Evaluation/Calibration Report

Ohio, SPS 2

Task Order 3, CLIN 2
Visit Dates: February 3 and 4, 2004

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1 Executive Summary

A visit was made to the Ohio SPS-2 site on February 3rd and 4th, 2004 for the purpose of conducting a field performance evaluation and calibration of the WIM system located on US Route 23 at milepost 19.7. **At this time, this site does not met research quality standards.**

The site is instrumented with Mettler-Toledo mechanical load cell sensors and WIM Controller.

The validation used the following trucks:

1) 3S2 with a tractor having air suspension and trailer having a standard leaf spring suspension, unloaded, weighing 31,470 lbs.
2) 3S2 with a tractor having air suspension and trailer having a standard leaf spring suspension, loaded to 48,070 lbs.
3) 3S2 with a tractor having air suspension and trailer having a standard leaf spring suspension, loaded to 75,810 lbs.

The speeds ranged from 42 to 59 based on a target range of 45 to 55 miles per hour. The temperatures ranged from 28 to 37 degrees Fahrenheit.

Table 1 Post-Validation results – 390200 - 4 February 2004

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-7.2% ± 5.6%	Pass
Loaded tandem axles	±15 percent	4.0% ± 19.6%	**Fail**
Gross vehicle weights	±10 percent	0.4% ± 10.3%	**Fail**
Vehicle speed	±1 mph [2 km/hr]	0.6 ± 2.1 mph	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	-0.1 ± 0.2 ft	Pass

This site as currently calibrated fails all LTPP precision requirements except loaded single axles and axle spacing. The failure is due to the wide variation in the error for the tandem and gross vehicle weights, primarily for the unloaded test truck. The size of the errors increased as the test truck weights decreased, indicating a potential pavement effect on the truck dynamics that appeared to be greatest with unloaded trucks. In the field, there were no distresses observed that would influence truck motions significantly. A visual survey of truck movement over the site determined that there is no discernable vertical or horizontal movement of the trucks prior to, passing over, or beyond the WIM scale area.

MACTEC field technicians worked with the agency representative to compute factor adjustments and the agency representative made all equipment changes. This was expected given the information on the Traffic Sheet 18 completed as part of the assessment visit held on November 12th and 13th, 2003.

It was reported following the site assessment conducted on November 12th and 13th, 2003, that the pavement condition was unsatisfactory for conducting a performance evaluation. All but two of the wheel paths exceed the WIM Index limit of 0.789 m/km. Based on the profile data analysis, the Ohio SPS-2 WIM site does not meet the requirements for WIM site locations since more than half of the calculated LRI and SRI values for the pavement site are higher than the index limits. Therefore, the replacement of the pavement was and remains the preferred option for improving the quality of data from the WIM System.

To reduce the increased error effect of the weights reported by the WIM system as the weights of the trucks decrease, the agency should coordinate with the manufacturer to complete an assessment and calibration of the "span" setting for each weight sensor in the LTPP lane.

2 Corrective Actions Recommended

An assessment and adjustment to the system's span value needs to be performed.

This should be conducted under observation of the WIM equipment manufacturer. The "scan" setting currently being utilized is a setting for each load cell sensor that compensates for the inherent nonlinear increase in weight error as the raw weight input from the sensor decreases (fully loaded trucks 0% error, half-loaded trucks 4% error, empty truck 10% error).

The systems calibration should also be set up to allow for speed dependency compensation, rather than the overall compensation currently being used.

If these adjustments cannot reduce the variability of the tandem and gross axle weights, pavement remediation or replacement will need to be performed to reduce or eliminate the effect of the pavement on the truck dynamics.

3 Post Calibration Analysis

This analysis is based on test runs conducted February 4, 2004 from 12:30 p.m. onwards till 3:30 p.m. at test site 390200 on US 23 North, 7.6 miles North of SR 37. This SPS-2 site is at milepost 19.7 on the Northbound, 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 air suspension and trailer having a standard leaf spring suspension, unloaded, weighing 31,470 lbs.
2) 3S2 with a tractor having air suspension and trailer having a standard leaf spring suspension, loaded to 48,060 lbs.
3) 3S2 with a tractor having air suspension and trailer having a standard leaf spring suspension, loaded to 75,810 lbs.

The front axle suspension of the unloaded five-axle tractor semi-trailer (truck #1) consisted of one standard leaf spring. The drive tandem axle of the tractor used air suspension. The axle tandem of the trailer had a leaf spring suspension, with one standard leaf on the front axle and one standard leaf on the rear axle.

The front axle suspension of the partially loaded five-axle tractor semi-trailer (truck #2) consisted of two standard leaf springs. The drive tandem axle of the tractor used air suspension. The axle tandem of the trailer had a leaf spring suspension, with three standard leafs on the front axle and three standard leafs on the rear axle.

The front axle suspension of the fully loaded five-axle tractor semi-trailer (truck #3) consisted of two standard leaf springs. The drive tandem axle of the tractor used air suspension. The axle tandem of the trailer used a leaf spring suspension, with one standard leaf on the front axle and one standard leaf on the rear axle.

The trucks made a total of 40 passes over the WIM scale at speeds ranging from approximately 43 to 56 miles per hour. Pavement surface temperatures were recorded during the test runs and the temperature was essentially constant at 36 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the test truck population are outside of the allowable limits except for single axles and axle spacing.

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

Table 2 Post-Validation Results - 390200 - 4 February 2004

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-7.2% ± 5.6%	Pass
Loaded tandem axles	±15 percent	4.0% ± 19.6%	**Fail**
Gross vehicle weights	±10 percent	0.4% ± 10.3%	**Fail**
Vehicle speed	±1 mph [2 km/hr]	0.6 ± 2.1 mph	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	-0.1 ± 0.2 ft	Pass

The runs were conducted early afternoon and resulted in a very narrow range of 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, but could not be split into temperature groups. The distribution of runs within these groupings is illustrated in Figure 3-1. The trend of speed with temperature is an artifact of the graph and not the temperature range. The speed groups were divided as follows: Low speed = 43.0-47.0 mph, Medium speed = 47.1-52.0 mph and High speed = 52.1+ mph.

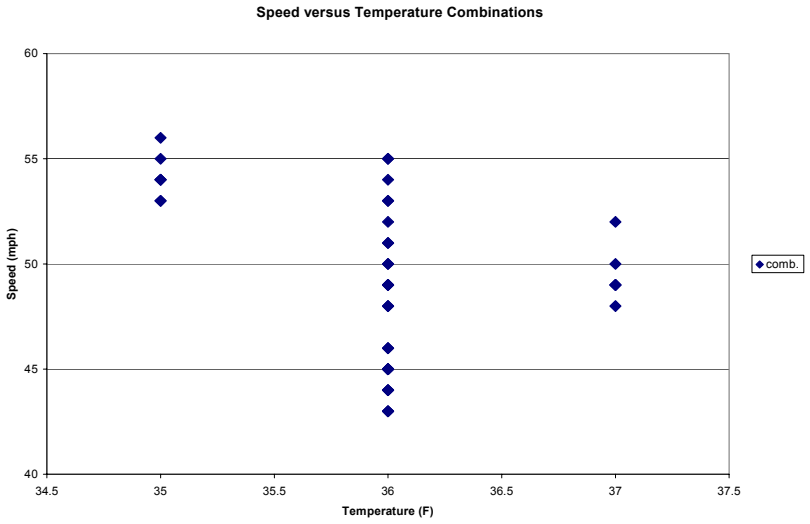


Figure 3-1 Post-Validation Speed-Temperature Distribution – 390200 - 4 February 2004

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

Figure 3-2 shows the By Truck GVW Error vs. Speed graph for the population as a whole. The figure shows that the error in GVW varies by truck. The variation is large for lighter truck compared to the medium and heavy trucks. Furthermore the errors appear to be trending down-wards for the lighter trucks and relatively horizontal for the loaded truck.

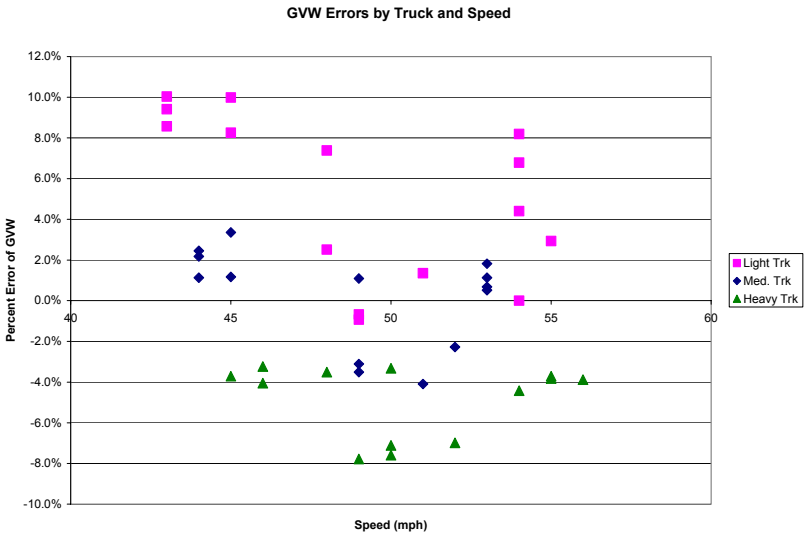


Figure 3-2 Post-validation GVW Percent Error vs. Speed by Truck – 390200 - 4 February 2004

Figure 3-3 shows the relationship between temperature and GVW percentage error. From Figure 3-3 it can be seen that accurate conclusions cannot be made since there is no significant temperature variation. The three temperature points being graphed are 35, 36 and 37 degrees Fahrenheit.

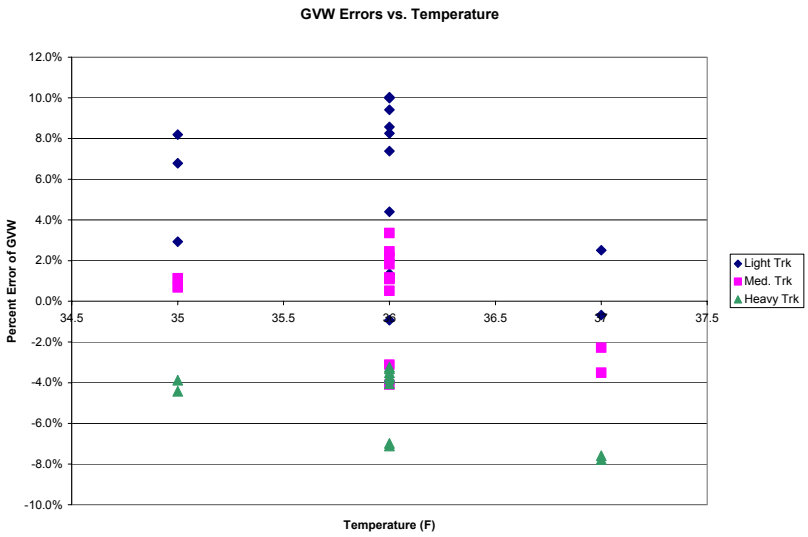


Figure 3-3 Post-Validation GVW Percent Error vs. Temperature by Truck – 390200 - 4 February 2004

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

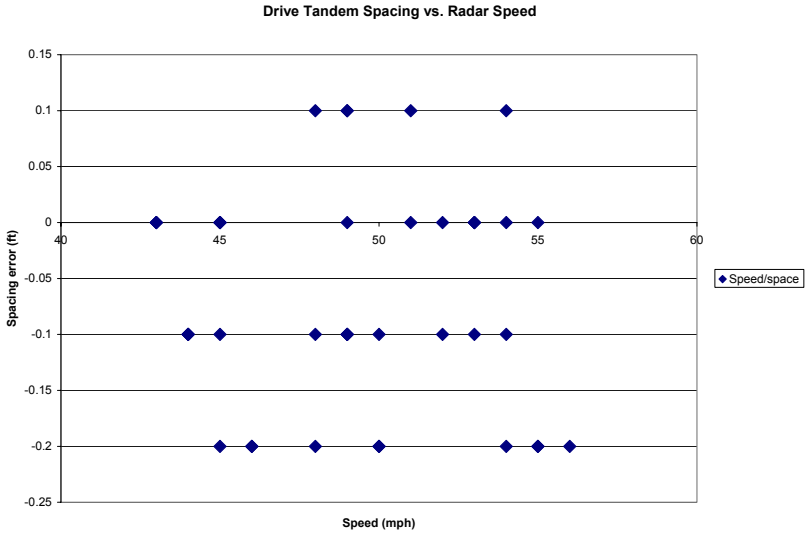


Figure 3-4 Post-Validation Speed vs. Spacing - 390200 - 4 February 2004

3.1 Temperature-based Analysis

There were no temperature ranges because the temperature was essentially the same during the post calibration process.

Table 3 Post-Validation Results by Temperature Bin – 390200 - 4 February 2004

Element	95% Limit	High Temp.
Single axles	±20 %	-7.2% ± 5.6%
Tandem axles	±15 %	4.0% ± 19.6%
GVW	±10 %	0.4% ± 10.3%
Speed	±1 mph	0.6 ± 2.1 mph
Axle spacing	± 0.5 ft	-0.1 ± 0.2 ft

Discussion of results by temperature from Table 3, Figure 3-5 and Figure 3-6 are not relevant since the temperature did not vary. The various figures are included for reporting consistency between sites.

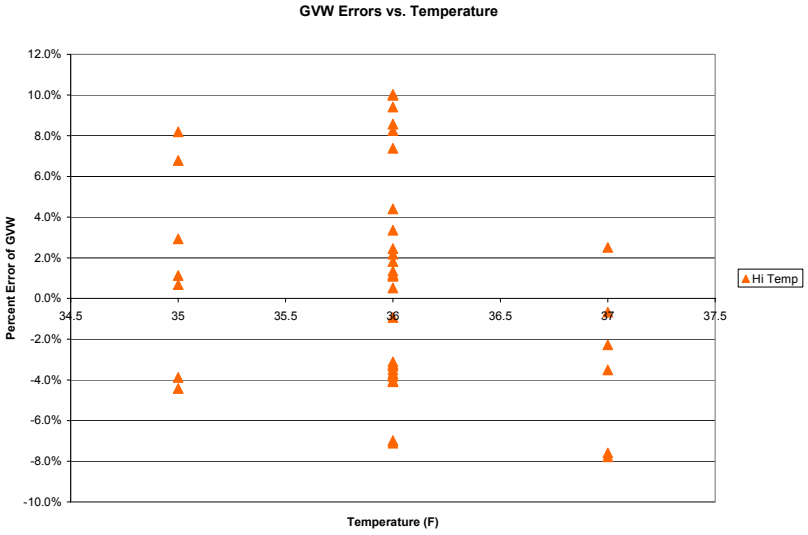


Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Group – 390200 - 4 February 2004

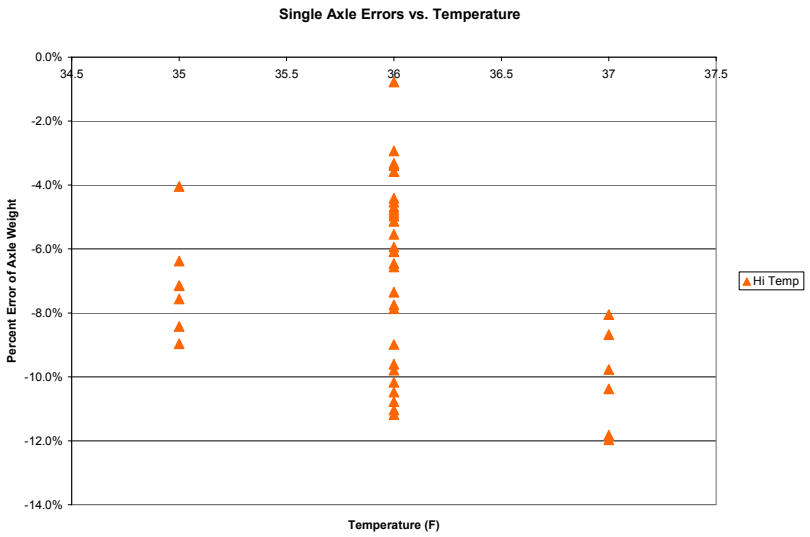


Figure 3-6 Post-Validation Steering Axle error vs. Temperature by Group - 390200 - 4 February 2004

3.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 43.0-47.0 mph, Medium speed = 47.1-52.0 mph and High speed = 52.1+ mph.

Table 4 Post-Validation Results by Speed Bin – 390200 - 4 February 2004

Element	95% Limit	Low Speed	Med. Speed	High Speed
Single axles	±20 %	-4.8% ± 5.1%	-9.0% ± 5.4%	-7.3% ± 2.9%
Tandem axles	±15 %	7.8% ± 23.3%	0.5% ± 17.1%	4.4% ± 17.8%
GVW	±10 %	3.5% ± 11.5%	-2.4% ± 8.8%	0.9% ± 9.4%
Speed	±1 mph	0.3 ± 1.4 mph	1.2 ± 2.6 mph	0.3 ± 1.9 mph
Axle spacing	± 0.5 ft	0.2 ± 0.2 ft	0.0 ± 0.2 ft	-0.1 ± 0.2 ft

From Table 4 there is no apparent trend in any of the elements with speed. With Figure 3-7 as a reference it would appear that if any trend exists it is not linear, but parabolic with a decrease in errors to around 50 miles per hour before the errors start increasing.

