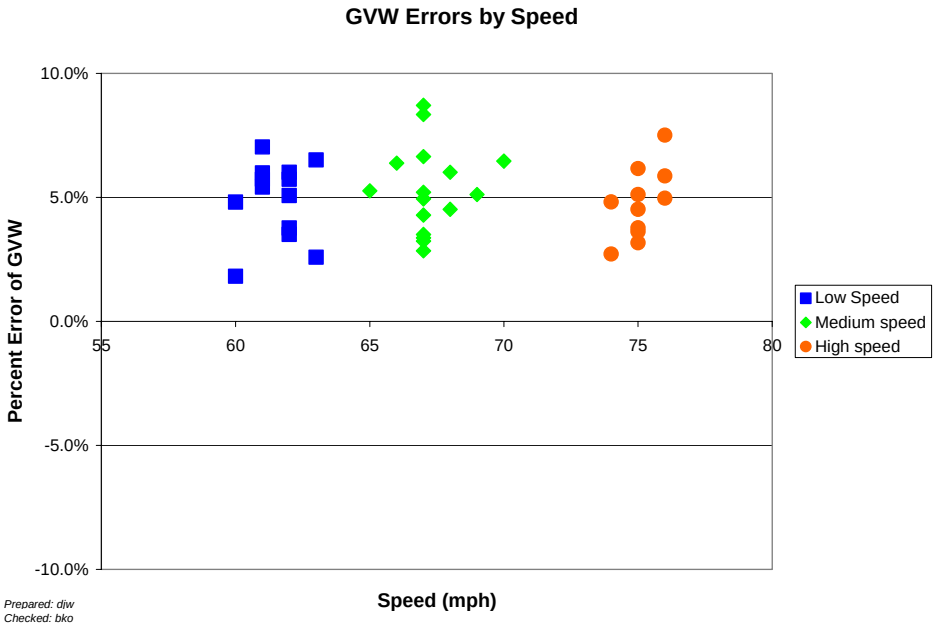


Figure 6-2 - Pre-Validation GVW Percent Error vs. Speed – 350100 – 20-Aug-2008

Figure 6-3 shows the relationship between temperature and GVW percentage error. It shows the overestimation of GVW which appears consistent for all temperatures.

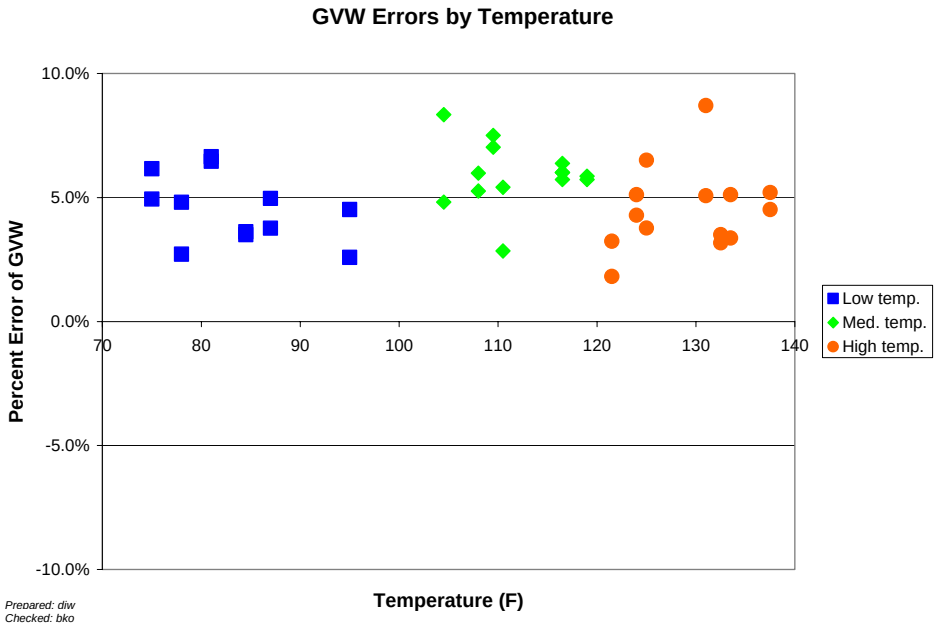


Figure 6-3 - Pre-Validation GVW Percent Error vs. Temperature – 350100 – 20-Aug-2008

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speed. 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. Speed has no apparent influence on spacing errors.

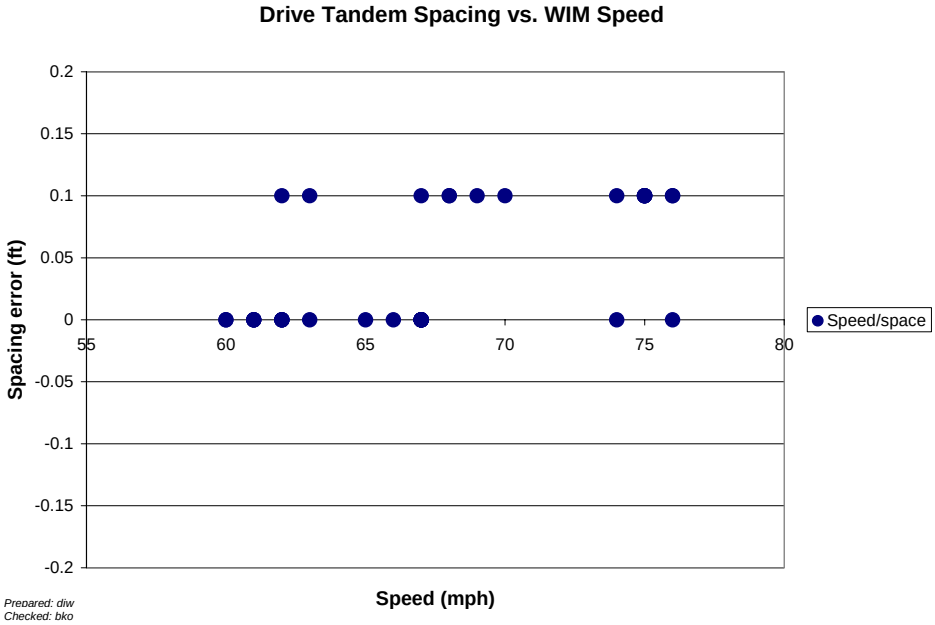


Figure 6-4 - Pre-Validation Spacing vs. Speed - 350100 – 20-Aug-2008

6.1 Temperature-based Analysis

The three temperature groups were created by splitting the runs between those at 75 to 96 degrees Fahrenheit for Low temperature, 97 to 119 degrees Fahrenheit for Medium temperature and 120 to 138 degrees Fahrenheit for High temperature.

Table 6-2 - Pre-Validation Results by Temperature Bin – 350100 – 20-Aug-2008

Element	95% Limit	Low Temperature 75 to 96 °F	Medium Temperature 97 to 119 °F	High Temperature 120 to 138 °F
Steering axles	±20 %	2.3 ± 3.8%	3.0 ± 5.0%	1.0 ± 5.3%
Tandem axles	±15 %	5.1 ± 5.8%	6.8 ± 6.0%	5.2 ± 6.8%
GVW	±10 %	4.6 ± 3.0%	5.9 ± 2.8%	4.5 ± 3.6%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.1 ± 0.1 ft

Prepared: sfm *Checked: bko*

Table 6-2 shows overestimation is higher for all elements at medium temperature.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck. There is no apparent temperature trend.

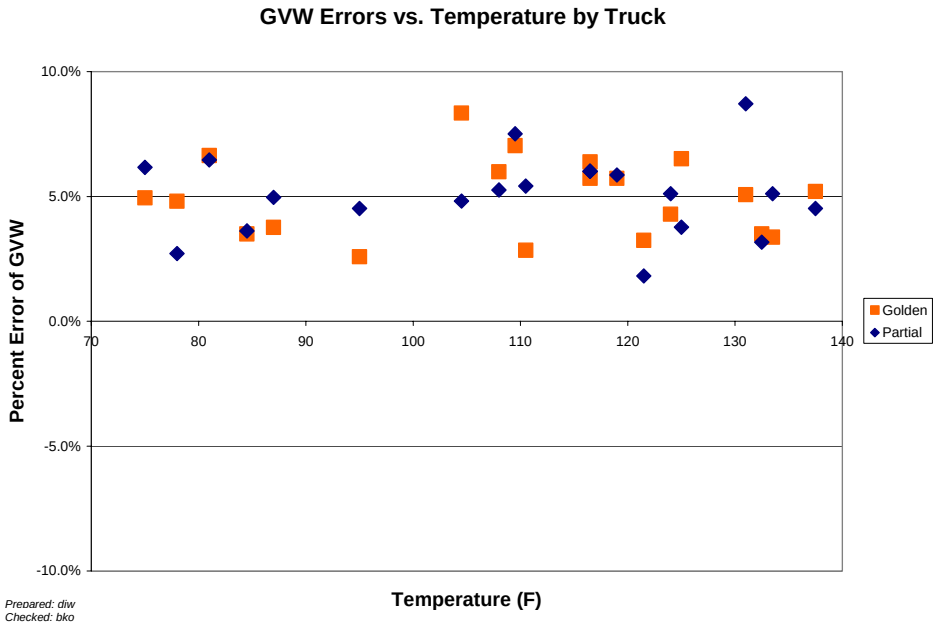


Figure 6-5 - Pre-Validation GVW Percent Error vs. Temperature by Truck – 350100 – 20-Aug-2008

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 only with Class 9 vehicles.

Figure 6-6 shows overestimation of steering axle errors at all temperatures. The scatter in the error appears to increase with increasing temperature.

