Assessment Report for
State – Delaware, SPS Experiment – 0100

Visit date: October 28, 2003

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1 Executive Summary

A visit was made to the Delaware SPS 0100 site on October 28, 2003 for the purposes of conducting an assessment of the WIM system located on US 113 South near Ellendale at Mile Post 25.04. This site is not considered a strong candidate for validation.

The site is instrumented with WIM piezo and a Peek Model ADR3000 as the controller.

The equipment seemed to be in working order, however, adjustments should be made to correct observed operational deficiencies such as speed varying by as much as 5-7 mph from radar collected speed. It was noted that a code of FFCE showed up from time to time, indicating an invalid record. The source of this problem should be determined and corrected.

The weights observed on the laptop connected to the ADR3000 seemed to be reasonable, but the data supplied from DelDOT seems to indicate extremely low weights for class 9 vehicles in the LTPP lane (#4, the outside southbound lane).

DelDOT stated that they have no unclassified or misclassified vehicles, and that the system automatically assigns them to a pre-determined class. DelDOT did not know what the system used for its default class, nor did they know the parameters for the classification algorithm.

There was insufficient information to fully support a Sheet 16 for classification verification. A Sheet 16 has been completed as record of this assessment but the error rates must be considered approximate rather than absolute.

The pavement condition is such that it may have a minor contribution to an inability to calibrate the system to obtain research quality data. The WIM sensors are in PCC pavement. There is a slight drop from the asphalt to the PCC pavement surface about 50 feet prior to the first sensor. The asphalt and PCC pavement was in good condition around the WIM sensors

The range of WIM Index values are between 0.27 m/km and 1.27 m/km. While the average values tend to exceed the threshold at which no pavement influence is anticipated to affect weight results, they are not sufficiently large to support any pavement remediation activity. Field observation of trucks concurs with this outcome.

A review of the speed information collected on-site/ indicates that the range of truck speeds to be covered during an evaluation is 45 to 55mph. This is lower than actual truck speeds. The measured speeds of trucks for the 15^{th} and 85^{th} percentiles exceed the speed limit of 55 mph.

This site has 0 (zero) years of data available through the LTPP program. This site still needs 5 (five) years of data to meet the need for 5 years of research quality data.

2 Corrective Actions Recommended

At a minimum, the equipment should be re-calibrated for all measurements, including documenting the algorithms in the software and the EPROM. The sensors are six or seven years old, which is a very long time for piezo sensors. It is recommended that they be replaced so they would have a better chance of lasting for 5 more years. It is also recommended that the electronics utilize an exterior temperature compensation device. The best option is to replace the complete system, instead of replacing piece by piece.

The pavement interface may need to be smoothed by grinding such that it will not cause the trucks to start oscillating after they pass over the interface of the asphalt and PCC pavement. This is not considered necessary to be done prior to a validation.

3 Equipment inspection and diagnostics

The equipment passed all the diagnostic tests. Two items to be corrected from the visual inspection are to use an external temperature-compensating probe and to ground the conduits leading into the cabinet.

The piezo sensors are 12 feet in length, 6 feet apart. A loop is between them, which is 5 foot 2 inches by 6 foot 7 inches.

There was no exterior temperature compensation detector evident on visual inspection of the equipment.

It is not known whether the system includes auto-calibration or not, although it most likely is contained in an (E)EPROM in the unit.

The case of the ADR3000 was somewhat rusty at this site, but it didn't seem to effect the operation of the unit.

The WIM sensors are in PCC pavement, which begins 47 feet 9 inches before the leading WIM sensor. There is a slight drop from the asphalt to the PCC pavement surface, which seemed to affect the body of the truck (a small dip after it passed over the interface), but was not discernable to the eye if it was affecting the tire loads at the WIM sensors. The asphalt and PCC pavement was in good condition around the WIM sensors

4 Classification Verification with test truck recommendations

The equipment provides data in the FHWA TMG scheme using S.I. units. The precise definitions of the various classes in terms of lengths and weights are not readily available from the agency and are believed to be hardwired in the equipment. This seems to be in the onboard EPROM. Classification data therefore indicates effectively no unknown or unclassified vehicles reported by the site.

A sample of 3 hours of data was collected at the site. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample there would appear to be about thirty percent ghost vehicles however this is not substantiated by the

reported vehicle characteristics in the downloaded records. The unclassified vehicles that were recorded by the equipment are typically 8 or 9 axles and weigh less than 4 thousand pounds. This would seem to indicate that there is an occasional set of very closely spaced vehicles between which the vehicle cannot differentiate.

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 classification from the video indicates 50 percent more Class 9s than recorded by the equipment and approximately half the percentage of Class 6s. As it was not possible to create a unique one to one comparison between the video and the down loaded records no additional statistics were calculated for the classification algorithm.

A review of the data collected by the state agency immediately following our site visit indicated that Class 9, Class 5s and Class 6s constitute at least 10 percent of the truck population. The Class9s constitute more than 50% of the heavy trucks and Class 6s less than 15%. Based on this information in addition to the air-suspension 3S2, the second vehicle used for evaluation should be a second Class 9 with little if any load as the site is most likely dominated by unloaded trucks.

5 Profile Evaluation

Profile data collected at the SPS WIM location by Stantec Inc. on August 21, 2003 was processed through the SPS WIM Index Butterworth Filter software. This WIM scale is installed on a Cement Concrete surfaced pavement. The results are shown in Table 1.