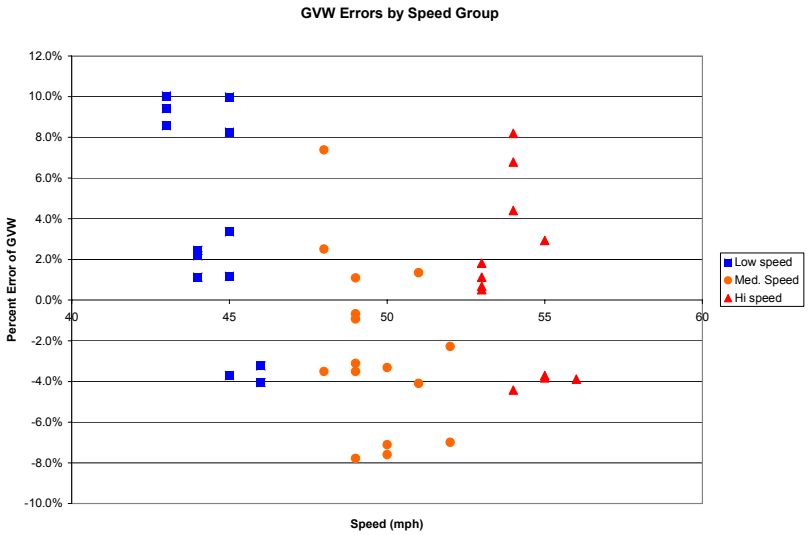


Figure 3-7 Post-Validation GVW Percent Error vs. Speed Group - 390200 - 4 February 2004

When Figure 3-7 is interpreted with a by truck component as it is in Figure 3-8 the dip isn't as apparent. Here the individual truck components of the variability are more clearly illustrated. The light truck (asterisks in the upper portion of the graph) are very widely spread. The medium truck (dots in the middle portion of the graph) are some what less variable with errors of plus or minus four percent of gross weight. The heavy truck (plus signs in the bottom portion of the graph) is under-estimated by four to eight percent, about the same variability as the medium truck. The range on the light truck by comparison was from one percent under to ten percent over on the GVW estimate.

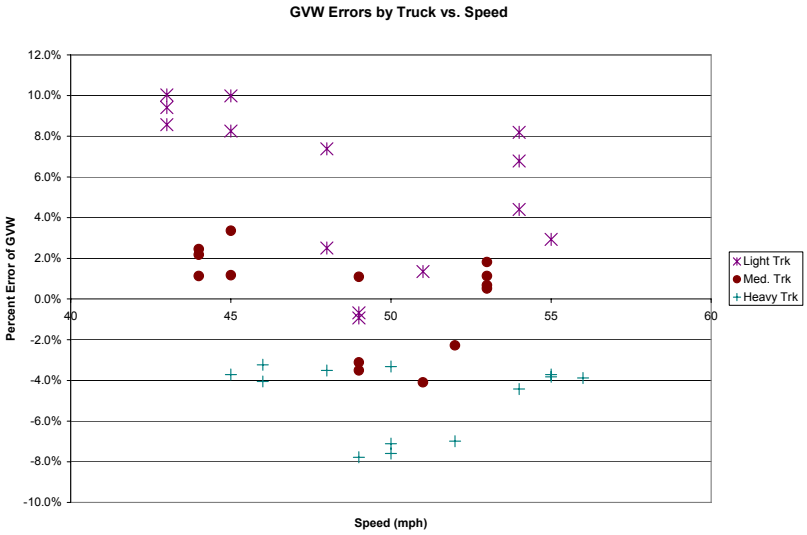


Figure 3-8 Post-Validation GVW Percent Error vs. Speed by Truck – 390200 - 4 February 2004

The single axles were also evaluated by speed group. As shown in Figure 3-9 it would appear that the underestimate of these axle weights increases with increasing speed. This trend is in fact dominated by the two lighter trucks.

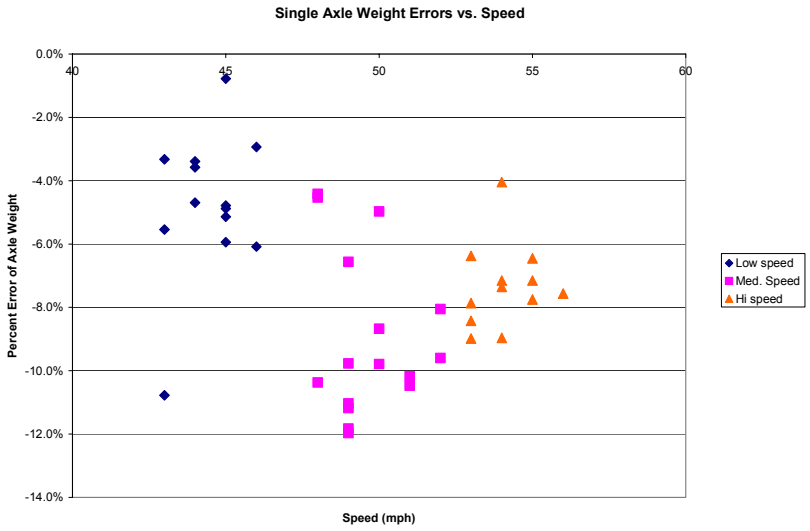


Figure 3-9 Post-Validation Steering Axle Percent Error vs. Speed Group - 390200 - 4 February 2004

Figure 3-10 shows the by truck distribution of errors. The solid symbols are the light and medium truck and show a distinct downward trend. The empty triangles of the empty truck however are scattered more randomly with respect to speed.

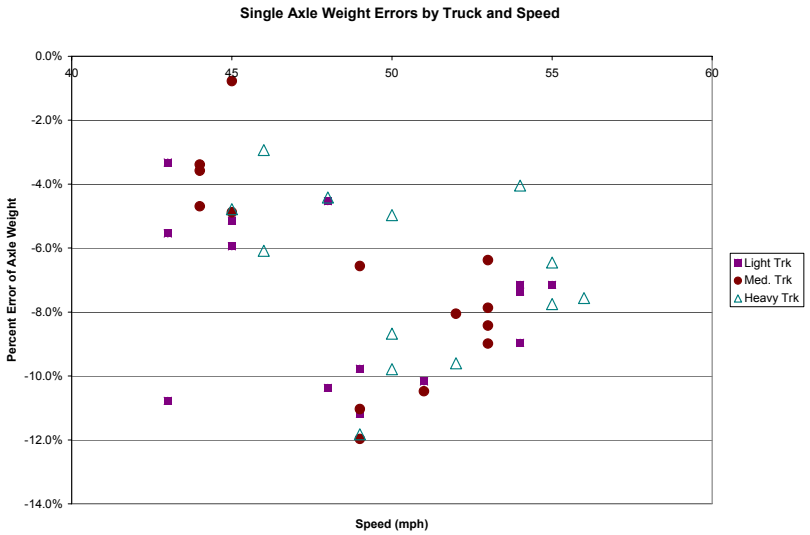


Figure 3-10 Post-Validation Steering Axle Percent Error vs. Speed by Truck - 390200 - 4 February 2004

Figure 3-11 shows the wide variation in response by truck and by tandem with speed. The light truck has the greatest difference in errors between the drive and trailer tandems. The Drive tandem is over-estimated by ten percent or less (the squares generally above the x-

axis). The trailer tandem however is any where from ten to thirty percent over-estimated. In contrast, the medium truck has a trailer tandem that is over-estimated to a greater degree than the drive tandem. (The diamonds are the medium trailer tandem and the triangles the drive tandem on the same vehicle.) The smallest difference in errors when comparing the tandems occurs with the heavy truck where the difference is an under-estimate of five percent or less.

This truck specific variability would suggest a speed dependency influenced by pavement conditions and related to either weight and or length. It should be noted that all of the trucks have similar suspensions and that the heavy truck is six or seven feet shorter than the other two trucks.

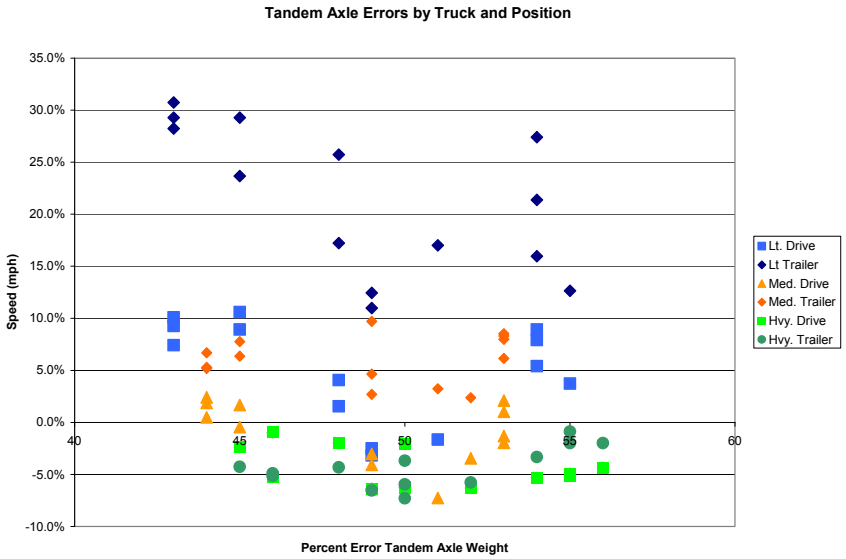


Figure 3-11 Tandem Axle Weight Errors by Position and Truck vs. Speed – 390200 – 4 February 2004

3.3 Classification Validation

The agency uses the 13-bin classification scheme of the FHWA Traffic Monitoring Guide.

A sample of 100 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. The following are the error rates by class. They are expressed in expected error per 100 vehicles of the given class observed. Since the statistics come from a 100vehicle sample they reflect the actual percentages of the errors by class.

Table 5 Error rates for Truck Classification

Class	Error rate	Class	Error rate	Class	Error rate
4	**-20**	**5**	**-70**	**6**	0
7	N/A				
8	0	**9**	**-3**	**10**	0
11	0	**12**	N/A	**13**	N/A

4 Pavement Discussion

The pavement smoothness did contribute to out-of-range results. Slightly more than half of the index values are higher than the values from the assessment. Those values used data collected in December 2002. Most values are still clearly higher than the threshold currently identified for little if any influence on the results.

The pavement condition did not influence truck movement across the sensors. There have been no changes in condition or maintenance since the assessment. The discontinuity at the asphalt Portland cement concrete interface remains.

4.1 Profile analysis

The WIM site is a section of pavement that is 305 meters long with the WIM scale located at 274.5 meters from the beginning of the test section. An ICC profiler was used to collect longitudinal profiles of the test section with a sampling interval of 25 millimeters. The Long Range Index (LRI) incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The Short Range Index (SRI) incorporates a shorter section of pavement profile beginning 2.7 m prior to the WIM scale and ending 0.5 m after the scale.

Profile data collected at the SPS WIM location by Stantec Inc. on February 4, 2004 have been processed through the LTPP SPS WIM Index software. This WIM scale is installed on a Portland cement concrete pavement. The results are shown in Table 6.

A total of 11 profiler passes have been conducted over the WIM site. Since the issuance of the LTPP directive on collection of longitudinal profile data for SPS WIM section, the requirements have been a minimum of 3 passes in the center of the lane and one shifted to each side. For this site the RSC has done 5 passes at the center of the lane, 3 passes shifted to the left side of the lane, and 3 passes shifted to the right side of the lane. Shifts to the sides of the lanes have been made such that data are collected as close to the lane edges as is safely possible. For each profiler pass, profiles are recorded under the left wheel path (LWP), and the right wheel path (RWP).

Table 6 shows the computed index values for all 11 profiler passes for this WIM site. The average values over the passes at each path are also calculated when three or more passes are completed. These are reflected in the next to last column of the table. Values above the index limits are presented in italics. Seven of twelve of these values are higher than

those contained in the assessment report for profile runs done in December 2002. The right-most column reflects the 2002 averages for comparison purposes.

Table 6 Long Range Index (LRI) and Short Range Index (SRI) - 390200 – 4 February 2004

Profiler Passes			**Pass 1**	**Pass 2**	**Pass 3**	**Pass 4**	**Pass 5**	**Ave. (2004)**	**Ave. (2002)**
Center	LWP	LRI (m/km)	*1.206*	*1.190*	*1.215*	*1.276*	*1.274*	***1.232***	***1.210***
		SRI (m/km)	*1.490*	*1.293*	*1.672*	*1.448*	*1.781*	***1.537***	***1.548***
	RWP	LRI (m/km)	*0.863*	*0.858*	*0.822*	*0.838*	0.770	***0.830***	***0.823***
		SRI (m/km)	0.657	0.581	0.700	0.587	0.664	**0.638**	***0.878***
Left Shift	LWP	LRI (m/km)	*1.240*	*1.187*	*1.312*			***1.246***	***1.254***
		SRI (m/km)	*2.026*	*1.567*	*1.824*			***1.806***	***1.667***
	RWP	LRI (m/km)	*1.020*	*0.817*	*1.028*			***0.955***	***0.988***
		SRI (m/km)	*0.979*	*0.834*	*1.174*			***0.996***	***1.532***
Right Shift	LWP	LRI (m/km)	*1.580*	*1.561*	*1.510*			***1.550***	***1.289***
		SRI (m/km)	*1.754*	*1.894*	*1.685*			***1.778***	***1.712***
	RWP	LRI (m/km)	*0.959*	*0.985*	*0.960*			***0.968***	**0.651**
		SRI (m/km)	*1.525*	*1.466*	*1.553*			***1.515***	**0.670**

At all locations except the Right Wheel Path SRI locations the WIM Index value exceeds the limit of 0.789 m/km as can be seen in the table. These six values were slightly higher than the values reported in the assessment report. When all values are less than 0.789 it is presumed unlikely that pavement roughness will significantly influence sensor output. Values above that level may or may not influence the reported weights and potentially vehicle spacings. Based on the profile data analysis, the Ohio SPS-2 WIM site does not meet the requirements for WIM site locations since eighty-five percent of the calculated LRI and SRI values for the pavement site are higher than the index limits. If any remedial action is taken it should be done for the entire section. Suggested alternatives for pavement corrections are grinding or slab replacement. It should be noted that the existing pavement is tined Portland cement concrete. Whether or not this is an Agency requirement was not investigated. However, the tining makes it highly unlikely that the resulting profile index values will be below the performance threshold.

4.2 Distress survey and any applicable photos

The pavement condition is satisfactory. There were no distresses observed that would influence truck motions significantly

4.3 Vehicle-pavement interaction discussion

A visual survey of truck movement over the site determined that there is no discernable vertical or horizontal movement of the trucks prior to, passing over, or beyond the WIM scale area. Most of the trucks were traveling along the wheel path. Daylight cannot be seen between the tires and any of the sensors of the equipment indicating that the truck tires appear to be fully touching the sensors.

5 Equipment Discussion

The traffic monitoring equipment at this location includes Mettler-Toledo load cell sensors and WIM Controller. These sensors are installed in a staggered configuration in concrete pavement. The roadway outside this short section is asphalt concrete.

There were no changes in basic equipment operating condition since the assessment on November 12th and 13th, 2003.

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 in working order.

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

The backup of the water being drained from the sensors identified during the assessment could not be reevaluated due to the accumulation of ice and snow in the median area where the drained water is accumulated. In conversation with the agency representative, it was explained that the water has backed up into the scale pit area and become frozen. Although there is adequate room for a significant amount of water, if the drainage pipe was to back up and become frozen, the scale pit will begin to fill, eventually keeping the scale from operating properly. It was observed during the colder temperatures that vehicle axles were missed or "ghost axles" added. It could not be determined if this was an effect of the scale not working properly, or the WIM controller.

5.2 Calibration Process

The equipment had two iterations of the calibration process between the initial 40 runs and the final 40 runs.

5.2.1 Calibration Iteration 1

The results of the 40 pre-calibration runs performed by the three test trucks produced an average combined GVW error of +5.3%. The compensation factor (P4) setting for that particular lane was increased from the original .740900 by 5.3% to .780262.

Table 7 Calibration 1 Results – 390200 - 4 February 2004

Element	95% Limit	Mean plus or minus Standard Deviations	Pass/ Fail
Single axles	±20 %	-2.2% ± 3.4%	Pass
Tandem axles	±15 %	9.1% ± 23.2%	**Fail**
GVW	±10 %	5.3% ± 10.7%	**Fail**
Speed	±1 mph	0.4 ± 2.3 mph	**Fail**
Axle spacing	± 0.5 ft	-0.1 ± 0.3 ft	Pass

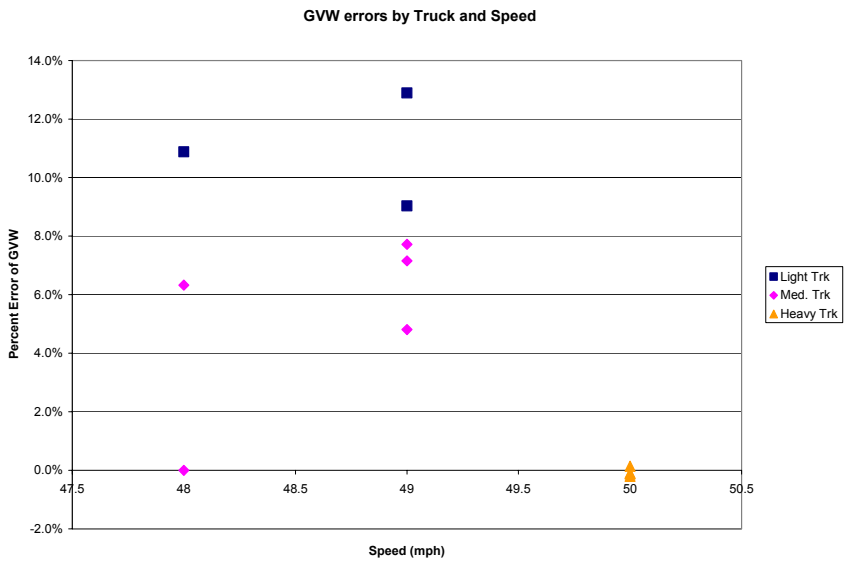


Figure 5-1 Calibration 1 Results - GVW by Truck by Speed – 390200 – 4 February 2004

The first set of 12 iterations performed by the three trucks produced an error of 4.2%. It was then determined that the P4 factor was not based on a percentage of the error, but actually represented a denominator that is a linear percentage adjustment to the scale weights, inversely proportional to the adjustment. The factor of .780262 was then increased to 5.00000.