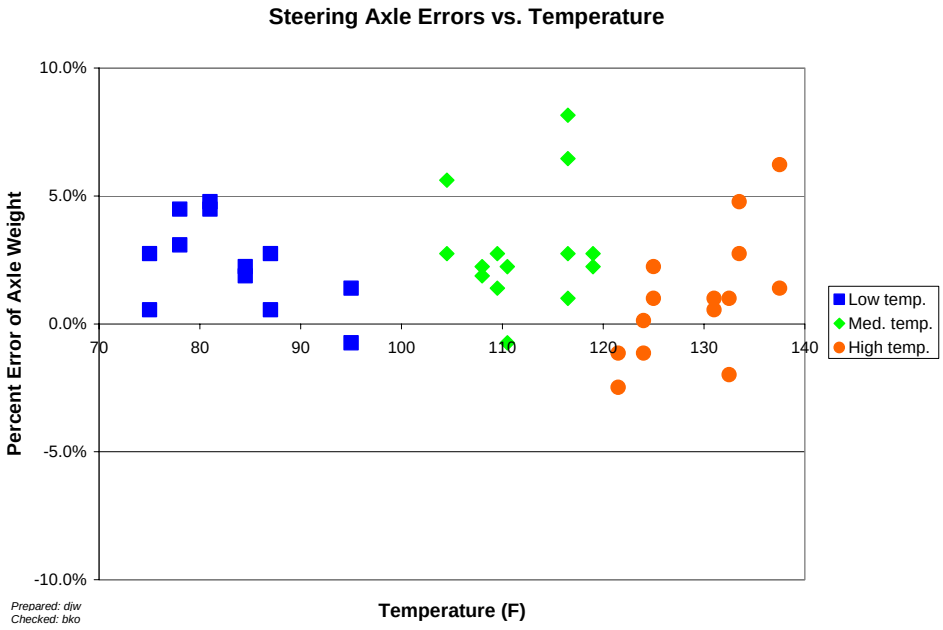


Figure 6-6 - Pre-Validation Steering Axle Error vs. Temperature by Group – 350100 – 20-Aug-2008

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 58 to 64 mph, Medium speed – 65 to 71 mph and High speed – 72+ mph.

Table 6-3 - Pre-Validation Results by Speed Bin – 350100 – 20-Aug-2008

Element	95% Limit	Low Speed 58 to 64 mph	Medium Speed 65 to 71 mph	High Speed 72+ mph
Steering axles	±20 %	2.1 ± 5.1%	2.5 ± 5.2%	1.5 ± 4.6%
Tandem axles	±15 %	5.5 ± 6.2%	6.0 ± 6.7%	5.7 ± 6.3%
GVW	±10 %	4.9 ± 3.4%	5.3 ± 3.7%	4.7 ± 3.1%
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.1 ± 0.1 ft

Prepared: sfm *Checked: bko*

GVW and tandem axles are overestimated by approximately five percent at all speeds. The variability is consistent at all speeds. Steering axle error is overestimated as well but not as much.

Figure 6-7 shows GVW percent error is consistently over estimated for both trucks at all speeds. The scatter is approximately the same for both trucks.

The runs at high speed are limited to the “Partial” truck (diamonds) since the Golden truck (squares) had a speed governor on the engine.

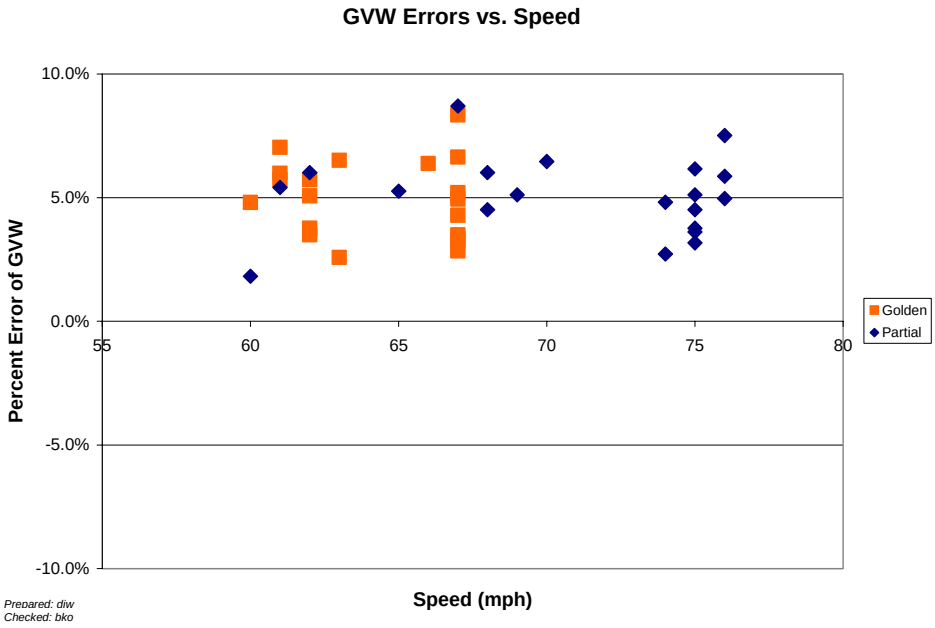


Figure 6-7 - Pre-Validation GVW Percent Error vs. Speed Group - 350100 –20-Aug-2008

Figure 6-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. Steering axle error is consistent at all speeds.

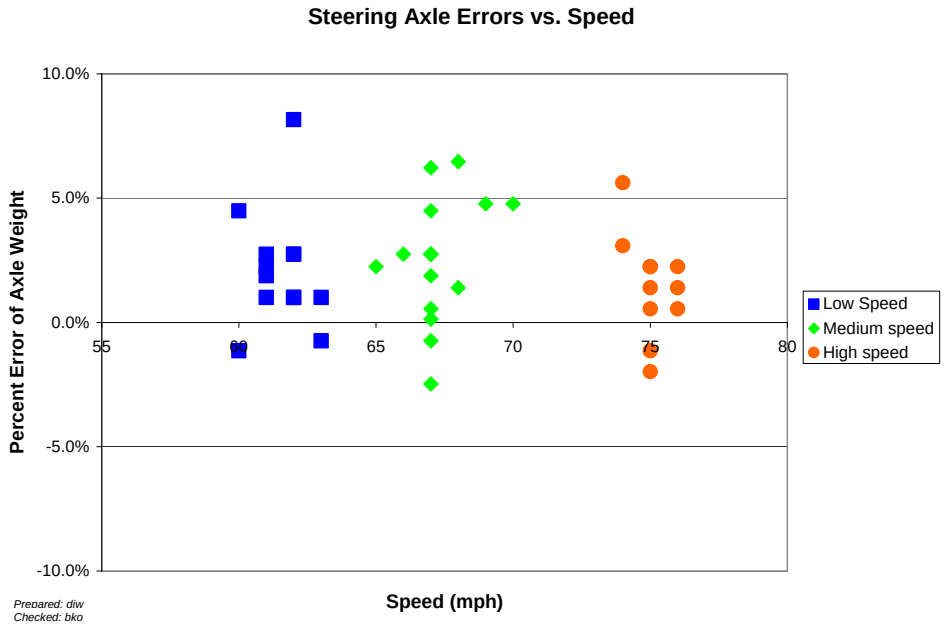


Figure 6-8 - Pre-Validation Steering Axle Percent Error vs. Speed Group - 350100 – 20-Aug-2008

6.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to define unclassified vehicles. Classification 14 is included for unknown vehicles.

A sample of 100 trucks was collected at the site. The classification identification is to identify gross errors in classification, not validate the classification algorithm. Video was taken at the site to provide ground truth for the evaluation. Based on the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles. **This is inconsistent with the data in the post-validation download.**

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

Table 6-4 - Truck Misclassification Percentages for 350100 – 20-Aug-2008

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

Prepared: sfm *Checked: bko*

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations

with at least one Class 9 and only six of them a re matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 6-5 - Truck Classification Mean Differences for 350100 – 20-Aug-2008

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

Prepared: sfm *Checked: bko*

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

A limited investigation of the precision and bias of the speeds reported by the equipment was undertaken. The values were not within the expected tolerances. The measurement method is thought to be the underlying cause.

6.4 Evaluation by ASTM E-1318 Criteria

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

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

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

Prepared: sfm *Checked: bko*

7 Data Availability and Quality

As of August 20, 2008 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements.

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

The amount and coverage for the site is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. This site is a new installation. In the absence of validation information for previous sensor installations no earlier data is included for this site.

Table 7-1 - Amount of Traffic Data Available 350100 – 20-Aug-2008

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2008	41	2	Full week	41	2	Full week

Prepared: sfm *Checked: bko*

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

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

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

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.

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

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

Table 7-2 - GVW Characteristics of Major sub-groups of Trucks – 350100 – 21-Aug-2008

Characteristic	Class 9	Class 5
Percentage Overweights	0.0%	0.0%
Percentage Underweights	0.5%	0.0%
Unloaded Peak	36,000 lbs	
Loaded Peak	72,000 lbs	
Peak		16,000 lbs

Prepared: sfm *Checked: bko*

The expected percentage of unclassified and unknown vehicles is 4.7 percent. This is based on the percentage of unclassified and unknown vehicles in the Post-Validation data download.