A total of 15 profiler passes were conducted over the WIM site. These included 5 passes at the center of the lane, 5 passes shifted to the left side of the lane, and 5 passes shifted to the right side of the lane. Shifts to the sides of the lanes were made such that data were collected as close to the lane edges as was safely possible. For each profiler pass, profiles were recorded under the left wheel path (LWP), the center of the vehicle, and the right wheel path (RWP).

Table 2 shows the computed index values for all the 15 profiler passes for this WIM site. The average values over the five passes at each path were also calculated, as shown in the right most column of the table. Values failing to meet the index limits are presented in italics. The anomalous values of 6.821 and 12.489 were omitted from the averages.

Table 1 Long Range Index (LRI) and Short Range Index (SRI)

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Center	LWP	LRI (m/km)	*0.971*	*1.032*	*1.001*	*1.005*	*0.999*	***1.002***
		SRI (m/km)	0.643	*0.878*	0.726	0.740	0.677	**0.733**
	RWP	LRI (m/km)	*0.834*	*0.904*	*0.833*	*0.902*	*0.841*	***0.863***
		SRI (m/km)	0.347	0.630	0.349	0.554	0.349	**0.446**
Left Shift	LWP	LRI (m/km)	*1.077*	*1.072*	*1.072*	*1.101*	*1.104*	***1.085***
		SRI (m/km)	*0.977*	*1.004*	*1.065*	*0.937*	*1.025*	***1.002***
	RWP	LRI (m/km)	0.781	*0.940*	*0.932*	*0.824*	*0.886*	***0.873***
		SRI (m/km)	0.272	0.346	0.370	0.268	0.353	**0.322**

Profiler Passes			Pass 1	Pass 2	Pass 3	Pass 4	Pass 5	Ave.
Right Shift	LWP	LRI (m/km)	*0.848*	*0.884*	*0.797*	*0.812*	*0.866*	***0.841***
		SRI (m/km)	0.441	0.358	0.438	0.422	0.308	**0.393**
	RWP	LRI (m/km)	*1.230*	*2.207*	*1.191*	*1.274*	~~*6.821*~~	***1.480***
		SRI (m/km)	0.639	*2.274*	*0.913*	0.674	~~*12.489*~~	***1.125***

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 LRI incorporates the pavement profile starting 25.8 m prior to the scale and ending 3.2 m after the scale in the direction of travel. The SRI incorporates a shorter section of pavement profile beginning 2.7 m prior to the WIM scale and ending 0.5 m after the scale.

There are 38 locations at which the WIM Index value of 0.789 m/km is exceeded as can be seen in the table. There are 33 values between 0.789 and 1.240 m/km. Additionally 5 locations exceed a value of 1.240 m/km. When all values are less than 0.789 it is presumed unlikely that pavement conditions will significantly influence sensor output. When values are between 0.789 and 1.240 m/km pavement condition may influence sensor output. Values above 1.240 m/km as considered an indicator that pavement remediation of some type may be required. Based on the profile data analysis, the Delaware SPS-1 WIM Site does not strictly meet the requirements for WIM site locations since most of the average LRI and SRI values for the pavement site are higher than the index threshold for no expected pavement effects. The more extreme values are at the lane lines, particular along the shoulder. Unless this is the typical truck path through the section, it should have no significant impact on the results reported by the equipment. The values that exceed the no effects threshold are on the left hand side of the lane. There was no observable impact on vehicles indicating a gross motion that would significantly influence reported weights. As the LRI is the predominant index failing this check, corrective action such as grinding would be of limited usefulness. It is recommended that no corrective action be taken to adjust pavement conditions.

6 Distress survey and any applicable photos

The pavement condition is good for the Delaware 0100 site with little or no distresses. However, there is a slight drop where Asphalt Concrete pavement changes to Cement Concrete pavement 47 feet 9 inches before the WIM sensors. This slight drop did not significantly alter the dynamics of the trucks over the WIM site. Figure 13-1 shows the condition of the pavement. Figure 13-2 shows transition from asphalt concrete pavement to cement concrete pavement.

7 Vehicle-pavement interaction discussion

The presence of the scale is not significantly affecting the movement and/or speed of the trucks crossing the scale. From the visual survey it shows that most of the trucks were traveling in the wheel path. Daylight is not visible between the tires and the sensors indicating that the tires were fully touching the sensors.

8 Speed data with speed range recommendations for evaluation

Based on the data collected on site the 15th and 85th percentile speeds for Class 9s are 56 and 63 respectively. The lower end of the range exceeds the posted speed limit of 55 mph. This range does not vary significantly for other truck classes. Since all speeds exceed the speed limit the recommended speed for the evaluation are 45, 50, and 55 mph. Due to the low volumes on this route this is not likely to impact traffic operations.

Measurements of speeds on-site indicated that the equipment is currently measuring speeds with a bias of nearly a mile per hour greater than a radar gun and an associated standard deviation of over 2.6 mph.

The review of drive axle spacings for Class 9 vehicles indicates that this is not affecting those measurements of length.

9 Traffic Data review: Overall Quantity and Sufficiency

As of October 29, 2003 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP's precision requirements. The precision requirements are shown in Table 3. Review of the data indicates that no information is available on the precision or bias of the weight data.