5.2.2 Calibration Iteration 2

The second set of iterations produced a mean error of -1.7% for GVW. No further adjustments were made, and 28 additional runs were performed to complete the required 40 post calibration runs.

Table 8 Calibration 2 Results– 390200 - 4 February 2004

Element	95% Limit	Mean plus or minus Standard Deviations	Pass/ Fail
Single axles	±20 %	-8.7% ± 5.5%	Pass
Tandem axles	±15 %	1.4% ± 15.9%	**Fail**
GVW	±10 %	-1.7% ± 8.8%	**Fail**
Speed	±1 mph	1.3 ± 2.6 mph	**Fail**
Axle spacing	± 0.5 ft	0.0 ± 0.2 ft	Pass

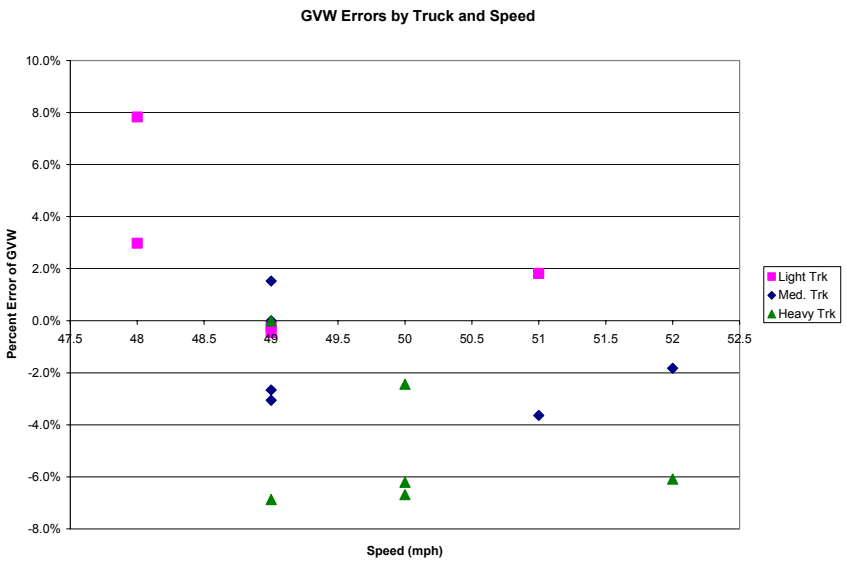


Figure 5-2 Calibration 2 Results - GVW by Truck by Speed – 390200 – 4 February 2004

5.3 Historical calibration information

This site has validation information from previous visits as well as the current one tabulated in the tables below.

Table 9 Classification Validation History - 390200

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
09/17/1999	No data available					
04/09/2001	No data available					
05/29/2002	No data available					
11/12/2003	No. Trucks	0	17	N/A	N/A	0
2/4/2004	No. Trucks	-3	0	-70 (Class 5)	N/A	0

Table 10 Weight Validation History - 390200

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
09/17/1999	Test Trucks	No data available		
04/09/2001	Test Trucks	No data available		
05/29/2002	Test Trucks	-1.5 (3.2)	2.1 (3.4)	-2.0 (3.1)
2/3/2004	Test Trucks	6.4 (3.6)	-1.3 (3.5)	10.5 (8.9)
2/4/2004	Test Trucks	0.4 (5.1)	-7.2 (2.8)	4.0 (9.8)

It should be noted that the 2002 validation was done with a single truck whereas this evaluation is using three trucks. The equipment has been Mettler-Toledo load cells for all validations.

5.4 Projected Maintenance/Replacement Requirements

Corrective maintenance on each WIM scale to resolve drainage deficiencies should be investigated and performed.

6 Pre-Validation Analysis

This initial analysis is based on test runs conducted February 3, 2004 and late morning hours at test site 390200 on US 23 North at 7.6 miles north of SR 37.

For the initial validation the three trucks made a total of 40 passes over the WIM scale at speeds ranging from approximately 47.0 to 60.0 miles per hour. Pavement surface temperatures were recorded during the test runs ranging from about 28.0 to 41.0 degrees Fahrenheit. The computed values of 95% confidence limits of each statistic for the total population are within Table 11.

As seen in Table 11 the site failed all the values except the loaded single axles and the axle spacing length. .

Table 11 Pre-Validation Results - 390200 - 3 February 2004

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Loaded single axles	±20 percent	-1.3% ± 7.0%	Pass
Loaded tandem axles	±15 percent	10.5% ± 17.8%	**Fail**
Gross vehicle weights	±10 percent	6.4% ± 7.2%	**Fail**
Vehicle speed	±1 mph [2 km/hr]	0.1 ± 2.0 mph	**Fail**
Axle spacing length	± 0.5 ft [150 mm]	-0.1 ± 0.2 ft	Pass

The test runs were conducted started during late morning hours and was carried out till mid afternoon. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The speed groups were divided as follows: Low speed = 42.0-48.0 mph, Medium speed = 48.1-54.0 mph and High speed = 54.1+ mph. The two temperature groups were created by splitting the runs between those at 28.0 to 32.0 for Low temperature, and 32.02 to 41.0 for High temperature. There is a clear link between the speed and the temperature in the combinations shown in Figure 6-1.

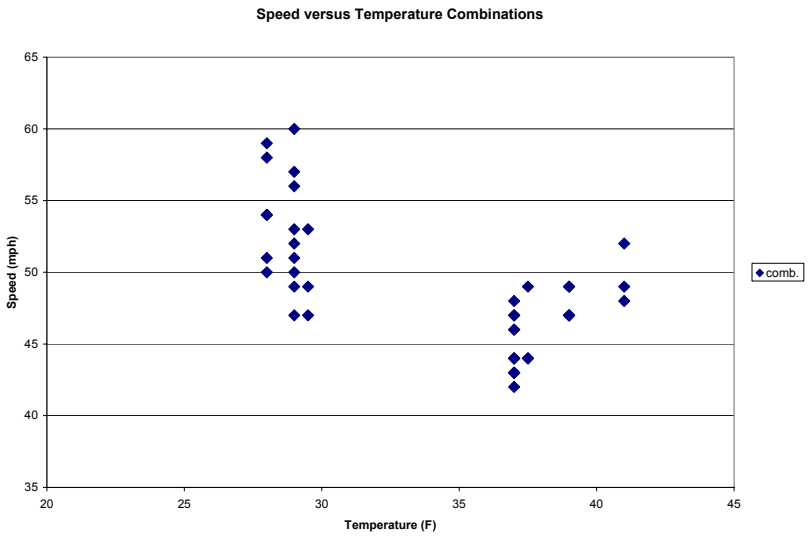


Figure 6-1 Pre-Validation Speed-Temperature Distribution– 390200 - 3 February 2004

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

Figure 6-2 shows the by truck GVW Percent Error vs. Speed for the population as a whole. From Figure 6-2 it appears that the error in GVW is varying significantly for lighter truck compared to the medium and heavily loaded trucks.

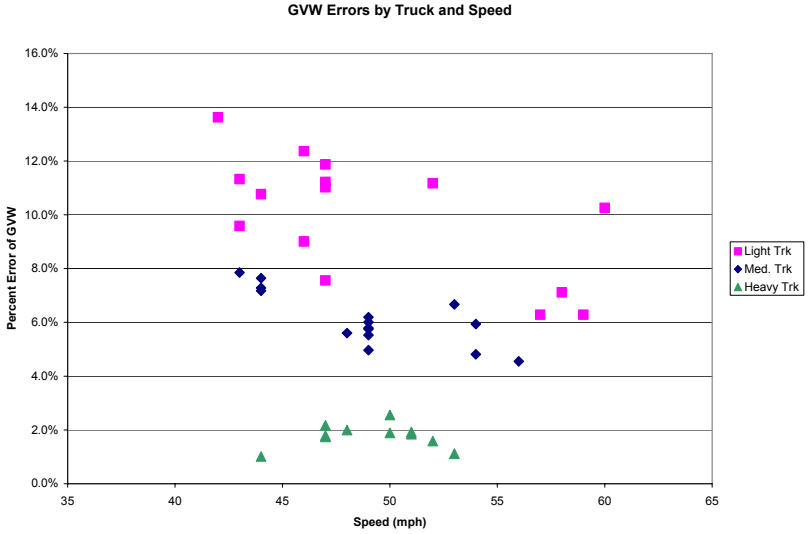


Figure 6-2 Pre-validation GVW Percent Error vs. Speed by Truck– 390200 - 3 February 2004

Figure 6-3 shows the relationship between Temperature and GVW percentage error. From Figure 6-3 it appears that as the temperature increased the error in GVW for lighter

truck increased significantly compared to the medium and the heavily loaded trucks. This is probably the result of confounding temperature with speed.

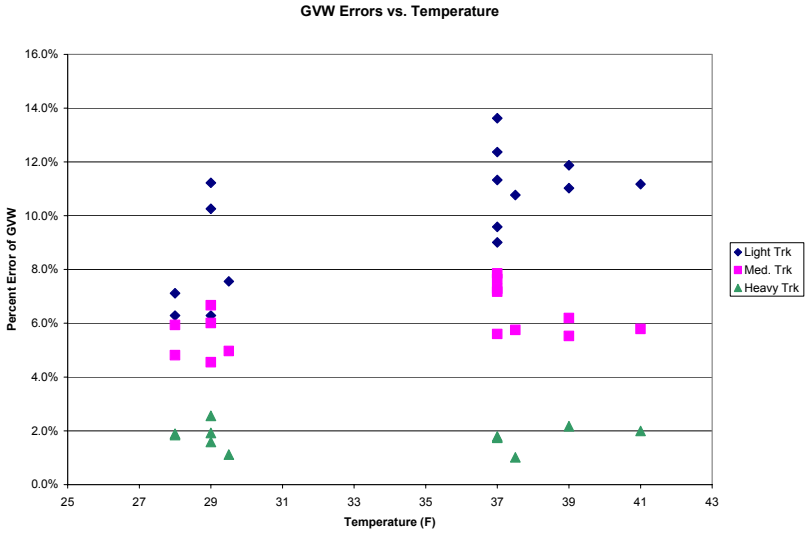


Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature by Truck – 390200 - 3 February 2004

Figure 6-4 shows the relationship between the spacing errors in feet and speeds. From this figure it can be seen that the spacing errors are not significantly affected by the increase in speed except for a few outliers.

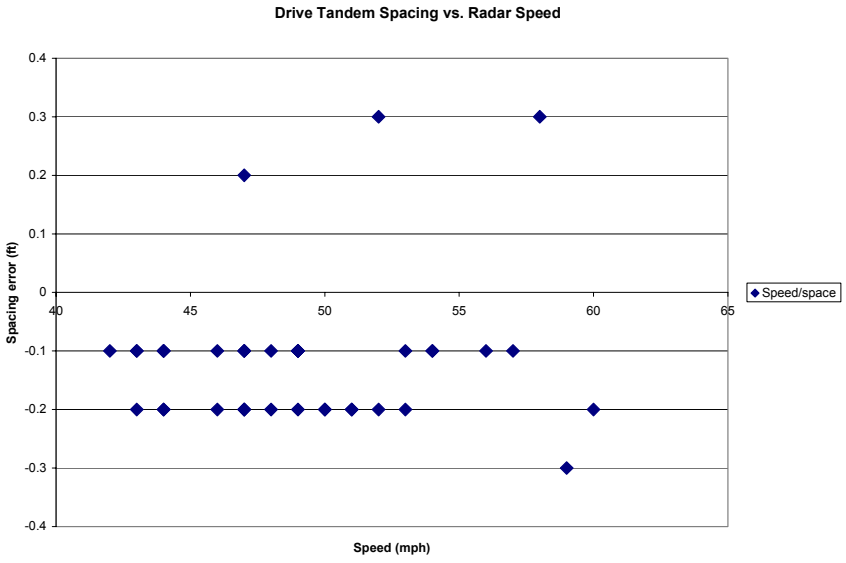


Figure 6-4 Pre-Validation Speed vs. Spacing - 390200 - 3 February 2004

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 28.0 to 32.0 for Low temperature, and 32.0 to 41.0 for High temperature.

Table 12 Pre-Validation Results by Temperature Bin - 390200 - 3 February 2004

Element	95% Limit	Low Temp.	High Temp.
Single axles	±20 %	-2.2% ± 5.3%	-0.6% ± 8.3%
Tandem axles	±15 %	-8.4% ± 14.7%	12.1% ± 19.8%
GVW	±10 %	5.1% ± 6.2%	7.3% ± 7.9%
Speed	±1 mph	0.3 ± 3.2 mph	0.0 ± 0.0 mph
Axle spacing	± 0.5 ft	-0.1 ± 0.3 ft	-0.1 ± 0.2 ft

From Table 12, Figure 6-5 and Figure 6-6 it appears that the increase in the temperature did not significantly affect the error in GVW and single axles. The trend is slight and is probably influenced more by speed than temperature.

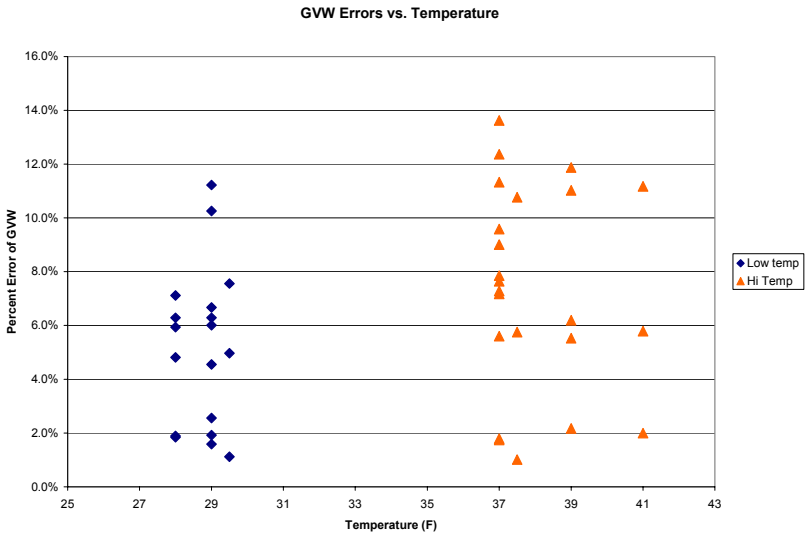


Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Group – 390200 - 3 February 2004

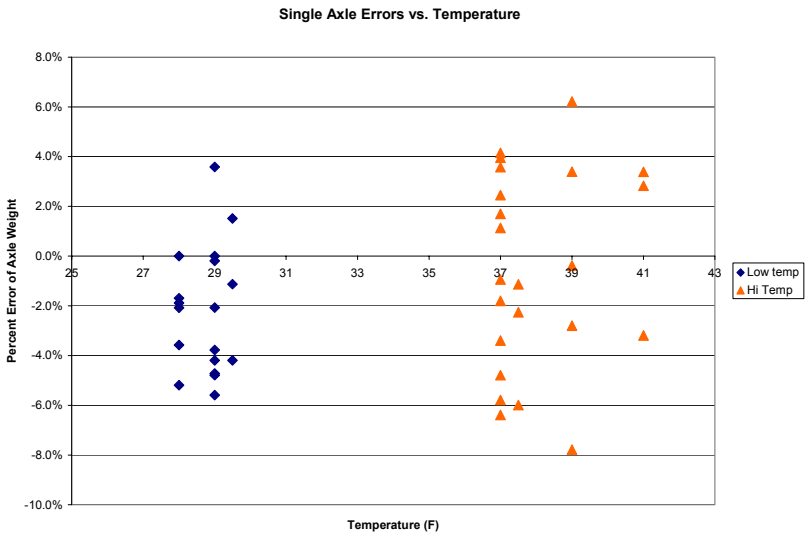


Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group - 390200 - 3 February 2004

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed = 42.0-48.0 mph, Medium speed = 48.1-54.0 mph and High speed = 54.1+ mph. The high-speed group is the smallest in size and effectively runs that exceed the upper end of the range of target speeds. The small size is a contributor to the results of the analysis since *t*-statistics are being used rather than a normal distribution in computing the two standard deviation limit.

Table 13 Pre-Validation Results by Speed Bin - 390200 - 3 February 2004

Element	95% Limit	Low Speed	Med. Speed	High Speed
Single axles	±20 %	-1.2% ± 8.8%	-0.7% ± 5.2%	-3.9% ± 6.3%
Tandem axles	±15 %	13.2% ± 21.0%	6.5% ± 12.0%	12.6% ± 13.9%
GVW	±10 %	7.6% ± 8.4%	4.6% ± 5.6%	6.9% ± 5.8%
Speed	±1 mph	0.1 ± 0.9 mph	0.3 ± 1.0 mph	0.0 ± 7.9 mph
Axle spacing	± 0.5 ft	0.2 ± 0.2 ft	-0.1 ± 0.3 ft	-0.1 ± 0.6 ft

From Table 13, Figure 6-7 thru Figure 6-10 it may appear that the average error in GVW and single axles is decreasing with increases in speed.