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

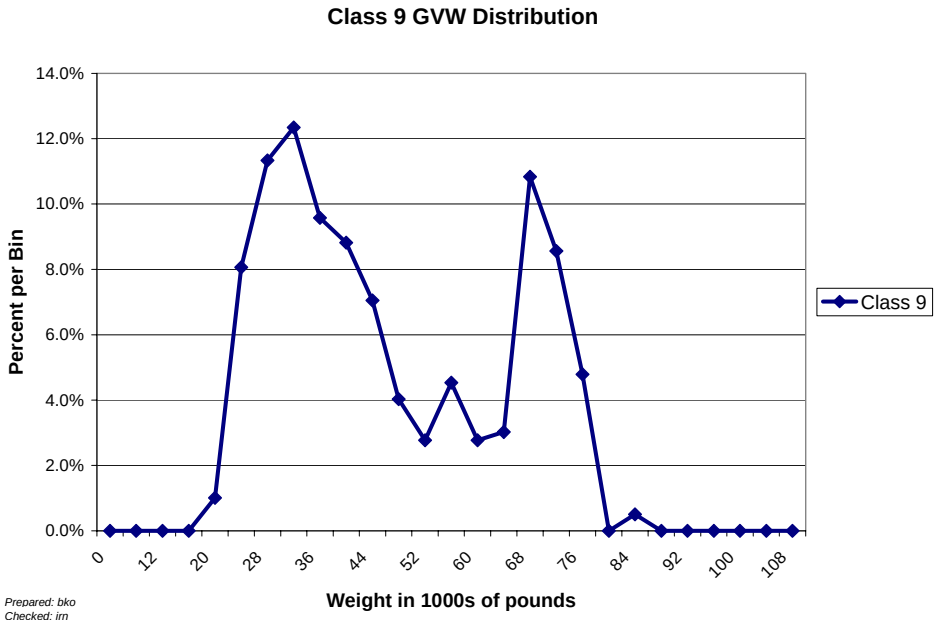


Figure 7-1 - Expected GVW Distribution Class 9 – 350100 – 21-Aug-2008

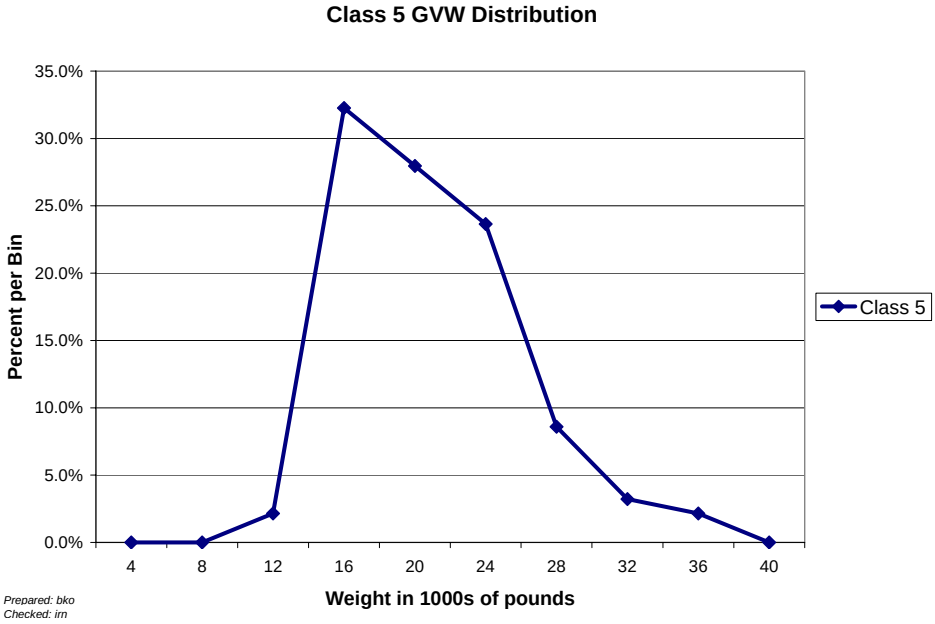


Figure 7-2 - Expected GVW Distribution Class 5 – 350100 – 21-Aug-2008

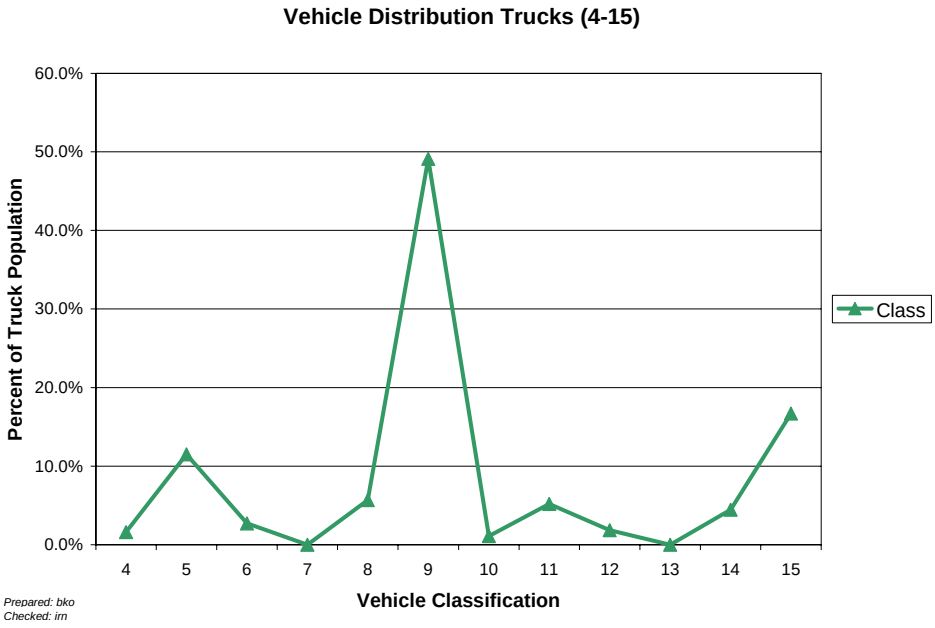


Figure 7-3 - Expected Vehicle Distribution – 350100 – 21-Aug-2008

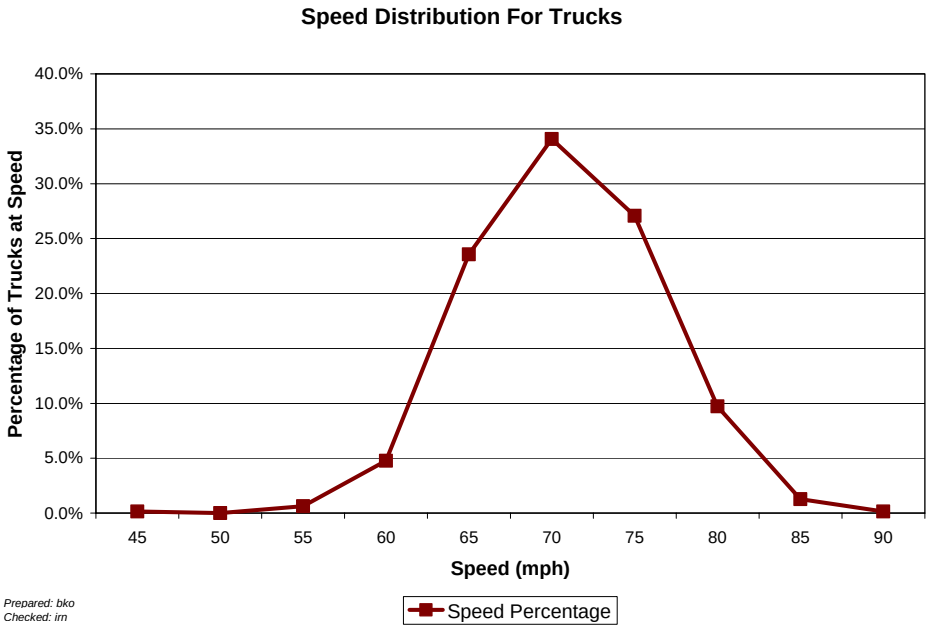


Figure 7-4 - Expected Speed Distribution – 350100 – 21-Aug-2008

8 Data Sheets

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

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

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

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

Calibration Iteration 1 Worksheets – (1 page)

Test Truck Photographs (6 pages)

LTPP Mod 3 Classification Scheme (1 page)

Final System Parameters (1 page)

9 Updated Handout Guide and Sheet 17

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

10 Updated Sheet 18

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

11 Traffic Sheet 16(s)

Sheet 16s for the Pre-Validation and Post-Validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: New Mexico

SHRP ID: 0100

1. General Information 1
2. Contact Information 1
3. Agenda 1
4. Site Location/ Directions 2
5. Truck Route Information 3
6. Sheet 17 – New Mexico (350100) 4

Figures

Figure 4-1 – Site Location for 350100 in New Mexico 2
Figure 5-1 – Scale Location for 350100 in New Mexico 3
Figure 5-2 – Truck Route for 350100 in New Mexico 3
Figure 6-1 – Site Map for 350100 in New Mexico 7

Photos

Photo 1 - 350100_Upstream_08_20_08.jpg 8
Photo 2 - 350100_Downstream_08_20_08.jpg 8
Photo 3 - 350100_Power_Meter_08_20_08.jpg 9
Photo 4 - 350100_Service_Mast_08_20_08.jpg 9
Photo 5 - 350100_Cell_Modem_08_20_08.jpg 10
Photo 6 - 350100_Cabinet_Exterior_08_20_08.jpg 10
Photo 7 - 350100_Cabinet_Interior_Front_08_20_08.jpg 11
Photo 8 - 350100_Cabinet_Interior_Back_08_20_08.jpg 11
Photo 9 - 350100_Leading_WIM_Sensor_08_20_08.jpg 12
Photo 10 - 350100_Trailing_WIM_Sensor_08_20_08.jpg 12
Photo 11 - 350100_Leading_Loop_08_20_08.jpg 13
Photo 12 - 350100_Trailing_Loop_08_20_08.jpg 13

1. General Information

SITE ID: *350100*

LOCATION: *Interstate 25 North at M.P. 36.1*

VISIT DATE: *August 20, 2008*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Bruce Bender, 505-827-5508, bruced.bender@state.nm.us*
Robert Meyers, 505-827-5466, robert.meyers@state.nm.us
Parveez Anwar, 505-827-5656, parveez.anwar@state.nm.us

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

FHWA Division Office Liaison: *Steven Von Stein, 505-820-2028, steven.von.stein@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No briefing requested for this visit*

