SUMMARY FOR 1996 LTPP TRAFFIC DATA COLLECTION

Annual Summary

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by

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1.0 INTRODUCTION

In 1996 the Research Unit continued to collect traffic data for the Long Term Pavement Performance Program, hereinafter referred to as the LTPP program. The LTPP program is essentially comprised of on-site computers that apply collected data to an algorithm in order to classify vehicle traffic on a given segment of the highway. Due to various equipment problems, on-line time was reduced from 90% in 1995 to about 86% in 1996. The system would shut down due to power surges and could only be reactivated by manually resetting the system on site. However, due to budget cuts, no extra effort was made to reset or repair equipment malfunctions.

Traffic data was collected by two different systems, the Automatic Vehicle Classifier (AVC and the Weigh in Motion (WIM). Classification data taken by the AVC and the WIM equipment was very similar with only one or two exceptions. For example, a three-axle bus pulling a trailer or a travel home pulling a car would be registered as a Class 11 (semi-truck). Appendix A contains a classification table based on numbers of axles and weight. Overall, traffic data collected was determined to be 90 percent accurate.

2.0 CLASSIFICATION DATA COLLECTION

In 1996, all 11 sites were in operation for the entire year. For most of the data collecting sites, data collection went well with few or no problems. Five sites produced data files 98 percent of the time while an additional four sites were on-line at least 90 percent of the year. LaGrande East, site 415006 was the main problem site. In addition to the standard problems, equipment problems included a dead backup battery in January and an unequal piezo sensor output (see Table 2.1).

Table 2.1: Days On-Line For AVC And WIM Combined.

GPS #	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	%
412002	30	28	31	29	30	30	31	31	30	28	29	30	361	98.9
415005	30	20	28	25	27	23	0	0	0	10	21	29	260	71.2
415006	31	19	19	23	0	19	29	17	0	4	11	0	209	57.3
415008	31	29	31	25	31	30	30	31	30	21	30	31	348	95.3
415021	31	29	30	30	30	15	30	30	28	31	30	31	361	98.9
415022	31	28	30	30	29	29	30	30	30	31	30	29	340	93.2
416011	31	28	28	27	31	29	29	27	29	24	24	3	340	93.2
417018	25	28	30	29	30	29	31	29	30	31	30	31	330	90.4
417019	31	29	30	30	31	28	30	30	30	31	29	31	359	98.4
417025	31	29	22	30	31	29	31	31	26	30	30	31	360	98.6
417081	31	28	31	29	17	30	31	31	30	31	13	27	359	98.4
TOTAL	333	295	310	307	287	291	302	287	263	272	277	273		86.9
%	81.6	77.8	83.3	88.2	84.1	84.7	72.6	75.6	81.4	90.6	86.0	87.7		

In order to produce a continuous classification record, classification files produced by the WIM equipment were saved. These were then combined with the AVC files to give a complete monthly classification record. Since both the AVC and the WIM controllers use the same algorithm, both systems produced similar classifications. The classifications were then verified by visual observations (see Table 2.2).

Table 2.2: Classification Percent Accuracy.

SITE NAME	GPS #	AVC	WIM
SUNSET	412002	99	99
ALBANY, S	415005	75	75
LAGRANDE, E	415006	97	97
LAGRANDE, W	415008	100	98
COTTAGE GROVE, N	415021	98	98
COTTAGE GROVE, S	415022	99	98
LAKE CREEK	416011	99	99
ALBANY, N	417018	96	91
WHITE CITY	417019	96	94
RICE HILL	417025	100	100
HERMISTON	417081	100	99
	TOTAL	97.5	97.0

3.0 WEIGH-IN-MOTION ACCURACY

Although the WIM and the AVC produce nearly the same classification files, the final TMG7 files can be different. One reason is that the WIM equipment can be programmed to discriminate classifications based on single axle or total weights. Therefore, vehicles with unusually low axle weights are not recorded as trucks and are tagged as invalid records. Alternatively, the AVC100's can only classify based on the number of axles and the spacing between axles. Thus, RV's towing a small car get wrongly classified as a four-axle truck (Oregon #8). The WIM record for the Oregon #8 classification is more accurate.

The TMG7 volumes produced by the WIM equipment will generally be less than those generated by the AVC controller. The difference is reflected in the percent of recorded invalid records. This variable is produced by the vendors software and is being monitored at each WIM setup. Invalid records are a function of the traffic volume and the pavement condition. The main invalid code indicates an imbalance of more than 40% between the left and right axles. While some of this error is due to lane changing, most is caused by different outputs from the two piezo sensors for the same load. Four of the GPS sites have errors greater than 20%, while the remainders have 10% or less (see Table 3.1).

The invalid records percent increased to a critical rate at two sites when compared to figures from 1995. This indicates failed piezo sensors. The rate at the Albany south site (415005) increased from 35 percent in 1995 to 65 percent in 1996. The LaGrande east site (415006) also had a large increase from 4.8 to 82.6 percent.