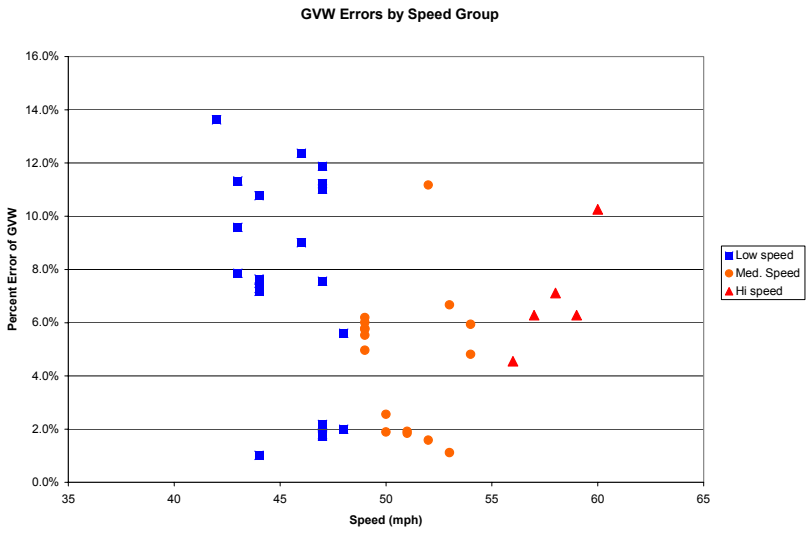


Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 390200 - 3 February 2004

In case of the trucks, the error in GVW is varying significantly for lighter truck compared to the heavily loaded trucks. In Figure 6-8 the plus signs represent the heavy truck with a over-estimate of weight of about two percent. The asterisks represent the light truck with an over-estimate of anywhere from six to fourteen percent. The dots are the medium truck whose errors are over-estimates of four to eight percent.

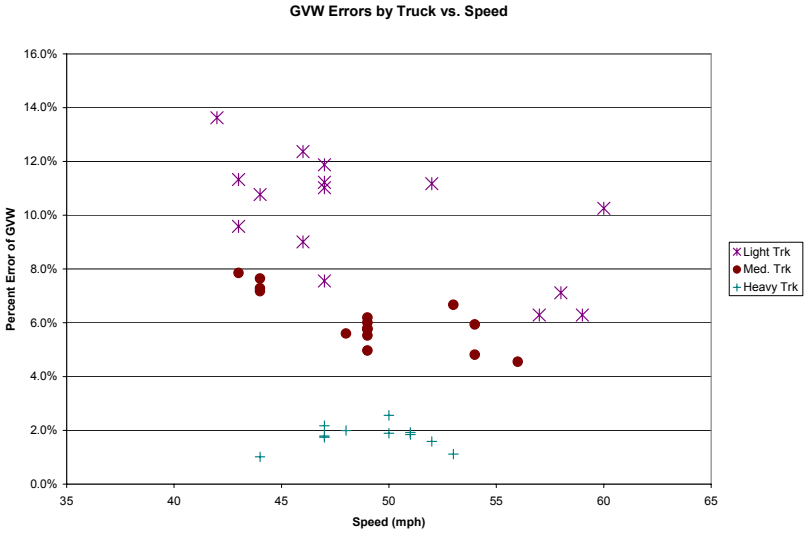


Figure 6-8 Pre-Validation GVW Percent Error vs. Speed by Truck – 390200 - 3 February 2004

For single axles the overall variability with increasing speeds as the speeds approach the speed limit at the site. The change in variability for single axles by speed group is shown in Figure 6-9.

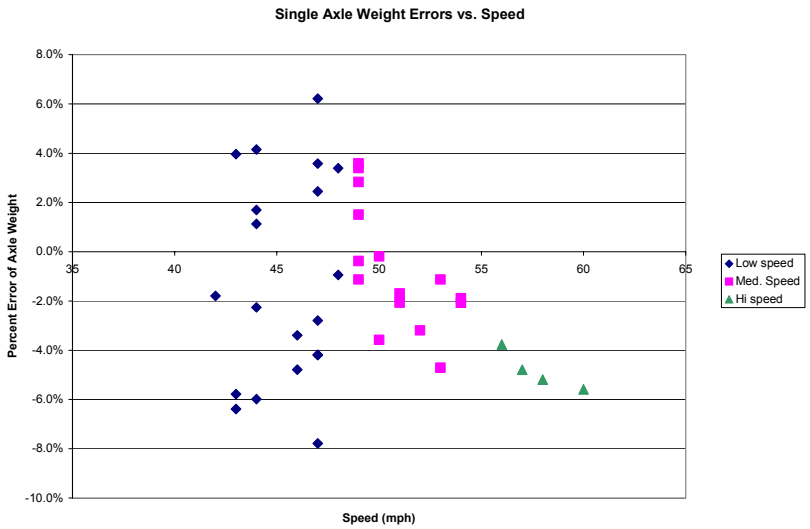


Figure 6-9 Pre-Validation Steering Axle Percent Error vs. Speed Group - 390200 - 3 February 2004

The errors for single axles when disaggregated by truck show varying patterns Figure 6-10. For the light truck the single axle weights (asterisks) are under-estimated. For the medium truck the errors go from over-estimates to under-estimates as speeds increase. A somewhat similar pattern exists for the heavy truck (triangles).

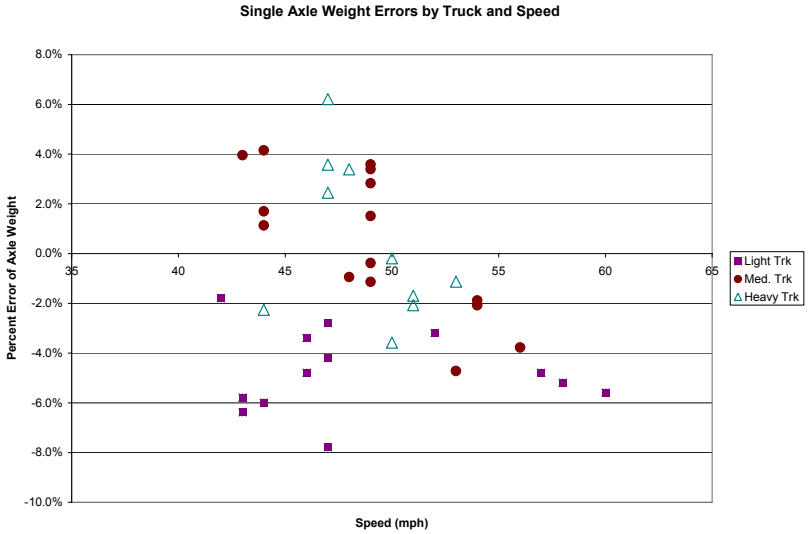


Figure 6-10 Pre-Validation Steering Axle Percent Error vs. Speed by Truck - 390200 - 3 February 2004

6.3 Classification Validation

The agency uses the 13-bin classification scheme of the FHWA Traffic Monitoring Guide. The agency had made an attempt to correct the classification problem noted at the assessment with a software upgrade.

A sample of 100 trucks was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based the sample it was determined that there are zero percent unknown vehicles and zero percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. The following are the error rates by class. They are expressed in expected error per 100 vehicles of the given class observed. Since the statistics come from a 100 vehicle sample they reflect the actual percentages of the errors by class.

Table 14 Error rates for Truck Classification

Class	Error rate	Class	Error rate	Class	Error rate
4	**-20**	**5**	**-70**	**6**	0
7	N/A				
8	0	**9**	**-3**	**10**	0
11	0	**12**	N/A	**13**	N/A

These figures exactly match the post-calibration figures since only one calibration validation check was done.

7 Data Availability and Quality

As of February 10, 2004 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 15. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table 1998, 2000 and 2001 have a sufficient quantity to be considered "full" years. Calibration of classification and weight equipment was done on September 17th 1999, April 9th 2001 and May 29th 2002 as of December 2003 upload. Statistics on data quality are only available for the May 29th 2002 validation. Together with the previously gathered calibration information it can be seen that at least 5 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research classification and weight data.

Table 15 Amount of Traffic Data Available 390200 – 4 February 2004

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1998	255	11	Complete Week	272 (229)*	11	Complete Week
2000	274	11	Complete Week	323	12	Complete Week
2001	273	12	Complete Week	290	11	Complete Week

* Days of Data after eliminating February and March information

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 9's constitute more than ten percent of the truck population. Based on the data collected from the end of the last calibration iteration the following are the expected values for these populations. The precise values will need to be determined by the RSCs on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 16 GVW Characteristics of Major sub-groups of Trucks - 390200 - 4 February 2004

	Class 9
Percentage Overweights	0.8%
Percentage Underweights	2.8%
Unloaded Peak	32,000 lbs
Loaded Peak	78,000 lbs

The expected percentage unclassified is zero.

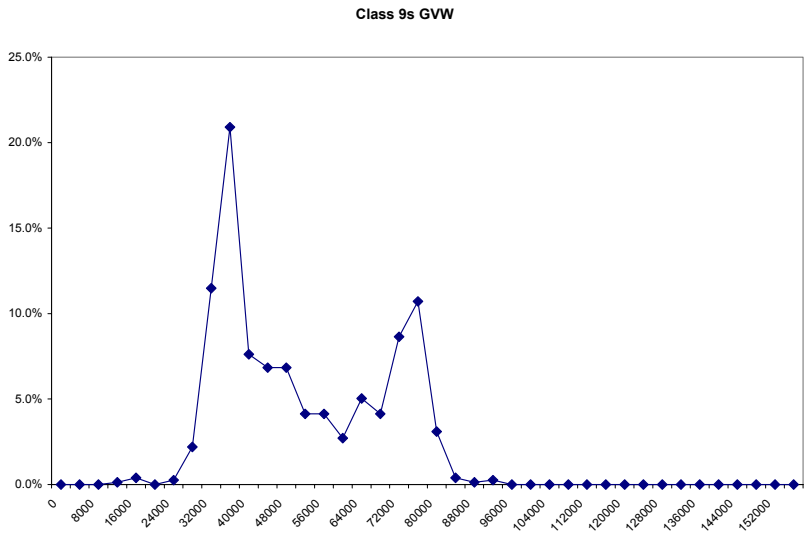


Figure 7-1 Graph of Expected GVW distribution Class 9 – 390200 - 4 February 2004

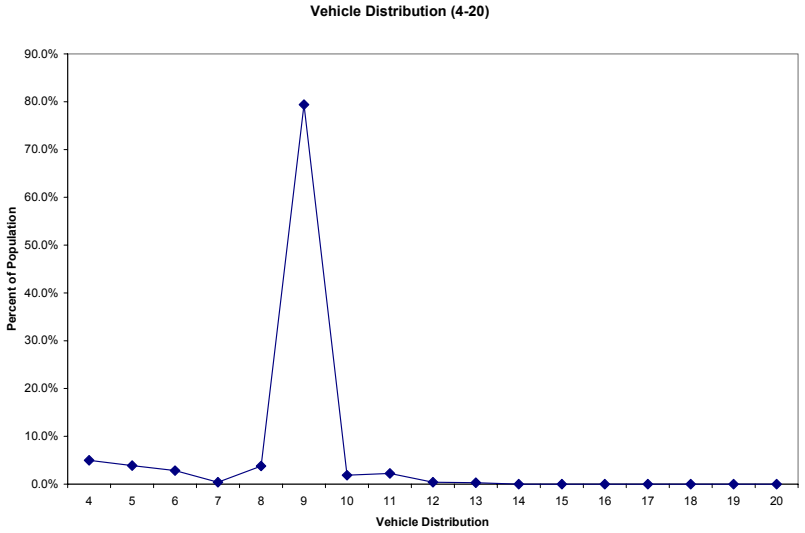


Figure 7-2 Expected vehicle distribution - 390200 - 4 February 2004

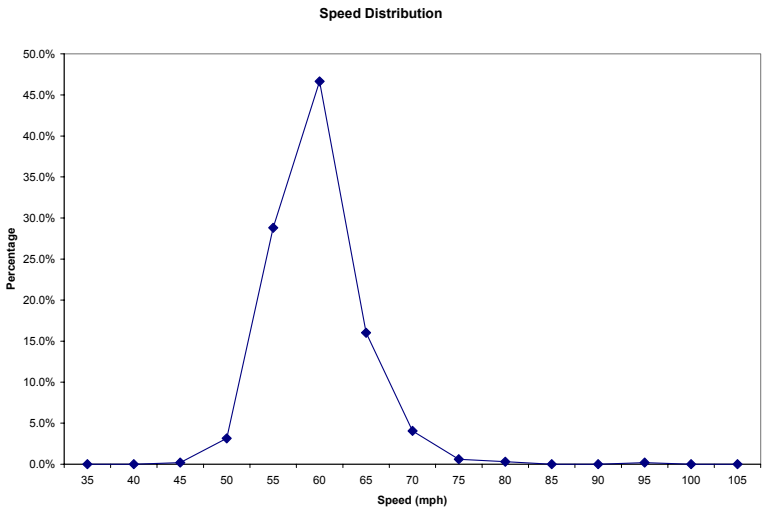


Figure 7-3 Expected speed distribution - 390200 - 4 February 2004

8 Data Sheets

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

Sheet 19 – Truck 1 – Class 9 empty (4 pages)
Sheet 19 – Truck 2 – Class 9 partially loaded (4 pages)
Sheet 19 – Truck 3 –Class 9 fully loaded (4 pages)

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

Sheet 21 – Pre-validation (6 pages)
Sheet 21 – Calibration Iteration 1 – (2 page)

Sheet 21 – Calibration Iteration 2 /Post-validation (4 pages)

9 Updated handout guide and Sheet 17

A copy of the handout has been included following page 27. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided except for the truck scales.

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 at the very end of the report following the updated Sheet 18 information.

HANDOUT GUIDE FOR SPS WIM FIELD PERFORMANCE EVALUATION AND CALIBRATION

STATE: Ohio

SHRP ID: 0200

Figures

1. General Information

SITE ID: *390200*

LOCATION: *US 23 North (Mile Post: 19.7) at Delaware*

VISIT DATE: *February 3rd and 4th, 2004*

VISIT TYPE: *Field Performance Evaluation and Calibration*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Steven Jessberger, 614-752-4057, steven.jessberger@dot.state.oh.us*

Roger Green, 614-995-5993, roger.green@dot.state.oh.us

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

FHWA Division Office Liaison: *Herman Rodrigo, 614-280-6850, herman.rodrigo@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *No Briefing Requested*

ONSITE PERIOD: *February 3rd and 4th, 2004*

TRUCK ROUTE CHECK: Completed at Assessment Visit *(See Truck Route)*

4. Site Location/ Directions

NEAREST AIRPORT: *Port Columbus International Airport, Columbus, OH*

DIRECTIONS TO THE SITE: *7.6 miles North of SR 37*

MEETING LOCATION: On site

WIM SITE LOCATION: *US 23North, Milepost 19.7*

WIM SITE LOCATION MAP:*See Figure 4.1*

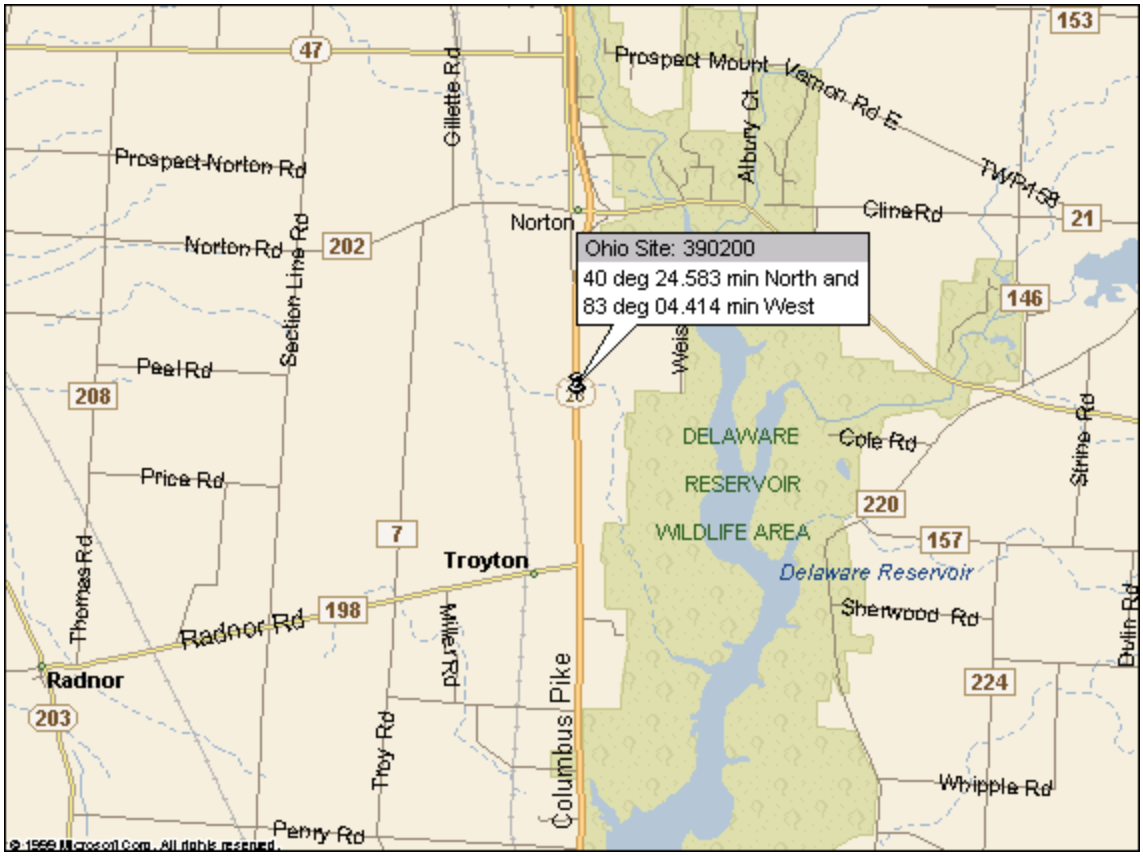


Figure: 4.1: Section 390200 near Delaware, Ohio

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: I71 *Milepost 129, Hours: 7:00 a.m.-3:00 p.m. and 8:00 p.m.-4:00 a.m. Contact: Don Brane (740) 965-3105. Cat Scales at Pilot Travel, I-71 at Exit 131, Sunbury, OH.*