ON SITE PERIOD: *August 20 - 21, 2008, beginning at 9:00 a.m.*

TRUCK ROUTE CHECK: *See Truck Route*

4. Site Location/ Directions

NEAREST AIRPORT: *El Paso International Airport, El Paso, Texas*

DIRECTIONS TO THE SITE: *0.7 mi. north of Rincon Interchange*

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

WIM SITE LOCATION: *Interstate 25 North at M.P. 36.1 (Latitude: 32.6777^0 and Longitude: -107.0654^0)*

WIM SITE LOCATION MAP:*See Figure 4.1*

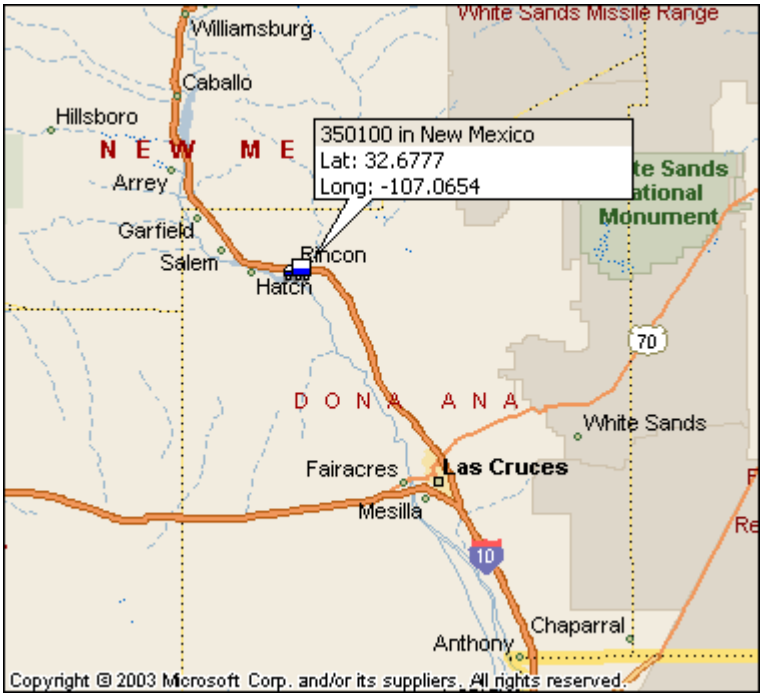


Figure 4-1 – Site Location for 350100 in New Mexico

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *TA Las Cruces, I-10, exit 139, 505-527-7400, Latitude: 32.30044^0, Longitude: -106.81306^0.*

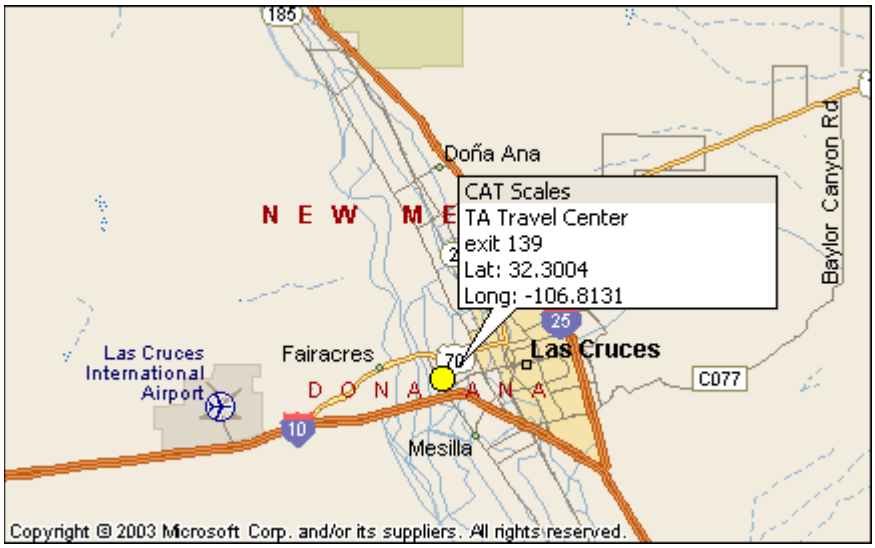


Figure 5-1 – Scale Location for 350100 in New Mexico

TRUCK ROUTE:

- *Northbound to Exit 41 Interchange (5.0 miles). West 0.2 miles, turnaround on right out of turnaround, East 200 feet to I-25 ramp.*
- *Southbound to Exit 32 Interchange (3.5 miles).*

Figure 5-2 – Truck Route for 350100 in New Mexico

6. Sheet 17 – New Mexico (350100)

1.* ROUTE ___I-25_____MILEPOST ___36.1___LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___~2____ % Sag vertical Y / N
Nearest SPS section downstream of the site __350101_ ___ ___ ___
Distance from sensor to nearest downstream SPS Section __850_____ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _12_ ft

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

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

Shoulder width _14__ ft

4.* PAVEMENT TYPE _____Asphalt_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _8/20/2008_ Filename ___35_0100_Upstream_08_20_2008.jpg____
Date _8/20/2008_ Filename ___35_0100_Downstream_08_20_2008.jpg _____
Date _____ Filename _____

6. * SENSOR SEQUENCE _____Loop – Quartz – Quartz – Loop _____

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

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

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

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

10. * CABINET LOCATION

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

Distance from edge of traveled lane __50___ ft

Distance from system __56__ ft

TYPE _____336S_____

CABINET ACCESS controlled by LTPP / STATE / JOINT?

Contact - name and phone number ___ Robert Meyers (505) 827-5466 __

Alternate - name and phone number _____

11. * POWER

Distance to cabinet from drop ___ __12_ ___ ft Overhead / underground / solar / AC in cabinet?

Service provider ____N/A_____ Phone number ____N/A_____

12. * TELEPHONE

Distance to cabinet from drop ___ __N/A___ ft Overhead / under ground / cell?

Service provider _earthlink_ Phone _newmexicosps1wim.earthlink.com/2100_

13.* SYSTEM (software & version no.)- ___iSINC_____

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

14. * TEST TRUCK TURNAROUND time ____20__ minutes DISTANCE __15__ mi.

15. PHOTOS FILENAME

Power source	__350100_Power_Meter_08_20_2008.jpg____
	__350100_ Service_Mast_08_20_08.jpg_____
Phone source	__350100_Cell_Modem_08_20_2008.jpg _____
Cabinet exterior	__350100_Cabinet_Exterior_08_20_2008.jpg _____
Cabinet interior	__350100_Cabinet_Interior_Front_08_20_2008.jpg _____
	__350100_Cabinet_Interior_Back_08_20_2008.jpg_____
Weight sensors	__350100_Leading_WIM_Sensor_08_20_2008.jpg _____
	__350100_Trailing_WIM_Sensor_08_20_2008.jpg_____
Classification sensors	__none_____
Other sensors	350100_Leading_Loop_08_20_2008.jpg_____
	350100_Trailing_Loop_08_20_2008.jpg_____

Description ___Loops_____

Downstream direction at sensors on LTPP lane

_____35_0100_Downstream_08_20_2008.jpg____

Upstream direction at sensors on LTPP lane

_____35_0100_Upstream_08_20_2008.jpg____

COMMENTS

GPS Coordinates: Latitude: 32^0 40.642' and Longitude: 107^0 4.030'

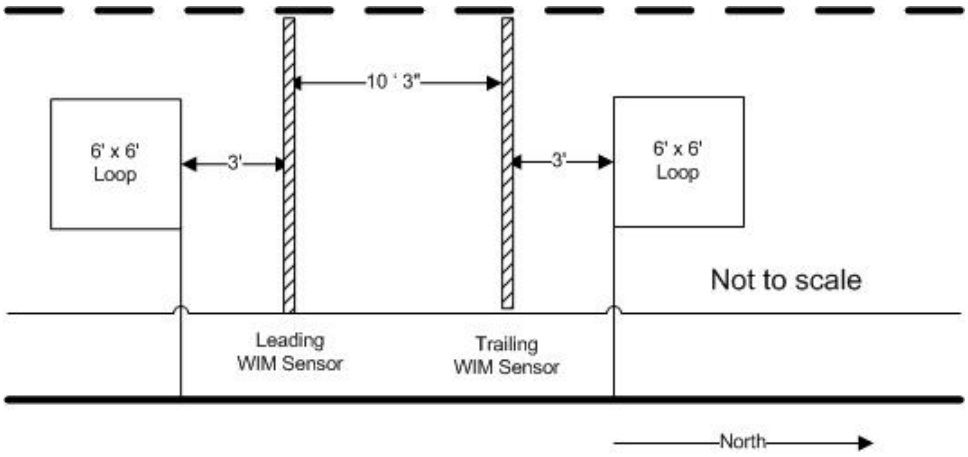
Closest Amenities 32 miles south of site in Las Cruces