Table 3.1: WIM Accuracy 1996 Winter Session

SITE NAME	GPS#	DATE	INVALID PERCENT	PAVEMENT CONDITION	AADT
LAKE CREEK	416011	Nov-95	24.2	EX	30,000
HERMISTON	417081	Oct-95	2.9	EX	5,600
COT.GROV.N	415021	Nov-95	3.9	GOOD	30,000
LAGRANDE.E	415006	Oct-95	84.6	FAIR	7,600
LAGRANDE.W	415008	Oct-95	6.1	FAIR	8,300
SUNSET	412002	Oct-95	6.7	EX	15,000
COT.GROV.S	415022	Nov-95	7.7	GOOD	33,000
WHITE CITY	417019	Dec-95	17.6	POOR	15,000
RICE HILL	417025	Dec-95	33.1	POOR	18,000
ALBANY.N	417018	Nov-95	24.4	POOR	49,000
ALBANY.S	415005	Sep-95	64.5	FAIR	36,000

4.0 SEASONAL WEIGH-IN-MOTION

Weigh-in-motion data was collected seasonally based on calendar quarters. ODOT's goal was to obtain a minimum of seven days worth of data at each site for each season/quarter. In 1996, however, ODOT's data collection effort was sporadic at best. Some sessions ran for almost three weeks while others were only a few days. Despite this, ODOT met the set goal at 33 out of the 44 possible setups, or about 75% of the time (see Table 4.1).

Additional problems were encountered at the Albany south site, 415005. This site had piezo sensor problems. ODOT installed an amplifier to boost the signal from the piezo sensors. However, this did not solve the problem. Signals from the sensors at this site were found non-linear. The lead axle may be right but then the trailing axles signal diminish out of proportion. The WIM data collected in December had a very high percentage of invalid records and was not submitted to the SHRP consultant.

Table 4.1: WIM Traffic Data Collection 1996

WEIGH-IN-MOTION TRAFFIC DATA COLLECTION 1996					
SITE NAME	GPS #	JAN-MAR	APR-JUN	JUL-SEP	OCT-DEC
SUNSET	412002	9	10	12	17
ALBANY, S	415005	0	0	8	0
LAGRANDE, E	415006	20	13	15	14
LAGRANDE,W	415008	20	13	15	20
COTTAGE GROVE, N	415021	10	13	4	15
COTTAGE GROVE, S	415022	10	13	4	15
LAKE CREEK	416011	17	11	14	3
ALBANY,N	417018	8	19	14	12
WHITE CITY	417019	6	13	18	0
RICE HILL	417025	6	13	18	0
HERMISTON	417081	12	12	112	2

APPENDIX A

Vehicle Classification Records

1. General Comments

Vehicle classification data collected at truck weigh sites are necessary to expand the truck weight information to the distribution of the various types of trucks in the traffic stream. The FHWA vehicle classification categories are discussed in Section 4 and the definitions are repeated here as a reference for the vehicle classification record format immediately following them.

Type Name and Description

1. Motorcycles (Optional)--All two- or three- wheeled motorized vehicles. Typical vehicles in this category have saddle-type seats and are steered by handle bars rather than a wheel this category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles. This vehicle type maybe reported at the option of the State.

2. Passenger Cars--All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.

3. Other Two-Axle, Four-Tire Single Unit Vehicles--All two-axle, four-tire vehicles, other than passenger cars. Included in this classification are pickups, panels, vans and other vehicles such as campers, motor homes, ambulances, hearses, and carryalls. Other two-axle, four-tire single unit vehicles pulling recreational or other light trailers are included in this classification.

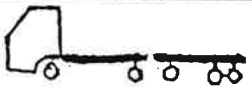
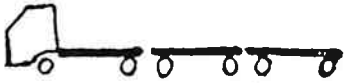
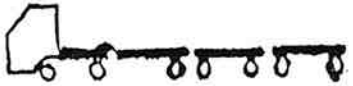
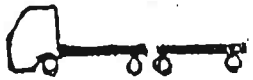
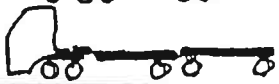
4. Buses--All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. All two-axle, four-tire minibuses should be classified as other two-axle, four-tire single unit vehicles. Modified buses should be considered to be a truck and be appropriately classified.

Note: In reporting information on trucks the following criteria should be used:

a. Truck tractor units traveling without a trailer will be considered single unit trucks.

b. A truck tractor unit pulling other such units in a "saddle mount" configuration will be considered as one single unit truck and will be defined only by the axles on the pulling unit.

c. Vehicles shall be defined by the number of axles in contact with the roadway. Therefore, "floating" axles are counted only when in the down position.