Table 2 Precision and Bias Requirements for Weight Data

Pooled Fund Site	95 Percent Confidence Limit of Error
Single Axles	± 20 percent
Axle groups	± 15 percent
Gross Vehicle Weight	± 10 percent
Vehicle Speed	±1 mph (2 kph)
Axle Spacing	± 0.5 ft (150 mm)

The amount and coverage for the site is shown in Table 3. This data has not been submitted to LTPP but was provided by the agency for purposes of this assessment.

Table 3 Amount of Traffic Data Available

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
2003	4	1	Weekdays and weekends	7	1	Weekdays and weekends

To evaluate the consistency of the existing data and determine its probable quality a series of reports and graphs have been generated. They typically include the SPS Summary report, vehicle distribution graphs, ESAL graphs, average daily steering axle weights for Class 9 vehicles, and GVW distributions both over all years and by month within years.

Data that has validation information available is reviewed in light of the patterns present in the two weeks immediately following the validation/calibration activity. A determination of research quality data is based on the consistency with the validation pattern. Data which 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 being considered research quality.

There is no validation data for this site and therefore a more limited group of graphs has been created to obtain maximum use of limited data provided.

9.1 SPS Summary Report

Due to insufficient data, generating the SPS Summary report for this site was not feasible.

9.2 Vehicle Distribution

The vehicle distribution graphs indicate whether the fleet mix is stable over time and any day of week or seasonal patterns that may exist. Figure 14-1 shows the observed by day of week pattern for classification data. The individual days show essentially the same mix to the fleet. It was not possible to identify any seasonal variation in truck patterns from the data provided.

9.3 ESALs per year

Average ESALs for Class 9 vehicles are a very crude method of identifying loading shifts. Due to the limited amount of data, no ESAL graph was generated.

9.4 Average Daily Steering Axle Weight

A frequently used statistic for checking scale calibration and doing auto-calibration of WIM equipment is the weight of the front axle. This value is site specific and should be relatively constant particularly for loaded Class 9s (vehicles in excess of 60,000 lbs.). Typically when auto-calibration is used this value either cycles repeatedly or with very large truck volumes results in an essentially straight line for the mean. As shown in Figure 14-2, there exists data only for October 2003 and the data shows a drastic change in weights. To further investigate this, a single axle graph was created. In Figure 14-3, the Friday line is the last day with a rational average weight for the Class 9 steering axle in spite of the very flat distribution. The equipment is clearly not correctly reporting weight data.

9.5 GVW Distributions for Class 9s

The Class 9 GVW graph is a generally accepted way to evaluate loading data reported at a site. A typical graph is has two peaks, one between 28,000 and 36,000 pounds and the other between 72,000 and 80,000 pounds. The first is the unloaded peak. The second, the loaded peak reflects the legal weight limit for a 5-axle tractor-trailer vehicle. Additionally, it is expected that less than 3 percent of the trucks will be excessively light (less than 12,000 pounds) and less than 5 percent will be significantly overweight (in excess of 96,000 pounds). Data that falls outside of the expected conditions needs a record of validation to verify that the pattern is in fact correct for the location. Data

meeting the expected patterns is not automatically considered to be of research quality, merely rational as bias in scale measurements may shift the peaks in the data from their true values.

The overall assessment of loading patterns is done using a Class 9 GVW graph by year over the available years. In this case, a monthly graph was all that was feasible. This graph is show in Figure 14-4 the typical pattern is shown in the gray line with Xs. This reinforces the indications of the steering axle graph that the equipment is failing to correctly report weights. A graph by day of week was also produced to see if the expected pattern was present for the Friday data provided. As can be seen in Figure 14-5 it was not.

10 Updated handout guide and Sheet 17

A copy of the handout has been included following page 13. It includes a current Sheet 17 with all applicable maps and photographs. The following information has changed since the handout guide was prepared: The evaluation truck route was mapped, and GPS locations for truck turnarounds and site location have been added to existing maps.

11 Updated Sheet 18

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

12 Traffic Sheet 16(s) (Classification Verification only)

A Sheet 16 has been prepared to record the visit, however all of the computations should be considered approximate due to the inability to conclusively match the video information to the downloaded data.