Various Hotels, Restaurants, Gas Stations, Lowe's, Wal-Mart

No SPS Test Section Upstream

COMPLETED BY Dean J. Wolf

PHONE 301-210-5105 DATE COMPLETED 8/20/2008



6-1 Sketch of Equipment Layout - 350100

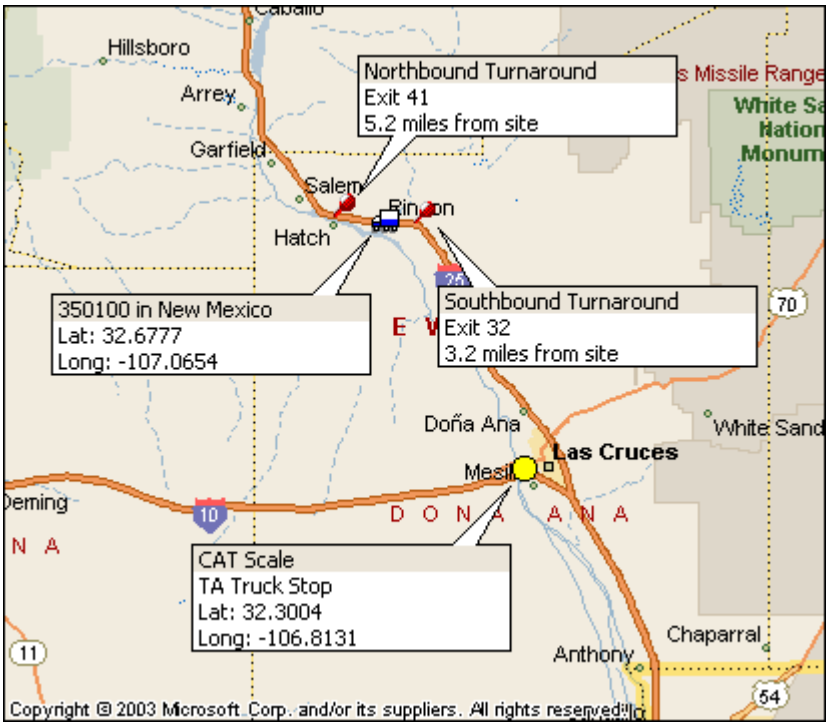


Figure 6-2 – Site Map for 350100 in New Mexico

Photo 1 - 350100_Upstream_08_20_08.jpg

Photo 2 - 350100_Downstream_08_20_08.jpg

Photo 3 - 350100_Power_Meter_08_20_08.jpg

Photo 4 - 350100_Service_Mast_08_20_08.jpg

Photo 5 - 350100_Cell_Modem_08_20_08.jpg

Photo 6 - 350100_Cabinet_Exterior_08_20_08.jpg

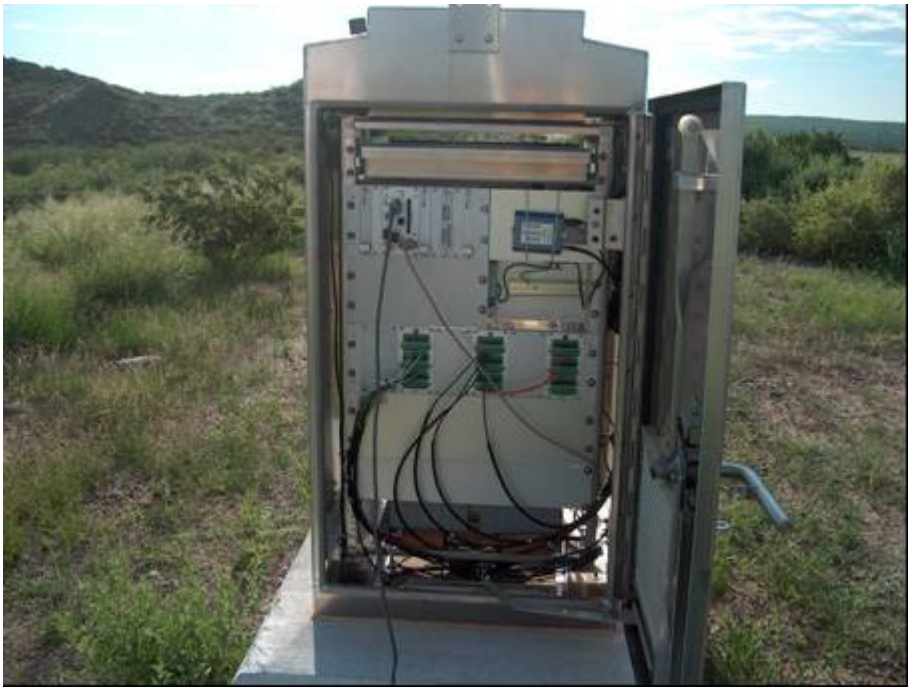


Photo 7 - 350100_Cabinet_Interior_Front_08_20_08.jpg

Photo 8 - 350100_Cabinet_Interior_Back_08_20_08.jpg

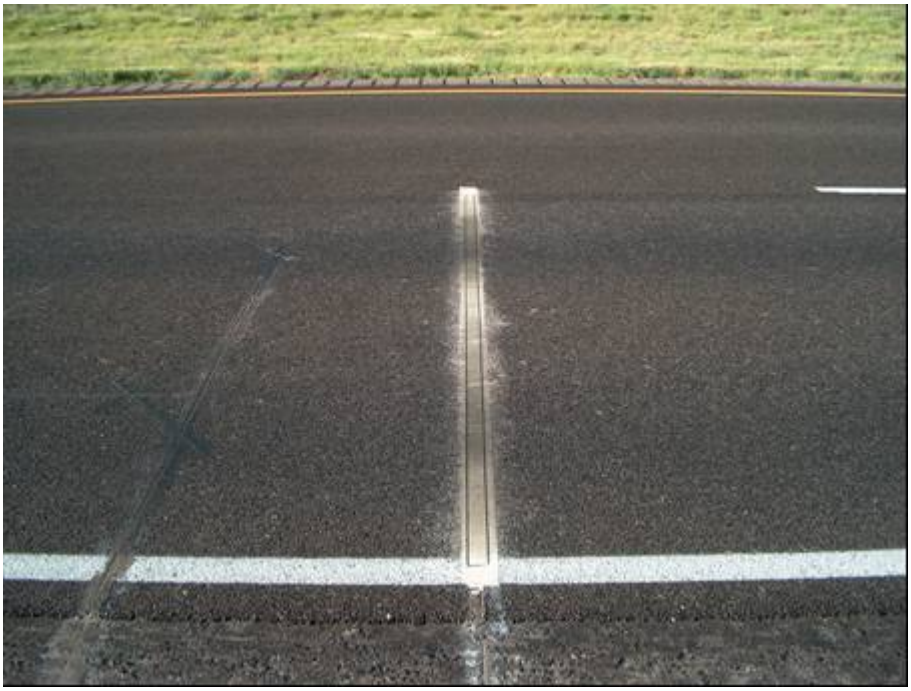


Photo 9 - 350100_Leading_WIM_Sensor_08_20_08.jpg

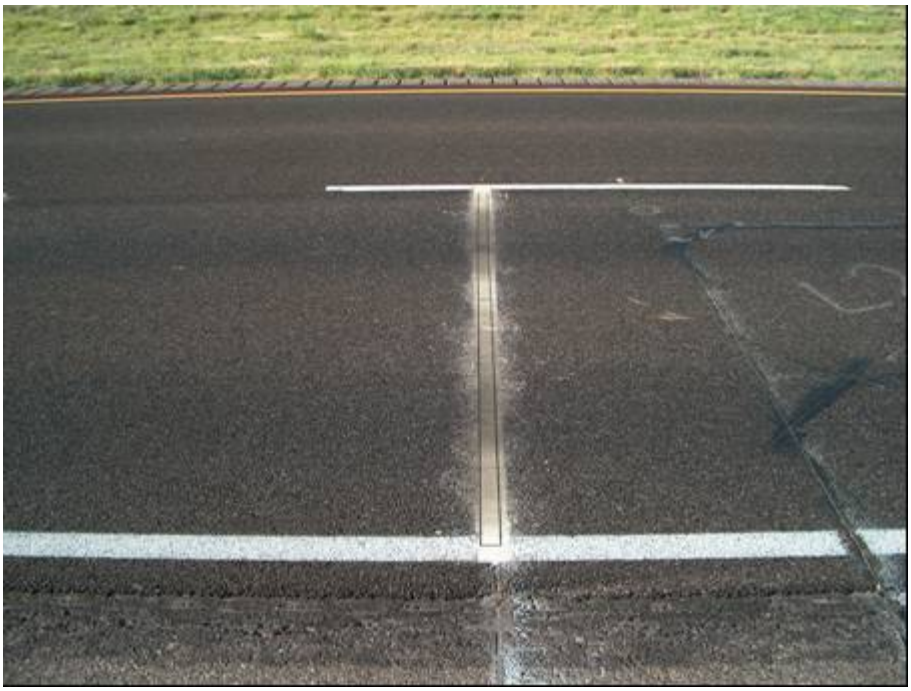


Photo 10 - 350100_Trailing_WIM_Sensor_08_20_08.jpg

Photo 11 - 350100_Leading_Loop_08_20_08.jpg

Photo 12 - 350100_Trailing_Loop_08_20_08.jpg

SHEET 18	STATE CODE [35]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [0100]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) 8/20/2008

Rev. 05/15/07

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

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

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

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

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

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

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

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

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

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

g. Communication –

i. Type –
- ☐ Landline
- ☒ Cellular
- ☐ Other

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

3. PAVEMENT –

a. Type –
- ☐ Portland Concrete Cement
- ☒ Asphalt Concrete

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

c. Profiling Site Markings –
- ☐ Permanent
- ☒ Temporary

4. ON SITE ACTIVITIES –

a. WIM Validation Check - advance notice required _2__ ☐ days ☒ weeks

b. Notice for straightedge and grinding check - __2_ ☐ days ☒ weeks

i. On site lead –
- ☐ State
- ☒ LTPP

ii. Accept grinding –
- ☐ State
- ☒ LTPP

c. Authorization to calibrate site –
- ☐ State only
- ☒ LTPP

d. Calibration Routine –
- ☒ LTPP – ☐ Semi-annually ☒ Annually
- ☐ State per LTPP protocol – ☐ Semi-annually ☐ Annually
- ☐ State other – _____

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

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

   _____

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

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

i. Traffic Control Required – ☐Yes ☒No

j. Enforcement Coordination Required – ☐Yes ☒No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – _____
   b. Reports – _____
   c. Other – _____
   d. Special Conditions – _____

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

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

      Agency: IRD

b. Maintenance (equipment) –

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

Agency: IRD

c. Data Processing and Pre-Visit Data –

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

Agency: IRD

d. Construction schedule and verification –

Name: _____ Phone:_____

Agency: _____

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

Name: Scott Sunderland Phone:(602) 463-8007

Agency: Otto Logistics

f. Traffic Control –

Name: _____ Phone:_____

Agency: _____

g. Enforcement Coordination –

Name: _____ Phone:_____

Agency: _____

h. Nearest Static Scale

Name: TA Travel Location:Las Cruces, NW Exit 139

Phone: _____

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [35] *SHRP SECTION ID [0100]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [8/20/2008]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
   ___ TRAFFIC STREAM -- ___STATIC SCALE (Y/N) _X_ TEST TRUCKS