TRUCK ROUTE:

- *Northbound Turnaround –1.678 miles from site at SR 229 (40^0 26.035' North and 83^0 04. 363' West)*
- *Southbound Turnaround –1.424 miles from site at Irwin Road (40^0 23. 356' North and 83^0 04.459' West)*

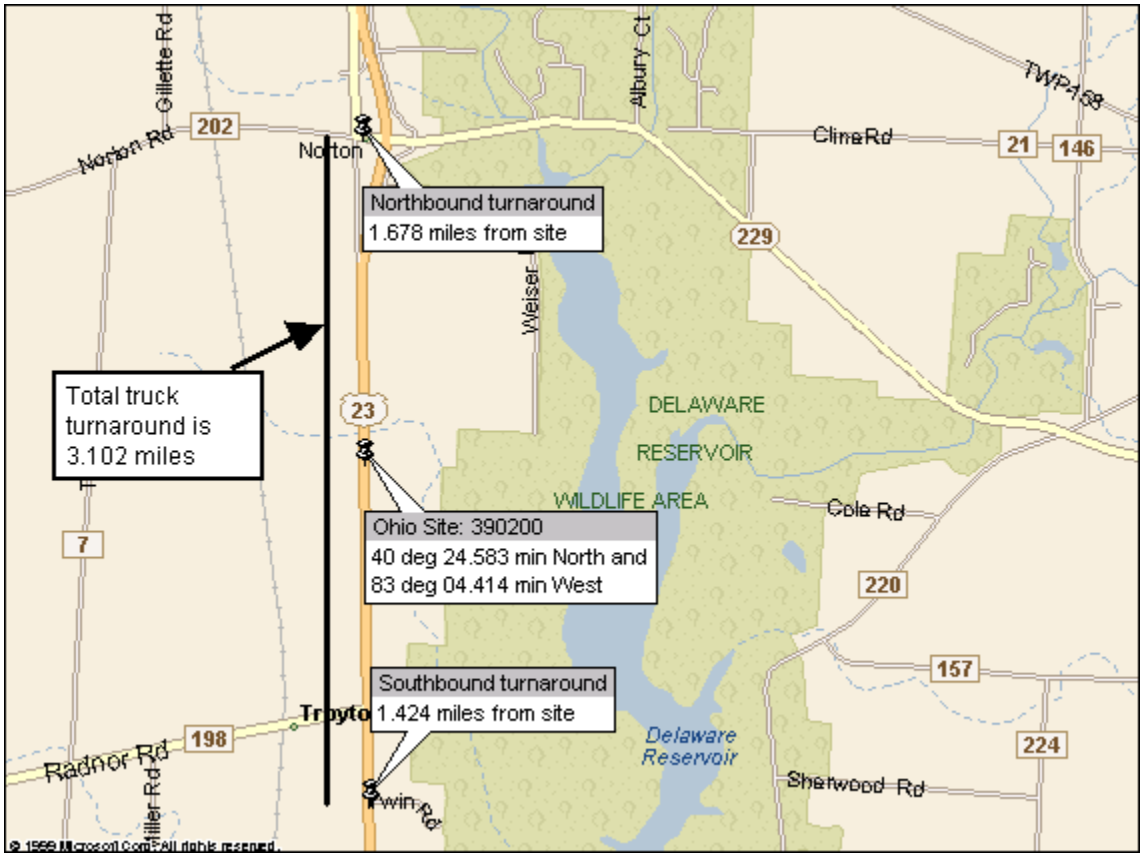


Figure 5.1: Truck Map at 390200

6. Sheet 17 – Ohio (390200)

1.* ROUTE ___US 23____ MILEPOST ___19.745__LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade __<_1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site _0__ _2__ __6_ _1__
Distance from sensor to nearest upstream SPS Section ___ _4__ _0__ _5__ 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 _____ Cement Concrete_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date _____11-12-03_____ Distress Photo Filename_
Downstream_1_TO_1_7A_39_0200_11_12_03.JPG_____
Date _____11-12-03_____ Distress Photo Filename
Downstream_2_TO_1_7A_39_0200_11_12_03.JPG _____
Date _____11-12-03_____ Distress Photo Filename
Upstream_1_TO_1_7A_39_0200_11_12_03.JPG _____

6. * SENSOR SEQUENCE _____Loop – Load Cell – Load Cell_

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 _5_ _4_ ft

Distance from system __ __ __ ft

TYPE ___Mettler - Toledo_____

CABINET ACCESS controlled by LTPP / STATE / JOINT?

Contact - name and phone number ___Steven Jessberger 614-752-4057

Alternate - name and phone number Dave Gardner 614-752-5740

11. * POWER

Distance to cabinet from drop ___ _1__ _0__ ftOverhead / underground / solar / AC in cabinet?

Service provider __Amer. Elec. Power_____ Phone number _____

12. * TELEPHONE

Distance to cabinet from drop _9__ _9__ _1__ ft Overhead / under ground / cell?

Service provider ____Verizon_____ Phone Number _____

13.* SYSTEM (software & version no.)- _____Mettler - Toledo_____

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

14. * TEST TRUCK TURNAROUND time __10_____ minutes DISTANCE _6.2__ mi.

15. PHOTOS FILENAME

Power source _AC_Meter_Box_TO_1_7A_39_0200_11_12_03.JPG____

Phone source _____

Cabinet exterior _Cabinet_Exterior_TO_1_7A_39_0200_11_12_03.JPG

Cabinet interior _Cabinet_Interior_TO_1_7A_39_0200_11_12_03.JPG

Weight sensors _Load_Cells_1_TO_1_7A_39_0200_11_12_03.JPG_

Classification sensors _Loop_Sensors_1_TO_1_7A_39_0200_11_12_03.JPG

Other sensors _____

Description _____

Downstream direction at sensors on LTPP lane

_Downstream_1_TO_1_7A_39_0200_11_12_03.JPG_____

Upstream direction at sensors on LTPP lane

_Upstream_1_TO_1_7A_39_0200_11_12_03.JPG_____

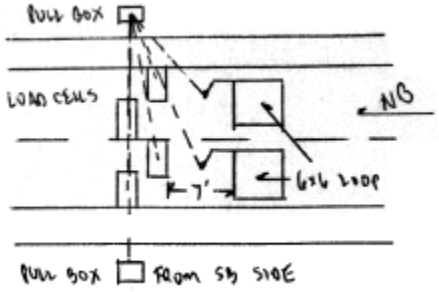
COMMENTS

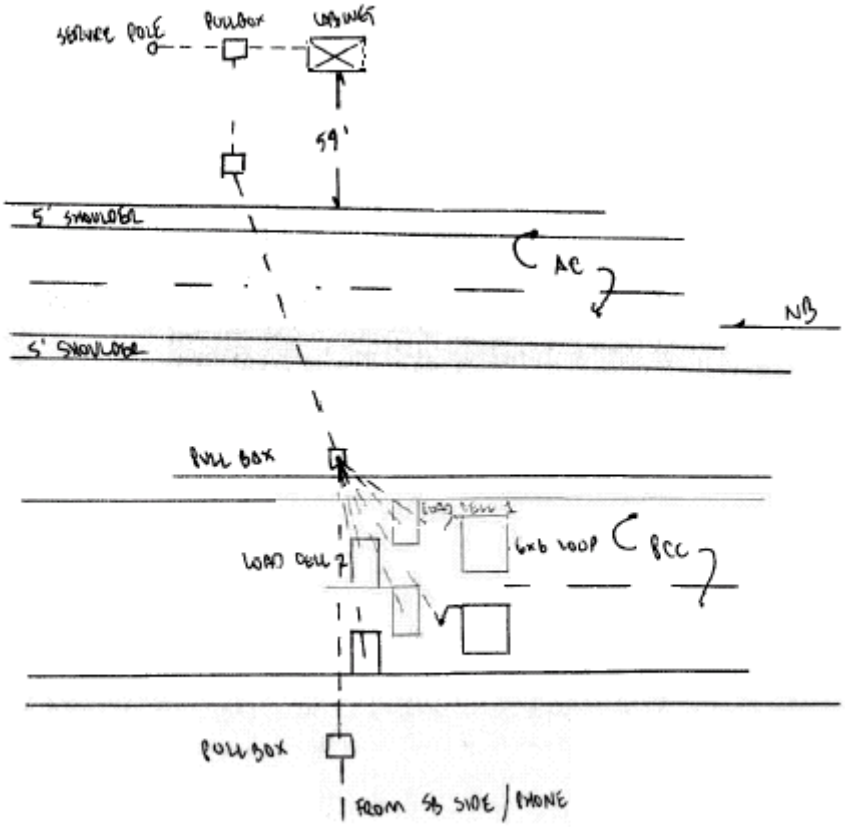
_____
_____GPS Coordinates for site: 40^0 24.583' North and 83^0 04.414' West_____
_____
_____Amenities_-_5.5_miles_ south_of_site_____
_____Food_-Wendy's & Mc Donald's_____
_____Gas_-_Citgo, Sunoco, mini-mart_____
_____Miscelleaneous_-_84 Lumber_____
_____Hotel_-_Travel Lodge _____
_____
_____10.0_miles south of site_____
_____
_____Food_-_Damon's, Wendy's, Taco Bell, Kroger's_____
_____Hotel_-_Super 8, Ameri Host_____
_____Miscellaneous_- Banks, Wal-Mart, Sears Hardware_____
_____
_____Contact for Lane Switch -__Dave Zurbe – 740-363-1251_(ext 266) - Striping___
_____Roger Green – LTPP Division Liaison (Ohio)_____
_____Delaware County Garage – Bob Lloyd 740-369-1569_____
_____
_____ Types of Trucks: Three Class 9s_____
_____
____Expected Weight Ranges: Truck 1 – Empty with no suspension requirements;____
Truck 2 – partially loaded 28,000 – 50,000 lbs no suspension requirements;_____
Truck 3 – 72,000 to 80,000 legal limit on gross and axles, air suspension;_____
_____
Speeds to be run: 45 to 55 mph_(Posted Speed Limit is 55 mph) _____
_____Corrective actions recommended: Controller classification firmware should be updated to facilitate the use of weights in the classification process. Grinding or replacement of the travel lane_pavement.
_____
_____
_____ Speed bias is 0.6 with a 2SD limit of 2.1
_____
_____
_____

COMPLETED BY ____Dean J. Wolf_____

PHONE _301-210-5105_____DATE COMPLETED _0_ 2_ /_0_ 4_ / _2_ 0_ 0_ 4_

Sketch of equipment layout





Site Map

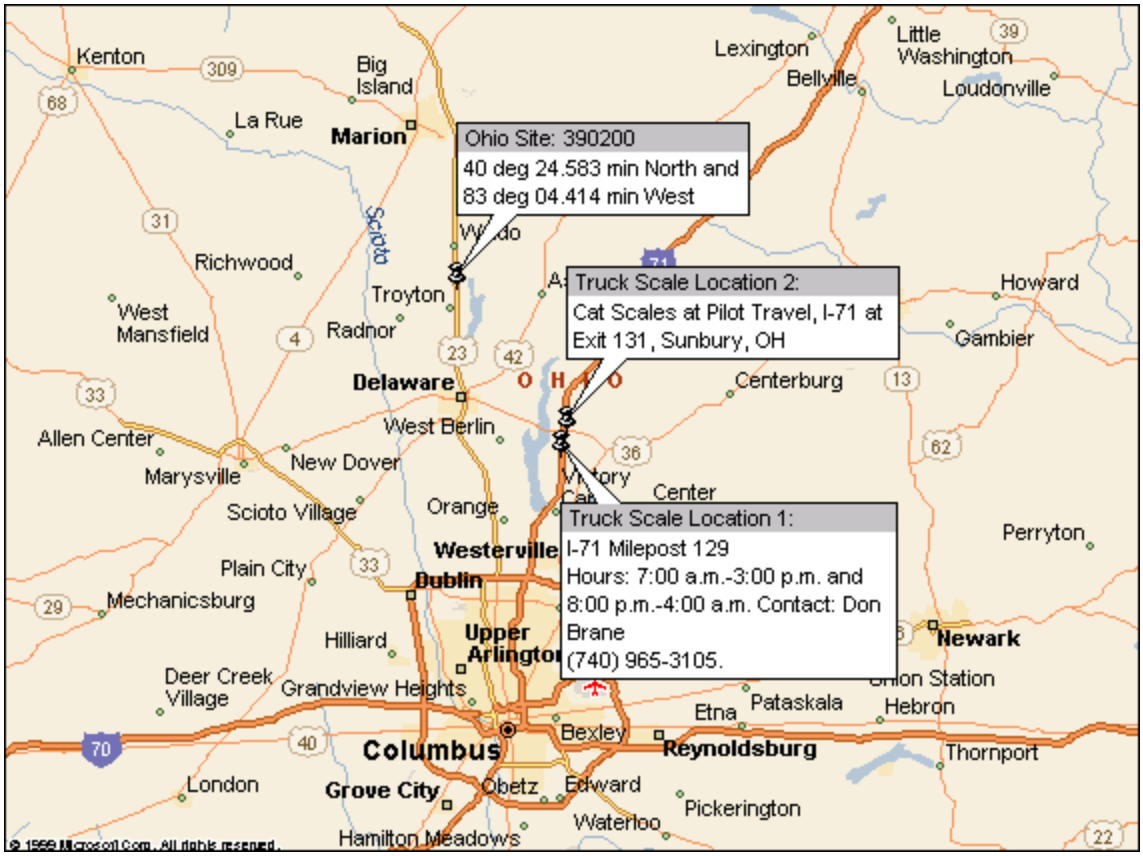


Figure 6.1: Site Map at 390200

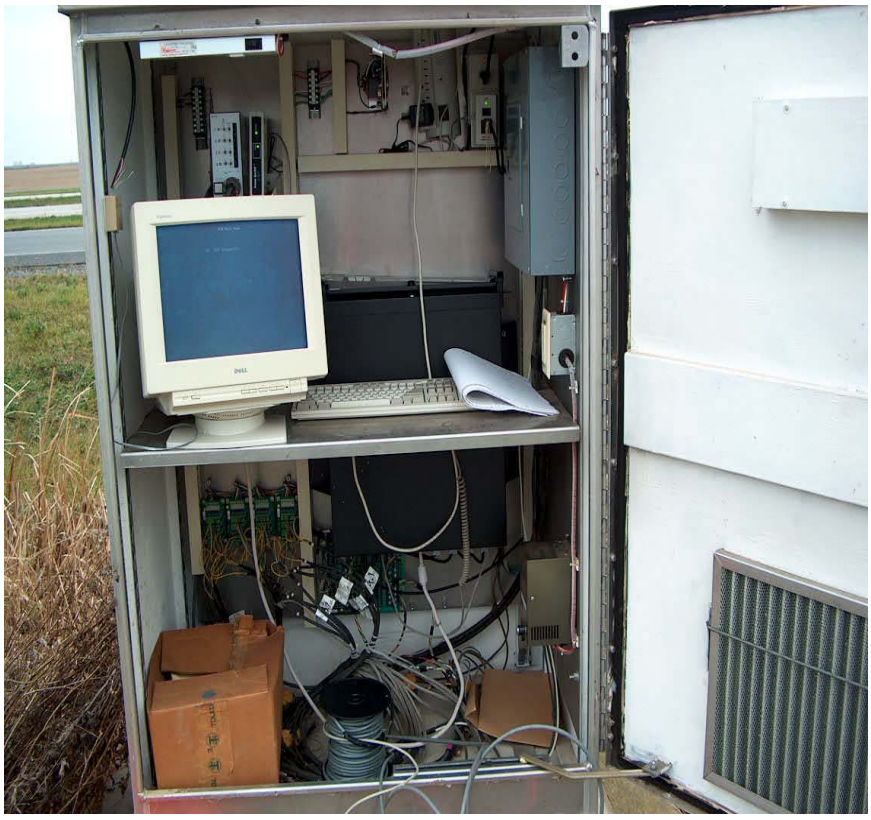
Downstream_1_TO_1_7A_39_0200_11_12_03.JPG (Distress Photo 1)

Downstream_2_TO_1_7A_39_0200_11_12_03.JPG (Distress Photo 2)

Upstream_1_TO_1_7A_39_0200_11_12_03.JPG (Distress Photo 3)