13 Distress Photographs

Figure 13-1 Pavement condition of Delaware 0100 at the sensors

Figure 13-2 Transition of asphalt concrete pavement to cement concrete pavement

14 Traffic Graphs

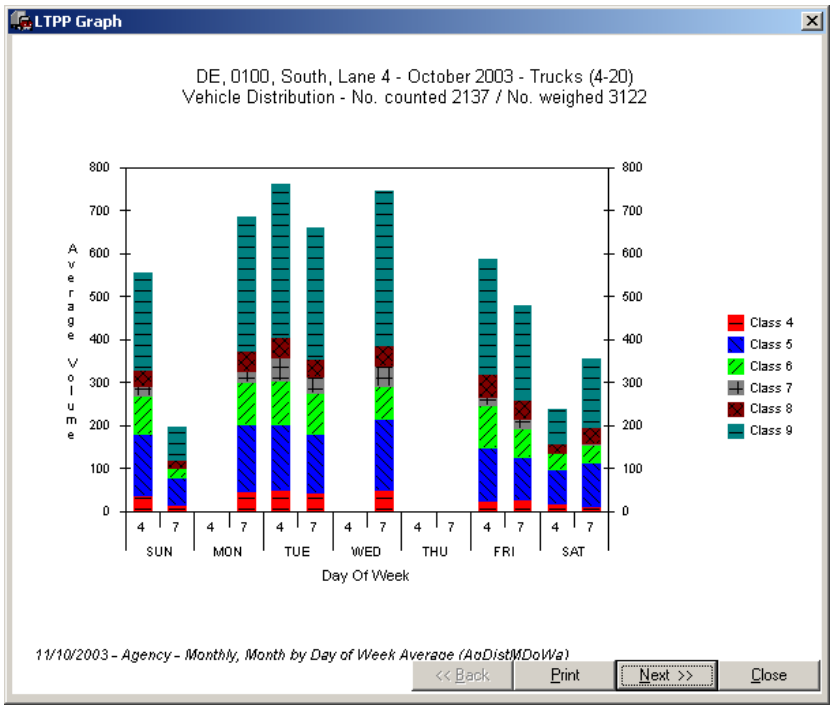


Figure 14-1 Vehicle Distribution by day of week - 100100

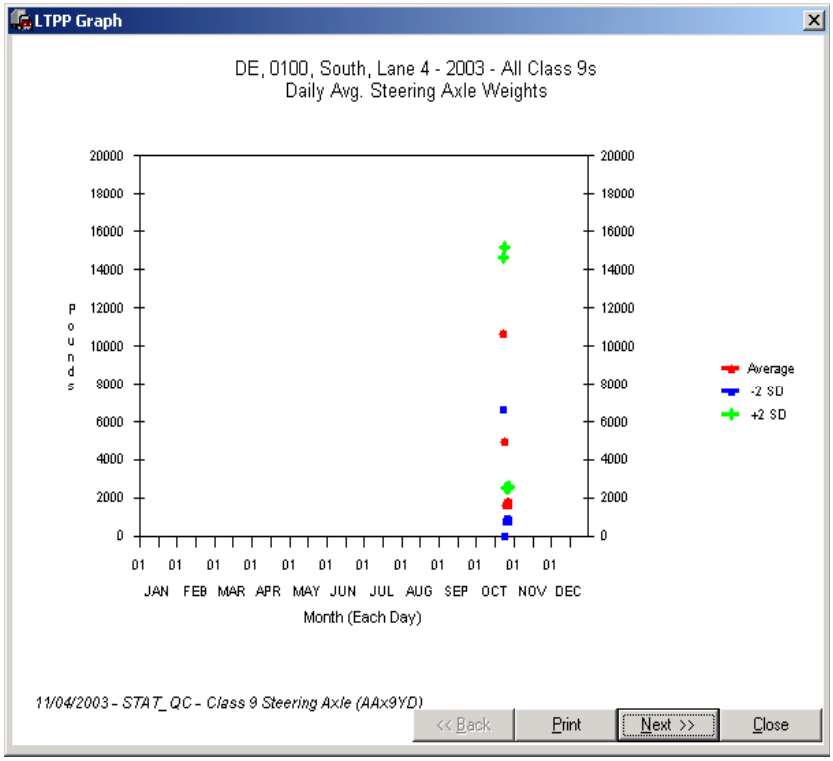


Figure 14-2 Average Daily Class 9 Steering Axle Weight - 2003 – 100100

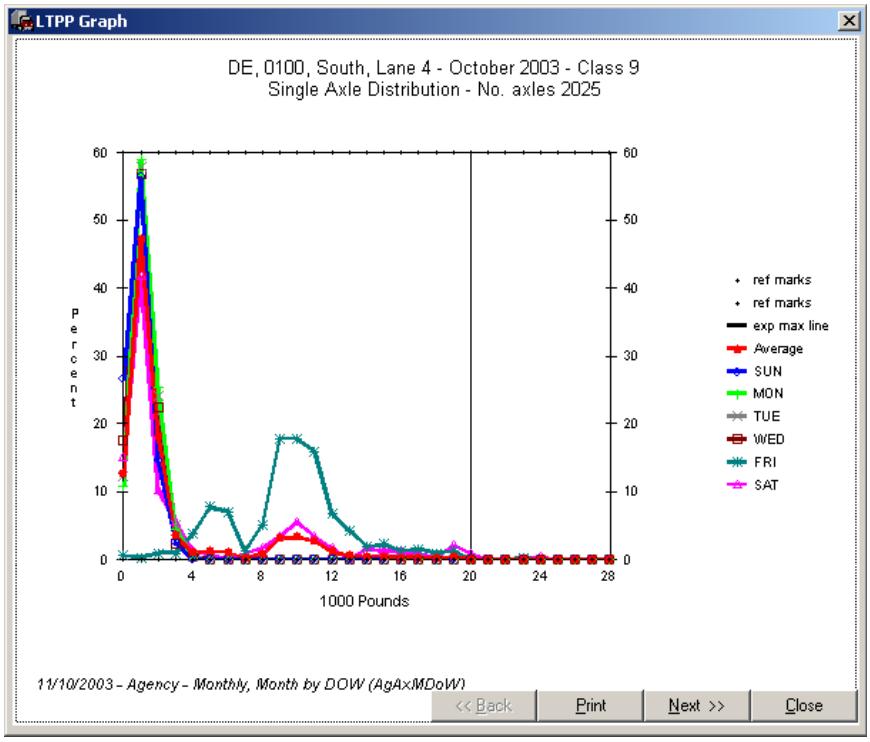


Figure 14-3 Single axle distributions by day of Week for Class 9s - 100100

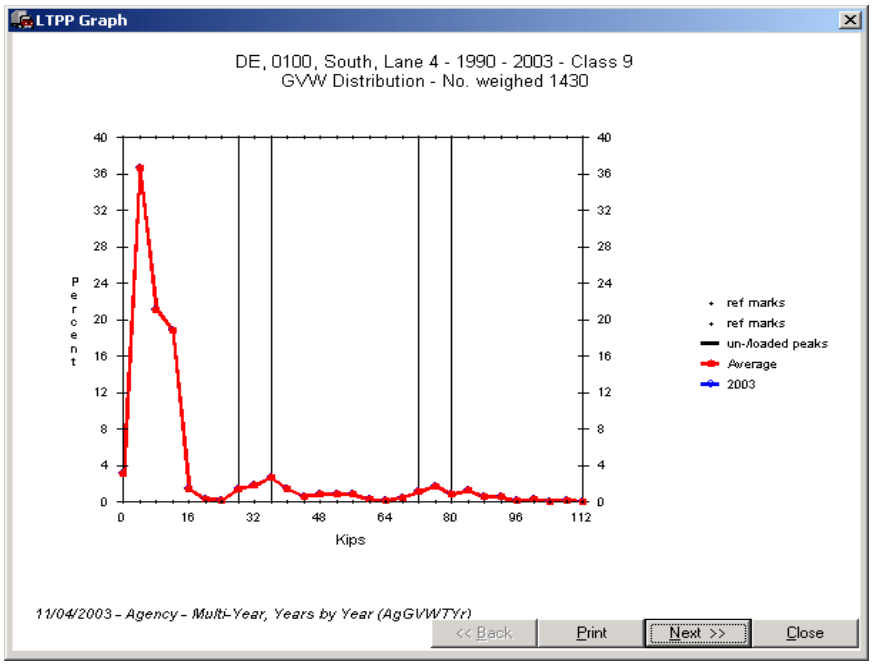


Figure 14-4 Class 9 GVW Distribution - 2003 - 100100

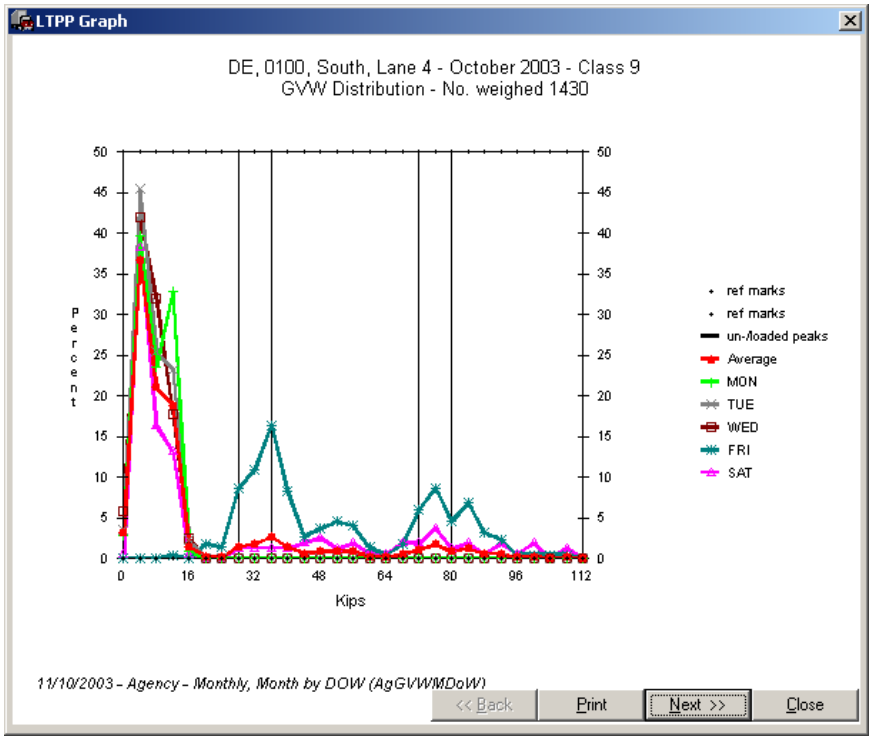


Figure 14-5 Class 9 GVW distribution by day of week - 100100

HANDOUT GUIDE FOR SPS WIM ASSESSMENT

STATE: Delaware

SHRP ID: 0100

Figures

1. General Information

SITE ID: *100100*

LOCATION: *US 113 SB (Mile Post: 25.04) (North of SR 579, Ellendale)*

VISIT DATE: *October 28, 2003*

VISIT TYPE: *Assessment*

2. Contact Information

POINTS OF CONTACT:

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

Highway Agency: *Mike Somers, 302-659-2024, msomers@mail.dot.state.de.us*
Tyrone Crittenden, 302-760-2162, tcrittenden@mail.dot.state.de.us

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

FHWA Division Office Liaison: *Paul Lang, 302-734-2835, paul.j.lang@fhwa.dot.gov*