   ___ NUMBER OF TRUCKS COMPARED __ 2__ NUMBER OF TEST TRUCKS USED

   __ 20__ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	1
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW 5.0 STANDARD DEVIATION 1.6
   DYNAMIC AND STATIC SINGLE AXLES 2.1 STANDARD DEVIATION 2.3
   DYNAMIC AND STATIC DOUBLE AXLES 5.7 STANDARD DEVIATION 3.1

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ 65 70 75 _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3332/2975___

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

CLASSIFIER TEST SPECIFICS***

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

13. METHOD TO DETERMINE LENGTH OF COUNT ___ TIME _X_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ 0 FHWA CLASS _5_ ____ ____ 0
   *** FHWA CLASS 8 ____ 0 FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [35] *SHRP SECTION ID [0100]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [8/21/2008]

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

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

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

5. EQUIPMENT MANUFACTURER ___IRD/ PAT Traffic_____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
   ___ TRAFFIC STREAM -- ___STATIC SCALE (Y/N) _X_ TEST TRUCKS

   ___ NUMBER OF TRUCKS COMPARED __ 2 __ NUMBER OF TEST TRUCKS USED

   __ 20 __ PASSES PER TRUCK

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

TRUCK	TYPE	SUSPENSION
1	9	1
2	9	1
3		

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW 1.0 STANDARD DEVIATION 2.4
   DYNAMIC AND STATIC SINGLE AXLES 0.8 STANDARD DEVIATION 2.7
   DYNAMIC AND STATIC DOUBLE AXLES 1.1 STANDARD DEVIATION 3.6

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ 65 70 75 _____ __ __ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___3146/2809___

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 ____ 11
   *** FHWA CLASS 8 ____ 0
   FHWA CLASS ___ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ____ ____ ____ _____
   FHWA CLASS ___ ____ ____ _____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ 0.0

PERSON LEADING CALIBRATION EFFORT: __Dean J. Wolf, MACTEC_____
CONTACT INFORMATION: _____301-210-5105_____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE_CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	08/20/08

Rev. 08/31/01

PART I.

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

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

GEOMETRY

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

9. a) * Make: International b) * Model: 9400i

10.* Trailer Load Distribution Description:

palletized super sacks of tire buffings loaded evenly along trailer

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

b). Trailer Tare Weight (units): _____

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

A to B 17.9 B to C 4.4 C to D 33.2

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 59.1

13. *Kingpin Offset From Axle B (units) +1.8' (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	75R22.5	2 full leaf spring
B	75R22.5	air
C	75R22.5	air
D	75R22.5	air
E	75R22.5	air
F		

Sheet 19	* STATE CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	08/20/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 76820
*c) Post Test Loaded Weight 76030
*d) Difference Post Test – Pre-test -790

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11640	16480	16480	16110	16110		76820
2	11620	16480	16480	16120	16120		76820
3							
Average	11630	16480	16480	16115	16115		76820

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11340	16320	16320	16040	16040		76060
2	11340	16320	16320	16010	16010		76000
3							
Average	11340	16320	16320	16025	16025		76030

Measured By _____ Verified By _____ Weight date 8/20/08

Sheet 19	* STATE_CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	8/21/02

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 77060

*c) Post Test Loaded Weight 76280

*d) Difference Post Test – Pre-test -780

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11800	16550	16550	16090	16090		77080
2	11760	16550	16550	16090	16090		77040
3							
Average	11780	16550	16550	16090	16090		77060

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11420	16360	16360	16070	16070		76280
2	11440	16360	16360	16060	16060		76280
3							
Average	11430	16360	16360	16065	16065		76280

Measured By _____ Verified By _____ Weight date 8/21/02

Sheet 19	* STATE_CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	08/20/08

Rev. 08/31/01

PART I.

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

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

GEOMETRY

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

9. a) * Make: Peterbilt b) * Model: unk

10.* Trailer Load Distribution Description:

palletized super sacks of tire buffings loaded evenly along trailer

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

b). Trailer Tare Weight (units): _____

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

A to B 20.0 B to C 4.3 C to D 32.7

D to E 4.1 E to F _____

Wheelbase (measured A to last) _____ Computed 61.1

13. *Kingpin Offset From Axle B (units) + 1.3 (_____)

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	295/75R22.5	2 full leaf spring
B	295/75R22.5	air
C	295/75R22.5	air
D	11R22.5	air
E	11R22.5	air
F		

Sheet 19	* STATE CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	8/20/08

Rev. 08/31/01

PART II

Day 1

*b) Average Pre-Test Loaded weight 67200
*c) Post Test Loaded Weight 66370
*d) Difference Post Test – Pre-test -830

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12000	15870	15870	11730	11730		67200
2	12040	15820	15820	11760	11760		67200
3							
Average	12020	15845	15845	11745	11745		67200

Table 6. Raw data – Axle scales –

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

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11640	15730	15730	11640	11640		66380
2	11660	15750	15750	11600	11600		66360
3							
Average	11650	15740	15740	11620	11620		66370

Measured By _____ Verified By _____ Weight date 8/20/08

Sheet 19	* STATE CODE	3 5
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	8/21/08

Rev. 08/31/01

Day 2

7.2 *b) Average Pre-Test Loaded weight 67330

*c) Post Test Loaded Weight 66500

*d) Difference Post Test – Pre-test -830

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

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	12040	15940	15940	11710	11710		67340
2	12120	15880	15880	11720	4720		67320
3							
Average	12080	15910	15910	11715	11715		67330

Table 6.2. Raw data – Axle scales –

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

Table 7.2 Raw data – Axle scales – post-test

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11760	15740	15740	11630	11630		66500
2	11780	15730	15730	11630	11630		66500
3							
Average	11770	15735	15735	11630	11630		66500

Measured By [signature] Verified By _____ Weight date 8/21/08

Sheet 20	* STATE_CODE	3 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
Speed and Classification Checks * 1 of* 2	* DATE	8 / 25 / 08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
68	9	33699	68	9	65	5	33811	65	5
72	9	33704	73	9	60	5	33812	60	5
75	9	33708	76	9	69	9	33815	67	9
67	9	33711	67	9	71	6	33819	71	6
80	9	33728	80	9	74	5	33821	74	5
66	9	33736	67	9	75	9	33827	74	9
72	9	33744	72	9	75	9	33840	75	9
67	9	33747	67	9	65	9	33845	65	9
70	5	33751	72	5	67	9	33852	67	9
79	9	33753	79	9	52	6	33854	52	6
85	9	33754	83	9	75	9	33863	74	9
73	9	33756	73	9	66	9	33869	65	9
62	9	33757	63	9	75	5	33871	74	5
62	11	33767	63	11	76	9	33873	74	9
65	9	33768	66	9	72	9	33875	71	9
75	9	33773	72	9	70	9	33877	70	9
77	9	33776	76	9	67	9	33886	65	9
69	9	33780	69	9	69	9	33889	68	9
63	8	33782	63	8	62	9	33894	61	9
67	9	33791	66	9	71	9	33909	69	9
72	5	33793	70	5	68	6	33911	68	6
65	9	33799	66	9	72	9	33912	72	9
64	9	33800	63	9	66	9	33917	66	9
70	9	33803	71	9	72	9	33923	71	9
68	9	33808	66	9	74	9	33927	73	9

Recorded by MARK 2 Direction N Lane 1 Time from 955 AM to 11:21 PM

Sheet 20	* STATE CODE 35
LTPP Traffic Data	*SPS PROJECT ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 8/25/08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
66	5	33928	65	5	75	9	34033	73	9
72	9	33942	72	9	68	9	34038	67	9
69	9	33950	68	9	62	9	34044	62	9
70	9	33952	67	9	70	9	34049	70	9
67	9	33958	65	9	68	9	34054	66	9
70	5	33961	69	5	65	9	34060	64	9
65	9	33965	63	9	71	6	34063	69	6
68	9	33968	67	9	73	9	34068	72	9
67	9	33972	67	9	69	11	34070	67	11
68	9	33978	66	9	64	12	34071	64	12
72	9	33980	71	9	63	9	34072	63	9
75	6	33982	74	6	75	5	34077	75	5
70	5	33985	[illegible]	5	61	9	34082	60	9
64	9	33986	64	9	68	9	34086	68	9
68	9	33988	66	9	60	5	34090	67	5
65	9	33989	64	9	64	9	34091	62	9
69	9	33990	67	9	70	9	34094	69	9
73	9	33995	70	9	65	9	34095	63	9
62	8	34002	63	8	72	9	34101	70	9
77	9	34005	77	9	55	9	34111	54	9
75	9	34015	76	9	65	5	35114	65	5
72	9	34016	72	9	68	9	35115	66	9
74	9	34023	74	9	67	9	34118	67	9
72	9	34024	71	9	71	9	34122	69	9
75	9	34027	76	9	75	9	34125	75	9

Recorded by MARK B Direction N Lane 1 Time from 11:21 PM to 12:23 PM

Sheet 20	* STATE_CODE	3 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
Speed and Classification Checks * 1 of* 2	* DATE	08/21/08