Vehicle Type			Vehicle Type		
1. 		Cars	13. 	(2-3)	Other 5 Axle Combinations
		Panels		(3-2)	
		Pickups	14. 	(3-S1-2)	6 Axle Combinations
2. 		Light Vehicles w/Trailers	15. 	(2-2-2)	
3. 		2 Axle, Single Units		(2-SI-3)	
4. 		2 Axle Buses	16. 	(2-S1-2-2)	Triples
5. 		3 Axle Singe Units	17. 	(3-S2-2)	Other 7 Axle Combinations
6. 	(2-S1)	3 Axle combinations		(2-2-3)	
7. 		3 Axle buses		(3-2-2)	
8. 	(2-S2)	4 Axle combinations	18. 	(3-S1-3)	8 Axle Combinations
	(2-2)			(3-S1-2-2)	
9. 	(3-S1)		19. 	(3-S2-2-3)	9 Axle or More Combinations
10. 		4 Axle Single Units		(2-S2-3-2)	
11. 	(3-S2)	5 Axle semis		(2-S2-3-2)	
12. 	(2-S1-2)	5 Axle twins			

SUMMARY LIST OF FHWA SCHEME "F"

Vehicle Classification (Bin Number)	Vehicle Type
F1	Motorcycles (Optional)
F2	Passenger Cars
F3	Other Two-axle, Four-tire, Single Unit Vehicles
F4	Buses
F5	Two-axle, Six-tire, Single Unit Trucks
F6	Three-axle, Single-unit Trucks
F7	Four-or-more-axle, Single-unit Trucks
F8	Four-or-less-axle, Single-trailer Trucks
F9	Five-axle, Single-trailer-Trucks
F10	Six-or-more-axle, Single trailer Trucks
F11	Five-or-less-axle, Multi -trailer Trucks
F12	Six-axle, Multi-trailer Trucks
F13	Seven-or-more-axle, Multi trailer Trucks

MODIFIED "F" SCHEME ADDITIONS * Not used by ODOT

F13 (M)	Seven-axle, Multi-trailer Trucks
F14 (M)	Eight-axle, Multi-trailer Trucks
F15 (M)	Nine-or-more-axle, Multi-trailer Trucks

LOOKUP TABLE FOR AVC
REVISED FEBRUARY 1990
KIPS
OREGON 19 BIN

* ESAL Equations
* L – Axle Load in

* Single = $1{,}239 \times 10^{-5} L^{3.905}$
* Dual = $1.623 \times 10^{-6} L^{3.865}$
* Tridem = $4.827 \times 10^{-7} L^{3.860}$

All measurements are in feet.

Tandem axle spacing is up to and including 8 feet.
Tridem axle spacing is up to and including 12 feet.

DESCRIPTION	CLASS	AXLES	ALGORITHM
Light Vehicles (Cars, Vans, Pickups)	1	2	(A1 – A2)<=12
Light Vehicles with Trailers	2	3 4	(A1 – A2)<=12, 8<(A2 – A3)<=18 (A1 – A2)<=9 (A2 – A3)>8, (A3 – A4)<3.9
Single Unit	3	2	12<(A1 – A2)<=20
Buses	4	2	(A1 – A2)>20
Single Unit	5	3	7<(A1 – A2)<=20, (A2 – A3)<=8
Combinations (2-S1)	6	3	Not Classed Elsewhere
Buses	7	3	(A1 – A2)>20, (A2 – A3)<=8
Combinations (2-S2, 2-2, 3-S1)	8	4	Not Classed Elsewhere (A3 – A4)>3.9
3-S1 Combination	9	4	(A1-A2)>7, (A2 – A3)<=8, (A3 – A4)>6
Single Unit	10	4	(A1 – A2)>7, (A2 – A3) + (A3 – A4)<=12
3-S2 Semi	11	5	(A2 - A3)<=8, (A4 – A5)<10.5
2-S1-2 Twins	12	5	(A2 – A3)>=8, (A3 – A4)<=15, (A5 –A5)>8
Combinations	13	5	Not Classified Elsewhere
3-S1-2 Combination	14	6	(A2 – A3)<=8, (A3 – A4)>15, (A4 – A5)>15, (A5 – A6)>15
Combinations	15	6	Not Classed Elsewhere
2-S1-2-2 Triples	16	7	(A2 – A3)>8, (A3 – A4)<=15 (A4 – A5)>8, (A5 – A6)<=15, (A6 – A7)>8
Combinations	17	7	Not Classed Elsewhere
Combinations	18	8	All
Combinations	19	9+	All

SHEET 7 LTPP TRAFFIC DATA VEHICLE CLASSIFICATION CONVERSION CHART	*STATE ASSIGNED ID [_ _ _ _ *STATE CODE [41] *SHRP SECTION ID [_ _ _ _]

FOR 4-BIN, 6-BIN, OR OTHER NON FHWA CLASSIFICATION SYSTEMS

USE THIS SHEET TO DESCRIBE HOW THE AGENCY'S CLASSIFICATION SYSTEM CAN BE CONVERTED TO THE FHWA 13-CLASSES, ENTER PERCENTAGE OF TOTAL SHA CLASS DISTRIBUTED TO EACH FHWA CLASS.

APPLICABLE SHA CLASSIFICATION SCHEME
FHWA CLASSES

SHA CLASS	1-3	2	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
1 A	100														
2 B	100														
3 C			100												
4 D		100													
5 E				100											
6 F						100									
7 G		100													
8 H						100									
9 I						100									
10J					100										
11K							100								
12L									100						
13M									100						
14N										100					
150								100							
16P											100				
17Q											100				
18R											100				
*19S											10				
T															

NAME OF PREPARER _____ PHONE # _____

DATE PREPARED _____