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

3. Agenda

BRIEFING DATE: *October 28, 2003 at 8:30 a.m. at 800 Bay Road, Dover, DE 19901*

ON SITE PERIOD: *October 28, 2003*

TRUCK ROUTE CHECK: *Done (See Route Map)*

4. Site Location/ Directions

NEAREST AIRPORT: *Philadelphia International Airport, Philadelphia, PA*

DIRECTIONS TO THE SITE: *Near Intersection of US 113 and SR 579*

MEETING LOCATION: *State of Delaware Highway Maintenance Shop, 14 Sign Shop Road, Dover, DE 19901- Contact Tom Hrupsa 302-222-5931. October 28, 2003 at 8:00 a.m.*

WIM SITE LOCATION: *On US 113 Southbound just North of SR 579*

WIM SITE LOCATION MAP: *See Figure 4.1*

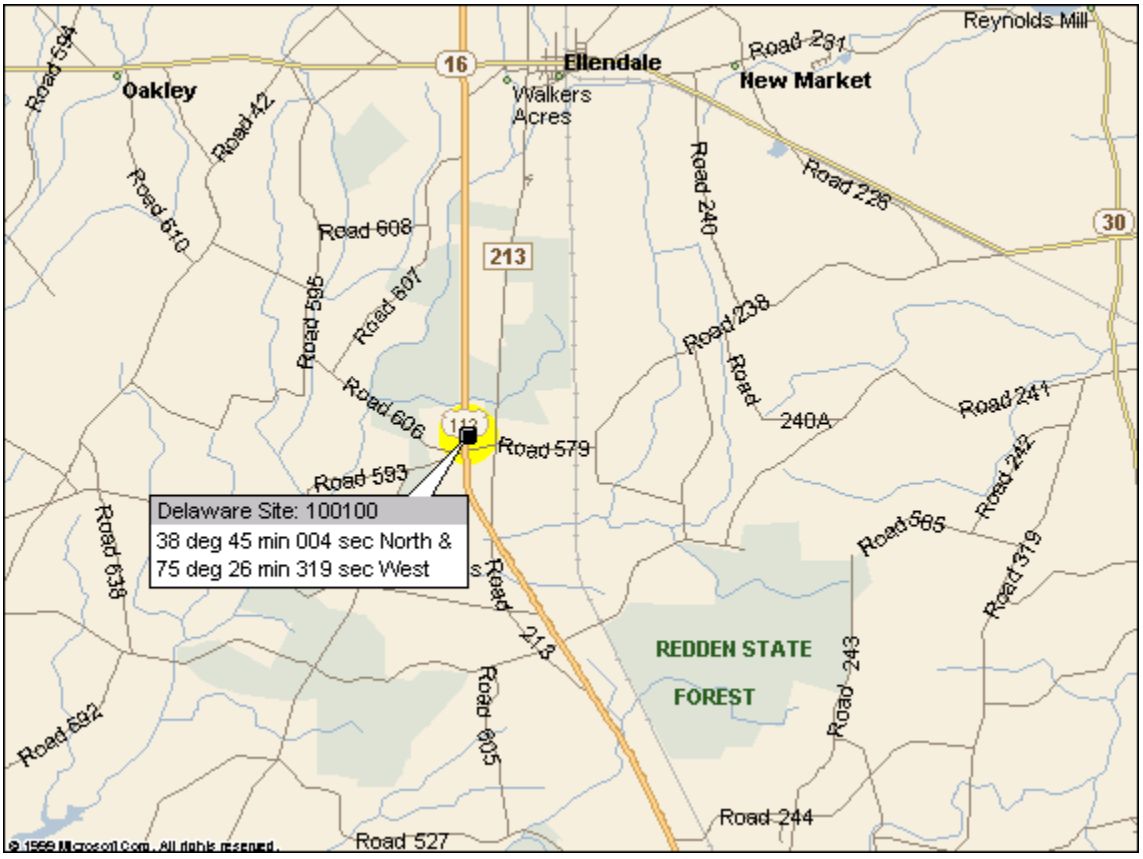


Figure 4.1: Section 100100 near Ellendale, Delaware

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *Delaware DOT Weigh Station on Route 13, in Smyrna, Delaware (35 miles North of Ellendale)*

TRUCK ROUTE:

- 0.660 miles to Southbound turn around (38^0 45’ 258’’ North and 75^0 26’ 175’’ West)
- 1.376 miles slow turn around to go Northbound or
- 1.813 miles high speed turn around past WIM to go Northbound (38^0 46’ 799’’ North and 75^0 26’ 311’’ West)

6. Sheet 17 – Delaware (100100)

1.* ROUTE ___US113____ MILEPOST __25.04__ LTPP DIRECTION - N S E W

2.* WIM SITE DESCRIPTION - Grade ___< 1_____ % Sag vertical Y / N
Nearest SPS section upstream of the site __0_ _1__ _0__ _4__
Distance from sensor to nearest upstream SPS Section ___1 _2__ _6__ ___ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2__ Lane width _1_ _2_ ft

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

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

Shoulder width _1__ _2__ ft

4.* PAVEMENT TYPE _____Cement Concrete_____

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date 10-28-03_____Distress ~~Map Filename~~ Photo
Pave_Cond_1_TO_1_DE0100_10_28_03.jpg_____
Date _____10-28-03_____Distress ~~Map Filename~~ Photo
Pave_Cond_2_TO_1_DE0100_10_28_03.jpg _____
Date _____10-28-03_____ Distress ~~Map Filename~~ Photo
Pave_Cond_3_TO_1_DE0100_10_28_03.jpg _____

6. * SENSOR SEQUENCE _____Piezo-Loop-Piezo___

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

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

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

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

10. * CABINET LOCATION

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

Distance from edge of traveled lane _5_ _0_ ft

Distance from system __ _5 _0 ft

TYPE _____

CABINET ACCESS controlled by LTPP / STATE / JOINT?