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
70	9	36293	70	9	70	9	36440	68	9
70	8	36304	69	8	65	9	36442	64	9
71	9	36305	71	9	66	9	36444	66	9
71	9	36311	70	9	68	9	36454	68	9
60	9	36313	59	9	67	9	36455	66	9
63	9	36329	62	9	74	5	36456	75	5
62	9	36346	63	9	74	6	36458	74	6
66	9	36351	66	9	64	9	36460	66	9
73	9	36361	74	9	73	9	36462	72	9
61	9	36368	59	9	68	9	36463	69	9
67	9	36369	65	9	65	9	36469	65	9
71	9	36377	71	9	65	8	36480	64	8
73	9	36378	73	9	62	9	36483	60	9
68	9	36381	67	9	68	9	36489	68	9
66	8	36385	65	8	73	9	36488	72	9
62	9	36393	63	4	73	9	36485	72	9
67	9	36394	67	9	68	9	36492	66	9
60	9	36395	60	9	71	9	36494	70	9
67	8	36400	67	8	80	9	36512	79	9
65	9	36410	65	9	65	9	36516	65	9
77	8	36421	76	8	61	9	36521	61	9
72	9	36422	69	9	68	5	36523	67	5
80	9	36425	79	9	65	9	36526	64	9
73	9	36430	74	9	65	9	36534	65	9
73	9	36437	72	9	74	5	36544	72	5

Recorded by MARK B Direction N Lane 1 Time from 9:45AM to 10:42 AM

Sheet 20	* STATE_CODE	3 5
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
Speed and Classification Checks * 2 of* 2	* DATE	0 8 / 2 1 / 0 8

Rev. 08/31/2001

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
70	8	36555	70	8	67	9	36658	65	9
60	9	36558	59	9	70	6	36668	69	6
65	5	36559	63	5	67	9	36670	66	9
63	11	36560	63	11	65	12	36671	65	12
62	9	36572	67	9	67	8	36673	67	8
64	6	36578	65	6	68	8	36674	67	8
62	9	36583	61	9	67	6	36678	66	6
* 62	8	36585	68	5	71	8	36685	70	8
65	9	36586	64	9	73	9	36686	73	9
67	9	36590	66	9	67	5	36688	67	5
56	9	36593	57	9	66	5	36690	68	5
64	9	36603	66	9	75	9	36694	76	9
70	9	36604	68	9	74	5	36695	73	5
75	9	36610	74	9	56	5	36703	57	5
73	9	36612	72	9	68	9	36704	68	9
73	9	36613	73	9	73	9	36705	74	9
67	9	36614	71	9	77	9	36706	77	9
70	9	36616	69	9	68	9	36707	68	9
69	9	36618	69	9	64	9	36710	64	0
60	9	36630	60	9	68	9	36717	67	9
60	9	36631	60	9	75	9	36719	75	9
67	9	36633	66	9	76	9	36723	76	9
65	9	36634	64	9	78	9	36726	71	9
77	9	36656	79	9	69	9	36727	68	9
65	9	36657	64	9	76	9	36730	75	9

Recorded by MARK Z Direction N Lane 1 Time from 10:42 AM to 11:37AM

Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 1 of 3	* DATE 8 / 20 / 08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight	Axle B weight	Axle C weight	Axle D weight	Axle E weight	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
95	67	1	1	8:29	33475	67	62/56	90/90	86/84	95/71	98/69		80.2	17.4	4.4	33.2	4.1	
95	75	2	1	8:30	33478	75	58/61	73/93	71/92	62/52	83/64		70.9	20.0	4.4	32.9	4.0	
78	58	1	2	8:50	33526	60	59/61	92/96	86/90	97/66	91/64		80.1	17.6	4.4	33.3	4.1	
78	73	2	2	8:50	33527	74	59/63	73/90	68/90	44/54	82/62		68.6	20.1	4.3	32.9	4.0	
81	67	1	3	9:11	33584	67	4/59	91/92	80/89	98/79	98/75		81.5	17.5	4.4	33.4	4.1	
81	70	2	3	9:12	33588	70	63/61	73/98	68/99	56/50	80/63		71.1	20.1	4.4	33.3	4.0	
87	62	1	4	9:33	33649	62	60/58	83/92	79/88	97/79	87/77		79.3	17.5	4.4	33.3	4.1	
87	76	2	4	9:33	33651	76	58/61	72/95	68/98	59/53	81/65		70.1	20.1	4.4	33.3	4.0	
84.5	67	1	5	9:54	33707	67	63/54	81/90	78/89	98/76	88/75		79.1	17.5	4.4	33.4	4.1	
84.5	75	2	5	9:55	33713	75	58/63	79/90	60/95	44/56	81/67		69.2	20.0	4.4	33.1	4.0	
95	62	1	6	10:16	33774	63	58/56	82/88	89/85	88/75	97/81		78.4	17.4	4.4	33.2	4.1	
95	69	2	6	10:17	33775	68	59/61	74/90	79/95	57/53	77/68		69.8	19.9	4.4	33.0	4.0	
104.5	67	1	7	10:37	33830	67	62/56	86/94	84/90	101/73	102/80		82.8	17.5	4.4	33.3	4.1	
104.5	73	2	7	10:38	33831	74	61/64	76/86	74/91	58/43	82/65		70.0	20.0	4.4	33.0	4.0	
109.5	61	1	8	10:58	33887	61	60/58	87/96	85/87	88/83	96/79		81.8	17.5	4.4	33.3	4.1	
109.5	76	2	8	10:58	33888	76	58/62	71/96	71/97	61/58	77/60		71.8	20.0	4.3	32.9	4.0	

Recorded by MARK E Checked by

Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 2 of 3	* DATE 8 / 20 / 08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
116.5	67	1	9	11:20	33947	66	59/59	87/95	82/88	100/25	95/74		81.3	17.5	4.4	33.2	4.1	
116.5	69	2	9	11:20	33948	68	62/64	76/93	71/93	54/51	84/62		70.8	20.0	4.4	33.0	4.0	
119	68	1	10	11:41	34022	62	62/56	85/51	82/80	95/78	90/81		80.8	17.5	4.4	33.4	4.1	
119	76	2	10	11:42	34025	76	58/63	75/95	71/91	52/51	84/66		70.7	20.0	4.4	33.0	4.0	
124	67	1	11	12:16	34118	67	61/54	85/94	76/84	92/78	93/81		79.7	17.4	4.4	33.0	4.1	
124	75	2	11	12:25	34148	75	56/61	71/92	68/94	57/52	85/66		70.2	19.9	4.4	32.9	4.0	
125	61	1	12	12:38	34185	63	59/57	88/93	83/80	98/76	92/78		81.4	17.5	4.5	33.3	4.1	
125	74	2	12	12:45	34196	75	60/61	72/92	72/83	55/47	83/61		69.3	20.0	4.4	33.0	4.0	
133.5	68	1	13	13:00	34232	67	64/54	86/95	78/86	96/69	94/68		79.0	17.5	4.4	33.2	4.1	
133.5	69	2	13	13:06	34248	69	61/63	76/91	72/91	58/52	74/63		70.2	20.0	4.4	32.0	4.0	
132.5	61	1	14	13:21	34294	62	62/54	87/87	84/84	95/72	98/68		79.1	17.5	4.4	33.2	4.1	
132.5	75	2	14	13:26	34308	75	55/61	71/94	69/98	35/57	81/69		68.9	20.0	4.4	33.3	4.0	
137.5	67	1	15	13:42	34348	67	62/60	91/95	84/94	96/58	102/61		80.4	17.5	4.4	33.4	4.1	
137.5	74	2	15	13:46	34357	75	57/63	71/91	69/95	50/51	84/67		69.8	20.2	4.4	33.3	4.0	
131	61	1	16	14:04	34424	62	59/57	88/93	84/88	92/72	99/69		80.3	17.5	4.4	33.3	4.1	
131	65	2	16	14:06	34428	67	60/59	77/93	79/93	53/54	91/67		72.6	19.9	4.4	33.1	4.0	

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 3 of 3	* DATE 8 / 20 / 08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
121.5	66	1	17	14:25	34481	67	60/52	85/90	82/86	92/73	89/80		78.9	17.5	4.4	33.1	4.1	
121.5	60	2	17	14:26	34482	60	59/58	73/92	72/94	39/49	84/63		68.0	19.9	4.3	32.9	4.0	
116.5	61	1	18	14:46	34534	61	69/56	88/80	91/88	93/75	92/75		~~86.3~~	17.5	4.4	33.2	4.1	
116.5	62	2	18	14:46	34535	62	64/64	74/95	70/92	53/52	82/63		70.8	20.1	4.4	33.1	4.0	
110.5	67	1	19	15:07	34587	67	61/53	84/90	53/86	92/73	89/75		78.6	17.4	4.4	33.8	4.0	
110.5	61	2	19	15:08	34588	61	61/60	72/90	72/92	67/49	91/61		70.4	19.9	4.3	32.8	4.0	
108	62	1	20	15:20	34648	61	62/55	90/89	85/82	10.0/73	10.9/75		81.0	17.5	4.4	33.1	4.1	
108	64	2	20	15:20	34649	65	64/59	71/88	69/89	65/53	87/66		70.3	19.9	4.3	32.9	4.0	

mg
80.5
MD

Recorded by MARK Z Checked by

Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 1 of 1	* DATE 0 8 / 2 1 / 2 0 0 5

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
81.5	66	2	1	9:17	36134	66	59/57	67/65	69/90	39/49	77/58		~~64.0~~	20.0	4.4	33.1	4.0	
83	60	1	1	8:38	36186	62	64/60	91/90	87/85	94/92	109/92		77.6	17.6	4.4	33.3	4.1	
83	75	2	2	8:38	36187	75	59/62	79/84	64/82	64/44	73/56		65.5	20.0	4.4	33.0	4.0	
88.5	65	1	2	8:58	36246	67	58/58	82/92	78/88	81/76	85/73		76.4	17.6	4.4	33.4	4.1	
88.5	66	2	3	8:59	36248	65	60/60	71/88	68/80	54/49	79/61		67.2	20.0	4.4	33.1	4.0	
92.5	62	1	3	9:20	36326	62	62/58	84/80	78/85	96/92	92/74		77.0	17.5	4.4	33.3	4.1	
92.5	~~73~~ 72	2	4	9:20	36327	73	62/61	75/88	70/86	58/58	73/62		69.3	20.1	4.4	33.1	4.1	
96.5	~~76~~ 65	1	4	9:40	36369	67	60/55	80/81	73/82	82/73	84/70		75.0	17.5	4.4	33.5	4.1	
96.5	74	2	5	9:41	36371	74	57/61	70/88	70/90	58/44	83/61		68.1	20.0	4.3	32.9	4.0	
99	63	1	5	10:02	36429	62	62/57	85/92	80/88	86/80	95/73		79.9	17.5	4.4	33.4	4.1	
99	~~73~~ 72	2	6	10:02	36431	73	64/61	72/89	68/86	44/48	80/57		66.8	20.0	4.4	33.1	4.0	
		~~5~~ 6	~~5~~ 6															
		~~6~~ 7	~~6~~ 7															