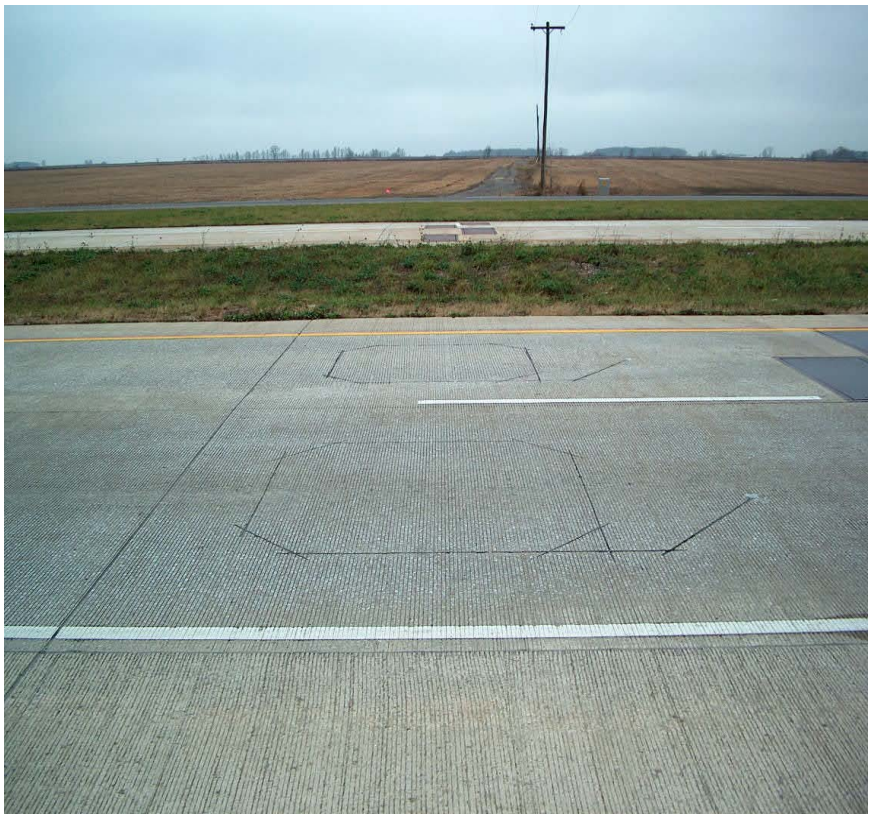
AC_Meter_Box_TO_1_7A_39_0200_11_12_03.JPG

Cabinet_Exterior_TO_1_7A_39_0200_11_12_03.JPG



Cabinet_Interior_TO_1_7A_39_0200_11_12_03.JPG

Load_Cells_1_TO_1_7A_39_0200_11_12_03.JPG



Loop_Sensors_1_TO_1_7A_39_0200_11_12_03.JPG

Downstream_1_TO_1_7A_39_0200_11_12_03.JPG

Upstream_1_TO_1_7A_39_0200_11_12_03.JPG

Sheet 18 STATE_CODE **3 9**

LTPP Traffic Data

WIM SITE COORDINATION SPS Project_ID 0 2 0 0

1. Equipment –
   - Maintenance – contract with purchase / separate contract LTPP / separate contract State / state personnel
     Contact: Steven Jessberger 614-752-4057

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

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

   - Calibration – Vendor / State / LTPP

   - Manuals and software – State / LTPP

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

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

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

2. Site visits – Evaluation

   - WIM Validation Check - advance notice required 14 days / weeks

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

     Drivers State / LTPP
     Contact _____

     Contractors with prior successful experience in WIM calibration in state:
     _____
     Nearest static scale (commercial or enforcement)
     _____

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

WIM SITE COORDINATION SPS Project_ID 0 2 0 0

- Pre-visit data
  - Classification and speed: Contact Steven Jessberger
  --Typical operating conditions (congestion, high truck volumes)
  Contact Steven Jessberger
  -- Equipment operational status: Contact Steven Jessberger

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

- State personnel required on site Y / N
Contact information Steven Jessberger

- Enforcement Coordination required Y / N
Contact information _____

- Traffic Control Required Y/ N
Contact information _____

- Maximum number of personnel on site 4
  Invitees _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

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

4. Site visits – Validation

- WIM Validation Check - advance notice required 14 days / weeks
  LTPP Semi-annually / Sate per LTPP protocol semi-annually / State other

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

  Drivers State / LTPP

WIM SITE COORDINATION SPS Project_ID 0 2 0 0

Contact _____

Contractors with prior successful experience in WIM calibration in state:
_____

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

- Pre-visit data
  – Classification and speed: Contact Steven Jessberger
  -- Equipment operational status: Contact Steven Jessberger

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

- State personnel required on site Y / N
  Contact information Steven Jessberger

- Enforcement Coordination required Y / N
  Contact information _____

- Traffic Control Required Y/ N
  Contact information _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

5. Site visit – Construction

- Construction schedule and verification – Contact _____

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

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

- Trucks – air suspension 3S2 State / LTPP
  2nd common State / LTPP
  Loads State / LTPP
  Drivers State / LTPP

  Contractors with prior successful experience in WIM calibration in state:

WIM SITE COORDINATION SPS Project_ID 0 2 0 0

_____

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

- Pre-visit data
  – Classification and speed: Contact _____
  -- Equipment operational status: Contact _____

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

- State personnel required on site Y / N
  Contact information _____

- Enforcement Coordination required Y / N
  Contact information _____

- Traffic Control Required Y/ N
  Contact information _____

- Authorization to calibrate site -- State only / LTPP

- Special conditions _____

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

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ _7_ _2_ _1_] *STATE CODE [_3_ _9_] *SHRP SECTION ID [0__ _2_ _0_ _0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_ _2_ / _0_ _3_ / _2_ _0_ _0_ _4_]

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

3. * REASON FOR CALIBRATION
   ____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
   ____ EQUIPMENT REPLACEMENT ____ TRAINING
   ____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
   _X___ OTHER (SPECIFY) ____ SITE EVALUATION AND CALIBRATION_____

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 __X__ LOAD CELLS ____ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO __X__ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER _____Mettler Toledo_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

   __ _3_ __ NUMBER OF TRUCKS COMPARED __ _3_ __ NUMBER OF TEST TRUCKS USED

   __ 13__ __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	__9_____	____2_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	__9_____	____2_____
3 - OTHER (DESCRIBE)	3	___9_____	____2_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ _6.4%__ ___ __ STANDARD DEVIATION __ _3.6%_. __
   DYNAMIC AND STATIC SINGLE AXLES ___ _-1.3%__ ___. __ STANDARD DEVIATION __ _3.5%_. __
   DYNAMIC AND STATIC DOUBLE AXLES ___ __10.5%_ ___. __ STANDARD DEVIATION __ _8.9%_. __

8. __3_ ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _____ __42-48, 48.1-54, 54.1-60 mph_ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) _.7409_(P4) ___ ___ . ___ ___

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 _100__ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ __3_ ____ FHWA CLASS __5__ ____ __-70__ ____ ____
   *** FHWA CLASS 8 ____ _0____ FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0__. ____

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

SHEET 16 **LTPP MONITORED TRAFFIC DATA** **SITE CALIBRATION SUMMARY**	*STATE ASSIGNED ID [__ _7_ _2_ _1_] *STATE CODE [_3_ _9_] *SHRP SECTION ID [0__ _2_ _0_ _0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_ _2_ / _0_ _4_ / _2_ _0_ _0_ _4_]

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

3. * REASON FOR CALIBRATION
   ____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
   ____ EQUIPMENT REPLACEMENT ____ TRAINING
   ____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
   _X___ OTHER (SPECIFY) ____ SITE EVALUATION AND CALIBRATION_____

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 __X__ LOAD CELLS ____ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO __X__ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   ____ OTHER (SPECIFY) _____

5. EQUIPMENT MANUFACTURER _____Mettler Toledo_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

   __ _3_ __ NUMBER OF TRUCKS COMPARED __ _3_ __ NUMBER OF TEST TRUCKS USED

   __13 __ __ PASSES PER TRUCK

	TRUCK	TYPE	SUSPENSION
TYPE PER FHWA 13 BIN SYSTEM	1	__9_____	____2_____
SUSPENSION: 1 - AIR; 2 - LEAF SPRING	2	__9_____	____2_____
3 - OTHER (DESCRIBE)	3	___9_____	____2_____

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ _0.4%__ ___ __ STANDARD DEVIATION __ _5.1%_. __
   DYNAMIC AND STATIC SINGLE AXLES ___ _-7.2%__ ___. __ STANDARD DEVIATION __ _2.8%_. __
   DYNAMIC AND STATIC DOUBLE AXLES ___ __4.0%_ ___. __ STANDARD DEVIATION __ _9.8
8. __3_ ____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) _____ _____ __43-47, 47.1-52, 52.1-56 mph_ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) __5 (P4)_ ___ ___ . ___ ___

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 _100__ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ __3_ ____ FHWA CLASS _5___ ____ ____ __70__ ____
   *** FHWA CLASS 8 ____ _0 FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ __0__. ____

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

APPENDIX A

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 * 200
*CALIBRATION TEST TRUCK # 1	* DATE 2/3/04

'ev. 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		~~9840~~ 9830 9840	10020	D / (C)
B		6160 6173	5840 5580	D / (C)
C		6050 12210 6080	5910 ~~5740~~ 11580	D / (C)
D		3700 3700	3860 9720	D / (C)
E		~~5600~~ ~~5610~~ 9310 9300 9825	5860 9720	D / (C)
F				D / C

GVW (same units as axles) pre calc is direct measure. post calc is direct axle group measure

7. a) Empty GVW _____

*b) Average Pre-Test Loaded weight 31620

*c) Post Test Loaded Weight 31320

*d) Difference Post Test – Pre-test 300

GEOMETRY

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

9. a) * Make: MACK b) * Model: CH613

10.* Trailer Load Distribution Description:

Empty

11. a) Tractor Tare Weight (units): 19,000

b). Trailer Tare Weight (units): 12,000

2/12,000
300

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100200
*CALIBRATION TEST TRUCK # 1	* DATE 2/3/04

Rev. 08/31/01

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

A to B 16.5 B to C 4.3 C to D 34.5

D to E 4.1 E to F

Wheelbased (measured A to last) Computed 59.4

13. *Kingpin Offset From Axle B (units) +20 (INCHES)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 22.5	LEAF - 1
B	11R 22.5	AIR
C	11R 22.5	AIR
D	295 75R 22.5	LEAF - 1
E	295 75R 22.5	LEAF - 1
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 + 200
*CALIBRATION TEST TRUCK # 1	* DATE 2/3/04

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	9840	II -I	6140	III -II	6020	IV -III	3680	V -IV	5660	V	31340
V -VI	9840	VI-VII	6180	VII-VIII	6080	VIII-IX	3720	IX`	~~5560~~ 5540	X	31360
										XI	32160
Avg.	9840	6160		6050		3700		~~5610~~ 5600		31,620	

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I	9840			10020
A + B	II	15980			15860
A + B + C	III	22000			21600
A + B + C + D	IV	25680			25460
A + B + C + D + E (1)	V	31340			31320
B + C + D + E	VI	~~21500~~ 21520			21300
C + D + E	VII	~~15360~~ 15340			15160
D + E	VIII	~~9340~~ 9260			9720
E	IX	~~5660~~ 5540			5860
A + B + C + D + E (2)	X	31360			31320
A + B + C + D + E (3)	XI	32160			

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	10020	II -I	5840	III -II	5740	IV -III	3860	V -IV	5860	V	31320
V -VI		VI-VII		VII-VIII		VIII-IX		IX`		X	
										XI	
Avg.	10020	5840		5740		3860		5860		31370	

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 + 200
*CALIBRATION TEST TRUCK # 1	* DATE 2/3/04

Rev. 08/31/01

Data entered into the Spreadsheets from below tables

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	9840	6180	6080	3720	5340	—	31560
2	9840	6040	6020	3680	5660	—	31340
3	9840	6200 *	6140	3700 *	6280	—	32160
Average	9840	6173.33	6080	3700	5826.67		31620

* Split based on pass 1, 2 values

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 * Split 50:50	Axle D	Axle E * Split 50:50	Axle F	GVW
1	10040	5790	5790	4000	4660		31520
2							
3							
Average	10040	5790	5790	4000	4660	—	31520

Measured By Joan J. Wolf Verified By Kurt / Bko

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 106 + 206
*CALIBRATION TEST TRUCK # 2	* DATE 2/3/04

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		10830 10760 10850	10600	D / C
B		9660 9605	9250 18420	D / C
C		9580 9585	9170	D / C
D		7440 7405	7740 18840	D / C
E		10660 10715		D / C
F				D / C

GVW (same units as axles)

pre-cal direct measure axles
post-cal direct measure axle group

7. a) Empty GVW _____

*b) Average Pre-Test Loaded weight 48280 48.00
*c) Post Test Loaded Weight 47860 47860
*d) Difference Post Test – Pre-test 420 - 310

GEOMETRY

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

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

10.* Trailer Load Distribution Description:

Empty beer bottles cases

11. a) Tractor Tare Weight (units): 16,000 lbs

b). Trailer Tare Weight (units): 17,000 lbs

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 & 200
*CALIBRATION TEST TRUCK # 2	* DATE 2/3/04

Rev. 08/31/01

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

A to B 17.5 B to C 4.3 C to D 35.0

D to E 4.1 E to F

Wheelbased (measured A to last) Computed 60.9

13. *Kingpin Offset From Axle B (units) +20 (INCHES)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 22.5	LEAF - 2
B	11R 22.5	AIR
C	11R 22.5	AIR
D	295/75R 22.5	LEAF - 3
E	295/75R22.5	LEAF - 3
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 + 200
*CALIBRATION TEST TRUCK # 2	* DATE 2/3/04

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	10840	II -I	9660	III -II	9600	IV -III	7380	V -IV	10620	V	48100 ~~48500~~
V -VI	10820	VI-VII	9660	VII-VIII	9560	VIII-IX	7500	IX`	10700	X	48240 ~~48100~~
										XI	~~48240~~
Avg.	10830	9660		9580		7440		10660		~~48260~~ 48170	

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I	10840			10600
A + B	II	20500			19850
A + B + C	III	30100			29070
A + B + C + D	IV	37480			36760
A + B + C + D + E (1)	V	~~48500~~ 48100			47860
B + C + D + E	VI	~~37260~~ 37420			27260
C + D + E	VII	~~27600~~ 27760			28010
D + E	VIII	~~18000~~ 18200			18840
E	IX	~~10620~~ 10700			11100
A + B + C + D + E (2)	X	~~48100~~ 48240			47860
A + B + C + D + E (3)	XI	~~48240~~			

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	10600	II -I	9250	III -II	9170	IV -III	7740	V -IV	11100	V	47860
V -VI		VI-VII		VII-VIII		VIII-IX		IX`		X	
										XI	
Avg.	10600	9250		9170		7740		11100		47860	

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 or 200
*CALIBRATION TEST TRUCK #2	* DATE 2/3/04

Rev. 08/31/01

Data entered into the Spreadsheets from below tables

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	.0840	9660	9600	7580	10620	--	48100
2	10620	9660	9560	7500	10700	--	48240
	.0860	9500 #	9600	7520 #	10000	--	48500
Average	.0846[7]	9606[67]	9586[67]	7466[67]	10773[3]	--	48280

~~Split~~ based on

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 Split 50..50	Axle D Split 50..50	Axle E	Axle F	GVW
1	10600	9210	9210	9420	9420	-	47860
2						-	
3						-	
Average	10600	9210	9210	9420	9420	-	47860

Measured By Dean J. Wolf Verified By [illegible]

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 0100 + 0200
*CALIBRATION TEST TRUCK # 3	* DATE 2/3/04

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		~~10970~~ 11560 10573	10420	D / C
B		~~15400~~ 15410 -	~~14885~~ 14900 15095	D / C
C		15840 .5785	~~15305~~ 15580 15015	D / C
D		14750	~~14670~~ 14860 17180	D / C
E		19340 19535	~~19470~~ 19480 17180	D / C
F				D / C

pre cal direct axle measure 3d Pass by group
post cal direct group measure

GVW (same units as axles)

7. a) Empty GVW _____

*b) Average Pre-Test Loaded weight 76453
*c) Post Test Loaded Weight 75170
*d) Difference Post Test – Pre-test 1283

GEOMETRY

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

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

10.* Trailer Load Distribution Description:

GRAVEL (57)

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

b). Trailer Tare Weight (units): _____

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 + 200
*CALIBRATION TEST TRUCK # 3	* DATE 2/3/09

Rev. 08/31/01

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

A to B 19.5 B to C 4.4 C to D 25.3

D to E 4.1 E to F _____

Wheelbased (measured A to last) _____ Computed 53.3

13. *Kingpin Offset From Axle B (units) +20 (INCHES)
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R 22.5	LEAF - 2
B	11R 22.5	AIR
C	11R 22.5	AIR
D	11R 22.5	LEAF - 1
E	11R 22.5	LEAF - 1
F		

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

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 a 200
*CALIBRATION TEST TRUCK # 3	* DATE 2/3/04

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PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	10980	II -I	~~15400~~ 15420	III -II	15840	IV -III	14900	V -IV	19760	V	76,900
V -VI	10960	VI-VII	15400	VII-VIII	15840	VIII-IX	14600	IX`	18920	X	75,720
										XI	76,740
Avg.	10970	~~15400~~ 15410		15840		14750		19340		76453	

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I	10980			10620
A + B	II	~~26380~~ 26400			25520
A + B + C	III	~~47220~~ 42240			40840
A + B + C + D	IV	~~57120~~ 57140			55700
A + B + C + D + E (1)	V	~~76880~~ 76900			75180
B + C + D + E	VI	~~65900~~ 64760			64560
C + D + E	VII	~~50500~~ 49360			49660
D + E	VIII	~~34660~~ 33520			34340
E	IX	~~19760~~ 18920			19480
A + B + C + D + E (2)	X	75720			75160
A + B + C + D + E (3)	XI	76740			