Contact - name and phone number ___Tom Hrupsa 302-222-5931____

Alternate - name and phone number _____Mike Sommers 302-659-2024_____

11. * POWER

Distance to cabinet from drop __6_ _1__ _5__ ft Overhead / underground / solar / AC in cabinet?

Service provider _____Del Electric Co-op_____Phone number

_____

12. * TELEPHONE

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

Service provider _Verizon(302-856-5666)_____ Phone Number

_____

13.* SYSTEM (software & version no.)- _____ADR 3000_____

Computer connection – RS232 / Parallel port / USB / Other

_____

14. * TEST TRUCK TURNAROUND time __~6_____ minutes

DISTANCE ~ 5 ___ mi.

15. PHOTOS FILENAME

Power source __Power_Source_TO_1_DE0100_10_28_03.jpg_____

Phone source Phone_Pedestal_TO_1_DE0100_10_28_03.jpg _____

Cabinet exterior Cabinet_Exterior_TO_1_DE0100_10_28_03.jpg

Cabinet interior Cabinet_Interior_TO_1_DE0100_10_28_03.jpg

Weight sensors Sensor_Location_1_TO_1_DE0100_10_28_03.jpg

Classification sensors Sensor_Location_2_TO_1_DE0100_10_28_03.jpg

Other sensors _____

Description _____

Downstream direction at sensors on LTPP lane __

Pave_Cond_3_TO_1_DE0100_10_28_03.jpg _____

Upstream direction at sensors on LTPP lane __

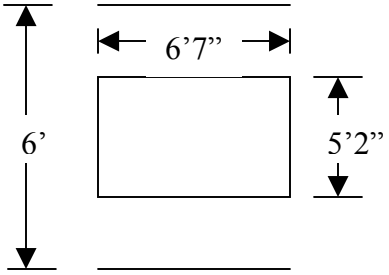
Pave_Cond_1_TO_1_DE0100_10_28_03.jpg _____