Recorded by MZ

Checked by

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Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 1 of 2	* DATE 8 / 21 / 08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
105.5	66	1	6	10:23	36502	60	61/55	84/87	80/86	88/75	84/71		77.1	17.5	4.4	33.3	4.1	
105.5	75	2	7	10:24	36504	75	55/62	67/93	65/92	49/54	77/65		67.9	20.1	4.4	32.4	4.0	
107.5	62	1	7	10:44	36563	62	62/58	88/92	85/87	91/81	91/75		81.1	~~17.5~~	4.4	33.4	4.1	17.4
107.5	66	2	8	10:45	36569	66	59/61	70/89	66/89	49/49	72/61		66.4	20.0	4.4	33.0	4.0	
113.5	65	1	8	11:06	36637	67	58/61	86/87	78/79	86/55	93/52		73.5	17.5	4.4	33.4	4.1	
113.5	74	2	9	11:06	36638	74	56/62	70/90	66/89	52/56	75/61		67.8	20.1	4.4	32.9	4.0	
118.5	62	1	9	11:27	36713	62	60/56	81/91	81/86	94/74	83/80		78.8	17.5	4.4	33.2	4.1	
118.5	66	2	10	11:28	36716	66	62/62	70/92	54/90	48/46	78/61		68.1	20.1	4.4	33.3	4.0	
122.5	60	1	10	11:48	36781	60	66/58	86/91	79/88	90/70	90/72		79.9	17.5	4.4	33.3	4.1	
122.5	74	2	11	11:48	36783	75	57/61	67/91	68/92	56/53	79/62		68.1	20.2	4.4	33.3	4.0	
129.5	61	1	11	12:57	36961	62	62/56	86/91	82/86	97/74	84/74		80.2	17.5	4.4	33.3	4.1	
129.5	75	2	12	12:58	36965	75	55/62	70/92	64/88	34/53	77/66		66.3	20.0	4.4	33.0	4.0	
133	67	1	12	13:18	37027	67	64/52	84/87	79/83	91/72	93/73		77.4	17.5	4.4	33.1	4.1	
133	64	2	13	13:19	37028	65	60/63	73/90	68/91	50/52	60/64		67.2	20.1	4.4	33.0	4.0	
140	61	1	13	13:40	37070	62	62/56	86/95	79/88	94/70	99/74		81.2	17.5	4.4	33.4	4.1	
	68	2	14	13:41	37072	68	52/56	67/83	70/85	74/67	80/62		66.6	19.5	4.4			

WRONG TRUCK

Recorded by MARK Z

Checked by

Sheet 21	* STATE_CODE 3 5
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
WIM System Test Truck Records 2 of 2	* DATE 8 / 21 / 08

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
140	68	2	14	13:41	37072	68	62/58	71/89	79/84	56/46	80/59		67.4	20.0	4.4	32.9	4.0	
136	65	1	14	14:02	37125	67	59/55	82/87	78/76	91/69	91/70		75.9	17.5	4.4	33.1	4.1	
136	63	2	15	14:02	37126	64	60/61	73/89	72/89	60/40	68/58		67.9	20.0	4.4	32.9	4.1	
134.5	61	1	15	14:23	37191	61	63/57	89/92	80/88	96/78	93/77		81.1	17.3	4.4	33.2	4.1	
134.5	67	2	16	14:24	37193	68	61/61	73/	68/89	42/47	79/65		66.6	20.0	4.4	33.0	4.1	
137	66	1	16	14:44	37258	68	58/54	79/87	76/81	84/74	99/81		77.4	17.5	4.4	32.4	4.5	
137	61	2	17	14:45	37261	60	63/62	74/91	72/93	51/50	81/60		69.7	20.0	4.3	33.0	4.0	
136	62	1	17	15:06	37331	62	59/58	89/90	84/87	92/66	96/65		78.8	17.5	4.4	33.3	4.1	
136	74	2	18	15:06	37332	76	57/59	73/90	79/86	57/44	85/55		67.9	20.0	4.4	33.2	4.0	
134	67	1	18	15:28	37397	67	58/54	82/89	77/79	88/73	90/77		76.6	17.5	4.4	33.1	4.0	
134	68	2	19	15:29	37398	68	61/58	69/84	67/84	56/45	82/62		66.7	20.0	4.4	32.8	4.0	
137.5	62	1	19	15:50	37452	62	64/57	89/71	81/66	92/43	89/43		69.3	17.5	4.4	33.3	4.1	
137.5	69	2	20	15:50	37454	70	60/61	72/88	70/84	31/54	82/60		66.2	20.1	4.4	33.2	4.1	
128	67	1	20	16:12	37525	67	59/55	78/87	71/81	86/72	89/76		75.3	17.4	4.4	33.3	4.1	
128	72	2	21	16:12	37524	72	60/60	74/91	79/86	41/51	77/60		67.1	20.1	4.4	33.2	4.0	

Recorded by MARK B Checked by

Calibration Worksheet

Site: 350100

Calibration Iteration 1 Date 8/21/08

Beginning factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic compensation	100	
Distance	distance (cm)	274	
1 – (55)	89 kph	3315	2962
2 – (60)	96 kph	3315	2962
3 – (65)	105 kph	3332	2975
4 – (70)	112 kph	3332	2975
5 – (75)	120 kph	3332	2975

Errors:

	Speed Point 1 (55)	Speed Point 2 (60)	Speed Point 3 (65)	Speed Point 4 (70)	Speed Point 5 (75)
F/A			+2.1 +2.1	+2.5 +2.5	+1.5 +1.5
Tandem			+5.5 +5.5	+6.0 +6.0	+5.7 +5.7
GVW			+4.9 +4.9	+5.3 +5.3	+4.7 +4.7

Adjustments:

	Raise	Lower	Percentage
Overall	☐	☐	
Front Axle	☒	☐	3.42 %
Speed Point 1	☐	☐	
Speed Point 2	☐	☐	
Speed Point 3	☐	☒	5.23 %
Speed Point 4	☐	☒	5.57 %
Speed Point 5	☐	☒	5.07 %

End factors:

Speed Point (mph)	Name	Left Sensor 1 / 3	Right Sensor 2 / 4
Overall			
Front Axle	dynamic compensation	103	
Distance	distance (cm)	276	
1 – (55)	88 kph	3315	2962
2 – (60)	96 kph	3315	2962
3 – (65)	105 kph	3158	2819
4 – (70)	112 kph	3146	2809
5 – (75)	120 kph	3163	2824

TEST VEHICLE PHOTOGRAPHS FOR SPS WIM VALIDATION

August 20, 2008

STATE: New Mexico

SHRP ID: 350100

Photo 1 - 350100_Truck_1_Tractor_08_18_08.jpg 2
Photo 2 - 350100_Truck_1_Trailer_08_18_08.jpg 2
Photo 3 - 350100_Truck_1_Suspension_1_08_18_08.jpg 3
Photo 4 - 350100_Truck_1_Suspension_2_08_18_08.jpg 3
Photo 5 - 350100_Truck_1_Suspension_3_08_18_08.jpg 4
Photo 6 - 350100_Truck_2_Tractor_08_18_08.jpg 4
Photo 7 - 350100_Truck_2_Trailer_08_18_08.jpg 5
Photo 8 - 350100_Truck_2_Suspension_1_08_18_08.jpg 5
Photo 9 - 350100_Truck_2_Suspension_2_08_18_08.jpg 6
Photo 10 - 350100_Truck_2_Suspension_3_08_18_08.jpg 6

Photo 1 - 350100_Truck_1_Tractor_08_18_08.jpg

Photo 2 - 350100_Truck_1_Trailer_08_18_08.jpg

Photo 3 - 350100_Truck_1_Suspension_1_08_18_08.jpg

Photo 4 - 350100_Truck_1_Suspension_2_08_18_08.jpg

Photo 5 - 350100_Truck_1_Suspension_3_08_18_08.jpg

Photo 6 - 350100_Truck_2_Tractor_08_18_08.jpg

Photo 7 - 350100_Truck_2_Trailer_08_18_08.jpg

Photo 8 - 350100_Truck_2_Suspension_1_08_18_08.jpg

Photo 9 - 350100_Truck_2_Suspension_2_08_18_08.jpg

Photo 10 - 350100_Truck_2_Suspension_3_08_18_08.jpg

ETG LTPP CLASS SCHEME, MOD 3

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

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

System Operating Parameters

New Mexico SPS-1 (Lane 1)

1st Validation

Calibration Factors for Sensor #1

Validation Visit	August 21, 2008	Installation Calibration	May 14, 2008
Front Axle	103	Front Axle	100
Distance	276	Distance	274
88 kph	3315	88 kph	3315
96 kph	3315	96 kph	3315
105 kph	3158	105 kph	3332
112 kph	3146	112 kph	3332
120 kph	3163	120 kph	3332

Calibration Factors for Sensor #2

Validation Visit	August 21, 2008	Installation Calibration	May 14, 2008
Front Axle	--	Front Axle	--
Distance	---	Distance	--
88 kph	2962	88 kph	2962
96 kph	2962	96 kph	2962
105 kph	2819	105 kph	2975
112 kph	2809	112 kph	2975
120 kph	2824	120 kph	2975