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I	10620	II -I	~~14900~~	III -II	15320	IV -III	14860	V -IV	19480	V	75180
V -VI	10620	VI-VII	14870	VII-VIII	15290	VIII-IX	14880	IX`	19500	X	75160
										XI	
Avg.	10620	14885		15305		14870		19490		75170	

Sheet 19	* STATE_CODE 39
LTPP Traffic Data	* SPS PROJECT ID 100 & 200
*CALIBRATION TEST TRUCK # 3	* DATE 2/3/04

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Data entered into the Spreadsheets from below tables

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	10180	15480	15840	14900	19760	-	76000
2	10560	15400	15840	14600	18720	-	75720
	10180	15410 *	15670	14750 *	19530	-	76740
Average	10173^3	15410	15785^3	14750	19536^7	-	76458^8

* split based on Pass #1, 2

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 split 50:50	Axle C	Axle D split 50:50	Axle E	Axle F	GVW
1	10620	15080	15080	17150	17190	-	75560
2	10620	15110	15110	17170	17170	-	75820
3							
Average	10620	15095	15095	17160	17180		75690

Measured By Dean J. Wolf Verified By Kmd/Bho

Sheet 20	* STATE_CODE	34
LTPP Traffic Data	*SPS PROJECT_ID	9200
Speed and Classification Checks * 1 of* 2	* DATE	2 3 / 0 1 / 2 0 0 4

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
54	9		56	9	51	9		52	9
58	9		57	9	50	5		53	9
55	9		55	9	53	9		54	9
58	9		58	9	58	10		58	10
[illegible]	9		[illegible]	9	[illegible]	[illegible]		[illegible]	9
61	9		60	9	50	9		52	9
61	9		60	9	55	9		53	9
53	5		55	5	58	5		59	9
[illegible]	9		57	9	54	9		54	9
55	5		[illegible]	5	51	9		51	9
55	5		57	5	[illegible]	9		[illegible]	9
60	9		56	9	54	6		51	6
63	6		51	5	53	9		53	9
50	3		51	5	[illegible]	9		56	9
51	3		52	5	[illegible]	9		54	9
[illegible]	9		[illegible]	9	59	3		62	5
[illegible]	9		53	9	57	9		59	9
56	4		55	4	[illegible]	9		57	9
54	5		55	5	51	9		57	9
[illegible]	9		54	9	[illegible]	9		56	9
61	9		61	9	54	8		54	8
60	9		59	9	57	4		57	4
59	5		59	9	62	4		61	4
58	9		58	9	49	9		49	9
57	9		55	9	56	9		54	9

Recorded by KMA Direction N Lane 1 Time from 3:12 to _____

Sheet 20	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
Speed and Classification Checks * 2 of* 2	* DATE	02/03/2004

Rev. 08/31/2001

NORTH

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
56	9		55	9	60	3		59	5
58	9		58	9	54	6		54	6
55	9		52	9	59	9		59	9
52	9		56	9	55	9		54	9
52	9		52	9	56	9		55	9
53	9		52	9	57	9		58	9
54	11		57	11	59	9		59	9
58	9		58	9	59	9		57	9
55	8		55	8	63	9		62	9
61	9		61	9	56	9		56	9
58	3		56	5	54	9		52	9
59	9		58	9	56	3		57	4
53	9		53	9	54	9		54	9
57	9		56	9	55	4		55	5
54	9		54	9	52	9		52	9
56	6		54	6	55	9		52	9
53	9		54	9	54	9		54	9
58	9		59	9	59	9		59	9
59	9		60	9	57	9		58	9
56	11		58	11	53	9		54	9
59	9		60	9	55	9		55	9
59	8		58	8	52	9		51	9
56	9		56	9	60	4		59	4
56	9		57	9	60	9		59	9
54	9		54	9	58	9		58	9

Recorded by KMA Direction N Lane 1 Time from _____ to _____

truck 1 = 51,620/34.5 truck 2 = 48,280/35.0 truck 3 = 76,453/25.3

Sheet 21
LTPP Traffic Data
WIM System Test Truck Records 1 of 6

* STATE_CODE 39
*SPS PROJECT_ID 0200
* DATE 02/07/2004

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NORTH SPS-2 Pre-Calibration

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
37		2	1	10:45 10:41:28	7282 7240??	44	5240 5800	4440 ~~5060~~ 5600	4600 5180	4700 5580	4440 6240		51820	17.3	4.1	33.9	3.8	+7.3
37		1	1	~~10:57~~ 10:43:55	7295 72839	43	4300 5160	2880 3600	3100 3370	2840 3290	2320 3660		34640	16.3	4.2	33.3	3.6	+9.6
37		2	2	~~10:56~~ [illegible]	7425 7413??	44	5160 5620	4540 5520	4300 5550	4580 ~~4500~~ 5580	4520 6160		51560	17.6	~~4.4~~ 4.2	34.5	3.8	+6.8
37°		1	2	~~10:57~~ 10:53:46	~~7455~~ 7443	43	4420 4960	3100 3300	3200 3570	3100 3260	2500 3560		35320	16.3	4.2	33.8	3.7	+11.7
37		2 DAVE	3	~~11:06~~ 11:02:40	~~7629~~ 7617	44	5100 5620	4600 ~~5300~~ 5380	4800 5140	4700 ~~5100~~ 5560	4560 ~~4160~~ 6160		51620	17.6	4.2	34.7	3.8	+6.9
37		1 DON	3	~~11:07~~ 11:03:25	~~7644~~ 7632	42	4500 5340	3000 3740	3180 3660	3120 3440	2780 3500		36260	16.4	4.2	31.9	3.9	+14.7
37		2 DAVE	4	~~11:16~~ 11:12:35	~~7800~~ 7788	43	~~43~~ 5260 5760	4660 5400	4640 ~~4600~~ 5320	4680 5540	4580 6100		51940	17.5	4.1	34.2	3.8	+7.6
37		1 DON	4	~~11:19~~ 11:15:22	~~7861~~ 7855	44	4420 5000	3140 3520	[illegible] [illegible]4	3040 3280	2640 3320		35100	16.4	4.2	33.2	3.5	+11

Recorded by kma/DSS Checked by

truck 1 avg = 34,807/33.7 truck 2 avg = 50,984/34.5 truck 3 avg = 76,536/24.8

Sheet 21	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 2 of 6	* DATE	02/03/2004

Rev. 08/31/2001

NORTH 34.5 25.3 35.0

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
37.5		2	5	~~11:25~~ 11:38:42	~~8075~~ ~~8095~~	49	5040 5440	4700 5000	4560 5060	4680 5720	1580 6000		50780	17.7	4.2	34.6	3.8	+5.2
39.5		3	1	~~11:25~~ 11:27:51	~~8087~~ 8074	44	4920 5460	7080 8700	7940 7980	7740 9000	7600 9520		75940	19.6	4.2	24.9	3.8	-.7
41		1	5	~~11:38~~ 11:39:22	~~8108~~ 8095	52	~~4440~~ 5260	2780 3680	3000 3420	2980 3340	1220 2020	3120	35260	17.8	4.6	37.2	4.0	+11.5
41	49	2	6	~~11:45~~ 11:41:24	~~8349~~ 8336	49	5240 5660	4760 5000	4320 5060	4660 5500	4820 5780		50800	17.8	4.2	34.5	3.8	+5.2
41		3	2	~~11:46~~ 11:42:28	~~8365~~ 8352	48	5160 5820	6820 8500	7760 8000	7780 9240	7940 9680		76700	19.7	4.2	~~24.7~~ 24.7	3.9	+.3
39		1	6	~~11:47~~ 11:43:56	~~8385~~ 8372	47	4520 5220	2840 3680	2820 3500	3020 3620	2400 3920		35540	16.4	4.2	31.4	~~3.5~~ 2.7	+12.4
39	49	2	7	~~11:50~~ 11:54:53	~~8410~~ 8397	49	5200 5760	4500 5340	4530 5040	4540 ~~5780~~ 5460	4780 5820		51020	17.8	4.2	34.8	~~4.0~~ 3.8	+5.7
39	47	3	3	~~11:54~~ 11:55:49	~~8409~~ 8595	47	5320 5960	6660 8860	7820 8080	7980 9440	7780 9640		76840	19.5	4.2	24.6	3.9	+.5

Recorded by KMA / DSL Checked by KMA / DSL

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 3 of 6	* DATE 02/03/2004

Rev. 08/31/2001

NORTH

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
39		1	7	~~12:02~~ 11:58:13	~~8653~~ 8639	47	4140 5100	2840 3720	2900 3640	3020 3580	2360 3500		35200	16.2	4.2	33.7	3.6	+11.3
39		2	8	~~12:13~~ 12:09:12	~~8841~~ 8827	~~46~~ 49	5020 5540	4420 5280	4500 5420	4360 5760	4560 5800		50660	17.7	4.2	34.6	3.8	+4.9
37		3	4	~~12:15~~ 12:11:24	~~8876~~ 8862	47	5000 6000	7000 8760	7780 8120	7760 9080	7560 9480		76540	19.7	4.2	24.9	3.9	+.1
CLS 37		1	8	~~12:18~~ 12:14:12	~~8927~~ 8913	46	4400 5280	2880 3640	2980 3560	3060 3480	2840 3620		35740	16.4	4.2	32.2	2.9	+13
37		2	9	~~12:30~~ 12:26:[illegible]	~~9179~~ 9165	48	4980 5520	4400 5700	4460 5440	4160 5700	4380 5380		50700	17.3	4.2	34.4	3.8	+5.0
37		3	5	~~12:34~~ 12:30:[illegible]	~~9253~~ 9239	47	5140 5740	6920 8740	7820 7820	7740 9020	7780 9780		76800	19.7	4.2	24.9	3.9	+.56
37		1	9	~~12:37~~ 12:33:[illegible]	~~9311~~ 9297	46	4100 5440	2600 3720	2720 3600	2820 3300	2140 3900		34420	16.1	4.1	30.9	2.7	+8.9

Recorded by KMA/DJW Checked by KMA/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 4 of 6	* DATE 02/03/2004

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north

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
29.5	49	2	10	~~1:25~~ 13:24:20	~~1774~~ 10269	49	4840 5920	~~4300~~ ~~5140~~	4080 5360	4340 5720	4600 6060		50,360	12.6	4.1	34.3	3.8	+4.3
~~29.5~~	53	3	6	~~1:28~~ 13:24:04	~~10335~~ 10322	54	4760 5740	6500 8340	7540 7920	7880 9240	7920 9780		76,020	19.7	4.2	24.9	3.9	-.6
~~29.5~~	47	1	10	~~1:51~~ 13:27:11	~~10355~~ 10280	49	4120 5460	2460 3860	2620 3580	2660 3160	1180 1820	2940 0	33,880	17.5	4.5	37.1	(6.4) 3.2	+7.1 ~~(7.1)~~
29.0		2	11	~~1:49~~ 13:39:42	~~10472~~ 10627	49	5000 5980	4380 5460	4560 5380	4320 5820	4440 5980		50920	17.7	4.2	34.4	3.8	+5.5
29.0	52	3	7	~~1:45~~ 13:41:19	~~10695~~ 10659	52	4880 5740	2080 8220	7[illegible] 8120	[illegible]	[illegible]		76,380	19.5	4.2	24.6	3.9	+.1
29.0	47	1	11	~~1:47~~ 13:43:38	~~10751~~ 10723	47	4280 [illegible]	[illegible] [illegible]	2080 3400	2080 [illegible]	2260 3900		35280	16.2	4.2	32.2	3.0	+11.6
29.0	56	2	12	~~1:54~~ 13:55:13	~~10963~~ 10947	54	4820 5020	~~4360~~ ~~5020~~	[illegible] [illegible]	[illegible] 5240	4420 6120		[illegible]	17.6	4.2	34.1	3.8	+3.9
29.0	50	3	8	~~2:03~~ 13:59:20	~~11059~~ 11043	50	5080 5320	[illegible] [illegible]	2080 [illegible]	8160 8860	8400 9580		77140	14.5	4.2	24.6	3.9	+.9

[illegible] km/[illegible]

[illegible] km/[illegible]

Sheet 21	* STATE_CODE	35
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 5 of 6	* DATE	09/03/2004

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North

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
29.0	57	1	12	~~2:06~~ 14:02:21	~~11134~~ 11118	56	4120 5420	2680 3840	2900 3520	1560 3860	1660 3860		33420	16.3	4.2	32.1	3.5	+6.3
[illegible]	52	2	1	~~[illegible]~~ 14:15:29	~~11435~~ 11419	52	[illegible]	[illegible]	[illegible] 5260	[illegible]	[illegible]		[illegible]	17.6	4.2	[illegible]	3.8	+6.2
[illegible]	51	[illegible]	9	~~2:21~~ 14:17:42	~~11465~~ 11449	52	4860 5540	6960 8360	7520 8000	8160 9220	7700 [illegible]		[illegible]	19.8	4.2	24.9	4.0	+.2
[illegible]	60	1	13	~~2:22~~ 14:19:28	~~[illegible]~~ 11478	59	[illegible]	[illegible]	[illegible]	[illegible] 2920	[illegible]		[illegible]	16.1	4.1	[illegible]	~~3.9~~ 3.4	+10.4
28.0	54	2	14	~~2:39~~ 14:30:45	11751 11735	54	4840 5500	4500 9080	4760 5040	4280 5140	4600 5860		50280	17.7	4.2	34.9	3.9	+4.1
28.0	51	3	10	~~2:33~~ 14:33:26	~~11817~~ 11801	52	4900 5540	6860 8500	7720 7860	8000 9220	7780 10200		76580	19.8	4.2	24.9	3.9	+.1
28.0	58	1	14	~~2:39~~ 14:34:49	~~11845~~ 11829	63	4080 5420	2680 2900	2660 2460	1500 4060	900 2160	2960	33720	17.8	4.6	37.0	3.7	+6.6 4.3
28.0	54	2	15	~~2:54~~ 14:49:56	~~12215~~ 12199	54	4660 5720	4660 ~~4620~~ 4720	4920 4600	4860 5720	5120 5720		50880	17.7	4.2	35.1	3.9	+5.4

Recorded by KMR/DJW Checked by KMR/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 6 of 6	* DATE 02/03/2004

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Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
28.0	50	3	11	14:52:17 ~~2:56~~	12240 ~~12256~~	51	4680 5560	[illegible] 8680	7520 8160	8080 9360	7660 10080		76420	19.7	4.2	[illegible]	3.9	+.2
28.0	59	1	15	~~2:58~~ 14:52:30	~~12257~~ 12281	58	4440 5880	2720 4260	2320 3960	1460 3720	1380 4080		33420	15.7	4.0	31.7	3.4	+5.7

Recorded by KMA/DJW Checked by KMA/DJW

truck 1 = 51,620/34.5 truck 2 = 48,280/35.0 truck 3 = 76,453/25.3

Sheet 21
LTPP Traffic Data
WIM System Test Truck Records 1 of 6

* STATE_CODE	39
*SPS PROJECT_ID	0200
* DATE	02/07/2004

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NORTH SPS-2 Pre-Calibration

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
37		2	1	10:45 10:41:28	7252 7240??	44	5240 5800	4440 ~~5060~~ 5600	4600 5180	4700 5580	4440 6240		51820	17.3	4.1	33.9	3.8	+7.3
37		1	1	~~10:47~~ 10:43:55	7295 72839	43	4300 5160	2880 3600	3100 3570	2840 3290	2320 3660		34640	16.3	4.2	33.3	3.6	+9.6
37		2	2	~~10:56~~ [illegible]	7425 74137?	44	5160 5620	4540 5520	4300 5550	4580 ~~4500~~ 5580	4520 6160		51560	17.6	~~4.4~~ 4.2	34.5	3.8	+6.8
37°		1	2	~~10:57~~ 10:55:46	~~7455~~ 7443	43	4420 4960	3100 3300	3200 3570	3100 3260	2500 3560		35320	16.3	4.2	33.8	3.7	+11.7
37		2 DAVE	3	~~11:06~~ 11:02:40	~~7629~~ 7617	44	5100 5620	4600 ~~5300~~ 5380	4800 5140	4700 ~~5100~~ 5560	4560 ~~4160~~ 6160		51620	17.6	4.2	34.7	3.8	+6.9
37		1 DON	3	~~11:07~~ 11:03:25	~~7644~~ 7632	42	4500 5340	3000 3740	3180 3660	3120 3440	2780 3500		36260	16.4	4.2	31.9	3.9	+14.7
37		2 DAVE	4	~~11:16~~ 11:12:35	~~7800~~ 7788	43	~~43~~ 5260 5760	4660 5400	4640 ~~4600~~ 5320	4680 5540	4580 6100		51940	17.5	4.1	34.2	3.8	+7.6
37.5		1 DON	4	~~11:19~~ 11:15:32	~~7867~~ 7855	44	4420 5000	3100 3520	3300 3440	3040 3280	2640 3320		35100	16.4	4.2	33.2	3.5	+11

Recorded by KMA/DEM Checked by

truck 1 avg = 34,807/33.7 truck 2 avg = 50,984/34.5 truck 3 avg = 76,536/24.8

Sheet 21	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 2 of 6	* DATE	02/03/2004