COMMENTS ____78’6” End of 104 to Concrete_____

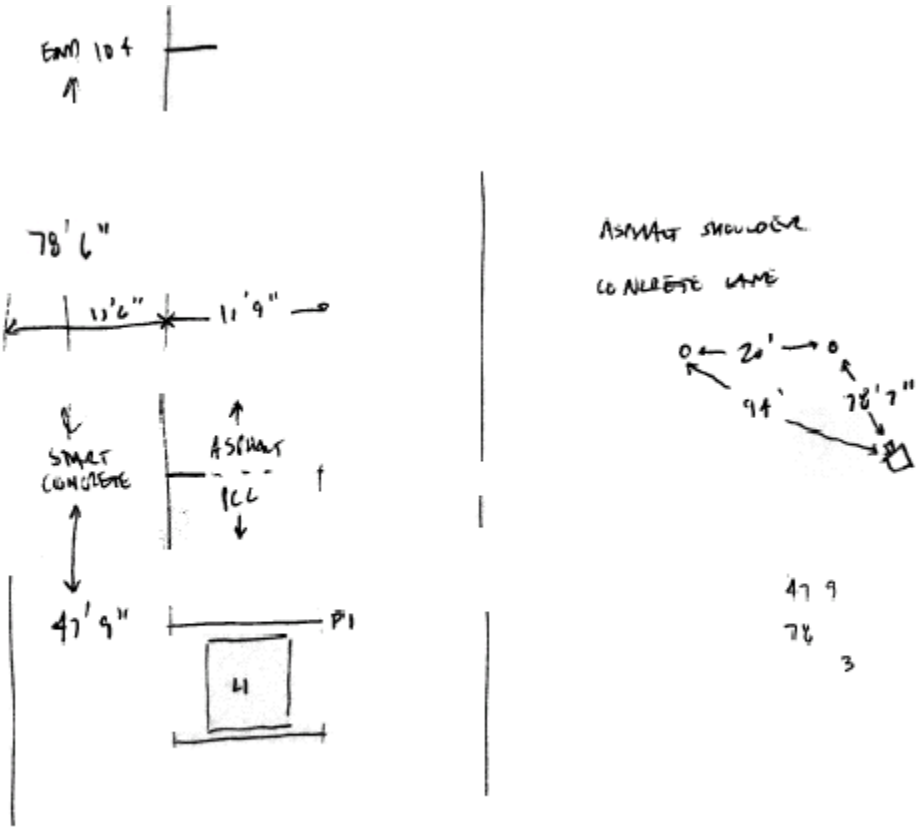
COMPLETED BY _____Charlie Copeland_____

PHONE _301-210-5105_____ DATE COMPLETED _1_ _0_ /_2_ _8_ / 2__ _0_ _0_ _3_

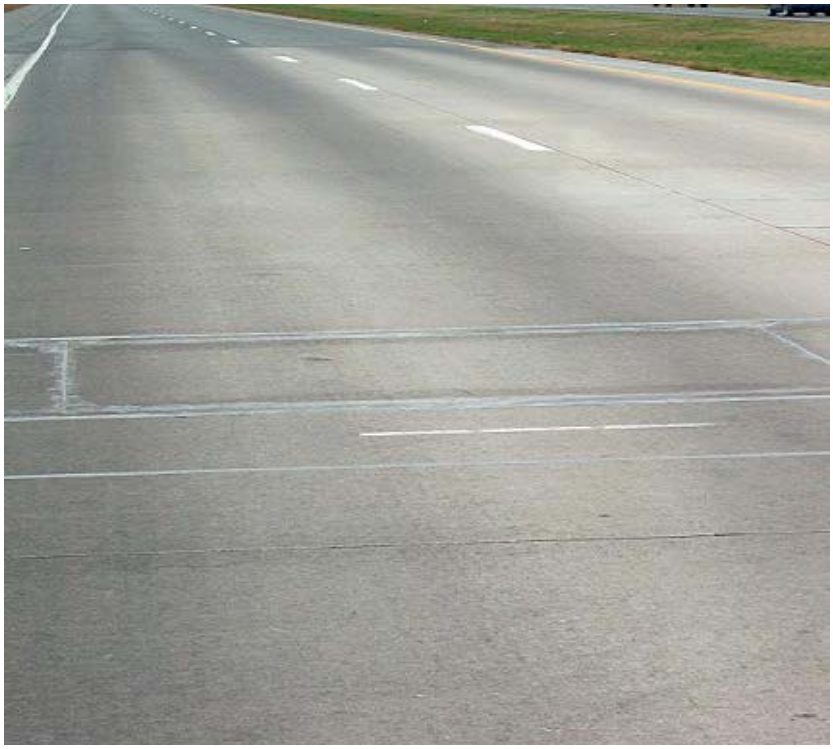
Sketch of equipment layout



Site Map



Pave_Cond_1_TO_1_DE0100_10_28_03.jpg



Pave_Cond_2_TO_1_DE0100_10_28_03.jpg

Pave_Cond_3_TO_1_DE0100_10_28_03.jpg

Power_Source_TO_1_DE0100_10_28_03.jpg

Phone_Pedestal_TO_1_DE0100_10_28_03.jpg

Cabinet_Exterior_TO_1_DE0100_10_28_03.jpg

Cabinet_Interior_TO_1_DE0100_10_28_03.jpg

Sensor_Location_1_TO_1_DE0100_10_28_03.jpg

Sensor_Location_2_TO_1_DE0100_10_28_03.jpg

Pave_Cond_3_TO_1_DE0100_10_28_03.jpg (downstream view)

Pave_Cond_1_TO_1_DE0100_10_28_03.jpg (upstream view)

WIM SITE COORDINATION

SPS Project_ID 0100

1. Equipment –
   - Maintenance – contract with purchase / separate contract LTPP / separate contract State / state personnel
     Contact Tyrone Crittenden – (302) 760-2162

   - 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 _____ 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)
     Smyrna Weigh station, Smyrna, DE (enforcement)

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

WIM SITE COORDINATION SPS Project_ID 0100

- Pre-visit data
  - Classification and speed: Contact Fred Hanks (302) 760-2622
  --Typical operating conditions (congestion, high truck volumes)
  Contact Fred Hanks (302) 760-2622
  -- Equipment operational status: Contact Tom Hrupsa (302) 739-4366

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

- State personnel required on site Y / N
Contact information Tyrone Crittenden – (302) 760-2162

- Enforcement Coordination required Y / N
Contact information _____

- Traffic Control Required Y/ N
Contact information _____

- Maximum number of personnel on site ___;
  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 _____ 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 _____

WIM SITE COORDINATION SPS Project_ID 0100

Drivers State / LTPP
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 Fred Hanks (302) 760-2622
  -- Equipment operational status: Contact Tom Hrupsa (302) 739-4366

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

- State personnel required on site Y / N
Contact information Tyrone Crittenden – (302) 760-2162

- 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

WIM SITE COORDINATION SPS Project_ID 0100

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

- 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 [8_0 _9_ 5__] *STATE CODE [_1 0__] *SHRP SECTION ID [_0 _1 _0 _0]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [1 _0 / _2 _8 / _2 _0 _0 _3]

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

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

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

5. EQUIPMENT MANUFACTURER _Peek ADR 3000_____

WIM SYSTEM CALIBRATION SPECIFICS**

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

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

   __ __ __ PASSES PER TRUCK

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

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

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

9. DEFINE THE SPEED RANGES USED (MPH) _____ _____ _____ _____ _____ _____ _____ _____
   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

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

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

CLASSIFIER TEST SPECIFICS***

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

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

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
   *** FHWA CLASS 9 ____ ____ __3__ FHWA CLASS ____ ____ ____ ____ ____
   *** FHWA CLASS 8 ____ ____ __1__ FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   FHWA CLASS ____ ____ ____ ____ ____
   *** PERCENT "UNCLASSIFIED" VEHICLES: ____ _0___ . _0___

PERSON LEADING CALIBRATION EFFORT: ____Dean Wolf_____
CONTACT INFORMATION: ___DJWolf@mactec.com_____ rev. November 9, 1999