Rev. 08/31/2001

NORTH 34.5 25.3 35.0

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
37.5		2	5	~~11:25~~ 11:38:42	~~8075~~ ~~8095~~	49	5040 5440	4700 5000	4560 5060	4680 5720	1580 6000		50780	17.7	4.2	34.6	3.8	+5.2
39.5		3	1	~~11:25~~ 11:27:51	~~8087~~ 8074	44	4920 5460	7080 8700	7940 7980	7740 9000	7600 9520		75940	19.6	4.2	24.9	3.8	-.7
41		1	5	~~11:38~~ 11:39:22	~~8108~~ 8095	52	~~4440~~ 5260	2780 3680	3000 3420	2980 3340	1220 2020	3120	35260	17.8	4.6	37.2	4.0	+11.5
41	49	2	6	~~11:45~~ 11:41:24	~~8349~~ 8336	49	5240 5660	4760 5000	4320 5060	4660 5500	4820 5780		50800	17.8	4.2	34.5	3.8	+5.2
41		3	2	~~11:46~~ 11:42:28	~~8365~~ 8352	48	5160 5820	6820 8500	7760 8000	7780 9240	7940 9680		76700	19.7	4.2	~~24.7~~ 24.7	3.9	+.3
39		1	6	~~11:47~~ 11:43:56	~~8385~~ 8372	47	4520 5220	2840 3680	2820 3500	3020 3620	2400 3920		35540	16.4	4.2	31.4	~~3.5~~ 2.7	+12.4
39	49	2	7	~~11:50~~ 11:54:53	~~8410~~ 8397	49	5200 5760	4500 5340	4530 5040	4540 ~~5780~~ 5460	4780 5820		51020	17.8	4.2	34.8	~~4.0~~ 3.8	+5.7
39	47	3	3	~~11:54~~ 11:55:49	~~8409~~ 8595	47	5320 5960	6660 8860	7820 8080	7980 9440	7780 9640		76840	19.5	4.2	24.6	3.9	+.5

Recorded by KMA / DSL Checked by KMA / DSL

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 3 of 6	* DATE 02/03/2004

Rev. 08/31/2001

NORTH

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
39		1	7	~~12:02~~ 11:58:13	~~8653~~ 8639	47	4140 5100	2840 3720	2900 3640	3020 3580	2360 3500		35200	16.2	4.2	33.7	3.6	+11.3
39		2	8	~~12:13~~ 12:09:12	~~8841~~ 8827	~~46~~ 49	5020 5540	4420 5280	4500 5420	4360 5760	4560 5800		50660	17.7	4.2	34.6	3.8	+4.9
37		3	4	~~12:15~~ 12:11:24	~~8876~~ 8862	47	5000 6000	7000 8760	7780 8120	7760 9080	7560 9480		76540	19.7	4.2	24.9	3.9	+.1
CLS 37		1	8	~~12:18~~ 12:14:12	~~8927~~ 8913	46	4400 5280	2880 3640	2980 3560	3060 3480	2840 3620		35740	16.4	4.2	32.2	2.9	+13
37		2	9	~~12:30~~ 12:26:[illegible]	~~9179~~ 9165	48	4980 5520	4400 5700	4460 5440	4160 5700	4380 5380		50700	17.3	4.2	34.4	3.8	+5.0
37		3	5	~~12:34~~ 12:30:[illegible]	~~9253~~ 9239	47	5140 5740	6920 8740	7820 7820	7740 9020	7780 9780		76800	19.7	4.2	24.9	3.9	+.56
37		1	9	~~12:37~~ 12:33:[illegible]	~~9311~~ 9297	46	4100 5440	2600 3720	2720 3600	2820 3300	2140 3900		34420	16.1	4.1	30.9	2.7	+8.9

Recorded by KMA/DJW Checked by KMA/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 4 of 6	* DATE 02/03/2004

Rev. 08/31/2001

north

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
29.5	49	2	10	~~1:25~~ 13:24:20	~~1774~~ 10269	49	4840 5920	~~4300~~ ~~5140~~	4080 5360	4340 5720	4600 6060		50,360	12.6	4.1	34.3	3.8	+4.3
~~29.5~~	53	3	6	~~1:28~~ 13:24:04	~~10335~~ 10322	54	4760 5740	6500 8340	7540 7920	7880 9240	7920 9780		76,020	19.7	4.2	24.9	3.9	-.6
~~29.5~~	47	1	10	~~1:51~~ 13:27:11	~~10355~~ 10280	49	4120 5460	2460 3860	2620 3580	2660 3160	1180 1820	2940 0	33,880	17.5	4.5	37.1	(6.4) 3.2	+7.1 ~~(7.1)~~
29.0		2	11	~~1:49~~ 13:39:42	~~10472~~ 10627	49	5000 5980	4380 5460	4560 5380	4320 5820	4440 5980		50920	17.7	4.2	34.4	3.8	+5.5
29.0	52	3	7	~~1:45~~ 13:41:19	~~10695~~ 10659	52	4880 5740	2080 8220	7[illegible] 8120	[illegible]	[illegible]		76,380	19.5	4.2	24.6	3.9	+.1
29.0	47	1	11	~~1:47~~ 13:43:38	~~10751~~ 10723	47	4280 [illegible]	[illegible] [illegible]	2080 3400	2080 [illegible]	2260 3900		35280	16.2	4.2	32.2	3.0	+11.6
29.0	56	2	12	~~1:54~~ 13:55:13	~~10963~~ 10947	54	4820 5020	~~4360~~ ~~5020~~	[illegible] [illegible]	[illegible] 5240	4420 6120		[illegible]	17.6	4.2	34.1	3.8	+3.9
29.0	50	3	8	~~2:03~~ 13:59:20	~~11059~~ 11043	50	5080 5320	[illegible] [illegible]	2080 [illegible]	8160 8860	8400 9580		77140	14.5	4.2	24.6	3.9	+.9

[illegible] km/[illegible]

[illegible] km/[illegible]

Sheet 21	* STATE_CODE	35
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 5 of 6	* DATE	09/03/2004

Rev. 08/31/2001

North

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
29.0	57	1	12	~~2:06~~ 14:02:21	~~11134~~ 11118	56	4120 / 5420	2680 / 3840	2900 / 3520	1560 / 3800	1660 / 3860		33420	16.3	4.2	32.1	3.5	+6.3
29.0	52	2	1	~~[illegible]~~ 14:15:29	~~11435~~ 11419	52	[illegible]	[illegible]	[illegible] / 5260	[illegible] / 5380	[illegible]		[illegible]	17.6	4.2	[illegible]	3.8	+6.2
29.0	51	[illegible]	9	~~2:21~~ 14:17:40	~~11465~~ 11449	52	4860 / 5540	6960 / 8360	7520 / 8000	8160 / 9220	7700 / 10240		[illegible]	19.8	4.2	24.9	4.0	+.2
29.0	60	1	13	~~2:22~~ 14:19:28	~~[illegible]~~ 11478	59	[illegible]	[illegible]	[illegible]	[illegible] / 2920	[illegible]		[illegible]	16.1	4.1	[illegible]	~~2.9~~ 3.4	+10.4
28.0	54	2	14	~~2:29~~ 14:30:45	11751 / 11735	54	4840 / 5500	4500 / 9080	4760 / 5040	4280 / 5140	4600 / 5860		50280	17.7	4.2	34.9	3.9	+4.1
28.0	51	3	10	~~2:33~~ 14:33:26	~~11817~~ 11801	52	4900 / 5540	6860 / 8500	7720 / 7860	8000 / 9220	7780 / 10200		76580	19.8	4.2	24.9	3.9	+.1
28.0	58	1	14	~~2:39~~ 14:34:49	~~11845~~ 11829	63	4080 / 5420	2680 / 2960	2660 / 2460	1900 / 4060	900 / 2180	2960	33720	17.8	4.6	37.0	3.7	+6.6 / 4.3
28.0	54	2	15	~~2:54~~ 14:49:56	~~12215~~ 12199	54	4660 / 5720	4660 ~~4620~~ / 4720	4920 / 4600	4860 / 5720	5120 / 5720		50880	17.7	4.2	35.1	3.9	+5.4

Recorded by KAR/DJW Checked by KMR/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 6 of 6	* DATE 02/03/2004

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Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
28.0	50	3	11	14:52:17 ~~2:56~~	12240 ~~12256~~	51	4680 5560	[illegible] 8680	7520 8160	8080 9360	7660 10080		76420	19.7	4.2	[illegible]	3.9	+.2
28.0	59	1	15	~~2:58~~ 14:52:30	~~12257~~ 12281	58	4440 5880	2720 4260	2320 3960	1460 3720	1380 4080		33420	15.7	4.0	31.7	3.4	+5.7

Recorded by KMA/DJW Checked by KMA/DJW

WIM 3:36 WIM 3:37

Sheet 21	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 1 of ~~2~~ 4	* DATE	02/07/2004

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~~Iteration 2~~ North POST - CALIBRATION

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
36		2	1	12:26:34 ~~12:29~~	~~9714~~ 9703	51	4880 4720	4670 4120	4570 4180	4540 4760	4880 4960		46180	18.2	~~4.1~~ 4.3	35.2	3.9	
36		3	1	12:28:29 ~~12:31~~	~~9748~~ 9737	52	4860 4400	6600 7680	7280 7200	7500 8400	7260 9180		70860	20.3	4.3	25.3	4.0	
36		1	1	12:29:12 ~~12:32~~	~~9759~~ 9748	51	4460 4460	2960 3040	3060 2660	2760 3000	2320 3200		31900	17.2	4.4	35.1	3.8	
36	49	2	2	12:46:43 ~~12:49~~	~~10022~~ 10010	51	4900 4640	[illegible] 4350	4680 [illegible]	4540 4820	4720 4960		46620	18.0	4.2	34.8	3.9	
36	50	3	2	12:42:55 ~~12:46~~	~~10083~~ 10071	51	4880 4860	6740 7440	7120 7160	7260 8680	7380 8960		70780	20.0	4.2	25.1	~~4.1~~ 4.0	
36	49	1	2	12:44:23 ~~12:47~~	~~10116~~ 10104	52	[illegible] [illegible]	3060 2700	3180 2600	2500 2960	2640 2720		31180	17.3	4.4	34.7	3.8	
37	49	2	3	12:52:12 ~~12:55~~	~~10311~~ 10299	51	[illegible] [illegible]	[illegible] [illegible]	[illegible] 4180	4500 [illegible]	4800 [illegible]		46440	18.2	4.3	35.6	4.0	
37	49	3	3	12:54:14 ~~12:57~~	~~10357~~ 10345	52	~~5820~~ 4820 4760	6520 7540	7520 9160	7220 8420	[illegible] 7260		70240	20.2	4.3	25.3	4.0	

Recorded by KMA/DJW   Checked by KMA/DJW

Sheet 21	* STATE_CODE	39
LTPP Traffic Data	*SPS PROJECT_ID	0200
WIM System Test Truck Records 2 of ~~2~~ 4	* DATE	02/09/2004

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Iteration #2 North

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A right / left weight.	Axle B right / left weight.	Axle C right / left weight.	Axle D right / left weight.	Axle E right / left weight.	Axle F right / left weight.	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
37	48	1	3	12:56:46 ~~1:00:00~~	~~10595~~ 10[illegible]	50	4200 4660	2880 3200	3140 2880	2680 2800	2480 3120		32280	16.9	4.4	35.1	3.8	
37		2	4	13:05:45 ~~1:09:00~~	~~10591~~ 10578	52	4940 4920	4440 4560	4640 4520	4260 5020	4520 5180		47,000	18.3	4.3	35.6	3.9	
37	50	3	4	13:07:59 ~~1:11:00~~	10621 ~~10634~~	53	4920 4540	6780 ~~7580~~ 7560	7400 ~~7020~~ 7020 ~~7560~~	7560 ~~8240~~ 8240 ~~7280~~	7280 ~~8240~~ 8740		76460	20.3	4.3	25.5	4.0	
37	49	1	4	13:09:45 ~~1:13:00~~	10659 ~~10672~~	51	4400 4560	3020 2800	3080 2720	2560 2860	2260 3000		31260	17.1	4.4	35.0	3.9	
36	45	2	5	13:37:08 ~~1:40:00~~	11314 ~~11328~~	49	5060 4960	4380 4700	4620 4540	4740 5260	4800 5540		48600	17.8	4.2	35.0	3.9	
36		3	5	13:39:10 ~~1:42:00~~	~~11382~~ 11368	50	4980 ~~4280~~ 5280	6810 8120	7440 7660	7820 8620	7380 9240		73380	16.8	4.2	25.0	4.0	
36	48	1	5	13:40:59 ~~1:44:00~~	11414 ~~11428~~	49	4420 5060	3040 ~~5060~~ 6080	3220 ~~3040~~ 3060	2800 ~~3080~~ 3280	2240 ~~3220~~ 3620		33980	16.7	4.2	34.2	3.8	

Recorded by KMA/DJW Checked by KMA/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 3 of 4	* DATE 02/04/2004

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
36		2	6	13:52:36	11689	45	5200	4960	4920	4480	4440		49740	17.7	4.2	34.6	3.8	
				1:15			5440	4880		5400	5660							
36	46	3	6	13:56:52	11769	47	4960	6860	7720	7380	7300		73440	19.8	4.2	24.8	3.9	
				2:00			5520	8240	7580	8660	9120							
36		1	6	13:57:37	11783	45	4500	3260	3140	2740	2800		34300	16.7	4.3	34.1	3.8	
				2:00			4920	3280	3300	3280	3080							
36		2	7	14:05:54	11966	45	5040	4560	4700	4320	4340		48640	17.9	4.3	34.8	3.8	
				2:09			5160	4840	4820	5480	5580							
36	46	3	7	14:08:24	12027	47	4960	5600	7620	7300	7400		72860	19.8	4.2	24.9	3.9	
				2:11			5180	8360	7500	8700	9240							
36		1	7	14:09:31	12047	45	4460	3240	3140	2920	3020		34960	16.7	4.3	34.0	3.7	
				2:12			4880	3540	3260	3420	3080							
36		2	8	14:18:06	12255	44	5100	4820	4740	4340	4620		49140	17.7	4.2	34.8	3.9	
				2:21			5220	5160	4660	5340	5220							
36	45	3	8	14:19:39	12288	47	5020	8920	7620	8940	9440		73100	19.8	4.2	24.9	3.9	
				2:22			5260	6820	7300	7160	7320							
36		1	8	14:20:26	12309	43	4460	3180	3320	3140	2800		34980	16.7	4.3	35.0	3.8	
				2:23			4920	3180	3340	3180	2460							
36		2	9	14:29:17	12515	44	5040	4460	4580	4300	4440		48620	17.7	4.2	35.3	3.9	
				2:32			5180	5080	4780	5240	5520							
		3	9															
36	43	1	9	14:31:46	12582	43	4560	3020	3360	2980	2840		34740	16.5	4.3	33.9	3.7	
				2:35			5040	3220	3200	3360	3160							
36		2	10	14:39:16	12804	44	5020	4640	4760	4280	4360		49280	17.6	4.2	34.3	3.8	
				2:43			5320	4880	4880	5560	5580							
36		3	9	14:40:47	12815	48	4980	6880	7460	7300	7400		73240	19.8	4.2	24.9	3.9	
				2:44			5340	8220	7520	8860	9280							
36	43	1	10	14:41:57	12836	43	4240	3260	3300	3020	2720		34420	16.6	4.3	34.4	3.7	
				2:45			4620	3320	3240	3360	3340							
36	53	2	11	2:55	13052	54	4560	4660	4440	4500	4660		48320	17.9	4.3	34.8	3.9	
				14:50:20	13058		5260	4660	4760	5420	5540							

Recorded by KMA/DJW

Checked by KMA/DJW

Sheet 21	* STATE_CODE 39
LTPP Traffic Data	*SPS PROJECT_ID 0200
WIM System Test Truck Records 4 of 4	* DATE 02/04/2004

Rev. 08/31/2001

North

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
36	55	3	10	14:51:46 / 2:55	13089 / 13103	56	4740 5360	6620 7880	7160 7680	7720 8920	7720 9280		73020	19.6	4.2	25.2	3.9	
36	54	1	11	14:52:55 / 2:56	13126 / 13140	53	4240 4960	2900 3220	3200 3240	1980 3620	1940 3620		32920	16.4	4.3	33.8	3.9	
36	53	2	12	14:59:57 / 3:03	13315 / 13329	53	4720 5160	4600 4960	4540 4900	4140 5720	4720 5520		48960	17.7	4.3	34.5	3.8	
36	55	3	11	15:01:07 / 3:04	13335 / 13349	56	4640 5320	6680 7780	6920 7740	7620 9180	7580 9640		73160	19.8	4.2	25.4	3.7	
35	54	1	12	15:01:52 / 3:05	13352 / 13366	53	4260 4960	2940 3560	3180 3180	2920 2820	2320 3620		[illegible]	16.4	4.2	33.6	3.7	
35	53	2	13	[illegible] / 3:13	13592 / 13606	54	4820 5220	4340 5340	4780 4740	4360 5280	4260 5280		48620	17.9	4.2	34.7	3.9	
35	56	3	12	15:12:11 / 3:15	13633 / 13647	55	4780 5200	6880 7680	7200 7600	7540 8900	7780 9420		72980	19.8	4.2	25.3	3.9	
35	54	1	13	15:12:55 / 3:16	13655 / 13669	55	4220 4820	3040 3440	3240 3260	3060 2120	2140 3940		34280	16.8	4.4	34.8	3.8	
35	53	2	14	15:20:07 / 3:23	13876 / 13862	54	4740 5080	4440 5020	4440 4640	4300 5540	4640 5540		48400	17.7	4.3	35.0	3.9	
35	54	3	13	15:24:29 / 3:24	12911 / 13950	54	5500 4860	7660 6560	7680 7160	8980 7440	9420 7340		72600	19.6	4.2	24.8	3.8	
35	55	1	14	3:25 / 15:27:07	13920 / 13906	55	4460 4820	2900 3400	2980 3080	1580 3200	1460 2600		32420	16.7	4.3	33.8	3.8	

Recorded by KMA/DJW

Checked by KMA/DJW